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Guide to the Wild Germplasm of Brassica and Allied Crops

Part V

Centre for Land
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Centre de recherches sur les
terres et les ressources biologiques

Canada

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The images represent the Research Branch's objective: to improve the long-term competitiveness of the Canadian agri-food sector through the development and transfer of new technologies.
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Conception par le Service aux programmes de recherches.

Guide to the Wild Germplasm of Brassica and Allied Crops

Part V
Life History and Geographical Data for Wild Species in the Tribe Brassiceae (Cruciferae)

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INTRODUCTION TO THE GUIDE:

The Cruciferae family, which contains about 3500 species and 350 genera, is one of the ten most economically important plant families (Rich 1991). The tribe Brassiceae is one of the 13-19 tribes which have been recognized within the family and is one of the few tribes believed to constitute a natural group (Hedge 1976, Al-Shehbaz 1984, 1985). It is the most important economically and the most distinctive (Gómez-Campo 1980, Al-Shehbaz 1985). It is distinguished on the basis of the presence of conduplicate cotyledons (i.e. the cotyledons are longitudinally folded around the radical) and/or two-segmented fruits (siliques) which contain seeds in one or both segments, and only simple hairs if present (Gómez-Campo 1980, Al-Shehbaz 1985).

Crop brassicas display enormous diversity and are used as a source of oil, vegetables, mustard condiments, and fodder. Those of particular importance in Canada are: *Brassica napus*, *B. rapa*, and *B. juncea* as sources of canola oil, and *B. oleracea* as cole-crops. The genera *Raphanus* and *Sinapis* are also of major importance, the former cultivated for its edible roots and the latter as a source of mustard condiments along with *B. nigra*. Several species have become naturalized weeds in Canada and the United States [eg. *Sinapis arvensis* (wild mustard), *Raphanus raphanistrum* (wild radish), and *B. rapa* (wild rape)], representing both a potential source of germplasm and agricultural problems. In other areas of the world *Crambe* is cultivated as an industrial oil, and the leaves of other genera (eg. *Eruca* and *Diplotaxis*) are eaten as salad greens.

An understanding of the genetic potential of wild relatives of the crop species of *Brassica* and allied genera (members of the Tribe Brassiceae) is critical for the establishment of long-term breeding programs of these crops. In addition, it is clear that many of the wild species in the tribe have potential value as new crops, as sources of industrial oils (*Crambe*, *Eruca*), condiments (*Sinapis alba*), and other diverse products. Wild relatives also possess a number of useful agronomic traits which could be incorporated into breeding programs, including: cytoplasmic and nuclear male sterility; resistance to disease and insect and nematode pests; intermediate C_3-C_4 photosynthetic activity; and tolerance of cold, salt and drought conditions.

The last comprehensive taxonomic treatment on the tribe was conducted by Schulz (1919, 1923, 1936). The tribe Brassiceae contains approximately 217 species and 51 genera (52? genera, with inclusion of *Quidproquo*), 26 of which are monotypic (Table below). Geographically, it is centered in the southwestern Mediterranean region, particularly Algeria, Morocco and Spain, where *c.* 41 genera are either endemic or exhibit maximum diversity. The tribal range extends eastward into India and Pakistan and southward into South Africa, with a poor representation in the New World (Hedge 1976, Gómez-Campo 1980, Al-Shehbaz 1985).

GENERA OF THE TRIBE BRASSICEAE (no. species in brackets)

Ammosperma (2)	*Hemicrambe* (2)
Boleum (1)	*Henophyton* (1)
Brassica (35)	*Hirschfeldia* (2)
Cakile (7)	*Kremeriella* (1)
Carrichtera (1)	*Moricandia* (9)
Ceratocnemum (1)	*Morisia* (1)
Chalcanthus (2)	*Muricaria* (1)
Coincya (6)	*Otocarpus* (1)
Conringia (6)	*Physorrhynchus* (2)
Cordylocarpus (1)	*Pseuderucaria* (2)
Crambe (25)	*Pseudofortuynia* (1)
Crambella (1)	*Psychine* (1)
Didesmus (2)	*Quezeliantha* (1)
Diplotaxis (28)	*Quidproquo* (1)
Dolichorhynchus (1)	*Raffenaldia* (2)
Douepia (1)	*Raphanus* (2)
Enarthrocarpus (5)	*Rapistrum* (2)
Eremophyton (1)	*Rytidocarpus* (1)
Eruca (3)	*Savignya* (1)
Erucaria (9)	*Schouwia* (1)
Erucastrum (19)	*Sinapidendron* (4)
Euzomodendron (1)	*Sinapis* (5)
Fezia (1)	*Succowia* (1)
Foleyola (1)	*Trachystoma* (3)
Fortuynia (2)	*Vella* (5)
Guiraoa (1)	*Zilla* (1)

Within the tribe, Schulz (1919, 1923, 1936) also recognized, somewhat arbitarily on the basis of morphological characters, seven subtribes: Brassicinae, Cakilinae, Moricandiinae, Raphaninae, Savignyinae, Vellinae, and Zillinae. Gómez-Campo (1980) has since proposed a reduction to six subtribes with the inclusion of the Savignyinae in the Vellinae. The Brassicinae and Moricandiinae both include genera with elongated siliquose dehiscent fruit, while the other subtribes include those with reduced or "nucamentaceous" fruits.

Generic boundaries in the tribe are still somewhat arbitrarily drawn, and the establishment of clear-cut intergeneric relationships requires clarification. Unlike many of the small genera, the species are generally very distinct throughout the family, with fruit characters being the most reliably used structures for the proper identification of genera and species. Taxonomic debate in the tribe has centred most particularly upon the number of and relationships between the subtribes and genera (Hedge 1976, Al-Shehbaz 1985).

The genus *Brassica* is one of ten core genera in the subtribe Brassicinae, which also includes *Coincya*, *Diplotaxis*, *Eruca*, *Erucastrum*, *Hirschfeldia*, *Raphanus*, *Sinapidendron*, *Sinapis*, and *Trachystoma*. The Brassicinae is defined primarily on the basis of elongated (siliquose) dehiscent fruits, presence of median nectaries, and usually seeded beaks. Although morphologically quite distinct from subtribes Cakilinae, Vellinae, and Zillinae, its separation from the Raphaninae and Moricandiinae is less clear. Current generic circumscriptions within the subtribe Brassicinae have also been considered to be highly artificial by many taxonomists, with generic delimitation based primarily on only one or two morphological traits.

Systematists are continuing to re-evaluate relationships within the tribe Brassiceae by way of morphological, cytological, hybridization, isozyme and molecular analyses (studies reviewed in Warwick and Black 1991, 1993). Such research has confirmed many proposed species relationships, but has also indicated new relationships between genera and species. In particular, these studies have identified new potential sources of germplasm for *Brassica* crops, indicating that the range of germplasm important to the genus is much greater than previously recognized.

The following Guide to the wild germplasm of *Brassica* and allied crops (Tribe Brassiceae, family Cruciferae) has been divided into five parts as indicated below:

I. **WARWICK, S.I.** 1993. Guide to the Wild Germplasm of *Brassica* and Allied Crops. Part I. Taxonomy and Genome Status in the Tribe Brassiceae (Cruciferae). Agriculture Canada Research Branch Technical Bulletin 1993-14E, 33 pp.
[Complete list of genera and species in the tribe and their genomic status, containing cross references for commonly confused names].

II. **WARWICK, S.I. & J.K. ANDERSON.** 1993. Guide to the Wild Germplasm of *Brassica* and Allied Crops. Part II. Chromosome Numbers in the Tribe Brassiceae (Cruciferae). Agriculture Canada Research Branch Technical Bulletin 1993-15E, 22 pp.

III. **WARWICK, S.I. & L.D. BLACK.** 1993. Guide to the Wild Germplasm of *Brassica* and Allied Crops. Part III. Interspecific and Intergeneric Hybridizations in the Tribe Brassiceae (Cruciferae). Agriculture Canada Research Branch Technical Bulletin 1993-16E, 31 pp.

IV. **WARWICK, S.I.** 1993. Guide to the Wild Germplasm of *Brassica* and Allied Crops. Part IV. Wild Species in the Tribe Brassiceae (Cruciferae) as Sources of Agronomic Traits. Agriculture Canada Research Branch Technical Bulletin 1993-17E, 19 pp.

