TITLE PAGE: VOLUME 1 OF 3

CROP GROUPING PETITION – LEAFY VEGETABLES, TECHNICAL AMENDMENT (ADDITION) TO 40 CFR 180.41 (c) AND 180.1 (g)

(Alexanders, leaves; Amaranth; Amaranth, bush greens; Amaranth, Chinese; Amaranth, slender; Amaranth, slim; Amaranth, spiny; Amaranth, spleen; Arugula; Aster, Indian; Beet, garden, leaves; Bellflower, Chinese, leaves; Blackjack; Blue ape, leaves; Broccoli raab; Broccoli, Chinese; Cabbage, Abyssinian; Cabbage, Seakale; Cassava, leaves; Cat's Whiskers; Cham-chwi; Cham-na-mul; Chayote, leaves; Chervil; Chicory, leaves; Chinese cabbage (bok choy); Chinese flat cabbage; Chipilin; Chrysanthemum, corn; Chrysanthemum, edible-leaved; Chrysanthemum, garland; Chrysanthemum, tricolor; Collards; Corn salad; Corn salad, Italian; Cosmos; Cress, American; Cress, Garden; Cress, Upland; Dandelion; Dock; Dol-nam-mul; Ebolo; Endive; Fameflower; Feather cockscomb; Fern, Black lady; Fern, Bracken; Fern, Broad buckler; Fern, Cinnamon; Ferns, Edible (Fiddleheads); Fern, Lady; Fern, Leather; Fern, Mother; Fern, Ostrich; Fern, Vegetable; Fern, Zenmai; Flowering white cabbage (choi sum); Good King Henry; Hanover salad; Huauzontle; Iceplant; Jute; Kabuna; Kale; Kale, branching bush; Kale, Jersey; Kale, marrow-stem; Lamb's lettuce; Lettuce, bitter; Lettuce, head; Lettuce, leaf; Lettuce, Romaine; Maca; Mizuna; Mustard greens; Mustard, field greens; Mustard, leaf; Mustard, big-stem; Mustard, tuberous rooted Chinese; Orach; Parsley, fresh; Parsley, Italian; Peppergrass; Plantain, buckhorn; Plantain, common; Primrose, English; Purple-stem mustard; Purslane, Garden; Purslane, Winter; Radish, leaves; Radish, Oil, leaves; Radish, Rat-tail, greens; Rampion, leaves; Rape greens; Rocket, wild; Rutabaga, greens; Salsify, black, leaves; Shepherd's purse; Sowthistle; Sowthistle, field; Spinach; Spinach, Malabar; Spinach, New Zealand; Sweet potato, leaves; Swiss chard; Tanier Spinach; Tanier, leaves; Taro, leaves; Turnip, greens; Ulluco, leaves; Velvet plant, leaves; Violet, Chinese; Watercress; Yam, leaves; Yam, Chinese, leaves; Yam, Greater, leaves; Yam, Lesser, leaves; Yam, Mapuey, leaves; Yam, White, leaves; Yam, Yellow, leaves)

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AUTHORS

William P. Barney and Tracey Switek

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RUTGERS UNIVERSITY
500 COLLEGE ROAD EAST, 201W
PRINCETON, NJ 08540

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TECHNICAL AMENDMENT (ADDITION):
40 CFR 180.41 (c)

IR-4 Project and the International Crop Grouping Consulting Committee (ICGCC) propose an amendment to 40 CFR 180.41 (c) (4) Crop Group 4, Leafy Vegetables.

PROPOSED AMENDMENT

Amend the existing crop group in 40 CFR 180.41 (c) (4) that consists of the following subgroups and 27 commodity entries:

Crop Subgroup 4A. Leafy greens subgroup:

1. Amaranth (leafy amaranth, Chinese spinach, tampala), *Amaranthus* spp.
2. Arugula (Roquette), *Eruca sativa*
3. Chervil, *Anthriscus cerefolium*
4. Chrysanthemum, Edible-leaved, *Chrysanthemum coronarium* var. *coronarium*
5. Chrysanthemum, Garland, *Chrysanthemum coronarium* var. *spatiosum*
6. Corn salad, *Valerianella locusta*
7. Cress, garden, *Lepidium sativum*
8. Cress, upland (yellow rocket, winter cress), *Barbarea vulgaris*
9. Dandelion, *Taraxacum officinale*
10. Dock (sorrel), *Rumex spp.*
11. Endive (escarole), *Cichorium endivia*
12. Lettuce, leaf and head, *Lactuca sativa*
13. Orach, *Atriplex hortensis*
14. Parsley, *Petroselinum crispum*
15. Purslane, Garden, *Portulaca oleracea*
16. Purslane, Winter, *Montia perfoliata*
17. Radicchio (red chicory), *Cichorium intybus*
18. Spinach, *Spinacia oleracea*
19. Spinach, New Zealand, *Tetragonia tetragonioides, T. expansa*
20. Spinach, Vine (Malabar spinach, Indian spinach, *Basella alba*

Crop Subgroup 4B. Leaf petioles subgroup:

21. Cardoon, *Cynara cardunculus*
22. Celery, *Apium graveolens* var. *dulce*
23. Celery, Chinese, *Apium graveolens* var. *secalinum*
24. Celtuce, *Lactuca sativa* var. *angustana*
25. Fennel, Florence (finochio), *Foeniculum vulgare* Azoricum Group
26. Rhubarb, *Rheum rhabarbarum*
27. Swiss chard, *Beta vulgaris* var. *cicla*

To an expanded crop group that consists of the following subgroups and commodity entries:

Crop Subgroup 4A. Leafy greens subgroup:

1. **Amaranth,** Amaranthaceae, *Amaranthus* spp.; including **Spiny amaranth,** *Amaranthus spinosus* L.; **Spleen amaranth,** *Amaranthus dubius* C. Mart. ex. Thell.; **Slim amaranth,** *Amaranthus hypochondriacus* L.; **Bush greens,** *Amaranthus cruentus* L.; **Slender amaranth,** *Amaranthus viridis* L.; **Amaranth, Chinese,** *Amaranthus tricolor* L.
2. **Aster, Indian,** Asteraceae, *Kalimeris indica* (L.) Sch. Bip.
3. **Blackjack,** Asteraceae, *Bidens pilosa* L.
4. **Cat's Whiskers,** Cleomaceae, *Cleome gynandra* L.
5. **Cham-chwi,** Asteraceae, *Doellingeria scabra* (Thunb.) Nees
6. **Cham-na-mul,** Apiaceae, *Pimpinella calycina* Maxim
7. **Chervil,** Apiaceae, *Anthriscus cerefolium* (L.) Hoffm.,
8. **Chipilin,** Fabaceae, *Crotalaria longirostrata* Hook & Arn.
9. **Chrysanthemum, corn,** *Glebionis segetum* (L.) Fourr. Including **Shungiku,** *Glebionis carinata* (Schousb.) Tzvelev
10. **Chrysanthemum, edible-leaved,** Asteraceae, *Glebionis* spp.
11. **Chrysanthemum, garland,** *Glebionis coronaria* (L.) Cass. ex Spach
12. **Chrysanthemum, tricolor,** *Glebionis carinata* (Schousb.) Tzvelev
13. **Corn salad,** Valerianaceae, *Valerianella* spp.; including **Lamb's lettuce,** *Valerianella locusta* (L.) and **Italian Corn salad,** *Valerianella eriocarpa* Desv.
14. **Cosmos,** Asteraceae, *Cosmos caudatus* Kunth
15. **Dandelion,** Asteraceae, *Taraxacum officinale* F.H. Wigg. aggr.
16. **Dock,** Polygonaceae, *Rumex patientia* L.
17. **Dol-nam-mul,** Crassulaceae, *Sedum sarmentosum* Bunge
18. **Ebolo,** Asteraceae, *Crassocephalum crepidioides* (Benth.) S. Moore
19. **Endive,** Asteraceae, *Cichorium endivia* L. ssp. *endivia*
20. **Fameflower,** Portulacaceae, *Talinum fruticosum* (L.) Juss.
21. **Feather cockscomb,** Amaranthaceae, *Glinus oppositifolius* (L.) Aug. DC.
22. **Ferns, Edible (Fiddleheads)**: Including: **Black lady fern,** Woodsiaceae, *Deparia japonica* (Thunb.) M. Kato; **Bracken fern,** Dennstaedtiaceae, *Pteridium aquilinum* (L.) Kuhn; **Broad buckler fern,** Dryopteridaceae, *Dryopteris dilatata* (Hoffm.) A. Gray; **Cinnamon fern,** Osmundaceae, *Osmundastrum cinnamomeum* (L.) C. Presl; **Lady fern,** Woodsiaceae, *Athyrium filix-femina* (L.) Roth ex Mert.; **Leather fern,** Pteridaceae, *Acrostichum aureum* L.; **Mother fern,** Woodsiaceae, *Diplazium proliferum* (Lam.) Thouars; **Ostrich fern,** Onocleaceae, *Matteuccia struthiopteris* (L.) Tod.; **Vegetable fern,** Woodsiaceae, *Diplazium esculentum* (Retz.) Sw.; **Zenmai fern,** Osmundaceae, *Osmunda japonica* Thunb. [all by crop definition]
23. **Good King Henry,** Chenopodiaceae, *Chenopodium bonus-henricus* L.
24. **Huauzontle,** Chenopodiaceae, *Chenopodium berlandieri* Moq.
25. **Iceplant,** Aizoaceae, *Mesembryanthemum crystallinum* L.
26. **Jute**, Tiliaceae, *Corchorus spp*.

27. **Lettuce, bitter,** Asteraceae, *Launaea cornuta* (Hochst. ex Oliv. & Hiern) C. Jeffrey
28. **Lettuce, head and leaf,** Asteraceae, *Lactuca sativa* L.; including: **Romaine lettuce,** *Lactuca sativa* var. *longifolia* Lam.; **Leaf lettuce,** *Lactuca sativa* var. *crispa* L. and **Lettuce, head,** *Lactuca sativa* var. *capitata* L.
29. **Orach,** Chenopodiaceae, *Atriplex hortensis* L.
30. **Parsley, fresh**, Apiaceae, *Petroselinum crispum* (Mill.) Nyman ex A.W. Hill; including **Italian Parsley,** *Petroselinum crispum* var. *neapolitanum* Danert
31. **Plantain,** Plantaginaceae, *Plantago* spp.; including **Buckhorn plantain,** *Plantago lanceolata* L. and **Common plantain,** *P. major* L.
32. **Primrose, English,** Primulaceae, *Primula vulgaris* Huds.
33. **Purslane, Garden,** Portulacaceae, *Portulaca oleracea* L.
34. **Purslane, Winter,** Portulacaceae, *Claytonia perfoliata* Donn ex Willd.
35. **Sowthistle,** Asteraceae, *Sonchus oleraceus* L. and including **Sowthistle, field,** *Sonchus brachyotus* DC.
36. **Spinach,** Chenopodiaceae, *Spinacia oleracea* L.
37. **Spinach, Malabar,** Basellaceae, *Basella alba* L.
38. **Spinach, New Zealand,** Aizoaceae, *Tetragonia tetragonioides* (Pall.) Kuntze
39. **Swiss chard,** Chenopodiaceae, *Beta vulgaris* L. subsp. *vulgaris*
40. **Tanier Spinach,** Araceae, *Xanthosoma brasiliense* (Desf.) Engl.
41. **Violet, Chinese,** Acanthaceae, *Asystasia gangetica* (L.) T. Anderson

Crop Subgroup 4B. Leafy *Brassica* greens subgroup:

1. **Arugula,** Brassicaceae , *Eruca sativa* Mill.
2. **Broccoli, Chinese,** Brassicaceae, *Brassica oleracea* var. *alboglabra* (L.H. Bailey) Musil
3. **Broccoli raab,** Brassicaceae , *Brassica ruvo* L.H. Bailey
4. **Cabbage, Abyssinian,** Brassicaceae, *Brassica carinata* A. Braun
5. **Cabbage, Seakale,** Brassicaceae, *Brassica oleracea* L. var. *costata* DC.
6. **Chinese cabbage (bok choy),** Brassicaceae , *Brassica rapa* subsp. *chinensis* (L.) Hanelt; including **Flowering white cabbage (choi sum),** Brassicaceae, *Brassica rapa* L. subsp. *chinensis* (L.) Hanelt var. *parachinensis* (L. H. Bailey) Hanelt; **Purple-stem mustard,** Brassicaceae, *Brassica rapa* L. subsp. *chinensis* (L.) Hanelt var. *purpuraria* (L. H. Bailey) Kitam. and **Chinese flat cabbage,** Brassicaceae, *Brassica rapa* L. subsp. *narinosa* (L. H. Bailey) Hanelt
7. **Collards,** Brassicaceae, *Brassica oleracea* var. *viridis* L.
8. **Cress, Garden,** Brassicaceae, *Lepidium sativum* L. including **Peppergrass,** Brassicaceae, *Lepidium virginicum* L.
9. **Cress, Upland,** Brassicaceae, *Barbarea vulgaris* W. T. Aiton including **American cress,** Brassicaceae**,** *Barbarea verna* (Mill.) Asch.
10. **Hanover salad,** Brassicaceae, *Brassica napus* var. *pabularia* (DC.) Rchb.
11. **Kale, common,** Brassicaceae, *Brassica oleracea* var. *sabellica* L.; including **Kale, branching bush,** Brassicaceae, *Brassica oleracea* L. var. *ramosa* DC.; **Kale, Jersey,** Brassicaceae, *Brassica oleracea* L. var. *palmifolia* DC. And **Kale, marrow-stem,** Brassicaceae, *Brassica oleracea* L. var. *medullosa* Thell.

12. **Maca,** Brassicaceae, *Lepidium meyenii* Walp.
13. **Mizuna,** Brassicaceae, Brassicaceae, *Brassica rapa* L. subsp. *nipposinica* (L. H. Bailey) Hanelt including **Kabuna**, Brassicaceae, *Brassica rapa* L. subsp. *nipposinica* (L. H. Bailey) Hanelt var. *perviridis* L. H. Bailey
14. **Mustard greens,** Brassicaceae, *Brassica juncea* subspp.; including **Leaf mustard,** Brassicaceae**,** *Brassica juncea* (L.) Czern. subsp. *integrifolia* (H. West) Thell. And **Big-stem mustard,** Brassicaceae**,** *Brassica juncea* (L.) Czern. subsp. *tsatsai* (T. L. Mao) Gladis
15. **Mustard, tuberous rooted Chinese,** Brassicaceae, *Brassica juncea* (L.) Czern. subsp. *napiformis* (Pailleux & Bois) Gladis
16. **Radish leaves,** Brassicaceae, *Raphanus sativus* L. var *sativus;* including **Rat-tail radish greens,** Brassicaceae, *Raphanus sativus* L. var. *mougri* H. W. J. Helm and **Oil radish greens,** Brassicaceae, *Raphanus sativus* L. var. *oleiformis* Pers.
17. **Rape greens,** Brassicaceae**,** *Brassica napus* L. var. *napus* including **Field mustard greens,** Brassicaceae, *Brassica rapa* subsp. *trilocularis* (Roxb.) Hanelt; *Brassica rapa* subsp. *dichotoma* (Roxb.) Hanelt and *Brassica rapa* subsp. *oleifera* Metzg.
18. **Rocket, wild,** Brassicaceae, *Diplotaxis tenuifolia* (L.) DC.
19. **Rutabaga greens,** Brassicaceae, *Brassica napus* var. *napobrassica* (L.) Rchb.
20. **Shepherd's purse,** Brassicaceae, *Capsella bursa-pastoris* (L.) Medik
21. **Turnip greens,** Brassicaceae, *Brassica rapa* L. subsp. *rapa*
22. **Watercress,** Brassicaceae, *Nasturtium officinale* W. T. Aiton

Crop Subgroup 4C. Leaves of Root and Tuber Vegetables (Human food):

1. **Alexanders leaves,** Apiaceae, *Smyrnium olusatrum* L.
2. **Beet, garden leaves,** Chenopodiaceae, *Beta vulgaris* L. subsp. *vulgaris*
3. **Bellflower, Chinese, leaves,** Campulanaceae, *Platycodon grandiflorus* (Jacq.) A. DC.
4. **Cassava, leaves,** Euphorbiaceae, *Manihot esculenta* Crantz
5. **Chayote leaves,** Cucurbitaceae*, Sechium edule* (Jacq.) Sw.
6. **Chicory,** Asteraceae, *Cichorium intybus* L.,
7. **Rampion leaves,** Campanulaceae, *Campanula rapunculus* L.
8. **Salsify, Black, leaves,** Asteraceae, *Scorzonera hispanica* L.
9. **Sweet potato leaves,** Convolvulaceae, *Ipomoea batatas* (L.) Lam. var. *batatas*
10. **Tanier leaves,** Araceae, *Xanthosoma sagittifolium* (L.) Schott; including **Blue ape leaves,** *Xanthosoma violaceum* Schott
11. **Taro leaves,** Araceae, *Colocasia esculenta* (L.) Schott
12. **Ulluco leaves,** Basellaceae, *Ullucus tuberosus* Caldas
13. **Velvet plant leaves,** Asteraceae, *Gynura bicolor* (Roxb. ex Willd.) DC.
14. **Yam leaves,** Dioscoreaceae, *Dioscorea* spp.; including **Greater yam,** *Dioscorea alata* L.; **Chinese yam,** *Dioscorea polystachya* Turcz.; **Lesser yam**, *Dioscorea esculenta* (Lour.) Burkill; **White yam,** *Dioscorea rotundata* Poir.; **Mapuey,** *Dioscorea trifida* L.f. and **Yellow yam,** *Dioscorea cayenensis* Lam.

BACKGROUND

Leaf vegetables, also called potherbs, green vegetables, greens, or leafy greens are leaves of plants that are cooked (steamed, stir-fried or cooked) or eaten fresh as a vegetable. They come from a wide variety of plants, but share common characteristics in leaf morphology. Leafy vegetables often come from short-lived herbaceous plants such as spinach and lettuce. Leaves of root and tuber crops are also consumed. Leafy vegetables are low in fat and calories and high in dietary fiber, calcium , iron and potassium and numerous vitamins. Leafy vegetables have edible parts, mainly leaves, that are fully exposed to pesticides during their growth period.

CULTURAL INFORMATION

Leafy vegetables and Brassica leafy vegetables are typically cool season crops that are grown as row crops. Crops that are consumed as leaves of roots and tubers (human food) are typically warm season crops, also grown as row crops. More detailed information can be found in the crop monographs in this volume.

PEST PROBLEMS

There are numerous insect pests, diseases and weeds that adversely impact the growth and quality of leafy vegetables. These insects, weeds and pathogens often need to be controlled by insecticides, fungicides and herbicides.

Damage to leafy vegetables results from holes chewed in leaves by caterpillars and beetles, leaf mining by fly larvae and disease transmission and head contamination by piercing sucking insects. Major pests of leafy vegetables are beet and southern armyworms, cutworms, cabbage loopers, dipterous leafminers, aphids, cucumber beetles and wireworms. Less common pests of leafy vegetables include seedcorn maggot, seedcorn beetle and corn earworm (http://edis.ifas.ufl.edu/ig161). Disease pests include powdery mildew (dandelion); anthracnose, mosaic, cotton root rot, rust, leaf and limb rot (endive and chicory); Botrytis, damping off, downy mildew, mosaic virus complex and soft rot (lettuce); and white rust, downy mildew, *Alternaria* leaf spot, damping off, anthracnose, curly top, beet western yellow viruses, and Fusarium decline (spinach). Weeds include winter annuals (lettuce) and pigweed, purslane, annual grasses, winter annual broadleaves, sow thistle and mallow (spinach) (http://aggie-horticulture.tamu.edu/extension/texascrops/leafygreensandpetioles/index.html).

A crop group regulation would facilitate the establishment of pesticide tolerances on numerous pesticides that are needed to control a wide diversity of leafy vegetable pests.

PROPOSED CROP GROUP

The revised Leafy Vegetable crop group proposal was initiated at the USDA/IR-4 Crop Grouping Symposium in Washington, DC, October 2002 (see Attachment 3 for the Symposium proposal). This workgroup was Chaired by Dan Kunkel (IR-4) and Co-Chaired by Tom Bloem, Hong Chen, Doug Dotson, Mary Lamberts, Yuen-Shaung NG and Ray Ratto.

The revised crop group was further discussed and developed within the Leafy Vegetable (except Brassica vegetable) Workgroup of the International Crop Grouping Consulting Committee (ICGCC). This workgroup consisted of 72 U.S. crop or regulatory experts from agriculture commodity groups, universities, agrichemical industry, IR-4 Project, USDA and EPA, and also 77 international crop or regulatory experts representing 26 countries. The Workgroup discussed, added additional crops and validated each of the proposed commodities. Tracey Switek (author, IR-4) researched, updated and developed new commodity monographs (included in this volume) as supporting data. A list of references is provided at the end of the monographs (Attachment 7). William Barney (author, IR-4), then reviewed and edited the monographs. Copies of partial references used in the revision and new monographs are included as Volumes 2 and 3 of this submission.

An important aspect of developing this new crop group was the harmonization with the Codex Crop Classification of Foods and Animal Feeds. The Codex classification system is currently under revision and revisions to the US system are used as a basis for the Codex revision. The IR-4/EPA Crop Grouping Working Group and the ICGCC are making every effort to collaborate with the revision of the Codex crop classification.

In the current US system, Leafy Vegetable Group 4 includes both a Leafy greens subgroup 4A and a Leaf petiole subgroup 4B, while Leafy *Brassica* greens are included as a subgroup (Leafy *Brassica* greens subgroup 5B) in Crop Group 5. In the current Codex Crop Classification of Foods and Animal Feeds, the Leafy vegetables Group 013 includes *Brassica* leafy vegetables, while Stalk and stem vegetables are included in a separate Group 017.

IR-4 (Bill Barney and Tracey Switek) and the EPA (Bernard Schneider, Ph.D) developed a joint ChemSAC proposals (Attachment 1). Proposal 1 was to "Transfer the *Brassica* Leafy Vegetable Subgroup 5B to Crop Group 4 (Leafy Vegetables except *Brassica* Vegetables) to form a new Subgroup 4C (Leafy *Brassica* Vegetables) and rename Group 4 as Leafy Vegetables and Crop Group 5 as the Head and Stem *Brassica* Vegetable Group. This proposal was developed because Leafy Vegatables and *Brassica* leafy vegetables are similar in growth pattern, leaf exposure and pesticide residues. Inclusion of *Brassica* leafy vegetables in a separate subgroup is desirable because of potentially different actions of herbicides on leafy Brassicas verses other leafy (non-Brassica) crops. The similarity of the two subgroups (4A and 5B) was borne out by a comparison of existing tolerances. ChemSAC (see minutes – Attachment 2) felt that moving the *Brassica* Leafy Vegetable Subgroup 4B into the Leafy Vegetable Group 4 would be justified by keeping it as a separate subgroup in Leafy Vegetable Group 4. ChemSAC also

recommended that further research into a possible Subgroup 4C: *Brassica* Leafy Vegetables should be made into the representative commodity being either mustard greens or kale to avoid trade irritants with Canada.

Proposal 2 in the joint IR-4 and EPA proposal (Attachment 1) suggested that adding stalk and stem vegetables to Subgroup 4B (leaf petioles) would be comparable to Codex Group 017, Stalk and Stem Vegetables. The Codex Stalk and Stem group contains several petiole crops, including celery and rhubarb, which are already members of Subgroup 4B. ChemSAC (Attachment 2) agreed that combining stem and stalk vegetables into the Leaf petiole subgroup 4B was a good idea. Also, ChemSAC agreed that the stalk, stem and petiole vegetable could be a separate crop goup similar to Codex. In an effort to harmonize with Codex, leaf petiole crops will be added to a proposed new Stalk, Stem and Leaf Petiole crop group to be submitted in the near future.

Proposal 3 in the joint IR-4 and EPA proposal (Attachment 1) offered the options of creating a new subgroup for aquatic vegetables in the Leafy Vegetable crop group 4 or to establish an entirely new crop group called Aqutic Vegetable crop group. ChemSAC (Attachment 2) in general recommended that aquatic vegetables should be in a separate crop group rather than making it a separate subgroup in the Leafy Vegetable Crop Group 4 since one aquatic vegetable would have to be a representative commodity in Crop Group 4. Aquatic vegetable crops were not included in this proposal.

This submission also proposes the inclusion of a separate subgroup for Leaves of Root and Tuber Vegetables (Human Food) in the Leafy Vegetable crop group. This concept is based on turnip greens which as included in the "Reviewer's Guide and Summary of HED ChemSAC Approvals for Amending Crop Group/Subgroups [40 CFR 180.41] and Commodity Definitions [40 CFR 180.1(h)], June 14, 2006, indicates that turnip greens will be removed from Crop Group 2: Leaves of root and tuber vegetables group [40 CFR 180.41 (2)] and it will become a member of Crop Group 5B: Leafy *Brassica* greens. Forage turnip varieties grown for livestock feed uses only will remain in Crop Group 2: Leaves of root and tuber vegetables group. In addition, leaves of radish and rutabaga, also in the Brassicaceae family, are also proposed for inclusion in a *Brassica* Leafy subgroup.

Chinese broccoli (*Brassica oleracea* var. *alboglabra* (L.H. Bailey) in currently a member of Crop Subgroup 5A. Head and stem Brassica subgroup. The leaf morphology of Chinese broccoli is more of a leafy nature rather than forming a tight head similar to other members of the Head and Stem subgroup. Residues in Chinese broccoli can be higher than the representative commodities of broccoli and cabbage (unpublished IR-4 data). This submission therefore proposes that Chinese broccoli be included in Subgroup 4-B, *Brassica* leafy vegetables.

Also, arugula (*Eruca sativa* Mill.), garden cress (*Lepidium sativum* L.) and upland cress (*Barbarea vulgaris* W. T. Aiton) are currently member of the Leafy greens Subgroup 4A. These crops are members of the Brassicaceae family and are therefore proposed for inclusion in Subgroup 4B, *Brassica* leafy vegetables instead of Leafy greens Subgroup 4A.

Swiss chard (*Beta vulgaris* L. subsp. *vulgaris*) is currently a member of Crop Group 4-B Leaf petioles subgroup. Because both the leaves and petioles are consumed and the

leaves constitute a major portion of the plant, this crop grouping proposal includes Swiss chard in the Leafy greens Subgroup 4A.

Some crops that are consumed both as herbs and as a leafy green including mallow (*Malva* spp.), white mugwort (*Artemisia lactiflora* Wall. ex DC), paracress (*Acmella oleracea* (L.) R. K. Jansen) and Asiatic pennywort (*Centella asiatica* (L.) Urb.) were researched and considered, but since they are mainly used for flavoring or seasoning and there is little commercial production, it was thought these crops would be better placed in a revised Herb and Spice Crop Group.

In addition crops such as cilantro, dokudami, grains of selim, honewort, nettle and perilla that were previously included in the revised Herb and Spice crop group submission were not included in this Leafy Vegetable proposal.

Leaves of certain Cucurbitaceae vegetables such as bitter melon (*Momordica* spp.), chayote (*Sechium edule* (Jacq.) Sw.), edible gourd (*Luffa* spp.), pumpkin (*Cucurbita* spp.) and fluted pumpkin (*Telfairia occidentalis* Hook. f.) were also considered. Leaves of Cucurbit vegetables are consumed in Asia, Africa and India, but were not included in the Leafy Vegetable proposal because the leaves are morphologically dissimilar to other typical leafy vegetables and do not readily fit into the proposed subgroups.

Leaves of certain Solanaceae crops such as African nightshade (*Solanum spp*.) [African vegetable], hot peppers (*Capsicum* spp.) [Asian cuisine] and okra (*Abelmoschus esculentus* (L.) Moench) [Middle East, Asia, part of North America and Caribbean] were also considered and researched, but were also omitted from this proposal because of the morphological dissimilarity to other typical leafy vegetables.

Another crop considered, but not included was lambsquarter (*Chenopodium album* L.), which although consumed in certain parts of the world (Africa, India, Japan and China), is considered a noxious weed in many other parts of the world.

Cowpea (*Vigna unguiculata* (L.) Walp.) was considered and although widely consumed in Africa, it was not included in this proposal because of its morphological dissimilarity to other typical leafy vegetables.

Commodities currently included in Codex Group 013 (Leafy vegetables (including Brassica leafy vegetables)), but not included in this proposal include: (1) betel leaves [carcinogenic]; (2) box thorn [leaves used to make tea]; (3) grape leaves [leaves of vines]; kangkung [water spinach, aquatic noxious weed in the US]; (4) marsh marigold [weed, poisonous]; (5) papaya leaves [leaves of a tree]; (6) pokeweed [toxic, medicinal]; (7) roselle leaves [use mostly medicinal]; sea kale [will include in stalk, stem and petiole crop group] and senna leaves [medicinal, laxative].

Selection of representative commodities should be based on a representative commodity that is most likely to: (1) contain the highest residues; (2) be major in terms of production and/or consumption and (3) similar in morphology, growth habit, pest problems and edible portion to the related commodities within a group or subgroup. Based on these criteria, three representative commodities are proposed (head lettuce, leaf lettuce and spinach) for Subgroup 4A; one representative commodity (mustard greens or kale) is proposed for Subgroup 4B and two representative commodities (garden beet and sweet potato leaves) are proposed for Subgroup 4C. The majority of tolerances established on

Leafy Vegetables, Brassica Leafy Vegetables and Leaves of Root and Tuber crops (human food) are based on the established crop groups (see Table 1, Table 2 and Table 3). Production statistics provided by FAO include lettuce and chicory and spinach (see Table 4). Table 5 shows a comparison of the Codex Classification of Foods and Animal Feeds, the EU regulations and the proposed US revision. This revised crop group regulation would benefit growers and consumers, save considerable taxpayer's money on residue studies, save time for government agencies on review of residue data and facilitate the establishment of import tolerances.

PROPOSED CROP GROUP AND SUBGROUPS

Crop Group / Subgroup	Proposed Rep. Commodities	Proposed Commodities
4A. Leafy Vegetables	**Head Lettuce and Leaf Lettuce and Spinach**	Amaranth; Amaranth, bush greens; Amaranth, Chinese; Amaranth, slender; Amaranth, slim; Amaranth, spiny; Amaranth, spleen; Aster, Indian; Blackjack; Cat's Whiskers; Cham-chwi; Cham-na-mul; Chervil; Chipilin; Chrysanthemum, corn; Chrysanthemum, edible-leaved; Chrysanthemum, garland; Chrysanthemum, tricolor; Corn salad; Corn salad, Italian; Cosmos; Dandelion; Dock; Dol-nam-mul; Ebolo; Endive; Fameflower; Feather cockscomb; Fern, Black lady; Fern, Bracken; Fern, Broad buckler; Fern, Cinnamon; Ferns, Edible (Fiddleheads); Fern, Lady; Fern, Leather; Fern, Mother; Fern, Ostrich; Fern, Vegetable; Fern, Zenmai; Good King Henry; Huauzontle; Iceplant; Jute; Lamb's lettuce; Lettuce, bitter; Lettuce, head; Lettuce, leaf; Lettuce, Romaine; Orach; Parsley, fresh; Parsley, Italian; Plantain, buckhorn; Plantain, common; Primrose, English; Purslane, Garden; Purslane, Winter; Sowthistle; Sowthistle, field; Spinach; Spinach, Malabar; Spinach, New Zealand; Swiss chard; Tanier Spinach; Violet, Chinese
4B. Brassica Leafy Vegetables	**Mustard Greens or Kale**	Arugula; Broccoli raab; Broccoli, Chinese; Cabbage, Abyssinian; Cabbage, Seakale; Chinese cabbage (bok choy); Chinese flat cabbage; Collards; Cress, American; Cress, Garden; Cress, Upland; Flowering white cabbage (choi sum); Hanover salad; Kabuna; Kale; Kale, branching bush; Kale, Jersey; Kale, marrow-stem; Maca; Mizuna; Mustard, field greens; Mustard, big-stem; Mustard greens; Mustard, leaf; Mustard, tuberous rooted Chinese; Peppergrass; Purple-stem mustard; Radish, leaves; Radish, Oil, greens; Radish, Rat-tail, greens; Rape greens; Rocket, wild; Rutabaga greens; Shepherd's purse; Turnip greens; Watercress
4C. Leaves of Roots and Tubers (Human Food)	**Beet, garden, leaves and Sweet potato, leaves**	Alexanders, leaves; Beet, garden, leaves; Bellflower, Chinese, leaves; Blue ape, leaves; Cassava, leaves; Chayote, leaves; Chicory, leaves; Rampion, leaves; Salsify, black, leaves; Sweet potato, leaves; Tanier, leaves; Taro, leaves; Ulluco, leaves; Velvet plant, leaves; Yam, leaves; Yam, Chinese, leaves; Yam, Greater, leaves; Yam, Lesser, leaves; Yam, Mapuey, leaves; Yam, White, leaves; Yam, Yellow, leaves

CROP DEFINITIONS

The current crop definitions that include Leafy vegetables include the following:

Specific Commodities Included in Definition	Comments
A	B
Lettuce	Lettuce, head; and lettuce, leaf
Lettuce, head	Lettuce, head; crisphead varieties only
Lettuce, leaf	Lettuce, leaf; cos (romaine), butterhead varieties
Endive	Endive, escarole

One additional crop definition is proposed for ferns, edible (fiddleheads) that includes many similar ferns. The following is a proposed crop definition for ferns, edible (fiddleheads):

A	B
Ferns, Edible (Fiddleheads)	Black lady fern; Bracken fern; Broad buckler fern; Cinnamon fern; Lady fern; Leather fern; Mother fern; Ostrich fern; Vegetable fern and Zenmari fern

SUGGESTED INTERIM TOLERANCE EXPRESSIONS

Until the new crop group is published in 40 CFR, the author suggests that the Minor Use Branch of the Registration Division and the ChemSAC, EPA/OPP approve the proposed crop group and establish the following interim tolerance expressions to be used in tolerance petitions:

Crop Subgroup 4A. Leafy greens subgroup:

Amaranth
Amaranth, bush greens
Amaranth, Chinese
Amaranth, slender
Amaranth, slim
Amaranth, spiny
Amaranth, spleen
Aster, Indian
Blackjack
Cat's Whiskers
Cham-chwi
Cham-na-mul
Chervil
Chipilin
Chrysanthemum, corn
Chrysanthemum, edible-leaved
Chrysanthemum, garland
Chrysanthemum, tricolor
Corn salad
Corn salad, Italian
Cosmos
Dandelion
Dock
Dol-nam-mul
Ebolo
Endive
Fameflower
Feather cockscomb
Fern, Black lady
Fern, Bracken
Fern, Broad buckler
Fern, Cinnamon
Ferns, Edible (Fiddleheads)
Fern, Lady
Fern, Leather
Fern, Mother
Fern, Ostrich
Fern, Vegetable
Fern, Zenmai

Good King Henry
Huauzontle
Iceplant
Jute
Lamb's lettuce
Lettuce, bitter
Lettuce, head
Lettuce, leaf
Lettuce, Romaine
Orach
Parsley, fresh
Parsley, Italian
Plantain, buckhorn
Plantain, common
Primrose, English
Purslane, Garden
Purslane, Winter
Sowthistle
Sowthistle, field
Spinach
Spinach, Malabar
Spinach, New Zealand
Swiss chard
Tanier Spinach
Violet, Chinese

Crop Subgroup 4B. Leafy *Brassica* greens subgroup:

Arugula
Broccoli raab
Broccoli, Chinese
Cabbage, Abyssinian
Cabbage, Seakale
Chinese cabbage (bok choy)
Chinese flat cabbage
Collards
Cress, American
Cress, Garden
Cress, Upland
Flowering white cabbage (choi sum)
Hanover salad
Kabuna
Kale
Kale, branching bush
Kale, Jersey
Kale, marrow-stem
Maca

Mizuna
Mustard, field greens
Mustard, big-stem
Mustard greens
Mustard, leaf
Mustard, tuberous rooted Chinese
Peppergrass
Purple-stem mustard
Radish, leaves
Radish, Oil, greens
Radish, Rat-tail, greens
Rape greens
Rocket, wild
Rutabaga greens
Shepherd's purse
Turnip greens
Watercress

Crop Subgroup 4C. Leaves of Root and Tuber Vegetables (Human food):

Alexanders, leaves
Beet, garden, leaves
Bellflower, Chinese, leaves
Blue ape, leaves
Cassava, leaves
Chayote, leaves
Chicory, leaves
Rampion, leaves
Salsify, black, leaves
Sweet potato, leaves
Tanier, leaves
Taro, leaves
Ulluco, leaves
Velvet plant, leaves
Yam, leaves
Yam, Chinese, leaves
Yam, Greater, leaves
Yam, Lesser, leaves
Yam, Mapuey, leaves
Yam, White, leaves
Yam, Yellow, leaves

The above proposed interim tolerance expressions would facilitate tolerance establishment of crop protection products in or on Leafy Vegetables, without requiring additional residue data for all the commodities proposed in the crop group.

Table 1. Tolerances established on Leafy Vegetables

(FASonline: mrldatabase.com; tolerances as of April 19, 2011; note that shading indicates a crop group tolerance)

	Amaranth, Leafy (ppm)			Corn Salad (ppm)			Dandelion Leaves (ppm)		
Compound	US	Codex	EU	US	Codex	EU	US	Codex	EU
Abamectin	0.1	--	0.01	0.1	--	0.1	0.1	--	--
Acetamiprid	3	--	3	3	--	5	3	--	--
Acibenzolar-S-methyl	0.25	--	0.3	0.25	--	0.02	0.25	--	--
Azoxystrobin	30	--	0.05	30	--	3	30	--	--
Bensulide	0.15	--	--	0.15	--	--	0.15	--	--
Beta-cyfluthrin	6	--	0.02	6	--	1	6	--	--
Boscalid	60	30	10	60	30	40	60	30	--
Buprofezin	35		0.05	35	--	0.5	35	--	--
Captan	0.05	--	0.1	0.05	--	0.02	0.05	--	--
Carbaryl	--	--	--	--	--	--	22	--	--
Carfentrazone-ethyl	0.1	--	0.01	0.1	--	0.01	0.1	--	--
Chlorantraniliprole	13	20	20	13	20	20	13	20	--
Clethodim	2	--	0.5	2	--	0.5	2	--	--
Clothianidin	3	--	0.02	3	--	0.1	3	--	--
Cyfluthrin	6	--	0.02	6	--	1	6	--	--
Cymoxanil	19	--	0.05	19	--	0.05	19	--	--
Cyprodinil	30	--	8	30	--	10	30	--	--
Cyromazine	7	--	0.05	7	--	15	7	--	--
d-Phenothrin	0.01	--	0.05	0.01	--	0.05	0.01	--	--
Dinotefuran	5	--	--	5	--	--	5	--	--
Emamectin	0.1	--	0.01	0.1	--	1	0.1	--	--
Famoxadone	25	--	0.02	25	--	0.02	25	--	--
Fenamidone	60	--	0.02	60	--	2	60	--	--
Fenhexamid	30	--	0.05	30	--	30	30	--	--
Flonicamid	4	--	0.05	4	--	0.05	4	--	--
Flubendiamide	11	--	0.01	11	--	0.01	11	--	--
Fludioxonil	30	--	7	30	--	10	30	--	--
Fluopicolide	25	--	0.01	25	--	0.01	25	--	--
Fluridone	--	--	--	--	--	--	0.1	--	--
Fosetyl-Al	100	--	75	100	--	75	100	--	--
Glyphosate	0.2	--	0.1	0.2	--	0.1	0.2	--	--
Imidacloprid	3.5	--	0.05	3.5	--	2	3.5	--	--
Indoxacarb	14	--	2	14	--	1	14	--	--
Malathion	8	--	0.02	8	--	0.02	8	--	--
Mandipropamid	20	25	25	20	25	25	20	25	--
Metalaxyl	5	--	0.05	5	--	0.2	5	--	--
Methomyl	--	--	--	--	--	--	6	--	--
Methoxyfenozide	30	--	0.02	30	--	0.02	30	--	--
Myclobutanil	9	--	0.02	9	--	5	9	--	--
Permethrin	20	--	0.05	20	--	0.05	20	--	--
Pymetrozine	0.6	--	0.02	0.6	--	2	0.6	--	--

Table 1. Tolerances established on Leafy Vegetables (continued)

(FASonline: mrldatabase.com; tolerances as of April 19, 2011; note that shading indicates a crop group tolerance)

	Amaranth, Leafy (ppm)			**Corn Salad (ppm)**			**Dandelion Leaves (ppm)**		
Compound	US	Codex	EU	US	Codex	EU	US	Codex	EU
Pyraclostrobin	29	--	0.5	29	--	10	29	--	--
Pyridalyl	20	--	0.01	20	--	0.01	20	--	--
Pyriproxyfen	3	--	0.05	3	--	0.05	3	--	--
Sethoxydim	4	--	0.5	4	--	0.5	4	--	--
Spinetoram	8	--	0.05	8	--	0.05	8	--	--
Spinosad	8	10	10	8	10	10	8	10	--
Spiromesifen	12	--	0.02	12	--	0.02	12	--	--
Spirotetramat	9	7	7	9	7	7	9	7	--
Tebufenozide	10	10	10	10	10	10	10	10	--
Thiamethoxam	4	--	0.05	4	--	5	4	--	--
Thiodicarb	35	--	0.05	35	--	0.02	35	--	--
Triflumizole	35	--	0.1	35	--	0.1	35	--	--
Zeta-Cypermethrin	10	0.7	0.7	10	0.7	2	10	0.7	--

Table 1. Tolerances established on Leafy Vegetables (continued)

(FASonline: mrldatabase.com; tolerances as of April 19, 2011; note that shading indicates a crop group tolerance)

	Dock (ppm)			Endive (ppm)			Purslane, Garden (ppm)		
Compound	US	Codex	EU	US	Codex	EU	US	Codex	EU
Abamectin	0.1	--	0.01	0.1	--	0.1	0.1	--	0.01
Acetamiprid	3	--	0.01	3	--	5	3	--	0.01
Acibenzolar-S-methyl	0.25	--	0.02	0.25	--	0.02	0.25	--	0.02
Azoxystrobin	30	--	3	30	--	3	30	--	3
Bensulide	0.15	--	--	0.15	--	--	0.15	--	--
Beta-cyfluthrin	6	--	0.5	6	--	1	6	--	0.5
Boscalid	60	30	0.5	60	30	10	60	30	0.5
Buprofezin	35	--	0.05	35	--	0.5	35	--	0.05
Captan	0.05	--	0.02	0.05	--	2	0.05	--	0.02
Carbaryl	--	--	--	10	--	0.05	--	--	--
Carfentrazone-ethyl	0.1	--	0.01	0.1	--	0.01	0.1	--	0.01
Chlorantraniliprole	13	20	20	13	20	20	13	20	20
Clethodim	2	--	0.5	2	--	0.5	2	--	0.5
Clothianidin	3	--	0.02	3	--	0.1	3	--	0.02
Cyfluthrin	6	--	0.5	6	--	1	6	--	0.5
Cymoxanil	19	--	0.05	19	--	0.2	19	--	0.05
Cyprodinil	30	--	10	30	--	10	30	--	10
Cyromazine	7	--	0.05	7	--	15	7	--	0.05
d-Phenothrin	0.01	--	0.05	0.01	--	0.05	0.01	--	0.05
Diazinon	--	--	--	0.7	--	0.01	--	--	--
Dicloran	--	--	--	10	--	0.1	--	--	--
Dimethoate	--	--	--	2	--	0.02	--	--	--
Dinotefuran	5	--	--	5	--	--	5	--	--
Emamectin	0.1	--	0.01	0.1	--	0.2	0.1	--	0.01
Famoxadone	25	--	0.02	25	--	0.02	25	--	0.02
Fenamidone	60	--	2	60	--	2	60	--	2
Fenhexamid	30	--	0.05	30	--	30	30	--	0.05
Flonicamid	4	--	0.05	4	--	0.05	4	--	0.05
Fluazifop-P-butyl	--	--	--	6	--	0.2	--	--	--
Flubendiamide	11	--	0.01	11	--	0.01	11	--	0.01
Fludioxonil	30	--	10	30	--	10	30	--	10
Fluopicolide	25	--	0.01	25	--	0.01	25	--	0.01
Fluridone	--	--	--	0.1	--	--	--	--	--
Fosetyl-Al	100	--	2	100	--	75	100	--	2
Glyphosate	0.2	--	0.1	0.2	--	0.1	0.2	--	0.1
Imazethapyr	--	--	--	0.1	--	--	--	--	--
Imidacloprid	3.5	--	0.05	3.5	--	1	3.5	--	0.05
Indoxacarb	14	--	0.02	14	--	2	14	--	0.02
Malathion	8	--	0.02	8	--	0.02	8	--	0.02
Mandipropamid	20	25	25	20	25	25	20	25	25

Table 1. Tolerances established on Leafy Vegetables (continued)

(FASonline: mrldatabase.com; tolerances as of April 19, 2011; note that shading indicates a crop group tolerance)

	Dock (ppm)			Endive (ppm)			Purslane, Garden (ppm)		
Compound	US	Codex	EU	US	Codex	EU	US	Codex	EU
Maneb	--	--	--	10	--	5	--	--	--
Metalaxyl	5	--	1	5	--	1	5	--	1
Methomyl	--	--	--	5	--	0.02	--	--	--
Methoxyfenozide	30	--	0.02	30	--	0.02	30	--	0.02
Myclobutanil	9	--	0.02	9	--	0.02	9	--	0.02
Paraquat dichloride	--	--	--	0.05	0.07	0.02	--	--	--
Permethrin	20	--	0.05	20	--	0.05	20	--	0.05
Phosphine	--	--	--	0.01	--	0.05	--	--	--
Propyzamide	--	--	--	1	--	1	--	--	--
Pymetrozine	0.6	--	0.02	0.6	--	2	0.6	--	0.02
Pyraclostrobin	29	--	2	29	--	2	29	--	2
Pyridalyl	20	--	0.01	20	--	0.01	20	--	0.01
Pyriproxyfen	3	--	0.05	3	--	0.05	3	--	0.05
Sethoxydim	4	--	0.5	4	--	0.5	4	--	0.5
Spinetoram	8	--	0.05	8	--	0.05	8	--	0.05
Spinosad	8	10	10	8	10	10	8	10	10
Spiromesifen	12	--	0.02	12	--	0.02	12	--	0.02
Spirotetramat	9	7	7	9	7	7	9	7	7
Tebufenozide	10	10	10	10	10	10	10	10	10
Thiamethoxam	4	--	0.05	4	--	5	4	--	0.05
Thiobencarb	--	--	--	0.2	--	0.1	--	--	--
Thiodicarb	35	--	0.02	35	--	0.02	35	--	0.02
Triflumizole	35	--	0.1	35	--	0.1	35	--	0.1
Trifluralin	--	--	--	0.05	--	0.5	--	--	--
Zeta-Cypermethrin	10	0.7	0.7	10	0.7	2	10	0.7	0.7

Table 1. Tolerances established on Leafy Vegetables (continued)

(FASonline: mrldatabase.com; tolerances as of April 19, 2011; note that shading indicates a crop group tolerance)

	Purslane, Winter (ppm)			Lettuce, Head (ppm)			Lettuce, Leaf (ppm)		
Compound	US	Codex	EU	US	Codex	EU	US	Codex	EU
Abamectin	0.1	--	0.01	0.1	--	0.1	0.1	0.05	0.1
Acephate	--	--	--	10	--	0.02	--	--	--
Acetamiprid	3	--	0.01	3	--	5	3	--	5
Acibenzolar-S-methyl	0.25	--	0.02	0.25	--	0.02	0.25	--	0.02
Azoxystrobin	30	--	3	30	3	3	30	3	3
Benfluralin	--	--	--	0.05	--	0.1	0.05	--	0.1
Bensulide	0.15	--	--	0.15	--	--	0.15	--	--
Beta-cyfluthrin	6	--	0.5	2	--	1	3	--	1
Bifenthrin	--	--	--	3	--	2	--	--	--
Boscalid	60	30	0.5	6.5	30	10	11	30	10
Buprofezin	35	--	0.05	6	--	0.5	35	--	0.5
Captan	0.05	--	0.02	0.05	--	0.02	0.05	--	0.02
Carbaryl	--	--	--	10	--	0.05	10	--	0.05
Carfentrazone-ethyl	0.1	--	0.01	0.1	--	0.01	0.1	--	0.01
Chlorantraniliprole	13	20	20	13	20	20	13	20	20
Chlorpyrifos	--	--	--	1	--	0.05	1	--	0.05
Clethodim	2	--	0.5	2	--	0.5	2	--	0.5
Clothianidin	3	--	0.02	3	--	0.1	3	--	0.1
Cryolite	--	--	--	7	--	--	7	--	--
Cyfluthrin	6	--	0.5	2	--	1	3	--	1
Cymoxanil	19	--	0.05	19	--	0.2	19	--	0.2
Cypermethrin	--	--	--	4	0.7	2	--	--	--
Cyprodinil	30	--	10	30	10	10	30	10	10
Cyromazine	7	--	0.05	7	4	15	7	4	15
d-Phenothrin	0.01	--	0.05	0.01	--	0.05	0.01	--	0.05
Diazinon	--	--	--	0.7	0.5	0.01	0.7	0.5	0.01
Dicloran	--	--	--	10	--	0.1	10	--	0.1
Dimethoate	--	--	--	--	--	--	2	--	0.02
Dimethomorph	--	--	--	10	10	10	10	--	10
Dinotefuran	5	--	--	5	--	--	5	--	--
Disulfoton	--	--	--	0.75	0.5	0.02	2	0.5	0.02
Emamectin	0.1	--	0.01	0.1	--	--	0.1	--	1
Endosulfan	--	--	--	11	--	0.05	6	--	0.05
Esfenvalerate	--	--	--	5	--	0.02	--	--	--
Famoxadone	25	--	0.02	25	--	0.02	25	--	0.02
Fenamidone	60	--	2	60	--	2	60	--	2
Fenhexamid	30	--	0.05	30	30	40	30	30	40
Flonicamid	4	--	0.05	4	--	0.05	4	--	0.05
Fluazinam	--	--	--	0.02	--	0.05	2	--	0.05
Flubendiamide	11	--	0.01	11	--	0.01	11	--	0.01

Table 1. Tolerances established on Leafy Vegetables (continued)

(FASonline: mrldatabase.com; tolerances as of April 19, 2011; note that shading indicates a crop group tolerance)

	Purslane, Winter (ppm)			Lettuce, Head (ppm)			Lettuce, Leaf (ppm)		
Compound	US	Codex	EU	US	Codex	EU	US	Codex	EU
Fludioxonil	30	--	10	30	10	10	30	--	10
Fluopicolide	25	--	0.01	25	--	0.01	25	--	0.01
Fluridone	--	--	--	0.1	--	--	0.1	--	--
Fosetyl-Al	100	--	2	100	--	75	100	--	75
Gamma Cyhalothrin	--	--	--	2	--	--	2	--	--
Glyphosate	0.2	--	0.1	0.2	--	0.1	0.2	--	0.1
Imazethapyr	--	--	--	0.1	--	--	0.1	--	--
Imidacloprid	3.5	--	0.05	3.5	2	2	3.5	--	2
Indoxacarb	14	--	0.02	14	7	2	14	15	2
Iprodione	--	--	--	25	10	10	25	25	10
Lambda Cyhalothrin	--	--	--	2	--	0.5	2	--	0.5
Malathion	8	--	0.02	8	--	0.02	8	--	0.02
Mancozeb	--	--	--	3.5	10	5	18	--	5
Mandipropamid	20	25	25	20	25	25	20	25	25
Maneb	--	--	--	10	10	5	10	--	5
Metalaxyl	5	--	1	5	2	2	5	--	2
Metaldehyde	--	--	--	1.73	--	1	1.73	--	1
Methamidophos	--	--	--	1	--	0.01	--	--	--
Methomyl	--	--	--	5	0.2	0.2	5	0.2	0.2
Methoxyfenozide	30	--	0.02	30	15	0.02	30	30	0.02
Mevinphos	--	--	--	0.5	--	0.01	0.5	--	0.01
Myclobutanil	9	--	0.02	9	--	0.02	9	--	0.02
Naled	--	--	--	1	--	--	1	--	--
Oxydemeton-methyl	--	--	--	2	--	0.01	--	--	--
Paraquat dichloride	--	--	--	0.05	0.07	0.02	0.05	0.07	0.02
Permethrin	20	--	0.05	20	2	0.05	20	--	0.05
Phosphine	--	--	--	0.01	--	0.05	0.01	--	0.05
Propamocarb hydrochloride	--	--	--	50	100	50	90	100	50
Propyzamide	--	--	--	1	--	1	--	--	--
Pymetrozine	0.6	--	0.02	0.6	--	2	0.6	--	2
Pyraclostrobin	29	--	2	29	2	2	29	--	2
Pyridalyl	20	--	0.01	20	--	3	20	--	3
Pyriproxyfen	3	--	0.05	3	--	0.05	3	--	0.05
Quinoxyfen	--	--	--	7	8	0.02	19	20	0.02
Sethoxydim	4	--	0.5	4	--	0.5	4	--	0.5
Spinetoram	8	--	0.05	8	10	10	8	10	10
Spinosad	8	10	10	8	10	10	8	10	10
Spiromesifen	12	--	0.02	12	--	0.02	12	--	0.02
Spirotetramat	9	7	7	9	7	7	9	7	7
Tebufenozide	10	10	10	10	10	10	10	10	10
Thiamethoxam	4	--	0.05	4	--	5	4	--	5

Table 1. Tolerances established on Leafy Vegetables (continued)

(FASonline: mrldatabase.com; tolerances as of April 19, 2011; note that shading indicates a crop group tolerance)

	Purslane, Winter (ppm)			**Lettuce, Head (ppm)**			**Lettuce, Leaf (ppm)**		
Compound	US	Codex	EU	US	Codex	EU	US	Codex	EU
Thiobencarb	--	--	--	0.2	--	0.1	0.2	--	0.1
Thiodicarb	35	--	0.02	35	--	0.2	35	--	0.2
Compound	US	Codex	EU	US	Codex	EU	US	Codex	EU
Tralomethrin	--	--	--	1	--	--	3	--	--
Triflumizole	35	--	0.1	35	--	0.1	35	--	0.1
Zeta-Cypermethrin	10	0.7	0.7	10	0.7	2	10	0.7	2

Table 1. Tolerances established on Leafy Vegetables (continued)

(FASonline: mrldatabase.com; tolerances as of April 19, 2011; note that shading indicates a crop group tolerance)

	Radicchio (ppm)			Spinach (ppm)			Spinach, New Zealand (ppm)		
Compound	US	Codex	EU	US	Codex	EU	US	Codex	EU
Abamectin	0.1	--	0.1	0.1	--	0.01	0.1	--	0.01
Acetamiprid	3	--	5	3	--	3	3	--	3
Acibenzolar-S-methyl	0.25	--	0.02	1	--	0.3	0.25	--	0.3
Azoxystrobin	30	--	3	30	--	0.05	30	--	0.05
Benoxacor	--	--	--	0.01	--	--	--	--	--
Bensulide	0.15	--	--	0.15	--	--	0.15	--	--
Beta-cyfluthrin	6	--	1	6	--	0.02	6	--	0.02
Bifenthrin	--	--	--	0.2	--	0.05	--	--	--
Boscalid	60	--	10	60	30	10	60	30	10
Buprofezin	6	--	0.5	35	--	0.05	35	--	0.05
Captan	0.05	--	2	0.05	--	0.1	0.05	--	0.1
Carbaryl	--	--	--	22	--	0.05	--	--	--
Carfentrazone-ethyl	0.1	--	0.01	0.1	--	0.01	0.1	--	0.01
Chlorantraniliprole	13	--	20	13	20	20	13	20	20
Clethodim	2	--	0.5	2	--	0.5	2	--	0.5
Clopyralid	--	--	--	5	--	1	--	--	--
Clothianidin	3	--	0.1	3	--	0.02	3	--	0.02
Cyazofamid	--	--	--	9	--	0.01	--	--	--
Cycloate	--	--	--	0.05	--	--	--	--	--
Cyfluthrin	6	--	1	6	--	0.02	6	--	0.02
Cymoxanil	19	--	0.2	19	--	0.05	19	--	0.05
Cyprodinil	30	--	10	--	--	--	30	--	8
Cyromazine	7	--	15	7	--	0.05	7	--	0.05
d-Phenothrin	0.01	--	0.05	0.01	--	0.05	0.01	--	0.05
Desmedipham	--	--	--	6	--	0.05	--	--	--
Diazinon	--	--	--	0.7	0.5	0.01	--	--	--
Dinotefuran	5	--	--	5	--	--	5	--	--
Emamectin	0.1	--	0.2	0.1	--	0.01	0.1	--	0.01
Endosulfan	--	--	--	2	--	0.05	--	--	--
Famoxadone	25	--	0.02	50	--	0.02	25	--	0.02
Fenamidone	60	--	2	60	--	0.02	60	--	0.02
Fenhexamid	30	--	30	--	--	--	30	--	0.05
Flonicamid	4	--	0.05	9	--	0.05	4	--	0.05
Flubendiamide	11	--	0.01	11	--	0.01	11	--	0.01
Fludioxonil	30	--	10	--	--	--	30	--	7
Fluopicolide	25	--	0.01	25	--	0.01	25	--	0.01
Fluridone	--	--	--	0.1	--	--	--	--	--
Fosetyl-Al	100	--	75	100	--	75	100	--	75
Glyphosate	0.2	--	0.1	0.2	--	0.1	0.2	--	0.1
Imidacloprid	3.5	--	1	3.5	--	0.05	3.5	--	0.05

Table 1. Tolerances established on Leafy Vegetables (continued)

(FASonline: mrldatabase.com; tolerances as of April 19, 2011; note that shading indicates a crop group tolerance)

	Radicchio (ppm)			Spinach (ppm)			Spinach, New Zealand (ppm)		
Compound	US	Codex	EU	US	Codex	EU	US	Codex	EU
Indoxacarb	14	--	2	14	--	2	14	--	2
Malathion	8	--	0.02	8	3	0.02	8	--	0.02
Mandipropamid	20	--	25	20	25	25	20	25	25
Metalaxyl	5	--	1	10	2	0.05	5	--	0.05
Metalaxyl-M (Mefenoxam)	--	--	--	10	--	0.05	--	--	--
Methomyl	--	--	--	6	--	0.05	--	--	--
Methoxyfenozide	30	--	0.02	30	--	0.02	30	--	0.02
Mevinphos	--	--	--	1	--	0.01	--	--	--
Naled	--	--	--	3	--	--	--	--	--
Myclobutanil	9	--	0.02	--	--	--	9	--	0.02
Permethrin	20	--	0.05	20	2	0.05	20	--	0.05
Phenmedipham	--	--	--	4	--	0.5	--	--	--
Propyzamide	2	--	1	--	--	--	--	--	--
Pymetrozine	0.6		2	0.6	--	0.02	0.6	--	0.02
Pyraclostrobin	29	--	2	29	--	0.5	29	--	0.5
Pyridalyl	20	--	0.01	20	--	0.01	20	--	0.01
Pyriproxyfen	3	--	0.05	3	--	0.05	3	--	0.05
S-metolachlor	--	--	--	0.5	--	0.05	--	--	--
Sethoxydim	4	--	0.5	4	--	0.5	4	--	0.5
Spinetoram	8	--	0.05	8	--	0.05	8	--	0.05
Spinosad	8	--	10	8	10	10	8	10	10
Spiromesifen	12	--	0.02	12	--	0.02	12	--	0.02
Spirotetramat	9	--	7	9	7	7	9	7	7
Tebufenozide	10	--	10	10	10	10	10	10	10
Thiamethoxam	4	--	5	4	--	0.05	4	--	0.05
Thiodicarb	35	--	0.02	35	--	0.05	35	--	0.05
Triflumizole	35	--	0.1	--	--	--	35	--	0.1
Zeta-Cypermethrin	10	--	2	10	0.7	0.7	10	0.7	0.7

Table 1. Tolerances established on Leafy Vegetables (continued)

(FASonline: mrldatabase.com; tolerances as of April 19, 2011; note that shading indicates a crop group tolerance)