V. **WARWICK, S.I. & A. FRANCIS.** 1993. Guide to the Wild Germplasm of *Brassica* and Allied Crops. Part V. Life History and Geographical Data for Wild Species in the Tribe Brassiceae (Cruciferae). Agriculture Canada Research Branch Technical Bulletin 1994-2E, 61 pp.
[Summary of life cycle, growth form, ecological habitats and geographical distributions of all species indicated in Part I.]

The information provided in this guide is intended to be useful in providing direction for future genebank needs for these crops and for assisting biotechnologists and breeders wishing to utilize these genetic resources in their research programs.

PART V. LIFE HISTORY AND GEOGRAPHICAL DATA FOR WILD SPECIES IN THE TRIBE BRASSICEAE (Cruciferae)

The following publication is the fifth part of a guide to the wild germplasm of *Brassica* and allied crops (Tribe Brassiceae, family Cruciferae). For each of the species, information will be summarized on its life cycle, growth form, ecology, geography and phytogeographical status.

LIFE CYCLE AND GROWTH FORM [LIFE/FORM]

The life cycle and growth form of each species are described using the terms in bold below:

Life cycle

annual: of only one year's duration, always herbaceous. **biennial:** of two years' duration. **perennial:** of greater than two years' duration. **winter-annual:** a plant from autumn-source seed which blooms and fruits in the following season.

Growth form

acaulescent: stemless. **caespitose:** growing in thick tufts or clumps. **herbaceous:** non-woody stem. **suffrutescent:** slightly woody or obscurely shrubby at the base of stem. Usually a short-lived perennial, unbranched stem. **suffruticose:** sub-shrub, distinctly woody at base of branched stem, softwooded and growing from ground level. **shrub:** long-lived woody, branched perennial, smaller than a tree, usually with several stems.

ECOLOGY

For each species there is a general climatic and topographical description of its range, followed by specific habitats and soil type where specified. The ecology and distribution of each species are described using the terms in bold below:

adventive: not native to an area; may have arrived as an alien, casual or accidental introduction in produce shipments, etc., or as a spreading weed; not naturalized. **alluvium:** rubble, sand or clay deposited along stream beds and river valleys during periodic flooding. **argillaceous:** sub-soil of chalk

mixed with clay. **barranco**: moist crevices of shaded rock face. **brush**: dense shrubby vegetation, thickets. **calcareous**: containing chalk or limestone, alkaline. **chalk**: soft, white powdery or earthy limestone; see also argillaceous. **clay**: stiff, viscous earth which becomes mud in humid regions and bakes to a solid surface or cracks into fissures in arid regions; see also loam. **coastal**: beaches, rocks, cliffs or plains bordering the sea. **crevices**: cracks in rocks and cliffs where moisture and plant debris may accumulate. **deserts**: arid regions with large expanses of sand, rubble, salt flats or dry pastures. **dry pastures**: characteristic landscape of arid and semi-arid regions, with forage plants scattered among sand and rubble. **dry stream beds**: shallow to deep depressions in arid to semi-arid areas, common where infrequent rains produce torrential flash floods which carry sand, rocks, pebbles and clay over hard sunbaked soil before retreating and drying up; called wadis in North Africa and Arabia; see also alluvium, gullies. **endemic**: native to a defined area. **escarpments**: steep sides of gorges, ravines, or tabletop mountains and outcrops. **fields**: land cleared for crops, cultivated or fallow; farmland; planted fields identified as crops. **gullies**: deep stream beds, ravines or gorges; in arid regions often derived from fissures in baked clay widened by flash flood waters. **gypsum** and **gypsaceous**: greyish alkaline chalky soil containing calcium sulphate. **introduced**: deliberately taken to a new area, e.g. as a garden or crop plant; see also adventive. **limestone**: soft, calcareous rock; see also chalk. **loam**: rich, loose soil of clay and sand mixed, often with a mixture of decomposed vegetable matter, common on steppes. **meadows**: pastures with low herbaceous vegetation cover; most common in temperate lowlands or alpine valleys. **montane**: on the slopes or in high valleys of mountain ranges, alpine, high sierras. **naturalized**: established after introduction. **nitrous**: neutral soil containing nitrates. **oases**: spring-fed islands of vegetation in deserts. **open woodland**: scattered trees on plains, pastures or grasslands; forest clearings. **parkland**: scattered trees only on grasslands. **pastures**: uncultivated areas with forage plants; see also dry pastures and meadows. **plateaus**: high steppes, dry pastures, or

flat tablelands in mountainous country, often between ranges. **porphyry**: unstratified or igneous rock with feldspar crystals predominating. **riparian**: along undisturbed river banks, lake shores. **roadsides and waste places**: disturbed places along worn tracks, banks of rivers, streams or canals, paths, railways, roads, open areas with denuded or impoverished soil, dumps. **rubble**: scattered rocks and pebbles. **saline**: containing salt. **schistose**: crumbling shale. **scree**: hillside rubble. **scrub**: semi-arid region with open bush or low shrubby vegetation; includes Mediterranean macchia or maquis; see also brush. **shale**: slate rock. **shingle**: coastal broken rock and stones. **siliceous**: containing silicates, quartz. **steppes**: flat to rolling fertile treeless plains or grasslands, prairies. **tropical montane**: very high slopes or plateaus in equatorial regions. **volcanic**: rock or soil formed from lava, basalt. **waste places**: see roadsides and waste places. **weedy**: tending to spread easily in disturbed areas or among crops, agrestal, escaped from cultivation.

GEOGRAPHY

The distribution of each species is grouped roughly by continents [i.e. EUROPE, ATLANTIC, AFRICA, ME/WASIA, AMERICAS, and AUST/ASIA] and then listed by the countries or areas which are indicated below in bold type. Country designations are adapted with slight modification from those found in Flora europaea (Tutin et al. 1964) and the Med-checklist (Greuter et al. 1986). Areas not included in those works have also been added to this tribal database. It should be noted that information on introductions to South America and Asia may not be complete. Complete distribution by province or state is given for Canada and the United States in Part IV of the Guide. Countries, regions, provinces, or other divisions mentioned in the Brassiceae literature which do not correspond to contemporary political boundaries are enclosed in square brackets and identified beside the current country code. Where plant distribution boundaries are uncertain, adjacent countries may be listed as a unit, or an earlier name retained. A number of islands and regions are listed separately because of distinctive ecology or restricted endemism. The symbol [?] indicates that a species has been reported, but that its presence has not been confirmed. Refer to the section on Phytogeographical zones for explanations of symbols [E] and [A].

Adriatic: eastern Adriatic coast from Trieste to Albania, including Dalmatian Coast and islands. **Aegean**: islands in eastern Aegean Sea, including Chios, Lesbos, and Rhodes. **Afghanistan**. **Albania**. **Algeria**: [Constantine prov., Draa, Hauts Plateaux, Hoggar (Central Sahara), Oran prov., ne Saharan Atlas, Tassili (Central Sahara), Tell]. **Anatolia**: central plateau of Asian Turkey; [nw Kurdistan]. **Argentina**. **Armenia**: former USSR republic; [Transcaucasus]. **Australia**: includes Tasmania. **Austria**: [Tyrol]. **Azerbaijan**: former USSR republic; [Baku, sw Caspian, Talish, Transcaucasus]. **Azores**: Portuguese Atlantic islands, including Corro, Faial, Florens, Graciosa, Pico, Santa Maria, São Jorge, São Miguel, Terceira; [Macaronesia]. **Bahrain**: [Gulf state]. **Balearic Islands**: Spanish w Mediterranean islands including Mallorca, Menorca, Ibiza. **Baltic**: region including Estonia, Latvia, Lithuania, nw Russia, s Finland, Baltic islands; other Baltic countries listed separately. **Belgium**: Belgium and Luxembourg. **Bolivia**. **Botswana**: [Bechuanaland]. **Brazil**. **Bulgaria**. **Canada**: for provincial distribution, see Guide IV. **Canary Islands**: Spanish Atlantic islands, including Fuerteventura, Gomera, Gran Canaria, Hierro, Lanzarote, Palma, Tenerife; [Macaronesia]. **Cape Verde**: Atlantic islands off the coast of Senegal, including Boa Vista, Brava, Fogo, Maio, Sal, Santo Antão, Santa Luzia, São Nicolau, São Tiago, São Vincente; [Macaronesia]. **Caribbean**: islands not listed separately. **Central America**. **Chad**: [Tibesti region, Central Sahara]. **Channel Islands**: British islands in the English Channel. **Chile**. **China**: includes Chinese Turkestan; Tibet listed separately. **Columbia**. **Corsica**: French w Mediterranean island. **Crete**: Greek c Mediterranean island. **Crimea**: Black Sea peninsula of Ukraine; [Krym]. **Cyprus**: e Mediterranean island with Greek and Turkish sectors. **Czech/Slovak Reps.**: [Czechoslovakia, Bohemia, Moravia]. **Denmark**: [Jutland, Zeeland]. **Ecuador**. **Egypt**: [Lower and Upper Egypt, e Libyan Desert, Nile Delta, Western Desert]; Sinai listed separately. **Ethiopia**: includes Somalia; [Abyssinia, Djibouti, Eritrea, German East Africa Somaliland]. **Faeröe Islands**: Danish North Sea islands. **Finland**. **France**: Corsica listed separately. **Georgia**: former USSR republic; [se Black Sea, Gruzia, Iberia, Tiflis, Transcaucasus].