	Spinach, Vine (ppm)			Chrysanthemum, Edible Leaved (ppm)			Chrysanthemum, Garland (ppm)		
Compound	US	Codex	EU	US	Codex	EU	US	Codex	EU
Abamectin	0.1	--	--	0.1	--	--	0.1	--	--
Acetamiprid	3	--	--	3	--	--	3	--	--
Acibenzolar-S-methyl	0.25	--	--	0.25	--	--	0.25	--	--
Azoxystrobin	30	--	--	30	--	--	30	--	--
Bensulide	0.15	--	--	0.15	--	--	0.15	--	--
Beta-cyfluthrin	6	--	--	6	--	--	6	--	--
Boscalid	60	30	--	60	30	--	60	30	--
Buprofezin	35	--	--	35	--	--	35	--	--
Captan	0.05	--	--	0.05	--	--	0.05	--	--
Carfentrazone-ethyl	0.1	--	--	0.1	--	--	0.1	--	--
Chlorantraniliprole	13	20	--	13	20	--	13	20	--
Clethodim	2	--	--	2	--	--	2	--	--
Clothianidin	3	--	--	3	--	--	3	--	--
Cyfluthrin	6	--	--	6	--	--	6	--	--
Cymoxanil	19	--	--	19	--	--	19	--	--
Cyprodinil	30	--	--	30	--	--	30	--	--
Cyromazine	7	--	--	7	--	--	7	--	--
d-Phenothrin	0.01	--	--	0.01	--	--	0.01	--	--
Dinotefuran	5	--	--	5	--	--	5	--	--
Emamectin	0.1	--	--	0.1	--	--	0.1	--	--
Famoxadone	25	--	--	25	--	--	25	--	--
Fenamidone	60	--	--	60	--	--	60	--	--
Fenhexamid	30	--	--	30	--	--	30	--	--
Flonicamid	4	--	--	4	--	--	4	--	--
Flubendiamide	11	--	--	11	--	--	11	--	--
Fludioxonil	30	--	--	30	--	--	30	--	--
Fluopicolide	25	--	--	25	--	--	25	--	--
Fosetyl-Al	100	--	--	100	--	--	100	--	--
Glyphosate	0.2	--	--	0.2	--	--	0.2	--	--
Imidacloprid	3.5	--	--	3.5	--	--	3.5	--	--
Indoxacarb	14	--	--	14	--	--	14	--	--
Malathion	8	--	--	8	--	--	8	--	--
Mandipropamid	20	25	--	20	25	--	20	25	--
Metalaxyl	5	--	--	5	--	--	5	--	--
Methoxyfenozide	30	--	--	30	--	--	30	--	--
Myclobutanil	9	--	--	9	--	--	9	--	--
Permethrin	20	--	--	20	--	--	20	--	--
Pymetrozine	0.6	--	--	0.6	--	--	0.6	--	--

Table 1. Tolerances established on Leafy Vegetables (continued)

(FASonline: mrldatabase.com; tolerances as of April 19, 2011; note that shading indicates a crop group tolerance)

	Spinach, Vine (ppm)			**Chrysanthemum, Edible Leaved (ppm)**			**Chrysanthemum, Garland (ppm)**		
Compound	US	Codex	EU	US	Codex	EU	US	Codex	EU
Pyraclostrobin	29	--	--	29	--	--	29	--	--
Pyridalyl	20	--	--	20	--	--	20	--	--
Pyriproxyfen	3	--	--	3	--	--	3	--	--
Sethoxydim	4	--	--	4	--	--	4	--	--
Spinetoram	8	--	--	8	--	--	8	--	--
Spinosad	8	10	--	8	10	--	8	10	--
Spiromesifen	12	--	--	12	--	--	12	--	--
Spirotetramat	9	7	--	9	7	--	9	7	--
Tebufenozide	10	10	--	10	10	--	10	10	--
Thiamethoxam	4	--	--	4	--	--	4	--	--
Thiodicarb	35	--	--	35	--	--	35	--	--
Triflumizole	35	--	--	35	--	--	35	--	--
Zeta-Cypermethrin	10	0.7	--	10	0.7	--	10	0.7	--

Table 1. Tolerances established on Leafy Vegetables (continued)

(FASonline: mrldatabase.com; tolerances as of April 19, 2011; note that shading indicates a crop group tolerance)

	Orach (ppm)			Parsley, fresh (ppm)		
Compound	US	Codex	EU	US	Codex	EU
Abamectin	0.1	--	--	0.1	--	1
Acetamiprid	3	--	--	3	--	5
Acibenzolar-S-methyl	0.25	--	--	0.25	--	0.3
Azinphos-methyl	--	--	--	5	--	0.05
Azoxystrobin	30	--	--	30	70	70
Bensulide	0.15	--	--	0.15	--	--
Beta-cyfluthrin	6	--	--	6	--	0.02
Boscalid	60	30	--	60	--	10
Buprofezin	35	--	--	35	--	4
Captan	0.05	--	--	0.05	--	0.1
Carbaryl	--	--	--	22	--	0.05
Carfentrazone-ethyl	0.1	--	--	0.1	--	0.01
Chlorantraniliprole	13	20	--	13	--	20
Clethodim	2	--	--	2	--	0.5
Clothianidin	3	--	--	3	--	0.02
Cyfluthrin	6	--	--	6	--	0.02
Cymoxanil	19	--	--	19	--	0.05
Cyprodinil	30	--	--	35	--	10
Cyromazine	7	--	--	7	--	15
d-Phenothrin	0.01	--	--	0.01	--	0.05
Diazinon	--	--	--	0.75	--	0.01
Dinotefuran	5	--	--	5	--	--
Emamectin	0.1	--	--	0.1	--	1
Famoxadone	25	--	--	25	--	0.02
Fenamidone	60	--	--	60	--	0.02
Fenhexamid	30	--	--	30	--	30
Flonicamid	4	--	--	4	--	0.05
Flubendiamide	11	--	--	11	--	0.01
Fludioxonil	30	--	--	30	--	1
Fluopicolide	25	--	--	25	--	0.01
Fluridone	--	--	--	0.1	--	--
Fosetyl-Al	100	--	--	100	--	75
Glyphosate	0.2	--	--	0.2	--	0.1
Imidacloprid	3.5	--	--	3.5	--	2
Indoxacarb	14	--	--	14	--	2
Linuron	--	--	--	0.25	--	1
Malathion	8	--	--	8	--	0.02
Mandipropamid	20	25	--	20	--	10
Metalaxyl	5	--	--	5	--	2
Methomyl	--	--	--	6	--	0.3

Table 1. Tolerances established on Leafy Vegetables (continued)

(FASonline: mrldatabase.com; tolerances as of April 19, 2011; note that shading indicates a crop group tolerance)

	Orach (ppm)			Parsley, fresh (ppm)		
Compound	US	Codex	EU	US	Codex	EU
Methoxyfenozide	30	--	--	30	--	0.02
Myclobutanil	9	--	--	9	--	0.02
Permethrin	20	--	--	20	--	0.05
Prometryn	--	--	--	0.6	--	--
Propiconazole	--	--	--	13	--	0.05
Pymetrozine	0.6	--	--	0.6	--	2
Pyraclostrobin	29	--	--	29	--	2
Pyridalyl	20	--	--	20	--	0.01
Pyriproxyfen	3	--	--	3	--	0.05
Sethoxydim	4	--	--	4	--	0.5
Spinetoram	8	--	--	8	--	0.05
Spinosad	8	10	--	8	--	10
Spiromesifen	12	--	--	12	--	0.02
Spirotetramat	9	7	--	9	--	0.1
Tebufenozide	10	10	--	10	--	0.05
Thiamethoxam	4	--	--	4	--	0.05
Thiodicarb	35	--	--	35	--	0.3
Triflumizole	35	--	--	35	--	0.1
Zeta-Cypermethrin	10	0.7	--	10	--	2

Table 2. Tolerances established on Brassica Leafy Vegetables
(FASonline: mrldatabase.com; tolerances as of April 20, 2011; note that shading indicates a crop group tolerance)

	Arugula (ppm)			Cress, Upland (ppm)			Broccoli, Chinese (ppm)		
Compound	US	Codex	EU	US	Codex	EU	US	Codex	EU
Abamectin	0.1	--	0.1	0.1	--	0.1	--	--	--
Acetamiprid	3	--	5	3	--	0.01	1.2	--	0.01
Acibenzolar-S-methyl	0.25	--	0.02	0.25	--	0.02	1	--	0.02
Azoxystrobin	30	--	3	30	70	3	3	5	5
Benoxacor	--	--	--	--	--	--	0.01	--	--
Bensulide	0.15	--	--	0.15	--	--	0.15	--	--
Beta-cyfluthrin	6	--	1	6	--	1	2.5	--	0.05
Bifenthrin	--	--	--	--	--	--	0.6	--	0.2
Boscalid	60	30	10	60	--	10	3	5	1
Buprofezin	35	--	0.5	35	--	0.5	12	--	0.05
Captan	0.05	--	0.02	0.05	--	0.02	0.05	--	0.02
Carbaryl	--	--	--	--	--	--	10	--	0.05
Carfentrazone-ethyl	0.1	--	0.01	0.1	--	0.01	0.1	--	0.01
Chlorantraniliprole	13	20	20	13	--	20	4	--	1
Chlorothalonil	--	--	--	--	--	--	5	--	3
Chlorpyrifos	--	--	--	--	--	--	1	--	0.05
Clethodim	2	--	0.5	2	--	0.5	3	--	0.5
Clopyralid	--	--	--	--	--	--	2	--	0.5
Clothianidin	3	--	0.1	3	--	0.1	1.9	--	0.02
Cryolite	--	--	--	--	--	--	7	--	--
Cyazofamid	--	--	--	--	--	--	1.2	--	0.01
Cyfluthrin	6	--	1	6	--	1	2.5	--	0.05
Cypermethrin	--	--	--	--	--	--	2	1	1
Cymoxanil	19	--	0.05	19	--	0.05	--	--	--
Cyprodinil	30	--	10	30	--	10	1	--	0.05
Cyromazine	7	--	15	7	--	15	1	--	0.05
d-Phenothrin	0.01	--	0.05	0.01	--	0.05	0.01	--	0.05
DCPA	--	--	--	--	--	--	5	--	0.5
Diazinon	--	--	--	--	--	--	0.7	--	0.01
Difenoconazole	--	--	--	--	--	--	1.9	--	0.2
Dimethoate	--	--	--	--	--	--	2	--	--
Dimethomorph	--	--	--	--	--	--	2	--	0.05
Dinotefuran	5	--	--	5	--	--	1.4	--	--
Disulfoton	--	--	--	--	--	--	0.75	0.5	0.02
Emamectin	0.1	--	1	0.1	--	--	0.05	--	0.01
Endosulfan	--	--	--	--	--	--	3	--	0.05
Esfenvalerate	--	--	--	--	--	--	1	--	0.02
Famoxadone	25	--	0.02	25	--	0.02	--	--	--
Fenamidone	60	--	2	60	--	2	5	--	0.02
Fenhexamid	30	--	30	30	--	30	--	--	--
Fenpropathrin	--	--	--	--	--	--	3	--	0.01
Flonicamid	4	--	0.05	4	--	0.05	1.5	--	0.05
Fluazinam	--	--	--	--	--	--	0.01	--	0.05
Flubendiamide	11	--	0.01	11	--	0.01	3	--	0.01
Fludioxonil	30	--	10	30	--	10	2	--	0.05
Fluopicolide	25	--	0.01	25	--	0.01	5	2	0.01

Table 2. Tolerances established on Brassica Leafy Vegetables (continued)
(FASonline: mrldatabase.com; tolerances as of April 20, 2011; note that shading indicates a crop group tolerance)

	Arugula (ppm)			Cress, Upland (ppm)			Broccoli, Chinese (ppm)		
Compound	US	Codex	EU	US	Codex	EU	US	Codex	EU
Fluridone	--	--	--	--	--	--	0.1	--	--
Flutolanil	--	--	--	--	--	--	0.1	--	0.05
Fosetyl-Al	100	--	75	100	--	75	60	--	10
Gamma Cyhalothrin	--	--	--	--	--	--	0.4	0.5	--
Glyphosate	0.2	--	0.1	0.2	--	0.1	0.2	--	0.1
Imidacloprid	3.5	--	2	3.5	--	2	3.5	--	0.5
Indoxacarb	14	--	0.02	14	--	0.02	12	--	0.3
Iprodione	--	--	--	--	--	--	25	--	0.1
Lambda Cyhalothrin	--	--	--	--	--	--	0.4	0.5	0.1
Malathion	8	--	0.02	8	--	0.02	8	--	0.02
Mancozeb	--	--	--	--	--	--	7	--	1
Mandipropamid	20	25	25	20	--	25	3	--	2
Maneb	--	--	--	--	--	--	10	--	1
Metalaxyl	5	--	2	5	--	1	2	--	0.2
Metaldehyde	--	--	--	--	--	--	2.5	--	1
Methomyl	--	--	--	--	--	--	3	--	0.02
Methoxyfenozide	30	--	0.02	30	--	0.02	7	--	0.02
Mevinphos	--	--	--	--	--	--	1	--	0.01
Myclobutanil	9	--	0.2	9	--	0.02	--	--	--
Naled	--	--	--	--	--	--	1	--	--
Napropamide	--	--	--	--	--	--	0.1	--	0.05
Novaluron	--	--	--	--	--	--	0.5	--	0.01
Oxydemeton-methyl	--	--	--	--	--	--	1	--	0.01
Oxyfluorfen	--	--	--	--	--	--	0.05	--	0.05
Paraquat dichloride	--	--	--	--	--	--	0.05	--	0.02
Pendimethalin	--	--	--	--	--	--	0.1	--	0.05
Pentachloronitrobenzene	--	--	--	--	--	--	0.1	--	0.02
Permethrin	20	--	0.05	20	--	0.05	2	--	0.05
Pymetrozine	0.6	--	2	0.6	--	2	0.5	--	0.02
Pyraclostrobin	29	--	2	29	--	2	5	0.1	0.1
Pyridalyl	20	--	0.01	20	--	0.01	3.5	--	0.01
Pyridate	--	--	--	--	--	--	0.03	--	0.05
Pyriproxyfen	3	--	0.05	3	--	0.05	0.7	--	0.05
S-metolachlor	--	--	--	--	--	--	0.6	--	0.05
Sethoxydim	4	--	0.5	4	--	0.5	5	--	0.5
Spinetoram	8	--	0.05	8	--	0.05	2	--	0.05
Spinosad	8	10	10	8	--	10	2	2	2
Spiromesifen	12	--	0.02	12	--	0.02	2	--	0.02
Spirotetramat	9	7	7	9	--	7	2.5	1	1
Sulfentrazone	--	--	--	--	--	--	0.2	--	--
Tebufenozide	10	10	10	10	--	10	5	--	0.5
Thiamethoxam	4	--	5	4	--	5	4.5	--	0.2
Thiodicarb	35	--	0.02	35	--	2	7	--	0.02
Tralomethrin	--	--	--	--	--	--	0.5	--	--
Triflumizole	35	--	0.1	35	--	0.1	8	--	0.1
Trifluralin	--	--	--	--	--	--	0.05	--	0.5
Zeta-Cypermethrin	10	0.7	2	10	--	2	2	1	1

Table 2. Tolerances established on Brassica Leafy Vegetables (continued)
(FASonline: mrldatabase.com; tolerances as of April 20, 2011; note that shading indicates a crop group tolerance)

	Broccoli, Raab (ppm)			Cabbage, Chinese, Bok Choy (ppm)			Kale (ppm)		
Compound	US	Codex	EU	US	Codex	EU	US	Codex	EU
Acetamiprid	1.2	--	0.01	1.2	--	0.01	1.2	--	0.01
Acibenzolar-S-methyl	1	--	0.02	1	--	0.02	1	--	0.02
Azoxystrobin	25	--	5	25	--	5	25	--	5
Bensulide	0.15	--	--	0.15	--	--	0.15	--	--
Beta-cyfluthrin	7	--	0.05	7	--	0.3	7	--	0.3
Bifenthrin	3.5	--	0.2	3.5	--	0.05	3.5	--	0.05
Boscalid	18	30	1	18	30	10	18	30	10
Captan	0.05	--	0.02	0.05	--	0.02	0.05	--	0.02
Carbaryl	10	--	0.05	10	--	0.05	10	--	0.05
Carfentrazone-ethyl	0.1	--	0.01	0.1	--	0.01	0.1	--	0.01
Chlorantraniliprole	11	20	1	11	20	20	11	20	20
Chlorpyrifos	1	--	0.05	1	--	0.5	1	--	0.05
Clethodim	3	--	0.5	3	--	1	3	--	1
Clothianidin	1.9	--	0.02	1.9	--	0.02	1.9	--	0.02
Cryolite	--	--	--	--	--	--	7	--	--
Cyazofamid	12	--	0.01	12	--	0.01	12	--	0.01
Cyfluthrin	7	--	0.05	7	--	0.3	7	--	0.3
Cypermethrin	14	0.7	1	14	0.7	1	14	0.7	1
Cyprodinil	10	--	0.05	10	--	0.05	10	--	0.05
Cyromazine	10	--	0.05	10	--	0.05	10	--	0.05
d-Phenothrin	0.01	--	0.05	0.01	--	0.05	0.01	--	0.05
DCPA	5	--	0.5	5	--	0.5	5	--	0.5
Diazinon	0.7	--	0.01	0.7	--	0.05	0.7	0.05	0.01
Difenoconazole	35	--	0.2	35	--	2	35	--	2
Diflubenzuron	9	--	1	9	--	1	9	--	1
Dimethoate	--	--	--	--	--	--	2	--	--
Dimethomorph	20	--	0.05	20	--	0.05	20	--	0.05
Dinotefuran	15	--	--	15	--	--	15	--	--
Emamectin	0.05	--	0.01	0.05	--	0.01	0.05	--	0.01
Endosulfan	--	--	--	--	--	--	2	--	0.05
Esfenvalerate	--	--	--	1	--	0.02	--	--	--
Fenamidone	55	--	0.05	55	--	0.02	55	--	0.02
Flonicamid	16	--	0.05	16	--	0.05	16	--	0.05
Fluazinam	0.01	--	0.05	0.01	--	0.05	0.01	--	0.05
Flubendiamide	25	--	0.01	25	--	0.01	25	--	0.01
Fludioxonil	10	--	0.05	10	--	0.05	10	--	0.05
Fluridone	0.1	--	--	--	--	--	0.1	--	--
Flutolanil	0.1	--	0.05	0.1	--	0.05	0.1	--	0.05
Fosetyl-Al	60	--	10	60	--	10	60	--	10
Glyphosate	0.2	--	0.1	0.2	--	0.1	0.2	--	0.1
Imidacloprid	3.5	--	0.5	3.5	--	0.5	3.5	--	0.3
Indoxacarb	12	--	0.3	12	--	0.2	12	--	0.2
Malathion	8	--	0.02	8	--	0.02	8	--	0.02
Mandipropamid	25	25	2	25	25	25	25	25	25
Maneb	--	--	--	10	--	0.5	10	15	0.5
Metalaxyl	0.1	--	0.2	0.1	--	0.05	0.1	--	0.2

Table 2. Tolerances established on Brassica Leafy Vegetables (continued)
(FASonline: mrldatabase.com; tolerances as of April 20, 2011; note that shading indicates a crop group tolerance)

	Broccoli, Raab (ppm)			Cabbage, Chinese, Bok Choy (ppm)			Kale (ppm)		
Compound	US	Codex	EU	US	Codex	EU	US	Codex	EU
Metaldehyde	2.5	--	1	2.5	--	1	2.5	--	1
Methomyl	0.2	--	0.02	5	--	0.02	6	--	0.02
Methoxyfenozide	30	--	0.02	30	--	0.02	30	--	0.02
Naled	--	--	--	--	--	--	3	--	--
Napropamide	0.1	--	0.05	0.1	--	0.05	0.1	--	0.05
Novaluron	25	--	0.01	25	--	0.01	25	--	0.01
Oxydemeton-methyl	2	--	0.01	--	--	--	--	--	--
Paraquat dichloride	0.05	0.07	0.02	0.05	0.07	0.02	0.05	0.07	0.02
Pentachloronitrobenzene	--	--	--	--	--	--	0.2	--	0.02
Phosphine	--	--	--	0.01	--	0.05	--	--	--
Pymetrozine	0.25	--	0.02	0.25	--	0.2	0.25	--	0.2
Pyraclostrobin	16	--	0.1	16	--	0.02	16	1	0.02
Pyriproxyfen	2	--	0.05	2	--	0.05	2	--	0.05
S-metolachlor	1.8	--	0.05	1.8	--	0.05	1.8	--	0.05
Sethoxydim	5	--	0.5	5	--	1	5	--	1
Spinetoram	10	--	0.05	10	--	0.05	10	--	0.05
Spinosad	10	10	2	10	10	2	10	10	2
Spiromesifen	12	--	0.02	12	--	0.02	12	--	0.02
Spirotetramat	8	7	1	8	7	7	8	7	7
Sulfentrazone	0.4	--	--	0.4	--	--	0.4	--	--
Tebuconazole	2.5	--	1	2.5	--	1	2.5	--	0.05
Tebufenozide	10	10	0.5	10	10	0.5	10	10	0.5
Thiamethoxam	3	--	0.2	3	--	0.2	3	--	0.2
Triflumizole	40	--	0.1	40	--	0.1	40	--	0.1
Trifluralin	0.05	--	0.5	0.05	--	0.5	0.05	--	0.5
Zeta-Cypermethrin	14	0.7	1	14	0.7	1	14	0.7	1

Table 2. Tolerances established on Brassica Leafy Vegetables (continued)
(FASonline: mrldatabase.com; tolerances as of April 20, 2011; note that shading indicates a crop group tolerance)

	Mizuna (ppm)			Mustard Greens (ppm)			Radish, Tops (ppm)		
Compound	US	Codex	EU	US	Codex	EU	US	Codex	EU
2,4-D	--	--	--	--	--	--	0.1	--	0.05
Acetamiprid	1.2	--	5	1.2	--	0.01	--	--	--
Acibenzolar-S-methyl	1	--	0.02	1	--	0.02	--	--	--
Azoxystrobin	25	--	3	25	--	3	50	--	3
Bensulide	0.15	--	--	0.15	--	--	--	--	--
Beta-cyfluthrin	7	--	1	7	--	1	--	--	--
Bifenthrin	3.5	--	2	3.5	--	2	4.5	--	2
Boscalid	18	30	10	18	30	10	--	--	--
Captan	0.05	--	0.02	0.05	--	0.02	0.05	--	0.02
Carbaryl	10	--	0.05	10	--	1	75	--	0.05
Carfentrazone-ethyl	0.1	--	0.01	0.1	--	0.01	0.1	--	0.01
Chlorantraniliprole	11	20	20	11	20	20	--	--	--
Chlorpyrifos	1	--	0.05	1	--	0.05	--	--	--
Clethodim	3	--	0.5	3	--	0.5	0.7	--	0.5
Clopyralid	5	--	0.5	5	--	0.5	--	--	--
Clothianidin	1.9	--	0.1	1.9	--	0.1	--	--	--
Cyazofamid	12	--	0.01	12	--	0.01	--	--	--
Cyfluthrin	7	--	1	7	--	1	--	--	--
Cypermethrin	14	0.7	2	14	0.7	2	--	--	--
Cyprodinil	10	--	10	10	--	10	10	--	10
Cyromazine	10	--	0.05	10	10	0.05	--	--	--
d-Phenothrin	0.01	--	0.05	0.01	--	0.05	0.01	--	0.05
DCPA	5	--	0.5	5	--	0.5	15	--	0.5
Deltamethrin	--	--	--	--	--	--	4	2	0.5
Diazinon	0.7	--	0.01	0.7	--	0.01	--	--	--
Difenoconazole	35	--	0.05	35	--	0.05	--	--	--
Diflubenzuron	9	--	0.2	9	--	0.2	--	--	--
Dimethenamid	--	--	--	--	--	--	0.01	--	0.01
Dimethoate	2	--	0.02	2	--	0.02	--	--	--
Dimethomorph	20	--	1	20	--	1	--	--	--
Dinotefuran	15	--	--	15	--	--	--	--	--
Emamectin	0.05	--	1	0.05	--	1	--	--	--
Endosulfan	--	--	--	2	--	0.05	--	--	--
Esfenvalerate	--	--	--	5	--	0.02	3	--	0.02
Fenamidone	55	--	2	55	--	2	--	--	--
Flonicamid	16	--	0.05	16	--	0.05	16	--	0.05
Fluazinam	0.01	--	0.05	0.01	--	0.05	--	--	--
Flubendiamide	25	--	0.01	25	--	0.01	--	--	--
Fludioxonil	10	--	10	10	10	10	30	--	10
Fluopicolide	--	--	--	--	--	--	15	--	0.01
Fluridone	--	--	--	0.1	--	--	--	--	--
Flutolanil	0.1	--	0.05	0.1	--	0.05	--	--	--
Fosetyl-Al	60	--	75	60	--	75	--	--	--
Glyphosate	0.2	--	0.1	0.2	--	0.1	0.2	--	0.1
Imidacloprid	3.5	--	2	3.5	--	2	4	5	2
Indoxacarb	12	--	1	12	--	0.02	--	--	--
Iprodione	--	--	--	15	--	10	--	--	--
Malathion	8	--	0.02	8	2	0.02	--	--	--

Table 2. Tolerances established on Brassica Leafy Vegetables (continued)
(FASonline: mrldatabase.com; tolerances as of April 20, 2011; note that shading indicates a crop group tolerance)

	Mizuna (ppm)			Mustard Greens (ppm)			Radish, Tops (ppm)		
Compound	US	Codex	EU	US	Codex	EU	US	Codex	EU
Mandipropamid	25	25	25	25	25	25	--	--	--
Maneb	--	--	--	10	--	5	--	--	--
Metalaxyl	0.1	--	2	5	--	0.05	15	--	2
Metaldehyde	2.5	--	1	2.5	--	1	--	--	--
Methomyl	6	--	0.02	6	--	0.02	--	--	--
Methoxyfenozide	30	--	0.02	30	30	0.02	30	7	0.02
Napropamide	0.1	--	0.05	0.1	--	0.05	--	--	--
Novaluron	25	--	0.01	25	--	0.01	--	--	--
Paraquat dichloride	0.05	0.07	0.02	0.05	0.07	0.02	--	--	--
Pentachloronitrobenzene	--	--	--	0.2	--	0.02	--	--	--
Pymetrozine	0.25	--	2	0.25	--	2	--	--	--
Pyraclostrobin	16	--	2	16	--	2	16	20	2
Pyridalyl	--	--	--	30	--	0.01	--	--	--
Pyriproxyfen	2	--	0.05	2	--	0.05	2	--	0.05
S-metolachlor	1.8	--	0.05	1.8	--	0.05	--	--	--
Sethoxydim	5	--	0.5	5	--	0.5	4.5	--	0.5
Spinetoram	10	--	0.05	10	--	0.05	10	--	0.05
Spinosad	10	10	10	10	10	10	10	10	10
Spiromesifen	12	--	0.02	12	--	0.02	--	--	--
Spirotetramat	8	7	7	8	7	7	--	--	--
Sulfentrazone	0.4	--	--	0.4	--	--	--	--	--
Tebuconazole	2.5	--	0.05	2.5	--	0.05	--	--	--
Tebufenozide	10	10	10	10	10	10	--	--	--
Thiamethoxam	3	--	5	3	--	5	0.8	--	5
Trifloxystrobin	--	--	--	--	--	--	10	--	0.02
Triflumizole	40	--	0.1	40	--	0.1	--	--	--
Trifluralin	0.05	--	0.5	0.05	--	0.5	0.05	--	0.5
Zeta-Cypermethrin	14	0.7	2	14	0.7	2	--	--	--

Table 2. Tolerances established on Brassica Leafy Vegetables (continued)
(FASonline: mrldatabase.com; tolerances as of April 20, 2011; note that shading indicates a crop group tolerance)

	Rape Greens (ppm)			Rutabaga, Tops (ppm)			Collards (ppm)		
Compound	US	Codex	EU	US	Codex	EU	US	Codex	EU
2,4-D	--	--	--	0.1	--	--	--	--	--
Acetamiprid	1.2	--	--	--	--	--	1.2	--	0.01
Acibenzolar-S-methyl	1	--	--	--	--	--	1	--	0.02
Azoxystrobin	25	--	--	50	--	--	25	--	5
Bensulide	0.15	--	--	--	--	--	0.15	--	--
Beta-cyfluthrin	7	--	--	--	--	--	7	--	0.3
Bifenthrin	3.5	--	--	--	--	--	3.5	--	0.05
Boscalid	18	30	--	--	--	--	18	30	10
Captan	0.05	--	--	0.05	--	--	0.05	--	0.02
Carbaryl	10	--	--	75	--	--	10	--	0.05
Carfentrazone-ethyl	0.1	--	--	0.1	--	--	0.1	--	0.01
Chlorantraniliprole	11	20	--	--	--	--	11	20	20
Chlorpyrifos	1	--	--	--	--	--	1	--	0.05
Clethodim	3	--	--	--	--	--	3	--	1
Clothianidin	1.9	--	--	--	--	--	1.9	--	0.02
Cryolite	--	--	--	--	--	--	7	--	--
Cyazofamid	12	--	--	--	--	--	12	--	0.01
Cyfluthrin	7	--	--	--	--	--	7	--	0.3
Cypermethrin	14	0.7	--	--	--	--	14	0.7	1
Cyprodinil	10	--	--	10	--	--	10	--	0.05
Cyromazine	10	--	--	--	--	--	10	--	0.05
d-Phenothrin	0.01	--	--	0.01	--	--	0.01	--	0.05
DCPA	5	--	--	--	--	--	5	--	0.5
Diazinon	0.7	--	--	--	--	--	0.7	0.05	0.01
Difenoconazole	35	--	--	--	--	--	35	--	2
Diflubenzuron	9	--	--	--	--	--	9	--	1
Dimethenamid	0.1	--	--	0.1	--	--	--	--	--
Dimethomorph	20	--	--	--	--	--	20	--	0.05
Dinotefuran	15	--	--	--	--	--	15	--	--
Emamectin	0.05	--	--	--	--	--	0.05	--	0.01
Endosulfan	--	--	--	--	--	--	2	--	0.05
Esfenvalerate	--	--	--	--	--	--	3	--	0.02
Fenamidone	55	--	--	--	--	--	55	--	0.02
Flonicamid	16	--	--	--	--	--	16	--	0.05
Fluazinam	0.01	--	--	--	--	--	0.01	--	0.05
Flubendiamide	25	--	--	--	--	--	25	--	0.01
Fludioxonil	10	--	--	30	--	--	10	--	0.05
Fluopicolide	--	--	--	15	--	--	--	--	--
Fluridone	--	--	--	--	--	--	0.1	--	--
Flutolanil	0.1	--	--	--	--	--	0.1	--	0.05
Fosetyl-Al	60	--	--	--	--	--	60	--	10
Glyphosate	0.2	--	--	0.2	--	--	0.2	--	0.1
Imidacloprid	3.5	--	--	4	--	--	3.5	--	0.3
Inorganic bromide	--	--	--	30	--	--	--	--	--
Indoxacarb	12	--	--	--	--	--	12	--	0.2
Malathion	8	--	--	--	--	--	8	--	0.02
Mandipropamid	25	25	--	--	--	--	25	25	25
Maneb	--	--	--	--	--	--	10	15	0.5

Table 2. Tolerances established on Brassica Leafy Vegetables (continued)
(FASonline: mrldatabase.com; tolerances as of April 20, 2011; note that shading indicates a crop group tolerance)

	Rape Greens (ppm)			Rutabaga, Tops (ppm)			Collards (ppm)		
Compound	US	Codex	EU	US	Codex	EU	US	Codex	EU
Metalaxyl	0.1	--	--	15	--	--	0.1	--	0.2
Metaldehyde	2.5	--	--	--	--	--	2.5	--	1
Methomyl	6	--	--	--	--	--	6	--	0.02
Methoxyfenozide	30	--	--	30	--	--	30	--	0.02
Naled	--	--	--	--	--	--	3	--	--
Napropamide	0.1	--	--	--	--	--	0.1	--	0.05
Novaluron	25	--	--	--	--	--	25	--	0.01
Paraquat dichloride	0.05	0.07	--	--	--	--	0.05	0.07	0.02
Pentachloronitrobenzene	--	--	--	--	--	--	0.2	--	0.02
Permethrin	--	--	--	--	--	--	15	5	0.05
Pymetrozine	0.25	--	--	--	--	--	0.25	--	0.2
Pyraclostrobin	16	--	--	16	--	--	16	1	0.02
Pyridate	--	--	--	--	--	--	0.03	--	0.2
Pyriproxyfen	2	--	--	2	--	--	2	--	0.05
S-metolachlor	1.8	--	--	--	--	--	1.8	--	0.05
Sethoxydim	5	--	--	--	--	--	5	--	1
Spinetoram	10	--	--	10	--	--	10	--	0.05
Spinosad	10	10	--	10	10	--	10	10	2
Spiromesifen	12	--	--	--	--	--	12	--	0.02
Spirotetramat	8	7	--	--	--	--	8	7	7
Sulfentrazone	0.4	--	--	--	--	--	0.4	--	--
Tebuconazole	2.5	--	--	--	--	--	2.5	--	0.05
Tebufenozide	10	10	--	--	--	--	10	10	0.5
Thiamethoxam	3	--	--	--	--	--	3	--	0.2
Triflumizole	40	--	--	--	--	--	40	--	0.1
Trifluralin	0.05	--	--	0.05	--	--	0.05	--	0.5
Zeta-Cypermethrin	14	0.7	--	--	--	--	14	0.7	1

Table 2. Tolerances established on Brassica Leafy Vegetables (continued)
(FASonline: mrldatabase.com; tolerances as of April 20, 2011; note that shading indicates a crop group tolerance)

	Cress (ppm)			Cress, Garden (ppm)			Watercress (ppm)		
Compound	US	Codex	EU	US	Codex	EU	US	Codex	EU
Abamectin	0.1	--	0.1	0.1	--	0.1	--	--	--
Acetamiprid	3	--	3	3	--	3	--	--	--
Acibenzolar-S-methyl	0.25	--	0.02	0.25	--	0.02	--	--	--
Azoxystrobin	30	--	3	30	--	3	3	--	0.05
Bensulide	0.15	--	--	0.15	--	--	--	--	--
Beta-cyfluthrin	6	--	1	6	--	1	--	--	--
Boscalid	60	30	10	60	30	10	--	--	--
Buprofezin	35	--	0.5	35	--	0.5	--	--	--
Captan	0.05	--	0.02	0.05	--	0.02	--	--	--
Carfentrazone-ethyl	0.1	--	0.01	0.1	--	0.01	--	--	--
Chlorantraniliprole	13	20	20	13	20	20	--	--	--
Clethodim	2	--	0.5	2	--	0.5	--	--	--
Clothianidin	3	--	0.1	3	--	0.1	--	--	--
Cyfluthrin	6	--	1	6	--	1	--	--	--
Cymoxanil	19	--	0.05	19	--	0.05	--	--	--
Cyprodinil	30	--	10	30	--	10	20	--	0.05
Cyromazine	7	--	15	7	--	15	--	--	--
d-Phenothrin	0.01	--	0.05	0.01	--	0.05	0.01	--	0.05
Diazinon	--	--	--	--	--	--	0.05	--	0.01
Dinotefuran	5	--	--	5	--	--	--	--	--
Emamectin	0.1	--	1	0.1	--	--	--	--	--
Endosulfan	--	--	--	--	--	--	2	--	0.05
Famoxadone	25	--	0.02	25	--	0.02	--	--	--
Fenamidone	60	--	2	60	--	2	--	--	--
Fenhexamid	30	--	30	30	--	30	--	--	--
Flonicamid	4	--	0.05	4	--	0.05	--	--	--
Flubendiamide	11	--	0.01	11	--	0.01		--	--
Fludioxonil	30	--	10	30	--	10	7	10	0.05
Fluopicolide	25	--	0.01	25	--	0.01	--	--	--
Fluridone	--	--	--	--	--	--	0.1	--	--
Fosetyl-Al	100	--	75	100	--	75	--	--	--
Glyphosate	0.2	--	0.1	0.2	--	0.1	0.2	--	0.1
Imidacloprid	3.5	--	2	3.5	--	2	3.5	--	2
Indoxacarb	14	--	0.02	14	--	0.02	--	--	--
Malathion	8	--	0.02	8	--	0.02	0.2	--	0.02
Mandipropamid	20	25	25	20	25	25			
Metalaxyl	5	--	0.05	5	--	0.05			
Metaldehyde	--	--	--	--	--	--	3.2	--	0.05
Methomyl	--	--	--	--	--	--	0.2	--	0.02
Methoxyfenozide	30	--	0.02	30	--	0.02	--	--	--
Myclobutanil	9	--	0.02	9	--	0.02	--	--	--
Permethrin	20	--	0.05	20	--	0.05	5	--	0.05
Pymetrozine	0.6	--	2	0.6	--	2	--	--	--

Table 2. Tolerances established on Brassica Leafy Vegetables (continued)
(FASonline: mrldatabase.com; tolerances as of April 20, 2011; note that shading indicates a crop group tolerance)

	Cress (ppm)			Cress, Garden (ppm)			Watercress (ppm)		
Compound	US	Codex	EU	US	Codex	EU	US	Codex	EU
Pyraclostrobin	29	--	2	29	--	2	--	--	--
Pyridalyl	20	--	0.01	20	--	0.01	--	--	--
Pyriproxyfen	3	--	0.05	3	--	0.05	2	--	0.05
Sethoxydim	4	--	0.5	4	--	0.5	--	--	--
Spinetoram	8	--	0.05	8	--	0.05	8	--	0.05
Spinosad	8	10	10	8	10	10	8	10	10
Spiromesifen	12	--	0.02	12	--	0.02	--	--	--
Spirotetramat	9	7	7	9	7	7	--	--	--
Tebufenozide	10	10	10	10	10	10	--	--	--
Thiamethoxam	4	--	5	4	--	5	--	--	--
Thiodicarb	35	--	0.02	35	--	0.02	--	--	--
Triflumizole	35	--	0.1	35	--	0.1	--	--	--
Zeta-Cypermethrin	10	0.7	2	10	0.7	2	--	--	--

Table 3. Tolerances established on Leaves of Root and Tuber Vegetables (Human Food)

(FASonline: mrldatabase.com; tolerances as of April 20, 2011; note that shading indicates a crop group tolerance)

	Beet, Garden, Tops (ppm)			Cassava, Leaves (ppm)			Chicory, Tops (ppm)		
Compound	US	Codex	EU	US	Codex	EU	US	Codex	EU
2,4-D	0.1	--	0.05	0.1	--	--	0.1	--	0.05
Azoxystrobin	50	--	0.05	50	--	--	50	--	3
Bifenthrin	15	--	0.05	--	--	--	--	--	--
Captan	0.05	--	0.02	0.05	--	--	0.05	--	2
Carbaryl	75	--	0.05	75	--	--	75	--	0.05
Carfentrazone-ethyl	0.1	--	0.01	0.1	--	--	0.1	--	0.01
Clopyralid	3	--	1	--	--	--	--	--	--
Cycloate	0.05	--	--	--	--	--	--	--	--
Cyprodinil	10	--	10	10	--	--	10	--	10
d-Phenothrin	0.01	--	0.05	0.01	--	--	0.01	--	0.05
Desmedipham	1	--	0.05	--	--	--	--	--	--
Diazinon	0.7	--	0.01	--	--	--	--	--	--
Dimethenamid	0.01	--	0.01	--	--	--	--	--	--
EPTC	0.5	--	0.05	--	--	--	--	--	--
Ethofumesate	5	--	0.05	--	--	--	--	--	--
Fludioxonil	30	--	7	30	--	--	30	--	10
Fluopicolide	15	--	0.01	15	--	--	15	--	0.01
Fluridone	0.1	--	--	--	--	--	--	--	--
Glyphosate	0.2	--	0.1	0.2	--	--	0.2	--	0.1
Imidacloprid	4	--	0.05	4	--	--	4	--	1
Indoxacarb	6	--	0.02	--	--	--	--	--	--
Malathion	8	--	0.02	--	--	--	--	--	--
Metalaxyl	0.1	--	0.05	15	--	--	15	--	1
Methomyl	6	--	0.02	--	--	--	--	--	--
Methoxyfenozide	30	--	0.02	30	--	--	30	--	0.02
Phenmedipham	0.2	--	0.5	--	--	--	--	--	--
Propiconazole	5.5	--	0.05	--	--	--	--	--	--
Pyraclostrobin	16	--	0.5	16	--	--	16	--	2
Pyrazon	7	--	3	--	--	--	--	--	--
Pyriproxyfen	2	--	0.05	2	--	--	2	--	0.05
Spinetoram	10	--	0.05	10	--	--	10	--	0.05
Spinosad	10	10	10	10	10	--	10	10	10
Tebuconazole	7	--	0.05	--	--	--	--	--	--
Trifluralin	0.05	--	0.5	0.05	--	--	0.05	--	0.5

Table 3. Tolerances established on Leaves of Root and Tuber Vegetables (Human Food)
(FASonline: mrldatabase.com; tolerances as of April 20, 2011; note that shading indicates a crop group tolerance)

	Salsify, Tops (ppm)		
Compound	US	Codex	EU
2,4-D	0.1	--	--
Azoxystrobin	50	--	--
Bifenthrin	--	--	--
Captan	0.05	--	--
Carbaryl	75	--	--
Carfentrazone-ethyl	0.1	--	--
Clopyralid	--	--	--
Cycloate	--	--	--
Cyprodinil	10	--	--
d-Phenothrin	0.01	--	--
Desmedipham	--	--	--
Diazinon	--	--	--
Dimethenamid	--	--	--
EPTC	--	--	--
Ethofumesate	--	--	--
Fludioxonil	30	--	--
Fluopicolide	15	--	--
Fluridone	0.1	--	--
Glyphosate	0.2	--	--
Imidacloprid	4	--	--
Indoxacarb	--	--	--
Malathion	8	--	--
Metalaxyl	15	--	--
Methomyl	0.2	--	--
Methoxyfenozide	30	--	--
Phenmedipham	--	--	--
Phosphine	0.01	--	--
Propiconazole	--	--	--
Pyraclostrobin	16	--	--
Pyrazon	--	--	--
Pyriproxyfen	2	--	--
Spinetoram	10	--	--
Spinosad	10	10	--
Tebuconazole	--	--	--
Trifluralin	0.05	--	--

Table 4. Leafy Greens Production in 2009 (FAOSTAT)

(FAOSTAT: http://faostat.fao.org/site/566/default.aspx, results as of April 18, 2011)

Countries/ Regions	Lettuce and Chicory	Spinach
Australia	7,411 ha 164,543 tonnes	1,373 ha 8,638 tonnes
New Zealand	1,241 ha 32,000 tonnes	No data No data
United States	110,966 ha 4,104,440 tonnes	20,315 ha 369,770 tonnes
Africa	14,505 ha 281,968 tonnes	13,051 ha 133,663 tonnes
North America	115,588 ha 4,212,668 tonnes	20,977 ha 374,851 tonnes
Central America	16,715 ha 342,751 tonnes	1,255 ha 17,250 tonnes
South America	19,029 ha 274,130 tonnes	1,736 ha 27,532 tonnes
Asia	739,558 ha 15,068,739 tonnes	823,663 ha 13,780,359 tonnes
Europe	141,731 ha 3,338,412 tonnes	31,865 ha 602,250 tonnes
World Total	1,057,715 ha 23,733,803 tonnes	895,103 ha 14,958,727 tonnes

Note: This table reports only the Leafy Greens available on the FAO website.

Table 5. Crop Group Comparisons – Leafy Vegetables

CODEX Crop Group 013, Leafy vegetables (including Brassica leafy vegetables); proposed new US Crop Group and EU Crop List of Regulation 2 (1) (iv)

Row #	Codex		Proposed US		EU Crop List or Regulation	
	Commodity Name and Code	**Botanical Name**	**Commodity Name**	**Botanical Name**	**Commodity Name**	**Botanical Name**
1	Amaranth, VL 0460	*Amaranthus* spp.	Amaranth	*Amaranthus* spp.	Not Listed	--
2	Not Listed	--	American cress	*Barbarea verna* (Mill.) Asch.	Land cress 0251050	*Barbarea verna*
3	See Rucola	--	Arugula	*Eruca sativa* Mill.	Rocket, Rucola 0251060	*Eruca sativa*
4	Balsam pear leaves, VL 0421	*Momordica charantia* L.	Not included	--	Not Listed	--
5	Not Listed	--	Alexanders, leaves	*Smyrnium olusatrum* L.	Not Listed	--
6	Not Listed	--	Aster, Indian	*Kalimeris indica* (L.) Sch. Bip.	Not Listed	--
7	Not Listed	--	Bellflower, Chinese, leaves	*Platycodon grandiflorus* (Jacq.) A. DC.	Not Listed	--
8	See Chard	*Beta vulgaris* L. subsp. *vulgaris*	Beet, garden, leaves	*Beta vulgaris* L. subsp. *vulgaris*	Beet leaves 0252030	*Beta vulgaris*
9	Betel leaves, VL 0461	*Piper betle* L.	[not included, carcinogenic]	--	Not Listed	--
10	Blackjack, VL 4321	*Bidens pilosa* L.	Blackjack	*Bidens pilosa* L.	Not Listed	--
11	Box thorn, VL 0462	*Lycium chinense* Mill.	[not included, mostly used for tea]	--	Not Listed	--
12	Broccoli, Chinese, **VB 0401 (Group 010)**	*Brassica oleracea* var. *alboglabra* Bailey	Broccoli, Chinese	*Brassica oleracea* var. *alboglabra* (L.H. Bailey) Musil	Not Listed	--
13	Broccoli raab, VL 4327	*Brassica campestris* L., *ruvo* group	Broccoli raab	*Brassica ruvo* L.H. Bailey	Not Listed	--
14	Cassava leaves, VL 0463	*Manifot esculenta* Crantz	Cassava leaves	*Manifot esculenta* Crantz	Not Listed	--
15	Not Listed	--	Cabbage, Abyssinian	*Brassica carinata* A. Braun	Not Listed	--

Table 5. Crop Group Comparisons – Leafy Vegetables (continued)

CODEX Crop Group 013, Leafy vegetables (including Brassica leafy vegetables); proposed new US Crop Group and EU Crop List of Regulation 2 (1) (iv)

Row #	Codex		Proposed US		EU Crop List or Regulation	
	Commodity Name and Code	Botanical Name	Commodity Name	Botanical Name	Commodity Name	Botanical Name
16	Not Listed	--	Cabbage, Seakale	*Brassica oleracea* L. var. *costata* DC.	Not Listed	--
17	Not Listed	--	Cat's Whiskers	*Cleome gynandra* L.	Not Listed	--
18	Not Listed	--	Cham-chwi	*Doellingeria scabra* (Thunb.) Nees	Not Listed	--
19	Not Listed	--	Cham-na-mul	*Pimpinella calycina* Maxim	Not Listed	--
20	Not Listed	--	Chayote leaves	*Sechium edule* (Jacq.) Sw.	Not Listed	--
21	Chard	*Beta vulgaris* L. subsp. *vulgaris*	See Beet, garden, leaves	*Beta vulgaris* L. subsp. *vulgaris*	Not Listed	--
22	Chervil, VL 0465	*Anthriscus cerefolium* (L.) Hoffmann	Chervil	*Anthriscus cerefolium* (L.) Hoffm.	Not Listed	--
23	Chicory leaves (green and red cultivars), VL 0469	*Cichorium intybus* L., var. *foliosum* Hegi	Chicory leaves	*Cichorium intybus* L.	Scarole (broad-leaf endive) 0251030	*Cichorium endiva*
24	Chinese cabbage (type Pe-tsai), VL 0467	*Brassica pekinensis* (Lour.) Ruprecht	Cabbage, Chinese (napa) included in Crop Group 5		Chinese cabbage, 0243010	*Brassica pekinensis*
25	See Pak-choi or Paksoi, VL 0466	--	Cabbage, Chinese (bok choy)	*Brassica rapa* subsp. *chinensis* (L.) Hanelt	Not Listed	--
26	Choisum, VL 0468	*Brassica campestris* L., var. *parachinensis* (Bailey) Sinsk.	Flowering white cabbage (choi sum)	*Brassica rapa* L. subsp. *chinensis* (L.) Hanelt var. *parachinensis* (L. H. Bailey) Hanelt	Not Listed	--
27	Not Listed	--	Chipilin	*Crotalaria longirostrata* Hook & Arn.	Not Listed	--
28	Not Listed	--	Chrysanthemum, corn	*Glebionis segetum* (L.) Fourr.	Not Listed	--
29	Not Listed	--	Chrysanthemum, edible-leaved	*Glebionis* spp.	Not Listed	--

Table 5. Crop Group Comparisons – Leafy Vegetables (continued)

CODEX Crop Group 013, Leafy vegetables (including Brassica leafy vegetables); proposed new US Crop Group and EU Crop List of Regulation 2 (1) (iv)

Row #	Codex		Proposed US		EU Crop List or Regulation	
	Commodity Name and Code	Botanical Name	Commodity Name	Botanical Name	Commodity Name	Botanical Name
30	Not Listed	--	Chrysanthemum, garland	*Glebionis coronaria* (L.) Cass. ex Spach	Not Listed	--
31	Collards, see Kale	*Brassica oleracea* L., convar. *acephala* (D. C.) Alef., var. *acephala*	Collards	*Brassica oleracea* var. *viridis* L.	Not Listed	--
32	Corn salad, VL 040	*Valerianella locusta* (L.) Laterrade	Corn salad	*Valerianella* spp.	Lamb's lettuce 0251010	*Valerianella locusta*
33	Cos lettuce, VL 0510	*Lactuca sativa* L., var. *romana*	See leaf lettuce	--	Lettuce 0251020	*Lactuca sativa*
34	Not Listed	--	Cosmos	*Cosmos caudatus* Kunth	Not Listed	--
35	Cress, Garden, VL 0472	*Lepidium satvum* L.	Cress, Garden	*Lepidium sativum* L.	Cress 0251040	*Lepidium sativum*
36	Not Listed	--	Cress, Upland	*Barbarea vulgaris* W. T. Aiton	Not Listed	--
37	Dandelion, VL 0474	*Taraxacum officinale* Weber	Dandelion	*Taraxacum officinale* F.H. Wigg. aggr.	Not Listed	--
38	Dock, VL 0475	*Rumex* spp.	Dock	*Rumex patientia* L.	Not Listed	--
39	Not Listed	--	Dol-nam-mul	*Sedum sarmentosum* Bunge	Not Listed	--
40	Not Listed	--	Ebolo	*Crassocephalum crepidioides* (Benth.) S. Moore	Not Listed	--
41	Endive, VL 0476	*Cichorium endivia* L.	Endive	*Cichorium endivia* L. ssp. *endivia*	Not Listed	--
42	Not Listed	--	Fameflower	*Talinum fruticosum* (L.) Juss.	Not Listed	--
43	Not Listed	--	Feather cockscomb	*Glinus oppositifolius* (L.) Aug. DC.	Not Listed	--
44	Not Listed	--	Ferns, edible (fiddleheads)	Various species	Not Listed	--

Table 5. Crop Group Comparisons – Leafy Vegetables (continued)

CODEX Crop Group 013, Leafy vegetables (including Brassica leafy vegetables); proposed new US Crop Group and EU Crop List of Regulation 2 (1) (iv)

Row #	Codex		Proposed US		EU Crop List or Regulation	
	Commodity Name and Code	**Botanical Name**	**Commodity Name**	**Botanical Name**	**Commodity Name**	**Botanical Name**
45	Goosefoot, VL 0477	*Chenopodium* spp.	Lambsquarter, not included, weed	--	Not Listed	--
46	Grape leaves, VL 0269	*Vitis vinifera* L.	Grape leaves, not included, vine	--	Not Listed	--
47	Not Listed	--	Good King Henry	*Chenopodium bonus-henricus* L.	Not Listed	--
48	Not Listed	--	Hanover salad	*Brassica napus* var. *pabularia* (DC.) Rchb.	Not Listed	--
49	Not Listed	--	Huauzontle	*Chenopodium berlandieri* Moq.	Not Listed	--
50	Not Listed	--	Iceplant	*Mesembryanthemum crystallinum* L.	Not Listed	--
51	Indian mustard, VL 0478	*Brassica juncea* (L.) Czern. & Coss.	See mustard greens	--	Not Listed	--
52	Japanese greens, various species, VL 0479	*Chrysantheumum coronarium* L.	See Chrysantheum, edible-leaves	--	Not Listed	--
53	Not Listed	--	Jute	*Corchorus spp*.	Not Listed	--
54	Kale, VL 0480	*Brassica oleracea* L. convar. *acephala* (D.C.) Alef., var. *acephala*	Kale	*Brassica oleracea* var. *sabellica* L.	Kale 0243020	*Brassica oleracea* convar. *acephalea*,
55	Kangkung, VL 0507	*Ipomoea aquatica* Forsk	[water spinach, not included]	--	Not Listed	--
56	Komatsuma, VL 0481	*Brassica pervirides* H.L. Bail.	See mizuna	--	Not Listed	--
57	Not Listed	--	Lettuce, bitter	*Launaea cornuta* (Hochst. ex Oliv. & Hiern) C. Jeffrey	Not Listed	--

Table 5. Crop Group Comparisons – Leafy Vegetables (continued)

CODEX Crop Group 013, Leafy vegetables (including Brassica leafy vegetables); proposed new US Crop Group and EU Crop List of Regulation 2 (1) (iv)

Row #	Codex		Proposed US		EU Crop List or Regulation	
	Commodity Name and Code	**Botanical Name**	**Commodity Name**	**Botanical Name**	**Commodity Name**	**Botanical Name**
58	Lettuce, Head, VL 0482	*Lactuca sativa L.,* var. *capitata*	Lettuce, head and leaf	*Lactuca sativa* L.	Lettuce 0251020	*Lactuca sativa*
59	Lettuce, Leaf, VL 0483	*Lactuca sativa* L., *var. crispa* L.	Lettuce, head and leaf	*Lactuca sativa* L.	Lettuce 0251020	*Lactuca sativa*
60	Not Listed	--	Maca	*Lepidium meyenii* Walp.	Not Listed	--
61	Mallow, VL 0484	*Malva verticillata* L.	[proposed for Herb and Spice crop group]	--	Not Listed	--
62	Marsh marigold, VL 0471	*Caltha palustris* L.	[weed, poisonous]	--	Not Listed	--
63	Not Listed	--	Mizuna	*Brassica juncea L.* subsp. *nipposinica* (L.H. Bailey) Hanelt	Leaves and sprouts of *Brassica* spp, includes mizuna, 0251080	*Brassica* spp.
64	Mustard greens, VL 0485	*Brassica juncea* (L.) Czern & Cross ssp. *juncea*	Mustard greens	*Brassica juncea* subspp.	Red Mustard 0251070	*Brassica juncea var. rugosa*
65	Not Listed	--	Mustard, tuberous rooted, Chinese	*Brassica juncea* (L.) Czern. subsp. *napiformis* (Pailleux & Bois) Gladis	Not Listed	--
66	New Zealand spinach, VL 0486	*Tetragonia tetragonioides* (Pallas) O. Kuntze				
67	Nightshade, Black, VL 0487	*Solanum nigrum* L.				
68	Orach, VL 0488	*Atriplex hortensis* L.	Orach	*Atriplex hortensis* L.	Not Listed	--
69	Pak-choi or Paksoi, VL 0466	*Brassica sinensis* L.	See Cabbage, Chinese (bok choy)	*Brassica rapa* subsp. *chinensis* (L.) Hanelt	Not Listed	--
70	Papaya leaves, VL 0337	*Carica papaya* L.	[Leaves of trees not included]	--	Not Listed	--

Table 5. Crop Group Comparisons – Leafy Vegetables (continued)

CODEX Crop Group 013, Leafy vegetables (including Brassica leafy vegetables); proposed new US Crop Group and EU Crop List of Regulation 2 (1) (iv)

Row #	Codex		Proposed US		EU Crop List or Regulation	
	Commodity Name and Code	Botanical Name	Commodity Name	Botanical Name	Commodity Name	Botanical Name
71	Parsley, HH 0740, Group 027, Herbs	*Petroselinum crispum* (Mill.) Nyman ex A.W. Hill	Parsley, fresh	*Petroselinum crispum* (Mill.) Nyman ex A.W. Hill	Not Listed	--
72	Pepper leaves, VL 0489	*Piper umbellatum* L. (Asia); *P. auritum* H.B.&K.; *P. sanctum* (Miq.) Schlecht. (C. and S. America)	[Solanaceae not included]	--	Not Listed	--
73	Plantain leaves, VL 0490	*Plantago major* L.	Plantain	*Plantago* spp.	Not Listed	--
74	Pokeweed, VL 0491	*Phytolacca americana* L.	[Not included, poisonous]	--	Not Listed	--
75	Not Listed	--	Primrose, English	*Primula vulgaris* Huds.	Not Listed	--
76	Purslane, VL 0492	*Portulaca oleracea* L., ssp. *sativa* (Haw) Celak.	Purslane, Garden	*Portulaca oleracea* L.	Not Listed	--
77	Purslane, Winter, VL 0493	*Claytonia perfoliata* Donn ex Willd.	Purslane, Winter	*Claytonia perfoliata* Donn ex Willd.	Not Listed	--
78	Radish leaves (including radish tops), VL 0494	*Raphanus sativus* L.	Radish leaves	*Raphanus sativus* L. var *sativus*	Not Listed	--
79	Not Listed	--	Rampion leaves	*Campanula rapunculus* L.	Not Listed	--
80	Rape greens, VL 0495	*Brassica napus* L.	Rape greens	*Brassica napus* L. var. *napus*	Not Listed	--
81	Not Listed	--	Rocket, wild	*Diplotaxis tenuifolia* (L.) DC.	Not Listed	--

Table 5. Crop Group Comparisons – Leafy Vegetables (continued)

CODEX Crop Group 013, Leafy vegetables (including Brassica leafy vegetables); proposed new US Crop Group and EU Crop List of Regulation 2 (1) (iv)

Row #	Codex		Proposed US		EU Crop List or Regulation	
	Commodity Name and Code	Botanical Name	Commodity Name	Botanical Name	Commodity Name	Botanical Name
82	Roselle leaves, VL 0446	*Hibiscus sabdariffa* L.	[Not included, use mostly medicinal]	--	Not Listed	--
83	Rucola, VL 0496	*Eruca vesicaria* (L.) Cav. ssp. *sativa* Mill.	See Arugula	*Eruca sativa* Mill.	Rocket, Rucola 0251060	*Eruca sativa*
84	Rutabaga greens, VL 0497	*Brassica napobrassica* (L.) Mill.	Rutabaga leaves	*Brassica napus* var. *napobrassica* (L.) Rchb.	Not Listed	--
85	Salsify leaves, VL 0498	*Tragopogon porrifolium* L.	Salsify, Black	*Scorzonera hispanica* L.	Not Listed	--
86	Sea kale, VL 0499	*Crambe maritime* L.	[Included in Stalk, Stem and Petiole: shoots blanched and served like asparagus]		Not Listed	--
87	Senna leaves, VL 0500	*Cassia senna* L.	[laxative medicinal use]	--	Not Listed	--
88	Not Listed	--	Shepherd's purse	*Capsella bursa-pastoris* (L.) Medik	Not Listed	--
89	Sowthistle, VL 0501	*Sonchus oleraceus* L.	Sowthistle	*Sonchus oleraceus* L.	Not Listed	--
90	Spinach, VL 0502	*Spinacia oleracea* L.	Spinach	*Spinacia oleracea* L.	Spinach 0252010	*Spinacia oleracea*
91	Spinach, Indian, VL 0503	*Basella alba* L.	Spinach, Malabar	*Basella alba* L.	Not Listed	--
92	See New Zealand spinach	*Tetragonia tetragonioides* (Pallas) O. Kuntze	Spinach, New Zealand	*Tetragonia tetragonioides* (Pall.) Kuntze	Not Listed	--
93	Sweet potato, leaves, VL 0508	*Ipomoea batatas* (L.) Poir.	Sweet potato, leaves	*Ipomoea batatas* (L.) Lam. var. *batatas*	Not Listed	--
94	See Chard	--	Swiss chard	*Beta vulgaris* L. subsp. *vulgaris*	Not Listed	--
95	Tannia leaves, VL 0504	*Xanthosoma sagittifolium* (L.) Schott	Tanier leaves	*Xanthosoma sagittifolium* (L.) Schott	Not Listed	--
96	Not Listed	--	Tanier Spinach	*Xanthosoma brasiliense* (Desf.) Engl.	Not Listed	--

Table 5. Crop Group Comparisons – Leafy Vegetables (continued)

CODEX Crop Group 013, Leafy vegetables (including Brassica leafy vegetables); proposed new US Crop Group and EU Crop List of Regulation 2 (1) (iv)

Row #	Codex		Proposed US		EU Crop List or Regulation	
	Commodity Name and Code	**Botanical Name**	**Commodity Name**	**Botanical Name**	**Commodity Name**	**Botanical Name**
97	Taro leaves, VL 0505	*Colocasia esculenta* (L.) Schott	Taro leaves	*Colocasia esculenta* (L.) Schott	Not Listed	--
98	Turnip greens, VL 0506	*Brassica rapa* L., var. *rapa*	Turnip greens	*Brassica rapa* L., var. *rapa*	Not Listed	--
99	Not Listed	--	Ulluco leaves	*Ullucus tuberosus* Caldas	Not Listed	--
100	Not Listed	--	Velvet plant leaves	*Gynura bicolor* (Roxb. ex Willd.) DC.	Not Listed	--
101	Not Listed	--	Violet, Chinese	*Asystasia gangetica* (L.) T. Anderson	Not Listed	--
102	Watercress	*Nasturtium officinale* R. Br. and hybrids	Watercress	*Nasturtium officinale* W. T. Aiton	Not Listed	--
103	Not Listed	--	Yam leaves	*Dioscorea* spp.	Not Listed	--

ATTACHMENT 1. CHEMSAC PROPOSAL – MAY 5, 2010

AND

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF CHEMICAL SAFETY AND POLLUTION PREVENTION

MEMORANDUM

DATE: **May 5, 2010**

SUBJECT: **Crop Grouping – Joint Proposal I: Options for Revising the Leafy Vegetable Crop Group 4 [40 CFR § 180.41 (c) (5)] and the Brassica Leafy Vegetable Crop Group 5 [(40 CFR § 180.41 (c) (6)].**

PC Code: NA	**DP Barcode:** NA
Decision No.: NA	**Registration No.:** NA
Petition No.: NA	**Regulatory Action:** Crop Grouping Regulation
Risk Assessment Type: None	**Case No.:** NA
TXR No.: NA	**CAS No.:** NA
MRID No.: NA	**40 CFR:** 180.41 (c) (5) and 180.41 (c) (6)

FROM: Bill Barney, Crop Grouping Manager Chairman, ICGCC
Tracy Switek, Assistant Coordinator
IR-4 Project Headquarters

AND

Bernard A. Schneider, Ph.D., Senior Plant Physiologist
Chemistry and Exposure Branch
Health Effects Division (7509P)

THROUGH: William Donovan, Ph.D. and Michael Doherty, Ph.D., Chairpersons
HED Chemistry Science Advisory Council (ChemSAC)
Health Effects Division (7509P)

TO: ChemSAC,
Denise MacGillivray, PMRA, and
Barbara Madden, Minor Use Officer, RD (7505P)

cc: IR-4 Project, Jerry Baron, Dan Kunkel, Debbie Carpenter, and Van Starner.

BACKGROUND AND ACTION REQUESTED:

As part of the Crop Grouping revision effort, William P. Barney, Crop Grouping Project Coordinator and Tracey Switek, Assistant Coordinator, USDA Interregional Research Project No. 4 (IR-4) have been researching the revision of Crop Group 4, Leafy Vegetables, except Brassica vegetables and its subgroups and the Brassica leafy vegetable crop group 5 and its subgroups. During discussions with Bernie Schneider, and various members of the International Crop Grouping Consulting Committee several suggestions have come up which IR-4 would like to have ChemSAC review and provide their expert suggestions prior to the further development of these crop groups.

IR-4 feels that these proposed changes would help us harmonize the crop groups more closely with Codex, provide flexibility to the growers, and more accurately reflect the pesticide residue levels on these vegetable crops.

There are three proposals for ChemSAC to consider, and for discussion purposes we will list the current Crop Groups 4 and 5 in Appendix I. Appendix II shows all the possible changes that could occur to the Crop group 4 Leafy Vegetable, while Appendix III shows all the possible changes that could occur to the Crop group 5 Brassica Leafy Vegetable.

IR-4 Proposal 1: 'Transfer the Brassica Leafy Vegetable Subgroup 5B to Crop Group 4 (Leafy Vegetables except Brassica Vegetables) to form a new Subgroup 4C (Leafy Brassica Vegetables) and rename Group 4 as Leafy Vegetable and Crop Group 5 as the Head and Stem Brassica Vegetable Group'.

Leafy vegetables and Brassica leafy vegetables are grouped separately in the U.S. crop grouping system. However, non-Brassica leafy vegetables and Brassica leafy vegetables are similar to each other in growth pattern and leaf exposure. Brassica leafy vegetables more closely resemble non-Brassica leafy vegetables in this manner than they do with Crop Subgroup 5A the Brassica head and stem vegetables with which they are currently grouped. One option considered was to combine the two leafy vegetables into one subgroup, however, after comments from a member of the ICGCC as well as consulting with IR-4 weed scientist Dr. Marija Arsenovic, grouping these vegetables

together within a single subgroup was found to be undesirable due to potentially differing actions of some herbicides on leafy Brassicas verses other leafy (non-Brassica) crops.

Another option would be to make a separate Leafy Brassica greens subgroup 4C. This subgroup would make Group 4 more comparable to the Codex Group 013, Leafy vegetables (including Brassica leafy vegetables). Codex has long grouped all leafy vegetables together and this move would allow our system to harmonize more closely with theirs, while still maintaining the integrity of existing herbicide registrations and allowing for registrations on a single subgroup for those herbicides which would otherwise be impractical for use on the entire group.

The similarity of these two existing subgroups is borne out by a comparison of existing tolerances. Based on the existing tolerances shown in Tables 1, 2 and 3 on crop subgroups 4A, 5A, and 5B it is clear that the levels of residues found in Subgroup 5B (Leafy Brassica greens) are closer to the levels of the same chemical found in Subgroup 4A (Leafy Greens) than those of Subgroup 5A (Brassica Head and Stem Vegetables). Moving the members of the Brassica Leafy Vegetables into group 4 would allow for greater accuracy when setting tolerances for crop groups 4 and 5. This proposed move has received support from members of the ICGCC, particularly due to the recent practice of growing Brassica and non-Brassica leafy vegetables together for "baby greens" and salad mixes.

Table 1. Comparison of tolerances between Crop Subgroup 4A (Leafy greens), Subgroup 5A (Head and stem Brassica), and Subgroup 5B (Leafy Brassica greens).

Existing tolerances by subgroup			
	Subgroup:		
Chemical:	**4A**	**5B**	**5A**
Cyprodinil	30	10	1
Fludioxonil	30	10	2
Methoxyfenozide	30	30	7
Spiromesifen	12	12	2
Tebufenozide	10	10	5
Triflumazole	35	40	8

Table 2. Comparisons between the Leafy Vegetable subgroups 4A, 5B, and 5A.

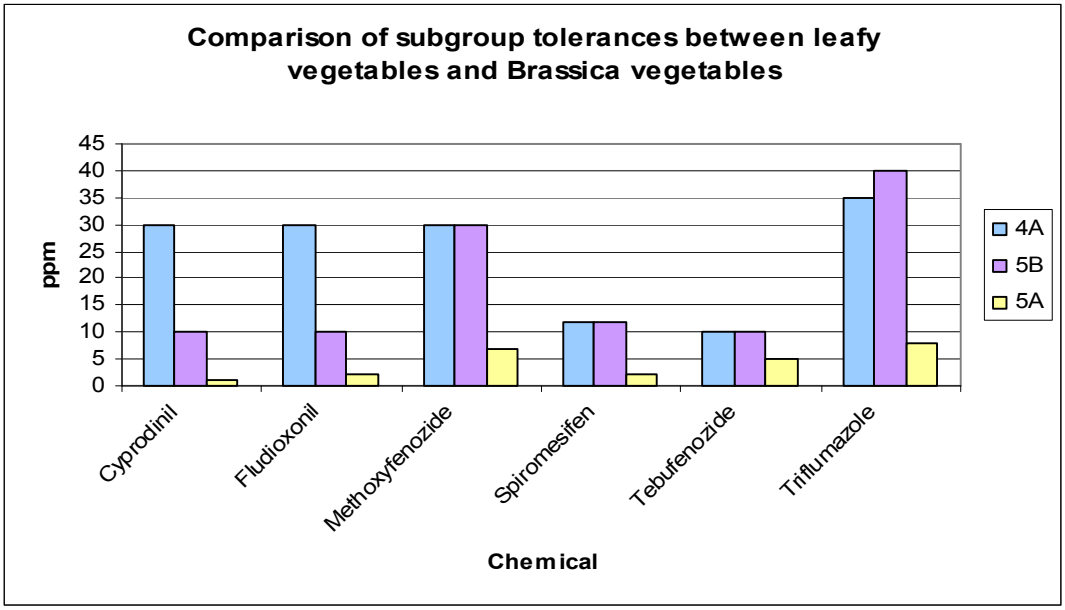
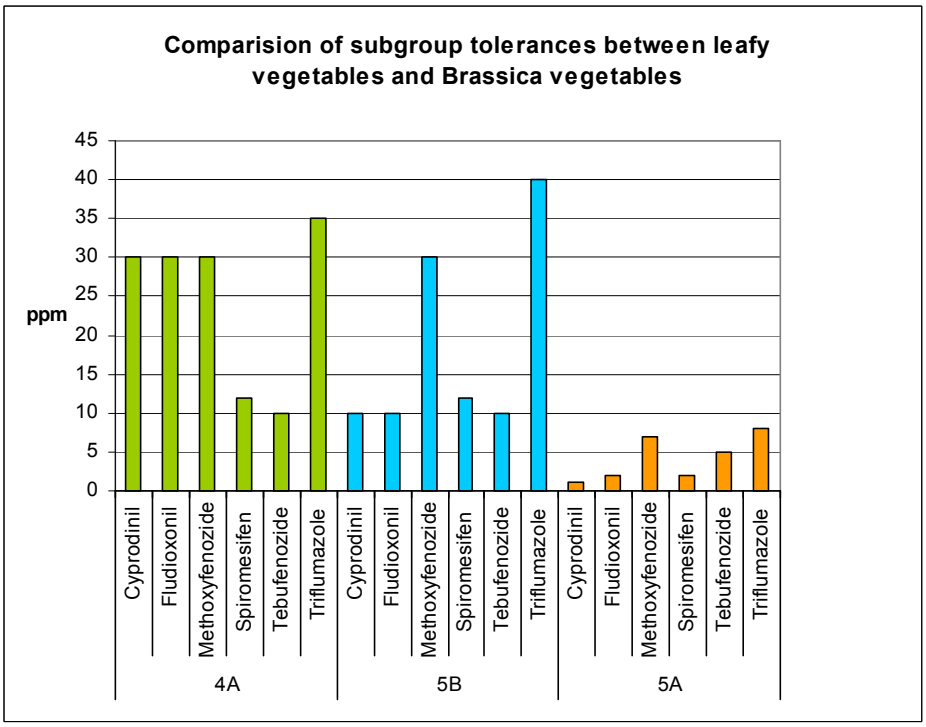


Table 3. More Visual Comparisons between the Leafy Vegetable subgroups 4A, 5B and 5A.



ChemSAC Recommendation for Proposal 1:

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IR-4 Proposal 2: 'Add Stalk and Stem vegetables (currently orphans) to existing Subgroup 4B (Leaf Petioles) to form a new Subgroup 4B (Stalk, Stem, and Petiole Vegetables)':

An amended Subgroup 4B would be comparable to Codex Group 017, Stalk and Stem Vegetables. The proposal to add stalk and stem vegetables to the existing leaf petiole subgroup was made to more closely harmonize with Codex. The Codex Stalk and Stem group contains several petiole crops, including celery and rhubarb, which are already members of Subgroup 4B.

It seems to be preferable to add the stalk and stem vegetables to the existing subgroup, rather than to form a new separate crop group for stalk, stem, and petiole vegetables because many leafy vegetables are also used as stalk, stem, or petiole crops. In some cases the petioles and the leafs are used as separate and distinct commodities, and in others the plant is harvested as a stalk vegetable when very young and later is harvested as a leafy vegetable. In these cases, if stalk, stem, and petiole vegetables were in a separate crop group, a large number of these crops would also have to be Crop Group 4, which would add a level of complexity to setting tolerances on these groups.

Although there was not enough available data to perform a comparison on the existing tolerances of the stalk and stem vegetables and the petiole vegetables, the pesticide exposure for these crops should be very similar to each other based on the morphology of the structures involved.

ChemSAC Recommendation for Proposal 2:

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IR-4 Proposal 3: 'Option Either Add a New Subgroup Aquatic Vegetables (4D) to the Leafy Vegetable Group 4 or Establish an Entirely New Crop Group Called Aquatic Vegetable Crop Group'.

Either making an aquatic vegetables subgroup or establish an entirely new Aquatic Vegetable crop group would allow for inclusion of those vegetables grown either partially or totally submerged. Although Codex currently places aquatic leafy vegetables in the same group with other leafy vegetables, we feel that these crops would be exposed to different pesticide use patterns. This is due to the distinctive challenges in applying pesticides to an aquatic system that are not present in land based agricultural systems, as well as to the difference that water makes in the quantity of residues found.

Placing these crops in a separate subgroup or group would accommodate the different use patterns that might be required for applications on these aquatic crops as well as the different levels of residue that might be found due to the presence of large amounts of water in the system.

Placing the aquatic vegetables in a separate subgroup would allow registrants not wishing to pursue tolerances on aquatic vegetables due to different registration issues to still seek tolerances for subgroups 4A, 4B, or 4C.

Also placing the aquatic vegetables in a new crop group would allow the group to expand beyond simply aquatic leafy vegetables to include other kinds of aquatic vegetables which might share similar challenges in crop protection and use patterns.

We seek ChemSAC recommendation in regards to the placement of the aquatic vegetables as either a separate crop group or a subgroup of Crop Group 4.

ChemSAC Recommendation for Proposal 3:

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APPENDIX I: THE CURRENT CROP GROUP 4 LEAFY VEGETABLE, EXCEPT BRASSICA AND CURRENT CROP GROUP 5 BRASSICA LEAFY VEGETABLES FOR REFERENCE PURPOSES:

CURRENT CROP GROUP 4 LEAFY VEGETABLE, EXCEPT BRASSICA:

Group Subgroups 4A and 4B	Representative Commodity	Commodities
Crop Subgroup 4A: Leafy greens	Head lettuce, leaf lettuce, and spinach	Amaranth; arugula; chervil; chrysanthemum, edible-leaved; chrysanthemum, garland; corn salad; cress, garden; cress, upland; dandelion; dock; endive; lettuce; orach; parsley; purslane, garden; purslane, winter; radicchio; spinach; spinach, New Zealand; spinach, vine.
Crop Subgroup 4B: Leaf petioles	Celery	Cardoon; celery; celery, Chinese; celtuce; fennel, Florence; rhubarb; Swiss chard

And

CURRENT CROP GROUP 5 BRASSICA LEAFY VEGETABLES

Group Subgroups 5 A and 5B	Representative Commodity	Commodities
Crop Subgroup 5A: Head and stem Brassica	Broccoli or cauliflower, and cabbage	Broccoli,; Chinese broccoli; Brussels sprouts; Cabbage; Chinese cabbage, napa; Chinese mustard cabbage; cauliflower; cavalo broccoli; kohlrabi
Subgroup 5B: Leafy Brassica greens	Mustard greens	Broccoli raab; Chinese cabbage, bok choy; collards; kale; mizuna; mustard greens; mustard spinach; rape greens

APPENDIX II. POSSIBLE CHANGES TO CROP GROUP 4 LEAFY VEGETABLE.

Revised Group 4: Leafy Vegetables	**Representative Commodity**	**Commodities[1]**
Revised Subgroup 4A: Leafy Greens	Leaf lettuce and spinach	Alexanders; amaranth; amaranth, Chinese; arugula; aster, Indian; beet, leaves; bellflower, Chinese; bitter melon (leaves); blackjack; cassava (leaves); cat's whiskers; celtuce (leaves); chervil; chicory (radicchio leaves and Belgian endive); chipilin; chrysanthemum, edible-leaved; chrysanthemum, garland; corn salad; cosmos; cowpea; cress, garden; cress, upland; dandelion; dock; dokudami; ebolo; endive; fameflower; feather cockscomb; fern, edible; foo yip; good-king-henry; gourd, edible (leaves); grains of selim; hibiscus, sunset; honewort; huauzontle; jute; lambsquarter; lettuce; lettuce, bitter; lettuce, head; lettuce, leaf; maca (leaves); mallow; marshmarigold; milk thistle; mugwort, white; nettle, nightshade, African; okra (leaves); orach; pak waan; paragrass; parsley; parsnip (leaves); pennywort, Asiatic; pepper leaf; perilla; primrose, English; pumpkin (leaves); pumpkin, fluted (leaves); purslane, garden; purslane, winter; radish (leaves); radish, Oriental (leaves); rampion (leaves); rhodiola; rocket, wild; roselle (leaves); salsify (leaves), salsify, black (leaves) spinach; spinach, buffalo; spinach, Malabar (formerly spinach, vine), spinach, Tanier; spinach, New Zealand; sweet potato, leaves; Swiss chard, leaves, Ullucu, leaves; velvet plant; violet, Chinese; watercress, leaves; yam, true, leaves
Revised Subgroup 4B: Stalk, Stem, and Leaf Petiole Vegetables	Celery	Agave (stalk); alexanders (petiole); arracacha (stems); asparagus; asparagus, sea; bamboo (shoots), burdock, edible; cardoon; celery; celery, Chinese; celtuce (stem); fennel, Florence; fuki; garlic (stalk); kale, sea; knotweed; mioga; rhubarb; Swiss chard (petioles), udo, watercress (above-ground rhizome functioning as a stem)
New Subgroup 4C: Brassica Leafy Vegetables	Mustard greens	Broccoli raab; cabbage, Chinese (bok choy); collards; kale; mizuna; mustard greens; mustard spinach; rape greens
New Subgroup 4D: Aquatic Leaf Vegetables Or New Crop Group: Aquatic Vegetables	**Water spinach**	Bamboo, water; caltrop, water; cattail, common; dropwort, water; euryale; lotus leaves; spinach, water; watershield, white snowflake

1: All commodities in these subgroups are subject to changes or additions pending further research.

APPENDIX III. POSSIBLE CHANGES TO CROP GROUP 5 BRASSICA LEAFY VEGETABLE TO BECOME HEAD AND STEM BRASSICA GROUP.

Head and Stem Brassica Group 5 - 10	Representative Commodity	Commodities
No Subgroups	Broccoli or cauliflower, and cabbage	Broccoli,; Chinese broccoli; Brussels sprouts; Cabbage; Chinese cabbage, napa; Chinese mustard cabbage; cauliflower; cavalo broccoli; kohlrabi

ATTACHMENT 2. CHEMSAC MINUTES – MAY 19, 2010

Subject: **Minutes of the 05/19/2010 ChemSAC Meeting**

To: **HED's Chemistry Interest Group**

From: **HED's Chemistry Science Advisory Council (ChemSAC)**

Attendees: Will Donovan (Chair), Thurston Morton (Minutes), Chris Olinger, Tom Bloem, Bill Drew, George Kramer, Meheret Negussie, Mike Doherty, Bernie Schneider, Beth Holman, Rick Loranger, Debra Rate, Dave Soderberg, Dennis McNeilly, Julie Van Alstine, Bonnie Cropp-Kohlligian, Doug Dotson, Barbara Madden, Andy Ertman, Ideliz Negron, and P. Yvonne Barnes.

Via telephone:

PMRA – Monica Lee and Denise MacGillivray
IR-4 – Tracy Switek, Bill Barney, and Kathryn Homa

1. Minutes of 5/12/10. Approved with minor editorial comments. Concerning the last item of the minutes, Chris Olinger noted that all U.S. registrations of methamidophos have been cancelled (personal email communication, J. Schnackenbeck to C. Olinger, 5/19/2010).

2. [Item 2 omitted]

3. Crop Grouping proposals for possible options to revise the Leafy Vegetable Crop Group 4 and the Brassica Leafy Vegetable Crop Group 5 as well as create new a new crop group named the Leafy, Tree, and Vine Vegetable Crop Group (B. Schneider and IR-4). Tracy Switek, USDA IR-4 presented the two proposals.

Note that the following is not a request for approval of new crop groups but rather a request for feedback about some ideas for how to best revise groups 4 and 5 and/or add new crop group(s)/subgroup(s). The intent is that ChemSAC feedback might assist in the development of proposals that may be submitted at a later time.

IR-4 Proposal 1 considered options for revising the Leafy Vegetable and Brassica Leafy Vegetable Crop Groups. Option 1 proposes to transfer the Brassica Leafy Vegetable Subgroup 5B to Crop Group 4 (Leafy Vegetables except Brassica Vegetables) to form a new Subgroup 4C (Leafy Brassica Vegetables) and rename Group 4 as Leafy Vegetable and Crop Group 5 as the Head and Stem Brassica Vegetable Group**.** Table 1 shows the proposed new changes to Crop Group 4 Leafy Vegetable, and Table 2 shows all the possible changes that could occur to the Crop Group 5 Brassica Leafy Vegetable. The leafy vegetables and Brassica leafy vegetables are grouped separately in the U.S. crop grouping system. However, non-Brassica leafy vegetables and Brassica leafy vegetables are similar to each other in growth pattern and leaf exposure. Brassica leafy vegetables (Subgroup 4B) more closely resemble non-Brassica leafy vegetables in this manner than they do Crop Subgroup 5A (the Brassica head and stem vegetables) with which they are currently grouped. The two options are to either 1) combine the Brassica leafy vegetables with the leafy vegetables into one subgroup or 2) make a separate Leafy Brassica Greens Subgroup 4C. This subgroup would make Group 4 more comparable to the Codex Group 013, Leafy Vegetables (including Brassica leafy vegetables). Codex has long grouped all leafy vegetables together and this move would allow our system to harmonize with this group more closely. The similarity of these two existing subgroups is borne out by a comparison of existing tolerances and use patterns. Based on a comparison of crop subgroups 4A, 5A, and 5B it is clear that the established tolerance levels in Subgroup 5B (Leafy Brassica Greens) are much closer to the levels of the same chemical found in Subgroup 4A (Leafy Greens) than those of Subgroup 5A (Brassica Head and Stem Vegetables). Thus moving members of the Brassica Leafy Vegetables into Group 4 would allow for greater accuracy when setting tolerances for both crop Groups 4 and 5.

ChemSAC Recommendation for Proposal 1:

ChemSAC felt that moving the Brassica Leafy Vegetable Subgroup 4B into the Leafy Vegetable Group 4 would be justified by keeping it as a separate subgroup in the Leafy Vegetable Group 4 (Table 1). Also, ChemSAC felt that Crop Group 5 could be renamed the Head and Stem Brassica Vegetable Group if the Leafy Brassica Subgroup is moved to Crop Group 4 (Table 2). ChemSAC also recommended that further research into a possible Subgroup 4C: Brassica Leafy Vegetables should be made into the representative commodity being either mustard greens or kale to avoid trade irritants with Canada.

IR-4 Proposal 2 discussed possibility of adding the stalk and stem vegetables (currently orphans) to the existing Subgroup 4B (Leaf Petioles) to form a new Subgroup 4B (Stalk, Stem, and Petiole Vegetables). An amended Subgroup 4B would be comparable to Codex Group 017, Stalk and Stem Vegetables. This proposal to add stalk and stem vegetables to the existing Leaf Petiole Subgroup was made to more closely harmonize with Codex. The Codex Stalk and Stem Group contains several petiole crops, including celery and rhubarb, which are already members of Subgroup 4B. IR-4 thought it would be preferable to add the stalk and stem vegetables to the existing subgroup, rather than to form a new separate crop group for stalk, stem, and petiole vegetables

because many leafy vegetables are also used as stalk, stem, or petiole crops. In some cases the petioles and the leafs are used as separate and distinct commodities, and in others the plant is harvested as a stalk vegetable when very young and later is harvested as a leafy vegetable. In these cases, if stalk, stem, and petiole vegetables were in a separate crop group, a large number of these crops would also have to be Crop Group 4, which would add a level of complexity to setting tolerances on these groups.

ChemSAC Recommendation for Proposal 2:

ChemSAC agrees that combing the stem and stalk vegetables into the Leaf Petioles Subgroup 4B is a good idea. Also, ChemSAC agreed that the stalk, stem and petiole vegetables could be a separate crop group similar to Codex. However, there needs to be more available data to perform a comparison on the existing tolerances of the stalk and stem vegetables with the petiole vegetables. The pesticide exposure for these crops should be similar to each other based on the morphology of the structures involved. More data are needed before recommending celery and or asparagus as a representative commodity. Barbara Madden, RD, volunteered her staff to help gather comparisons of tolerance and use pattern data for celery and asparagus.

IR-4 Proposal 3: Either add a new subgroup Aquatic Vegetables (4D) to the Leafy Vegetable Group 4 or establish an entirely new crop group, namely, Aquatic Vegetable Crop Group.

Either making an aquatic vegetables subgroup or establishing an entirely new Aquatic Vegetable crop group would allow for inclusion of those vegetables grown either partially or totally submerged in water. Although Codex currently places aquatic leafy vegetables in the same group with other leafy vegetables, we feel that these crops would be exposed to different pesticide use patterns. This is due to the distinctive challenges in applying pesticides to an aquatic system that are not present in land based agricultural systems, as well as to the difference that water makes in the quantity of residues found.

Placing these crops in a separate subgroup or group would accommodate the different use patterns that might be required for applications on these aquatic crops as well as the different levels of residue that might be found due to the presence of large amounts of water in the system.

IR-4 is seeking ChemSAC recommendation in regards to the placement of the aquatic vegetables as either a separate crop group or a subgroup of Crop Group 4.

ChemSAC Recommendation for Proposal 3:

ChemSAC in general recommends that aquatic vegetables should be in a separate crop group rather than making it a separate subgroup in the Leafy Vegetable Crop Group 4. This would recognize its unique growing conditions over conventional land grown leafy vegetables, and avoid exceptions to the Leafy Vegetable Group 4 since one aquatic vegetable would have to be a representative commodity in Crop Group 4. ChemSAC

also recommends considering what aquatic crop makes the best representative commodity instead of water spinach. Seaweed was also named as a possible aquatic crop.

TABLE 1: POSSIBLE CHANGES TO CROP GROUP 4-10 LEAFY VEGETABLE.

Revised Group 4-10: Leafy Vegetables	**Representative Commodity**	**Commodities being researched and ChemSAC Notes**
Revised Subgroup 4A: Leafy Greens	Leaf lettuce and spinach	List of commodities deleted for the minutes.
Revised Subgroup 4B: Stalk, Stem, and Leaf Petiole Vegetables	Celery **or Asparagus proposed**	List of commodities deleted for the minutes. ChemSAC agrees with combing the stem and stalk vegetables into a crop subgroup provided more information is developed for residue comparisons in both of these crops.
New Subgroup 4C: Brassica Leafy Vegetables	Mustard greens **or kale**	Current commodities are: Broccoli raab; cabbage, Chinese (bok choy); collards; kale; mizuna; mustard greens; mustard spinach; rape greens. ChemSAC agrees that the Brassica leafy vegetable subgroup 5B could be transferred to crop group 4C. Further research should be made into the representative commodity being either mustard greens or kale to avoid trade irritants with Canada.
New Subgroup 4D: Aquatic Leaf Vegetables Or New Crop Group: Aquatic Vegetables	**Water spinach**	Bamboo, water; caltrop, water; cattail, common; dropwort, euryale water; lotus leaves; spinach, water; watershield, white snowflake **ChemSAC** recommends further investigation into an appropriate representative crop, and addition of other aquatic crops such as taro leaves and seaweed. Also, ChemSAC favors a new crop group for aquatics over it being a separate crop subgroup in crop group 4.

TABLE 2: POSSIBLE CHANGES TO CROP GROUP 5 BRASSICA LEAFY VEGETABLE TO BECOME HEAD AND STEM BRASSICA GROUP 5 -10.

Head and Stem Brassica Group 5-10	Representative Commodity	Commodities
No Subgroups	Broccoli or cauliflower, and cabbage	Broccoli,; Chinese broccoli; Brussels sprouts; Cabbage; Chinese cabbage, napa; Chinese mustard cabbage; cauliflower; cavalo broccoli; kohlrabi

IR-4 Proposal IR-4: Establish an entirely new crop group separate from the Leafy Vegetable Group 4 and the Brassica Leafy Vegetable Group 5 that would contain Edible Leaves of Trees, Shrubs, and Vines.

In the course of researching the revision of Crop Group 4, Leafy Vegetables (except Brassica vegetables) and its subgroups, many new crops were discovered or proposed for inclusion that either do not fit the traditional definition of leafy vegetables, or do not fit into the existing subgroups (Crop Groups 4 or 5 or any of its subgroups). The existing members of Crop Group 4 are all relatively small, herbaceous plants grown as vegetables for their leaves or petioles. However, there are many economically and nutritionally valuable leafy vegetable crops which do not fit this description. Many of these are trees, shrubs, or very large vines which are valued for their edible leaves (see Table 3 for what the crop group may look like). Although they are technically leaf vegetables, they can be expected to require very different pesticide use patterns and exhibit different residues than the smaller, low to the ground herbaceous plants which currently make up Crop Group 4: Leafy Vegetables (except Brassica Leafy Vegetables) and Crop Subgroup 5B Leafy Brassica Greens. Their uses also may vary some from salad type vegetables such as banana leaves that are wrapped around food and cooked, and grape leaves which are used widely in Mediterranean cooking and filled with rice before cooking and eaten whole. IR-4 would like ChemSAC advice regarding formation of this proposed new crop group.

TABLE 3: Proposed New Crop Group - Leafy Tree, Shrub, and Vine Vegetable.

Group Name	Proposed Representative Commodity	Proposed Commodities
Leafy Tree, Shrub, and Vine Vegetables Group	Grape, leaves	Agathi; banana, leaves; banana, Abyssinian; baobab, bitterleaf; chaya; Chinese toon; goji, leaves; grape, leaves; horseradish tree; papaya, leaves

ChemSAC Recommendation for Proposal 4:

In general ChemSAC was opposed to establishing a new crop group for Edible Leaves of Trees, Shrubs, and Vines because the proposed commodities may be too variable in use patterns and too minor to be internationally traded, making the selection of a standard representative commodity for all these unique types of growth problematic. However, with increasing availability of ethnic crops in U.S. stores (particularly Asian, Hispanic, Caribbean, and Middle Eastern), analysis of food consumption trends is recommended before keeping these crops as distinct orphans.

ATTACHMENT 3. SYMPOSIUM PROPOSAL

Root and Tuber and Leafy Vegetables

Workgroup # 1

IR-4/USDA Crop Grouping Symposium
7-8 October 2002
Arlington, Virginia

Chair: Dan Kunkel
Co-Chairs: Tom Bloem, Hong Chen, Doug Dotson, Mary Lamberts, Yuen-Shaung NG, Ray Ratto.

Workgroup #1's mission was to review, evaluate and validate established Crop Groups 1, 2, 3, 4, 5, and the proposed Crop Group A to include additional crops.

Note: The established Crop Groups reflected the US EPA's 40 CFR 180.41, Health Canada's Pest Management Regulatory Agency's Directive 98-02 and Mexico's Crop Grouping System which are identical.

Crop Group 4. Leafy Vegetables (Except *Brassica* Vegetables) Crop Groups US = 4 Canada = 4 Codex = VL Mexico = 4			Author's Classification of Leafy Vegetables (Except *Brassica* Vegetables) Crop Groups US = 4 Canada = 4 Codex = VL Mexico = 4	
Rep. Commodities	**Established Commodities**	**Validate: Y/N**	*Proposed Commodity Additions/Changes*	**Validate: Y/N**
Celery, Head lettuce, Leaf lettuce, and Spinach	Amaranth (Chinese spinach) (014)	Y	Amaranth/Chinese (014) CG 4D + 4A	Y
	Arugula (roquette) (033)	Y	Amaranth/leafy (016)	Y
	Cardoon (125)	Y	Arugula (033)	Y
	Celery (138)	Y	Chicory (153,231)	Y
	Celery/Chinese (139)	Y	Comfrey (189)	Y
	Celtuce (334)	Y	Coriander (cilantro) (181)	Y
	Chervil (148)	Y	Coriander/false (192) CULANTRO	Y
	Chrysanthemum/edible-leaved (156)	Y	Dock (224, 557, 558)	Y
	Chrysanthemum/garland (156)	Y	Fameflower ((235) WATER LEAF	Y
	Corn salad (194)	Y	Fenugreek (240)	Y
	Cress/garden (202)	Y	Fern/edible (241)	Y
	Cress/upland (203)	Y	Good-king-Henry (259)	Y
	Dandelion (218)	Y	Gow kee (263)	Y
	Dock (sorrel) (224 557, 558)	Y	Ice plant (291)	Y
	Endive (escarole) (231)	Y	Japanese honewort (301)	Y
	Fennel/Florence (239)	Y	Jute/nalta (310) FRUIT ALSO EATEN	Y
	Lettuce/head and leaf (333)	Y	Kale/sea (312)	Y
	Orach (426)	Y	Lettuce (333)	Y
	Parsley (439)	Y	Lettuce/celery (334)	Y
	Purslane/garden (498)	Y	Lettuce/head (335)	Y
	Purslane/winter (499)	Y	Lettuce/leaf (336)	Y
	Radicchio (red chicory) (153)	Y	Marshmarigold (364)	Y
	Rhubarb (512)	Y	Plantain (043, 475)	Y
	Spinach (569)	Y	Pokeweed (483)	Y
	Spinach/New Zealand (570)	Y	Sorrel/French (557)	Y

	Spinach/vine (571) MALABAR	Y	Sorrel/garden (558)	Y
	Swiss chard (595)	Y	Water dropwort (644)	Y
			Water spinach (645)	Y
			Watercress (647)	Y
			Amaranth (Chinese spinach) covered in Amaranth/Chinese (014)	Y
			Arugula (roquette) covered in Arugula (033)	Y
			Chrysanthemum/garland covered in Chrysanthemum/edible-leaved (156)	Y

Subgroups (Established and Proposed) for Crop Group # 4:
4A – Leafy Greens (Established)

4B – leaf petiole (Established)
4C – Aquatic Leaf and Stem (Proposed)
4D – Edible Ferns (Proposed)
4E – Lettuce (Proposed as outlined in 4.44)
4F – Spinach (Proposed as outlined in 4.45)

Subgroups for Crop Group 4: Leafy Vegetables (Except *Brassica* Vegetables)

Subgroup 4A. Leafy Greens Subgroup (Established)		
Rep. Commodities	Commodities	**Validate: Y/N**
Head lettuce and leaf lettuce, and spinach	Amaranth (Chinese spinach); arugula; chervil; chrysanthemum/edible-leaved; chrysanthemum/garland; corn salad; cress/garden; cress/upland; dandelion; dock; endive; lettuce; orach; parsley; purslane/garden; purslane/winter; radicchio; spinach; spinach/New Zealand; spinach/vine New: Chicory; Comfrey; Coriander(cilantro); Coriander/false; Fameflower; Fenugreek; Fern/edible;Good-king-Henry;Gow kee;Ice plant; Jute/nalta; Kale/sea; Marshmarigold; Plantain; Pokeweed; Sorrel/French; Sorrel/garden; Water spinach; Watercress	Y

ADDITIONS MADE BY WORKGROUP #1 TO SUBGROUP 4A; LEAFY GREENS SUBGROUP.

Common Name	Scientific Name	CG/SG Placement	Rep Crop	Edible Part	Person(s) Requesting	Comments	Validate: Y/N
TANIER LEAVES		2 AND 4A	LETTUCE AND SPINACH	LEAVES	KUNKEL	INCLUDE IN BOTH 2 AND 4	Y
YAM LEAVES		2 AND 4A	LETTUCE AND SPINACH	LEAVES	KUNKEL	INCLUDE IN BOTH 2 AND 4	Y
ARRACACHA LEAVES		2 AND 4A	LETTUCE AND SPINACH	LEAVES	KUNKEL	INCLUDE IN BOTH 2 AND 4	Y
HONEWORT LEAVES		2 AND 4A	LETTUCE AND SPINACH	LEAVES	KUNKEL	INCLUDE IN BOTH 2 AND 4	Y
MACA LEAVES		2 AND 4A	LETTUCE AND SPINACH	LEAVES	KUNKEL	INCLUDE IN BOTH 2 AND 4	Y
MASUHA LEAVES		2 AND 4A	LETTUCE AND SPINACH	LEAVES	KUNKEL	INCLUDE IN BOTH 2 AND 4	Y
RAMPION LEAVES		2 AND 4A	LETTUCE AND SPINACH	LEAVES	KUNKEL	INCLUDE IN BOTH 2 AND 4	Y
TANIER SPINACH LEAVES		2 AND 4A	LETTUCE AND SPINACH	LEAVES	KUNKEL	INCLUDE IN BOTH 2 AND 4	Y
TARO LEAVES		2 AND 4A	LETTUCE SPINACH	LEAVES	KUNKEL	INCLUDE IN BOTH 2 AND 4	Y
YAUTIA LEAVES		2 AND 4A	LETTUCE SPINACH	LEAVES	KUNKEL	INCLUDE IN BOTH 2 AND 4	Y
BURDOCK LEAVES		2 AND 4A	LETTUCE	LEAVES	KUNKEL	INCLUDE IN BOTH 2 AND 4	Y
BEETS, TABLE(GARDEN) LEAVES		2 AND 4A	SPINACH	LEAVES	KUNKEL	INCLUDE IN BOTH 2 AND 4	Y
CASSAVA LEAVES		2 AND 4A	LETTUCE	LEAVES	KUNKEL	INCLUDE IN BOTH 2 AND 4	Y
CHICORY LEAVES		2 AND 4A	SPINACH	LEAVES	KUNKEL	INCLUDE IN BOTH 2 AND 4	Y
DASHEEN (TARO) LEAVES		2 AND 4A	LETTUCE	LEAVES	KUNKEL	INCLUDE IN BOTH 2 AND 4	Y

PARSNIP, LEAVES		2 AND 4A	SPINACH	LEAVES	KUNKEL	INCLUDE IN BOTH 2 AND 4	Y
SALSIFY BLACK, LEAVES		2 AND 4A	LETTUCE	LEAVES	KUNKEL	INCLUDE IN BOTH 2 AND 4	Y
SWEET POTATO LEAVES		2 AND 4A	SPINACH	LEAVES	KUNKEL	INCLUDE IN BOTH 2 AND 4	Y
ULLUCO LEAVES		2 AND 4A	LETTUCE	LEAVES	KUNKEL	INCLUDE IN BOTH 2 AND 4	Y
SALSIFY LEAVES		2 AND 4A	SPINACH	LEAVES	KUNKEL	INCLUDE IN BOTH 2 AND 4	Y
DAYLILY TOPS		4A	LETTUCE SPINACH	LEAVES	KUNKEL		Y
GRAPE LEAVES		4A			KUNKEL		Y
CORIANDER/FALSE		4A	LETTUCE SPINACH	LEAVES	KUNKEL	INCLUDE CULANTRO IN NAME	Y

Subgroup 4B. Leaf Petioles Subgroup (Established)		
Rep. Commodities	**Commodities**	**Validate: Y/N**
Celery	Cardoon; celery; celery/Chinese; celtuce; fennel/Florence; rhubarb; Swiss chard New; Japanese honewort; Water dropwort	Y

ADDITIONS MADE BY WORKGROUP #1 TO SUBGROUP 4B: LEAFY PETIOLES SUBGROUP							
Common Name	**Scientific Name**	**CG/SG Placement**	*Rep Crop*	**Edible Part**	**Person(s) Requesting**	**Comments**	**Validate: Y/N**
CELERIAC LEAVES		4B	CELERY	LEAVES	KUNKEL	INCLUDE IN BOTH 2 AND 4B	Y
YAUTIA LEAVES		4B	CELERY	LEAVES	KUNKEL	INCLUDE IN BOTH 2 AND 4B	Y
YACON LEAVES		4B	CELERY	LEAVES	KUNKEL	INCLUDE IN BOTH 2 AND 4B	Y
TANIER SPINACH		4B	CELERY	LEAVES	KUNKEL	INCLUDE IN BOTH 2 AND 4B	Y

TARO LEAVES		4B	CELERY	LEAVES	KUNKEL	INCLUDE IN BOTH 2 AND 4B	Y
MAUKA LEAVES		4B	CELERY	LEAVES	KUNKEL	INCLUDE IN BOTH 2 AND 4B	Y

CROP SUBGROUP 4C: AQUATIC LEAFY AND STEM VEGETABLES PROPOSED BY WORKGROUP #1 (Proposed)

Common Name	Scientific Name	CG/SG Placement	Rep Crop	Edible Part	Person(s) Requesting	Comments	Validate: Y/N
COMMOM CATTAIL	*TYPHA LATIFOLIA L.*	4C	WATERCRESS	BUDS	H. CHEN		Y
EURYALE	*EURYALE FEROX SALISB.*	4C	WATERCRESS	YOUNG LEAF STALKS	H. CHEN		Y
WATER BAMBOO	*ZIZINIA LATIFOLIA (GRISEB.) TURCZ. EX STAPF./Z. CADUCIFLORE (TURCZ.) HAND. –MAZZ.*	4C	WATERCRESS	STEMS	H. CHEN		Y
WILD RICE	*ZIZANIA AQUATICA L.*	4C	WATERCRESS	STEMS	H. CHEN		Y
WATER CALTROP	*TRAPA SPP.*	4C	WATERCRESS	NUT-LIKE FRUIT, LEAVES & STEMS	H. CHEN		Y
WATER DROPWORT	*OENANTHE JAVANICA (BLUME) DC.*	4C	WATERCRESS	LEAVES & STEMS	H. CHEN		Y
WATER SHIELD	*BRASENIA SCHREBERI J.F. GMELIN*	4C	WATERCRESS	LEAVES & STEMS	H. CHEN		Y

WATER SPINACH	*IPOMOEA AQUATICA FORSSK.*	4C	WATERCRESS	LEAVES & STEMS	M. LAMBERTS	THIS IS AN ADDITIONAL CLASSIFICATION SINCE THERE ARE 2 FORMS OF THIS CROP. NOTE: THIS IS A CLASS I PROHIBITED PLANT (FL. DEPT OF ENV. PROTECT.) IN FL THOUGH IT CAN BE GROWN AS A PERMITTED CROP, **NOT** THE AQUATIC FORM	Y
SPIRULINA	*SPIRULINA*	4C	WATERCRESS	ENTIRE PLANT	M. BRAVERMAN	AQUATIC ALGAE	Y

SUBGROUP 4D: EDIBLE FERNS , PROPOSED BY WORKGROUP # 1 (Proposed)							
Common Name	**Scientific Name**	**CG/SG Placement**	**Rep Crop**	**Edible Part**	**Person(s) Requesting**	**Comments**	**Validate: Y/N**
BRACKEN FERN	*PTERIDIUM AQUILINUM (L.) KUHN VAR. LATIUSCULUM (DESV.) UNDERW.EX A. HELLER*	4D	LETTUCE AND/OR SPINACH	YOUNG STEMS	H. CHEN	BRACKEN FERN	Y
CINNAMON FERN	*OSMUNDA CINNAMOMEA L. AND O. CINNAMOMEA L. VAR. ASIATICA FERNALD.*	4D	LETTUCE AND/OR SPINACH	YOUNG STEMS	H. CHEN	CINNAMON FERN	Y
JAPANESE FLOWERING FERN	*OSMUNDA JAPONICA THUNB.*	4D	LETTUCE AND/OR SPINACH	CROZIERS	H. CHEN	JAPANESE FLOWERING FERN	Y
OSTRICH FERN	*MATTEUCCIA STRUTHIOPTERIS (L.) TODARO*	4D	LETTUCE AND/OR SPINACH	CROZIERS	H. CHEN	OSTRICH FERN	Y

Workgroup Worksheet

Workgroup #: ___1_____Crop Group: __4_____

Additions to Established Crop Groups and Subgroups							
Common Name	**Scientific Name**	**Group/SG Placement**	**Rep Crop**	**Edible Part**	**Person(s) Requesting**	**Comments**	**Validate: Y/N**
4.1 Skullcap	*Scutellaria laterifolia* (Lamiaceae)	4 AND 19		Top	J. Rabin (NJ)		Y
4.2 St. Johnswort	*Hypericum perforatum* (Clusiaceae)	4		Top	J. Rabin (NJ)		Y
4.3 Huauzontle	*Chenopodium berlandieri* (Chenopodiaceae)	4, 15 and 16	Spinach	Top, seed	Mexico	Leaves used as spinach; seed used in bread; (Azetec Red Spinach)	Y
4.4 Spinach Subgroup	See comments, crop already in established crop group	4F	Spinach	Top	IR-4	Arugula, cress, BRASSICA CROP GROUP ALSO, dock, dandelion, parsley, CHICORY TOPS, etc.	Y
4.5 Warrigal greens	*Tetragonia tetragonoides* (Aizoaceae)	**4F**	Spinach	Top	G. Bulow (Australia)	New Zealand Spinach	Y
4.6 Balloon Flower	*Platycodon grandiflorus* (Campanulaceae)	4		Root and top		White root is primary use. Young leaves eaten boiled.	Y
4.7 Watercress	*Rorippa nasturtium-aquaticum* (Brassicaceae)	4A	Lettuce and Spinach	Top	G. Saxena (FL)	Water issue vs. upland watercress INCLUDE WITH BRASSICA	Y
4.8 Alfalfa	*Medicago hispida* (Fabaceae)	4A	Head & leaf lettuce, Spinach	Young shoots	H. Chen	Monograph 008	Y
4.9 Cat's Whiskers	*Cleome gynamdra* (Capparaceae)	4A	Head & leaf lettuce, Spinach	Flower stems with attached leaves	H. Chen		Y

4.10 Chinese Mallow	*Malva vericillata* (Malvaceae)	4A	Head & leaf lettuce, Spinach	Tender leaves and shoot tips	H. Chen		Y
4.11 Coltsfoot	*Tussilago farfara* (Asteraceae)	4A	Head & leaf lettuce, Spinach	Leafstalks, flower stems & buds	H. Chen		Y
4.12 Common Sow Thistle	*Sonchus oleraceae* (Asteraceae)	4A	Head & leaf lettuce, Spinach	Young leaves	H. Chen		Y
4.13 Day Lily	*Hemerocallis spp.* (Liliaceae)	4A	Head & leaf lettuce, Spinach	Flower buds	H. Chen	Monograph 221, 245	Y
4.14 Cilantro	*Coriandrum sativum* (Apiaceae)	4A	Head & leaf lettuce, Spinach	Leaves and petioles	H. Chen	Monograph 191	Y
4.15 Field Sow Thistle	*Sonchus brachyotus* (Asteraceae)	4A	Head & leaf lettuce, Spinach	Young plants and leaves	H. Chen		Y
4.16 Gynura	*Gynura bicolor* (Asteraceae)	4A	Head & leaf lettuce, Spinach	Young plants and leaves	H. Chen		Y
4.17 India Kalimeris	*Kalimeris indica* (Asteraceae)	4A	Head & leaf lettuce, Spinach	Shoots	H. Chen		Y
4.18 (Reserved)							
4.19 Vegetable Chryanthemum	*Chryanthemum nankingensis* (Asteraceae)	4A 4F	~~Celery~~ SPINACH	Leaves & stem	H. Chen		Y
4.20 Water Caltrop	*Trapa spp.* (Cyperaceae)	4C	Watercress	Leaves & stem	H. Chen	Monograph 646	Y
4.21 Water Dropwort	*Oenanthe javanica* (Onagraceae)	4C 4B	CELERY	Leaves & stem	H. Chen	Monograph 234	Y
4.22 Water Shield	*Brasenia schreberi* (Cabombaceae)	4C	WATERCRESS	Leaves & stem	H. Chen		Y
4.23 Bracken Fern	*Pteridium aquilinum var. latiusculum* (Dennstaediaceae)	4D		Young stems	H. Chen	Monograph 241	Y

4.24 Cinnamon Fern	*Osmunda cinnamomea and O. cinnamomea var. asiatica* (Osmundaceae)	4D		Young stems	H. Chen	Monograph 241	Y
4.25 Japanese Flowering Fern	*Osmunda japonica* (Osmundaceae)	4 D		Croziers	H. Chen	Monograph 241	Y
4.26 Ostrich Fern	*Matteuccia struthiopteris* (Dryoptericaceae)	4 D		Croziers	H. Chen		Y
4.27 Fresh Herbs	Many in 19 A (See list)	4A	Lettuce and Spinach	Tops	C. Coiner (FL)	~~Move~~ INCLUD*E* IN BOTH 19A and Crop Group 4A	Y
4.28 Water Spinach	*Ipomoea aquatica* (Convolulaceae)	4C	~~Lettuce and Spinach~~	Tops	IR-4	Monograph (645), also called Ong Choy	Y
4.29 Chicory Dandelion		4A	Lettuce	Tops	Ray Ratto (CA)	Chard Dandelion	Y
4.30 English Primose	*Primula vulgaris* (Primulaceae)	4A	Lettuce and Spinach	Flowers & leaves	M. Braverman	Flowers and leaves eaten raw	Y
4.31 Cowslip	*Primula veris* (Primulaceae)	4A	Lettuce and Spinach	Flowers & leaves	M. Braverman	Flowers and leaves eaten raw	Y
4.32 Yerba Mansa	*Anemopsis californica* (Saururaceae)	4A	Lettuce and Spinach	Top	M. Braverman		Y
4.33 Grasswort	*Salicornia europaea* (Salicorniaceae)	4A AQUATIC LEAFY VEG. 4C	Lettuce and Spinach	Top	M. Braverman	Leaves and stems eaten raw or as potherb. Edible seeds can be used for edible oil	Y
4.34 Madeira Vine	*Anredera cordifolia* (Basellaceae)	4A	Lettuce and Spinach	Leaves	M. Braverman	Also in root group	Y
4.35 Chicory Leaf (Frisee)	Presently in 2	4A	Lettuce and Spinach	Top	C. Coiner (FL)	Add chicory leaf to 4A	Y
4.36 Beet Top	Presently in 2	4A	Lettuce and Spinach	Top	C. Coiner (FL)	Add beet top to 4A	Y
4.37 Swiss Chard	Presently in 4B	4A	Lettuce and Spinach	Top	Ray Ratto (CA)	Add Swiss chard to 4A	Y
4.38 Kava Leaf	*Piper methysticum* (C. piperaceae)	4A	Lettuce and Spinach	Leaf	M. Braverman	Also see Crop Group 2	Y

4.39 Fresh Mint	*Mentha spp.* (Lamiaceae)	4A	Lettuce and Spinach	Leaves	M. Braverman	See monograph (382)	Y
4.40 Epazote	*Chenopodium ambrosioides* (Chenopodiaceae)	4A	Lettuce and Spinach	Leaves	M. Braverman	See monograph (232)	Y
4.41 Stevia Leaf	*Stevia rebaudiana* (Asteraceae)	4A	Lettuce and Spinach	Leaves	M. Braverman	Sweet Leaf Monograph (579)	Y
4.42 Spirulina	*Spirulina spp.* (Oscillatoriaceae)	4A AQUATIC 4C	Lettuce and Spinach WATERCRESS	Algae	M. Braverman	Blue-green algae	Y
4.43 Sunset Hibiscus	*Abelmoschus manihot* (Malvaceae)	4A	Lettuce and Spinach	Leaves	M. Braverman	Young leaves eaten raw, cooked, used to wrap meat.	Y
4.44 Lettuce Subgroup		4E	Lettuce	Leaves	IR-4	Include head and leaf lettuce, endive, radicchio	Y
4.45 Spinach Subgroup		4F	Spinach	Leaves	IR-4	Include amaranth, arugula, chervil, chrysanthemum, corn salad, cress, dandelion, Dock, endive, orach, parsley, purslane, spinach, New Zealand spinach. CHICORY TOPS, CILANTRO, DILL. CONSIDER SOME HERBS FOR THE 4C & 4D SUBGROUPS OR ALL IN 4F	Y

WORKGROUP #1 CROP GROUP #4, ADDITIONS FROM WORKGROUP							
Common Name	**Scientific Name**	**Group/SG Placement**	**Rep Crop**	**Edible Part**	**Person(s) Requesting**	**Comments**	**Validate: Y/N**

HORSERADISH TREE	*MORINGA PTERYGOSPERMA* *M. OLEIFERA*	4		LEAF FLOWERS PODS	M. LAMBERTS	(066)	Y
UDO	*ARALIA CONDATA*	CG A, WITH ASPARAGUS	CELERY	SHOOT	S. MIYAZAKI	MONOGRAPH 627	YES TO ASPARAGUS + BAMBOO SHOOTS
BANANA FLOWER	*MUSA SP.*	4	LETTUCE	FLOWER	M. BRAVERMAN		Y
BANANA LEAF	*MUSA SP.*	4	LETTUCE	LEAF IN COOKING	M. BRAVERMAN		Y
LOTUS LEAF	*NELUMBO NUCEFERA*	2 AND 4	LETTUCE	LEAF IN COOKING	M. BRAVERMAN		Y

Crop Group 5. *Brassica* (Cole) Leafy Vegetables **Crop Groups** **US = 5 Canada = 5 Codex = VL & VB** **Mexico = 5**			**Author's Classification of *Brassica* (Cole) Leafy Vegetables** **Crop Groups** **US = 5 Canada = 5 Codex = VL & VB** **Mexico = 5**	
Rep. Commodities	**Established Commodities**	**Validate: Y/N**	**Proposed Commodity Additions/Changes**	**Validate: Y/N**
Broccoli or cauliflower, Cabbage, and Mustard greens	Broccoli (090, 136)	Y	Abyssinian cabbage (002)	Y
	Broccoli/Chinese (gai lon) (091)	Y	Bok choy (085)	Y
	Broccoli raab (rapini) (092)	Y	Broccoli/Chinese (091)	Y
	Brussels sprouts (096)	Y	Broccoli raab (092)	Y
	Cabbage (105)	Y	Cabbage/Chinese (106)	Y
	Cabbage/Chinese (bok choy) (106)	Y	Cabbage Seakale (107)	Y
	Cabbage/Chinese (napa) (106)	Y	Hanover salad (276) (UNCOMMON KALES)	Y
	Cabbage/Chinese mustard (gai choy) (397)	Y	Kale/common (311)	Y
	Cauliflower (136)	Y	Mustard/wild (396)	Y

	Cavalo broccolo(090) (136)	Y	Rape (507)	Y
	Collards (188)	Y	Turnip (greens) (625)	Y
	Kale (311)	Y	Broccoli/Chinese (Gai lon) covered in Broccoli/Chinese (091)	Y
	Kohlrabi (319)	Y	Broccoli raab (rapini) covered in broccoli raab (092)	Y
	Mizuna (397)	Y	Cabbage/ Chinese (bok choy) covered in Bok choy (085)	Y
	Mustard greens (397)	Y	Cabbage/Chinese Mustard (Gai choy) covered under Mustard greens (397)	Y
	Mustard spinach ((397)	Y	Cabbage/Chinese (napa) covered in Cabbage/Chinese (106)	Y
	Rape greens (507)	Y	Cavalo broccolo covered in broccoli (090)	Y
			Change term from kale to ~~kale/common~~ (311)	NO
			Mizuna and Mustard Spinach covered in Mustard greens (397)	Y
			Rape greens covered in Rape (507)	Y

Subgroups (Established and Proposed) for Crop Group # 5:

5A – head and stem *Brassica* (Established)

5B – Leafy *Brassica* (Established)
5C – Broccoli (Proposed as outlined in 5.6)

Subgroups for Crop Group 5: *BRASSICA* (COLE) LEAFY VEGETABLES

Subgroup 5A. Head & Stem *Brassica* Subgroup (Established)		
Rep. Commodities	**Commodities**	**Validate: Y/N**
Broccoli or cauliflower and cabbage	Broccoli; broccoli/Chinese; brussels sprouts; cabbage; cabbage/Chinese (napa); cabbage/Chinese mustard; cauliflower; cavalo broccolo; kohlrabi	Y

Subgroup 5B. Leafy *Brassica* Greens Subgroup (Established)		
Rep. Commodities	**Commodities**	**Validate: Y/N**
Mustard greens	Broccoli raab; cabbage/Chinese (bok choy);collards; kale; mizuna; mustard greens; mustard spinach; rape greens New: Abyssinian cabbage; Broccoli/Chinese; Cabbage/Seakale; Hanover salad; Mustard/wild; Turnip (greens); Chinese cabbage	Y

ADDITIONS TO CROP SUBGROUP 5B BY WORKGROUP #1							
Common Name	**Scientific Name**	**Group/SG Placement**	**Rep Crop**	**Edible Part**	**Person(s) Requesting**	**Comments**	**Validate: Y/N**
FLOWERING CHINESE FLAT LEAF MUSTARD (397)		5B					**Y**
TURNIP TOPS		2 and 5B	MUSTARD GREENS	LEAVES	KUNKEL	INCLUDE IN BOTH CG 2 AND 5B	Y
RADISH TOPS		2 and 5B	MUSTARD GREENS	LEAVES	KUNKEL	INCLUDE IN BOTH CG 2 AND 5B	Y
ORIENTAL RADISH TOPS		2 and 5B	MUSTARD GREENS	LEAVES	KUNKEL	INCLUDE IN BOTH CG 2 AND 5B	Y
TYFON TOPS		2 and 5B	MUSTARD GREENS	LEAVES	KUNKEL	INCLUDE IN BOTH CG 2 AND 5B	Y
RUTABAGA TOPS		2 and 5B	MUSTARD GREENS	LEAVES	KUNKEL	INCLUDE IN BOTH CG 2 AND 5B	Y

CANOLA GREENS		5B	MUSTARD GREENS	LEAVES	KUNKEL	ADD TO CROP GROUP	Y
ARUGULA TOPS		2 and 5B	MUSTARD GREENS	LEAVES	KUNKEL	INCLUDE IN BOTH	Y
CRESS GARDEN		5B	MUSTARD GREENS	LEAVES	KUNKEL	ADD TO CROP GROUP	Y
CRESS UPLAND		5B	MUSTARD GREENS	LEAVES	KUNKEL	ADD TO CROP GROUP	Y

Workgroup Worksheet

Workgroup #: ____1_____Crop Group: ___5_____

Additions to Established Crop Groups and Subgroups							
Common Name	**Scientific Name**	**Group/Subgroup Placement**	**Rep Crop**	**Edible Part**	**Person(s) Requesting**	**Comments**	**Validate: Y/N**
5.1 Turnip Greens	*Brassica rapa* (Brassicaceae)	5B	Mustard greens	Leaves	IR-4	Move Turnip Greens from CG 2to CG 5	**Y**
5.2 Flat Chinese Cabbage	*Brassica campestris* spp.*Chinensis* var. *rosularis*/*B. rapa* var. *parachinensis* (Brassicaceae)	5B – Leafy *Brassica* greens	Mustard greens	Entire plant	H. Chen	Monograph 085, 092, 106, 397, 507, 625 YES FOR ALL.	**Y**
5.3 Flowering Purple Stem Chinese Cabbage	*Brassica campestris* spp.*Chinensis* var. *rosularis/B. rapa* var. *purpurea* (Brassicaceae)	5B – Leafy Brassica greens	Mustard greens	Stems and shoots	H. Chen	Monograph 085, 092, 106, 397, 507, 625	**Y**
5.4 Tatsoi (Rosette bok choy)	Brassica rapa (Brassicaceae)	5B	Mustard greens	Top	IR-4	Tatsoi is monograph 085. Add CN Rosette Bok Choy	**Y**
5.5 Kale vs. Mustard Greens as rep crop	Surrogate data	5B	Mustard greens OR KALE	Top	Canada	Use Kale as rep crop in place of Mustard greens for Canada Crop Group 5	**Y**

5.6 Broccoli or Cauliflower subgroup	New Subgroup	5C	Broccoli or Cauliflower	Tops	IR-4	Include Broccoli, Chinese Broccoli, BROCCOLI RAAB~~,Cabbage,~~ Cauliflower, ~~Chinese mustard~~ **BROCCOLI OR CAULIFLOWER**	**Y**

Proposed Crop Group A: Stalk and Stem Vegetables **Current Crop Group** **US = Miscellaneous Canada = None Codex = VS Mexico = None**	
Author's Commodity List (Greenbook) Greenbook monograph number follows the crop name	*Validate: Y/N*
Airpotato *(006)* – NOXIOUS WEED	NO
Artichoke/globe (030)	Y
Asparagus (035)	Y
Bamboo (042, 253)	Y
Japanese knotweed (302)	Y
Palm heart (432)	Y
Udo (627)	Y
Water bamboo (643) MOVE TO AQUATIC STALK AND STEM VEG. 4C	Y

Subgroups (Proposed) for Crop Group 'A':
Aa – Stem (Proposed)
Ab – Stalk and Stem (Proposed)

Proposed Subgroups for Crop Group A

Subgroup : Aa, Stem Subgroup (Proposed)		
Rep. Commodities	**Commodities**	**Validate:Y/N**
Asparagus	~~Airpotato~~; Asparagus; Bamboo; Japanese knotweed; Palm heart; Udo; Water Bamboo	Y
Proposed Subgroup : Ab, Stalk and Stem Subgroup (Proposed)		
Rep. Commodities	**Commodities**	**Validate:Y/N**
Asparagus and Artichoke	Artichoke; Airpotato (COVERED UNDER YAM); Asparagus; Bamboo; Japanese knotweed; Palm heart; Udo; ~~Water Bamboo~~	Y

Workgroup Worksheet

Workgroup #: ___1_____ Crop Group: ___A (Stalk and Stem Vegetables)__

Additions to Proposed Crop Groups and Subgroups							
Common Name	**Scientific Name**	**Group/Subgroup Placement**	**Rep Crop**	**Edible Part**	**Person(s) Requesting**	**Comments**	**Validate :Y/N**
A.1 Bamboo Shoot	*Bambusoideae spp.* (Poaceae)	A	Asparagus	Young shoots	H. Chen		Y
A.2 Chinese Toon	*Toona sinensis* (Meliaceae)	A	Asparagus	Young shoots	H. Chen		AI
A.3 Common Cattail	*Typha latifolia* (Typhaceae)	A AQUATIC	Artichoke	Buds	H. Chen	SEE 4C	Y
A.4 Euryale	*Euryale ferox* (Nymphaeaceae)	A AQUATIC	Asparagus	Young leaf stalks	H. Chen	SEE 4C	Y
A.5 Water Bamboo	*Zizania latifolia/Z. caduciflore* (Poaceae)	A AQUATIC	Asparagus	Stems	H. Chen	SEE 4C	Y
A.6 Wild Rice STEM	*Zizania aquatica* (Poaceae)	A AQUATIC	Asparagus	Stems	H. Chen	SEE 4C MONOGRAPH 681	STEMS Y
A.7 Asparagus	*Asparagus officinalis* (Liliaceae)	A	Asparagus	Spear	A. Schreiber (WA)	Is Group 4 better? NO	Y
A.8 Artichoke, Globe	*Cynara cardunculus* (Asteraceae)	A	Artichoke	Buds	IR-4	Monograph 031	Y

A.9 Agave	*Agave spp.* (Agavaceae)	A	Artichoke	Base of plant	IR-4	COVERED BY OTHER CROP GROUP 'M', OR CUCURBITS	Y
ADDITIONS TO PROPOSED CROP GROUP A BY WORKGROUP #1							
JAPANESE KNOTWEED	*POLYGONUM CUSPIDATUM*	A	ASPARAGUS	YOUNG STEM	MIYAZAKI	MONOGRAPH 302	Y
LOTUS STEM	*NOLUMBO NUCIFERA*	A	ASPARAGUS	STEM	M. BRAVERRN AN	MONOGRAPH 347	Y
MIOGA, BUD	*ZINGIBER MIOGA*	4B AND CG A	ASPARAGUS	FLOWER BUDS AND YOUNG SHOOTS	S. MIYAZAKI	GARNISH USE	Y
NOPAL CACTI IN CACTI GROUP. REP.			PRICKLY PEAR			SEE PROPOSED CROP GROUP M	Y

WG #1.6 12/16/02

ATTACHMENT 4. MONOGRAPHS – LEAFY VEGETABLES

(016)

1. **Amaranth**

Amaranthaceae

Amaranthus spp.