Germany: reunited East and West Germany; [Bavaria, Brandenburg, Mecklenburg, Prussia, Saxony, Schleswig-Holstein, Helgoland]. **Great Britain**: England, Scotland, Wales; Channel Islands listed separately. **Greece**: [n and w Aegean, Corfu, Cyclades, Ionian Islands, Macedonia, Peloponnesus, Thessaly]; Crete and Cyprus listed separately; Eastern Aegean islands listed separately under Aegean. **Hungary**. **Iceland**. **India**: [Bengal, Bhutan, Deccan, sw Himalayas, e Punjab, Rajastan]. **Iran**: [Beluchistan, Fars, Khorassan, e Kurdistan, Luristan, Persia, se Transcaucasus]. **Iraq**: [Assyria, w Kurdistan, Mesopotamia]. **Ireland**: Irish Republic (Eire) and Northern Ireland (Br.). **Israel/Jordan**: [Dead Sea, Gaza, Palestine, West Bank]; two countries are shown together if exact location is not clearly stated. **Italy**: [Piedmont, Appenines]; Sardinia and Sicily listed separately. **Japan**. **Java**. **Jordan**: see also Israel/Jordan; two countries are shown together if exact location is not clearly stated. **Kazakhstan**: former USSR republic; [ne Caspian, Central Asia]. **Kenya**: [East Africa, German East Africa]. **Korea**. **Kuwait**: [Gulf state]. **Kyrgyzstan**: former USSR republic; [Turkestan]. **Lebanon/Syria**: includes Golan Heights [nw Mesopotamia]; two countries are shown together if exact location is not clearly stated. **Libya**: [Cyrenaica, Fezzan, Tripolitania]. **Madeira**: Portuguese Atlantic island group, including Desertans, Madeira, Porto Santo; [Macaronesia]. **Mali**: [Central Sahara]. **Malta**: w Mediterranean island. **Manchuria**. **Mauritania**: [Central Sahara]. **Mexico**. **Mongolia**. **Morocco**: [Anti-Atlas, Middle and High Atlas, Rif]; Western Sahara listed separately. **Namibia**: [South West Africa, German South West Africa]. **Nepal**: [sw Himalayas]. **Netherlands**: [Friesland, Holland]. **Niger**: [Central Sahara]. **Norway**. **Oman**: [e Arabia Felix, Gulf state]. **Pakistan**: [e Beluchistan, nw India, Punjab, Sind]. **Paraguay**. **Peru**. **Poland**: [Danzig, Pomerania]. **Portugal**: Azores and Madeira listed separately. **Qatar**. **Romania**: [Carpathia, Moldavia, Transylvania, Wallachia]. **Ruanda**. **Russia**: (= w Russian Federation) former USSR federal republic; includes European regions and states of the Federation; [ne Black Sea, nw Caspian Sea, n Caucasus, Ciscaucasus, Volga Basin, White Sea]; the Asian part of the Russian Federation is listed

separately under Siberia; the Baltic region is under Baltic. **Sardinia:** Italian island in the w Mediterranean. **Saudi Arabia:** [Arabia Petraea, Stony Arabia]. **Siberia:** Asian part of Russian Federation; [Altai]. **Sicily:** Italian island in the c Mediterranean. **Sinai:** Egyptian peninsula east of Suez. **Socotra:** Yemeni Island in the Gulf of Aden. **South Africa:** [Dutch colonies, High Veld, Orange R.]. **Spain:** includes Gibraltar (Br.); Balearic Islands and Canary Islands listed separately. **Sudan:** [Nubia]. **Sweden:** includes Gotland island. **Switzerland.** **Syria:** see also Lebanon/Syria; two countries are shown together if exact location is not clearly stated. **Tajikistan:** former USSR republic; [Pamirs]. **Tanzania:** [German East Africa, Tanganyika]. **Tibet.** **Turkey:** European region and the e Aegean, Mediterranean, and Black Sea coasts of the Asian region; [Bosphorus, Pontic Region, Thrace]; Cyprus and Anatolia listed separately. **Turkmenistan:** former USSR republic; [e Caspian Sea, Central Asia, Turkestan, Turcomania]. **Uganda.** **Ukraine:** former USSR republic, includes Moldava Republic; [e Carpathia, e Moldavia]; Crimea listed separately. **United Arab Emirates:** [Gulf state]. **United States:** for state distribution see Guide IV. **Uruguay.** **Uzbekistan:** former USSR republic; [Bokhara, Central Asia, Turkestan]. **Venezuela.** **Western Sahara:** [former Spanish Sahara, w Central Sahara]. **Yemen:** Reunited North and South Yemen; [Aden, Arabia Felix]; Socotra Island listed separately. **Yugoslavia:** area of the former republic of that name, including Bosnia, Croatia, Hercegovina, Macedonia, Montenegro, Serbia, Slovenia; Dalmatian coast and e Adriatic islands listed separately under Adriatic.

Phytogeographical Zones [PHYTOGEO]

This category applies only to the area where the species is endemic or found naturally, including areas of origin and/or regions where the species has been naturalized for such a long time that its origin cannot be accurately determined. The majority of species in the tribe are narrow endemics confined naturally to a restricted geographical area. The symbol [E] after the names of countries or areas indicates where endemism of the species has been suggested in the literature or, if not specifically stated, where we believe endemism can be reasonably assumed. The symbol [E?]

indicates that a species has been reported, but that its endemic status is not certain. The symbol [A] indicates that the species is known to be either recently introduced, adventive and/or has become naturalized following natural spreading from such introductions. [A?] indicates that a species would have [A] status, but its presence has not been confirmed. Because of wide spread cultivation, the endemic range for several crop species (*Brassica*, *Eruca*, and *Raphanus*) is not known with certainty.

The following zones are adapted from Zohary (1973), Hedge (1976), and Oztürk et al. (1983) with the addition of American, East African/Red Sea and South African regions.

American: North America, Central America, Caribbean.

East African/Red Sea: areas east of the Rift Valley, Red Sea coasts of Saudia Arabia and s Yemen, including the Ethiopian plateau and highlands of Eritrea, Ethiopia, Kenya, Ruanda, Uganda, and Tanzania. Sea level to tropical highlands.

Euro-Siberian: Atlantic, North Sea, and Baltic Europe, Belarus, n Ukraine, n Caucasus, Russia, s Siberia and central western and eastern Europe from n Portugal to s Russia, c Italy, n Turkey.

Irano-Turanian: Anatolian plateau, interior Syria and Israel, Jordan, Iraq, southern Caucasus, most of Iran, Afghanistan, n Pakistan, Turkmenistan, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan.

Macaronesian: northeastern to central eastern Atlantic Islands -- Azores, Madeira, Canary Islands, Cape Verde Islands.