1. **Spiny amaranth** (bledo, pakai kuku, blero, thorny pigweed, edlebur, spiny amaranth thorny amaranth, ci xian, épinard cochon, épinard malabre, dorniger Fuchsschwanz, Malabarspinat, katemath, bredo-bravo, bredo-de-espinho, carurú-de-espinho, caruru-bravo, bledo espinoso, espinaca de Malabar (GRIN, MARKLE)]

Amaranthus spinosus L.

1. **Spleen amaranth** [ibondwe, bledo, brède de Malabar, carurú, bledos malezas, pira (GRIN, MARKLE)]

Amaranthus dubius C. Mart. ex. Thell.

1. **Slim amaranth** [vlete, smooth pigweed, Prince of Wales'-feather, prince's-feather, prince's-feather amaranth, qian sui gu, chua, ramdana, alegría, huantli (GRIN, MARKLE)]

Amaranthus hypochondriacus L. (syn: *A. frumentaceus* Buch.-Ham. ex Roxb., *A. hybridus* var. *erythrostachys* Moq., *A. hybridus* var. *hypochondriacus* (L.) B. L. Rob., *A. leucocarpus* S. Watson)

1. **Bush greens** [bledo, red amaranth, purple amaranth, achita, African-spinach, blood amaranth, caterpillar amaranth, red shank, Sudan-spinach, amarante étalée, queue de renard, Rispenfuchsschwanz (GRIN, MARKLE)]

Amaranthus cruentus L. (syn: *A. chlorostachys* Willd, *A. hybridus subsp. cruentus* (L.) Thell, *A. paniculatus* L.)

1. **Slender amaranth** [green amaranth, pakai, cararu, bledo, pigweed, tropical green amaranth, zhou guo xian, amarante verte, grüner Amarant, bredo, carurú-comum, carurú-de-mancha, carurú-de-porco, carurú-de-soldado (GRIN, MARKLE)]

Amaranthus viridis L. (syn: *.A. gracilis* Desf., *Euxolus viridis* (L.) Moq.)

2. Tropical annual herbs, some species growing up to 2 m (6.6 ft), mostly native to Central and South America. Several species are naturalized in the U.S., particularly *A. cruentus*, and many are also grown in Asia, India, and Africa. The taxonomy is confused, and there may be additional, obscure species also valued as vegetables. They typically grow erect, with fairly large, alternate leaves and bear numerous small flowers on terminal and axillary spikes. They also produce small, highly nutrious seeds which are used as a grain, much like quinoa, to which it is closely related. Types grown specifically for vegetable use produce less seed than those selected specifically for seed production. The foliage is used as a vegetable and almost exclusively eaten cooked (MARKLE, MANSFELD, GRIN, EFLORA, RUBATSKY, WIKIPEDIA).

3. Crop Data:

a. Season: In the U.S., grows best in summer heat (WIKIPEDIA).

b. Cultivation: Grown primarily from seed, accepts a wide range of soils, and prefers a hot sunny position. Harvest either by pulling the plant from the roots or successive cuttings of the leaves every 7-10 days to delay flowering (PLANT FOR A FUTURE, RUBATSKY).

c. Availablity in the marketplace: Not very common in the U.S. but can be found in some ethnic markets. Very prevalent in Asia, Indian, and parts of Africa.

d. Preparation for cooking: Ocassionally very young leaves are eaten raw; otherwise fresh leaves are steamed, boiled, or sautéed (SCHNEIDER).

e. Nutritional aspects: Rich in many essential vitamins and minerals; may be high in nitrates if grown on soil that has been heavily fertilized (PLANTS FOR A FUTURE, RUBATSKY)

f. Medicinal aspects: No data.

g. Crop Photos:

4. Production in U.S.: No data, but several species grow as a weed in the U.S.

5. Other production regions: India, Africa, Asia, Central America, and South America (MANSFELD, MARKLE, RUBATSKY).

6. Use: Vegetable, pot herb, grain, fodder, dye (MARKLE, MANSFELD, EFLORA).

7. Part(s) of plant consumed: Leaves and young stems; some seeds

8. Portion analyzed/sampled: Tops (leaves and stems)

9. Classifications:
    a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A
    b. EPA Crop Group (Group & Subgroup): Leafy Vegetables, Leafy green subgroup 4A
    c. Codex Group: 013, Leafy vegetables (including Brassica leafy vegetables),VL 0460, Amaranth
    d. EPA Crop Definition: None
10. References: GRIN, CODEX, MARKLE, MANSFELD, SCHNEIDER, RUBATSKY, WIKIPEDIA, PLANTS FOR A FUTURE, EFLORAS
11. Production Map: Found in all EPA production regions.
12. Plant Codes:
    a. Bayer Code: AMACR (*A. cruentus* and *A. hybridus*), AMADU (*A. dubius*), AMASP (*A. spinosa*), AMAVI (*A. viridis*), AMACH (*A. hypochondriacus*)

1. **Amaranth, Chinese** [Joseph's-coat, amaranto, caliloo, calilu, edible amaranth, bush greens, Chinese amaranth, amaranth, leafy amaranth, hon toi moi, tampala, Chinese spinach, aupa, summer-poinsettia, xian, amarante comestible, amarante tricolore, Gemüseamarant, math, hageito, hiyu, moco de pavo (GRIN, MARKLE)]

Amaranthaceae

Amaranthus tricolor L. [syn: *A. gangeticus* L., *A. melancholicus*, *A. gangeticus* var. *melancholicus* (L.), *A. mangostanus*, *A. polygamus* L., *A. tricolor* subsp. *mangostanus* (L.), *A. tricolor* subsp. *tristis* (L.) (GRIN)]

2. A short lived tropical annual, native to Southeast Asia. It reaches 30-90 cm (1-3 ft) tall with leaves up to 15.2 cm (6 in). It produces small flowers on terminal and axillary spikes, and small, edible seeds. This species is particularily valued for its foliage throughout Asia and the Pacific islands, from Japan to New Guinea. It is adapted to temperate growing climates as well as the tropics, and is escaped as a weed in many places, including the U.S. The color of the foliage varies greatly and some brightly colored varieties are grown as ornamentals. For food use varieties, leaves and young sprouts are eaten both cooked and fresh. The stems are also consumed in places, particularly India. This species is highly nutiritious and valued for food since ancient times. The seeds of this species may also be eaten as a grain, but this is not a common use (MARKLE, MANSFELD, WIKIPEDIA, YAMAGUCHI, PLANTS FOR A FUTURE).

3. Crop Data:

a. Season, seeding to harvest: 3 to 6 weeks (MARKLE).

b. Cultivation: Propagated by seed in ligh, well drain soils. Seedlings can be transplanted after 2-3 weeks. Mature plant spacing is 30-40 cm (12-14 in), and whole plants may be harvested when they reach 15-20 cm (6-8 in). Cuttings of leaves every 7-10 days increase yields and delay flowering (YAMAGUCHI, MARKLE).

c. Availablity in the marketplace: Can be found in the U.S. in ethnic markets or areas with a large Asian population. Commonly available fresh throughout Asia.

d. Preparation for cooking: Leaves are used fresh, salted, or stewed (MANSFELD).

e. Nutritional aspects: Contains large amounts of protein, fiber, and vitamins A and C. Also contains high amounts of oxalic acid which inhibits the absorption of calcium and zinc should be avoided or eaten in moderation by people with kidney disorders, gout, or rheumatoid arthritis (YAMAGUCHI, WIKIPEDIA).

f. Medicinal aspects: Some folk remedy use (PLANTS FOR A FUTURE).

g. Crop Photos:

4. Production in U.S.: No data. Mainly a weed or ornamental, some cultivation for food by Asian immigrants on a small scale (MARKLE, MANSFELD).

5. Other production regions: Asia, particularly S and SE Asia (MANSFELD).

6. Use: Vegetable (cooked and fresh), dye, ornamental, grain, medicinal (PLANTS FOR A FUTURE).

7. Part(s) of plant consumed: Young stems and leaves.

8. Portion analyzed/sampled: Tops (leaves and stems).

9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A

b. EPA Crop Group (Group & Subgroup): Leafy vegetables (except *Brassica* vegetables) group, Leafy greens subgroup 4A.

c. Codex Group: 013, Leafy vegetables (including Brassica leafy vegetables),VL 0460, Amaranth

d. EPA Crop Definition: None

10. References: GRIN, CODEX, MARKLE, MANSFELD, PLANTS FOR A FUTURE, WIKIPEDIA, YAMAGUCHI

11. Production Map: EPA Crop Production Regions 1, 2, 3, 4, and 5

12. Plant Codes:

a. Bayer Code: AMATR

1. **Aster, Indian** (PLANTS)
    Asteraceae
    Kalimeris indica (L.) Sch. Bip.
2. A rhizomatous perennial herb, native to southern and eastern China (particularly the Yangtze region). Puplish, sparsely hairy stems grow erect, up to 60 cm (23.6 in), with new shoots emerging from the rootstock. The leaves are alternate, wide and toothed on the end and tapering toward the base, although the leaf shape can vary greatly and different named types exist based on the leaves. The flower heads are about 2.5 cm (1 in) across, with purple-violet ray flowers and yellow tubular florets. The young shoots and young rosette leaves are eaten cooked, in soups, salads, or stir-fries. It is usually gathered from the wild and rarely cultivated, although some cultivation exist outside of Shanghai, where it is particularly popular. It is typically found along roadsides, river banks, and lowland meadows. The whole plant, fresh or dried, is used medicinally and in teas in Asia (CHEN 2001, MANSFELD, HU 2005).
3. Crop Data:
    a. Season, harvest: Spring, prior to flowering (CHEN 2001, HU 2005).
    b. Cultivation: In the wild plants reproduce by seeding or vegetatively by tillering. Prefers damp soils and the foliage is not frost hardy. The root of the plant survives the winter and produces new shoots in the spring (CHEN 2001).
    c. Availablity in the marketplace: No data in the U.S., but found locally where it is grown (HU 2005).
    d. Preparation for cooking: Plant is always cooked for culinary consumption (CHEN 2001).
    e. Nutritional aspects: No data.
    f. Medicinal aspects: Used in traditional asian medicine (MANSFELD, CHEN 2001).
    g. Crop Photos:
4. Production in U.S.: No data.
5. Other production regions: Jiangsu (particularly near Shanghai), Zhejiang, and Anhui provinces of China (CHEN 2001).
6. Use: Vegetable, medicinal (MANSFELD 2001)
7. Part(s) of plant consumed: Young shoots/leaves before flowering
8. Portion analyzed/sampled: Young shoots/leaves before flowering
9. Classifications:
    a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A
    b. EPA Crop Group (Group & Subgroup): Miscellaneous
    c. Codex Group: No specific entry
    d. EPA Crop Definition: None
10. References: MANSFELD, CHEN 2001, HU 2005
11. Production Map: EPA Crop Production Region 13
12. Plant Codes:
    a. Bayer Code: KASIN

1. **Blackjack** [cobblers'-pegs, hairy beggar-ticks, Spanish-needles, bident hérissé, bident poilu, herbe d'aiguill, Zweizahn, carrapicho-de-agulha, picão-preto, bidente piloso, mozote (GRIN)]

Asteraceae

Bidens pilosa L.

2. An erect annual plant growing to 1 m (3.3 ft), growing as a weed throughout much of the tropical world, but also found in more temperate climates of North America. Usually hairy with opposite leaves pinnately divided into 3-5 leaflets with toothed margins and a winged petiole. Flowers are composite, orange or yellow and seeds are a prickly burr. Leaves are used as a vegetable and for medicinal purposes in parts of Asia and Africa. It is under some cultivation in Africa but mainly is gathered from the wild. In Africa the leaves are used to make sauces, and may be dried, powdered and stored through the dry season. It is one of the few vegetables available during the rainy season. The flowers are used in the Philippines to make alcohol (MANSFELD, GRUBBEN 2004, IEWF, WIKIPEDIA, PLANTS FOR A FUTURE).

3. Crop Data:

a. Season, emergence to havest: Four to six weeks (GRUBBEN 2004).

b. Cultivation: Sow from seeds. Grows well in disturbed areas and poor soils, in full or partial sun. Mostly harvested from the wild (GRUBBEN 2004, PLANTS FOR A FUTURE).

c. Availablity in the marketplace: Mostly local markets in Africa and parts of Asia.

d. Preparation for cooking: Leaves are eaten fresh, cooked, or dried and ground into a powder for use later (GRUBBEN 2004).

e. Nutritional aspects: Good source of iodine (PLANTS FOR A FUTURE).

f. Medicinal aspects: Many uses in folk medicine, particularly to treat wounds and bacterial or fungal infections (PLANTS FOR A FUTURE, GRUBBEN 2004).

g. Crop Photos:

4. Production in U.S.: No data; grows as a weed in some temperate forests.

5. Other production regions: Cultivated in Nigeria, Benin, and Zimbabwe; otherwise found and used throughout the tropics.

6. Use: Vegetable, animal fodder, medicinal, dye, insecticide, tea, alcohol (GRUBBEN 2004, MANSFELD).

7. Part(s) of plant consumed: Leaves

8. Portion analyzed/sampled: Leaves

9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A

b. EPA Crop Group (Group & Subgroup): Miscellaneous

c. Codex Group: 013, Leafy vegetables (including Brassica leafy vegetables), VL 4321, Blackjack

d. EPA Crop Definition: None

10. References: MANSFELD, IEWF, GRUBBEN 2004, WIKIPEDIA, PLANTS FOR A FUTURE).

11. Production Map: EPA Crop Production Regions 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, and 13

12. Plant Codes:

a. Bayer Code: BIDPI

1. **Cat's Whiskers** [African spider-flower, bastard-mustard, feuilles caya, mozambé, acaya, mouzambi, volatín (GRIN)]

Cleomaceae

Cleome gynandra L. (syn: *Cleome pentaphylla* L., *Gynandropsis gynandra* (L.) Briq., *Gynandropsis pentaphylla* (L.) DC.)

2. An erect annual herb, native to Asia but naturalized throughout the tropics and is particularly grown in Africa. It can grow up to 1.5 m (4.9 ft) in height. The stem and leave stalks are sticky with glandular hairs. Leaves are palmately compound, with 3-5 leaflets. The leaf petiolie is long and the leaflets radiate from the tip of the leaf stalk and taper toward the base. The inflorescence is showier, with many pink or white flowers. The leaves are valued as a nutritious bitter vegetable in Africa, parts of Southeast Asia, and the Caribbean. The leaves may be eaten fresh, but due to their bitterness are usually cooked, fermented, or pickled. They may also be dried. They are often cooked with other African leafy vegetables, such as cowpea, amaranth, and black nightshade. In India it is used to flavor sauces, as a potherb, and in Thailand it is used to make a fermented food product called 'pak-sian-dong. The seeds may be used like mustard seeds, and also yield an edible oil (MANSFELD, NEW CROPS AUSTRALIA, WIKIPEDIA, PLANTZAFRICA).

3. Crop Data:

a. Season, harvest: 4-6 weeks after seedling emergence, may continue for 4-5 weeks (NEW CROPS AUSTRALIA).

b. Cultivation: Propagation by seed. Requires full sun, temperatures of 18-25 °C, and fertile soil from sandy loam to clay loam (NEW CROPS AUSTRALIA).

c. Availablity in the marketplace: Rare to unknown outside its range.

d. Preparation for cooking: Leaves are boiled, dried, pickled, or fermented (MANSFELD, NEW CROPS AUSTRALIA).

e. Nutritional aspects: Rich in vitamins A and C, as well as in calcium and iron (NEW CROPS AUSTRALIA).

f. Medicinal aspects: Used in some traditional medicines as an analgesic and anti-inflammatory (NEW CROPS AUSTRALIA).

g. Crop Photos:

4. Production in U.S.: No data.

5. Other production regions: Some cultivation Africa, Southeast Asia, the Carribbean (MANSFELD).

6. Use: Leaf vegetable, pickles, potherb, medicinal, insect repellant (MANSFELD, NEW CROPS AUSTRALIA).

7. Part(s) of plant consumed: Leaves and seeds.

8. Portion analyzed/sampled: Leaves.

9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A

b. EPA Crop Group (Group & Subgroup): Miscellaneous

c. Codex Group: No specific entry

d. EPA Crop Definition: None

10. References: GRIN, MANSFELD, NEW CROPS AUSTRALIA, WIKIPEDIA, PLANTZAFRICA

11. Production Map: EPA Crop Production Regions 1, 2, 3, 4, 6, 8, and 13.

12. Plant Codes:

a. Bayer Code: GYAGY

1. **Cham-chwi** [Shirayama-giku, chamchwi (GRIN)]
   Asteraceae
   Doellingeria scabra (Thunb.) Nees (Syn: *Aster scaber* Thunb.)
2. Perennial herb 1-1.5 m (3.3-4.9 ft) tall native to eastern Asia. Growth habit is typical of other asters with large radical leaves, triangular-ovate up to 12 cm (4.7 in) long on long petioles, then progressively smaller, more ovate leaves with shorter petioles on branching stems above. Flowers are composite white and yellow, typical of the family; fruit is a small achene. In Korea and China this plant is cultivated or gathered from the wild for its young leaves and shoots in the early spring (JUNG 2011, MANSFELD, HU 2005, AUSSIE GARDENING).
3. Crop Data:
   a. Season, harvest: Very early spring before bolting (JUNG 2011).
   b. Cultivation: Hardy to zone 7. Succeeds in most moist, well-drained soils in a sunny or partially shaded position. Naturally a woodland or hillside plant. Propagated by seed or by division. Does best when seeds are pre-chilled prior to germination (AUSSIE GARDENING).
   c. Availability in the marketplace: Grows throughout China and east Asia, particular in northern areas.
   d. Preparation for cooking: Young basal leaves and shoots are used fresh in making salads or as a potherb (JUNG 2011, MANSFELD, HU 2005).
   e. Nutritional aspects: No data.
   f. Medicinal aspects: No data.
   g. Crop Photos:
4. Production in U.S.: No data.
5. Other production regions: Korea, China, Japan (HU 2005, JUNG 2011, AUSSIE GARDENING)
6. Use: Salad green, potherb (HU 2005, JUNG 2011)
7. Part(s) of plant consumed: Young leaves and shoots before bolting.
8. Portion analyzed/sampled: Young leaves and shoots before bolting.
9. Classifications:
   a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A
   b. EPA Crop Group (Group & Subgroup): Miscellaneous
   c. Codex Group: No specific entry
   d. EPA Crop Definition: None
10. References: GRIN, JUNG 2011, MANSFELD, HU 2005, AUSSIE GARDENING
11. Production Map: No specific entry.
12. Plant Codes:
   a. Bayer Code: ASTSC (as *Aster scaber*)

1. **Cham-na-mul**

Apiaceae

Pimpinella calycina Maxim. (syn: *Aegopodium brachycarpum* (Kom.) Schischk., *Pimpinella brachycarpa* (Kom.) Nakai, *Pimpinella calycina* var. *brachycarpa* Kom., *Spuriopimpinella brachycarpa* (Kom.) Kitag., *Spuriopimpinella calycina* (Maxim.) Kitag.)

2. A perennial plant native to eastern Asia, reaching up to 1.2 m (3.9 ft) in height. Stem is erect and branched. Leaves are mostly glabrous and two or three times pinnate with pinnatifid leaflets, each 3-14 cm (1.2-5.5 in) long, ovate-rhomboid and single or doubly serrate borne on longer petioles below and nearly sessile near the top. Flowers are small, white, and borne in terminal compound umbels typical of the family. Fruits are tiny mericarps with very slight ribbing, 3 mm (0.1 in) in diameter. Cultivated and gathered from the wild as a leafy vegetable in Korea, and gathered from the wild in China (MANSFELD, HU 2005, JUNG 2011, EFLORAS).

3. Crop Data:

a. Season, harvest: April and June, prior to flowering (HU 2005).

b. Cultivation: Mainly gathered from the wild, prefers thickets and grassy slopes in its natural habitat (EFLORAS).

c. Availability in the marketplace: Local only, primarily in China and Korea.

d. Preparation for cooking: Young leaves are used in making salads and in the production of some kind of kimchi in Korea. In China the plants may be blanched, cut, and pickled in brine (HU 2005, JUNG 2011, MANSFELD).

e. Nutritional aspects: No data

f. Medicinal aspects: No data

g. Crop Photos:

4. Production in U.S.: No data.

5. Other production regions: Eastern Russia, northeasten China, Korea, and Japan (MANSFELD)

6. Use: Leafy vegetable (fresh or cooked)

7. Part(s) of plant consumed: Tops (leaves and stems)

8. Portion analyzed/sampled: Tops (leaves and stems)

9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A

b. EPA Crop Group (Group & Subgroup): Miscellaneous

c. Codex Group: No specific entry

d. EPA Crop Definition: None

10. References: GRIN, MANSFELD, HU 2005, JUNG 2011, EFLORAS

11. Production Map: No specific entry.

12. Plant Codes:

a. Bayer Code: No specific entry.

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1. **Chervil** [garden chervil, cerfeuil, cerfeuil cultivé, Kerbel, cerefólio, cerafolio, perifollo (GRIN)]
   Apiaceae
   Anthriscus cerefolium (L.) Hoffm. (syn: *Anthriscus longirostris* Bertol.)
2. Chervil is a biennial plant (although often grown as an annual), native to Eurasia and northern Africa. The plants reach a height of 0.3-0.6 m (1-2 ft). The leaves are much compounded, in general resembling parsley. Garden forms with curled leaves are available. Chervil is grown for its pungent, aromatic and decorative leaves, which are used fresh in salads, fresh or dried as a potherbs, and as a garnish. One of the *fine herbes* of French cookery (which include basil, chives, parsley, sage, savory and tarragon), chervil has been cultivated since the early days of the Roman Empire. The leaves have an anise-seed flavor, and the flowers are also, occasionally, used as an herb (MARKLE, MANSFELD, SPICE PAGES, PLANTS FOR A FUTURE).
3. Crop Data:
   a. Season, seed to first harvest: 6 to 8 weeks, and several harvests may be made (MARKLE).
   b. Cultivation: Requires well drained soil and relatively cool conditions or will go quickly to seed (PLANTS FOR A FUTURE).
   c. Availability in the marketplace: Common in Europe, U.S., and parts of Asia and the Middle East.
   d. Preparation for cooking: Leaves are used fresh or dried (SPICE PAGES).
   e. Nutritional aspects: No data.
   f. Medicinal aspects: Not much used medicinally (PLANTS FOR A FUTURE).
   g. Crop photos:
4. Production in U.S.: Cultivated in the U.S. to a limited extent (MARKLE).
5. Other production regions: Cultivated in Mediterranean region and Russia (MARKLE).
6. Use: Seasoning, vegetable, garnish, ornamental (PLANTS FOR A FUTURE, MANSFELD).
7. Part(s) of plant consumed: Leaves, flowers
8. Portion analyzed/sampled: Leaves (fresh and dried)
9. Classifications:
   a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A and Crop Group 19 (dried)
   b. EPA Crop Group (Group & Subgroup): Crop Group 4: Leafy vegetables (except *Brassica* vegetables) group, Leaf petiole subgroup 4B; Herbs and spices (19A) (dried)
   c. Codex Group: 013, Leafy vegetables (including *Brassica* leafy vegetables), VL 0465, Chervil
   d. EPA Crop Definition: None
10. References: GRIN, CODEX, MARKLE, MANSFELD, SPICE PAGES, PLANTS FOR A FUTURE
11. Production Map: EPA Crop Production Regions 1, 2, 5, 7, 9, 11 and 12
12. Plant Codes:
    a. Bayer/EPPO Code: ANRCE

1. **Chipilin** [castanet-plant, long-beak rattlepod, chipilín de comer (GRIN)]
   Fabaceae
   Crotalaria longirostrata Hook & Arn.
2. An erect, subtropical perennial which grows as an annual in temperate climates. It has divided leaves with three, ovate and entire leaflets and a long, thin petiole. Chipilin bears dry pods, and scatters seed over a large range. It is considered a noxious invasive weed in the U.S. It is primarily found in Hawaii. However, in southern Mexico and much of Central America is is considered a tasty and nutritious leafy vegetable, both cultivated and gathered from the wild. It is used as a potherb to flavor soups and to add flavor and color to dough for tamales and other traditional dishes (MANSFELD, WIKIPEDIA, UMASS VEGETABLE, RED TOMATO).
3. Crop Data:
   a. Season: Summer (UMASS VEGETABLE).
   b. Cultivation: Direct seed or transplants if growing in an area with a shorter growing season. Not frost tolerant (UMASS VEGETABLE).
   c. Availablity in the marketplace: Common in Central America, Mexico, and any area with a large number of immigrants from that region. Being researched for broader markets in the Northeast U.S.
   d. Preparation for cooking: Leaves and young shoots are nearly always eaten cooked, usually by boiling or sautéing. Chiplin may also be dried as a seasoning, or added to dough for flavor and color (RED TOMATO, MANSFELD).
   e. Nutritional aspects: Rich in iron, calcium and beta carotene (RED TOMATO).
   f. Medicinal aspects: No data.
   g. Crop Photos:
4. Production in U.S.: Massachusetts (UMASS VEGETABLE, RED TOMATO).
5. Other production regions: Throughout much of southern Mexico and Central America to Honduras. Exported, frozen, from Guatemala (ALLEN 2007).
6. Use: Potherb, vegetable, seasoning, food coloring (MANSFELD, RED TOMATO)
7. Part(s) of plant consumed: Leaves and young shoots
8. Portion analyzed/sampled: Leaves
9. Classifications:
   a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A
   b. EPA Crop Group (Group & Subgroup): Miscellaneous
   c. Codex Group: No specific entry
   d. EPA Crop Definition: None
10. References: UMASS VEGETABLE, RED TOMATO, MANSFELD, WIKIPEDIA
11. Production Map: EPA Crop Production Region 13
12. Plant Codes:
   a. Bayer Code: CVTLO

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1. **Chrysanthemum, Edible-leaved** [pua-pake, margarita, crisantemo (MARKLE)]
   Asteraceae
   Glebionis spp.

1. **Chrysanthemum, garland** [shungiku, tan o, kor tongho, chopsuey, tongho, Japanese greens, chop-suey-green, crown daisy, garland chrysanthemum, Japanese-green, tongho, antimonio, mirabeles, moya (GRIN, MARKLE)]
   Glebionis coronaria (L.) Cass. ex Spach (syn: *Chrysanthemum coronarium* L., *Chrysanthemum coronarium* var. *spatiosum* L. H. Bailey, *Chrysanthemum roxburghii* Desf., *Chrysanthemum spatiosum* (L. H. Bailey) L. H. Bailey, *Glebionis roxburghii* (Desf.) Tzvelev)

1. **Corn chrysanthemum** [tangho, tongho, corn marigold, marguerite dorée, Saatwucherblume, malmequer, corona de Rey (GRIN, MARKLE)]
   Glebionis segetum (L.) Fourr. (syn: *Chrysanthemum segetum* L.)

1. **Tricolor chrysanthemum** [shungiku]
   Glebionis carinata (Schousb.) Tzvelev (syn: *Chrysanthemum carinatum* Schousb., *Ismelia carinata* (Schousb.) Sch. Bip.)

2. Annual herbaceous plant 30-91 cm (1-3 ft) tall, originally native to the Mediterranean region, but now primarily grown in Asia for use as a leafy vegetable. The leaves are highly variable and there are three distinct varieties: small-leaf, which has feathery, deeply cut leaves, is strongly flavored, low yielding with small leaves and an upright growth form, and most popular in Northern China; large-leaved, which has much thicker, only slightly serrate leaves, bushier growth, a mild flavor, and is grown throughout China; and the intermediate which has moderately cut, dark green leaves, and is high yielding and tolerant of both warm and cool climates. The flowers are small, yellow, and resemble daisies. The radical leaves and yound tender stems are used fresh or cooked as a vegetable throughout China, Japan, Korea, and other Asian countries where its is considered a common man's vegetable. Popular in Europe in the Middle Ages, it is now relatively rare in the West although beginning to gain popularity in markets with a large Asian population. The leaves are aromatic and become more strongly flavored and bitter the older they are, so tender young leaves are often favored. The flowers are also edible, although the center is very bitter so normally only the outer petals are used (MANSFELD, HU 2005, LARKCOM, PLANTS FOR A FUTURE, MARKLE).

3. Crop Data:
   a. Season, seeding to harvest: First cuttings can be made 6-8 weeks after seeding and continue for up to 3 months (LARKCOM).
   b. Cultivation: A cool season plant, grows best in early spring and late fall. In some climates may be grown through the winter, outside or under protection such as hoops houses or cold frames. Grows readily from seeds, although cuttings may also be used. Tolerates a wide range of soil conditions and requires full sun. Space plants (10 cm) 4 in apart in garden, harvest multiple times by cutting back stems and pinching off flower buds to prevent leaves from turning bitter. May self sow (LARKCOM, PLANTS FOR A FUTURE, SPLITTSTOESSER).
   c. Availablity in the marketplace: Common throughout much of Asia; rarer elsewhere although can be found in Asian speciality stores in the U.S. and other countries.
   d. Preparation for cooking: Young leaves and stems are used fresh in salads, to flavor soups and stocks, boiled, or stir-fried. In Japan, Chrysanthemum greens are used in tempura (LARKCOM).
   e. Nutritional aspects: Rich in vitamin B and other minerals (KITAZAWA SEED).
   f. Medicinal aspects: Various traditional remedies, particularly disorders of the stomach (PLANTS FOR A FUTURE).
   g. Crop Photos:

4.Production in U.S.: No data, but some cultivation in home gardens around the Boston area (HU 2005).
5. Other production regions: China, Japan, Korea (MARKLE).
6. Use: Pot herb, salad green, vegetable, medicinal
7. Part(s) of plant consumed: Leaves and tender shoots
8. Portion analyzed/sampled: Tops

9. Classifications:
    a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A
    b. EPA Crop Group (Group & Subgroup): Leafy vegetables (except *Brassica* leafy vegetables) group, Leafy greens subgroup 4A.
    c. Codex Group: 013, Leafy vegetables (including *Brassica* leafy vegetables), VL 0479, Japanese greens
    d. EPA Crop Definition: None
10. References: GRIN, MARKLE, MANSFELD, HU 2005, LARKCOM, SPLITTSTOESSER, PLANTS FOR A FUTURE, KITAZAWA SEED
11. Production Map: EPA Crop Production Regions 1, 2, 3, 4, 5, 10, 11, and 12
12. Plant Codes:
    a. Bayer Code: CHYCO (*C. coronarium*), CHYSE (*C. segetum*)

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1. **Corn salad**

Valerianaceae

Valerianella spp.

1. **Lamb's lettuce** [fetticus, European corn salad, mache, doucette, lechuga de campo, valérianelle, Feldsalat, Rapunzel, alface (GRIN)]

Valerianella locusta (L.) (syn: *Valeriana locusta* L., *Valerianella olitoria* (L.) Pollich)

1. **Italian Corn salad** [hairy-fruited cornsalad, mâche d'Italie, italienisches Rapünzchen, alface-de-Alger, valerianela de Italia (GRIN)]

Valerianella eriocarpa Desv.

2. Biennial herb native to Europe, North Africa, and Western Asia. The plant grows in a basal rosette of round to spoon-shaped leaves up to 6 in (15.2 cm) long. The whole rosette is never more than 1 ft (0.3 m) across. The rosette grows the first year, and the second year the seed stalk appears, although it may bolt the same year if heat is excessive. The leaves are tender, smooth, and slightly succulent, with a sweet, mild flavor and delicate texture. It is extensively grown in Europe and parts of China as a cool season salad vegetable, but is still relatively rare in the U.S., although it has become naturalized on both the east and west coasts. It is a cool season plant, and can be grown all year round in some cool temperate areas. Italian corn salad is somewhat more heat-tolerant than *V. locusta*, but is correspondingly more bitter. Flowers and flowering stems also edible (MARKLE, HU 2005, WIKIPEDIA, FLORDATA, PLANTS FOR A FUTURE).

3. Crop Data:

a. Season, seeding to harvest: 2 to 3 months (MARKLE).

b. Cultivation: Requires cool temperatures. Sow directly from seed. Seeds do not germinate in warm weather. Plant 2-4 weeks before last frost in spring or at time of first frost in fall. May be grown over winter in warmer climates. Grows well in most soils, but prefers a light, rich soil and sunny position (although some shade can be beneficial during warmer months). Will often self sow (PLANTS FOR A FUTURE, FLORIDATA).

c. Availability in the marketplace: Popular throughout Europe and parts of China. Gaining popularity in the U.S. in gourmet markets and high-end restaurants.

d. Preparation for cooking: Usually eaten fresh in salads but in China sometimes stirfried (FLORIDATA, HU 2005).

e. Nutritional aspects: No data.

f. Medicinal aspects: No data.

g. Crop Photos:

4. Production in U.S.: No data, but some production in New York, Maine, and Florida (MARKLE).

5. Other production regions: Europe and parts of China, particularly around Shanghai (MARKLE, HU 2005).

6. Use: Salad, occasionally potherb/stirfry (MARKLE).

7. Part(s) of plant consumed: Leaves

8. Portion analyzed/sampled: Leaves

9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A

b. EPA Crop Group (Group & Subgroup): Leafy vegetables (except *Brassica* leafy vegetables) group, Leafy greens subgroup 4A.

c. Codex Group: 013, Leafy vegetables (including *Brassica* leafy vegetables), VL 0470, Corn salad

d. EPA Crop Definition: None

10. References: GRIN, MARKLE, HU 2005, WIKIPEDIA, FLORIDATA, PLANTS FOR A FUTURE

11. Production Map: EPA Crop Production Regions 1, 2, 4, 5, 7, 9, 10, 11, and 12

12. Plant Codes:

a. Bayer Code: VLLER (*V. eriocarpa*), VLLLO (*V. locusta*)

1. **Cosmos** [Ulam raja, King's salad (WIKIPEDIA)]
   Asteraceae
   Cosmos caudatus Kunth
2. An annual herb, found worldwide throughout the tropics and growing up to 2 m (6.6 ft) in height. It has much divided, deeply cut leaves and a light green, succulent stem slightly tinged with purple. The ray florets are white, pink, or purple. Cosmos has a distinct smell, similar to turpentine, and its edible foliage and young shoots have a very strong flavor. It is eaten primarily in Southeast Asia and parts of Central America, and may be considered a weed elsewhere. In Malayasia it is also used medicinally (MANSFELD, WIKIPEDIA, RUBATSKY).
3. Crop Data:
   a. Season: No data.
   b. Cultivation: Requires a warm climate (WIKIPEDIA)
   c. Availablity in the marketplace: Rare to unknown in this country. Mostly found in Southeast Asia, particularly Mayasia.
   d. Preparation for cooking: Eaten primarily, if not exclusively raw, it often used in "Ulam", a very popular Malay herbal salad.
   e. Nutritional aspects: No data.
   f. Medicinal aspects: Has anti-fungal and anti-bacterial properties, and it also used for a variety of fold remedies (WIKIPEIDA).
   g. Crop Photos:
4. Production in U.S.: Home gardens (RUBATSKY).
5. Other production regions: Indonesia, the Philippines, Malaysia, Central America (WIKIPEDIA, MANSFELD).
6. Use: Leafy salad green.
7. Part(s) of plant consumed: Leaves
8. Portion analyzed/sampled: Leaves
9. Classifications:
   a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A
   b. EPA Crop Group (Group & Subgroup): Miscellaneous
   c. Codex Group: No specific entry
   d. EPA Crop Definition: None
10. References: MANSFELD, WIKIPEDIA, RUBATSKY
11. Production Map: EPA Crop Production Regions 3 and 13
12. Plant Codes:
   a. Bayer Code: CMSCA

1. **Dandelion** [common dandelion, pissenlit, seiyotanpopo, Chinese dandelion, diente-de-lion, Russian dandelion, lion's tooth, gow gay, dent de lion, pissenlit vulgaire, Löwenzahn, dente-de-leão, achicoria amarga , amargón, diente de león (GRIN, MARKLE)]

Asteraceae

Taraxacum officinale F.H. Wigg. aggr. (syn: *Leontodon taraxacum* L.*, Taraxacum dens-leonis* Desf.*, Taraxacum vulgare* Schrank)

2. An herbaceous perennial, native to Europe and Asia but naturalized throughout much of the temperate world. Considered a weed in many areas. Forms a basal rosette of long, extremely toothed leaves which taper towards the base. Cultivated varieties have much larger rosettes than wild forms, reaching 46-61 cm (18-24 in). The bright yellow to orange flowers are born on a hollow stem and have 40 to 100 florets per head. The small, ridged seeds are oblong, tapering at both ends, and attached to a silky "parachute" which catches the wind and disperses the seeds. The seeds and parachutes are arranged around the fruiting head to appear as a soft sphere when ripe. The plant typically has a long, unbranched taproot and is difficult to uproot. All parts of the plant contain a milky-white latex. Dandelion has long been used both medicinally and for culinary purposes. The flowers, foliage, and root are all consumed and have a somewhat bitter flavor. It is cultivated in North America, Europe, and Asia. The foliage is sometimes considered a gourmet salad green, although it is shunned in some places due to its prevalence as a weed. When dandelion is grown with tomatoes it has been found to reduce the incidence of *Fusarium*. It is often confused with chicory, as the names are occasionally used interchangeably and their leaf shape and growth forms are similar (MARKLE, MANSFELD, HU 2005, WIKIPEDIA, MUNRO, SASKATCHEWAN AG).

3. Crop Data:

a. Season, seeding to harvest: Young, tender leaves can be harvested in a matter of weeks. The older the leaves, the more bitter they become. Flowers typically in summer, but has also been known to flower in every month of the year (MUNRO).

b. Cultivation: An extremely hardy plant that and grows most soils and tolerates cold very well. Requires full sun. Can be sown very early in the spring, or sown in the fall and overwintered to provide greens all year round. The leaves can be tied up in a bundle several weeks before harvest to produce a blanched center, similar to Belgian endive. Seedlings should be thinned early, as once the root develops they are difficult to remove. In the winter, the roots can be brought inside and forced to sprout, new green growth. Some areas have regulations regarding the cultivation of dandelion, due to weed issues. Measures to prevent re-seeding may be required (MUNRO, SASKATCHEWAN AG, PLANTS FOR A FUTURE).

c. Availability in the marketplace: Dandelion greens and dandelion wine are available in many places in the U.S. and Europe. The greens are fairly common in China and very popular in France.

d. Preparation for cooking: The leaves are used fresh in salads, and cooked as a potherb or in stir-fries. The roots can be roasted and ground and used as a coffee substitute. They can also be eaten cooked or raw, like turnips, although this is rare. The flower buds can be fried into fritters or preserved in vinegar for use like capers. The flowers themselves are used to make dandelion wine. Both the leaves and the roots are used to flavor soft drinks and herbal beers. Dandelion extract is used commercially to flavor desserts, confections, beverages, and cheese (PLANTS FOR A FUTURE, WIKIPEDIA, MANSFELD).

e. Nutritional aspects: The leaves in particular are extremely nutritious and contain high amounts of Vitamin A, Vitamin C, iron and calcium, as well as thiamine and riboflavin (SASKATCHEWAN AG, WIKIPEDIA, PLANTS FOR A FUTURE).

f. Medicinal aspects: All parts of the plant are used medicinally, particularly the extracted latex. It is used as a folk remedy for many ailments, particularly stomach ailments. It is recognized as a diuretic in Germany. Dandelion is also very high in anti-oxidants (SASKATCHEWAN AG, PLANTS FOR A FUTURE).

g. Crop Photos:

4. Production in U.S.: Grown on a large scale in Florida, and cultivated elsewhere in the U.S. (MARKLE).

5. Other production regions: Cultivated in Canada, West and Central Europe, India, China, and Japan (HU 2005, MANSFELD).

6. Use: Potherb, salad green, vegetable, wine, medicinal, condiment, companion plant, beverage, flavoring (MANSFELD, SASKATCHEWAN AG, MUNRO).
7. Part(s) of plant consumed: Primarily leaves; also flowers and roots
8. Portion analyzed/sampled: Leaves
9. Classifications:
    a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A
    b. EPA Crop Group (Group & Subgroup): Leafy vegetables (except *Brassica* leafy vegetables) group, Leafy greens subgroup 4A.
    c. Codex Group: 013, Leafy vegetables (including *Brassica* leafy vegetables), VL 0474, Dandelion
    d. EPA Crop Definition: None
10. References: GRIN, MARKLE, MANSFELD, HU 2005, PLANTS FOR A FUTURE, MUNRO, SASKATCHWAN AG, WIKIPEDIA
11. Production Map: All EPA Production Regions.
12. Plant Codes:
    a. Bayer Code: TAROF

(224)

1. Dock [Spinach dock, herb patience, patience dock, hierba de la paciencia, ba tian suan mo, oseille epinard, romaza hortense, épinard-oseille, grande patience, oseille, patience, Gartenampfer, Gemüseampfer, azeda-espinafre (GRIN, MARKLE)

Polygonaceae

Rumex patientia L.

2. Dock is a strong growing perennial native to Southern Europe and Asia, but escaped and naturalized elsewhere. The stems are upright and may reach 1.5 m (5 ft) when flowering. Rosette leaves are 20-30 cm (8-12 in) long, tapering at both ends. Stem leaves are rounded at the base, long and thin, arranged alternately around the reddish stem. Inflorescences are terminal panicles, with small green flowers arranged in whorls. The fruit is a small. 3.5 x 2.5 mm (0.14 x 0.01 in), brown, egg-shaped achene. It was long cultivated in Europe, China, and North America as a leafy vegetable, similar to spinach. Today, cultivation has been almost entirely abandoned and it is considered a weed in many places. However it is still sometimes gathered from the wild for use as a vegetable or for herbal remedies. In parts of China the young leaves and leafy shoots are still consumed (MARKLE, MANSFELD, HU 2005, EFLORAS, WIKIPEDIA).

3. Crop Data:

a. Season, harvest: Young leaves available in early spring from established roots (MARKLE).

b. Cultivation: Typically grows in waste areas, such as roadsides, old fields, and disturbed meadows (EFLORAS).

c. Availability in the marketplace: Mainly gathered from the wild for personal use. Seed may be purchased over the internet for home gardening.

d. Preparation for cooking: Young leaves and leafy shoots are cooked, much like spinach (MANSFELD, MARKLE).

e. Nutritional aspects: No data.

f. Medicinal aspects: The rhizome has been used as a purgative (MANSFELD).

g. Crop Photos:

4. Production in U.S.: No data, but naturalized in North America (MARKLE).

5. Other production regions: Europe, England, China (MANSFELD)

6. Use: Pot herb greens, vegetable, medicinal (MANSFELD, MARKLE).

7. Part(s) of plant consumed: Leaves only

8. Portion analyzed/sampled: Leaves

9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A

b. EPA Crop Group (Group & Subgroup): Leafy vegetables (except *Brassica* leafy vegetables) group, Leafy greens subgroup 4A.

c. Codex Group: 013, Leafy vegetables (including *Brassica* leafy vegetables), VL 0475, Dock

d. EPA Crop Definition: None

10. References: GRIN, MARKLE, MANSFELD, HU 2005, EFLORAS, WIKIPEDIA

11. Production Map: All EPA Production Regions except 13.

12. Plant Codes:

a. Bayer Code: RUMPA

Dol-nam-mul [chui pen cao, whorled stonecrop, stringy stonecrop (GRIN, PLANTS, ILLINOIS WILDFLOWERS)]

Crassulaceae

Sedum sarmentosum Bunge

2. A perennial, creeping plant native to Asia, reaching 10-25 cm (3.9-9.8 in) tall. The thick succulent leaves are oblanceolate to oblong, up to 2.8 cm (1.1 in) in length, and arranged in whorls of three around the central stems. The flowering stems are mostly postrate and may root at nodes where they come in contact with the ground. The tiny yellow flowers are sessile and 5-parted and bear tiny (0.5 mm) ovoid seeds. The plant is fast-growing and makes excellent, attractive ground cover. In the U.S. it is known primarily as an ornamental plant or an escaped weed. In Asia, particularly in Korea, it is grown or gathered from the wild as a leafy vegetable or a medicinal plant. The whole tops are harvested prior to flowering and used in salad (JUNG 2011, MANSFELD, ILLINOIS WILDFLOWERS).

3. Crop data

a. Season, harvest: Early spring (before May), prior to flowering (JUNG 2011).

b. Cultivation: Full sun to light shade. Does well in dry, rocky soil and can survive droughts very well. Often grows in open woodlands, vacant lots, roadsides, city parks, and waste ground (ILLINOIS WILDFLOWERS).

c. Availability in the marketplace: Found mainly in Korea as a food plant; medicinal plant in China, Vietnam and Korea.

d. Preparation for cooking: Leaves used fresh in salads (JUNG 2011).

e. Nutritional aspects: No data

f. Medicinal aspects: Traditional medicinal plant in Asia (MANSFELD).

g. Crop photos:

4. Production in U.S.: No data, ornamental cultivation and escaped as a weed in the eastern part of the country (PLANTS).

5. Other production regions: China, Korea, Vietnam (MANSFELD).

6. Use: Ornamental, ground cover, salad green, medicinal (JUNG 2011, MANSFELD, ILLINOIS WILDFLOWERS).

7. Part(s) of plant consumed: Tops, prior to flowering.

8. Portion analyzed/sampled: Tops, prior to flowering.

9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A

b. EPA Crop Group (Group & Subgroup): Miscellaneous

c. Codex Group: No specific entry

d. EPA Crop Definition: None

10. References: GRIN, PLANTS, JUNG 2011, MANSFELD, ILLINOIS WILDFLOWERS

11. Production Map: EPA Crop Production Regions 1, 2, 3, 4, and 5 (PLANTS).

12. Plant Codes:

a. Bayer/EPPO Code: SEDSA

1. Ebolo [thickhead, redflower ragleaf, fireweed (WIKIPEDIA)]

Asteraceae

Crassocephalum crepidioides (Benth.) S. Moore

2. An annual herb, native to tropical Africa but spread throughout tropical Asia and the Pacific, including Australia. It grows erect, up to 1.2 m (3.9 ft), and is somewhat succulent. The alternate leaves have winged petioles and are elliptic, 9-15 cm (3.5-5.9 in) long and 3.5-8 cm (1.4-3.1 in) wide, irregularly and sharply serrate. Leaves may be pinnately lobed. Inflorescence is a terminal corymb borne on loosely branch stems and are often nodding. Composite flowers are small and variable in color, from purple to orange-red. Fruit is a ribbed achene, 2 mm (0.08 in) long, dark purplish and covered in white hairs 9-12 mm (0.35-0.47 in) long, and are dispersed by the wind. Ebolo is prized in Africa for its foliage and stems, which is fleshy and mucilaginous with a flavor that is sharp, but not bitter. It used as a potherb, vegetable, and medicinal plant. It is also eaten in China and Australia (MANSFELD, WIKIPEDIA, HU 2005, GRUBBEN 2004, FLORA OF ZIMBABWE).

3. Crop Data:

a. Season, seeding to harvest: First harvest is 5-6 weeks after planting. Plants can be harvested once by uprooting, or many times by cutting 8-10 cm (3.1-3.9 in) above the ground every 7-10 days for up to 40 days (GRUBBEN 2004).

b. Cultivation: Propagation by seed. Seeds are typically sown by broadcast in a prepared seed bed in a cool spot and watered twice daily. When they reach 8-10 cm (3.1-3.9 in), they are transplanted to the field at a 30 cm (11.8 in) spacing. Direct seeding is rare. Prefers rich, well drained soils and in the wild is often weedy in waste places. Grows well under shade in tea or cocoa plantations. Can tolerate wet conditions but will not grow if waterlogged. Require warm temperatures. After harvest, leaves wilt quickly and should be placed in water to keep them fresh. Typically harvested in the early morning or evening to keep cool and fresh for the market (GRUBBEN 2004).

c. Availablity in the marketplace: Mainly found in local markets in urban and rural West and Central Africa; may also be obtainable in Australia and China.

d. Preparation for cooking: The leaves are sometimes eaten fresh, as a salad green, mainly in Australia. In Africa more typically a cooked vegetable, blanched and then used in soups and stews with other vegetables, melons, fish, or meat. In Sierra Leone, the leaves are made into a sauce with groundnut paste. In China it is used as a potherb (GRUBBEN 2004, HU 2005).

e. Nutritional aspects: Very nutritious green; a good source of protein, fiber, and calcium (GRUBBEN 2004).

f. Medicinal aspects: Used widely in Africa for various remedies such as for wounds, upset stomachs, epilepsy, and headaches (GRUBBEN 2004).

g. Crop Photos:

4. Production in U.S.: No data.

5. Other production regions: West and Central Africa (Nigera, DR Congo, Uganda, Tanzania, Camaroon, Ghana, Ziare and Benin), China, and Australia (GRUBBEN 2004, MANSFELD).

6. Use: Potherb, vegetable, condiment, medicinal (GRUBBEN 2004, MANSFELD)

7. Part(s) of plant consumed: Tops

8. Portion analyzed/sampled: Tops

9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A

b. EPA Crop Group (Group & Subgroup): Miscellaneous

c. Codex Group: No specific entry

d. EPA Crop Definition: None

10. References: MANSFELD, HU 2005, GRUBBEN 2004, WIKIPEDIA, FLORA OF ZIMBABWE

11. Production Map: EPA Production Regions 3 and 13.

12. Plant Codes:

a. Bayer Code: CRSCR

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1. **Endive** [escarole, Andijvie, chicon, chicorée endive, Endivie, endivia, chicória, escarole, escarola crespa (GRIN)]

Asteraceae

Cichorium endivia L. ssp. *endivia* (syn: *Cichorium endivia* var. *crispum* Lam., *Cichorium endivia* var. *latifolium* Lam.)

2. Endive is a cool season annual plant, probaby native to the Mediterranean region and cultivated for its loose headed leaves. Although closely related, endive should not be confused with Belgian endive or chicory (even though it is sometimes sold under the name chicory). Endive is grown for its loose-headed leaves which are used in salads and to some extent as pot herbs. Two leaf types are grown. In the first type, commonly termed endive, the numerous leaves are oblong, curled and fringed. The second type, termed escarole, has broad, generally nearly flat leaves. Endive is a low growing, plant, most cultivars just 6-10 in (15-25.4 cm) tall, whereas escarole has a central "head" of smooth fleshy leaves and is larger and more upright; some cultivars to 2 ft (0.6 m) in height. The leaves of both endive and escarole are a little more thick and chewy than those of lettuce. The leaves are typically bright green but depending on the cultivar may be pale green, brown, or even reddish along the midrib. Both types produce pale blue composite flowers on stalks, but leaves should be harvested prior to flowering to prevent an undesirable. To reduce some of the bitterness, endive should blanched (MARKLE, MANSFELD, WIKIPEDIA, FLORIDATA, SCHNEIDER 2001).

3. Crop Data:

a. Season, seeding to harvest: 3 to 3 1/2 months. (MARKLE).

b. Cultivation: Method of growing endive and escarole is similar to that for lettuce. Plants may be started in beds, but more generally seeds are field sown. As a cool season crop, endive usually is planted in early spring. Seed should be thinly sown, covered with not more than 0.8 cm (0.3 in) of finely sifted, mature compost humus and clean sand. Endive should be planted in rows one foot apart and thinned to one foot apart in the row. For a fall crop, seed must be sown in late summer. Endive require full sun to partial shade, and should be given plenty of moisture and feeding to promote quick growth, as that yields the most desirable leaves. Endive is somewhat frost tolerant (although escarole is hardier than endive varities), but become unedible in hot weather. To blanch the heads, they can be covered by a pot or bag, or tied up tightly so that no light reaches the hearts of the plants. Care should be taken that this is not done in damp weather or the plants will rot (FLORIDATA).

c. Availability in the marketplace: Relatively common in produce markets as a popular salad green or part of a salad mix.

d. Preparation for cooking: The young leaves are picked and used fresh in salads or ocassionally as potherbs (MARKLE, FLORIDATA).

e. Nutritional aspects: Rich in foliate, vitamin A, potassium, and fiber (WIKIPEDIA).

f. Medicinal aspects: No data.

g. Crop Photos:

4. Production in U.S.: Grown in the U.S. in the same regions where lettuce and other salad greens are cultivated, particularly Florida, New Jersy, New York, California, and Ohio (MARKLE).

5. Other production regions: Europe

6. Use: Mainly in salads, some as pot herb; also grown as goose fodder (MARKLE, MANSFELD).

7. Part(s) of plant consumed: Leaves

8. Portion analyzed/sampled: Leaves

9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A

b. EPA Crop Group (Group & Subgroup): Leafy vegetables (except *Brassica* leafy vegetables) group, Leafy greens subgroup 4A.

c. Codex Group: 013, Leafy vegetables (including *Brassica* leafy vegetables), VL 0476, Endive; VL 4341, Endive, broad or plain leaves and VL 4343, Endive, curled

d. EPA Crop Definition: Endive = Escarole

10. References: GRIN, MARKLE, MANSFELD, WIKIPEDIA, FLORIDATA, SCHNEIDER 2001

11. Production Map: EPA Crop Production Regions 1, 5, 10, 11, and 12.

12. Plant Codes: a. Bayer Code: CICEC

(**235)**

1. **Fameflower** [waterleaf, Surinam purslane, Surinam spinach, pourpier grand bois, pink purslane, verdolaga de playa, Ceylon-spinach, Philippine-spinach, Surinam-purslane, waterleaf, grand pourprier, Ceylonspinat , Javaspinat, espinaca de Java, espinaca de Surinam (GRIN, MARKLE)]

Portulacaceae

Talinum fruticosum (L.) Juss. (syn: *Portulaca fruticosa* L., *Portulaca triangularis* Jacq., *Talinum crassifolium* (Jacq.) Willd., *Talinum triangulare* (Jacq.) Willd.)

2. A slightly succulent perennial herb, probably native to the tropical Americas but now widespread and often cultivated throughout the tropics. A small upright herb, reaching up to 1 m (3.3 ft) tall. It branches readily with glabrous, alternate leaves that have extremely short petioles. The leaves are obvate to spatulate. The flowers are borne in a terminal cyme, and are small, pink, and five-parted. It is a common and important vegetable in Africa, South America, and the Caribbean, valued for its leaves and young sprouts. It has a slightly slimy texture and contains a lot of moisture. It is also considered to be a medicinal plant in many places. It also is used as food colorant, and as fodder for raising giant snails (MARKLE, MANSFELD, WIKIPEDIA, GRUBBEN 2004).

3. Crop Data:

a. Season, planting to harvest: Three weeks from planting a cutting to first harvestable growth. Up to four harvests 1-2 weeks apart may occur (GRUBBEN 2004).

b. Cultivation: Grows best under shade in warm, humid conditions. Propagation for commercial cultivation is mainly by cuttings. Although propagation by seed is possible, it is less desirable as the seeds are difficult to collect owing to their small size and tendency to explode when touched. Plants should be spaced 15 cm (5.9 in) apart if grown as a sole crop, to discourage weeds. Flameflower is often also used to intercrop with other plants. Water daily the first week and three times a week thereafter (GRUBBEN 2004).

c. Availability in the marketplace: Available throughout much of the tropics, at fresh markets or dried.

d. Preparation for cooking: Leaves are usually cooked into soups or stews, or steamed. It is often combined with other vegetables in sauces, and may be dried for storage and later use. It most often serves to complement starchy vegtables. Ocassionally the leaves are eaten fresh in salads (GRUBBEN 2004).

e. Nutritional aspects: Rich in vitamins A and C, and in iron and calcium. Should be avoided by those with kidney problems or arthritis, as it contains high level oxalic acid (WIKIPEDIA).

f. Medicinal aspects: Used in India, Camaroon, and Indonesia for various traditional remedies (GRUBBEN 2004).

g. Crop Photos:

4. Production in U.S.: Naturalized in Florida; grown here as an ornamental (MARKLE, MANSFELD).

5. Other production regions: Africa, India, Southeast Asia, the Philippines, Brazil, and the West Indies (MANSFELD).

6. Use: Salad green, vegetable, potherb, medicinal, food coloring, animal fodder (GRUBBEN 2004).

7. Part(s) of plant consumed: Young leaves and tender stems.

8. Portion analyzed/sampled: Leaves

9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A

b. EPA Crop Group (Group & Subgroup): Miscellaneous

c. Codex Group: No specific entry

d. EPA Crop Definition: None

10. References: GRIN, MANSFELD, MARKLE, WIKIPEDIA, GRUBBEN 2004

11. Production Map: EPA Crop Production Regions 3 and 13.

12. Plant Codes:

a. Bayer Code: TALTR

1. **Feather cockscomb** [qing xiang, red-spinach, Silber-Brandschopf, silver cockscomb, plume cockscomb (GRIN, WIKIPEDIA)]

Amaranthaceae

Glinus oppositifolius (L.) Aug. DC.

2. An erect annual herb probably native to tropical Asia or Africa, but now spread throughout much of the tropical world. In growth form and use is similar to amaranth, to which it is closely related. Plants may reach up to 2 m (6.7 ft) in height, with few branches, and alternate, entire leaves about 2 cm x 6 cm (0.8 x 2.4 in). This species, along with several others in the genus, is known for spectacular inflorescences made up of many tiny flowers borne in a spike or feathery cluster and brightly colored. Many varieties of this species exist for ornamental use, and a wide range of colors and shapes of inflorescence had been bred, from long feathery plumes to densely-packed clusters low to the ground that resemble velvety brain coral. This species is known worldwide as an ornamental. However, in Africa and parts of Asia it has also been long valued as a nutritious and easy-to-grow food source, mainly as a cooked vegetable in Nigeria and the surrounding areas. In addition it has been used for animal fodder, and to plant in fields of millet or maize to repell striga, a parasitic plant than can decimate the harvest of these staple crops (MANSFELD, HU 2005, NRC 2006).