Mediterranean: southern Europe from se Portugal and e Spain through se France, Ligurian and Adriatic Italy, Dalmatian coast, Albania, Greece, w and s Turkey, coastal Syria, Lebanon, Israel, and Egypt, ne Libya, Tunisia, n Algeria, n and nw Morocco, including islands from Gibraltar and the Balearics to Cyprus.

Saharo-Sindian: broad desert belt stretching from northwest Africa to Sind, including Saharan Morocco and Algeria, most of Libya, Egypt, s Sudan, and Sinai, Saudi Arabian peninsula (excluding the southern Red Sea coasts), Kuwait, s Iran, w Pakistan, nw India.

South African: South African plateau from northeastern prairies or High Veld to southwestern tableland, includes Namibian sub-desertic pasture lands.

SPECIES: *Ammosperma cinereum* (Desf.) Hook. f.
LIFE/FORM: annual
ECOLOGY: desert plains and hills; dry steppes, pastures and stream beds, damp sandy places
GEOGRAPHY:
AFRICA: nc & c Algeria [E], n Libya [E], s Tunisia [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Ammosperma variabile* Nègre & Le Houérou
LIFE/FORM: annual
ECOLOGY: desert; disturbed sites; sand or powdery gypsaceous soil
GEOGRAPHY:
AFRICA: sw Libya [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Boleum asperum* (Pers.) Desv.
LIFE/FORM: perennial, suffrutescent
ECOLOGY: arid sub-desert; dry pastures and scree; saline or brown calcareous to strongly gypsaceous soils
GEOGRAPHY:
EUROPE: e Spain [E]
PHYTOGEO: Mediterranean

SPECIES: *Brassica assyriaca* Mouton
LIFE/FORM: biennial, perennial?
ECOLOGY: montane; slopes of mountain peak
GEOGRAPHY:
ME/WASIA: n Syria (Summit Jab) [E]
PHYTOGEO: Irano-Turanian

SPECIES: *Brassica balearica* Pers.
LIFE/FORM: perennial, shrub
ECOLOGY: montane to 1400 m; scrub, rock crevices, chalky cliffs; limestone
GEOGRAPHY:
EUROPE: Balearic Islands (Mallorca) [E]
PHYTOGEO: Mediterranean

SPECIES: *Brassica barrelieri* (L.) Janka
LIFE/FORM: annual, rarely perennial
ECOLOGY: non-arid to semi-arid coastal, plains, hills to 900 m; beaches, estuaries, sandy cliffs and fields; sandy places, sometimes on quartz sand; calcareous and acidic sub-soils
GEOGRAPHY:
EUROPE: Balearic Islands [E], s Portugal [E], s & c Spain [E]
AFRICA: n Algeria [E], n & w Morocco [E]
AUST/ASIA: sw Australia [A]
PHYTOGEO: Mediterranean

SPECIES: *Brassica bourgeaui* (Webb.) Kuntze
LIFE/FORM: perennial, suffrutescent
ECOLOGY: hills to 600 m; cliffs, rocks, rock crevices in steep, shady barrancos
GEOGRAPHY:
ATLANTIC: Canary Islands (Gomera [E, extinct?], La Palma, Tenerife [E, extinct?]) [E]
PHYTOGEO: Macaronesian

SPECIES: *Brassica cadmea* Heldr. ex O.E. Schulz
LIFE/FORM: annual
ECOLOGY: inland hills; clay soils
GEOGRAPHY:
EUROPE: c Greece (near Thivai) [E]
PHYTOGEO: Mediterranean

SPECIES: *Brassica carinata* A. Braun
LIFE/FORM: annual
ECOLOGY: high plateaus, montane valleys to 4000 m; wild form unknown, cultivated (Ethiopian plateau) and weedy escape in fields
GEOGRAPHY:
AFRICA: Ethiopia [E], n Kenya [E]
PHYTOGEO: East African/Red Sea

SPECIES: *Brassica cretica* Lam.
LIFE/FORM: perennial, suffrutescent
ECOLOGY: coastal rocks, hills, montane to 1050 m; limestone cliffs and islets, crevices, ungrazed slopes, ravines; often shaded or north facing; limestone
GEOGRAPHY:
EUROPE: Aegean [E], Crete [E], Greece [E], sw Turkey [E]
ME/WASIA: Israel [E], c to s Lebanon [E]
PHYTOGEO: Mediterranean

SPECIES: *Brassica deflexa* Boiss.
LIFE/FORM: annual
ECOLOGY: desert plains, montane to 2000 m; steppes, rocky slopes, cliffs; weedy in roadsides and waste places, fields, orchards, grain crops
GEOGRAPHY:
ME/WASIA: sw Afghanistan [E], Anatolia [E], Iran [E], Iraq [E], Kuwait [E], Lebanon [E], Saudi Arabia [E], Syria [E]
PHYTOGEO: Irano-Turanian

SPECIES: *Brassica deserti* Danin & Hedge
LIFE/FORM: annual, perennial, herbaceous
ECOLOGY: desert montane to 1300 m; dry stream beds; chalky soil
GEOGRAPHY:
ME/WASIA: Sinai [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Brassica desnottesii* Emb. & Maire
LIFE/FORM: perennial, herbaceous, caespitose
ECOLOGY: semi-arid montane to 1250 m; fields, dry pastures, rubble, open woodland; calcareous soil
GEOGRAPHY:
AFRICA: ne Morocco [E]
PHYTOGEO: Mediterranean

SPECIES: *Brassica elongata* Ehrh.
LIFE/FORM: biennial to perennial, suffrutescent/caespitose?
ECOLOGY: semi-arid to arid desert plains, high plateaus, hills, montane to 1700 m; grassy steppes, dry pastures, dry rocky slopes; weedy in roadsides and waste places, fields, crops, vineyards; chalky soils
GEOGRAPHY:
EUROPE: Austria [E], Bulgaria [E], Crimea [E], Czech/Slovak Reps. [E], Denmark [A], France [A], Germany [A], Great Britain [A], Hungary [E], Italy [A], Netherlands [A], Romania [E], s & sw Russia [E], Turkey [E], Ukraine [E], Yugoslavia [E]
AFRICA: Morocco [E]
ME/WASIA: Afghanistan [E], Anatolia [E], Armenia [E], Georgia [E], Iran [E], Iraq [E], w Siberia [E], Turkmenistan [E], Uzbekistan [E]
AUST/ASIA: Australia [A]
PHYTOGEO: Irano-Turanian, Euro-Siberian

SPECIES: *Brassica fruticulosa* Cyr.
LIFE/FORM: annual to perennial, suffrutescent
ECOLOGY: semi-arid coastal, plains, montane; sandy plains, cliffs, rocks, crevices, rubble, scree, brush; weedy in fields, vineyards, olive groves
GEOGRAPHY:
EUROPE: Adriatic [?], s France [E], Greece [?], Italy [E], Malta [E], Sardinia [E], Sicily [E], Spain [E], Switzerland [A], Yugoslavia [?]
AFRICA: n Algeria [E], n Morocco [E], Libya [?]
AMERICAS: United States [A]
AUST/ASIA: Australia [A]
PHYTOGEO: Mediterranean

SPECIES: *Brassica glabrescens* Poldini
LIFE/FORM: perennial, herbacaeous, caespitose
ECOLOGY: foothills (Alps) from 140-160 m; along river beds in dry chalk rubble with sparse grass cover; stony calcareous soils
GEOGRAPHY:
EUROPE: ne Italy [E]
PHYTOGEO: Euro-Siberian

SPECIES: *Brassica gravinae* Ten.
LIFE/FORM: perennial, herbaceous, caespitose
ECOLOGY: non-arid to semi-arid coastal, hills, montane to 2300 m; rock and cliff crevices, scree, summits, gullies, fields, meadows; chalky soil
GEOGRAPHY:
EUROPE: c & s Italy (Appenines) [E]
AFRICA: n Algeria [E], n Libya [E], n & ec Morocco [E], Tunisia [E]
PHYTOGEO: Mediterranean

SPECIES: *Brassica hilarionis* Post
LIFE/FORM: perennial, suffrutescent
ECOLOGY: coastal hills (Kyrenia range) from 300-1000 m; steep limestone cliffs, crevices in castle walls
GEOGRAPHY:
EUROPE: n Cyprus [E]
PHYTOGEO: Mediterranean

SPECIES: *Brassica incana* Ten.
LIFE/FORM: perennial, suffrutescent
ECOLOGY: coastal cliffs, hills to 900 m; limestone cliffs, stones and rocks below cliffs; rubble, scree, scrub, roadsides and waste places; limestone
GEOGRAPHY:
EUROPE: Adriatic [E], s Crimea [E?], nw Greece [E], s & c Italy [E], e Sicily [E], s Yugoslavia [E]
PHYTOGEO: Mediterranean

SPECIES: *Brassica insularis* Moris
LIFE/FORM: perennial, suffrutescent
ECOLOGY: coastal cliffs, hills to 750 m; limestone cliffs, rarely rocks below cliffs, usually open sunny rocks, crevices, gullies, rocky limestone islets with scrub vegetation; limestone, rarely porphyry or volcanic rock
GEOGRAPHY:
EUROPE: Corsica [E], Sardinia [E]
AFRICA: ne Algeria [E], n Tunisia [E]
PHYTOGEO: Mediterranean

SPECIES: *Brassica jordanoffii* O.E. Schulz
LIFE/FORM: biennial to perennial, suffrutescent/caespitose
ECOLOGY: montane above 2500 m; limestone and calcareous rocks and scree
GEOGRAPHY:
EUROPE: Bulgaria (Mt. Pirin Planina) [E]
PHYTOGEO: Euro-Siberian

SPECIES: *Brassica juncea* (L.) Czern. & Coss.
LIFE/FORM: annual
ECOLOGY: coastal lowlands, plateaus, montane to 1150 m or more; wild, cultivated, weedy escape; weedy in sandy roadsides and waste places, fields, crops
GEOGRAPHY:
EUROPE: Bulgaria, Czech/Slovak Reps., Germany, Great Britain, Hungary, Netherlands, Romania, Russia, Spain, Ukraine
AFRICA: East, North and South Africa
ME/WASIA: Afghanistan, Anatolia, Azerbaijan, Iran, Iraq, Kyrgyzstan, Kuwait, Oman, Pakistan, Saudi Arabia, Turkmenistan, Yemen
AMERICAS: Canada [A], United States [A]
AUST/ASIA: Australia [A], China [A], India [A]; widely cultivated c and e Asia
PHYTOGEO: Euro-Siberian, Irano-Turanian
[Center of origin uncertain, likely Middle East; possibly multiple origins within overlapping ranges of parental taxa *B. rapa* and *B. nigra*]

SPECIES: *Brassica macrocarpa* Guss.
LIFE/FORM: perennial, suffrutescent
ECOLOGY: coastal mountains; crevices in limestone cliffs, rocks, rocky slopes, gullies; limestone
GEOGRAPHY:
EUROPE: nw Sicily (and off-shore islets) [E]
PHYTOGEO: Mediterranean

SPECIES: *Brassica maurorum* Durieu
LIFE/FORM: annual
ECOLOGY: semi-arid coastal to foothills; dry pastures, fields, brush, roadsides and waste places
GEOGRAPHY:
AFRICA: nw Algeria [E], ne Morocco [E]
PHYTOGEO: Mediterranean

SPECIES: *Brassica montana* Pourret
LIFE/FORM: perennial, suffrutescent
ECOLOGY: coastal to hills, up to 1000 m; limestone cliffs and rocks below, rocky limestone islets, scree, gorges, quarries, scrub, waste places
GEOGRAPHY:
EUROPE: s France [E], nw Italy [E], ne Spain [E]
PHYTOGEO: Mediterranean

SPECIES: *Brassica napus* L.
LIFE/FORM: annual, biennial
ECOLOGY: coastal lowlands, plateau, montane to 3000 m; wild (locations not certain), cultivated and weedy escape; stony cliffs, dry sandy or grassy places, dry stream beds, riparian; weedy in roadsides and waste places, fields, crops, gardens, oases, palm groves
GEOGRAPHY:
EUROPE: Corsica, France, Greece, Italy, Romania, s Russia (Caucasus), Sardinia, w Siberia, Sicily, Spain, Yugoslavia
[Cultivated in all countries except n Russia, n Scandinavia]
ATLANTIC: Madeira
AFRICA: Algeria, Cameroon, Central Sahara, Kenya, Morocco, Tunisia
ME/WASIA: Afghanistan, Anatolia, Egypt, Iran, Iraq, Pakistan, Tibet, Turkmenistan, Uzbekistan, n Yemen
AMERICAS: Argentina [A], Canada [A], Central America [A], Chile [A], Columbia [A], Ecuador [A], Mexico [A], Peru [A], United States [A]
AUST/ASIA: Australia [A], China [A], India [A], Indonesia [A], Japan [A], Korea [A], New Zealand [A]
PHYTOGEO: Euro-Siberian, Irano-Turanian
[Center of origin uncertain, likely multiple origins in Europe within overlapping ranges of parental taxa *B. rapa* and *B. oleracea* and its related *n*=9 species]

SPECIES: *Brassica nigra* (L.) Koch
LIFE/FORM: annual
ECOLOGY: coastal lowlands, plateaus, montane; wild, cultivated and weedy escape; sea cliffs, shingle, rubble, scrub, dry stream beds, riparian; weedy in roadsides and waste places, fields, crops, gardens, oases; damp calcareous loamy clays and silty soils
GEOGRAPHY:
EUROPE: Aegean [E], Bulgaria [E], Corsica [E?], Crete [E?], Crimea [?], Cyprus [E], Denmark [A], Finland [A], France [E?], Germany [A], Great Britain [A], Greece [E?], Hungary [A], Ireland [A], Italy [E?], Malta [E?], Poland [A], Portugal [E?], Romania [E?], Sardinia [E?], Sicily [E?], Spain [E?], Sweden [A], Switzerland [A], Turkey [E], Yugoslavia [E?]
ATLANTIC: Azores [E?], Canary Islands [E?], Cape Verde [E?], Madeira [E?]
AFRICA: n Algeria [E?], Ethiopia [E?], Kenya [A], n Libya [E?], n Morocco [E?], South Africa [A], Tunisia [E?]
ME/WASIA: Afghanistan [E?], Anatolia [E], Egypt [E], Iran [E?], Iraq [E?], Israel/Jordan [E], Lebanon/Syria [E], Pakistan [E?], Sinai [E?]
AMERICAS: Canada [A], United States [A], South America [A]
AUST/ASIA: Australia [A], India [A], Japan [A]
PHYTOGEO: Euro-Siberian, Irano-Turanian, Mediterranean
[Center of origin and native range uncertain]

SPECIES: *Brassica nivalis* Boiss. & Heldr.
LIFE/FORM: perennial, suffrutescent/caespitose
ECOLOGY: montane from 2000-2500 m, above tree line near permanent snow; limestone and calcareous scree and rocks
GEOGRAPHY:
EUROPE: Greece (Mt. Olympus) [E]
PHYTOGEO: Euro-Siberian

SPECIES: *Brassica oleracea* L.
LIFE/FORM: biennial, perennial, suffrutescent
ECOLOGY: coastal; wild, cultivated and weedy escape; wild on limestone and chalky cliffs, beaches (rarely shingle), rocks, shale, sandstone, undisturbed grassy slopes, scree, gullies, brush; weedy in roadsides and waste places, fields, gardens
GEOGRAPHY:
EUROPE: Aegean [A?], Bulgaria [A], Channel Islands [E], Corsica [A], Czech/Slovak Reps. [A], w & n France [E], Germany (Helgoland) [E], Great Britain [E], Ireland [A], s Italy [A], Netherlands [A], n Spain [E], Yugoslavia [A?] (also widely cultivated)
AFRICA: Tunisia [A] (also widely cultivated in North, East and South Africa)
ME/WASIA: Lebanon/Syria [A], Saudi Arabia [A], n Yemen [A]
AMERICAS: Canada [A], United States [A] (cultivated and rare weedy escape, reported to be naturalized on coastal cliffs in California)
AUST/ASIA: Australia [A], China [A], Japan [A] (widely cultivated in Asia)
PHYTOGEO: Euro-Siberian