3. Crop Data:

a. Season, planting to harvest: Six weeks to first harvest. Successive harvest may continue by removing the young leaves and terminal shoots as they appear until the plant reaches 45 cm (17.7 in) in height, at which point the plant becomes too stringy for consumption (NRC 2006).

b. Cultivation: Highly tolerant of both moist tropical and dry climates, and will grow in a range of soil types. Grows best in full sun. Susceptible to few diseases or pests. Requires warm conditions, but can grow in the summer in many temperate regions. Propagated by seed, usually spread via broadcast over the soil and then covered with a layer of straw or dry grass until rooted. Also can be sown directly into the ground by hand, or into pots for transplant as seedlings. Will self-sow if allowed. When the tallest plants reach 15 cm, they should be harvested to thin the remaining plants to 25-30 cm (9.8-11.8 in). These plants are the first harvest. The remaining plants can then be harvested from repeated cuttings until they become too large and undesireable (NRC 2006, WIKIPEDIA).

c. Availablity in the marketplace: Common in Central Africa, parts of China, Indonesia, and surrounding regions as food. Available through much of the rest of the world as an ornamental (MANSFELD, NRC 2006).

d. Preparation for cooking: The young leaves, shoots, and stems are eaten, cooked, usually in soups, stews, and vegetable dishes with fish or meat. The leaves may also be finely chopped for use as a potherb (NRC 2006, MANSFELD).

e. Nutritional aspects: Nutritional content varies with variety and location, but in general seems comparable to amaranth, containing high amounts of protein, as well as Vitamins A and C, and calcium (NRC 2006).

f. Medicinal aspects: Used for traditional medicine in SE and E Asia (MANSFELD).

g. Crop Photos:

4. Production in U.S.: Common as ornamental (NRC 2006).

5. Other production regions: Senegal, Camaroon, Nigeria, Zaire, Indonesia, China, Papua New Guinea, and the West Indes.

6. Use: Vegetable, potherb, ornamental, medicinal, companion crop, dye (red leaved forms), fodder (NRC 2006, MANSFELD).

7. Part(s) of plant consumed: Young shoots, leaves, stems, and budding flower heads.

8. Portion analyzed/sampled: Tops of young plants

9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A

b. EPA Crop Group (Group & Subgroup): Miscellaneous

c. Codex Group: No specific entry

d. EPA Crop Definition: None

10. References: GRIN, MANSFELD, WIKIPEDIA, HU 2005, NRC 2006

11. Production Map: No entry

12. Plant Codes: a. Bayer Code: GUSOP

(241)

1. Ferns, Edible (Fiddleheads)

2. Ferns are a group of about 12,000 species of non-flowering, vascular plants which reproduce via spores. They were one of the earliest lineages of vascular plants, and they range in size from tiny floating aquatic plants to tree ferns up to 20 m in height. Many species of fern are consumed in various ways, but the most common species used as leafy vegetables are generally small to medium ferns, no more than 2 m in height at maturity, with pinnate, much divided leafy fronds. The young fronds emerge from the ground curled up and are harvested before they can uncurl, and are known in North America as fiddleheads. Fronds are generally not edible once they have uncurled. Fiddleheads are rarely cultivated and are often gathered from the wild for personal consumption, or sold to markets and restaurants. They have a very limited season, typically early spring for a short time as the fronds first emerge. Many species of fern are not edible even when young, and fiddleheads are usually eaten cooked as they often contain toxins which may are destroyed in the cooking process. The most common species of fern utilized as fiddleheads are listed below (MARKLE, WIKIPEDIA, AMERICAN FERN SOCIETY, UMAINE).

Black lady fern

Woodsiaceae

Deparia japonica (Thunb.) M. Kato

A woodland and lowland fern found in Japan, Korea, China, the Himalayas, Russia, and Siberia, preferring temperate and warm temperate climate. It is medium in size and has a creeping rhizome. The fiddleheads are edible. (HOSHIZAKI, HARDY FERN LIBRARY).

- -

Bracken fern

Dennstaedtiaceae

Pteridium aquilinum (L.) Kuhn

A temperate to subtropical fern that has become an invasive weed throughout much of the world. It can grow in sandy, relatively dry upland habitats. Although the fiddleheads have been much consumed as a vegetable, primarily in Japan where it is highly prized, even the very young fronds are carcinogenic and extremely high rates of stomach cancer are reported in communities which consume large quantities of the fern (PLANTS FOR A FUTURE, HARDY FERN LIBRARY, WIKIPEDIA).

- -

Broad buckler fern

Dryopteridaceae

Dryopteris dilatata (Hoffm.) A. Gray

A fern found in acidic, moist woodlands throughout northern and central Europe, northern Asia and naturalized in the Pacific Northwest of the U.S. and Canada. The fiddlehead is gathered in the early spring (HARDY FERN LIBRARY, ALDERLEAF WILDNERNESS COLLEGE).

- -

Cinnamon fern

Osmundaceae

Osmundastrum cinnamomeum (L.) C. Presl

A large fern, up to 5 ft in height which grows in huge clonal colonies in wetlands and bogs throughout much of North America, South America, and eastern Asia. In North America it is found as far north as Labrador and as far south as Mexico. The young, edible fiddleheads are covered in a cinnamon-colored pubescence (FLORIDATA, WIKIPEDIA).

- -

Lady fern

Woodsiaceae

Athyrium filix-femina (L.) Roth ex Mert.

A feathery fern with fronds up to 3 ft, native to much of the Northern Hemisphere's temperate zone. It grows in moist, wooded areas. The young fronds contain thiaminase, an enzyme that robs the body of its vitamin B complex, and so should never be eaten raw. The cooking processes destroys the enzyme, and allows the fiddlehead to be eaten safely as a vegetable (WIKIPEIDA, MOBOT, PLANTS FOR A FUTURE).

- -

Leather fern

Pteridaceae

Acrostichum aureum L.

A tropical fern, in the U.S. only in Florida and Puerto Rico. It can reach 1.8 m in height, and has tough, leathery fronds with wavy-margined leaflets. It is typically found near mangrove swamps and is salt-tolerant provided there is also adequate fresh water nearby. The fiddleheads are mucilaginous and may also be eaten fresh. This species is considered rare (EAT THE WEEDS, SMS).

- -

Mother fern

Woodsiaceae

Diplazium proliferum (Lam.) Thouars

A tropical fern native to Africa, Madagascar, Polynesia, and South-East Asia. The fronds are dark green, tough, only once-divided. It is found in thickets and wetlands. The fiddleheads are eaten cooked (boiled or steamed) or as a fresh vegetable in salad (PROTA, HOSHIZAKI).

- -

Ostrich fern

Onocleaceae

Matteuccia struthiopteris (L.) Tod.

A large fern with fronds up to 1.7 m, native to temperate North America, Europe, and Asia. The fronds grow erect in clumps, forming large colonies, usually on shaded riverbanks or other moist woodland areas. Ostrich fern is the most popular fern used for fiddleheads in the U.S. and can even be found in some supermarkets in the spring. It is almost always cooked, although it can be eaten raw. It is also much consumed in Japan (WIKIPEDIA, PLANTS FOR A FUTURE).

- -

Vegetable fern

Woodsiaceae

Diplazium esculentum (Retz.) Sw.

A fern of tropical Asia, introduced to North America. It grows in moist soil in woodland and in partial sun. It may be the most consumed fern in the world, eaten in Asia, Southeast Asia (including India), and the Philippines. The young fronds are stir-fried or used in salads (WIKIPEDIA, EFLORAS).

- -

Zenmai

Osmundaceae

Osmunda japonica Thunb.

A medium fern with fronds to 50 cm and leaflets well spaced, native to Japan and temperate Asia. Zenmai is popular in Japan as a spring vegetable, and it is also eaten in India, where it is pickled (WIKIPEDIA, MARKLE, HARDY FERN LIBRARY).

3. Crop Data:
    a. Season, planting to harvest: Perennial, harvest immature fronds in the early spring.
    b. Cultivation:
    c. Availablity in the marketplace:
    d. Preparation for cooking:
    e. Nutritional aspects:
    f. Medicinal aspects:
    g. Crop Photos:
4. Production in U.S.: No data.
5. Other production regions: Grown in temperature regions (YAMAGUCHI, 1983).
6. Use: Immature fronds, called crosiers, buckhorns or fiddleheads are used in soups or boiled and served on toast.

7. Part(s) of plant consumed: Immature fronds. Note that even the very young fronds of the braken fern are carcinogenic and extremely high rates of stomach cancer are reported in communities which consume large quantities of the fern.
8. Portion analyzed/sampled: Immature frond.
9. Classifications:
    a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A
    b. EPA Crop Group (Group & Subgroup): Miscellaneous
    c. Codex Group: No specific entry
    d. EPA Crop Definition: None
10. References: MARKLE, WIKIPEDIA, AMERICAN FERN SOCIETY, UMAINE, HOSHIZAKI, HARDY FERN LIBRARY, PLANTS FOR A FUTURE, ALDERLEAF WILDNERNESS COLLEGE, FLORIDATA, MOBOT, EAT THE WEEDS, SMS, PROTA, EFLORAS, YAMAGUCHI 1983
11. Production Map: No entry
12. Plant Codes:
    a. Bayer Code: GUSOP

(259)

1. **Good King Henry** [mercury, utter, fat-hen, wild spinach, perennial goosefoot, allgood, Lincolnshire asparagus allgood, épinard sauvage, utter e Bon-Henri, bon Henri, utter Heinrich, wilder Mehl-spinat, buen Enrique, pie de ganso (GRIN, MARKLE)]

Chenopodiaceae

Chenopodium bonus-henricus L.

2. The plant is a stout, erect, perennial herb native to Europe and now found in parts of North America as well. The cultivated form is indistinguishable from the wild form. It grows up to 40–80 cm (15.7-31.5 in) high. The leaves are 5-10 cm (1.9-3-9 in) long and broad, triangular to diamond-shaped, with a pair of broad pointed lobes near the base, with a slightly waxy, succulent texture. The tiny, green flowers are produced in a tall, nearly leafless spike 10–30 cm (3.9-11.8 in) long. Formerly very popular in Europe and colonial America, but has been replaced in the last 200 years by other vegetables, such as true spinach, swiss chard, and beets. Still sometimes grown as an heirloom vegetable and in home gardens. It is grown for the leaves, which are used like spinach, and the young shoots which are cooked like asparagus (MARKLE, MANSFELD, MONRO, WIKIPEDIA, PLANTS FOR A FUTURE).

a. Season, seeding to first harvest: About 2 months (MARKLE).

b. Cultivation: Propagated by seed. Prefers rich, well drained soil, although can succeed in most soils. May produce a better harvest in light shade. Young shoots may be blanched like asparagus by covering during the spring (MONRO, PLANTS FOR A FUTURE).

c. Availability in the marketplace: Rare, mainly home gardens in U.S., Canada, and Europe.

d. Preparation for cooking: Leaves may be cooked like spinach, steamed, used as a potherb, or used in salads as a minor component with other, tastier leaves. Shoots in the spring can be cooked like asparagus and have a mild flavor (MANSFELD, PLANTS FOR A FUTURE, MONRO).

e. Nutritional aspects: No data

f. Medicinal aspects: Various folk remedies, mainly as a laxative (PLANTS FOR A FUTURE).

g. Crop Photos:

4. Production in U.S.: No commercial cultivation.
5. Other production regions: Possibly some cultivation in Europe and Canada (MONRO, MANSFELD).
6. Use: As pot herb for leaves, young shoots and flowers. Young shoots used as asparagus.
7. Part(s) of plant consumed: Leaves, young stems and shoots.
8. Portion analyzed/sampled: Tops
9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A

b. EPA Crop Group (Group & Subgroup): Miscellaneous

c. Codex Group: No specific entry

d. EPA Crop Definition: None

10. References: GRIN, MARKLE, MANSFELD, PLANTS FOR A FUTURE, MONRO
11. Production Map: EPA Crop Production Regions 1, 2, 5, and 9
12. Plant Codes:

a. Bayer Code: CHEBH

1. Huauzontle [pigweed, pitseed goosefoot, Berlandiers Gänsefuß (GRIN)]

Chenopodiaceae

Chenopodium berlandieri Moq.

2. An annual herbaceous plant, found in Mexico and the southern United States, reaching up to 0.9 m (3 ft) in height. The leaves are spatulate to rhomboid, and often tinged slightly with red. Small, unshowy flowers are borne in spikes. Closely related to quinoa, the small seeds are edible and can be used as a pseudo-cereal. This species was historically cultivated by both people native to the Americas and European settlers of Florida, Louisiana, and the southwestern U.S as a source of grain. Today cultivation for its seed is rare, having been replaced by more desirable species, but it is still valued for it greens. Young plants are used like spinach. The fresh plant is said to have an unpleasant smell, which vanishes when the leaves are cooked (MANSFELD, GRIN, PLANTS FOR A FUTURE, TRADEWINDSFRUIT, AUSTIN 2004, TULL 1999).

3. Crop Data:

a. Season: Sow in spring in field; germinates rapidly. It is in flower from July to October, and the seeds ripen from August to October (PLANTS FOR A FUTURE).

b. Cultivation: Succeeds in most soils but prefers a moderately fertile soil, and requires full sun. Needs a relatively long growing season and is better suited to warmer climates, although it can be grown successfully in more temperate environments (PLANTS FOR A FUTURE, TRADEWINDS FRUIT).

c. Availablity in the marketplace: No data.

d. Preparation for cooking: Leaves and young plants are cooked, as are the inflorescences. The whole flower spikes are sometimes picked while still green wrapped in dough and fried. Raw leaves should only be eaten in small amounts due to toxicity concerns regarding the amounts of saponins and oxalic acid found in the raw plant (PLANTS FOR A FUTURE, MANSFELD).

e. Nutritional aspects: No data.

f. Medicinal aspects: No data.

g. Crop Photos:

4. Production in U.S.: Grows wild in the southern U.S. (MANSFELD).

5. Other production regions: Mexico.

6. Use: Vegetable, grain, flour, dye (MANSFELD, PLANTS FOR A FUTURE, AUSTIN 2004)

7. Part(s) of plant consumed: Leaves

8. Portion analyzed/sampled: Leaves

9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A

b. EPA Crop Group (Group & Subgroup): Miscellaneous

c. Codex Group: No specific entry

d. EPA Crop Definition: None

10. References: GRIN, MANSFELD, GRIN, PLANTS FOR A FUTURE, TRADEWINDSFRUIT, AUSTIN 2004, TULL 1999

11. Production Map: All EPA Crop Production Regions except 13.

12. Plant Codes:

a. Bayer Code: CHEBE

(291)

1. **Iceplant [**fig marigold, frost plant, diamond plant, midday flowers, dew plant, binghua, algazul, ficoide, crystalline iceplant, ficoïde crystalline, ficoïde glaciale, Eiskraut, barrilha, barrilla de Canarias, escarchada, escarchosa (GRIN)]

Aizoaceae

Mesembryanthemum crystallinum L. (syn: *Cryophytum crystallinum* (L.) N. E. Br.)

2. A perennial or annual prostrate, succulent plant native to Africa and Europe, now spread through warm parts of the Americas and Australia. It grows low to the ground, often shrubby with many stems, and may spread out to 1 m (3.3 ft) in width. The leaves are densely papillose and covered in bladder cells which accumulate salt and give the plant a glistening appearance. Highly tolerant of salty conditions and mainly found in coastal areas and salt flats. May inhibit the growth of other plants by causing the accumulations of salt in the soil, as when the plant dies the bladder cells begin to leach the stored salt back into the soil. Considered invasive in some areas, but can only establish itself in previously disturbed areas. Iceplant has been introduced in California to help with sand fixation. Iceplant has a mechanism which allows it to switch from C_3 photoynthesis to CAM in times of severe drought or high salinity, making it extremely hardy. The leaves are edible and it is cultivated as a potherb and vegetable in Central Europe, India, and the Mediterranean (MARKLE, MANSFELD, ANBG-WFHC, CALFLORA, CAL-IPC, CHILEFLORA).

3. Crop Data:

a. Season, seeding to harvest: Pick the leaves once plant is well established (MARKLE).

b. Cultivation: Requires full sun, does not tolerate freezing. Will grow on a wide range of soil types and pH. Can obtain moisture solely through condensation of coastal fog if necessary. Highly drought and salt tolerant. Inhibits the growth of other plants and leaves behind a mat of dead matter which may take several years to decay. In the U.S., hardy only in Zones 10 and 11 (ANBG-WFHC, CALFLORA, CAL-IPC, CHILEFLORA).

c. Availability in the marketplace: Primarily local trade where it is grown.

d. Preparation for cooking: Leaves boiled and eaten like spinach. Seeds also edible (ANBG-WFHC, MARKLE).

e. Nutritional aspects: No data

f. Medicinal aspects: Used in traditional medicine in South Africa (MANSFELD).

g. Crop Photos:

4. Production in U.S.: California (MARKLE, MANSFELD).

5. Other production regions: Africa, India, Chile, Central Europe, Mediterranean, Australia (MANSFELD, ANBG-WFHC, CHILEFLORA, MARKLE)

6. Use: Potherb, vegetable, soap, medicinal, sand fixation, soda, ornamental (MANSFELD, ANBG-WFHC, MARKLE).

7. Part(s) of plant consumed: Leaves. Also, edible fruit.

8. Portion analyzed/sampled: Leaves

9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A

b. EPA Crop Group (Group & Subgroup): Miscellaneous

c. Codex Group: No specific entry

d. EPA Crop Definition: None

10. References: GRIN, MARKLE, MANSFELD, ANBG-WFHC, CALFLORA, CAL-IPC, CHILEFLORA

11. Production Map: No entry.

12. Plant Codes:

a. Bayer Code: MEKCR

(310)

1. **Jute**

Tiliaceae

Corchorus spp.

2. Annual, much-branched herb 90-120 cm tall, with various species found throughout most of the tropical and sub-tropical world. Leaves are 6-10 cm long, 3.5-5 cm broad, elliptic-lanceolate, apically acute or acuminate, glabrous, serrate, the lower serratures on each side prolonged into a filiform appendage over 6 mm long. Flowers are pale yellow and small black seeds borne in a capsule. Jute is best known in the U.S. as a fiber plant for making rope or coarse cloth for sacks. However, it is also valued in many regions, especially in Africa and the Middle-East, as a vegetable and is grown in many home gardens for sustenance. The leaves and young shoots are used at pot herbs and vegetables, and the fruit and seeds are also eaten in parts of Africa. The leaves are often compared to okra, being extremely mucilaginous and a natural thickening agent. There are many species of *Corchorus* which are grown both for fiber and for food around the the world. The plants are also used as animal fodder (MARKLE, MANSFELD, PURDUE, WIKIPEDIA).

3. Crop Data:

a. Season, planting to first harvest for food: About 3 months. Depending on conditions, the first edible crop may be had in as little as 1 to 2½ months with subsequent cuttings each month (MARKLE).

b. Cultivation: Requires a warm climate, and some species can tolerate relatively dry conditions. In India, seeds of *C. olitorius* are sown in March-May in carefully prepared soil, plowed and cross plowed 5 or 6 times, clay soils requiring more plowing. Cow dung and wood ashes are applied as manure. Rotted water hyacinth or its ashes may also be applied. Seeds are broadcast or dribbled behind the plow. When soils are moist, seeds may germinate in 2-3 days. If germination is bad, replowing and resowing is recommended. Starting at 8-25 cm tall, the seedlings are harrowed with a rake 3 to 4 times, and weeded 2 to 3 times. After the final weeding, plants are spaced at 10-15 by 15 cm (PURDUE, WIKIPEDIA).

c. Availability in the marketplace: Widely available as food throughout India, North and West Africa, eastern Asia.

d. Preparation for cooking: Leaves and young shoots and stems are usually cooked and eaten as a vegetable. Due to the thickening properties, it is most often used in soup, stews, and sauces. However it is also prepared as a relish, eaten in salads, and made into a tea. The fruit and seed are eaten in Zaire (MANSFELD, WIKIPEDIA).

e. Nutritional aspects: The leaves are rich in beta carotene, iron, calcium, and Vitamin C (WIKIPEDIA).

f. Medicinal aspects: Contains antioxidants. Also used in a variety of traditional remedies in Africa (MANSFELD, WIKIPEDIA).

g. Crop Photos:

4. Production in U.S.: Hawaii, Puerto Rico (MARKLE).

5. Other production regions: Found throughout tropical and warm areas of Asia (including India, Pakistan, China, Japan, and Taiwan), Africa (particularly North and West African countries), Australia, South America, and the Middle East (MANSFELD, MARKLE).

6. Use: Fiber, vegetable, potherb, tea, animal fodder, medicinal (MANSFELD).

7. Part(s) of plant consumed: Leaves, occasional fruit/seed

8. Portion analyzed/sampled: Leaves

9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A

b. EPA Crop Group (Group & Subgroup): Miscellaneous

c. Codex Group: No specific entry

d. EPA Crop Definition: None

10. References: GRIN, MARKLE, MANSFELD, PURDUE, WIKIPEDIA

11. Production Map: EPA Crop Production Regions 1, 2, 3, 4, 6, 8, 9, 10 and 13

12. Plant Codes:

a. Bayer Code: CRGOL

1. **Lettuce, bitter**

Asteraceae

Launaea cornuta (Hochst. ex Oliv. & Hiern) C. Jeffrey (syn: *Launaea exauriculatus* (Oliv. & Hiern) Amin ex Boulos, *Sonchus bipontini* var. *exauriculatus* Oliv. & Hiern, *Sonchus cornutus* Hochst. ex Oliv. & Hiern, *Sonchus exauriculatus* (Oliv. & Hiern) O. Hoffm.)

2. A perennial herb, found from northeast to southcentral Africa, and reaching up to 1.7 m (5.6 ft) in height. Stems are hollow, branched above or sometimes from the base. Leaves sessile, linear to narrowly elliptic, sometimes with 1-3 pairs of lobes near the base; midrib prominent beneath. Flowers are small, yellow and composite. Bitter lettuce is used as a cooked vegetable and is an important food source in many of the countries in sub-Saharan Africa. It has a very bitter taste and is often mixed with other vegetables to reduce the strength of the taste, or soaked in water before cooking. Bitter lettuce is also grown as fodder, and used in many traditional remedies. It is often gathered from the wild, or the least bitter specimens are planted in home gardens and propagated there to create a uniform crop (JSTOR PLANTS, FLORA OF ZIMBABWE, GRUBBEN 2004, SHAKLETON 2009, KEDING 2007).

3. Crop Data:

a. Season, flowering: August – September (FLORA OF ZIMBABWE).

b. Cultivation: Can be weedy and tends to grow on roadsides and disturbed lands. Can also be found in grasslands, hot coastal lowlands, and near lakes. Prefers sandy, relatively dry soil but will grow in many other conditions. Propagation is usually vegetative, by splitting the plant at the roots to produce multiple plantlets (JSTOR PLANTS, GRUBBEN 2004).

c. Availablity in the marketplace: Common throughout sub-Saharan Africa and Madagascar (FLORA OF ZIMBABWE).

d. Preparation for cooking: Cooked along with other vegetables such as amaranth and pumpkin leaves. If cooked alone, cooking water may be changed to reduce the bitterness. It is also sometimes used to flavor food in Kenya (JSTOR PLANTS, GRUBBEN 2004, SHAKLETON 2009).

e. Nutritional aspects: No data.

f. Medicinal aspects: Used for a variety of traditional remedies, including to cure stomachache, sore throat/cough (JSTOR PLANTS, GRUBBEN 2004).

g. Crop Photos:

4. Production in U.S.: No data.

5. Other production regions: Kenya, Camaroon, Tanganyika, Malawi, Zimbabwe, Mozambique, Somalia, Djibouti, Madagascar, Nigeria, Tanzania (JSTOR PLANTS, FLORA OF ZIMBABWE, GRUBBEN 2004, SHAKLETON 2009).

6. Use: Cooked vegetable, animal fodder, medicinal, seasoning, liquor (JSTOR PLANTS, GRUBBEN 2004).

7. Part(s) of plant consumed: Leaves

8. Portion analyzed/sampled: Leaves

9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A

b. EPA Crop Group (Group & Subgroup): Miscellaneous

c. Codex Group: No specific entry

d. EPA Crop Definition: None

10. References: GRIN, JSTOR PLANTS, FLORA OF ZIMBABWE, GRUBBEN 2004, SHAKLETON 2009, KEDING 2007

11. Production Map: No entry.

12. Plant Codes:

a. Bayer Code: LNECO

(336)

1. **Lettuce, leaf and head**

Asteraceae

Lactuca sativa L.

1. **Romaine lettuce** [cos lettuce, Roman lettuce, Avignon lettuce, Bindesalat , römischer Salat (GRIN, MARKLE)]

Lactuca sativa var. *longifolia* Lam. (syn: *Lactuca sativa* var. *romana* L. H. Bailey)

1. **Leaf lettuce** [green oakleaf lettuce, ye woju, red oakleaf lettuce, lolla rossa lettuce, greenhouse lettuce, bunch lettuce, Simpson lettuce, prayhead lettuce, Grand Rapid lettuce, salad bowl lettuce, cutting lettuce, looseleaf lettuce, redleaf lettuce, greenleaf lettuce, curled lettuce, tango lettuce, curled lettuce, Blattsalat, Pflücksalat, Schnittsalat (GRIN, MARKLE)]

Lactuca sativa var. *crispa* L.

1. **Lettuce, head** [Great Lakes lettuce, imperial lettuce, iceberg lettuce, crisphead lettuce, woju, cabbage lettuce, butterhead lettuce, Kopfsalat, Boston lettuce, bibb lettuce, May king lettuce, greenhouse lettuce, red perella lettuce, Tom Thumb lettuce, eaten lettuce, Batavian lettuce (GRIN, MARKLE)]

Lactuca sativa var. *capitata* L.

2. An annual plant with succulent leaves growing from basal rosette, sometimes forming heads. It is known only in cultivation, and originated in the Mediterranean region. Grown in temperate climates worldwide. Lettuce is a cool-season crop, as it bolts quickly at high temperatures. Lettuce is the world's most used salad crop, and is eaten almost exclusively fresh. Lettuce has a white sap containing latex, of which wild species have a much higher concentration. When lettuce bolts, the short stem lengthens to become a flower stalk with a dense panicle of tiny self-pollinating florets, eventually yielding numerous achenes. Some varieties of lettuce are cultivated as an oilseed crop in the Middle East, and this may have been original reason for domestication. Lettuce is always harvested prior to bolting, to prevent a bitter flavor. **Head lettuce** varieties form a definite head of leaves closely packed about the very short stem or core. There are two type of head lettuce: crisphead (eg, iceberg) lettuce and butterhead lettuce. Crisphead lettuce has thick, crisp and watery leaves and forms a tight head where the inner leaves have minimal to no exposure. Butterhead types have a looser head, and most of the leaves in the head are partially exposed, even at late stages of growth. This type does not ship and handle as well as the crisp head varieties, so is produced mainly for nearby markets. **Leaf lettuce** has leaves that rise from the short stem tend to roll outward, so the leaves are largely separated during development and at harvest. Leaves may be of different shapes, from spatulate to deeply lobed or cut leaf. This is the most easily grown type of lettuce and is most popular in home gardens. Exposure of edible parts is comparable to that of spinach. **Romaine** lettuce develops into an elongated, somewhat oval shaped head. Leaves are elongated, with thick stems and mid-ribs. Heads are only medium firm, and up to 25 cm (10 in) in length. Outer leaves, which are largely discarded, enfold the head during late stages of growth. Exposure of the portion usually consumed is similar to that in crisp head lettuce (MARKLE, MANSFELD, RUBATZKY 1997, RYDER 1979, WIKIPEDIA).

3. Crop Data:

a. Season, seeding to harvest: About 40 to 50 days for leaf lettuce, 70 days for romaine, 55 to 70 days for butterhead, and 60-80 days for crisphead lettuce (MARKLE).

b. Cultivation: Lettuce can be grown in a wide range of soil types, but sandy loams or other soils with good moisture retention and drainage are preferred. Typically direct-seeded shallowly into the field or transplanted from seedlings. Requires flat and smooth beds for uniform seedling establishment. Often requires supplemental irrigation when grown in arid areas. The roots are shallow and require easily accessible nutrients, and in particular large amounts of nitrogen and phosphorus. Final plant spacing should be between 25-40 cm (9.8-15.7 in) within the row and 40-75 cm (15.7-29.5 in) between the rows depending on they variety being grown. Heading varieties should be spaced further apart. Lettuce is often grown in a greenhouse for winter production in cold climates (RUBATZKY 1997, Ryder 1979).

c. Availability in the marketplace: Common throughout much of the world, particularly the temperate areas in which it is grown.

d. Preparation for cooking: Typically used raw in salads. For heading varieties, the outer leaves are usually removed (MARKLE).

e. Nutritional aspects: High water content (94-95%) and also high in Vitamin A (RYDER 1979).

f. Medicinal aspects: No data.
g. Crop Photos:

4. Production in U.S.: 4,110,160 tonnes of lettuce and chicory in 2008 (FAOSTAT).
5. Other production regions: Worldwide production of lettuce and chicory was 23,531,963 tonnes in 2008. The top producing countries other than the U.S. were China (12,505,500 tonnes) and Spain (1,107,700 tonnes). Lettuce is grown commericially in at least 96 countries (FAOSTAT).
6. Use: Salad green.
7. Part(s) of plant consumed: Leaves
8. Portion analyzed/sampled: Leaves
9. Classifications:
   a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A
   b. EPA Crop Group (Group & Subgroup): Leafy vegetables (except *Brassica* leafy vegetables) group, Leafy greens subgroup 4A.
   c. Codex Group: 013, Leafy vegetables (including *Brassica* leafy vegetables), VL 0510, Cos lettuce; VL 0482, Lettuce, Head and VL 0483, Lettuce, Leaf
   d. EPA Crop Definition: Lettuce = Lettuce, head; and lettuce, leaf. Lettuce, leaf = Cos (Romaine) and butterhead varieties. Lettuce, head = Lettuce, head; crisphead varieties only.
10 References: GRIN, MARKLE, WIKIPEDIA, FAOSTAT, MANSFELD, RUBATZKY 1997, RYDER 1979
11. Production Map: EPA Crop Production Regions 1, 2, 5, 6, 7, 8, 9, 10, 11, 12, and 13
12. Plant Codes:
   a. Bayer Code: LACSA (*L. sativa*), LACSC (*L. sativa* var *capitata*), LACSP (*L. sativa* var *crispa*), LACSO (*L. sativa* var *longifolia*), LASSR (romaine and cos)

1. **Orach** [arroche, garden orach, orache, mountain spinach, French spinach, sea purslane, butter leaves, garden orache, yu qian bo cai, arroche des jardins, Gartenmelde, armolas, armuelle mole, bledos moles (GRIN, MARKLE)]

Chenopodiaceae

Atriplex hortensis L. (syn: *Atriplex hortensis* var. *rubra* L.)

2. A hardy annual, known only in cultivation, which is grown as a substitute for spinach in Europe and in the Northern Plains in the U.S. The plant is drought resistant, and slower to form a seed stalk than spinach. Leaves are dark green to purple, in shape cordate or triangular oblong, 12.7-17.8 cm (5-7 in) long and marginally toothed. A rosette of leaves first develops, followed by the flowering stalk, which may reach a height up to 2.4 m (8 ft). Flowers are tiny, inconspicuous, and wind pollinated. Leaves are harvested prior to bolting and used as pot herbs. Due to the attractive color of the leaves, orach is today often grown as an ornamental plant. An indigo dye may be obtained from the the leaves (MANSFELD, MARKLE, WIKIPEDIA, PURDUE, FLORIDATA).

3. Crop Data:

a. Season, seeding to harvest: 40 to 60 days (MARKLE).

b. Cultivation: Orach is a cool season annual grown in winter or early spring, more frost hardy than spinach. Propagated from seed; plant the entire husk (which contains a single seed) about an inch deep and thin seedlings to about 15 cm (6 in) apart. Plant every three or four weeks to insure a continuous supply of young, tender leaves until the plant bolts. Requires full sun and prefers regular watering, but is somewhat drought resistant. Grows well in poor, sandy soils and is tolerant of salty and alkaline conditions (FLORIDATA, PURDUE).

c. Availability in the marketplace: Available fresh in farmers markets in the U.S. and Europe.

d. Preparation for cooking: Leaves are cooked briefly and used like spinach. Seeds can be ground into a flour (MARKLE, MANSFELD, PURDUE).

e. Nutritional aspects: Seeds contain high amount of vitamin A (PURDUE).

f. Medicinal aspects: No data.

g. Crop Photos:

4. Production in U.S.: No data. Mostly in home gardens. Northern Plains of U.S.

5. Other production regions: Europe

6. Use: Vegetable, pot herb, ornamental, dye, flour (PURDUE, MANSFELD)

7. Part(s) of plant consumed: Leaves and young stems

8. Portion analyzed/sampled: Leaves and young stems

9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A

b. EPA Crop Group (Group & Subgroup): Leafy vegetables (except *Brassica* leafy vegetables) group, Leafy greens subgroup 4A.

c. Codex Group: 013, Leafy vegetables (including *Brassica* leafy vegetables), VL 0488, Orach

d. EPA Crop Definition: None

10. References: GRIN, MANSFELD, MARKLE, WIKIPEDIA, PURDUE, FLORIDATA

11. Production Map: EPA Crop Production Regions 1, 2, 5, 7, 8, 9, 10, 11, and 12.

12. Plant Codes:

a. Bayer Code: ATXHO

(439)

1. **Parsley**

Apiaceae

Petroselinum crispum (Mill.) Nyman ex A.W. Hill (syn: *Petroselinum hortense* Hoffm., *Petroselinum sativum* Hoffm., *Apium crispum* Mill., *Apium petroselinum* L, *Carum petroselinum* (L.) Benth. & Hook. f., *Petroselinum vulgare* Lag.)

1. **Italian Parsley** [persil grand de Naples, italienische Petersilie, neapolitanische Petersilie (GRIN)]

Petroselinum crispum var. *neapolitanum* Danert

2. Parsley is a leafy plant originally native to Iran but grown throughout much of Europe, North America, and western parts of Asia. Leaf shape is generally triangular, and varies from 3-leaflet to greatly curled and cut. The two main foliage types are plain (Italian) and curled leaf. For market, the plant is grown as an annual. The leaves are used as an herb, often dried. They can also be eaten as a leafy vegetable or used as a garnish. Parsley is popular in Mediteranian and Middle Eastern cooking. The flavor of the leaves is delicate and does not stand up to heavy cooking. The root may also be eaten, usually boiled, much like a turnip (MARKLE, WIKIPEDIA, SPICE PAGES).

3. Crop data:

a. Season, harvest: 70 to 90 days after seeding. Normally, the fresh market parsley is cut 1-2 times, while dehydrated acreage is cut 3-5 times during the production cycle on a 30 day schedule (MARKLE).

b. Cultivation: Seed may be sown in beds for field transplanting, or direct in the field. In harvesting, the outer leaves may be removed for fresh market as they attain suitable size, and the plant continues to produce (MARKLE).

c. Availability in the marketplace: Common throughout the U.S. and Europe; available in much of the world.

d. Preparation for cooking: Leaves used fresh or dried. Root boiled whole.

e. Nutritional aspects: No data.

f. Medicinal aspects: Powerful diuretic (SPICE PAGES, WIKIPEDIA).

g. Crop photos:

4. Production in U.S.: 5,100 acres in U.S. reported by EPA in 1994, with approximately half in California. The majority of the acreage in California is for dehydration. Minor acreage in Hawaii. Washington State grows about 70 acres of parsley as a seed crop which represents about 50% of the U.S. acreage (MARKLE).

5. Other production regions: Canada and Mexico (MARKLE).

6. Use: Seasoning, garnish, medicinal, vegetable (MARKLE, SPICE PAGES, WIKIPEDIA).

7. Part(s) of plant consumed: Fresh (Leaves and stems); May be dehydrated (dried leaves only).

8. Portion analyzed/sampled: Leaves and stems (fresh); Leaves only (dried). Parsley: Fresh parsley is included in Crop Group 04: Leafy Vegetables under 40 CFR 180.41. Dried parsley is included in Crop Subgroup 19A: Herbs under 40 CFR 180.41.

9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A (fresh parsley); Crop Group 19: Herbs and Spices (Subgroup 19B: Dried Herbs)

b. EPA Crop Group (Group & Subgroup): Leafy vegetables (except *Brassica* leafy vegetables) group, Leafy greens subgroup 4A.; Herbs and Spices group (19A) (dried)

c. Codex Group: 027, Herbs, HH 0740, Parsley

d. EPA Crop Definition: Parsley = Cilantro

10. References: GRIN, CODEX, MARKLE, WIKIPEDIA, SPICE PAGES

11. Production Map: All EPA Crop Production Regions.

12. Plant Codes:

a. Bayer/EPPO Code: PARCR

1. **Plantain**

Plantaginaceae

Plantago spp.

1. Buckhorn plantain [chou qi zhuang che qian, estrellamer, cuerno de ciervo, minutina, herba stella, capuchins beard, misticanza, English plantain, buckhorn, ribgrass, ribwort, plantain, petit plantain, plantain ance olé, Spitzwegerich, changjilgyeongyi, tanchagem-menor, llantén menor (GRIN, MARKLE)]

Plantago lanceolata L.

1. **Common plantain** [greater plantain, broadleaf plantain, whitemans foot, carttrack plant, grand plantain, plantain majeur, Breitwegerich, tanchagem-maior, lantana-maior, llantén común, llantén major (GRIN, MARKLE)]

P. major L.

2. Perennial herbs, originally native to Eurasia but widely naturalized in much of the world. Plants have a rosette of leaves 15-30 cm (5.9-11.8 in) in diameter. Each leaf is oval, 5-20 cm (2-7.9 in) long and 4-9 cm (1.6-3.5 in) broad, with an acute apex and a smooth margin; there are five to nine distinctive veins. The flowers are tiny, usually yellow or white, and borne in a dense spike. The plants are self-fertile. Plaintain is known as a leaf vegetable, particular in salads, medicinal plant, and animal fodder. It is most typically found in North America as a weed in grassy fields and lawns. The leaves can be quite bitter, particular when older, and are sometimes blanched before use. They are also very fibrous and the fiberous strands should be removed before eating. The varieties and cultivars found in Asia are less bitter. The leaves become somewhat mucilaginous when cooked (MARKLE, MANSFELD, PLANTS FOR A FUTURE, WIKIPEDIA).

3. Crop data:

a. Season, harvest: Through the year as needed, particularly in the spring (MARKLE).

b. Cultivation: Hardy plants can grow in most soils, including highly compacted soils. Requires full sun and does best when kept moist. Can tolerate maritime conditions (WIKIPEDIA, PLANTS FOR A FUTURE).

c. Availability in the marketplace: In this country mostly gathered from the wild. Cultivated in Asia and Central America as a vegetable and sold in markets.

d. Preparation for cooking: Leaves may be used fresh or cooked, although fresh leaves may be too bitter unless blanched briefly. Leaves are sometimes dried and made into a tea for medicinal purposes (MANSFELD, WIKIPEDIA, PLANTS FOR A FUTURE).

e. Nutritional aspects: No entry.

f. Medicinal aspects: Used in many tradition remedies, particularly to treat wounds. Leaves contain a coagulant and the seeds are a laxative (WIKIPEDIA, PLANTS FOR A FUTURE).

g. Crop photos:

4. Production in U.S.: No data. Grows wild.

5. Other production regions: Europe (particularly Italy), tropical Central America, India, Russia, SE Asia, China, Brazil, Cuba, and North Africa (MANSFELD, MARKLE).

6. Use: Leafy vegetable (salads and potherb), animal fodder, medicinal (MARKLE, MANSFELD).

7. Part(s) of plant consumed: Leaves primarily. Roots and seeds are also edible.

8. Portion analyzed/sampled: Leaves (fresh).

9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A

b. EPA Crop Group (Group & Subgroup): Leafy vegetables (except *Brassica* leafy vegetables) group, Leafy greens subgroup 4A.

c. Codex Group: 013, Leafy vegetables (including *Brassica* leafy vegetables), VL 0490, Plantain leaves

d. EPA Crop Definition: None

10. References: GRIN, MARKLE, MANSFELD, PLANS FOR A FUTURE, WIKIPEDIA, PLANTS

11. Production Map: EPA Crop Production Region: All EPA Production Regions (PLANTS)

12. Plant Codes:

a. Bayer Code: PLALA (*P. lanceolata*), PLAMA (*P. major*)

Primrose, English [primrose, primevère acaule, Kissenprimel, stängellose Schüsselblume (GRIN)]
Primulaceae
Primula vulgaris Huds. (syn: *Primula acaulis* (L.) Hill, *Primula veris* var. *acaulis* L.)
2. A low-growing, semi-evergreen, herbaceous perennial, native to Europe and western parts of Asia. The leaves are thick, dark green and wrinkled with a hairy underside, obovate in shape up to 25 cm (9.8 in) long and 6 cm (2.3 in) broad, with an irregularly dentate or crenate margin. They form an open basal rosette with the flowers at the center. The flowers are showy, typically about 2.5 cm (1 in) across, tubular and five-parted, and may come in nearly any color but always with a bright yellow center. The flowers are borne on thin stalks that rise 15 cm (5.9 in) or less above the leaves, and each plant produces 3-25 flowers. Where it grows wild, primrose may form dense carpets of flowers. Today it is primarily known as an ornamental plant, of which there are hundreds of named cultivars. However, both the flowers and leaves are edible as well as having medicinal uses (PLANTS FOR A FUTURE, MANSFELD, WIKIPEDIA, FLORIDATA, BACKYARD GARDENER).
3. Crop Data:
a. Season: Flowers in very early spring, one of the earliest wildflowers in Europe. Leaves may be gathered throughout most of the year, sometimes even through the winter (PLANTS FOR A FUTURE).
b. Cultivation: In the wild, primrose is often found in lightly shaded open woodlands. It is hardy to Zone 4, and prefers cool climates and indirect sunlight. Primrose does not do well in extreme heat. Prefers rich, loamy, moist soil that is well-drained, but can tolerate a variety of soils including heavy clay. It can also tolerate some maritime conditions. Propagation is usually by division; primrose is a short-lived perennial and does best when divided every few years (PLANTS FOR A FUTURE, WIKIPEDIA, FLORIDATA, BACKYARD GARDENER).
c. Availablity in the marketplace: Mainly grown in home gardens, particularly in the U.S. In Europe there is more availability of the leaves in fresh markets, and the flowers as condiments or wine.
d. Preparation for cooking: Leaves are used as a cooked vegetable and potherb, and also as a salad green although the older leaves may be tough and bitter. The leaves are also dried for tea. The flowers are used as a garnish, or a vegetable in their own right. Sometimes they are candied or made into conserves. The young flowers are also fermented with water and sugar to make primrose wine. The flowers are used for tea as well, and both the flowers and the leaves may be made into a syrup (MANSFELD, PLANTS FOR A FUTURE, WIKIPEDIA).
e. Nutritional aspects: No data.
f. Medicinal aspects: Historically used as an herbal remedy for conditions involving spasms, cramps, or other muscle pains (PLANTS FOR A FUTURE).
g. Crop Photos:
4. Production in U.S.: No data; mainly as an ornamental.
5. Other production regions: Southern and western Europe, particularly Italy and Hungary. England; western Asia, Turkey to Iran; northwestern Africa (PLANTS FOR A FUTURE, MANSFELD, WIKIPEDIA).
6. Use: Ornamental, medicinal, tea, wine, leafy vegetable, salad green, potherb, garnish, conserves, condiment (PLANTS FOR A FUTURE, MANSFELD, WIKIPEDIA).
7. Part(s) of plant consumed: Leaves and flowers
8. Portion analyzed/sampled: Leaves and flowers
9. Classifications:
a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A
b. EPA Crop Group (Group & Subgroup): Miscellaneous
c. Codex Group: No specific entry
d. EPA Crop Definition: None
10. References: GRIN, MARKLE, PLANTS FOR A FUTURE, MANSFELD, WIKIPEDIA, FLORIDATA, BACKYARD GARDENER
11. Production Map: No entry,
12. Plant Codes:
a. Bayer Code: PRIVU

(498)

1. **Purslane, Garden** [garden purslane pusley, fatweed, kitchen purslane, common purslane, verdolaga, pourpier commun, ma chi xian, portulak, ghol, suberi-hiyu, beldroega (GRIN, MARKLE)]

Portulacaceae

Portulaca oleracea L.

2. A common, herbaceous annual with succulent leaves that is found on all continents in temperate to warm climates. Although it can grow as tall as 40 cm (15.7 in) in height, it most often is seen as a persistent, trailing recumbent weed with fleshy, reddish stems. Leaves are small, spatulate or narrow obovate, thick and green or red in color. The yellow flowers have five regular parts and are up to 6 mm (0.02 in) wide. It is one of the oldest known cultivated vegetables and has been used around the world as a potherb. Although here used as a vegetable for much of American history, it fell out of favor in the past century and was known mainly as a weed. Recently, however, purslane has come to be considered a gourmet delicacy and is beginning to be cultivated more and gathered from the wild for high-end restaurants. Purslane is also much-consumed in Africa, Mexico and parts of Asia and India. It is said to have a slightly sour and salty flavor to it (MARKLE, MANSFELD, GRUBBEN 2004, SPECIALTY PRODUCE, WIKIPEDIA).

3. Crop Data:

a. Season: First harvest may occur 3-4 weeks after seeding in the summer, then may have 2-3 cuts low to the ground 2-3 times after that. Flowering reduces quality of harvests (GRUBBEN 2004).

b. Cultivation: Propagation is generally by seed, and purslane will reseed itself easily in most cases. Stem cuttings also root without difficulty. The tiny seeds can be broadcast over soil at a rate of 20 kg/ha (110 lb/A) and then covered with a light (no more than 6 cm (2.3 in) deep) layer of compost. Purslane can grow in most soils, but as it is a shallow-rooted crop for commercial production, a fertile topsoil is preferred. It should be watered every 3-4 days in dry climates, and is salt tolerant (GRUBBEN 2004).

c. Availability in the marketplace: Available in high-end produce markets in the U.S. More common as a fresh vegetable in other parts of the world.

d. Preparation for cooking: Purslane leaves may be eaten fresh, as part of a salad. The leaves and stems may be cooked in soups, steamed or used as a potherb. When cooked for very long purslane can become slimy. The leaves can also be preserved by pickling. The tiny seeds are also edible and can be made into flour and porridge (GRUBBEN 2004, MANSFELD).

e. Nutritional aspects: High in polyunsaturated fat and antioxidants. Rich in vitamin A, vitamin C and magnesium. However purslane also contains oxalic acid and nitrates so consumption should be limited; purslane has been known to poison livestock, although in some places it is used as fodder so levels of toxin may vary (GRUBBEN 2004, SPECIALTY PRODUCE).

f. Medicinal aspects: Widely used in traditional medcines to treat a variety of ailments; shows some promise in modern medicine and has analgesic/muscle-relaxant properties (GRUBBEN 2004).

g. Crop Photos:

4. Production in U.S.: Grown in California, possibly elsewhere. Found as a weed throughout the warm areas of the country, some cultivation for specialty markets (SPECIALTY PRODUCE, WIKIPEDIA).

5. Other production regions: Throughout Europe, China, the West and East Indies, Ascension Island, Japan, India, Australia, Cote d'Ivoire, Benin, Camaroon, Kenya, Uganda, South Africa, Angola, Mexico, and the Middle East (MANSFELD, GRUBBEN 2004, SPECIALTY PRODUCE, WIKIPEDIA).

6. Use: Salad greens, potherbs, soups and stews, flour, porridge, medicinal (GRUBBEN 2004, MANSFELD).

7. Part(s) of plant consumed: Leaves and young stems. Ocassionally seeds as flour.

8. Portion analyzed/sampled: Leaves and young stems.

9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A

b. EPA Crop Group (Group & Subgroup): Leafy vegetables (except *Brassica* leafy vegetables) group, Leafy greens subgroup 4A

c. Codex Group: 013, Leafy vegetables (including *Brassica* leafy vegetables), VL 0492, Purslane

d. EPA Crop Definition: None

10. References: GRIN, MARKLE, MANSFELD, GRUBBEN 2004, SPECIALTY PRODUCE, WIKIPEDIA

11. Production Map: All EPA Crop Production Regions.

12. Plant Codes: a. Bayer Code: POROL

1. **Purslane, Winter** [Cuban spinach, miner's lettuce, springbeauty (GRIN, MARKLE)]
   Portulacaceae
   Claytonia perfoliata Donn ex Willd. (syn: *Montia perfoliata* (Donn ex Willd.) Howell)
2. Winter purslane is a short-lived annual native to the coastal regions of North America, but also cultivated as a winter crop in warmer climates such as parts of Africa and Cuba. It is naturalized in western Europe. The leaves are fleshy and opposite, mostly rising from the root to form a rosette at the base of the plant, generally ovate in shape and up to 4 cm (1.6 in) long, borne on an extremely long petiole. The small, five-parted flowers are pink or white with petals 2-6 mm (0.07-0.2 in) long and they grow in groups of 5-40. The flowers are borne on a long stem with two leaves below them that are fused around the stem giving the appearance of a single, circular leaf. The plant may have an erect or trailing growth form. The young leaves are valued as a fresh and cooked vegetable, and should be picked before they are exposed to much heat and begin to dry out, as they may turn bitter. The flavor is said to resemble water chestnut (MARKLE, MANSFELD, PLANTS FOR A FUTURE, MUNRO, NVSUK, WIKIPEDIA).
3. Crop Data:
   a. Season: In climates with a harsh winter, seeds may be sown in very early spring for an early summer crop or in late summer for a fall crop. In warmer climates may be grown over winter. Can be harvested about 1 month after sowing (MARKLE, MUNRO, MANSFELD).
   b. Cultivation: In the wild grows in moist soils and waste places. In cultivation, prefers a sandy loam rich in organic matter. Winter purslane prefers high levels of moisture but can succeed in drier soils and harsher conditions. Cool and moist is preferable for ideal leaf production and flavor. Propagated by seed and will self-sow well. Spacing should be 5-7 cm (1.9-2.8 in). Full sun to partial shade (NVSUK, MUNRO, PLANTS FOR A FUTURE).
   c. Availability in the marketplace: In the U.S. found in gourmet specialty markets and restaurants. Available relatively common in England and other parts of Europe in produce markets. Can also be found in season in Cuba, parts of South America, and tropical Africa.
   d. Preparation for cooking: Young leaves and stems are harvested before the plant starts to flower and used as a fresh salad green, or boiled briefly and used like spinach. The leaves have a somewhat mucilaginous texture. The flowers are also edible (MUNRO, WIKIPEDA).
   e. Nutritional aspects: Rich in vitamin C (WIKIPEDIA).
   f. Medicinal aspects: Laxative and diuretic (PLANTS FOR A FUTURE).
   g. Crop Photos:
4. Production in U.S.: No data. Cultivated in North America and found wild along the coasts from Mexico to Canada (MARKLE, MANSFELD).
5. Other production regions: Britain, France, Germany, Belgium, the Netherlands, tropical Africa, South America, and Cuba (MUNRO, MANSFELD).
6. Use: Salad green, potherb, medicinal (PLANTS FOR A FUTURE, MARKLE).
7. Part(s) of plant consumed: Leaves
8. Portion analyzed/sampled: Leaves
9. Classifications:
   a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A
   b. EPA Crop Group (Group & Subgroup): Leafy vegetables (except *Brassica* leafy vegetables) group, Leafy greens subgroup 4A
   c. Codex Group: 013, Leafy vegetables (including *Brassica* leafy vegetables), VL 0493, Purslane, Winter
   d. EPA Crop Definition: None
10. References: MARKLE, MANSFELD, PLANTS FOR A FUTURE, MUNRO, NVSUK, WIKIPEDIA
11. Production Map: EPA Crop Production Regions 1, 2, 5, 7, 8, 9, 10, 11, and 12
12. Plant Codes:
   a. Bayer Code: CLAPE

Sowthistle [annual sow thistle, common sow thistle, hare's-lettuce, chicória-brava, serralha-lisa, cerraja (GRIN)]

Asteraceae

Sonchus oleraceus L.

Sowthistle, field

Sonchus brachyotus DC.

2. Annual to biennial herb, up to 2 m (6.6 ft) tall, native to Europe but adventive elsewhere, almost cosmopolitan. Leaves alternate, simple; blade lanceolate to oblanceolate up to 30 x 9 cm (11.8 x 3.5 in), deeply pinnately lobed with few, reflexed lobes and bottom two lobes grasping the stem. The leaves are coarsely toothed, covered in glandular hairs which may be spiny. In overall appearance the plant resembles any typical thistle. The inflorescence is a stalked head with a yellow composite flower typical of the family. The fruit is a tiny, ribbed achene, 4 mm (0.16 in) long with a downy white pappus. Sowthistle (so named because it is also a good wild food for pigs) is cultivated or gathered from the wild as a nutrititous leafy vegetable. It is weedy and found throughout much of the temperate world. Field sowthistle is prized in China, particularly, as a vegetable and is native to eastern Asia (MANSFELD, HU 2002, PROTA, GRUBBEN 2004, WIKIPEDIA, MALTA).

3. Crop Data:

a. Season: Flowers late February to March in warm, Mediterranean climates (MALTA).

b. Cultivation: Grows in poor soil and waste places. Weedy and seeded by the wind. Can succeed in most soils in sunny position. Cultivated in some places, but often gathered from the wild (GRUBBEN 2004, MALTA, WIKIPEDIA).

c. Availablity in the marketplace: Fresh leaves are traded in local markets in Africa, and other areas where it is grown.

d. Preparation for cooking: Leaves may be eaten fresh in salads, or cooked like spinach or used as a bitter vegetable. The leaves may be dried for storage and cooked later. The stems may also be peeled and eaten like asparagus. The root is edible and can be cooked and eaten but it is not very desirable (MALTA, GRUBBEN 2004).

e. Nutritional aspects: High in Vitamin C and calcium (WIKIPEDIA).

f. Medicinal aspects: Used in many traditional remedies, particular in the treatment of skin problems and various infections (MALTA, GRUBBEN 2004).

g. Crop Photos:

4. Production in U.S.: No data.

5. Other production regions: Cultivated in the Philippines, Indonesia and New Zealand. Gathered from the wild in China and Africa (MANSFELD, HU 2002, GRUBBEN 2004).

6. Use: Salad green, leafy vegetable, pot herb, root vegetable (rarely), chewing gum, medicinal, animal fodder (MANSFELD, MALTA, GRUBBEN 2004).

7. Part(s) of plant consumed: Leaves; rarely stems and roots.

8. Portion analyzed/sampled: Leaves.

9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A

b. EPA Crop Group (Group & Subgroup): Miscellaneous

c. Codex Group: 013, Leafy vegetables (including *Brassica* leafy vegetables), VL 0501, Sowthistle

d. EPA Crop Definition: None

10. References: GRIN, MANSFELD, HU 2002, PROTA, GRUBBEN 2004, WIKIPEDIA, MALTA

11. Production Map: All EPA Crop Production Regions.

12. Plant Codes:

a. Bayer Code: *Sonchus oleraceus,* SONOL.

(569)

1. **Spinach** [gemuese spinat, epinard, espinaca, bo cai, Spinat, pinni, horenso, espinafre (GRIN, MARKLE)]

Chenopodiaceae

Spinacia oleracea L. (syn: *Spinacia inermis* Moench, *Spinacia oleracea* var. *inermis* (Moench) Peterm., *Spinacia spinosa* Moench)

2. An herbaceous annual plant, native to southwestern and central Asia but grown widely in the Middle East, Europe, America, and Australa. It is an extremely nutritious, cool season crop. Next to cabbage, spinach is the most important of the vegetables grown for greens or pot herbs in the U.S. Varieties differ in leaf shape from smooth and broad (arrow-shaped), to savoyed or wrinkled, but all leaves are hairless and dark green. Plants form a rosette of leaves on a very short stem, which later grows into a seed stalk, and leaves should be harvested prior to stem elongation for optimal flavor. Very young leaves (baby spinach) have become popular and are harvested very early in the season for salads, while older leaves are more commonly cooked or used for processing (MARKLE, MANSFELD, WIKIPEDIA, PLANTS FOR A FUTURE, SANDERS 2001).

3. Crop Data:

a. Season, seeding to harvest: Usually 35 to 70 days depending on season for traditional spinach; less for baby spinach (MARKLE).

b. Cultivation: Spinach can be grown successfully on a variety of soils, but a fertile sandy loam high in organic matter is preferred. The use of cover crops and green manure crops is recommended to maintain the soil organic matter. The soil pH should range between 6.4 to 6.8. Spinach requires a high level of fertility, especially nitrogen. Early spring spinach may require larger quantities of fertilizer than fall crops. Fertilizer is often broadcast and worked into the soil prior to seeding. Fresh seed germinates readily at 3.3-4.4 °C (38-40 °F). Higher soil temperatures result in reduced germination. Multiple rows on a bed will increase production efficiency per unit of land. Beds can range from 0.91-1.5 m (3-5 ft) wide depending on planting and cultivating equipment. The spinach may be sown 10-15 cm (4-6 in) in-row and in rows as close as 25-30 cm (10-12 in) at a depth of 1.3-1.9 cm (0.5-0.75 in). Spinach requires abundant moisture to insure a high quality product. Spinach will bolt quickly in hot weather (SANDERS 2001).

c. Availability in the marketplace: Extremely common throughout Asia, Europe, North America, and Australia, both fresh and frozen or canned.

d. Preparation for cooking: Young spinach may be used fresh, although care should be taken as spinach contains high amount of oxalic acid, particularly in the older leaves. Cooking reduces the amount of oxalic acid in the vegetable. Spinach is prepared a number of ways, including steamed, boiled, and fried. It is commonly cooked and then frozen or canned to preserve it. Fresh spinach does not have a long shelf life, and should be consumed as soon as possible to prevent spoilage and loss of nutrients (MANSFELD, MARKLE, WIKIPEDIA, PLANTS FOR A FUTURE).

e. Nutritional aspects: Spinach is particularly rich in iron and calcium but is a good source of many other nutrients as well, including vitamin A, vitamin C, vitamin E, vitamin K, magnesium, manganese, folate, betaine, vitamin B2, potassium, vitamin B6, folic acid, copper, protein, phosphorus, zinc, niacin, selenium and omega-3 fatty acids (WIKIPEDIA, PLANTS FOR A FUTURE).

f. Medicinal aspects: Used in some home remedies and as a laxative (PLANTS FOR A FUTURE).

g. Crop Photos:

4. Production in U.S.: In 2008, the total US spinach production was 353,430 tonnes (389,589 tons). Spinach is grown primarily in Washington, California, Oklahoma, Tennessee and Wisconsin, Colorado, New Jersey, Maryland, and Virgina but is grown to some extent in most states (MARKLE, FAOSTAT).

5. Other production regions: In 2008, world production of spinach was 14,584,093 tonnes (16,076,210 tons). The primary producing country was China (12,512,005 tonnes/13,792,124 tons), followed by the U.S., Japan (292,700 tonnes/322,646 tons), Turkey (225,746 tonnes/248,842 tons), Indonesia (152,130 tonnes/167,694 tons), and France (123,500 tonnes/136,135 tons).
6. Use: Salad green, leafy vegetable, dye (MARKLE, PLANTS FOR A FUTURE).
7. Part(s) of plant consumed: Leaves
8. Portion analyzed/sampled: Leaves
9. Classifications:
    a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A
    b. EPA Crop Group (Group & Subgroup): Leafy vegetables (except *Brassica* leafy vegetables) group, Leafy greens subgroup 4A (representative crop).
    c. Codex Group: 013, Leafy vegetables (including *Brassica* leafy vegetables), VL 0502, Spinach
    d. EPA Crop Definition: None
10. References: GRIN, MARKLE, MANSFELD, WIKIPEDIA, PLANTS FOR A FUTURE, SANDERS 2001, FAOSTAT
11. Production Map: EPA Crop Production Regions 1, 2, 5, 6, 8, 9, 10, 11, and 12.
12. Plant Codes:
    a. Bayer Code: SPQOL

(571)

1. **Spinach, Malabar** [vine spinach, Indian spinach, Malabar nightshade, Ceylon spinach, libato, gui, red vine spinach, country spinach, basella, luo kui, épinard de Malabar, baselle, brède d'Angola, Malabarspinat, bacela, bertalha, bretalha, espinaca Blanca, espinace de Malabar (GRIN, MARKLE)]

Basellaceae

Basella alba L. (syn: *Basella cordifolia* Lam., *Basella rubra* L.)

2. A perennial vine which may reach up to 9.1 m (30 ft), native to India but naturalized in the tropics. It is grown as a leafy vegetable in many tropical countries. It has a smooth, twining stem, which may be green to purple to red (in ornamental varieties). Leaves are fleshy, simple and alternate with a petiole up to 9 cm long. They are usually cordate (but may vary in shape to obvate), up to 15 cm (6 in) by 12.5 cm (4.9 in), with no stipules. The axillary inflorescence is up to 22 cm (8.6 in) long, drooping with a long peduncle and clusters of perfect 5-parted white or pink flowers up to 6 cm (2.4 in) in diameter. The fruit is a purplish-black subglobose pseudo berry. It is grown in the tropics, mainly in Africa and Asia and used both as a potherb like spinach and as a mucilaginous vegetable. In temperate areas it may be a warm-season replacement for spinach, and is sometimes planted as an ornamental in the U.S. and Europe (MARKLE, MANSFELD, PLANTS FOR A FUTURE, HU 2002, PLANTS FOR A FUTURE, WIKIPEDIA, TROPILAB, GRUBBEN 2004).