SPECIES: *Brassica oxyrrhina* (Coss.) Willk. & Lange
LIFE/FORM: annual
ECOLOGY: non-arid to semi-arid coastal to inland plains; beaches, sandy plains, riparian; sandy soil
GEOGRAPHY:
EUROPE: s Spain [E], s Portugal [E]
AFRICA: nw Morocco [E]
AUST/ASIA: New Zealand [A]
PHYTOGEO: Mediterranean

SPECIES: *Brassica procumbens* (Poiret) O.E. Schulz
LIFE/FORM: annual
ECOLOGY: plains, hills; steppes, grassy meadows, dry pastures, rubble, scree; weedy in roadsides and waste places, fields, crops
GEOGRAPHY:
EUROPE: Corsica [A], Italy (Giglio Isl.) [E, extinct?]
AFRICA: n Algeria [E], Tunisia [E]
PHYTOGEO: Mediterranean

SPECIES: *Brassica rapa* L.
LIFE/FORM: annual, winter annual, biennial
ECOLOGY: non-arid coastal lowlands, plateaus, hills, montane to 2300 m; wild (locations not certain), cultivated, and weedy escape; steppes, high meadows, pastures, grassy places, bare slopes, alluvium; weedy in roadsides and waste places, fields, gardens, crops
GEOGRAPHY:
EUROPE: Albania, Balearic Islands, Bulgaria, Corsica, France, Greece, Italy, Malta, Romania, Sardinia, Sicily, Spain, Yugoslavia (long cultivated in most of Europe, north to Iceland, east to Siberia)
ATLANTIC: Canary Islands (Tenerife)
AFRICA: n Algeria, Ethiopia, n Libya, n Morocco, South Africa, Tunisia
ME/WASIA: Anatolia, Egypt, Iran, Israel/Jordan, Kuwait, Lebanon/Syria, Oman, Qatar, Saudi Arabia, n Yemen
AMERICAS: Argentina [A], Bolivia [A], Brazil [A], Canada [A], Caribbean [A], Mexico [A], United States [A], Uruguay [A] (cultivated & weedy)
AUST/ASIA: Australia [A], China [A], Japan [A], Java [A], Korea [A], Manchuria [A] (cultivated and weedy)
PHYTOGEO: Euro-Siberian, Mediterranean
[Center of origin and native range uncertain]

SPECIES: *Brassica repanda* (Willd.) DC.
LIFE/FORM: perennial, herbaceous, caespitose
ECOLOGY: semi-arid coastal rocks (rare), plateaus, hills, montane to 3650 m; steep cliffs and precipices, rubble, scree, limestone and silica rocks, gypsum and clay slopes, riparian, dry pastures, open woodlands; sandy, calcareous and argillaceous soils
GEOGRAPHY:
EUROPE: se France [E], nw Italy [E], Spain [E]
AFRICA: nw Algeria [E], n Morocco [E]
PHYTOGEO: Mediterranean

SPECIES: *Brassica rupestris* Raf.
LIFE/FORM: perennial, suffrutescent
ECOLOGY: sea level to coastal montane to 1100 m; limestone, rarely sandstone cliffs, usually north faces; rocky slopes; limestone
GEOGRAPHY:
EUROPE: w Sicily [E]
PHYTOGEO: Mediterranean

SPECIES: *Brassica souliei* (Batt.) Batt.
LIFE/FORM: annual to perennial, herbaceous to suffrutescent
ECOLOGY: semi-arid coastal hills, high plateaus, montane to 1500 m; cliffs, rocks, scree, dry pastures, meadows, brush; weedy in roadsides and waste places, fields; clay, chalky slate or argillaceous soils
GEOGRAPHY:
EUROPE: Sicily [E]
AFRICA: n Algeria [E], ne Morocco [E], Tunisia [E]
PHYTOGEO: Mediterranean

SPECIES: *Brassica spinescens* Pomel
LIFE/FORM: perennial, suffruticose
ECOLOGY: coastal rocks and cliffs; calcareous or siliceous soils
GEOGRAPHY:
AFRICA: n Algeria [E]
PHYTOGEO: Mediterranean

SPECIES: *Brassica tournefortii* Gouan
LIFE/FORM: annual
ECOLOGY: semi-arid to arid coastal and riparian sands and dunes, plateaus to 1000 m; dry pastures; weedy in roadsides and waste places and occasionally weedy in fields, gardens, oases, crops
GEOGRAPHY:
EUROPE: Aegean [E], Crete [E], Cyprus [E], France [A], Greece [E], Italy [E], Malta [E], Portugal [?], Sardinia [E], Sicily [E], Spain [E], Turkey [E]
AFRICA: Algeria [E], Libya [E], Morocco [E], South Africa [A], Tunisia [E]
ME/WASIA: Anatolia [E], Azerbaijan [E], Bahrain [E], Egypt [E], Iran [E], Iraq [E], Israel/Jordan [E], Kuwait [E], Lebanon/Syria [E], w Pakistan [E], Qatar [E], Saudi Arabia [E], Sinai [E], United Arab Emirates [E], s Yemen [E]
AMERICAS: United States [A]
AUST/ASIA: Australia [A], New Zealand [A]
PHYTOGEO: Mediterranean, Saharo-Sindian (Irano-Turanian)

SPECIES: *Brassica villosa* Biv.
LIFE/FORM: perennial, suffrutescent
ECOLOGY: sea level to 1000 m; limestone, rarely sandstone, cliffs and rocks, usually north-facing or shaded; limestone
GEOGRAPHY:
EUROPE: c & nw Sicily [E]
PHYTOGEO: Mediterranean

SPECIES: *Cakile arabica* Velen. & Bornm.
LIFE/FORM: annual
ECOLOGY: inland desert from near sea level to 800 m; stable sands and gravel
GEOGRAPHY:
ME/WASIA: sw Iran [E], s Iraq [E], Kuwait [E], Saudi Arabia [E], United Arab Emirates [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Cakile arctica* Pobedimova [=*Cakile edentula* ssp. *islandica*]
LIFE/FORM: annual
ECOLOGY: arctic coastal; sandy beaches, dunes, dispersal of seeds by water
GEOGRAPHY:
EUROPE: Faeröe Islands [E], Iceland [E], n Russia [E]
PHYTOGEO: Euro-Siberian

SPECIES: *Cakile constricta* Rodman
LIFE/FORM: annual
ECOLOGY: seacoast; sandy beaches, dispersal of seeds by water
GEOGRAPHY:
AMERICAS: se United States [E]
PHYTOGEO: American

SPECIES: *Cakile edentula* (Bigelow) Hook. [excludes ssp. *islandica*]
LIFE/FORM: annual
ECOLOGY: seacoasts, shores of Great Lakes; sandy and gravelly beaches, dispersal of seeds by water
GEOGRAPHY:
ATLANTIC: Azores [A]
AMERICAS: Canada [E], Mexico [E], United States [E]
AUST/ASIA: se Australia [A], New Zealand [A]
PHYTOGEO: American

SPECIES: *Cakile geniculata* (Robinson) Millsp.
LIFE/FORM: annual
ECOLOGY: seacoasts; sandy beaches, dispersal of seeds by water
GEOGRAPHY:
AMERICAS: e Mexico [E], se United States [E]
PHYTOGEO: American

SPECIES: *Cakile lanceolata* (Willd.) O.E. Schulz
LIFE/FORM: annual
ECOLOGY: seacoasts; sandy beaches, dispersal of seeds by water
GEOGRAPHY:
AMERICAS: Caribbean [E], Central America [E], Columbia [E], Mexico [E], Venezuela [E], s United States [E]
PHYTOGEO: American