3. Crop Data:

a. Season, seeding to harvest: 55 to 80 days for leaf harvest. Normally, after about 3 months, the established plants may be cut or pruned on a weekly basis (MARKLE).

b. Cultivation: Grows best in full sun at low elevations in hot and humid climates, although some shade can induce it to produce larger and more succulent leaves. Does best in sandy loam soils rich in organic matter with pH ranging from 5.5 to 8.0, although it can grow in poor soils. Production is slowed by cooler temperatures. Propagation is by direct seeding, transplants, or by stem cuttings (GRUBBEN 2004, TROPILAB, WIKIPEDIA).

c. Availability in the marketplace: Found in many ethnic Asian stores, and common in produce markets throughout Asia and Africa.

d. Preparation for cooking: The leaves and young stems are used fresh in salads or steamed, boiled, or prepared with tofu or or fish. May be used in any way that spinach is, but care should be taken when preparing as a leafy vegetable to cook the leaves too long or they will become slimy. Leaves and stems may intentionally be cooked longer to be eaten as a mucilaginous vegetable or a thickener for soups and stews (GRUBBEN 2004, PLANTS FOR A FUTURE, WIKIPEDIA).

e. Nutritional aspects: High in protein and soluble fiber. Rich in vitamin A, vitamin C, iron, and calcium (WIKIPEDIA, GRUBBEN 2004).

f. Medicinal aspects: Used for various traditional remedies in Africa (GRUBBEN 2004).

g. Crop Photos:

4. Production in U.S.: No data.

5. Other production regions: Throughout much of tropical Asia and Africa, including China, Korea, Vietnam, India, Bangladesh, and Kenya (GRUBBEN 2004).

6. Use: Salad green, pot herb, leafy vegetable, mucilaginous vegetable and thicking agent, medicinal, ornamental, dye and ink (from berries), animal fodder/medicine (GRUBBEN 2004, MARKLE).

7. Part(s) of plant consumed: Leaves and young stems.

8. Portion analyzed/sampled: Leaves and young stems.

9. Classifications:
    a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A
    b. EPA Crop Group (Group & Subgroup): Leafy vegetables (except *Brassica* leafy vegetables) group, Leafy greens subgroup 4A
    c. Codex Group: 013, Leafy vegetables (including *Brassica* leafy vegetables), VL 0503, Spinach, Indian
    d. EPA Crop Definition: None
10. References: GRIN, MARKLE, MANSFELD, PLANTS FOR A FUTURE, HU 2002, PLANTS FOR A FUTURE, WIKIPEDIA, TROPILAB, GRUBBEN 2004.
11. Production Map: EPA Crop Production Region 13.
12. Plant Codes:
    a. Bayer Code: BADAL

(570)

1. **Spinach, New Zealand** [tsuru-na, warrigal cabbage, fan xing, tétragone cornue, Neuseelandspinat (GRIN)]

Aizoaceae

Tetragonia tetragonioides (Pall.) Kuntze (syn: *Demidovia tetragonoides* Pall., *Tetragonia expansa* Murray)

2. A small but hardy annual herb, native to New Zealand, Australia, and Tasmania and now grown in many temperate to subtropical region. The growth form is prostrate and spreading; each plant may attain a diameter of up to 1 m (3.3 ft). The leaves are dark green and slightly fuzzy. They are succulent, alternate and simple, deltoid-ovate in shape and up to 7 cm (2.7 in) long by 5 cm (1.9 in) wide (although may be much smaller). The flowers as axillary, small, and inconspicuous, greenish yellow and 2-3 mm (0.08-0.1 in). New Zealand Spinach was first used by Captain Cook and his crew while exploring Oceania to prevent scurvy. It was brought back to Europe and became the first crop from Australia to be cultivated there, quickly spreading to parts of Asia, North America, and Africa. The leaves are used like spinach, both fresh in salads and cooked as a potherb. It grows well in hot weather, and is a good warm season replacement for spinach. The flavor is said to be mild, but slightly bitter, and is grown in the U.S. as a minor and heirloom vegetable (MARKLE, MANSFELD, MUNRO, WIKIPEDIA, HU 2002, GRUBBEN 2004).

3. Crop Data:

a. Season, seeding to first harvest: About 2 months (MARKLE).

b. Cultivation: Does best in a warm moist environment (although it can withstand drought well), and tolerates a coastal environment and saline soil.. Its native environment is dunes and rocky beaches, and thus it prefers a sandy, well drained soil. Propagation is by seed (actually the whole, hard fruit), which should be soaked for 24 hours and then sown directly into the field or planted indoors and transplanted. Germination is in 2-3 weeks up as long as three months. In home gardens, tender shoots, tips, and leaves are cut and used throughout the summer. Commercially, whole plants are usually cut above the ground when small. New growth from the cut stem base will produce a later crop. It is resistent to most pests (GRUBBEN 2004, MARKLE, MUNRO, WIKIPEDIA).

c. Availability in the marketplace: A minor crop; mainly home gardens in North America. More common in areas where it is commercially grown and generally available in local markets in season.

d. Preparation for cooking: The leaves may be used fresh or cooked, like spinach. However, the plant may contain oxalates which can be removed by blanching in hot water and then soaking in cold water prior to cooking. In the U.S. the very young tips are eaten raw in salads (GRUBBEN 2004, WIKIPEDIA).

e. Nutritional aspects: Relatively high in protein, calicum, and foliate (GRUBBEN 2004).

f. Medicinal aspects: No data.

g. Crop Photos:

4. Production in U.S.: Mainly in home gardens. Commerically grown in California. No data on other states (MARKLE).

5. Other production regions: Native to New Zealand, Austria, and Tasmania. Cultivated in Europe, eastern Africa, China, Japan, and Canada (MARKLE, MANSFELD, GRUBBEN 2004, MUNRO).

6. Use: As potherb or greens in salads (MARKLE).

7. Part(s) of plant consumed: Young leaves and stem tips.

8. Portion analyzed/sampled: Tops (leaves)

9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A

b. EPA Crop Group (Group & Subgroup): Leafy vegetables (except *Brassica* leafy vegetables) group, Leafy greens subgroup 4A

c. Codex Group: 013, Leafy vegetables (including *Brassica* leafy vegetables, VL 0486, New Zealand Spinach

d. EPA Crop Definition: None

10. References: GRIN, MARKLE, MANSFELD, MUNRO, WIKIPEDIA, HU 2002, GRUBBEN 2004
11. Production Map: EPA Crop Production Regions 1, 2, 3, 5, 7, 10, 11, 12 and 13
12. Plant Codes:
    a. Bayer Code: TEATE

(595)

1. **Swiss chard** [garden beet, table beet, ramolacha, betterave, betabel, beetroot, field beet, fodder beet, foliage beet, mangel, mangel-wurzel, mangold, red beet, Sicilian broad-rib beet, spinach beet, spinach chard, sugarbeet, Swiss chard, yellow beet, betterave fourragère, betterave jaune, betterave potagère, betterave rouge, betterave sucrière, poirée à couper, poirée à carde, Futterrübe, rote Bete, rote Rübe, Runkelrübe, Zuckerrübe, Mangold, Schnittmangold, Stielmangold, beterraba, beterraba-açucareira, beterraba-forrageira, beterraba-sacarina, acelga, betarraga azucarera, betarraga forrajera, remolacha amarilla , remolacha azucarera, remolacha colorada, remolacha de mesa, remolacha forrajera, remolacha roja, acelga (GRIN)]

Chenopodiaceae

Beta vulgaris L. subsp. *vulgaris* (syn: *Beta altissima* Steud., *Beta brasiliensis* hort. ex Voss, *Beta chilensis* hort., *Beta cicla* (L.) L., *Beta vulgaris* var. *altissima* Döll, *Beta vulgaris* subsp. *cicla* (L.) W. D. J. Koch, *Beta vulgaris* var. *cicla* L., *Beta vulgaris* cv. *conditiva* Alef., *Beta vulgaris* cv. *crassa* Alef., *Beta vulgaris* subsp. *flavescens* Lam., *Beta vulgaris* var. *flavescens* (Lam.) DC., *Beta vulgaris* var. *rapacea* W. D. J. Koch, *Beta vulgaris* f. *rhodopleura* (Alef.) Helm, *Beta vulgaris* var. *rubra* DC., *Beta vulgaris* cv. *saccharifera* Alef.)

2. Swiss chard is a foliage beet, probably originating in Sicily, developed for its large fleshy leaf petioles and broad, crisp leaf blades. It is the same subspecies as the table beet, but different cultivars produce a much smaller, undesirable root and large, edible foliage instead. The leaves are large, up to 45.7 cm (18 in) in length, usually thick, dark green, wrinkled, and glabrous. The petioles are fleshy, elongate, and grooved in the middle, like celery but not ribbed. There are many kinds of Swiss chard and the leaves and petioles can vary greatly in size and color. Some cultivars produce very long and thin petioles with smaller leaves, while others may have very wide and stout petioles on extremely large leaves. Colors of petiole and midrib range from white to yellow to red. Colorful (or "rainbow") varieties of Swiss chard are often planted as ornamentals. Swiss chard is valued for its petiole and leaves, which may be eaten together or separately. Swiss chard is especially popular in Europe and the Mediterranean, although the petiole is often the only part eaten and the leaf blade discarded (MARKLE, MANSFELD, WIKIPEDIA, FLORIDATA, SCHNEIDER 2001).

3. Crop Data:

a. Season, planting to first harvest: 50 to 60 days (MARKLE).

b. Cultivation: Plants may be started in beds and transplanted to the field; but more commonly direct field seeding, followed by plant thinning, is practiced. Plantings made in the spring will produce leaves for greens in about 60 days, by harvesting the outer leaves only and leaving the inner ones intact, and will continue to produce "greens" or leaves until frost if the growing point if not injured. Growing requirements are virtually identical to garden beets, although Swiss chard is slightly less drought tolerant (MARKLE, FLORIDATA).

c. Availability in the marketplace: Common in the U.S. and Europe when in season, as it is highly perishable. Can be found frozen in the off season in many places.

d. Preparation for cooking: Swiss chard may be eaten fresh in salads or cooked, with the leaf blades used like spinach and the petioles eaten like celery or asparagus. Young leaves are preferred if eaten fresh as older leaves may be too tough. Swiss chard is slightly bitter and benefits from cooking. Leaf blades are often separated from petioles before cooking. Petioles can be chopped up and cooked in stir-fries, soups, or other dishes. The whole leaf with petiole may also be steamed. Swiss chard is highly perishable and should be used immediately or blanched then frozen (SCHNEIDE 2001, FLORDATA, WIKIPEDIA).

e. Nutritional aspects: High in vitamins A, K and C, as well as fiber and protein (WIKIPEDIA).

f. Medicinal aspects: No data.

g. Crop Photos:

4. Production in U.S.: Wisconsin, New York, Oregon, Texas, California, and New Jersey (MARKLE).

5. Other production regions: Canada, Europe (MARKLE, WIKIPEDIA).

6. Use: Leaf and stem vegetable, cooked or fresh.
7. Part(s) of plant consumed: Leaves with petioles
8. Portion analyzed/sampled: Leaves with petioles
9. Classifications:
    a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A
    b. EPA Crop Group (Group & Subgroup): Leafy vegetables (except *Brassica* vegetables) (4B)
    c. Codex Group: 013, Leafy vegetables (including *Brassica* leafy vegetables), VL 0464, Chard
    d. EPA Crop Definition: None
10. References: GRIN, MARKLE, MANSFELD, WIKIPEDIA, FLORIDATA, SCHNEIDER 2001.
11. Production Map: EPA Crop Production Regions 1, 2, 5, 6, 7, 8, 9, 10 and 12.
12. Plant Codes:
    a. Bayer Code: BEAVD

(**603)**

1. **Tanier Spinach** [Tanier Spinach, Tahitian taro, belembe, malanga, Tahitian spinach, quélimbé, calalú (GRIN, MARKLE)]

Araceae

Xanthosoma brasiliense (Desf.) Engl. (syn: *Caladium brasiliense* Desf.)

2. A perennial plant to about 61 cm (2 ft) tall, native to the tropical Americas. The plant develops from a rather insignificant corm. The leaves are sagitate to trilobed, glabrous, dark green and succulent with long petioles coming out of the ground and no above ground stem produced. The leaves, both old and young, are eaten like spinach and may be harvested year round for up to two years before the plant begins to suffer. It is a valuable crop in areas of the world where malnutrition is a problem, as it is extremely nutritious, easy to grow, and a good producer (MARKLE, MANSFELD, TROPILAB, LEAF FOR LIFE).
3. Crop data

a. Season, planting with corms to harvest: Suitable leaves for harvest are produced in 2 to 3 weeks, but 6 weeks are needed for mature leaves. Single leaves cut weekly or all leaves every 6 to 8 weeks (MARKLE).

b. Cultivation: Propagated by corm or stem cuttings (has very poor seed production). Requires a moist, rich, well-drained soil and does not grow well in sandy soil or soil with very low organic matter content. Can be successfully grown in soils with pH 5.0 –8.0. Does best in temperatures averaging 26.7 °C (80 °F). Typically grown at a density of about 14,000 to 20,000 plants per hectare. Tanier spinach is relatively shade tolerant and is sometimes intercropped with bananas or coconut. Resistant to most pests (TROPILAB, LEAF FOR LIFE).

c. Availability in the marketplace: Relatively rare here; more common in the tropics where it is grown.

d. Preparation for cooking: Rarely eaten raw as leaves may irritate the mouth. Cooked like spinach and used as any leafy vegetable in various dishes. Before cooking, the leaves and petioles are cut up. They are typically boiled for 10-15 minutes (LEAF FOR LIFE, TROPILAB).

e. Nutritional aspects: High in protein, vitamins A and C, and phosphorus (LEAF FOR LIFE).

f. Medicinal aspects: No data.

g. Crop Photos:

4. Production in U.S.: Hawaii (MANSFELD).
5. Other production regions: Tropical Americas, Surinam, the Carribbean, Micronesia, Tahiti, and the West Indies (MANSFELD, MARKLE, TROPILAB).
6. Use: Leafy vegetable.
7. Part(s) of plant consumed: Leaves and petioles. Tubers are edible when cooked but too small to be used for food (MARKLE).
8. Portion analyzed/sampled: Leaves and petioles
9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A

b. EPA Crop Group (Group & Subgroup): Miscellaneous

c. Codex Group: No specific entry

d. EPA Crop Definition: None

10. References: GRIN, MARKLE, MANSFELD, TROPILAB, LEAF FOR LIFE
11. Production Map: EPA Crop Production Region 13.
12. Plant Codes:

a. Bayer Code: XATBR

1. **Violet, Chinese** [tropical primrose, Herbe le rail, mange-tout, herbe pistache, pistache marron, Asistasía branca, fuchwe, mtikini, kichwamangwo (GRIN)]

Acanthaceae

Asystasia gangetica (L.) T. Anderson

2. A spreading, perennial herb with ascending stems up to 2 m (6.5 ft) long, native to tropical Africa and Asia but now a pantropical weed. The leaves are opposite, simple with entire margins, ovate to lanceolate often with a cordate base and up to 8 x 4.5 cm (3.1 x 1.8 in). Inflorescence a terminal raceme up to 25 cm (9.8 in) long, with bisexual, slightly zygomorphic, 5-parted flowers, typically white with purple spots inside the bottom lobe. The fruit is an explosive capsule which sprays seeds far and wide when mature. Chinese violet is cultivated as a leafy vegetable and medicinal plant in Africa, Asia, and parts of the tropical Americas. However in some places, such as Australia, it is considered an invasive weed. In Africa, it is also valued highly as fresh animal fodder (MANSFELD, WIKIPEDIA, PROTA).

3. Crop Data:

a. Season: 8-10 weeks from germination to seed dispersal. Young shoots and leaves may be harvested upon emergence (PROTA).

b. Cultivation: Propagated by seeds. Can grow under many conditions, from poor, water logged soils to well drained fertile areas, but does not do well in areas with a long dry season. It thrives on coastal alluvium, peat soils with 85% organic matter and pH 3.5–4.5, sandy loams and clay soils, and yet may be found at elevations up to 2,100 m (6,889 ft). Does well in full sun, but can tolerate an almost entirely closed canopy, although this will slow growth significantly (PROTA).

c. Availablity in the marketplace: Mainly gathered from the wild or cultivated in home gardens in Africa, Asia, and rural tropical Americas.

d. Preparation for cooking: Leaves are cooked and eaten as a vegetable, often with other leafy vegetables or sometimes with beans or sesame paste. The leaves may also be dried and ground for use later (PROTA).

e. Nutritional aspects: Contains significant protein and calcium (PROTA).

f. Medicinal aspects: Used in Africa, India, and Indonesia for a variety of herbal remedies (PROTA).

g. Crop Photos:

4. Production in U.S.: No data.

5. Other production regions: Tropical Americas, Kenya, Tanzania, India, Indonesia, and W. Africa (PROTA, MANSFELD).

6. Use: Leafy vegetable, potherb, medicinal, ornamental, animal fodder, and insect repellant (PROTA).

7. Part(s) of plant consumed: Leaves

8. Portion analyzed/sampled: Leaves

9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy greens subgroup 4A

b. EPA Crop Group (Group & Subgroup): Miscellaneous

c. Codex Group: No specific entry

d. EPA Crop Definition: None

10. References: GRIN, MANSFELD, WIKIPEDIA, PROTA.

11. Production Map: EPA Crop Production Regions 3 and 13.

12. Plant Codes:

a. Bayer Code: ASYCO

ATTACHMENT 5. MONOGRAPHS – BRASSICA LEAFY VEGETABLES

(033)

1. **Arugula** [rocket salad, tira, arrugula, gargeer, roka, roquette, garden rocket, roka, rucola, rugula, salad rocket, rocket-salad, Ölrauke, Ruke, Senfrauke, jamba, taramira, rábano-silvestre, oruga común, roqueta (GRIN, MARKLE)]

Brassicaceae

Eruca sativa Mill. (syn: *Brassica eruca* L.*, Brassica erucoides* Roxb.*, Eruca longirostris* Uechtr*, E. stenocarpa* Boiss. & Reut.*, Eruca vesicaria* subsp. *sativa* (Mill.) Thell.)

2. This is a low growing annual 30-60 cm (1-2 ft) high, found wild in the Mediterranean, North Africa, the Balkans, and parts of Asia. The leaves are 7.6-18 cm (3-7 in) long and deeply lobed, and it bears white, cross-shaped flowers. It is mainly used as a salad green and has long been popular in Europe, India, the Middle East and parts of Asia, and is used especially heavily in Italy. Previously arugula was mainly collected from the wild, and commercial cultivation is a relatively recent phenomenon, having only occurred in the past few decades. The leaves are best when used young, and the flavor is pungent and spicy, resembling horseradish. Recently, it has grown in popularity in the U.S. and is now a relatively common part of salad mixes, particularly in gourmet markets. In addition to fresh usage, it can also be cooked in stews, sauces, and stir-fries. The seeds yield an oil known as "jamba oil" which can be used for cooking, lamp oil, or taken medicinally. This is most commonly found in India. The seeds may also be ground into a kind of mustard powder. On the island of Ischia in the Gulf of Naples, a local specialty is a liquor made from the leaves of arugula which is drunk after meals (MARKLE, MANSFELD, WIKIPEDIA, FLORIDATA, PURDUE, PLANTS FOR A FUTURE).

3. Crop Data:

a. Season, seeding to first harvest: For leaves, about 2 to 3 months. Normally harvested when leaves are about 6 to 8 inches. The seed crop is direct seeded in early April and harvested early September by cutting, dried in the field for 10 to 14 days and combined (MARKLE).

b. Cultivation: A very hardy plant, can grow in most kinds of soil, sun to partial shade, and is drought resistant (PLANTS FOR A FUTURE).

c. Availability in the marketplace: Fairly common in the U.S., particularly in more affluent areas, as it is considered a gourmet food. Common in Europe, the Middle East, North Africa, and parts of Asia.

d. Preparation for cooking: Leaves used fresh or cooked by stewing, boiling, or stir-frying. Seeds dried and ground or pressed for oil (MARKLE, MANSFELD, WIKIPEDIA).

e. Nutritional aspects: Rich in vitamin C and potassium (WIKIPEDIA).

f. Medicinal aspects: Long considered an aphrodisiac, and some use in folk remedies, but little to no medicinal use today (WIKIPEDIA, PLANTS FOR A FUTURE).

g. Crop Photos:

4. Production in U.S.: Arizona, California, Florida, New Jersey, New York and South Carolina (MARKLE). It is also being investigated as a potential crop in the Midwest.

5. Other production regions: Southern Europe, North and Northeast Africa, the Middle East, Central Asia, and North and Central India.

6. Use: Salad green, cooked vegetable, cooking oil, lamp oil, seasoning/spice, condiment, liquor, medicinal (MANSFELD, PLANTS FOR A FUTURE).

7. Part(s) of plant consumed: Young leaves mainly; older leaves which are too hot to eat added to sauces as a seasoning.

8. Portion analyzed/sampled: Leaves (fresh)

9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy *Brassica* greens subgroup 4B

b. EPA Crop Group (Group & Subgroup): Leafy Vegetables, Leafy green subgroup 4A

c. Codex Group: 013 (VL 0496) Leafy vegetables (including *Brassica* leafy vegetables), VL 0496, Rucola

d. EPA Crop Definition: None

10. References: GRIN, MARKLE, MANSFELD, PURDUE, FLORIDATA, PLANTS FOR A FUTURE, WIKIPEDIA
11. Production Map: EPA Crop Production Regions 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, and 12 (PLANTS)
12. Plant Codes:
    a. Bayer Code: ERUVE

(085)

1. **Chinese Cabbage (Bok choy)** [chongee, baak choi, pai tsai, white stalk, taisai, lei choy, bok choi, paksoi, Chinese cabbage, paktsoi, white mustard cabbage, spoon cabbage, Japanese white celery mustard, pak choy sum, Chinese chard, pak choy, pak toy, celery mustard, Chinese mustard cabbage, joi choy, tak tsai, Chinese savoy, celery cabbage, tatsoi, osaka-na, caisin, Chinese mustard, Chinese white cabbage, false pak-choi, flowering white cabbage, mock pak-choi, mustard cabbage, purple-stem mustard, white celery mustard, cai xin, qing cai, ze cai hua, ze tai cai, zi cai tai, chou de Chine, Chinakohl, pecai, sawi hijau, sawi kembang, sawi putih, shakushina, taisi, junggukpaechu, puhit, bunga, sawi putih, couve-chinesa, kapusta kitajskaja, col de China, repollo chino (MARKLE, GRIN)]

Brassicaceae

Brassica rapa subsp. *chinensis* (L.) Hanelt (syn: *Brassica campestris* subsp. *chinensis* (L.) Makino, *Brassica chinensis* L., *Brassica chinensis* subsp. *utilis* M. Tsen & S. H. Lee, *Brassica dubiosa* L. H. Bailey, *Brassica oleracea* var. *chinensis* (L.) Prain, *Brassica rapa* var. *amplexicaulis* Y. Tanaka & Ono, *Brassica rapa* var. *chinensis*, *Brassica rapa* var. *rosularis* M. Tsen & S. H. Lee)

1. Flowering white cabbage (choi sum) [flowering bok choy, yu choy, u-choy, tsai shim, tsoi sum, false pak choi, Chinese cabbage, choy sum, mock pakchoi, choisum, yow choy, edible rape, caisin, mock pak-choi, cai xin, sawi hijau, sawi kembang, sawi bunga (MARKLE, GRIN)]

Brassica rapa L. subsp. *chinensis* (L.) Hanelt var. *parachinensis* (L. H. Bailey) Hanelt (syn: *Brassica parachinensis* L. H. Bailey)

1. Purple-stem mustard [ze cai hua, ze tai cai, zi cai tai (GRIN)]

Brassica rapa L. subsp. *chinensis* (L.) Hanelt var. *purpuraria* (L. H. Bailey) Kitam. (syn: *Brassica campestris* var. *purpurea* L. H. Bailey, *Brassica purpurea* (L. H. Bailey) L. H. Bailey)

1. Chinese flat cabbage [broad-beak mustard, Chinese savoy, ta ke cai, wutacai, kisaragina, taasai (GRIN)]

Brassica rapa L. subsp. *narinosa* (L. H. Bailey) Hanelt (syn: *Brassica narinosa* L. H. Bailey, *Brassica rapa* var. *narinosa* (L. H. Bailey) Kitam.)

2. This group of Chinese cabbages should not be confused with Chinese napa cabbage, which forms a tight head. Bok choy and its close relatives form loose rosettes but not true heads, despite often being referred to as Chinese cabbage. The taxonomy of this group is confusing, and the confusion is made greater by the numerous common names (some of them overlapping with other subspecies or varieties) in both Chinese and English, and the many cultivars of these plants. However, all are grown in a similar manner, for similar uses and greatly resemble each other. All are known only in cultivation and are low-growing, annual or biennial, cool season cabbages that tend to form basal rosettes of edible leaves with thickened, often white or purple, petioles. The leaves, petioles, and young flower stalks (flowers and seeds are typical of the family) are all edible, but it is the crisp petiole that is particularly favored for stir-fries and other vegetable dishes. They tend to have a slightly sharper and more "mustardy" flavor than the napa cabbage, although some types can be quite bland and watery. Bok choy is the most familiar to Western markets, and there are many cultivars featuring different sizes, colors, and growing requirements. It is typically the largest of the group, with the thickest and most desirable petiole, which may range from white to green to purple in color (as in the variety purple-stem mustard). It is typically biennial (grown as an annual) although if stressed may bolt the first year. It is also the only type that is typically dried for later use in soups and other dishes. It is highly versatile and is eaten at every stage from seedling to flowering. Flowering white cabbage (choi sum) is an annual, and is the only one of the group grown primarily for its flowering stem. It forms the loosest bunches and has the most slender petioles. Although the whole plant is consumed, it is the flower stalk with its flower buds and just-opened flowers that is most prized, usually for cooking or pickling. Chinese flat cabbage is much like bok choy, only smaller and lower to the ground (prostrate or semi-prostrate). It tends to form wide, low rosettes only a few inches tall and it is extremely hardy, even able to survive under snow cover for a time. It also tends

to be slow to bolt in the spring, making it a highly useful, if slow-growing, crop (MARKLE, MANSFELD, GRIN, SCHNEIDER 2001, WIKIPEDIA, INNVISTA, LARKCOM).

3. Crop Data:

a. Season, seeding to harvest: Time varies based on cultivar and desired crop, ranging from only a few weeks for bok choy seedlings, to three months or more for flower stalks. When leaves and petioles are desired, several cuttings of the outer leaves may be made throughout the season (LARKCOM).

b. Cultivation: Typically grows best in 15-20 °C (59-68 °F) temperatures, although some cultivars may be more heat or cold resistant. As typical of many cabbages, these have a fine, shallow root system and require fertile soil and high moisture levels for a productive crop. Dryness and heat will cause premature bolting, but excessive water results in susceptibility to pests (particularly slugs) and fungal disease. Typically planted either in the very early spring or in late summer for fall harvest, although some cultivars can over-winter in mild climates. These plants often do well with slight shading, particularly in warmer months, and traditionally are often intercropped with corn, carrots, or other *Brassica* crops. Can be started in containers and in some cases grown to maturity in them. Also suitable for year-round greenhouse cultivation under carefully controlled conditions. Susceptible to most common *Brassica* pests, particularly flea beetle and cabbage caterpillar, as well as being vulnerable to bacterial rot and clubroot (LARKCOM, DIXON 2007, NONNECKE).

c. Availability in the marketplace: Ubiquitous throughout most of Asia, becoming more common in the West. Bok choy in particular is available at most large supermarkets in the U.S., as well as specialty markets.

d. Preparation for cooking: Rarely eaten fresh, although leaves (particularly of seedlings) are occasionally used in salads. Leaves and petioles may be cooked together or used separately. The thicker petioles are sometimes peeled before use. Flower stalks with budded or just-opened flowers are also eaten cooked. These vegetables are used throughout Asian cuisine in nearly every way imaginable in dishes with other vegetables, alone, or with fish, meat, rice, or noodles. They can be boiled, blanched, fried, stir-fried, steamed, or pickled. Bok choy is occasionally dried for use in soups or stews out of season, as fresh leaves do not store well (LARKCOM, SCHNEIDER 2001).

e. Nutritional aspects: Very nutritious, more so than many other cabbages, and particularly high in potassium, vitamin A, and calcium (NONNECKE).

f. Medicinal aspects: No data.

g. Crop Photos:

4. Production in U.S.: Bok choy is grown throughout the country, usually in very small acreage for local markets. Grown in much greater quantity in California and Florida, particularly, as well as in New York, New Jersey, Michigan, Arizona, and Texas (NONNECKE).

5. Other production regions: Major crop in China. Also grown in Canada, Japan, Korea, S.E. Asia, the Philippines. Recently as a winter crop in tropical Africa, Brazil, and the Antilles (MARKLE, MANSFELD, NONNECKE).

6. Use: Raw vegetable, cooked vegetable, pickles, dried vegetable (LARKCOM, SCHNEIDER 2001, MANSFELD).

7. Part(s) of plant consumed: Leaves, petioles, and flowering stalk.

8. Portion analyzed/sampled: Leaves and petioles; flowering stalk only in flowering white cabbage.

9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy *Brassica* greens subgroup 4B

b. EPA Crop Group (Group & Subgroup): *Brassica* (cole) leafy vegetables, *Leafy Brassica* greens subgroup 5B

c. Codex Group: 013, Leafy vegetables (including *Brassica* leafy vegetables, VL 0468, Choisum; 013, Leafy vegetables (including *Brassica* leafy vegetables); VL 0466, Pak-choi or Paksoi

d. EPA Crop Definition: None

10. References: MARKLE, MANSFELD, GRIN, SCHNEIDER 2001, WIKIPEDIA, INNVISTA, LARKCOM, NONNECKE, DIXON 2007

11. Production Map: EPA Crop Production Regions: Bok choy: 2, 3, 10 and 13 (MARKLE).
12. Plant Codes:
    a. Bayer Code: BRSCH (*B. rapa* subsp. *chinensis*), BRSNR (*B. rapa* subsp. *narinosa*)

1. **Broccoli, Chinese** [white flowering Chinese broccoli, gay lon, gai lan, kailaan, gai lohn, Chinese kale, gai lon, gaillon, kailan, yellow flowering Chinese broccoli, kaai-laan, white flowered broccoli, tsai shim, bai hua gan lan, chinesischer Brokkoli (MARKLE, GRIN)]

Brassicaceae

Brassica oleracea var. *alboglabra* (L.H. Bailey) Musil (syn: *Brassica alboglabra* L.H. Bailey)

2. An annual, cool season crop for a long time grown primarily in China and Asia although probably originating in antiquity from the Mediterranean. In shape and form very similar to broccoli, with thick, green-blue leaves, although the leaves are broader and the stems somewhat longer than in true broccoli. The flower stalk and buds are lighter in color than true broccoli and they do not form the large, tightly packed heads but instead have many smaller, less dense inflorescences. The inflorescences and surrounding leaves are eaten as a cooked vegetable, typically right before the flowers bloom although they sometimes are harvested just as blooming begins. The small yellow or white flowers are edible and tasty and may be eaten with the rest of the tops. In flavor, much like broccoli although sometimes described as more bitter, more sweet, or more peppery. There are many cultivars of this plant in China, each for a particular growing season and climate so that it can be grown virtually year-round there (MARKLE, MANSFELD, SCHNEIDER, HU 2005, WIKIPEDIA, DPI QUEENSLAND, IFAS-EDIS).

3. Crop Data:

a. Season, seeding to first harvest: 40 to 60 days (MARKLE).

b. Cultivation: Can be grown all year round in some climates. Propagated by seed. Optimum temperatures for germination are 25 to 30 °C (68 to 95 °F). May bolt quickly at sustained high temperatures. Grows in most fertile soil types, with good drainage and high organic content. Ideal pH is neutral to slightly acid, but not below 5.0. Chinese broccoli can be directly sown at a depth of 0.6 cm (2.4 in) allowing 8-12 cm (3.1-4.7 in.) between plants and with 2 to 4 rows per raised bed. Particularly susceptible to downy mildew, as well as white rust and Alternaria. Aphids, green looper caterpillar, white butterfly caterpillar and diamondback moth are common pests of Chinese broccoli. For harvest, young flowering stems are cut by hand at 15-20 cm (5.9-7.9 in.) length with a sharp knife. Chinese broccoli should be harvested frequently to prevent bolting and toughening, particularly in summer. About three cuts can be obtained from one stem, and the main stalk should be cut relatively short to enhance further growth (DPI QUEENSLAND).

c. Availability in the marketplace: Extremely common in Asia and easily found in Asian markets; becoming more common in mainstream markets in the U.S.

d. Preparation for cooking: May be cooked and prepared in the same way as broccoli, most often steamed and served with oyster sauce or stir-fried with ginger and garlic (WIKIPEDIA).

e. Nutritional aspects: A good source of Vitamin E, Vitamin B6, iron, phosphorus, zinc and copper, and a very good source of dietary fiber, Vitamin A, Vitamin C, Vitamin K, thiamin, riboflavin, foliate, calcium, magnesium, potassium and manganese (NUTRITION DATA).

f. Medicinal aspects: No data.

g. Crop Photos:

4. Production in U.S.: Grown in many areas of the U.S. including California, Florida and Washington (MARKLE).

5. Other production regions: China, Vietnam, Thailand, Myanmar, Canada, Australia (WIKIPEDIA, MARKLE, DPI QUEENSLAND)

6. Use: Cooked vegetable.

7. Part(s) of plant consumed: Flowerhead, stalk, and leaves.

8. Portion analyzed/sampled: Flowerhead, stalk, and leaves.

9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy *Brassica* greens subgroup 4B

b. EPA Crop Group (Group & Subgroup): *Brassica* (cole) leafy vegetables, Head and Stem *Brassica* subgroup 5A

c. Codex Group: 010, *Brassica* (cole or cabbage) vegetables, Head cabbages, Flowerhead *Brassicas,* VB 0401, Broccoli, Chinese.

d. EPA Crop Definition: Broccoli = Chinese broccoli (gai lon, white flowering broccoli).

10. References: GRIN, MARKLE, MANSFELD, SCHNEIDER, HU 2005, WIKIPEDIA, DPI QUEENSLAND, NUTRITION DATA, IFAS-EDIS

11. Production Map: EPA Crop Production Regions 10 and 3 (MARKLE)

12. Plant Codes:

    a. Bayer Code: BRSAG

(092)

1. **Broccoli raab** [rapa, rapini, taitcat, Italian turnip, broccoli turnip, Chinese flowering cabbage, choy sum, spring broccoli, Italian mustard, turnip rape, rappone, Italian turnip broccoli, nabana, ruvo kale, saishin, tsai-hsin, tsai-tai, cima-de-rapa (GRIN, MARKLE)]

Brassicaceae

Brassica ruvo L.H. Bailey (syn: *Brassica campestris* L. (Ruvo group); *Brassic rapa* L.)

2. An annual or biennial cool-season crop known only in cultivation but probably originating in North Africa and Eurasia. Closely related to turnips and rapeseed (canola), but closer resembling young broccoli, it has many thick, dark green, spiked leaves which surround small clusters of small green flower buds. It is grown for its tender leaves and flowers shoots which are often eaten together and used as cooked vegetables or pot herbs. Plants develop rather rapidly and are typically harvested before the flower buds open, although the yellow flowers are edible and tasty. The overall flavor of the vegetable has been described as nutty, bitter, and pungent. General growth habit and exposure of edible parts are similar to spinach and Chinese broccoli. Long used almost exclusively in Italian and Asian cuisines, broccoli raab has recently become much more familiar in the U.S. and other parts of the world (MARKLE, MANSFELD, WIKIPEDIA, COOKSFRESHMARKET, NCCE, IPMCENTERS).

3. Crop Data:

a. Season: About 60 days from seeding to harvest, although crops may be planted in the fall and overwintered for harvest in the spring. In warm climates, may be grown in the fall or winter (NCCE).

b. Cultivation: May be direct-seeded or transplanted. Broccoli raab prefers heavy loams, although if it is being over-wintered or planted in early spring, better drained loams with more sand content are superior. Soil should have a high organic content and an optimal pH of 6.0-6.5. Requires high amounts of nitrogen to produce good color and tenderness, and it should be fed at least twice in overwintering crops. If weather is dry, irrigation is recommended. It is susceptible to a large range of pests, particular insect pests, similar to those which attach other *Brassica* crops. Broccoli raab can go to seed very quickly in warm weather. It is harvested by cutting leaves and flower buds when they are 10-20 cm (4-8 in.) high and kept in cool conditions until sold, and has a very short shelf-life (NCCE, IPMCENTERS).

c. Availability in the marketplace: Fairly common in fresh markets throughout the U.S., and in Asian and Italian ethnic markets. More common in Europe.

d. Preparation for cooking: Broccoli raab can be steamed, boiled, stir-fried, sautéed, microwaved and braised. It is too tough and bitter to eat raw, and while the whole stem is edible, the tough bottom portion should be cut off and it should be thoroughly washed before cooking. Blanching in hot salted water and then plunging into ice water removed bitterness. It is most typically eaten in hearty dishes and paired with garlic (in Italian cuisine) and other strong flavors. Served as a vegetable and side dish (COOKSFRESHMARKET, WIKIPEDIA).

e. Nutritional aspects: Contains vitamins A, C, and K, as well as potassium, calcium, and iron (WIKIPEDIA).

f. Medicinal aspects: No data.

g. Crop Photos:

4. Production in U.S.: Grown in many states, including New Jersey, California, North Carolina, and Arizona (MARKLE, IPMCENTERS, NCCE).

5. Other production regions: Grown throughout much of the temperate world but particularly Europe (Italy and Portugal) and China (WIKIPEDIA, MARKLE, MANSFELD).

6. Use: As a cooked vegetable, like broccoli or Chinese broccoli.

7. Part(s) of plant consumed: Tops (leaves, stems and flower buds)

8. Portion analyzed/sampled: Tops

9. Classifications:
    a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy *Brassica* greens subgroup 4B
    b. EPA Crop Group (Group & Subgroup): *Brassica* (cole) leafy vegetables group 5, Brassica greens subgroup 5B
    c. Codex Group: 013, Leafy vegetables (including Brassica leafy vegetables), VL 4327, Broccoli raab
    d. EPA Crop Definition: Turnip tops or greens = Broccoli raab (raab, raab salad), hanover salad turnip tops (turnip greens).
10. References: MARKLE, MANSFELD, WIKIPEDIA, COOKSFRESHMARKET, NCCE, IPMCENTERS
11. Production Map: No specific entry.
12. Plant Codes:
    a. Bayer Code: BRSRW

(002)

1. **Cabbage, Abyssinian** [Abyssinian mustard, African cabbage, karate, Ethiopian mustard, mustard collard, Ethiopian kale, Ethiopian rape, chou Éthiopien, d'Abyssinie, abessinischer Kohl, figiri (MARKLE, GRIN)]

Brassicaceae

Brassica carinata A. Braun

2. An erect African annual or perennial *Brassica* known only in cultivation, resembling the wild mustards and grown primarily as a leafy vegetable. Leaves are alternate with a short petiole, and lower leaves may be double-crinulate while upper leaves are often obvate and entire. Fruit and flowers are typical of the genus. May reach up to 1.5 m (4.9 ft) in height, but if grown for greens, tender leaves and stems are typically cut before they reach 30 cm (1 ft). Older leaves and stems may be cooked. Although a warm-weather species, one cultivar (TexSel, developed by Texas A&M University) can be grown in cooler climates. The greens are said to be somewhat milder than collards and without the pungency of mustard greens. In Ethiopia, it is also grown as an oilseed for cooking, illumination, and household and industrial uses. Although known to contain high levels of erucic acid, which is toxic, some cultivars have been selected to be almost free of erucic acid and these are used for cooking. The seed can also be used as spice or condiment (MARKLE, MANSFELD, PLANTS FOR A FUTURE, GRUBBEN 2004, WIKIPEDIA).

3. Crop data:

a. Season, seeding to harvest: About 35-53 days for use as a leafy vegetable, and can be harvested multiple times in a season (MARKLE).

b. Cultivation: Does best in a sunny position in moist, well-drained, fertile soil under slightly alkaline conditions, but can succeed nearly anywhere and is somewhat weedy. Propagation is by seed. When grown for leaves, high additions of N will enhance growth. Requires regular irrigation if rain is infrequent, as water stress will induce early flowering. Leaves should be harvested prior to flowering as bolting ruins the flavor and tenderness of the leaves. It is highly susceptible to Turnip Mosaic Virus and blackrot, as well as common *Brassica* pests (GRUBBEN 2004, PLANTS FOR A FUTURE).

c. Availability in the marketplace: Mainly local markets, primarily in Africa.

d. Preparation for cooking: Young and tender leaves and stems are used fresh in salads, while larger and older tops are cooked and eaten like broccoli or cabbage. The seeds of some cultivars may be pressed for edible cooking oil or used as a spice like mustard seed (GRUBBEN 2004, PLANTS FOR A FUTURE).

e. Nutritional aspects: No data.

f. Medicinal aspects: The seed is used in folk-medicine to treat stomachache (GRUBBEN 2004).

g. Crop Photos:

4. Production in U.S.: Some production at least in Texas and Florida (MARKLE).

5. Other production regions: Ethiopia, Tanzania, Malawi, Zimbabwe, and other West African nations (GRUBBEN 2004).

6. Use: Salad green, cooked vegetable, potherb, medicinal, illumination, household oil, condiment, seasoning, animal fodder, biodiesel (GRUBBEN 2004, MARKLE, MANSFELD).

7. Part(s) of plant consumed: Leaves and stems (rarely seeds and seed oil).

8. Portion analyzed/sampled: Leaves and stems.

9. Classifications:

a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy *Brassica* greens subgroup 4B

b. EPA Crop Group (Group & Subgroup): Miscellaneous

c. Codex Group: No specific entry

d. EPA Crop Definition: None

10. References: GRIN, MARKLE, MANSFELD, PLANTS FOR A FUTURE, GRUBBEN 2004, WIKIPEDIA,

11. Production Map: EPA Crop Production Regions 3, 6, and 8 (MARKLE).

12. Plant Codes:

a. Bayer Code: BRSCA

(**107)**

1.**Cabbage, Seakale** [Bedford cabbage, braganza, Portuguese cabbage, Portuguese cole, Portuguese tree kale, tronchuda cabbage, tronchuda kale, chou à grosses côtes, chou tronchuda, portugiesischer Kohl, Rippenkohl, Tronchudakohl, couve-de-nervuras , couve-Manteiga, couve-penca, couve-portuguesa, couve-tronchuda, col de pezon grueso, col tronchuda, butter cabbage (MARKLE, GRIN)]

Brassicaceae

Brassica oleracea L. var. *costata* DC. (syn: *Brassica oleracea* var. *tronchuda* L. H. Bailey)

2. Not to be confused with sea kale (*Crambe maritima*), this is a hardy perennial type of cabbage that appears to be intermediate between the heading cabbages we are most familiar with and the kales. It is considered a savoy cabbage, with crinkled leaves. The plant resembles a thick-stemmed collard with large floppy leaves which grow close together and have thickened leaf stalks and leaf ribs. It may form a loose head or no head at all, depending on the temperatures at which it is grown (warm weather seems to prevent any heading at all). Grown for the petioles and the leaves, which are used as cooked vegetables (MARKLE, MANSFELD, STEPHENS, BAILEY 1916, DIXON).

3. Crop data:
   a. Season: Cool season crop, in timing similar to other cabbages (MARKLE, STEPHENS).
   b. Cultivation: Propagated by seed or cuttings. Grow under typical conditions for other cabbages. Frost hardy, but will tolerate warmer climates, though it may not head at all and may be more vulnerable to pests such as cabbage loopers and imported cabbage worms (MARKLE, STEPHENS).
   c. Availability in the marketplace: Rare in the U.S. Mainly Portugal and surrounding areas.
   d. Preparation for cooking: Cook leaf stalk, rib, and leaf blade as a vegetable (MANSFELD).
   e. Nutritional aspects: No data; likely similar to other cabbages.
   f. Medicinal aspects: No data.
   g. Crop Photos:
4. Production in U.S.: No data; some experimental growth in Florida at least (MARKLE).
5. Other production regions: Portugal (MANSFELD).
6. Use: Cooking greens (MARKLE).
7. Part(s) of plant consumed: Leaves and petiole
8. Portion analyzed/sampled: Leaves and petiole
9. Classifications:
   a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy *Brassica* greens subgroup 4B
   b. EPA Crop Group (Group & Subgroup): Miscellaneous
   c. Codex Group: 013, Leafy vegetables (including *Brassica* leafy vegetables), VL 0499, Sea kale
   d. EPA Crop Definition: None
10. References: GRIN, MARKLE, MANSFELD, STEPHENS, BAILEY 1916, DIXON
11. Production Map: No specific entry
12. Plant Codes:
    a. Bayer Code: BRSOT

(188)

1. **Collards** [winter greens, cow cabbage, spring heading cabbage, tall kale, tree kale, kale, fodder kale, Portuguese kale, caulet, chou cavalier, chou commun, chou en arbre, chou fourrager, chou vert, Blätterkohl, Blattkohl, Futterkohl, Kuhkohl, berza común, col forrajera (GRIN, MARKLE)]
   Brassicaceae
   Brassica oleracea var. *viridis* L. (Syn: *Brassica oleracea* var. *acephala* DC.)
2. Collards are a perennial or biennial, non-heading cabbage closely related to the kales. Probably originally native to Europe and Africa, collards have long been a traditional crop in the American South, South America, and Kashmir. They are grown for their large, smooth, thick leaves which grow in a rosette around an upright main stem which may reach 61 cm (2 ft) in height. Collards are especially prized for their flexibility, as although they are a cool season crop they can withstand far more heat in the summer than many other *Brassica* types. It is most popular in climates that are too warm to successfully grow heading cabbages. It is described as having a strong, rather bitter flavor which may be improved by frost. Collards are never eaten raw and need to be boiled or cooked well to make them soft enough to eat, otherwise the leaves can be tough. The younger the leaves when picked, the more tender they are (MARKLE, MANSFELD, SCHNEIDER 2001, GRIMES HORT, NCCE, WIKIPEDIA).
3. Crop Data:
   a. Season, seeding to harvest: About 2 to 3 months (MARKLE).
   b. Cultivation: Full sun or partial shade. Collards can grow in many kinds of soil but the best yields come from well drained, heavy loamy soils with high organic content and a pH of 6.0-6.5. Regular applications of fertilizer are recommended for good leafy growth. May be planted in late summer or fall for fall/winter harvest and/or in the early spring for spring harvest, depending on climate. Plants should be irrigated during dry periods. Seedlings can be started inside and transplanted, or direct seeded in the field and thinned to about anywhere from 5-46 cm (2-18 in) spacing, depending on the type of production desired. Collards are susceptible to several kinds of worms (cabbage worm, cabbage looper) as well as Harlequin bug and downy mildew. To harvest, plants may be cut when very small (like mustard greens) to produce several successive cuttings of small leaves, the whole plant may be cut when half grown or when completely grown, or the tender leaves may be cut from the plant while leaving the central stem intact for several cuttings. Leaves are bound and marketed in bunches, and can stay fresh for up to 10 days on ice (GRIMES HORT, NCCE, WIKIPEDIA).
   c. Availability in the marketplace: Common in the U.S. and parts of Europe and Africa, fresh, canned, or frozen.
   d. Preparation for cooking: Collards should be well cooked before eating. The larger the leaves, the longer they should be cooked to become tender. Collards are favorite dish in the American South, where they are traditionally eaten with smoked meats, particularly pork. They are also considered good luck to eat on New Year's Day with black-eyed peas and pork. They are also sometimes fermented into a kraut. In South America the leaves are sliced thin and eaten as a side dish or added to soups. In Kashmir, the whole plant including the root is eaten with soup, rice, meat, fish, or cheese. It is also pickled (WIKIPEDIA, SCHNEIDER).
   e. Nutritional aspects: High in Vitamin A, Vitamin C, potassium, calcium, and soluble fiber (WIKIPEDIA, GRIMES HORT).
   f. Medicinal aspects: No data.
   g. Crop Photos:
4. Production in U.S.: Production in many U.S. states including Georgia, South Carolina, North Carolina, Texas, New Jersey, Maryland, California, Alabama, Arizona, and Tennessee.
5. Other production regions: Canada, Portugal, Egypt, Brazil, and Kashmir (MARKLE, MANSFELD, WIKIPEDIA).
6. Use: Mainly as greens or potherbs.
7. Part(s) of plant consumed: Leaves, rarely roots and buds.
8. Portion analyzed/sampled: Leaves

9. Classifications:
    a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy *Brassica* greens subgroup 4B
    b. EPA Crop Group (Group & Subgroup): *Brassica* (cole) leafy vegetables group 5, Brassica greens subgroup 5B
    c. Codex Group: Kale: 013, Leafy vegetables (including *Brassica* leafy vegetables), VL 4332, Collards, see Kale, VL 0480
    d. EPA Crop Definition: None
10. References: GRIN, MARKLE, MANSFELD, SCHNEIDER 2001, GRIMES HORT, NCCE, WIKIPEDIA.
11. Production Map: EPA Crop Production Regions 1, 2, 3, 4, 5, 6 and 10 (MARKLE).
12. Plant Codes:
    a. Bayer Code: BRSOA

1. **Cress, Garden** [garden cress, cresson alenois, Gartenkresse, agriao, mastruco, berro de huerta (GRIN)]
Brassicaceae
Lepidium sativum L.

1. **Peppergrass** [Virginia peppergrass, poor-man's-pepper, Virginia pepperweed, Virginia-cress, mastruço, mastruz, menstruz, cresón, mancuerno (GRIN)]
Lepidium virginicum L.

2. Annual herb grown throughout much of the temperate and warm-temperate world, reaching a height of 30-61 cm (1-2 ft). The leaves rise from the root crown at the soil surface and are variable in shape, some forms being greatly divided like parsley, others curled. If only lower leaves are removed, new leaves will continue to be formed on the central stalk. Peppergrass is a closely related plant, native in the U.S., which is not cultivated, but often is gathered and used similarly. Cress is valued for its sprouts, which are eaten raw or used as a garnish, as well at its spicy older leaves which can be used as vegetable or seasoning. The seedpods can be used as a spice and the seed oil is a nutritious, edible oil. The root is also strongly flavored and used as a condiment in China. All parts of the plant are used medicinally (MARKLE, MANSFELD, WIKIPEDIA, PLANTS FOR A FUTURE, HU 2005).

3. Crop Data:
   a. Season, seeding to harvest: 6-8 weeks for leaves, 1-2 weeks for young shoots/sprouts (MARKLE, WIKIPEDIA).
   b. Cultivation: Propagated from seed. Succeeds in most soils, but requires moisture. Prefers full sun to slight shade (PLANTS FOR A FUTURE).
   c. Availability in the marketplace: Rare but not unknown in the U.S. More common in Europe, Asia, and Africa.
   d. Preparation for cooking: Leaves added to soups, sandwiches and salads for its tangy flavor. Sprouts eaten fresh. The fresh or dried seed pods can be used as a peppery seasoning. In England cut cress shoots are typically used in sandwiches with boiled eggs, mayonnaise and salt (WIKIPEDIA).
   e. Nutritional aspects: Leaves contain, Vitamins A and C and protein (WIKIPEDIA).
   f. Medicinal aspects: Used in various folk remedies and in Ayurveda to prevent postnatal complications (PLANTS FOR A FUTURE, WIKIPEDIA).
   g. Crop Photos:

4. Production in U.S.: No data, but primarily grown in home gardens (MANSFELD).

5. Other production regions: Commercially grown in England, France, the Netherlands and Scandinavia. Also cultivated in Asia, North Africa, India, and North America. Cultivated for oil in Ethiopia (WIKIPEDIA, MANSFELD).

6. Use: Salad green, sprout, spice, oil, medicinal, condiment (WIKIPEDIA, PLANTS FOR A FUTURE, MANSFELD).

7. Part(s) of plant consumed: Leaves and sprouts (primarily), root, seedpods, seed oil.

8. Portion analyzed/sampled: Leaves and sprouts.

9. Classifications:
   a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy *Brassica* greens subgroup 4B
   b. EPA Crop Group (Group & Subgroup): Garden cress: Leafy vegetables (except *Brassica* vegetables) group, Leafy greens subgroup 4A
   c. Codex Group: 013, Leafy vegetables (including *Brassica* leafy vegetables), VL 0472, Garden cress
   d. EPA Crop Definition: None

10. References: GRIN, MARKLE, MANSFELD, WIKIPEDIA, PLANTS FOR A FUTURE, HU 2005, PLANTS.

11. Production Map: All EPA Production Regions (PLANTS)

12. Plant Codes:
   a. Bayer Code: LEPSA (*L. sativum*), LEPVI (*L. virginicum*)

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1. Cress, Upland [dryland cress, wintercress, scurvy grass, Belle Isle cress, spring cress, yellow rocket, toi, early wintercress, landcress, garden yellowrocket, early yellowrocket, herb-Barbaras, rocket cress, herbe aux charpentiers, herbe de Sainte-Barbe, Barbarakraut, erva-de-Santa-Bárbara, agrião-de-inverno, hierba de Santa Bárbara (GRIN, MARKLE)]

Brassicaceae

Barbarea vulgaris W. T. Aiton (syn: *Barbarea arcuata* (Opiz ex J. Presl & C. Presl) Rchb., *Barbarea vulgaris* var. *arcuata* (Opiz ex J. Presl & C. Presl) Fr., *Barbarea vulgaris* var. *brachycarpa* Rouy & Foucaud, *Barbarea vulgaris* var. *longisiliquosa* Carion, *Barbarea vulgaris* var. *sylvestris* Fr., *Campe barbarea* (L.) W. Wight ex Piper, *Erysimum arcuatum* Opiz ex J. Presl & C. Presl, *Erysimum barbarea* L.)

1. **American cress** [early winter cress, land cress, Normandy cress, upland cress, cresson de jardin, Frühlingsbarbarakraut, agrião-de-horta, berrillo, berro mastuerzo, hierba de Santa Bárbara (GRIN)]

Barbarea verna (Mill.) Asch. (syn: *Barbarea praecox* (Sm.) W. T. Aiton*, Erysimum vernum* Mill.)

2. Hardy biennial herbs of the mustard family, native originally to Southern Europe and Asia but now naturalized throughout much of Europe and North America. Leaves, which are highly lobed with a round, terminal lobe and then pairs of progressively smaller lobes arranged down a smooth 15.2-20.3 cm (6- 8 in) stem, form a basal rosette. A 61-91 cm (2-3 ft) flower stalk sprouts the second year, bearing clusters of yellow, cross-shaped flowers. Seed pods are thin and cylindrical, about 3.8 cm (1.5 in) long. Rarely if ever cultivated today, but still occasionally gathered from the wild for its pre-flowering foliage. Formerly cultivated in Europe, as well as in the U.S. by European settlers. Still quite popular in Belgium. Considered a weed in much of North America (MARKLE, MANSFELD, WIKIPEDIA, PLANTS FOR A FUTURE, BRILL, MUNRO).

3. Crop Data:

a. Season, harvest: Late fall, winter, and early spring while the leaves are still relatively mild. Once the plant has flowered the flavor becomes too spicy and bitter for consumption (BRILL, MARKLE).

b. Cultivation: Prefers neutral, fertile soils. Often grows in wet places but does not like to be submerged. In the garden, requires sun (unless temperatures are likely to be high, then partial shade is advisable) and frequent watering. A cool season plant, propagated by seed, it can be sown as soon as the soil can be worked and will tolerate some frost. Seedling should be thinned to 10 cm apart. Weedy and will often self-sow (WIKIPEDIA, BRILL, MUNRO, PLANTS FOR A FUTURE).

c. Availability in the marketplace: Rare in most places, although may be obtainable in some areas of Europe. Primarily grown in the home garden or gathered from the wild for personal use.

d. Preparation for cooking: Young leaves are used fresh in salads as a vegetable, flavoring, or garnish. Leaves, young or older, are also cooked as a vegetable (like spinach) or pot herb in soups and stews, although older leaves may require long cooking and rinsing to be palatable. Flower buds may be used for flavoring in salads or other vegetable dishes. Sprouts also eaten (MUNRO, BRILL, PLANTS FOR A FUTURE).

e. Nutritional aspects: No data.

f. Medicinal aspects: Some use in folk medicine (PLANTS FOR A FUTURE).

g. Crop Photos:

4. Production in U.S.: No data.

5. Other production regions: Some cultivation in Europe, possibly France (MUNRO).

6. Use: Vegetable, potherb, salads, medicinal (PLANTS FOR A FUTURE, MUNRO).

7. Part(s) of plant consumed: Leaves

8. Portion analyzed/sampled: Leaves

9. Classifications:
    a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy *Brassica* greens subgroup 4B
    b. EPA Crop Group (Group & Subgroup): Upland cress: Leafy vegetables (except *Brassica* vegetables) group, Leafy greens subgroup 4A
    c. Codex Group: 027, Herbs, HH 0751, Wintercress, Common; American
    d. EPA Crop Definition: None
10. References: GRIN, MARKLE, MANSFELD, MUNRO, WIKIPEDIA, PLANTS FOR A FUTURE, BRILL, PLANTS.
11. Production Map: All EPA Production Regions except 13 (PLANTS).
12. Plant Codes:
    a. Bayer Code: BARVE (*B. verna*), BARVU (*B. vulgaris*)

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1. Hanover salad [Hanover kale, spring kale, Hanover turnip, Siberian kale, winter rape, curled kitchen kale, rape kale, chou à faucher, Schnittkohl, couve nabiça , nabicol (MARKLE, GRIN)]

Brassicaceae

Brassica napus var. *pabularia* (DC.) Rchb. (Syn: *Brassica campestris* var. *pabularia* DC.)

2. This member of the cabbage family, a type of kale that is closely related to rape, is grown for the tender leaves used as potherbs and in salads. In growth, it is much like turnip, but the root is non-tuberous. The leaves form a rosette and are smooth and generally scalloped. The stems vary from purple to white. Siberian kale differs from other kales in that the foliage is bluish-green in color and is less curled, and the leaves are more tender and less bitter. It is also grown as a forage and green manure crop in the American South, where it can be planted in the fall and overwinter (MARKLE, MANSFELD, STEPHENS 2, PURDUE, BOTANY).
3. Crop data:
    a. Season, seeding to harvest: 2 to 3 months (MARKLE).
    b. Cultivation: Cool weather crop grown much like collards. Direct seeded via broadcast or transplanted from seedlings. Rows 61-76 cm (24-30 in) apart, plants 25-46 cm (10-18 in) apart. Susceptible to cabbage loopers and other caterpillars (STEPHENS 2).
    c. Availability in the marketplace: Primarily found in specialty markets and home gardens.
    d. Preparation for cooking: Eaten fresh in salads or cooked as a potherb (STEPHENS 2)
    e. Nutritional aspects: No data.
    f. Medicinal aspects: No data.
    g. Crop Photos:
4. Production in U.S.: Grown in Florida and other parts of the southern U.S. (MARKLE, STEPHENS 2).
5. Other production regions: Grown in temperate regions (MARKLE).
6. Use: As salads and potherbs (MARKLE).
7. Part(s) of plant consumed: Leaves
8. Portion analyzed/sampled: Leaves
9. Classifications:
    a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy *Brassica* greens subgroup 4B
    b. EPA Crop Group (Group & Subgroup): Miscellaneous
    c. Codex Group: No specific entry.
    d. EPA Crop Definition: Turnip tops or greens = Broccoli raab (raab, raab salad), hanover salad turnip tops (turnip greens).
10. References: GRIN, MARKLE, MANSFELD, STEPHENS 2, PURDUE, BOTANY.
11. Production Map: No entry, see Kale.
12. Plant Codes:
    a. Bayer Code: No specific entry.

1. **Kale** [Scotch kale, borecole, flowering kale, curly kale, kitchen kale, dwarf Siberian kale, curled kitchen kale, curlies, decorative kale, flowering cabbage, ornamental cabbage, ornamental kale, Scottish kale, yu yi gan lan, chou d'aigrett, chou frangé, chou fries, chou lacinié, Braunkohl, Federkohl, Grünkohl, Krauskohl, Zier-Kohl, braunkol', col crespa (GRIN, MARKLE)]

Brassicaceae

Brassica oleracea var. *sabellica* L. (syn: *Brassica oleracea* var. *acephala* auct., *Brassica oleracea* var. *selenisia* L.)

1. Kale, branching bush [branching cabbage, bush kale, perennial kale, perpetual kale, thousand-head kale, eeuwig moes, splijtkool, splijtmoes, stekkool,chou à mille têtes, branchu, chou vivace, Staudenkohl, Strauchkohl, Tausendkopfkohl, col de mil cabezas (GRIN)]

Brassica oleracea L. var. *ramosa* DC. (syn: *Brassica oleracea* subsp. *fruticosa* Metzg., *Brassica oleracea* var. *fruticosa* (Metzg.) L. H. Bailey)\

1. **Kale, Jersey** [giant Jersey kale, palm kale, palm-tree kale, tree kale, chou palmier, italienischer Kohl, Palmkohl GRIN)]

Brassica oleracea L. var. *palmifolia* DC.

1. Kale, marrow-stem [chou moellier, chou mollier, Markkohl, Markstammkohl, cavolo, mozgovaja kapusta, col de meollo, col medular, col meollosa (GRIN)]

Brassica oleracea L. var. *medullosa* Thell.

2. The kales are a large group of (typically) non-heading *Brassica* which encompasses several varieties and countless cultivars. Kale grown for food is handled as an annual, although the plant is biennial, producing a seed crop the second year, and is very similar to collards in growth and cultivation requirements. The majority of kale grown for food in the U.S., Europe, and Canada is common kale, which may vary widely in color, and leaf form from thick, flat wrinkled leaves with entire margins to extremely curly and divided leaves. Kale leaves can be dark, almost bluish-green to light green to white, reddish or purple. Kale typically forms a loose rosette of leaves around a central stem, and may reach nearly 1 meter (3.3 ft) in height for some of the more robust types, although other types may not exceed 10 cm (3.9 in) in height until the flower stalk begins to grow. A number of varieties of kale are grown for strictly ornamental purposes and have very fancy leaves, bright colors, and may form a loose head. These are often planted in place of flowers for decoration in the cool season, although they are perfectly edible provided they have not been treated with pesticides that are not approved for food use. Kale is used as a leaf vegetable, sometimes for fresh greens when very young but usually as a potherb and cooked vegetable. It has a strong, somewhat bitter and nutty taste to it. The flavor is sweetened by frost and made unpalatable by heat and bolting. Branching bush kale is a primitive variety of kale which is cultivated primarily in Africa, Central, America and Asia. It is more tolerant of heat than other varieties and the leaves and young sprouts are eaten, although it is mostly cultivated for fodder. Marrow-stem kale is a variety of kale cultivated in Europe, North America, and Australia, which has thick, tough stalks and is also primarily used for cattle fodder. Jersey kale is a traditional European type of kale, now in decline, but still grown in some places as an heirloom or relic crop, particularly in Northern Italy (MARKLE, MANSFELD, SCHNEIDER, PLANTS FOR A FUTURE, WHFOODS, FLORIDATA, WIKIPEDIA, ELZEBROEK 2008).

3. Crop data:

a. Season, seeding to harvest: 1 to 3 months (MARKLE, FLORIDATA).

b. Cultivation: Temperature and moisture requirements vary by type. However kale is a cool season crop and typically cannot tolerate temperatures consistently above 26.7 °C (80 °F), and does well down to about -6.7 °C (20 °F). Does best in full sun to light shade and well drained loamy soils, although it may grow in nearly any type of soil as long as it receives enough moisture. Kale prefers an alkaline soil and Jersey kale can tolerate maritime conditions. In the southern U.S., kale is often planted in the fall and harvested over winter and into the spring. The leaves may be harvested as a bunch at the end of the season or taken as needed for several harvests over the growing season. Kale is susceptible to the typical pests and diseases of Brassicas (ELZEBROEK 2008, FLORIDATA, PLANTS FOR A FUTURE).

c. Availability in the marketplace: Very common throughout North America, Australia, and Europe; different varieties available in Asia, Africa, and South America.
d. Preparation for cooking: Kale leaves are used fresh in salads when young and tender or made into a slaw. More often they are cooked, canned, frozen, or pickled/fermented. It is eaten throughout Europe, Asia, Australia and North America and in parts of South America and Africa. It may be boiled, stir fried or steamed. It is used in soups, casseroles, and meat dishes or served as a vegetable side dish. It is sometimes dried and eaten as a snack and in Japan a health-drink is made from it (MARKLE, MANSFELD, WIKIPEDIA, SCHNEIDER, ELZEBROEK 2008).
e. Nutritional aspects: Kale is very high in beta carotene, vitamin A, vitamin K, vitamin C, lutein, zeaxanthin, and calcium (WIKIPEDIA, WHFOODS).
f. Medicinal aspects: May have anti-cancer properties (WIKIPEDIA).
g. Crop Photos:

4. Production in U.S.: Grown widely throughout the South but not limited to that area. Grown particularly in Georgia, California, Maryland, Texas, New Jersey, Pennsylvania, North Carolina, Virginia, Illinois, and Ohio (MARKLE).
5. Other production regions: Worldwide in temperate zones (MARKLE, MANSFELD, WIKIPEDIA).
6. Use: Salad green, potherb, dried vegetable, beverage, slaw, pickles (WIKIPEDIA, SCHNEIDER, WHFOODS)
7. Part(s) of plant consumed: Leaves
8. Portion analyzed/sampled: Leaves
9. Classifications:
   a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy *Brassica* greens subgroup 4B
   b. EPA Crop Group (Group & Subgroup): *Brassica* (cole) leafy vegetables group, Leafy *Brassica* greens subgroup 5B
   c. Codex Group: 013 (VL 0480) Leafy vegetables (including *Brassica* leafy vegetables), VL 0480, Kale; 052 Miscellaneous fodder and forage crop for feed, AV 0480, Kale forage
   d. EPA Crop Definition: None
10. References: GRIN, MARKLE, MANSFELD, SCHNEIDER, PLANTS FOR A FUTURE, WHFOODS, FLORIDATA, WIKIPEDIA, ELZEBROEK 2008.
11. Production Map: EPA Crop Production Regions 1, 2, 5, 6 and 10 (MARKLE).
12. Plant Codes:
    a. Bayer Code: BRSOA (Kale), BRSOC (Curly kale)

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1. **Maca** [maka, Peruvian ginseng (GRIN, MARKLE)]
Brassicaceae
Lepidium meyenii Walp. (Syn: *Lepidium peruvianum* G. Chacón de Popovici)

2. Maca is a long-lived annual or biennial plant native to the Andes and cultivated primarily for its tuberous root. The growth form is low to the ground and mat-like and prostrate, with the scalloped leaves forming a rosette. In general, the plant greatly resembles cress and has the small, self-fertile, off-white flowers typical to the mustard family. The edible root for which it is grown is actually a fleshy hypocotyl which is fused with the taproot. Maca is cultivated at altitudes from 2,438 to 4,419 m (8,000 to 14,500 ft), elevations at which few other crops can be grown. The nutrituous tuber ranges in color form yellow to purple to black and has been in cultivation for up to 3,000 years, in some places acting as a staple food for the population. The leaves are also consumed as a vegetable. Although cultivation was decreasing for some time, in recent years it has begun to become more popular again, likely due to growing interest in the crop as a nutritional supplement (MARKLE, MANSFELD, WIKIPEDIA, RUBATSKY 1997, RAINTREE).

3. Crop data:
a. Season, seeding to harvest: About 7 to 11 months for the roots (RUBATSKY 1997).
b. Cultivation: Propagation is from seed, which is planted via broadcast methods and stomped into the ground. Maca does well in intense sunlight at high elevations and is one of the most frost-tolerant plants in cultivation. This plant may tend to exhaust the soil of nutrients and requires several years of fallow between plantings. Yields are low, about 3 tonnes/ha (1.3 tons/A). Roots are harvested at the onset of the dry season (RUBASTKY 1997).
c. Availability in the marketplace: As a vegetable, mainly in Andean countries where it is grown. However the dried and ground root powder is available as a nutritional supplement in many other parts of the world.
d. Preparation for cooking: The root may be eaten fresh, cooked, or dried and reconstituted, often with milk. The dried roots may be stored for up to year and remain edible. It can also be mashed and cooked to form a puree or porridge, ground into a flour, or fermented to make a weak beer. The leaves are mainly consumed fresh in salads, much like other *Lepidium* species (MANSFELD, WIKIPEDIA, MARKLE).
e. Nutritional aspects: Maca is high in protein for a root vegetable, and also contains significant amounts of calcium and iron as well as many important amino acids (RAINTREE).
f. Medicinal aspects: Maca has long been considered by native peoples to be an aphrodesiac, to be useful for impotence, and to increase fertility. Recently it has become popular as a nutritional supplement for these purposes, although the amount of plant material in the capsules commonly sold in the U.S. is far less than is consumed weekly by regular maca eaters in its native countries and recent studies indicate that it does not affect sex hormones in humans (RAINTREE, WIKIPEDIA).
g. Crop Photos:

4. Production in U.S.: No data
5. Other production regions: Peru and Boliva; Andean mountains (MANSFELD, RUBATSKY 1997).
6. Use: Root vegetable (raw or cooked), leafy vegetable, medicinal, beer, flour (RAINTREE, MANSFELD, WIKIPEDIA).
7. Part(s) of plant consumed: Root and tops
8. Portion analyzed/sampled: Root (fresh and dried) and tops
9. Classifications:
a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy *Brassica* greens subgroup 4B
b. EPA Crop Group (Group & Subgroup): Miscellaneous
c. Codex Group: No specific entry
d. EPA Crop Definition: None
10. References: GRIN, MARKLE, MANSFELD, RAINTREE, WIKIPEDIA, RUBATSKY 1997.
11. Production Map: No specific entry.

12. Plant Codes:
    a. Bayer Code: No specific entry.

1. **Mizuna** [kabuna, spinach mustard, tendergreen, turnip greens, zairainatane, wang sheng cai, raapsteeltjes, moutarde épinard, Mosterdspinat, Senfspinat, komatsuna, kyona, mibuna, mostaza espinaca(GRIN)]

Brassicaceae

Brassica rapa L. subsp. *nipposinica* (L. H. Bailey) Hanelt (syn: *Brassica japonica* Makino, *Brassica nipposinica* L. H. Bailey)

2. **Kabuna** [spinach mustard, tendergreen, turnip greens, zairainatane, raapsteeltjes, moutarde épinard, Mosterdspinat, Senfspinat, komatsuna, mostaza espinaca (GRIN)]

Brassica rapa L. subsp. *nipposinica* (L. H. Bailey) Hanelt var. *perviridis* L. H. Bailey (syn: *Brassica perviridis* (L. H. Bailey) L. H. Bailey)

2. Mizuna (and its variety, kabuna) is an annual vegetable native to Japan and grown in Asia, Europe, and the U.S. It is closely related to the turnip and does have tuberous, edible roots although it is primarily grown as a leafy vegetable, particularly in the U.S. Mizuna forms a large, loose rosette of feathery leaves which are typically dark green in color. When fully grown, the leaves may reach nearly 40.6 cm (16 in) in height, although mizuna is often harvested when much smaller than that. Depending on the variety, the flavor of mizuna may vary from watery and almost bland to bright, sharp, and peppery (although never as hot as arugula). Mizuna leaves are very tender and delicate and most often eaten fresh or very briefly cooked. Mizuna is both heat and cold tolerant and is relatively bolt resistant. It may be harvested at any time from the seedling stage to the fully grown plant, including the flower stalk which may also be eaten. The leaves become tougher, more bitter, and more fibrous as they age (MARKLE, MANSFELD, WIKIPEDIA, SPECIALTY PRODUCE, LARKCOM, HHG).

3. Crop data:

a. Season, seeding to harvest: As soon as 2-3 weeks for first harvest of seedlings or several months for adult leaves or flower stalks. Multiple cuttings may be made (LARKCOM).

b. Cultivation: A cool weather crop, mizuna may be sown in spring or fall. It can withstand extremes of up to 32 °C (90 °F) without bolting and down to -16 °C (3 °F) if in a sheltered location. It may be overwintered in many areas with only an unheated poly-tunnel or cold frame. Mizuna can be direct-seeded or transplanted and spacing is dependent on what the plants will be harvested (from 10 cm/4 in for seedlings to 46 cm/18 in for fully grown plants). It does best in direct sunlight to light shade and succeeds in most soils as long as they are moisture-retentive and can tolerate pH range of 5.6-7.5. Mizuna should not be allowed to dry out, especially when very young. Mizuna grown for baby greens can do well when intercropped with larger Brassicas, corn, or other widely spaced crops. It does well in containers. It is often sold for the home garden in seed mixes with other tender greens. Mizuna is fairly pest resistant but is most susceptible to slugs and flea beetles. Mizuna should be used within 3-5 days of harvest (LARKCOM, HHG).

c. Availability in the marketplace: Common in Japan and China. Popular in the West as part of bagged salad mixes (LARKCOM, MANSFELD).

d. Preparation for cooking: Mizuna is mostly used fresh in salads as very young leaves. However it may also be used as a garnish, in soups, or added to stir-fries at the last minute. Mizuna may also be used as a part of many other dishes. In Japan it is often pickled. Older leaves have prominent leaf-stalks which may be removed and cooked separately (LARKCOM, WIKIPEDIA, MANSFELD).

e. Nutritional aspects: High in beta-carotene and fiber (SPECIALTY PRODUCE).

f. Medicinal aspects: No data.

g. Crop Photos:

4. Production in U.S.: No data. Mainly in home gardens (particularly as winter crop in the south-east) or grown for micro-greens (MARKLE, MANSFELD).
5. Other production regions: Japan, China, U.K (MANSFELD, WIKIPEDIA).
6. Use: Salad green, garnish, pot herb, root vegetable (MARKLE, LARKCOM).
7. Part(s) of plant consumed: Leaves; occasionally roots.
8. Portion analyzed/sampled: Leaves.

9. Classifications:
    a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy *Brassica* greens subgroup 4B
    b. EPA Crop Group (Group & Subgroup): Mizuna - *Brassica* (cole) leafy vegetables group, Leafy *Brassica* greens subgroup 5B
    c. Codex Group: No specific entry
    d. EPA Crop Definition: None
10. References: GRIN, MARKLE, MANSFELD, WIKIPEDIA, SPECIALTY PRODUCE, LARKCOM, HHG
11. Production Map: No specific entry.
12. Plant Codes:
    a. Bayer Code: BRSNO

1. **Mustard greens** [gui choy, kai choy, Chinese mustard, gai chow, karashina, Japanese greens, potherb mustard, Chinese green mustard, specialty mustards, kyona, Indian mustard, Chinese mustard, mostaza, takana, leaf mustard, prong, gar choy, California peppergrass, gai choy, komatsuma, cabbage leaf mustard, komatsuna, curled mustard, cutleaf mustard, dissected-leaf mustard, yau choi, ostrich plume, raya, moutarde Chinese, raapstecltjes, southern curled mustard, head mustard, spinach mustard (MARKLE)]

Brassicaceae

Brassica juncea (L.) Czern.

1. **Leaf mustard** [cabbage-leaf mustard, chopped mustard, curled mustard, cut-leaf mustard, dissected-leaf mustard, hakka mustard, head mustard, horned mustard, large-petiole mustard, leaf mustard, ostrich-plume, southern curled mustard, Swatow mustard, shui cai, moutarde de Chine, irana, setsuriko, takana, mostaza de la tierra (GRIN)]

Brassica juncea (L.) Czern. subsp. *integrifolia* (H. West) Thell.

1. **Big-stem mustard** [swollen-stem mustard, zha cai, chicken mustard, multishoot mustard, nine-head mustard (GRIN)]

Brassica juncea (L.) Czern. subsp. *tsatsai* (T. L. Mao) Gladis

2. Numerous *B. juncea* subspecies, varieties, and cultivars are grown for greens and are typically lumped together under the name "mustard greens". Other *Brassica* mustards are grown for greens as well, but most plants known as mustard greens are *B. juncea*. The vast majority of these are *B. juncea* subsp. *integrifolia* varieties, but *B. juncea* subsp. *tsatsai* varieties are grown not only for their leaves but for their thickened petiole, which is eaten as vegetable. All are annuals grown from seed, and form clusters of leaves, the edible portion, prior to forming a seed stalk, but do not typically form a true head. Leaves may vary in size, shape and texture, from small to large (>15.2 cm/6 in), entire to lobed or serrate, and from smooth to prickly to wrinkly to hairy. The flavor may also vary from fairly mild to extremely hot and peppery, depending on the type grown and when in the season the leaves are harvested. Some of the types of *B. juncea* grown for greens are also grown for mustard seed and for oil. When grown for leaves, they are typically harvested while still young and tender, to prevent the flavor from becoming too hot or bitter and the leaves from becoming too fibrous. Mustard greens are grown through much of the world, but variety may differ by region and they are most common in Asia and the southern U.S. Mustard greens are also used as green manure, animal fodder, and for phytoremediation. Culture and exposure of leaves are comparable to spinach (MARKLE, MANSFELD, WIKIPEDIA, SCHNEIDER 2001, MUNRO, GRUBBEN 2004, FLORIDATA).

3. Crop data:

a. Season, seeding to harvest: As little as 30 days for tender leaves (GRUBBEN 2004).

b. Cultivation: Mustards are a very versatile plant and can succeed in almost any soil. Naturally a plant of waste places they can survive very inhospitable conditions provided they receive full sun and adequate water. When grown for food, they are grown as a cool season crop, as high temperatures will ruin the flavor of the leaves and cause the plants to bolt quickly. They may be direct seeded or transplanted. Final spacing if grown for leaves is 30-50 cm (0.9-1.6 ft) between rows and 20-40 cm (0.6-1.3 ft) in-row; can be planted more densely for seed or oil production. In leaf production, ideal conditions are a moist, well drained, loamy soil with plenty of nitrogen inputs. Mustard greens are particularly susceptible to root rots and to other common *Brassica* pests (GRUBBEN 2004, FLORIDATA, MUNRO).

c. Availability in the marketplace: Common worldwide, and ubiquitous in Asia. In the U.S. is commonly found in salad mixes.

d. Preparation for cooking: Leaves are used fresh in salads, cooked in soups, stir-fries, or side dishes. Also may be frozen, canned or pickled. The thickened petioles of some varieties are eaten as a cooked vegetable, alone or with the leaves, much like chard. In addition, the seeds are

sometimes used as a spice or crushed for edible oil (WIKIPEDIA, MANSFELD SCHNEIDER 2001, MUNRO, GRUBBEN 2004).

e. Nutritional aspects: Can hyper-accumulate cadmium and many other soil trace elements. Can be used as a selenium, chromium, iron and zinc food supplement. High in vitamins A and K (WIKIPEDIA).

f. Medicinal aspects: Mustard "plasters" are a home remedy for sore muscles and chest congestion (MUNRO).

g. Crop Photos:

4. Production in U.S.: Grown throughout much of the country, particularly Georgia, California, Florida, Texas, Arkansas, North Carolina, Tennessee, South Carolina, Ohio, Mississippi, and Arizona (MARKLE).
5. Other production regions: Mexico, Asia, Europe, Africa, Canada (MUNRO, GRUBBEN 2004, WIKIPEDIA).
6. Use: Fresh, canned, frozen for potherbs and to limited extent in salads or cooked; green manure, phytoremediation, nutritional supplement, animal fodder, condiment, seed, seed oil, medicinal (MARKLE, MANSFELD, GRUBBEN 2004, MUNRO, WIKIPEDIA).
7. Part(s) of plant consumed: Leaves, including stems; sometimes seeds and seed; see "mustard seed".
8. Portion analyzed/sampled: Leaves with stems.
9. Classifications:
    a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy *Brassica* greens subgroup 4B
    b. EPA Crop Group (Group & Subgroup): *Brassica* (cole) leafy vegetables group, Leafy *Brassica* greens subgroup 5B
    c. Codex Group: 013, Leafy vegetables (including *Brassica* leafy vegetables), VL 0485, Mustard greens; 013 Leafy vegetables (including *Brassica* leafy vegetables) for Komatsuma, VL 0478, Indian mustard.
    d. EPA Crop Definition: None
10. References: GRIN, MARKLE, MANSFELD, WIKIPEDIA, SCHNEIDER 2001, MUNRO, GRUBBEN 2004, FLORIDATA
11. Production Map: All EPA Crop Production Regions (PLANTS).
12. Plant Codes:
    a. Bayer Code: BRSJU (*B. juncea*)

1. **Mustard, tuberous rooted Chinese** [Chinese turnip, tuberous root mustard, Dai tou jie, root mustard, turnip-root mustard, large-root mustard. # large-root mustard (Source: Opera Bot 55:16.1980 [as *Brassica juncea* var. *napiformis*]) – English, jie cai ge da (MARKLE, GRIN)

Brassicaceae

Brassica juncea (L.) Czern. subsp. *napiformis* (Pailleux & Bois) Gladis (syn*: Brassica juncea* var. *megarrhiza* M. Tsen & S. H. Lee, *Brassica juncea* var. *napiformis* (Pailleux & Bois) Kitam., *Brassica napiformis* (Pailleux & Bois) L. H. Bailey, *Sinapis juncea* var. *napiformis* Pailleux & Bois)

2. This mustard subspecies develops a tuberous root, in appearance much like a globular turnip. Roots reach a diameter of 7.6-10.2 cm (3-4 in), and are similar to turnips in appearance, texture, flavor and culture. The leaves are dark green, irregularly shallow-lobed and serrate with stiff hairs. The root is white and fleshy and may weigh up to three pounds. It is rarely grown in the U.S., although popular in China. The roots are sliced and made into salty pickles. The leaves are edible as any other mustard green and may also be pickled, although it is usually cultivated primarily for the roots (MARKLE, MANSFELD, LARKCOM, HU 2005, WRIGHT 2001).

3. Crop data:
   a. Season, seeding to harvest: No data; for leaves see mustard greens.
   b. Cultivation: No data; for root cultivation see turnip, for leaf cultivation see mustard greens.
   c. Availability in the marketplace: Common in China, mainly as pickles/preserves.
   d. Preparation for cooking: The root is cleaned, cut into several pieces and laid in the sun to partially dehydrate. It is then mixed with salt and placed in large earthenware urns with pressure applied to the top. After some time the roots turn black and can be eaten or stored for many years (HU 2005).
   e. Nutritional aspects: No data.
   f. Medicinal aspects: No data.
   g. Crop Photos:
4. Production in U.S.: No data
5. Other production regions: China, especially northern provinces (HU 2005).
6. Use: Root and leaves used, as turnips, mainly for pickling (MARKLE, HU 2005).
7. Part(s) of plant consumed: Roots and leaves (including petioles).
8. Portion analyzed/sampled: Roots and leaves (including petioles).
9. Classifications:
   a. Authors Class: Root and tuber vegetables; Crop Group 4: Leafy Vegetables, Leafy *Brassica* greens subgroup 4B
   b. EPA Crop Group (Group & Subgroup): Miscellaneous
   c. Codex Group: 013, Leafy vegetables (including *Brassica* leafy vegetables), VL 0485, Mustard greens.
   d. EPA Crop Definition: None
10. References: GRIN, MARKLE, MANSFELD, LARKCOM, HU 2005, WRIGHT 2001
11. Production Map: No entry
12. Plant Codes:
    a. Bayer Code: BRSJU (*B. juncea*)

1. **Radish [**Chinese radish, Japanese radish, small radish, garden radish, common radish, turnip radish, fejil, lai fu, luo bo, ying tao luo bo, petit rave, radis, radis japonais, ravon, chinesischer Rettich, Radieschen, Rettich, lobak, radice, rafano, ravanello, daikon, hatsuka daikon, rábano, rabanete, rábano blanco, rabanillo, rabanito (GRIN, MARKLE)

Brassicaceae

Raphanus sativus L. var *sativus* (syn: *Raphanus sativus* var. *niger* J. Kern., *Raphanus sativus raphanistroides* Makino, *Raphanus sativus* var. *raphanistroides* (Makino) Makino)

1. Rat-tail radish [serpent radish, tail-pod radish, shu wei luo bo, radis de Madras, radis serpent, Schlangenrettich, mungra, mougri (GRIN)]

Raphanus sativus L. var. *mougri* H. W. J. Helm (syn: *Raphanus caudatus* L. f., *Raphanus sativus* var. *caudatus* (L. f.) H. Vilm.)

1. **Oil radish** [fodder radish, radis fourrager, radis oléifère, Ölrettich, rafano da foraggi, rábano-de-azeite, nabo-forrageiro, rábano oleaginoso (GRIN)]

Raphanus sativus L. var. *oleiformis* Pers. (syn: *Raphanus sativus* var. *oleifer* Stokes)

2. A highly variable erect, annual herb probably originating the Mediterranean but now cultivated throughout much of the world. It has been grown since ancient times as an oilseed, root vegetable, leaf vegetable, and fodder crop. Radish has green elongate, lobed leaves with a large terminal lobe. The leaves are arranged alternately and the large lower leaves form a rosette. The higher leaves are much smaller with a short petiole. The flowers form on a terminal raceme and are perfect, small (1.5 cm/0.6 in) and 4-parted, usually white to light purple. The seeds form in an elongated indehiscent pod, 2-12 seeds in each, and are yellowish and approximately 3 mm (0.1 in) in diameter. The main product is the tuberous root, which is valued as a vegetable around the world. There are many cultivars and among these the root size may vary from just a few grams to more than 20 kg (44 lb), and may be nearly any color (including white, red, or black) or shape (round to very elongate). Although the roots are usually the primary commodity, all parts of the plant are edible. The seeds are used as a spice or garnish for oil, the seed pods are eaten as a vegetable, and the leaves are used as a salad green. Rat-tail radish is cultivated exclusively for the immature seed-pods and the root is not eaten at all. Oil radish is grown mainly for oilseed and fodder. Cultivars common to America and Europe are most typically small, usually round, and reddish. Cultivars grown in Asia and for other markets may be much larger and vary greatly in shape, color, and flavor (GRUBBEN 2004, MARKLE, MANSFELD, WIKIPEDIA, SCHNEIDER 2001, HU 2002).

3. Crop data:

a. Season: Although radish is considered a cool season crop in the U.S., many cultivars are grown in tropical climates. Small, quick growing types may take only 3 weeks from planting to harvest, but larger cultivars require quite a long growing season to reach their full size. In North America, varieties are in season from April to June and from October to January. In general, radishes should be harvested when the roots are fully developed but before they begin to turn hard and pithy (GRUBBEN 2004, WIKIPEDIA).

b. Cultivation: Practices vary by cultivar. Radish is propagated by seed, sown directly into the ground in drills. Radish requires full sun, and light, well drained soil with a pH of 6-6.5. In general, it favors cooler climates. Seeds may germinate in 4 days. When grown for the roots, radishes require plenty of moisture and fertilizer. It is desirable that they grow quickly and stay damp to produce the crisp roots they are prized for. Too much fertilizer and not enough moisture can result in pithy and tough roots. Both the leaves and the roots should be harvested before flowering (GRUBBEN 2004).

c. Availability in the marketplace: Roots, often with leaves or leaves separately, can be found in markets around the world. Preserved radish is also obtainable in many places, particularly Asia.

d. Preparation for cooking: The roots are used fresh in salads, slaws, and vegetable plates; cooked by steaming, put in soups and sauces, sliced, or served with meat; and preserved through being salted, dried, pickled, or fermented. The leave, are most often eaten fresh in salads; the youngest

leaves may be used like cress and older leaves may be cooked like spinach. The seeds are pressed for oil, or used as a garnish or seasoning. The immature seed pods are eaten as a vegetable: fresh, cooked, pickled (GRUBBEN 2004, WIKIPEDA, MANSFELD, SCHNEIDER 2001) .

e. Nutritional aspects: Rich in ascorbic acid, folic acid, and potassium and a good source of vitamin B6, riboflavin, magnesium, copper, and calcium (WIKIPEDIA).

f. Medicinal aspects: Used to help with digestion and gas pain, as well as various other traditional remedies (HU 2002).

g. Crop Photos:

4. Production in U.S.: No data on current production amounts, but radish is grown throughout much of the country, particularly in Florida, Michigan, California, Ohio, Minnesota, New York, Oregon, and New Jersey (MARKLE).
5. Other production regions: World production was at approximately 7 million tonnes (7,716,179 tons) per year, as of 2004, mainly concentrated in Asia and Europe. Japan, Korea, Taiwan, and Yemen are major producers. Radish is also cultivated in tropical Africa and Canada (GRUBBEN 2004).
6. Use: Root vegetable, salad green, leafy vegetable, seasoning, pickles, kimchee, dried vegetable, fruiting vegetable, soups, fodder (MANSFELD, GRUBBEN, MARKLE).
7. Part(s) of plant consumed: Roots, tops, immature fruits.
8. Portion analyzed/sampled: Roots and tops; immature fruits for *R. sativus* var. *mougri* only.
9. Classifications:

a. Authors Class: Root and tuber vegetables; Crop Group 4: Leafy Vegetables, Leafy *Brassica* greens subgroup 4B

b. EPA Crop Group (Group & Subgroup): Root and tuber vegetables (1A and 1B); Leaves of Root and tuber vegetables (2). (Representative crop)

c. Codex Group: 016, Root and tuber vegetables, VR 0494, Radish; Group 013 (VL 0494) Leafy vegetables (including *Brassica* leafy vegetables), VL0494, Radish leaves

d. EPA Crop Definition: Radish, oriental, roots = *Raphanus sativus* var. *longipinnatus* (roots and tops), including Chinese or Japanese radish (both white and red), winter radish, daikon, lobok, lo pak, and other cultivars and/or hybrids of these. Radish, oriental, tops = *Raphanus sativus* var. *longipinnatus* (roots and tops), including Chinese or Japanese radish (both white and red), winter radish, daikon, lobok, lo pak, and other cultivars and/or hybrids of these.

10. References: GRIN, GRUBBEN 2004, MARKLE, MANSFELD, WIKIPEDIA, SCHNEIDER 2001, HU 2002
11. Production Map: All EPA Crop Production Regions.
12. Plant Codes:

a. Bayer Code: RAPSR (*R. sativus* var *sativus*), RAPSO (*R. sativus* var. *oleiformis*

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1. **Rapeseed** [rape greens, colpa, chou oleifere, bird rape, forage rape, annual rape, Argentine canola, canola, colza, oilseed rape, rape, summer rape, Swede rape, winter rape, ou zhou you cai, colza d'hiver, colza de printemps, navette, Sommerraps,Winterraps, ravizzone, nabina, nabo(GRIN, MARKLE)]

Brassicaceae

Brassica napus L. var. *napus* (syn: *Brassica campestris* f. *annua* Schübl. & G. Martens, *Brassica campestris* f. *biennis* Schübl. & G. Martens, *Brassica campestris* subsp. *napus* (L.) Hook. f. & T. Anderson, *Brassica napus* f. *annua* (Schübl. & G. Martens) Thell., *Brassica napus* var. *annua* W. D. J. Koch, *Brassica napus* f. *biennis*, *Brassica napus* var. *biennis* (Schübl. & G. Martens) Rchb., *Brassica napus* subsp. *oleifera* (Delile) Sinskaya, *Brassica napus* var. *oleifera* Delile, *Brassica napus* var. *sahariensis* A. Chev.)

1. **Field mustard** [brown sarson, toria, rapeseed oil, Indian rape, spring turnip rape, Indian colza, yellow sarson, canola, natane, winter turnip rape, yu tsai (GRIN, MARKLE)]

Brassica rapa subsp. *trilocularis* (Roxb.) Hanelt (syn: *Brassica campestris* var. *sarson* Prain, *Brassica campestris* subsp. *trilocularis* (Roxb.) G. Olsson, *Brassica napus* var. *glauca* (Roxb.) O. E. Schulz, *Brassica napus* var. *trilocularis* (Roxb.) O. E. Schulz, *Brassica rapa subsp. sarson* (Prain) Denford, *Brassica rapa var. trilocularis* (Roxb.) Kitam., *Brassica trilocularis* (Roxb.) Hook. f. & Thomson, *Sinapis glauca* Roxb., *Sinapis trilocularis* Roxb.)

Brassica rapa subsp. *dichotoma* (Roxb.) Hanelt (Syn: *Brassica campestris* var. *dichotoma* (Roxb.) G. Watt, *Brassica campestris* var. *toria* Duthie & J. B. Fuller, *Brassica napus* var. *dichotoma* (Roxb.) Prain, *Brassica rapa* var. *dichotoma* (Roxb.) Kitam., *Sinapis dichotoma* Roxb.)

Brassica rapa subsp. *oleifera* Metzg. (Syn: *Brassica campestris* a. *oleifera* DC., *Brassica rapa* c. *oleifera* DC.)

2. Rape is grown sparingly as a pot herb, more generally for livestock feed and as an oil source. As a pot herb the leaves of young plants are used. Leaves are generally lobed, 10-30 cm (4-12 in) long, half as wide, near glabrous, but with scattered hairs. Flower stems are much branched, up to 91 cm (3 ft). In exposure of edible parts young rape plants used as pot herbs are similar to spinach. Rapeseed oil is obtained from the seeds primarily of the species *B. napus* and *B. rapa* and the oil from different species is not distinguished on the market, since all have similar properties. Rapeseed oil is vastly important in North America, Europe, and Asia. The small, near globular seeds are borne in elongated, closed capsules. They contain 30 to 45 percent of a semi-drying oil. The oil is separated either by solvent extraction or by cold or hot pressing. The term "colza" refers to refined oil. Low glucosinolate and erucic acid levels are now defined as “double low” or canola quality, which is less than 2 percent erucic acid and having less than 30 micromoles of aliphatic glucosinolates per gram of defatted meal and are called low erucic acid rapeseed. This is the edible cooking oil most people are familiar with, and it is primarily made from specific varieties bred to produce high quality, edible oil. Non-canola types of rapeseed oil are not usable for food but are of importance in industry and as a potential biofuel. The by-products of rapeseed production are used in animal fodder and feed (MARKLE, PURDUE, WIKIPEDIA, MANSFELD).

3. Crop data:

a. Season: Depending on the cultivar and climate, may be grown at nearly any time of the year (MARKLE, PURDUE).

b. Cultivation: There are summer, winter, and spring cultivars and their requirements vary. In general, rapeseed grows best in mild maritime climates and requires good drainage and a light, somewhat sandy soil rich in organic material. It needs adequate moisture to bloom and set pods. Optimum growth occurs at temperatures around 20 °C (68 °F) for most types, although it can survive up to 30 °C/86 °F and down to -4 °C/24.8 °F (or -30 °C/-22 °F) for short periods if hardened off properly). Boron deficiency can cause low yields (PURDUE).

c. Availability in the marketplace: Very common as a cooking oil or ingredient in margarine in North America, Europe, and Asia.

d. Preparation for cooking: Seeds are pressed for the edible oil (usually commercially) which is either sold by itself or used as an ingredient in other food products. The young leaves may be eaten in a salad or cooked as a potherb, although it is not cultivated commercially for this purpose in the U.S. (MARKLE, MANSFELD, WIKIPEDIA).

e. Nutritional aspects: High in omega-3 and omega-6 fatty acids (WIKIPEDIA)

f. Medicinal aspects: No data.

g. Crop photos.

4. Production in U.S.: Production of rapeseed in the U.S. in 2008 was 655,610 tonnes/722,686 tons, and it is cultivated throughout the country, particularly in the Midwest (MARKLE, FAOSTAT).

5. Other production regions: Worldwide production in 2008 was 58,061,092 tonnes/64,000,000 tons. Top producing countries included Canada (12,642,900 tonnes/13,940,000 tons), China (12,102,010 tonnes/13,340,000 tons), India (5,834,000 tonnes/6,431,000 tons), Germany (5,154,700 tonnes/5,682,000 tons), and France (4,719,053 tonnes/5,202,000 tons) (FAOSTAT).

6. Use: Primarily industrial and edible oils. Also use for potherb and grazing (MARKLE).

7. Part(s) of plant consumed: Seeds and leaves (green) (MARKLE).

8. Portion analyzed/sampled: Oil use: Seeds and its processed commodities meal and refined oil. Foliage use: Leaves (green). For rapeseed meal, residue data are not needed for non-canola type rapeseed oil since it is produced for industrial uses and is not an edible oil. The edible oil is only produced from canola. Meal is required for both, but it is recommended to conduct the trials on canola to include both (MARKLE).

9. Classifications:

a. Authors Class: Oilseed; Crop Group 4: Leafy Vegetables, Leafy *Brassica* greens subgroup 4B

b. EPA Crop Group (Group & Subgroup): Oilseed group 20, rapeseed subgroup 20A; Rape greens – Brassica (Cole) Leafy Vegetables group 5, Leafy *Brassica* greens subgroup 5B.

c. Codex Group: 013 (VL 0495) Leafy vegetables (including *Brassica* leafy vegetables), VL 0495, Rape greens; Group 023, SO 0495, Rape seed; Group 023, Oilseed for field mustard seed, SO 0694, Mustard seed, Field; Group 067, Crude vegetable oils, OC 0495, Rape seed oil, crude; Group 068, Edible vegetable oils, OR 0495, Rape seed oil, edible

d. EPA Crop Definition: Rapeseed = *B. napus*, *B. campestris* and *Crambe absyssinica* (oilseed-producing varieties only which include canola and crambe).

10. References: GRIN, MARKLE, MANSFELD, WIKIPEDIA, PURDUE, FAOSTAT, FAOSTAT, PLANTS.

11. Production Map: All EPA Crop Production Regions (PLANTS).

12. Plant Codes:

a. Bayer Code: BRSRO (*B. rapa* ssp. *oleifera*), BRSNN (*B. napus* var. *napus*)

1. **Rocket, wild** [Lincoln's-weed, sand mustard, sand rocket, wall rocket (GRIN)]
   Brassicaceae
   Diplotaxis tenuifolia (L.) DC. (Syn: *Sisymbrium tenuifolium* L.)
2. A weedy perennial native to Europe and western Asia, but naturalized through much of the temperate world. It is not well known, but the leaves are used in salads like arugula and it is gaining in popularity. It is often confused with arugula in culinary discussions but they are not the same plant. It forms a dense bushy rosette with erect branched stems up to 50 cm (19.7 in) tall. The leaves are lanceolate, up to 15 cm (6 in) long with irregular lobes. They are mainly confined to the lower parts of the stems and rosette. Flowers are four-parted and bright yellow borne on short flowering stems from the upper part of the plans. The fruit is a dehiscent pod from 1-4 cm (0.4-1.6 in) long by 5 mm (0.2 in) in diameter with a small beak-shaped end, the seeds are arranged in two rows. Although considered a weed in places, it is consumed in parts of Europe, particularly Italy, and may be gathered from the wild (MANSFELD, WIKIPEDIA, PLANTS FOR A FUTURE, WADAF).
3. Crop Data:
   a. Season, flowering: Summer (WADAF)
   b. Cultivation: In the wild grows well in waste places and disturbed areas. Prefers well-drained sandy soils. Propagation by seed. Light shade to full sun. Can tolerate dry or moist condition (PLANTS FOR A FUTURE, WADAR).
   c. Availability in the marketplace: Rare in our area; gathered from the wild or grown in home gardens. Available in some markets in Europe.
   d. Preparation for cooking: Leaves are used fresh in salads, much like arugula (MANSFELD).
   e. Nutritional aspects: No data.
   f. Medicinal aspects: No data.
   g. Crop Photos:
4. Production in U.S.: No data. Naturalized in North America.
5. Other production regions: Southern Europe; S. France and S. Italy, primarily (MANSFELD).
6. Use: Leafy vegetable.
7. Part(s) of plant consumed: Leaves
8. Portion analyzed/sampled: Leaves
9. Classifications:
   a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy *Brassica* greens subgroup 4B
   b. EPA Crop Group (Group & Subgroup): Miscellaneous
   c. Codex Group: No specific entry
   d. EPA Crop Definition: None
10. References: GRIN, MANSFELD, WIKIPEDIA, PLANTS FOR A FUTURE, WADAF, PLANTS.
11. Production Map: EPA Crop Productions Regions 1, 2, 3, 5, 6, 8, 9, 10, 11, and 12 (PLANTS).
12. Plant Codes:
   a. Bayer Code: DIPTEX

(520)

1. **Rutabaga** [Swede, Swedish turnip, Turnip-rooted cabbage, Laurentian turnip, Russian turnip, Nabo] Brassicaceae
   Brassica napus var. *napobrassica* (L.) Rchb. (syn: *Brassica napobrassica* (L.) Mill., *Brassica napus* subsp. *napobrassica* (L.) Jafri, *Brassica napus* subsp. *rapifera* (Metzg.) Sinskaya, *Brassica napus* var. *rapifera* Metzg., *Brassica oleracea* var. *napobrassica* L.)

2. Rutabaga is a biennial plant, grown as an annual, which originated in Europe and is known only in cultivation. Rutabaga originated as a cross between a turnip and a cabbage, and it is primarily grown as a root crop. In form and flavor it is very similar to turnip, but differing from turnip in having a denser-textured root which bears more side roots. The plant reaches 50-60 cm (1.6-2 ft) high. The leaves are glabrous with a bluish bloom, instead of hairy as in turnip. Roots are harvested at a more advanced stage than turnip, so the growing season is longer. Roots may be stored for winter use. Rutabagas are better adapted to northern regions than turnips. Rutabaga roots are harvested at 7.6-12.7 cm (3-5 in) in diameter, generally yellow or white fleshed (although white fleshed varieties are less sweet and often used only for fodder) with a tan to purple exterior skin, and are longer and rounder than turnips. The large, fleshy leaves are also edible and sometimes used as a leafy vegetable (MARKLE, MANSFELD, HU 2005. SCHNEIDER 2001, PURDUE, NCCE, AGGIE-HORT).

3. Crop Data:
   a. Season, seeding to harvest: Three months or more (MARKLE).
   b. Cultivation: Rutabaga cultivation is very similar to that of the turnip. Propagation is typically by seed. Rutabaga is a cool season crop and planting should be done in the very early spring or fall. Fall planted rutabagas take longer to mature than those planted in the spring. A moderately deep, highly fertile soil with pH 6.0 to 6.5 is preferred, and rutabaga does best in full sun. Spacing is typically 10 cm (4 in) within rows and 30-38 cm (12-15 in) between rows. Major insect pests are turnip aphids, flea beetles, root maggots and wireworm. Rutabagas are susceptible to clubroot, root knot, leaf spot, white rust, white spot, anthracnose and Alternaria (PURDUE, AGGIE-HORT, NCCE).
   c. Availability in the marketplace: Commonly found in North America, Europe, and Asia.
   d. Preparation for cooking: Rutabaga roots are usually eaten cooked (although they sometimes appear fresh and shredded in salads and slaws), and are typically peeled prior to preparation. They may be used like any other root vegetable and are oven boiled, baked, mashed, pureed or cut up and cooked with other vegetables or meat. They may also be made into vegetable chips. The leaves are cooked and eaten much like spinach or kale (WIKIPEDIA, SCHNEIDER, MANSFELD).
   e. Nutritional aspects: A 3-1/2 ounce cooked serving of rutabaga contains 144 calories, 35 percent of the RDA for vitamin C and only 18 milligrams of sodium (AGGIE-HORT).
   f. Medicinal aspects: No data
   g. Crop Photos:

4. Production in U.S.: No data, normally combined with turnip roots. Grown in Wisconsin, Minnesota and Washington (MARKLE).
5. Other production regions: Canada, Europe, China, Russia, India (MANSFELD, WIKIPEDIA).
6. Use: Root vegetable, leafy vegetable, animal fodder (MARKLE).
7. Part(s) of plant consumed: Root; occasionally leaves.
8. Portion analyzed/sampled: Root, (40 CFR 180.1 (J)(6) states that rutabaga tops are removed and discarded before analyzing roots).
9. Classifications:
   a. Authors Class: Root and tuber vegetables; Crop Group 4: Leafy Vegetables, Leafy *Brassica* greens subgroup 4B
   b. EPA Crop Group (Group & Subgroup): Root and tuber vegetables (1A and 1B); Leaves of root and tuber vegetables (2)
   c. Codex Group: 016 (VR 0497) Root and tuber vegetables, VR 0497 (see Swede, VR 0497; Group 01, Leafy vegetables (including *Brassica* leafy vegetables), VL 0497, Rutabaga greens.
   d. EPA Crop Definition: None

10. References: GRIN, MARKLE, MANSFELD, HU 2005. SCHNEIDER 2001, PURDUE, NCCE, AGGIE-HORT
11. Production Map: EPA Crop Production Regions 5, 8 10, 11 and 12 (MARKLE).
12. Plant Codes:
    a. Bayer Code: BRSNA

1. **Shepherd's purse** [bourse à Pasteur, capselle à Pasteur, Hirtentäschel, naengi, bolsa-de-pastor, erva-do-bom-pastor, zurrón de pastor (GRIN)]

Brassicaceae

Capsella bursa-pastoris (L.) Medik (syn: *Thlaspi bursa-pastoris* L.)

2. Shepherd's purse is an annual or biennial herbaceous plant found worldwide as a weed. The plant has a basal rosette of pinnately lobed, oblanceolate, variable leaves up to 10 cm (3.9 in) long. The fruiting and flowering stalk may reach up to 0.5 m (1.6 ft) tall and bears small, white, 4-parted flowers in terminal racemes. The fruit is a flattened triangular or heart-shaped pod, from which the plant takes its common name. Shepherd's purse has long been cultivated and gathered from the wild in China, Japan, and Korea as a leafy vegetable and medicinal plant. All parts of the plant are edible, including the flowers, flower stalk, seeds, and seed pods. In Korea it is also grown for the edible root. The general flavor of the plant is peppery or mustardy, similar to cress. Young leaves are often gathered before the plant can bolt so that they will have a more mild flavor (JUNG 2011, WIKIPEDIA, HU 2005, MANSFELD, PLANTS FOR A FUTURE, LARKCOM).

3. Crop Data:

a. Season, harvest: Nearly any time of year, depending on the part desired; tender leaves for salads are harvested in the early spring; in cultivation they may be harvested for the first time only a month after sowing (JUNG 2011, WIKIPEDIA, LARKCOM).

b. Cultivation: Shepherd's purse can and will grow nearly anywhere, under almost any conditions. It is not frost-tender and will grow in any soil, making it an ideal weed. Seeds are direct seeded in the field and will self-sow for the next year if allowed. It does not require external inputs to maintain itself. It will bolt quickly in hot or dry weather. It is best started in late autumn or early spring. It is susceptible to white rust and downy mildew (PLANTS FOR A FUTURE, LARKCOM, WIKIPEDIA).

c. Availability in the marketplace: Grows wild in many places; common in Korea, Japan, and parts of China.

d. Preparation for cooking: Young leaves are you used fresh in salads or added to soups. Older leaves may also be eaten raw or cooked in soups, stir-fried, or used to fill dumplings. They can also be dried for later use. The young flower stalks may also be eaten raw or cooked. The seeds may be eaten raw, roasted, or ground into a meal for the addition to soups, although this less common because the seeds are so small and difficult to harvest. They can also be pressed for an edible oil, and the entire seedpod may be used as a peppery seasoning. The root may be used dried or fresh, much like ginger (JUNG, PLANTS FOR A FUTURE, LARKCOM).

e. Nutritional aspects: Fairly high in protein; good source of calcium, iron, and Vitamin C (PLANTS FOR A FUTURE).

f: Medicinal aspects: Used as a traditional remedy to stop bleeding of various types (PLANTS FOR A FUTURE, MANSFELD).

g. Crop Photos:

4. Production in U.S.: No data; endemic as a weed.
5. Other production regions: Found wild nearly universally, but cultivated mainly in China, Japan, and Korea (MANSFELD, WIKIPEDIA).
6. Use: Vegetable (raw and cooked), seasoning, medicinal, cooking oil, root vegetable, animal fodder, insecticide, soil reclamation (MANSFELD, WIKIPEDIA, PLANTS FOR A FUTURE).
7. Part(s) of plant consumed: Primarily leaves but all parts of plant may be used.
8. Portion analyzed/sampled: Tops (leaves and stems)
9. Classifications:
   a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy *Brassica* greens subgroup 4B
   b. EPA Crop Group (Group & Subgroup): Miscellaneous
   c. Codex Group: No specific entry
   d. EPA Crop Definition: None
10. References: GRIN, JUNG 2011, WIKIPEDIA, HU 2005, MANSFELD, PLANTS FOR A FUTURE, LARKCOM, PLANTS
11. Production Map: All EPA Crop Production Regions (PLANTS).

12. Plant Codes:
    a. Bayer Code: CAPBP

1.**Turnip** [garden turnip, Italian kale, rappina, rappone, namenia, tendergreen, turnip green, Japanese greens, rapini, seven-top turnip, man jing, wu jing, höstoe, majroe, meiraap, stopelknol, navet, Herbstrübe, Mairübe, Speiserübe, Stoppelrübe, Wasserrübe, weiße Rübe, salgam, rapa, kabu, nabo, rábano, repa, turneps, nabo colza, nabo forrajero, rofva (GRIN, MARKLE)]

Brassicaceae

Brassica rapa L. subsp. *rapa* (syn: *Brassica campestris* var. *rapa* (L.) C. Hartm., *Brassica campestris* subsp. *rapifera* (Metzg.) Sinskaya, *Brassica napus* var. *quadrivalvis* (Hook. f. & Thomson) O. E. Schulz, *Brassica quadrivalvis* Hook. f. & Thomson, *Brassica rapa* subsp. *rapifera* Metzg., *Brassica rapa* var. *septiceps* L. H. Bailey, *Brassica septiceps* (L. H. Bailey) L. H. Bailey)

2. The turnip is a biennial grown as an annual, closely related to the rutabaga, which is cultivated nearly worldwide as both a root vegetable and a leafy green. The turnip has been cultivated both as a vegetable for human consumption and for animal fodder since antiquity. Although it is a cool season plant, it is even grown in tropical areas at high elevations. The plant first forms a rosette of thin, hairy leaves on slender petioles which resemble mustard greens. The root soon enlarges to a globular or generally flattened tuberous tissue, which is tender but later becomes tougher and somewhat fibrous. The root is round, and is typically white on the lower portion shading to red or purple on the upper parts where the root pokes above the soil. Roots are generally harvested when 7.6 cm (3 in) or less in diameter although they may reach up to 20 cm (7.9 in) in diameter and a kilogram in weight. Although turnip is usually thought of as a root crop only, the greens are eaten as a vegetable in many places including the southern U.S., Europe, and much of Asia. Certain varieties, such as seven-top, topper and Italian kale, are grown primarily for the leaves (MARKLE, MANSFELD, SCHNEIDER 2001, PURDUE, NCCE, WIKIPEDIA).

3. Crop Data:

a. Season, seeding to harvest: For greens about 4 to 7 weeks. For roots about 8 to 14 weeks (MARKLE).

b. Cultivation: Plants should grow rapidly for best quality, both for greens and roots. Turnip varieties grown for tops only can be harvested 1 to 3 times per season with first cutting about 1 month after seeding. A moderately deep, highly fertile soil with pH 6.0 to 6.5 is preferred, and turnip does best in full sun. Spacing is typically 10 cm (4 in) within rows and 30-38 cm (12-15 in) between rows. Turnip crops are attacked by two different flea beetles, which eat holes in the cotyledons and first leaves, chew stems and cause extensive plant loss. Turnip crops may suffer from clubroot, root knot, leaf spot, white rust, scab, anthracnose, turnip mosaic virus and Rhizoctonia rot (PURDUE, MARKLE, NCCE).

c. Availability in the marketplace: Turnips are ubiquitous throughout much of the world. In the U.S., turnips and turnip greens are typically sold separately, while in other countries they may be sold separately or whole with the leaves still attached.

d. Preparation for cooking: Turnips roots are usually peeled before consumption and may be eaten fresh in salads or slaws, or cooked with other vegetables and meat. Like any other root crop they may be boiled, baked, mashed, pureed, or used in soups. Turnip greens are eaten cooked as a potherb or a leafy vegetable. They are typically too hairy to eat raw, although young green may be lightly steamed or wilted instead of thoroughly cooked. Turnip greens are used like mustard greens and have a similar flavor. They may be steamed, stir-fried, or used in soups or as a side-dish. Leaves are also canned or frozen for later use (MARKLE, WIKIPEDIA, SCHNEIDER 2001).

e. Nutritional aspects: Turnip roots as high in vitamin C. Turnip greens are a good source of vitamin A, folate, vitamin C, vitamin K, and calcium. They are also high in lutein (WIKIPEDIA).

f. Medicinal aspects: No data.

g. Crop Photos:

4. Production in U.S.: Turnips, both for greens and roots, are grown throughout much of the U.S., particularly in Georgia, California, North Carolina, Texas, New Jersey, Oregon, South Carolina, Michigan, Tennessee, Indiana, Oklahoma, Alabama, Arkansas, North Carolina, Illinois, and Ohio (MARKLE).

5. Other production regions: Grown throughout much of the world, particularly North America, Europe, Asia, North Africa, and New Zealand (MANSFELD).
6. Use: Root vegetable, leafy vegetable, animal fodder (both roots and leaves).
7. Part(s) of plant consumed: Roots tops (leaves).
8. Portion analyzed/sampled: Roots and tops (leaves). Analyze separately.
9. Classifications:
    a. Authors Class: Root and tuber vegetables; Crop Group 4: Leafy Vegetables, Leafy *Brassica* greens subgroup 4B
    b. EPA Crop Group (Group & Subgroup): Root and tuber vegetables (1A and 1B); Leaves of root and tuber vegetables (2) (Tops are representative crop)
    c. Codex Group: 013 (VL 0506) Leafy vegetables (including *Brassica* leafy vegetables), VL 0506, Turnip greesn; Group 016, Root and tuber vegetables, VR 0506, Turnip, Garden; Group 052, Miscellaneous Fodder and Forage crops, AM 0506, Turnip fodder; Group 052, Miscellaneous Fodder and Forage crops, AV 0506, Turnip leaves or tops.
    d. EPA Crop Definition: Turnip tops or greens = Broccoli raab (raab, raab salad), hanover salad turnip tops (turnip greens).
10. References: GRIN, MARKLE, MANSFELD, SCHNEIDER 2001, PURDUE, NCCE, WIKIPEDIA.
11. Production Map: EPA Crop Production Regions: Turnip roots: 1, 2, 3, 4, 5, 6, 10, 11 and 12; Turnip tops: 2, 3, 4, 5, 6, 8 and 10 (MARKLE).
12. Plant Codes:
    a. Bayer Code: BRSRR

(647)

1. **Watercress** [crestles, berro, eker, biller, bilure, ribcress, brown cress, wellgrass, leko, teng tongue, long tails, berro de agua, cresson de fontaine, upland watercress, bronkors, cresson d'eau, Brunnenkresse, selada-air, mizu-garashi, oranda-garashi, agrião (GRIN, MARKLE)]

Brassicaceae

Nasturtium officinale W. T. Aiton (syn: *Nasturtium nasturtium-aquaticum* (L.) H. Karst., *Radicula nasturtium* Cav., *Radicula nasturtium-aquaticum* (L.) Rendle & Britten, *Rorippa nasturtium* Beck, *Rorippa nasturtium-aquaticum* (L.) Hayek, *Sisymbrium nasturtium* Thunb., *Sisymbrium nasturtium-aquaticum* L.)

2. Watercress is a perennial, creeping, semi-aquatic herb probably native to Europe, but now distributed nearly worldwide. The leaves are fleshy, smooth, and pinnatisect, three to a dozen nearly round leaflets and terminal segments 1-3 cm (0.4-1.2 in) long and 1-2.5 cm (0.4-1 in) wide. The plant is characterized by floating or ascending stems up to 1 m in length, and has small, white flowers in short terminal racemes. The plant is grown for the pungent leaves and young stems, which are widely used for garnishing and in salads, as well as a potherb. It is also sometimes grown and sold as sprouts. Watercress has a sharp, peppery taste, which is appealing. In the wild it is found along side streams or other water sources, either growing in the wet soil or in the water itself. Watercress that does not have enough water while growing becomes much hotter in flavor and inedible. Watercress is grown mostly in Europe, Africa, Southeast Asia, and the U.S., although in some places it is regarded as a weed (MARKLE, MANSFELD, HU 2002, PROTA, PLANTS FOR A FUTURE, WIKIPEDIA, PURDUE).

3. Crop data:

a. Season: Cutting continuous throughout year. About 3 weeks after the seedlings appear, the plants are ready to harvest or 4-6 weeks after cuttings are transplanted. Harvested leaves are from 4 to 12 inches (MARKLE).

b. Cultivation: Watercress is normally grown in pools of gently flowing water. The leaves and stems are partially submerged during growth. However, in commercial cultivation in many countries, including the U.S., the flooded fields are drained prior to the application of pesticides. Therefore, for the purposes of residues, watercress cannot truly be considered an aquatic plant. Care must be taken with watercress to insure the water source is not contaminated, as that will contaminate the harvest. Water cress may be propagated by seed or by cutting. Beds of watercress can be maintained for about ten years without re-sowing or replanting, if it is not harvested too often (more than once per month). Optimum soil ph is 7.2. If watercress is to be grown as a perennial, it must have frost-free winters. Watercress does not last long after harvest, and even with careful packaging must be used within a few days of harvest (MARKLE, PURDUE, PROTA, WIKIPEDIA, PLANTS FOR A FUTURE).

c. Availability in the marketplace: Fairly common in markets in the U.S., Asia, Europe, and Africa.

d. Preparation for cooking: Watercress maybe added fresh to salads or used as a garnish, or cooked as a potherb in soups, or added to other dishes for nutrition and flavor.

e. Nutritional aspects: High in calcium, vitamin A, vitamin C, iron, and folic acid (PLANTS FOR A FUTURE, WIKIPEDIA).

f. Medicinal aspects: In herbal medicine it is considered a diuretic, an expectorant, and a digestive aid, and is used in many traditional remedies. Watercress is beneficial for the thyroid, and can be used to prevent scurvy (PLANTS FOR A FUTURE, WIKIPEDIA, PROTA).

g. Crop Photos:

4. Production in U.S.: Florida, California, Hawaii, Maryland, and Virginia (MARKLE).

5. Other production regions: Canada, Europe, E. Africa including Ethiopia and surrounding countries, the Indies, the Philippines, Madagascar, China, Japan, United Kingdom, France, Indonesia (MARKLE, MANSFELD, HU 2002, PROTA, WIKIPEDIA).

6. Use: Leafy green, garnish, potherb, medicinal, sprouts (MARKLE, MANSFELD, PLANTS FOR A FUTURE).

7. Part(s) of plant consumed: Leaves and young stems.

8. Portion analyzed/sampled: Leaves and stems.

9. Classifications:
    a. Authors Class: Crop Group 4: Leafy Vegetables, Leafy *Brassica* greens subgroup 4B
    b. EPA Crop Group (Group & Subgroup): Miscellaneous
    c. Codex Group: 013, Leafy vegetables (including *Brassica* leafy vegetables), VL 0473, Watercress
    d. EPA Crop Definition: None
10. References: GRIN, MARKLE, MANSFELD, HU 2002, PROTA, PLANTS FOR A FUTURE, WIKIPEDIA, PURDUE, PLANTS.
11. Production Map: All EPA Crop Production Regions (PLANTS).
12. Plant Codes:
    a. Bayer Code: NAAOF

ATTACHMENT 6. MONOGRAPHS – LEAVES OF ROOT AND TUBER VEGETABLES (HUMAN FOOD)

1. **Alexanders** [black-lovage, horse-parsley, maceron (GRIN)]
Apiaceae
Smyrnium olusatrum L.
2. An erect, glabrous perennial reaching up to 1.5 m (5 ft), probably native to the Mediterranean and now spread through much of Europe, parts of Asia, and North Africa. Leaves pinnately divided and dark green, with a long, sheathed petiole. Stems are thick and often grooved. Tiny flowers borne in terminal umbels. In overall appearance typical of the family Apiaceae. Alexanders has been in cultivations since ancient times, perhaps as early as in the Iron Age. It is not very popular today, having been mostly replaced by celery, but it still is grown and used as a vegetable in some places, particularly in Europe where it still grows wild. The young shoots, leaves, leaf petioles, and stems are all eaten as vegetables, with the petioles and stems eaten much like celery, both raw and cooked. The leaves are used much like parsley. The taste is bitter when raw, turning blander after cooking. The stems can be blanched when growing to decrease bitterness. The root is also eaten and is used as a parsnip substitute. The flower buds maybe added to salads and the pungent seeds can be used as a pepper substitute. The whole plant is also used medicinally (MANSFELD, PLANTS FOR A FUTURE, WRIGHT 2001, BURTON 2002, WIKIPEDIA).
3. Crop Data:
a. Season, harvest: Fall into winter (PLANTS FOR A FUTURE).
b. Cultivation: Prefers an open position in well drained, moisture retaining soils, but also grows well in partial shade and on woodland edges (PLANTS FOR A FUTURE).
c. Availablity in the marketplace: Whole plant rarely found, but seeds can be purchased for home gardening and is sometimes gathered from the wild.
d. Preparation for cooking: Foliage and stems eaten fresh in salads, boiled or made into sauces. Root cooked like parsnip. Flowers eaten fresh (PLANTS FOR A FUTURE, BURTON 2002)
e. Nutritional aspects: No data.
f. Medicinal aspects: Considered a diuretic and digestive (BURTON 2002).
g. Crop Photos:
4. Production in U.S.: No data.
5. Other production regions: Grown throughout much of Europe and temperate Asia (PLANTS FOR A FUTURE).
6. Use: Vegetable, sauces, seasoning, medicinal (BURTON 2002, PLANTS FOR A FUTURE).
7. Part(s) of plant consumed: Leaves, roots
8. Portion analyzed/sampled: Leaves, roots
9. Classifications:
a. Authors Class: Root and tuber vegetables and leaves of root and tuber vegetables
b. EPA Crop Group (Group & Subgroup): Miscellaneous
c. Codex Group: No specific entry
d. EPA Crop Definition: None
10. References: MANSFELD, PLANTS FOR A FUTURE, WRIGHT 2001, BURTON 2002, WIKIPEDIA
11. Production Map: No entry
12. Plant Codes:
a. Bayer Code: SMYOL

(065)

1. **Beet, Garden** [garden beet, table beet, ramolacha, betterave, betabel, beetroot, field beet, fodder beet, foliage beet, mangel, mangel-wurzel, mangold, red beet, Sicilian broad-rib beet, spinach beet, spinach chard, sugarbeet, Swiss chard, yellow beet, betterave fourragère, betterave jaune, betterave potagère, betterave rouge, betterave sucrière, poirée à couper, poirée à carde, Futterrübe, rote Bete, rote Rübe, Runkelrübe, Zuckerrübe, Mangold, Schnittmangold, Stielmangold, beterraba, beterraba-açucareira, beterraba-forrageira, beterraba-sacarina, acelga, betarraga azucarera, betarraga forrajera, remolacha amarilla , remolacha azucarera, remolacha colorada, remolacha de mesa, remolacha forrajera, remolacha roja, acelga (GRIN)]

Chenopodiaceae

Beta vulgaris L. subsp. *vulgaris* (syn: *Beta altissima* Steud., *Beta brasiliensis* hort. ex Voss, *Beta chilensis* hort., *Beta cicla* (L.) L., *Beta vulgaris* var. *altissima* Döll, *Beta vulgaris* subsp. *cicla* (L.) W. D. J. Koch, *Beta vulgaris* var. *cicla* L., *Beta vulgaris* cv. *conditiva* Alef., *Beta vulgaris* cv. *crassa* Alef., *Beta vulgaris* subsp. *flavescens* Lam., *Beta vulgaris* var. *flavescens* (Lam.) DC., *Beta vulgaris* var. *rapacea* W. D. J. Koch, *Beta vulgaris* f. *rhodopleura* (Alef.) Helm, *Beta vulgaris* var. *rubra* DC., *Beta vulgaris* cv. *saccharifera* Alef.)