SPECIES: *Cakile maritima* Scop.
LIFE/FORM: annual or biennial, rarely perennial
ECOLOGY: seacoasts; sandy beaches, dunes, shingle, rubble, debris, dispersal of seeds by water
GEOGRAPHY:
EUROPE: Adriatic [E], Aegean [E], Albania [E], Balearic Islands [E], Baltic [E], Belgium [E], Bulgaria [E], Corsica [E], Crete [E], Crimea [E], Cyprus [E], Denmark [E?], Faeröe Islands [E], Finland [E], France [E], Germany [E], Great Britain [E], Greece [E], Ireland [E], Italy [E], Malta [E], Netherlands [E], Norway [E?], Poland [E], Portugal [E], Romania [E], Russia [E], Sardinia [E], Sicily [E], Spain [E], Sweden [E], Turkey [E], Yugoslavia [E]
ATLANTIC: Canary Islands [E], Madeira [E]
AFRICA: n Algeria [E], n Libya [E], n & w Morocco [E], Tunisia [E]
ME/WASIA: n Egypt [E], Israel [E], Lebanon [E], Sinai [E]
AMERICAS: Argentina [A], w Canada [A], w United States [A], Uruguay [A]
AUST/ASIA: Australia [A]
PHYTOGEO: Euro-Siberian, Mediterranean

SPECIES: *Carrichtera annua* (L.) DC.
LIFE/FORM: annual
ECOLOGY: semi-arid to arid coastal, plains, hills, desert depressions; beaches, steppes, rocky places, brush, dry pastures; weedy in roadsides and waste places, fields, crops, vineyards; sandy, silty, or chalky soils
GEOGRAPHY:
EUROPE: Balearic Islands [E], Crete [E], Corsica [A], Cyprus [E], Greece [E], Italy [A], Portugal [E], Sardinia [E], Sicily [E], Spain [E]
ATLANTIC: Canary Islands (except Hierro, Palma) [E]
AFRICA: n Algeria [E], n Libya [E], Morocco [E], Tunisia [E]
ME/WASIA: n Egypt [E], w & s Iran [E], Iraq [E], Israel/Jordan [E], Kuwait [E], Lebanon/Syria [E], Saudi Arabia [E], Sinai [E]
AUST/ASIA: Australia [A]
PHYTOGEO: Mediterranean, Irano-Turanian (Saharo-Sindian)

SPECIES: *Ceratocnemum rapistroides* Coss. & Bal.
LIFE/FORM: annual
ECOLOGY: semi-arid to arid plateaus, hills to 1100 m; steppes, fields, pastures, brush, scree and rubble
GEOGRAPHY:
AFRICA: ne Morocco [E]
PHYTOGEO: Mediterranean

SPECIES: *Chalcanthus renifolius* Boiss.
LIFE/FORM: perennial, herbaceous
ECOLOGY: montane to 3600 m; high slopes, chalk cliffs
GEOGRAPHY:
ME/WASIA: nw Afghanistan [E], Iran [E], n Iraq [E], Turkmenistan [E]
PHYTOGEO: Irano-Turanian

SPECIES: *Chalcanthus tuberosus* Kom.
LIFE/FORM: perennial, herbaceous
ECOLOGY: montane from 1300-2000 m; high valley slopes and cliffs
GEOGRAPHY:
ME/WASIA: Turkmenistan [E]
PHYTOGEO: Irano-Turanian

SPECIES: *Coincya longirostra* (Boiss.) Greuter & Burdet
LIFE/FORM: biennial to perennial, herbaceous
ECOLOGY: hills from 600-800 m; rocky outcrops, schistose or shale slopes
GEOGRAPHY:
EUROPE: sc Spain [E]
PHYTOGEO: Mediterranean

SPECIES: *Coincya monensis* (L.) Greuter & Burdet
LIFE/FORM: annual to perennial, herbaceous
ECOLOGY: coastal and riparian sands and dunes, non-arid inland montane to 3200 m; shaded rocky slopes, crevices and scree, open woodland; weedy in roadsides and waste places, fields; siliceous or calcareous rocks and sand
GEOGRAPHY:
EUROPE: Channel Islands [E], Corsica [E], France [E], Germany [E], Great Britain (w England, w Scotland, Isle of Man) [E], Italy [E], Portugal [E], Spain [E]
AFRICA: n Morocco [E]
AMERICAS: United States [A]
PHYTOGEO: Euro-Siberian

SPECIES: *Coincya richeri* (Vill.) Greuter & Burdet
LIFE/FORM: perennial, herbaceous
ECOLOGY: montane (sw Alps) from 1750-2500 m; schistose rocks, crevices, rubble, grassy places, alpine meadows, near glaciers
GEOGRAPHY:
EUROPE: se France [E], nw Italy [E]
PHYTOGEO: Euro-Siberian

SPECIES: *Coincya rupestris* Porta & Rigo ex Rouy
LIFE/FORM: biennial to perennial, herbaceous
ECOLOGY: hills from 700-1100 m; scree, crevices in calcareous or schistose rocky outcrops
GEOGRAPHY:
EUROPE: sc Spain [E]
PHYTOGEO: Mediterranean

SPECIES: *Coincya transtagana* (Cout.) Clemente & Hernández-Bermejo
LIFE/FORM: annual
ECOLOGY: arid low hills; dry pastures, roadsides and waste places, disturbed land at mining sites; sand, rubble, clay
GEOGRAPHY:
EUROPE: sw Spain [E], s Portugal [E]
PHYTOGEO: Mediterranean

SPECIES: *Coincya wrightii* (O.E. Schulz) Stace
LIFE/FORM: biennial?, perennial, herbaceous
ECOLOGY: coastal; granitic cliffs and shale slopes
GEOGRAPHY:
EUROPE: Great Britain (se Lundy Island, Bristol Channel) [E]
PHYTOGEO: Euro-Siberian

SPECIES: *Conringia austriaca* (Jacq.) Sweet
LIFE/FORM: annual, biennial
ECOLOGY: low valleys, montane to 1350 m; sunny, stony cliffs, meadows, brush; weedy in roadsides and waste places, fields; loam and chalky soils
GEOGRAPHY:
EUROPE: Austria [E], Bulgaria [E], Crimea [E], Czech/Slovak Reps. [E], Greece [E], Hungary [E], Italy [E], s Russia [E], Turkey [E], Yugoslavia [E]
ME/WASIA: Anatolia [E], Armenia [E], Georgia [E], nw Iran [E]
PHYTOGEO: Euro-Siberian (Irano-Turanian)

SPECIES: *Conringia clavata* Boiss.
LIFE/FORM: annual
ECOLOGY: plains, hills, montane to 1700 m; steppes, scree, cliffs, rubble; weedy in roadsides and waste places, fields, vineyards, crops; loam and calcareous soils
GEOGRAPHY:
EUROPE: Crimea [E], s Russia [E], Turkey [E]
ME/WASIA: nw Afghanistan [E], Anatolia [E], Armenia [E], Azerbaijan [E], Georgia [E], Iran [E], n Iraq [E], Lebanon/Syria [E], Turkmenistan [E]
PHYTOGEO: Irano-Turanian

SPECIES: *Conringia grandiflora* Boiss. & Heldr.
LIFE/FORM: annual
ECOLOGY: coastal hills from 300-1000 m; rocky limestone slopes
GEOGRAPHY:
EUROPE: sw Turkey (Antalya Coast) [E]
PHYTOGEO: Mediterranean

SPECIES: *Conringia orientalis* (L.) Andrzejowski ex DC.
LIFE/FORM: annual, biennial, winter annual
ECOLOGY: non-arid to arid coastal, high plateaus, montane to 3280 m; weedy in roadsides and waste places, fields, crops, vineyards, oases; argillaceous, calcareous, gypsaceous soils
GEOGRAPHY:
EUROPE: Aegean [E], Albania [E], Austria [E], Balearic Islands [A], Belgium [A], Bulgaria [E], Crimea [E], Cyprus [E], Czeck/Slovak Reps. [E], Denmark [A], Finland [A], France [E], Germany [E], Great Britain [A], Greece [E], Hungary [E], Iceland [A], Italy [E], Malta [E], Netherlands [A], Norway [A], Poland [E], Romania [E], n, c & s Russia [E], Sicily [E], Spain [A], Switzerland [A], Turkey [E], Yugoslavia [E] (adventive or widely naturalized)
AFRICA: n Algeria [E], Libya [E], Morocco [E], Tunisia [E]
ME/WASIA: Afghanistan [E], Anatolia [E], Armenia [E], Azerbaijan [E], Egypt [E], Georgia [E], Iran [E], Iraq [E], Israel/Jordan [E], Lebanon/Syria [E], nw Pakistan [E], Turkmenistan [E]
AMERICAS: Canada [A], United States [A]
AUST/ASIA: Australia [A]
PHYTOGEO: Mediterranean, Euro-Siberian, Irano-Turanian