2. An herbaceous plant grown primarily for its enlarged bulbous root and thick, edible foliage. All cultivated varietes fall into this subspecies; for information on those grown solely for foliage see Swiss Chard. The beet is normally a biennial, producing a rosette of leaves and the bulbous root one year, and a seed stalk the following year. However in cultivation it is usually treated as an annual as the root become tougher and harder with age. It is most likely originally native to the Mediterranean, and is of ancient origin. Today it is grown throughout Europe and the U.S. The root is typically dark pink or red, although white, golden, and striped cultivars exist as well. The leaves are large, dark green and thick with a large, often brightly colored midrib. The foliage of the varieties cultivated for the root may also be eaten, and beets are often sold with greens still attached, which may be used fresh in salads or cooked like any other leaf vegetable. The roots are extremely sweet, and are eaten cooked as a vegetable. Root beets are typically divided in to "garden beets" and "sugar beets". The vast majority of commercially produced garden beets are canned or pickled and sold in supermarkets in the U.S. and Europe. In Easten Europe borscht, a cold soup made from beets is very popular. Sugar beets are grown specifically for its high sugar content and processed commercially into table sugar and other sweetening products such as syrup. Byproducts of the sugar beet industry pulp, which is used as animal fodder, and pulp mixed with raw juice, which is solds as a fertilizer or growing medium for yeast. Various alcoholic beverages in Europe are also made from sugar beet juice, and other types of beet juice are also valued for their (non-fermented) juice, which is considered extremely healthy (MANSFELD, WIKIPEDIA, MARKLE, NGA).

3. Crop data:

a. Season, seeding to harvest: About 2 to 4 months. Fresh market beets are generally harvested 55-80 days after planting and processing beets 90-110 days (MARKLE).

b. Cultivation: Plants are usually harvested for fresh market or processing when the near globular or oblate enlarged root is not more than 5 cm (2 in) in diameter. At that stage the root is tender, but becomes harder and tougher with greater age. The beet develops best under cool conditions, so may be grown in winter in the far South, or in summer in the North. Baby beets are about 2.5 cm (1 in) in diameter and harvested about 40 to 54 days after seeding (MARKLE).

c. Availablity in the marketplace: Commonly available throughout the U.S. and Europe, as well as cooler parts of Asia and South America.

d. Preparation for cooking: Garden beet roots are usually cooked by boiling or pickled before being eaten. Beet leaves are eaten fresh in salad, boiled or steamed. Sugar is extracted from sugar beets in an elaborate process through which the juice is extracted, carbonated, evaporated, crystallized, and granulated (WIKIPEDIA, MANSFELD).

e. Nutritional aspects: Roots are rich in betaine, which is important for cardiovascular health and may also protect from liver disease. Beet root juice has been shown to lower blood pressure. Beets are also rich in boron (WIKIPEDIA).

f. Medicinal aspects: Long used an aphrodisiac, notably by the Romans, and also traditional used to treat a variety of illnessness, primarily those relating to digestion or the blood (WIKIPEDIA).

g. Crop Photos:

4. Production in U.S.: Fresh market beets grown primarily in Wisconsin, New York, Oregon, Texas, California, and New Jersey (MARKLE).
5. Other production regions: Sugar beet producing countries are Australia, Brazil, Thailand, South Africa, India, and various European countries (SUCROSE)
6. Use: Vegetable, canned vegetable, pickles, animal fodder, dye, sugar/sweetener, alcohol, medicinal, juice (WIKIPEDIA, MARKLE, MANSFELD).
7. Part(s) of plant consumed: Root and tops (leaves)
8. Portion analyzed/sampled: Root and tops (leaves); Analyzed separately.
9. Classifications:
    a. Authors Class: Root and tuber vegetables and leaves of root and tuber vegetables
    b. EPA Crop Group (Group & Subgroup): Root and tuber vegetables (1A and 1B); Leaves of root and tuber vegetables (2) (Representative Crop)
    c. Codex Group: 013, Leafy vegetables (including Brassica leafy vegetables, VL 0464, Chard; Group 016, Root and tuber vegetable, VR 0574, Beetroot and VR 0596, Sugar beet; Group 052, Miscellaneous Fodder and Forage crops, AV 0596, Sugar beet leaves or tops
    d. EPA Crop Definition: None
10. References: GRIN, CODEX, MARKLE, WIKIPEDIA, MANSFELD, NGA, SUCROSE
11. Production Map: EPA Crop Production Regions 1, 2, 5, 6, 7, 8, 9, 10 and 12.
12. Plant Codes:
    a. Bayer Code: BEVD

1. **Bellflower, Chinese** [balloonflower, platycodon, jie geng, kikyo, toraji (GRIN)]
   Campulanaceae
   Platycodon grandiflorus (Jacq.) A. DC. (syn: *Campanula glauca* Thunb., *Campanula grandiflora* Jacq., *P. glaucus* (Thunb.) Nakai)
2. Perennial herbaceous plant native to East Asia, growing 0.4-05 m (1.3 – 1.6 ft) tall. It has branching stems, sharply dentate leaves, and large five-parted blue flowers (although cultivars with white or pink flowers also exist). It also has a long, carrot like taproot, up to 20 cm (7.9 in). It is often grown in the U.S. as an ornamental, but in China and Korea it is valued both as a vegetable and as a medicinal plant. In Korea the root is the main part used, both fresh and dried. In China, the leaves and young shoots are eaten cooked, as a potherb. Many ornamental cultivars also exist (PLANTS FOR A FUTURE, WIKIPEDIA, EFLORAS, HU 2005, KADEREIT 2007).
3. Crop Data:
   a. Season, harvest: Young shoots collected March-April; roots gathered in fall after leaves have withered (HU 2005).
   b. Cultivation: Frost tolerant. Grows well in most temperate areas; prefers light, sandy soil and full to partial sun (PLANTS FOR A FUTURE).
   c. Availablity in the marketplace: Mainly found in China and Korea; can be purchased in Chinese grocery stores in the U.S.
   d. Preparation for cooking: Leaves cooked; root peeled and used fresh, dried, boiled, or pickled (PLANTS FOR A FUTURE, HU 2005).
   e. Nutritional aspects: No data.
   f. Medicinal aspects: An effective expectorant and anti-inflammatory, much used in Asian medicine. Basal leaves may be toxic (PLANTS FOR A FUTURE, KADEREIT 2007).
   g. Crop Photos:
4. Production in U.S.: Mainly ornamental, fairly common in American gardens (HU 2005).
5. Other production regions: Temperate Asia including China, Korea, Hong Kong, Japan, and East Siberia (WIKIPEDIA, HU 2005)
6. Use: Ornamental, medicinal, vegetable, soup, tea, seasoning (PLANTS FOR A FUTURE, HU 2005).
7. Part(s) of plant consumed: Leaves (tops), taproot
8. Portion analyzed/sampled: Leaves (tops), taproot
9. Classifications:
   a. Authors Class: Root and tuber vegetables and leaves of root and tuber vegetables
   b. EPA Crop Group (Group & Subgroup): Miscellaneous
   c. Codex Group: No specific entry
   d. EPA Crop Definition: None
10. References: EFLORAS, GRIN, PLANTS FOR A FUTURE, HU 2005, KADEREIT 2007, WIKIPEDIA.
11. Production Map: EPA Crop Production Regions 1 and 2
12. Plant Codes:
a. Bayer Code: PLXGR

1. **Cassava** (Manioc, Mandioca, Tapioca plant, Sweet potato tree, Yuca, Miami fries, Manihot)
Euphorbiaceae
Manihot esculenta Crantz

2. Cassava is a short-lived perennial shrub, native to the tropical Americas but cultivated as a food source throughout the non-arid tropical world. Cassava has large, palmately lobed (5-7 lobes) leaves and some varieties may reach up to 5 m (16 ft) in height. The tuberous roots form in a cluster at the stem base and are 20-38 cm (8-15 in) long with some to 0.9 m (3 ft) long. It is mainly valued for the roots, which are extremely high in starch and are the third largest source of carbohydrates in the human diet worldwide. Although it is a staple food in many countries, it is important to note that all parts of the plant contain cyanide as well as several other toxins, and that they must be carefully detoxified before consumption. The many varieties of cassava as usually divided into "bitter" (high amounts of HCN) and "sweet" (lower amounts of HCN) types. The bitter types may require extended soaking or fermentation before it is safe to eat, while some of the sweet types may be rendered safe by simple cooking. It is advisable to take care with this process, as consumption improperly prepared cassava has been known to cause paralysis and even death. This is most common in rural areas where local people process their own cassava; the commercial processing methods are complex and very effective at removing toxins. For food use, the root is peeled and pounded and dried into flour (tapioca), boiled or deep fried, as a root vegetable, fermented, dried and eaten, or squeezed for the juice. Tapioca flour is used in cakes, puddings, stews, soups, bread, chips, to make distinctive tapioca "pearls", and many other food products. Without treatment, such as freezing or coating in wax, the whole roots are highly perishable. The leaves, particularly the young leaves and shoots, are eaten as a vegetable in Africa, parts of Southeast Asia, and the Indes. These must be carefully pounded or soaked and then cooked for several hours before use, as they contain much higher amounts of HCN than the root and may always retain trace amounts of it. Cassava roots and leaves are also used for animal fodder, and cassava is under investigation as potential biofuel (MARKLE, MANSFELD, LANCASTER 1983, PURDUE, WIKIPEDIA, FAODOC).

3. Crop data:
   a. Season, planting to harvest: Usable roots in 8 to 16 months. Although there is no "mature" stage, as the plant ages the center portion of the root becomes woody and inedible. Leaves may be harvested every month after the first 5 months if grown primarily for leaves, or every 2-3 months without negatively impacting the root harvest (MARKLE, PURDUE, LANCASTER 1983).
   b. Cultivation: Propogated through vegetative cuttings, which must be carefully oriented in the ground so that the top of the plant is up. Typical spacing is 1 m x 1 m. Not frost hardy, can withstand moist conditions and drought, but does not tolerate flooding (PURDUE).
   c. Availiblity in the marketplace: Fairly common in some form worldwide, although in non-tropical areas tapioca flour and products are the most common form available, due to the perishability of the whole root.
   d. Preparation for cooking: Roots must always be peeled before use. See above.
   e. Nutritional aspects: Leaves are high in protein, calcium, and iron. Roots contain large amounts of starch (MANSFELD, LANCASTER 1983).
   f. Medicinal aspects: Folk medicine uses for digestive problems and malaria. In the West, valued as a gluten-free substitute for people allergeric to wheat (WIKIPEDIA).
   g. Crop Photos:

4. Production in U.S.: No data but some production in Guam, Puerto Rico, and the Virgin Islands (MARKLE).

5. Other production regions: World production in 2007 was more than 214 million tonnes. Top producing countries included Nigeria (34,410,000 tonnes), Thailand (26,915,541 tonnes), Brazil (26,541,200 tonnes), and the Congo (15,004,430 tonnes). Cassava is grown throughout Africa, Tropical Asia, and South America (FAOSTAT).

6. Use: Root vegetable, leaf vegetable, starch, flour, thickener, sauces, medicinal, animal fodder, biofuel (MANSFELD, WIKIPEDIA).

7. Part(s) of plant consumed: Roots and young leaves

8. Portion analyzed/sampled: Roots and leaves

9. Classifications:
    a. Authors Class: Root and tuber vegetables and leaves of root and tuber vegetables
    b. EPA Crop Group (Group & Subgroup): Root and tuber vegetables (1C and 1D); Leaves of root and tuber vegetables (2).
    c. Codex Group: 016, Root and tuber vegetables, VR 0463, Cassava and Group 013, Leafy vegetables (including Brassica leafy vegetables), VL 0463, Cassava leaves
    d. EPA Crop Definition: None
10. References: GRIN, MARKLE, MANSFELD, LANCASTER 1983, PURDUE, WIKIPEDIA, FAODOC, FAOSTAT
11. Production Map: EPA Crop Production Regions 3, 4, 6, 8, and 13.
12. Plant Codes:
a. Bayer Code: MANES

(**142)**

1. **Chayote** (choco, xuxu, alligator pear, kajot, choke, merliton, christophine, vegetable pear, pepineca, chayotli, mirliton, mango squash, custard marrow, cho-cho, talote, chayotte)

Cucurbitaceae

Sechium edule (Jacq.) Sw. (syn: *S. edulis* Jacq.)

2. A tender, perennial vine native to Central America and now cultivated throughout most of the warm-temperate to tropical areas of the world. It was cultivated in Mexico since pre-Columbian times and was quickly spread by the Spanish explorers into South America, as well as brought back to Europe and spread widely from there. Vines may reach in excess of 9.1 m (30 ft) and may be grown along the ground or trellised. Leaves are large and rough to the touch, palmate in shape and often lobed. The vine produces many climbing tendrils. The small, white to green flowers are borne in the axils and produce pear-shaped, whitish, greenish, or brownish fruit with a long wrinkle or fold along the bottom of the wider end. The fruit may vary in texture as well as color, from smooth to very winkled or hairy. The roots are long and tuberous. All parts of the plant are consumed. The fruit is the most recognizable commodity, often compared with winter squash, but the nutritrious roots and young leaves are also valued as food. The seeds are also eaten and have a nutty flavor. In addition to feeding humans, all parts of the plant are valued as animal fodder, as it is very cost-effective to grow (MARKLE, MANSFELD, HORTWISC, PURDUE, FLORIDATA, SAADE).

3. Crop data:

a. Season, bloom to maturity: About 2 months, but bloom and fruit setting continuous. Seeding to first harvest is about 6 months (MARKLE)

b. Cultivation: Chayote requires full sun and relatively warm temperatures. It is still grown in a large part in traditional home garden cultivation throughout much of the world. However, there is also a large amount of commercial cultivation. Traditionally, the entire fruit is planted in the spring or at the start of the rainy season and spaced 3 m (10 ft) apart with each plant producing 30 to 35 fruits, and may be grown along the ground, trellised, or trained to grow up a tree. Commerically the plant is nearly always trellised to minimize disease and loss of fruit, and new plants are more often grown from cuttings than from seed. Requires a lot of care immediately after planting (irrigation, fertilizer, etc) but grows quickly and becomes hardy. May even be grown as an annual in cooler temperate climates, but requires day lengths of at least 12 hours to bloom and set fruit. Bearing life of the plants is 3-5 years (MARKLE, HORTWISC, PURDUE, FLORIDATA).

c. Availability in the marketplace: Widely available throughout much of the world. Less common in colder climates, although may be found in areas that have a high concentration of immigrants Central America, South America, India, or Asia.

d. Preparation for cooking: The fruit may be eaten raw in salads or salsa (although it is quite bland on its own), or cooked in stirfries, casseroles, soups, and curries. It can be fried, pickled, roasted, boiled, scalloped, or sautéed. The seed is soft may be fried, sautéed with butter, or roasted. The tuber is similar to a yam and used in much the same ways, including being candied, baked, fried, and used in desserts. The leaves are steamed and used like spinach, and the shoot tips may be eaten like asparagus.

e. Nutritional aspects: No data.

f. Medicinal aspects: No data.

g. Crop photos:

4. Production in U.S.: Grown in Florida, Louisana, California, and Puerto Rico.

5. Other production regions: Main commericially producing countries are Costa Rica, Guatemala, Mexico and the Dominican Republic. But cultivated also in Europe, Asia, Africa, India, and Australia (SAADE, HORTWISC, MARKLE, MANSFELD).

6. Use: Raw vegetable, cooked vegetables, salads, soups, curries, stews, dessert, tea, fodder, fiber, nectar (MANSFELD, MARKLE, PURDUE, HORTWISC).

7. Part(s) of plant consumed: Fruit including seed, tuberous root, young leaves and shoots.

8. Portion analyzed/sampled: Fruit including seed, tuberous root, young leaves and shoots.

9. Classifications:
    a. Authors Class: Root and tuber vegetables and leaves of root and tuber vegetables
    b. EPA Crop Group (Group & Subgroup): Root and tuber vegetables (1C and 1D) and Cucurbit vegetables (9B).
    c. Codex Group: 016, Root and tuber vegetables, VR 0423, Chayote root and Group 011, Fruiting vegetables, Cucurbits, VC 0423, Chayote
    d. EPA Crop Definition: Summer squash (fruit) = Chayote (fruit)
10. References: GRIN, MARKLE, MANSFELD, HORTWISC, PURDUE, FLORIDATA, SAADE
11. Production Map: EPA Crop Production Regions 4 and 13.
12. Plant Codes:
    a. Bayer Code: SEHED

(**153)**

1. **Chicory** [common chicory, Italian dandelion, asparagus chicory, catalogua chicory, succory, achicoria, Frisee, Radichetta, Green chicory, coffee chicory, chicory root, radicchio, Begium endive, Belgian endive, Brunswick chicory, Magdeburg, red chicory, white endive, red endive, French endive, ondeev, chicon, witloof, chicory, Brussels chicory, succory, witloof, chicorée, chicorée de Bruxelles, endive witloof, Chicorée, Kaffeezichorie, Salatzichorie, Wegwarte, Wurzelzichorie, achicoria de Bruselas, achicoria de café, achicoria de raíz (GRIN, MARKLE)]

Asteraceae

Cichorium intybus L. [(Syn: *Cichorium intybus* var. *foliosum* Hegi, *Cichorium intybus* var. *sativum* (Bisch.) Janch. (GRIN)]

2. Chicory is a perennial herbaceous plant reaching up to 1 m (3.3 ft) at maturity, native to Europe and southwestern Asia but naturalized in the U.S. and Australia. Chicory is a useful plant and has been cultivitated since antiquity for the root, the tender young leaves, and the forced head known as Belgian endive. At maturity, chicory is erect in growth form with tough, woody stems. The leaves are stalked, lanceolate and unlobed. The composite flower heads are 2-4 cm (0.79-1.6 in) wide, and bright blue. Chicory may be grown in many different ways, depending on the desired crop, and there are a large number of cultivars. Asparagus or Catalogua chicory is grown for the tender leaves and flower shoots, and used as pot herbs or salad greens. Radicchio is red and resembles a small romaine or head lettuce with a zesty flavor. Mature roots of chicory are dried, ground and used as a coffee substitute or supplement. Roots are also grown during the summer, dug and buried upright in damp sand or other material for year round forcing in a dark, warm place for blanched tops. This produces the witloof, Belgian, white, red or French endive, used as a tender salad vegetable or cooked vegetable. Roots are held in cold storage for 6 to 11 months before being forced. All parts of the plant have a slightly bitter flavor (MARKLE, MANSFELD, SCHNEIDER 2001, WIKIPEDIA, PURDUE).

3. Crop Data:

a. Season, seeding to harvest: For greens, 2 to 3 months. For roots for coffee or forcing, 5 to 6 months. Roots are forced for 3 to 4 weeks for tops (MARKLE).

b. Cultivation: Chicory is a temperate climate crop that will tolerate nearly any kind of soil (although it require good drainage) and easily becomes weedy. Chicory does best in with a pH of 4.5 to 8.3, an annual rainfall of 30-400 cm (11.8-157.5 in), and an annual mean temperature of 6-27 °C (43-68 °F). It will not survive overly long or hot summer. When grown as a root crop, soil must be tilled deeply and relatively free of stones which would inhibit root development. Seed should be planted, or drilled, in a firm, fine-textured seed bed, at a depth of not more than 0.6 cm (0.2 in) in rows spaced 45-60 cm (17.7-23.6 in) apart, at a rate of 2.25 kg/ha (12.26 lb/A) and may be thinned to 25 cm (9.8 in) apart. For good growth, chicory require high amounts of manure applied to the top of the soil (PURDUE, MARKLE).

c. Availablity in the marketplace: Common in Europe, North America, Australia, and parts of Asia.

d. Preparation for cooking: The roots are dried and ground into an inexpensive coffee substitute which may be used on its own or blended with true coffee. Chicory root is also added to some beers to enhance flavor, and it is processed to obtain inulin, a starch and sweetener. Chicory root extract is a food additive and nutritional supplement. The young leaves, know as chicory if non-heading (resembling dandelion leaves) or radicchio if heading, are used fresh in salads or as a potherb and cooked vegetable in dishes such as risotto and pasta. The forced heads known as Belgian endive are most commonly used in salads for their delicate flavor, but may also be cooked as a vegetable (PURDUE, SCHNEIDER 2001, MARKLE, MANSFELD, WIKIPEDIA).

e. Nutritional aspects: The root is a rich source of inulin (WIKIPEDIA).

f. Medicinal aspects: Used in many folk remedies and is known to decrease the occurance of intestinal parasites (WIKIPEDIA).

g. Crop Photos:

4. Production in U.S.: No data on total amount cultivated, but grown in many states for various puroposes, particularly California, New Jersey, and New York (MARKLE).

5. Other production regions: Total worldwide production of chicory root in 2008 was 622,577 tonnes. Top producing countries included Belgium (425,085 tonnes), France (125,475 tonnes), and Poland (30,402 tonnes) (FAOSTAT).

6. Use: Green tops as potherbs, cooked vegetable, and forage for animals. Roots as coffee supplement, food extract, beer flavoring, starch source, sweetener, and medicinal use. Forced tops as salad and cooked vegetable. Radicchio tops as salad and potherb (MARKLE, SCHNEIDER 2001, WIKIPEDIA, MANSFELD).
7. Part(s) of plant consumed: Green, red or forced tops, roots for coffee substitute or food extract.
8. Portion analyzed/sampled: Tops (leaves) for chicory, radicchio (fresh leaves) and Belgium endive; Roots for chicory coffee substitute.
9. Classifications:
    a. Authors Class: Root and tuber vegetables and leaves of root and tuber vegetables
    b. EPA Crop Group (Group & Subgroup): Root and tuber vegetables (1A and 1B); Crop group 2: Leaves of root and tuber vegetables. Crop group 4: Radicchio: Leafy vegetables (except *Brassica* vegetables) group, Leafy greens subgroup 4A (radicchio).
    c. Codex Group: 013, Leafy vegetables (including *Brassica* leafy vegetables), VL 0469, chicory leaves; Group 016, Root and tuber vegetables, VR 0469, Chicory, roots and Group 017, Stalk and stem vegetables, VS 0469, Witloof chicory (sprouts).
    d. EPA Crop Definition: None
10. References: GRIN, MARKLE, MANSFELD, SCHNEIDER 2001, WIKIPEDIA, PURDUE, FAOSTAT.
11. Production Map: All EPA Crop Production Regions.
12. Plant Codes:
a. Bayer Code: CICIN

(506)

1. **Rampion** [bellflower, little turnip, rampion bellflower (MARKLE, GRIN)]
   Campanulaceae
   Campanula rapunculus L. (Syn: *Campanula elatior* Hoffmanns. & Link, *Campanula verruculosa* Hoffmanns. & Link)
2. Rampion is a biennial, herbaceous plant native to Europe, northern Africa, and western Siberia and grown as a root and leafy vegetable. Plants may reach up to 0.9 m (3 ft) tall, but in cultivation is grown as an annual. Leaves are entire, obovate to linear lanceolate in shape, 15 cm (6 in) or more in length. They form a rosette at the root crown. The roots are long, up to 30 cm (1 ft), slender, and white. For young roots, the plant resembles radish in culture and exposure. Older roots are used much like turnips. Rampion was once much cultivated throughout much of Europe and in North America, but has been widely replaced in favor of other root vegetables. It is still cultivated in some areas, and on land where other crops will not grow, and is available in the U.S. from several seed companies. Cultivation in Europe is slightly more popular (MARKLE, MANSFELD, MUNRO, WRIGHT 2001, PLANTS FOR A FUTURE).
3. Crop data
   a. Season, seeding to harvest: Up to 5 months (MARKLE).
   b. Cultivation: Although a biennal, rampion in cultivation is grown as an annual, as after flowering the roots and leaves are inferior. In hot conditions or poor soil, however, it may flower the first year. Thus it is important to provide good growing conditions to produce a desirable crop. Propagation is by seed, which may remain viable for up to five years. The field is directed seed via broadcast of the seeds mixed with sand. After planting, seedling may be thinned to 8-10 cm (3.1-3.9 in) in rows 20 cm (7.8 in) apart. Rampion does best in a light, deep soil that is kept moist but well-drained, and does well in full sun or light shade. Leaves may be taken throughout the growing season for use as a leafy vegetable, but if root production is also desired care should be taken not to take too many leaves or root growth will be retarded (MUNRO, PLANTS FOR A FUTURE).
   c. Availability in the marketplace: Rare in our area, although grown in some home gardens in the U.S. and Canada. Available in some markets in Europe and North Africa.
   d. Preparation for cooking: Roots may be eaten raw or cooked, often steamed and used like any other common root vegetable. The leaves may be used fresh in salads or cooked as a potherb in soups or other dishes. In the spring the young shoots can be blanched and cooked like asparagus (PLANTS FOR A FUTURE, WRIGHT 2001, MANSFELD).
   e. Nutritional aspects: No data.
   f. Medicinal aspects: No data.
   g. Crop Photos:
4. Production in U.S.: No data. Grown in Florida gardens. Naturalized in North America (MARKLE).
5. Other production regions: Europe, northern Africa, western Siberia (WRIGHT 2001).
6. Use: Root vegetable, salad green, potherb (MANSFELD, MARKLE).
7. Part(s) of plant consumed: Roots and leaves.
8. Portion analyzed/sampled: Roots and leaves.
9. Classifications:
   a. Authors Class: Root and tuber vegetables and leaves of root and tuber vegetables
   b. EPA Crop Group (Group & Subgroup): Miscellaneous
   c. Codex Group: 016, Root and tuber vegetables, VR 0592, Rampion roots
   d. EPA Crop Definition: None
10. References: GRIN, MARKLE, MANSFELD, MUNRO, WRIGHT 2001, PLANTS FOR A FUTURE
11. Production Map: No entry
12. Plant Codes:
    a. Bayer Code: CMPRP

(530)

1. **Salsify, Black** [scorzonera, coconut root, mock oyster, black oyster plant, serpent root, viper grass, oysterplant, escorzonera, Spanish salsify, common viper's-grass, scorzonera, grote schorseneer, salsifis noir, scorsonère, Schwarzwurzel, escorcioneira, salsifí negro (GRIN, MARKLE)]

Asteraceae

Scorzonera hispanica L.

2. An erect, perennial, branched herb up to 130 cm (51 in) in height probably native to Europe and known only in cultivation. The plant has a long, fleshy tap root to up to 1 m long, similar to salsify, but black in surface color, with white flesh. The leaves are entire, alternate, and lanceolate, grass-like but much wider than grass (up to 40 cm/15.7 in long by 6 cm/2.4 in wide at the widest part). The inflorescence is a terminal head of yellow ray flowers. Black salsify is cultivated primarily for its root, which has been used as a vegetable at least since the 15th century, mostly in Europe, and is said to have a sweet, agreeable flavor. The young shoots, leaves, and flower buds are also consumed. In addition to Europe, it is also been spread to South America and Africa (MARKLE, MANSFELD, GRUBBEN 2004, PLANTS FOR A FUTURE, WIKIPEDIA, FAO DOC).

3. Crop data

a. Season: Sown in spring and harvested 3-6 months later, depending on the cultivar (MARKLE, GRUBBEN 2004).

b. Cultivation: Although it is a perennial, salsify is grown as an annual for root production. Propagated by seed and can be planted at a density of up to 66,000 plants per hectare. Best grown in full sun and in light, sandy soil for optimal root production. Once established, black salsify is very drought resistant. Although its natural climate is the Mediterranean, it will grow in tropical and subtropical regions as well. Yields up to 8 tonnes per hectare (GRUBBEN 2004, PLANTS FOR A FUTURE).

c. Availability in the marketplace: Rare in the U.S.; more common in produce markets in Europe, Africa, and South America. Can be found fresh in upscale urban markets, as well as sold frozen or canned in places.

d. Preparation for cooking: The root does not store well and should be used quickly. It should be peeled before use and placed into water with lemon to prevent the flesh from turning black. It can be used raw in a salad, steamed, sauteed, boiled, baked, fried, or be preserved in sugar. It is eaten with meat, eggs, other vegetables, or on toast with a creamy sauce and herbs. It can also be roasted and ground as a coffee substitute, like chicory. The leaves are boiled and eaten, while the youngest leaves may be eaten fresh as salad greens. In early spring the shoots are eaten like asparagus (sometimes even blanched). The flowers and flower buds are added to salads for flavoring and are said to smell somewhat like cocoa (GRUBBEN 2004, PLANTS FOR A FUTURE, FAO DOC).

e. Nutritional aspects: Contains high levels of inulin, an indigestible starch which passes through the human body (FAO DOC).

f. Medicinal aspects: A diuretic and used for various folk remedies in Europe (GRUBBEN 2004).

g. Crop Photos:

4. Production in U.S.: No data, very limited (MARKLE).

5. Other production regions: Primary commercial producer is Belgium, with 2,000 ha per year. Other areas include Canada, the Mediterranean region, Spain, Portugal, the Democratic Republic of Congo, Kenya, Tanzania, Mauritius, Chile, and India (GRUBBEN 2004, MANSFELD).

6. Use: Root vegetable, salad green, potherb, medicinal, flavoring, beverage, leafy vegetable.

7. Part(s) of plant consumed: Mainly roots, leaves sometimes.

8. Portion analyzed/sampled: Root and tops (leaves)

9. Classifications:

a. Authors Class: Root and tuber vegetables and leaves of root and tuber vegetables

b. EPA Crop Group (Group & Subgroup): Root and tuber vegetables (1A and 1B); Leaves of root and tuber vegetables (2)

c. Codex Group: 016, Root and tuber vegetables, VR 0594, Scorzonera

d. EPA Crop Definition: None

10. References: GRIN, MARKLE, MANSFELD, GRUBBEN 2004, PLANTS FOR A FUTURE, WIKIPEDIA, FAO DOC

11. Production Map: EPA Crop Production Region 10.

12. Plant Codes: a. Bayer Code: SCVHI

(594)

1. **Sweet potato** [batata, yam, Cuban sweetpotato, boniato, camote, sweet potato vine, kkumara, tuktuka, patate douce, Batate, Süßkartoffel, batata-doce, apichu, papa dulce (GRIN, MARKLE)]

Convolvulaceae

Ipomoea batatas (L.) Lam. var. *batatas* (Syn: *Convolvulus batatas* L.)

2. A trailing perennial herb, native to Central and South America but now known only in cultivation and grown as an annual worldwide through out the tropics and subtropics, primarily as a staple root vegetable. Takes the form of a trailing vine, with cordate to deltoid-ovate leaves up to 12 cm (4.7 in) long which may be slightly lobed. The flowers are 5-parted with a fused corolla in a trumpet shape, white on the outside and purple to lavender inside. The commercial product is the enlarged, flesh root which may be fusiform or oblong with white, orange, or purple flesh. Sweet potato is extremely variable in morophology, and there are firm and soft fleshed varieties of sweet potato, and the soft fleshed varieties are often confused with yams. Sweet potato is an extremely important crop in all tropical countries; some varieties can also be grown in temperate climates under the right conditions and with the aid of greenhouses. It is highly nutrituous and is a staple and subsistence crop in many places. The root can be stored easily for up to six months. In addition to the root, the young leaves and shoots are prized as a leafy vegetable, particularly in West Africa. The entire plant is also used for animal fodder and feed, and some varieties are grown as an ornamental (MARKLE, MANSFELD, PLANTS FOR A FUTURE, WIKIPEDIA, PURDUE, HU 2002).

3. Crop data:

a. Season, field setting to harvest: Two to nine months, depending on temperature and conditions. Matures more quickly under warmer conditions (WIKIPEDIA).

b. Cultivation: Although it is a perennial, sweet potato is typically grown as an annual plant. It requires warm weather (over 23.9 °C/75 °F average temperatures) with no frosts and a relatively long growing season. It is typically propagated by cuttings. In the U.S., sweet potato roots of the previous crop are laid in beds, which in cooler climates are heated, then covered. Sprouts (slips) growing from these are pulled free and field planted. Stem cuttings from field plantings may also be planted in the field in areas of long season. Sweet potato does best in a well-drained, light to medium soil and can tolerate a pH ranging from 4.5 to 7.0. It is somewhat drought tolerant, although drying out should be avoided when the tubers are first setting, and it does not tolerate water logging. To obtain high quality tubers, the soil should be well amended with nitrogen and potash (MARKLE, WIKIPEDIA, PURDUE).

c. Availability in the marketplace: The tubers readily available throughout much of the world, either fresh, canned, or frozen. The leaves are typically available fresh in produce markets in parts of Asia and West Africa.

d. Preparation for cooking: Sweet potatoes are typical peeled before being eaten. They are baked, cooked in stews or with other vegetables, mashed, fried, boiled, cooked and frozen, dehydrated into chips, and dried and ground into flour for breads and baked goods. The young leaves are cooked like spinach (MARKLE, PURDUE, WIKIPEDIA).

e. Nutritional aspects: Rich in rich in complex carbohydrates, dietary fiber, beta carotene, vitamin C, and vitamin B6 (PURDUE, WIKIPEDIA).

f. Medicinal aspects: No data.

g. Crop Photos:

4. Production in U.S.: Grown in Guam, Puerto Rico, Texas, Lousiana, Florida, California, Alabama, Mississippi, North Carolina and South Carolina. Total U.S. production in 2008 was 836,560 tonnes (MARKLS, FAOSTAT).

5. Other production regions: World production in 2008 was 106,501,450 tonnes. Top producing countries were China (80,522,926 tonnes), Nigeria (3,318,000 tonnes), Indonesia (1,876,944 tonnes), India (1,094,000 tonnes), and Japan (1,011,000 tonnes) (FAOSTAT).

6. Use: Root vegetable, leafy vegetable, livestock feed and fodder, dye, ceramics, ornamental, bio-fuel, starch (MARKLE, PURDUE, WIKIPEDIA).

7. Part(s) of plant consumed: Tuberous roots, generally with peel removed, and young tops. Non-marketable roots are used as livestock feed.

8. Portion analyzed/sampled: Roots and young tops.

9. Classifications:
    a. Authors Class: Root and tuber vegetables and leaves of root and tuber vegetables
    b. EPA Crop Group (Group & Subgroup): Root and tuber vegetables (1C and 1D); Leaves of root and tuber vegetables (2).
    c. Codex Group: 016 (VR 0508) Root and tuber vegetables, VR 0508, Sweet potato; Group 013, Leafy vegetables (including *Brassica* leafy vegetables, VL 0508, Sweet potato, leaves
    d. EPA Crop Definition: Sweet potato = Sweet potato, yam
10. References: GRIN, FAOSTAT, MARKLE, MANSFELD, PLANTS FOR A FUTURE, WIKIPEDIA, PURDUE, HU 2002
11. Production Map: EPA Crop Production Region 1, 2, 3, 4, 5, 8, 9 and 13
12. Plant Codes:
    a. Bayer Code: IPOBA

(690)

1. **Tanier** [new cocoyam, tannia, malanga, ocumo, Cuban dasheen, tarrier, taya, yellow yautia, tannie, mangaras, tanyah, chou Caraïbe, malanga marron, taye, tayove, Tania, adão, costela-de-adão, tiquisque blanco, yautía blanca (GRIN, MARKLE)]

Araceae

Xanthosoma sagittifolium (L.) Schott

1. **Blue ape** [badu, black malanga, blue taro, primrose malanga, malanga noir, batata-de-taxola, otó, tiquisque morado, yautia (GRIN, MARKLE)]

Xanthosoma violaceum Schott

2. This is a tropical, herbaceous perennial reaching 2 m (6.5 ft), native to tropical South America and the Caribbean, but cultivated extensively throughout much of the tropics, particularly the West Indies and West Africa. It is related closely to taro and in some areas it is a staple crop. It has a corm or main underground stem in the form of a rhizome from which swollen secondary shoots, or cormels, sprout. It is grown mainly for these, and for its leaves. The leaves are large and smooth, 30-61 cm (1- 2 ft) long, sagittate and erect, borne on long, ribbed petioles radiating from the "mother" or large corm. The top of the corm may be at or above ground level. The interior has an extremely crisp texture and can vary in color from cream, yellow or pink. The corms are highly nutritious and are often milled into flour, as the starch they contain is extremely digestible and hypo-allergenic due its tiny particle size. The young leaves of some varieties are valued as a vegetable. Some varieties are planted as ornamentals have spectacular, varigated foliage (MANSFELD, MARKLE, WIKIPEDIA, PURDUE, TOP TROPICALS).

3. Crop data

a. Season, planting to harvest: 6 to 12 months (MARKLE).

b. Cultivation: Propagation is by planting small cormels or by cutting the top off of the "mother" corm with some of the petioles still remaining. Tanier requires an extremely long growing season for corm production. The growth cycle lasts from nine to 11 months: during the first six months the corms and leaves develop; in the last four months, the foliage remains stable and, when it begins to dry, the plants are ready for the cormels to be harvested. It is typically planted on mounds, and weed control must be carefully practiced until the plants are large. In nature Tanier is a rainforest plant, although it is grown in full sun for commercial cultivations. It requires moist, well drained soils and does not tolerate waterlogging. For optimal growth, the mean temperature must exceed 20 °C (68 °F). Harvest is done by hand (MARKLE, MANSFELD, PURDUE).

c. Availablity in the marketplace: Mainly found in areas where it is grown, but available in the U.S. in some specialty markets, particularly in areas with a large proportion of immigrants from West Africa, the West Indies, and the Caribbean.

d. Preparation for cooking: The large corm and smaller cormels are peeled, cooked, and eaten as a vegetable. They have an earthy, nutty flavor and eaten grilled, fried, or pureed. In addition they are commonly dried and milled into flour for cookies, breads, and cakes. The leaves and petioles, when young and unfurled, are boiled as a leaf vegetable in soups and stews (MANSFELD, MARKLE, WIKIPEDIA).

e. Nutritional aspects: High in carbohydrates and similar in nutrition to a potato (PURDUE).

f. Medicinal aspects: Used in various folk remedies (MANSFELD).

g. Crop Photos:

4. Production in U.S.: Minimal production; primarily Puerto Rico and the Virgin Islands (MARKLE).

5. Other production regions: Worldwide production in 2008 was 443,543 tonnes (488,922 tons). Top producing countries were Cuba (240,000 tonnes/264,554 tons), Venezuela (83,996 tonnes/92,589 tons), and El Salvador (52,000 tonnes/57,320 tons). Tanier is also cultivated in the West Indies and Africa (FAOSTAT, MANSFELD, WIKIPEDIA).

6. Use: Root vegetable, leaf vegetable, animal feed, flour/starch, medicinal (MANSFELD, WIKIPEDIA, TOP TROPICALS).

7. Part(s) of plant consumed: Corms and leaves

8. Portion analyzed/sampled: Corms and leaves

9. Classifications:
    a. Authors Class: Root and tuber vegetables and leaves of root and tuber vegetables
    b. EPA Crop Group (Group & Subgroup): Root and tuber vegetables (1C and 1D); Leaves of root and tuber vegetables for *X. sagittifolium* only.
    c. Codex Group: 013, Leafy vegetables (including *Brassica* leafy vegetables), VL 0504, Tannia leaves; Group 016, Root and tuber vegetables, VR 0504, Tannia
    d. EPA Crop Definition: None
10. References: GRIN, MANSFELD, MARKLE, WIKIPEDIA, PURDUE, TOP TROPICALS, FAOSTAT
11. Production Map: EPA Crop Production Regions 3, 6, 8 and 13.
12. Plant Codes:
    a. Bayer Code: XATSA (*X. sagittifolium*)

(606)

1. **Taro** [dasheen, kalo, taro de chine, Chinese potato, malanga, sato imo, poi, luau, see coo, wetland taro, old cocoyam, eddoe, eddo, upland taro, yu tau, woo chai, gabi, elephants' ear, cocoyam, yu, madumbe, colocasie, arum, daun keladi, inhame, inhame-branco, inhame-da-África, inhame-da-costa, taioba-de-São-Tomé, alcocaz, colocasia, tayoba (GRIN, MARKLE)]

Araceae

Colocasia esculenta (L.) Schott (syn: *Arum esculentum* L., *Caladium esculentum* (L.) Vent., *Colocasia antiquorum* Schott, *Colocasia antiquorum* var. *esculenta* (L.) Schott, *Colocasia antiquorum* var. *euchlora* (K. Koch & Sello) Schott ex Engl.)

2. A perennial herbaceous plant (grown as annual) reaching up to 2 m (6.5 ft) tall and grown throughout the tropics and subtropics. The edible corm is a vital staple crop for up to 100 million people worldwide, and is particularly important in China, India, and much of the South Pacific. It may be one of the oldest cultivated plants known. When Captain Cook first visited the Hawaiian Islands there were over 300 varieties in cultivation there alone. The leaves are very large, up to 85 cm (33.4 in) long by 85 cm (33.4 in) wide, and cordate-elongate with rounded lobes at base, entire, thick, glabrous and with 3 main veins. Inflorescence is a large spadic typical of the family. The corm, which is the main commercial commodity, may reach up to 4 kg (8.8 lb) and is cylindrical or spherical, up to 30 x 15 cm (11.8 x 6 in). Although a valuable food crop, the entire plant is inedible before cooking, as it contains calcium oxalate crystals which are both toxic and irritating to the mouth and cause an acrid taste when raw. Cooking destroys both the crystals and any enzyme inhibitors the plant may contain, render it it both edible and nutritious. There are two groups of taro cultivars. The Dasheen group, which produces one large "mother" corm and many smaller cormels which can be harvested for food over time without destroying the plant contains very little calcium oxalate, but is not suitable for poi and requires a more moist environment and warmer temperatures. The Eddoe group produces many large cormels and is the common type grown in Africa. In addition to its value as a root vegetable, the young taro leaves and leaf stalks are also much consumed and are a nutritious leafy vegetable after cooking (MARKLE, MANSFELD, GRUBBEN 2004, WIKIPEDIA, PROTA, MOBOT, HU 2002, SCHNEIDER 2001).

3. Crop data:

a. Season, planting to harvest: About 7 to 18 months (13 months normal). Harvested when tops are dried. Upland taro about 8-9 months (MARKLE).

b. Cultivation: The wide range of cultivars allows for taro to be grown under almost any conditions given a long enough growing seasons. Some types are drought resistant, while others are adapted to growing in flooded field. Taro is typically shade tolerant and is often intercropped with cocoa, coffee, coconut, sugarcane, or even maize. In general, the crop does best in areas where annual rainfall exceeds 200 cm (78.7 in) and temperatures are in the 21–27 °C (69.8-80.6 °F) range. Eddoe types prefer well-drained loamy soils, and dasheen types grow best where the soil is heavy and has high moisture-holding capacity. A pH of 5.5–6.5 is optimal. Some cultivars tolerate high soil salinity. Flooded taro requires greater quantities of fertilizer for maximum yields than upland taro. Potash is particularly important and the crop also has a relatively high calcium requirement. In situations with abundant water availability, closer spacing is advised; also when taro is intercropped it can be planted closer. Propagation is usually through corms or cormels. In Hawaii the cut stem portion with petiole attached called huli or set are obtained at harvest (PROTA, GRUBBEN 2004, MARKLE).

c. Availability in the marketplace: Available worldwide in various forms including fresh, frozen, or otherwise preserved.

d. Preparation for cooking: It is very important to thoroughly cook all parts of the plan before eating. Care should be taken when handling the raw corms particularly, and gloves are recommended as the calcium oxalate is an irritant to skin. Taro may be cooked in a variety of ways including boiling, roasting, frying, or steaming. In many places it is used much like the potato or any other root vegetable. It may be ground into flour, extracted for its starch (the starch is highly digestible and ideal for baby formula), made in to chips, and, most famously, fermented into poi. Taro is used in meat dishes, fish dishes, soups, stews, beverages, puddings, and cereal. The young leaves and leaf stalks are steamed, boiled, or stir-fried and used much like Swiss chard (GRUBBEN 2004, PROTA, SCHNEIDER 2001, WIKIPEDIA, MOBOT).

e. Nutritional aspects: Taro is high in protein, calcium, vitamins A and C, and phosphorus. It also contains a small amount of fat (MOBOT).
f. Medicinal aspects: No data
g. Crop Photos:

4. Production in U.S.: 1,950 tonnes in 2008, almost exclusively in Hawaii, Guam, and Florida (MARKLE, FAOSTAT).
5. Other production regions: World production of taro in 2008 was 11,780,470 tonnes. Top producting countries were Nigeria (5,387,000 tonnes), Ghana (1,688,330), China (1,638,592) and Camaroon (1,200,000 tonnes).
6. Use: Cooked root vegetable, cooked leafy vegetable, animal fodder/feed, beverage, flour/starch, and ornamental (MARKLE, GRUBBEN 2004, MOBOT, WIKIPEDIA).
7. Part(s) of plant consumed: Corms and young leaves.
8. Portion analyzed/sampled: Corm and foliage.
9. Classifications:
   a. Authors Class: Root and tuber vegetables and leaves of root and tuber vegetables
   b. EPA Crop Group (Group & Subgroup): Root and tuber vegetables (1C and 1D); Leaves of roots and tuber vegetables (2).
   c. Codex Group: 016, Root and tuber vegetables, VR 0505, Taro; Group 013, Leafy vegetables (including *Brassica* leafy vegetables), VL 0505, Taro leaves
   d. EPA Crop Definition: None
10. References: GRIN, MARKLE, MANSFELD, GRUBBEN 2004, WIKIPEDIA, PROTA, MOBOT, HU 2002, SCHNEIDER 2001.
11. Production Map: EPA Crop Production Regions 2, 3, 4, 6, 8 and 13
12. Plant Codes:
    a. Bayer Code: CXSES

(628)

1. **Ulluco** [ulluco, papalisa, olluco, melloco, ulluca, ullugue, ruba, melloco, papa lisa, uljuku (GRIN)]

Basellaceae

Ullucus tuberosus Caldas (syn: *Basella tuberosa* (Caldas) Kunth, *Melloca peruviana* Moq., *Melloca tuberosa* (Caldas) Lindl., *Ullucus kunthii* Moq.)

2. An erect, compact perennial herb to 50 cm (19.7 in) in height, native to the Andean mountains and known only in cultivation. Ullucu is grown primarily for its nutritious tubers. The leaves are alternate, heart-shaped, and borne on long petioles. Flowers are small and yellow, arising from the leaf-axils. The tubers are up to 8 cm (3.1 in) long, spherical to cylindrical, and may range in color from white, yellow, light green, pink and orange to purple. They have a crisp texture and a sweet flavor, like jicama, which remains after cooking. The leaves are also edible and may be used like spinach. Although this crop has been neglected in recent years it is beginning to attract interest as a traditional crop and is becoming more popular (MARKLE, MANSFELD, PURDUE, WIKIPEDIA, PLANTS FOR A FUTURE, WIKIPEDIA).

3. Crop data

a. Season, planting to harvest: As short as 5 months, but up to 8 months depending on elevation (MARKLE).

b. Cultivation: Typically grown as an annual and propagated by tubers. Similar in culture to potato and other Andean root crops. Ullucu requires full sun and moist light to medium (loamy) soils, but can tolerate drought and will grown in nutrient-poor areas. It is frost-tolerant but susceptible to viral infections (MARKLE, MANSFELD, PLANTS FOR A FUTURE, PURDUE).

c. Availability in the marketplace: Mainly found in markets in the Andes, although also can be purchased in areas with large immagrant populations from those countries.

d. Preparation for cooking: Ullucu is an important table vegetable in many traditional Andean cultures. Although it cannot be baked, due to its high water content, it can be used in other ways much like a potato. It is often boiled or fried. By alternating freezing and drying a traditional dish called “chuno” is made. It can also be sliced thin and pickled for use in condiments. The tuber can also be used fresh in salads or dried. The tuber stores well and can be kept for up to 12 months in a cool location. The leaves are mucilaginous and can be used fresh or cooked, like spinach (PLANTS FOR A FUTURE, WIKIPEDIA, PURDUE).

e. Nutritional aspects: The leaves are high in protein. The tuber is also rich in protein and contains high amounts of vitamin C, calcium, and carotene (WIKIPEDIA, PLANTS FOR A FUTURE).

f. Medicinal aspects: No data

g. Crop Photos:

4. Production in U.S.: No data.

5. Other production regions: The Andes mountains, particularly Columbian, Peru, Bolivia and Argentina (MARKLE, MANSFELD).

6. Use: Root vegetable, salad green, potherb, condiment (PURDUE, WIKIPEDIA, PLANTS FOR A FUTURE)

7. Part(s) of plant consumed: Tuber and leaves

8. Portion analyzed/sampled: Tuber and leaves

9. Classifications:

a. Authors Class: Root and tuber vegetables and leaves of root and tuber vegetables

b. EPA Crop Group (Group & Subgroup): Miscellaneous

c. Codex Group: 016, Root and tuber vegetables, VR 0599, Ullucus

d. EPA Crop Definition: None

10. References: GRIN, MARKLE, MANSFELD, PURDUE, WIKIPEDIA, PLANTS FOR A FUTURE, WIKIPEDIA
11. Production Map: No entry
12. Plant Codes:
    a. Bayer Code: ULLTU

1. **Velvet plant** [Okinawa spinach, red groundsel (WIKIPEDIA, HU 2002)]
Asteraceae
Gynura bicolor (Roxb. ex Willd.) DC.
2. An erect, perennial herb, up to 1.5 m (4.9 ft) in height, native to eastern and south eastern Asia. Stems fleshy, slightly woody at base, much branched, leafy throughout. Leaves obovate to oblanceolate, margins lobed and irregularly dentate, 5-10 cm (1.9-3.9 in) long, may be green on the top but purple on the underside, glabrous to sparsely pubescent. Flower heads in corymbs, to 2 cm (0.8 in) long, with orange to yellow florets. The highly succulent leaves and young shoots are eaten as a vegetable in China, Japan, and Taiwan particularly. The roots are also eaten in China, and it is grown as an ornamental in Japanese gardens (MANSFELD, HU 2002, WIKIPEDIA, EFLORAS, LARKCOM).
3. Crop Data:
a. Season: Young shoots and leaves collected in spring (HU 2002).
b. Cultivation: Propagated by cuttings. Frost-tender (LARKCOM).
c. Availablity in the marketplace: Mainly available where it is grown or can be collected from the wild.
d. Preparation for cooking: The leaves and young shoots are used cooked as a potherb or stand-alone vegetable. The roots are cooked with sliced pork in China (LARKCOM, HU 2002).
e. Nutritional aspects: No data.
f. Medicinal aspects: Some medicinal use in Asia (MANSFELD).
g. Crop Photos:
4. Production in U.S.: No data.
5. Other production regions: Japan, China, Taiwan, and northwestern India (MANSFELD).
6. Use: Cooked leafy vegetable, root vegetable, medicinal, ornamental.
7. Part(s) of plant consumed: Leaves and young shoots; roots
8. Portion analyzed/sampled: Leaves and young shoots; roots
9. Classifications:
a. Authors Class: Root and tuber vegetables and leaves of root and tuber vegetables
b. EPA Crop Group (Group & Subgroup): Miscellaneous
c. Codex Group: No specific entry
d. EPA Crop Definition: None
10. References: GRIN, MANSFELD, HU 2002, WIKIPEDIA, EFLORAS, LARKCOM
11. Production Map: No entry
12. Plant Codes:
a. Bayer Code: GYUBI

(688)

1. **Yam**

Dioscoreaceae

Dioscorea spp.

1. **Greater yam** [wateryam, winged yam, uhi, ten months yam, pei tsao, Lisbon yam, bak chiu, agua yam, Guyana arrowroot, white yam, name-de-agu, ubi yam, Guyana arrowroot, grande igname, igname ailée, igname de Chine, geflügelter Yam, wasser Yamswurzel, inhame, ñame blanco, ñame de agua, tabena (GRIN, MARKLE)

Dioscorea alata L. (syn: *Dioscorea rubella* Roxb.)

1. **Chinese yam** [cinnamon vine, Chinese potato, Japanese yam, nago imo, shan yao, shan yuek, shu yu, igname , chinesische Yamswurzel, naga-imo (GRIN, MARKLE)

Dioscorea polystachya Turcz. (syn: *Dioscorea batatas* Decne., *Dioscorea decaisneana* Carrière, *Dioscorea opposita* auct.)

1. **Lesser yam** [gado, Asiatic yam, spiny yam, Chinese yam, potato yam, gan shu, igname des blancs, chinesischer Yam, inhame-de-São, inhame, batata de China (GRIN, MARKLE)]

Dioscorea esculenta (Lour.) Burkill (syn: *Dioscorea aculeata* L., *Dioscorea fasciculata* Roxb., *Dioscorea sativa* auct., *Oncus esculentus* Lour.)

1. **White yam** [white Guinea yam, Guinea yam, eboe yam, igname blanc, igname de Guinée, Guinea Yamswurzel, weißer Guinea Yam, ñame blanco, ñame guineo blanco (GRIN, MARKLE)]

Dioscorea rotundata Poir.

1. **Mapuey** [cush cush, cushcush yam, aja, yampi, maona, napi, cara doce, yampee, cush-cush yam, couche-couche, cousse-couche, Kusch-kusch, Kuschkusch-Yamswurzel, cará-doce, inhame, name, ñame de la India, tabena, sacha papa (GRIN, MARKLE)]

Dioscorea trifida L.f.

1. **Yellow yam** [yellow Guinea yam, twelve months yam, Lagos yam, attoto yam, gelbe Yamswurzel, cará-do-Pará (GRIN, MARKLE)]

Dioscorea cayenensis Lam. (syn: *Dioscorea occidentalis* R. Knuth)

2. Perennial herbaceous plants with long trailing vines reaching 3- 9.1 m (10-30 ft), grown throughout the tropics as a staple food. There are many species of yam that are grown for food, and they are highly variable in shape, size, color, and flavor. Typically, they have cordate to sagittate leaves which are bright green, smooth, and shiny, with climbin tendrils. It is grown primarily for the edible underground tubers which vary in size and shape averaging 1.4-3.6 kg (3-8 lb), but some tubers have been found weighing up to 70 kg (154 lb). They may be white, purple, red, or orange and may vary in taste from sweet to starchy to bitter. Depending on the species, from one to several tubers are produced per plant. The tubers develop deep in the ground and are difficult to dig. Yams are extremely nutritious and in some parts of the world are a primary food source. In the U.S. yams and sweet potatoes are often confused with one another, and the moist varieties of sweet potato are often marketed as yams. However, true yams are grown almost exclusively in the tropics as they require a much longer and hotter growing season than our climate can provide. Although some *Dioscorea* species do grow wild in the U.S., none of them are edible and they are often highly toxic. Almost all specied of yam must be cooked before eaten, and handling of raw yams may cause itching and skin irritation. The young leaves and shoots of some species of yam are also consumed as a leafy vegetable. The tubers can be stored for up to six months without refrigeration, making them extremely valuable in areas with a distinct dry season. Yams are so important in some cultures that they are the center of religious and magical rituals (MARKLE, MANSFELD, HU 2002, SCHNEIDER 2001, GRUBBEN 2004, WIKIPEDIA).

3. Crop data

a. Season, planting to harvest: Plant small tubers or portions of tubers or presprout tubers before planting. About 10 months. In Florida, tubers are planted in March-April and harvested 10-11 months later. Time to first harvest depends on species, the size of the seed tuber and if presprouted; normally 6 to 10 months after emergence (MARKLE).

b. Cultivation: Propagation is typically by small tubers or tuber portions. Yams require tropical to subtropical conditions and are not tolerant of frost. They require a long growing season to produce marketable tubers. Yams are typically grown in regions with well-defined wet and dry seasons. They require, loose, well-drained fertile soil for high yields, and do not do well in waterlogged conditions. Performance under dry conditions varies by species. Yams require intensive management and high nutrient inputs. They are typically grown on trellises or other support systems, and may be intercropped with maize or other commodities. The tubers are harvested at the end of the rainy season, once the foliage begins to die back. Many yams grow well in forested conditions (RUBATSKY, GRUBBEN).

c. Availablity in the marketplace: Extremely common throughout much of the world; however in some temperate countries like the U.S. they may be confused with sweet potato.

d. Preparation for cooking: Yams are eaten cooked cooked, with or without the skin, and may be boiled, fried, baked, or steamed. They may be added to meat or vegetable dishes, eaten whole, dried and pounded into a powder which is used to make a thick, starchy paste, mashed, or pureed. Yams are also used as an ingredient in baking and confections, as well as being made into chips like potato chips. They are used in curries, soups, and stews. The very young and tender leaves are eaten as cooked vegetable (WIKIPEDIA, MANSFELD, MARKLE, HU 2002. SCHNEIDER 2001).

e. Nutritional aspects: High vitamin C, dietary fiber, vitamin B6, potassium, and manganese; while being low in saturated fat and sodium. They have a relatively low glycemic index (WIKIPEDIA).

f. Medicinal aspects: Used in many traditional remedies, particularly in Africa (MANSFELD).

g. Crop Photos:

4. Production in U.S.: Production in the U.S. is limited due to climate, but yams are grown in Guam, Puerto Rico, the Virgin Islands, and southern Florida (MARKLE).

5. Other production regions: Worldwide production of yams in 2008 was 53,085,709 tonnes (58,516,977 tons). Top producing countries were Nigeria (35,017,000 tonnes/38,599,635 tons), Cote de Ivoire (6,932,950 tonnes/7,642,269 tons) and Ghana (4,894,850 tonnes/5,395,648 tons). Yams are grown throughout the tropics and sub-tropics including Asia, the South Pacific, the Indies, the Caribbean, South and Central America, and Oceania (FAOSTAT, WIKIPEDIA, MANSFELD, RUBATSKY).

6. Use: Root vegetable, leaf vegetable, flour, starch, livestock feed, food additive, chips, medicinal, religious (MARKLE, MANSFELD, HU 2002).

7. Part(s) of plant consumed: Tubers, sometimes young leaves and shoots.

8. Portion analyzed/sampled: Tubers

9. Classifications:

a. Authors Class: Root and tuber vegetables and leaves of root and tuber vegetables

b. EPA Crop Group (Group & Subgroup): Root and tuber vegetables; Leaves of root and tuber vegetables (2).

c. Codex Group: 016, Root and tuber vegetables, VR 0600, Yams

d. EPA Crop Definition: Sweet potato (root) = Yam (root)

10. References: GRIN, MARKLE, MANSFELD, HU 2002, SCHNEIDER 2001, GRUBBEN 2004, WIKIPEDIA, RUBATSKY, FAOSTAT.

11. Production Map: EPA Crop Production Region 3, 4, and 13.
12. Plant Codes:
a. Bayer Code: DIUAL (D. alata), DIUBA (D. batatas)

ATTACHMENT 7. MONOGRAPH REFERENCES

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