SPECIES: *Conringia persica* Boiss.
LIFE/FORM: annual
ECOLOGY: hills, montane from 1000-3600 m; high valleys, rubble, rocky ridges; weedy in roadsides and waste places, fields
GEOGRAPHY:
ME/WASIA: Afghanistan [E], Anatolia [E], Armenia [E], Azerbaijan [E], Georgia [E], Iran [E], ne Iraq [E], w Pakistan [E], Turkmenistan [E]
PHYTOGEO: Irano-Turanian

SPECIES: *Conringia planisiliqua* Fischer & C.A. Meyer
LIFE/FORM: annual
ECOLOGY: montane from 1000-4600 m; grassy and rocky slopes, brush, riparian, sandy, stony places, shale
GEOGRAPHY:
ME/WASIA: Afghanistan [E], Anatolia [E], Armenia [E], Georgia [E], Iran [E], w Pakistan [E], w Tibet [E], Turkmenistan [E], Uzbekistan [E]
PHYTOGEO: Irano-Turanian

SPECIES: *Cordylocarpus muricatus* Desf.
LIFE/FORM: annual
ECOLOGY: semi-arid plains, high plateaus, hills; steppes, alluvium of dry stream beds and gullies, open woodlands and brush, dry pastures; weedy in roadsides and waste places, fields, crops; argillaceous soil
GEOGRAPHY:
AFRICA: nw Algeria [E], ne Morocco [E]
ME/WASIA: Israel [A]
PHYTOGEO: Mediterranean

SPECIES: *Crambe abyssinica* Hochst. ex O.E. Schulz
[treated as separate from *C. hispanica* here]
LIFE/FORM: annual
ECOLOGY: tropical montane (Abyssinian Highlands) to 2000 m; base of volcano; shade of trees, brush, fields; wild and cultivated
GEOGRAPHY:
AFRICA: Ethiopia [E], Ruanda [E]
PHYTOGEO: East African/Red Sea

SPECIES: *Crambe cordifolia* Steven
LIFE/FORM: perennial, herbaceous
ECOLOGY: plains, hills, montane from 700-1000 m; w Tibetan highlands to 4500 m; steppes, high valleys, sunny slopes, riparian
GEOGRAPHY:
EUROPE: s Russia (n Caucasus) [E]
ME/WASIA: nw Afghanistan [E], Azerbaijan [E], Iran [E], Kazakhstan [E], Pakistan [E], w Tibet [E], Turkmenistan [E], Uzbekistan [E]
PHYTOGEO: Irano-Turanian

SPECIES: *Crambe edentula* Fischer & C.A. Meyer
LIFE/FORM: perennial, herbaceous
ECOLOGY: coastal and inland sea depressions (Caspian and Aral Seas); sandy plains
GEOGRAPHY:
ME/WASIA: Turkmenistan [E], Uzbekistan [E]
PHYTOGEO: Irano-Turanian

SPECIES: *Crambe filiformis* Jacq.
LIFE/FORM: perennial, herbaceous
ECOLOGY: semi-arid hills, montane to 2200 m; high valleys, riparian, rocks, crevices, gullies, rubble, pastures, meadows, open woodlands and brush, fields, hedges; calcareous rock
GEOGRAPHY:
EUROPE: s Spain [E]
AFRICA: nw Algeria [E], Morocco [E]
PHYTOGEO: Mediterranean

SPECIES: *Crambe fruticosa* L. f.
LIFE/FORM: perennial, suffruticose
ECOLOGY: coastal rocks and cliffs, hills; dry, sunny exposed cliffs and rocks, ridges
GEOGRAPHY:
ATLANTIC: Madeira (Madeira, Porto Santo, islets) [E]
PHYTOGEO: Macaronesian

SPECIES: *Crambe gordjaginii* Sprygin & Popov
LIFE/FORM: perennial, suffruticose to shrubby
ECOLOGY: plateau, foothills (Pamirs); dry steppes
GEOGRAPHY:
ME/WASIA: se Kazakhstan [E], Tajikistan [E], e Uzbekistan [E]
PHYTOGEO: Irano-Turanian

SPECIES: *Crambe grandiflora* DC.
LIFE/FORM: perennial, herbaceous
ECOLOGY: coastal, plains, foothills; river valleys, grassy steppes
GEOGRAPHY:
EUROPE: Crimea [E], s Russia (n Caucasus) [E]
ME/WASIA: Georgia [E]
PHYTOGEO: Euro-Siberian

SPECIES: *Crambe hispanica* L.
[*C. abyssinica* treated as separate from *C. hispanica* here]
LIFE/FORM: annual
ECOLOGY: non-arid to semi-arid coastal, plains, hills to 1200 m; beaches, shaded rocks and crevices, grassy slopes, rubble, fields, olive groves; limestone and silica rocks, fertile soils
GEOGRAPHY:
EUROPE: Adriatic [E], Cyprus [E], Greece [E], Italy [E, extinct?], s Portugal [E], Sardinia [E, extinct?], Sicily [E, extinct?] Spain [E], Yugoslavia [E]
AFRICA: n Morocco [E]
ME/WASIA: w Iran [E], Israel/Jordan [E], Lebanon/Syria [E]
PHYTOGEO: Mediterranean

SPECIES: *Crambe kilimandscharica* O.E. Schulz
LIFE/FORM: annual
ECOLOGY: plateaus (East African), tropical montane to 1600 m; grassy steppes, fields, brush
GEOGRAPHY:
AFRICA: Ethiopia [E], n Kenya [E]
PHYTOGEO: East African/Red Sea

SPECIES: *Crambe koktebelica* (Junge) N. Busch
LIFE/FORM: perennial, herbaceous
ECOLOGY: coastal valleys, hills; loam and chalky soils
GEOGRAPHY:
EUROPE: se Crimea [E], s Russia (nw Caucasus) [E]
PHYTOGEO: Euro-Siberian

SPECIES: *Crambe kralikii* Coss. ex Reboud
LIFE/FORM: annual, perennial, herbaceous
ECOLOGY: desert and arid sub-desert plains, montane to 2700 m; dry pastures, dry stream beds, gullies, rock crevices, sand and rubble, scree, oases; loam and chalky soils
GEOGRAPHY:
AFRICA: nc & s Algeria [E], s & ec Morocco [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Crambe laevigata* DC. ex Christ
LIFE/FORM: perennial, suffruticose
ECOLOGY: no precise information
GEOGRAPHY:
ATLANTIC: Canary Islands (Tenerife) [E]
PHYTOGEO: Macaronesian

SPECIES: *Crambe maritima* L.
LIFE/FORM: perennial, herbaceous
ECOLOGY: coastal (shores of Atlantic, Baltic, Black and Azov Seas); sandy or stony beaches, shingle, rarely on sea cliffs; occasionally cultivated, weedy escape
GEOGRAPHY:
EUROPE: Austria [A], Baltic [E], Belgium [E], Bulgaria [E], Channel Islands [E], Crimea [E], Czech/Slovak Reps. [A], Denmark [E], Faeröe Islands [E], France [E], Germany [E], Great Britain [E], Hungary [A], Ireland [E], Netherlands [E], Norway [E], Romania [E], s Russia [E], Sweden [E], Turkey [E], Ukraine [E]
ME/WASIA: Georgia [E], Israel/Jordan [E]
AMERICAS: United States [A]
PHYTOGEO: Euro-Siberian

SPECIES: *Crambe mitridatis* Juz.
LIFE/FORM: perennial, herbaceous
ECOLOGY: coastal; calcareous rock crevices
GEOGRAPHY:
EUROPE: Crimea (Kerch Peninsula) [E]
PHYTOGEO: Euro-Siberian

SPECIES: *Crambe orientalis* L.
LIFE/FORM: perennial, herbaceous
ECOLOGY: plateaus, hills, montane to 2800 m; grassy or stony steppes and slopes, exposed rocks, forest margins, rubble; weedy (tumbleweed) in fields and wastelands; loam, chalky, or argillaceous soils
GEOGRAPHY:
EUROPE: Crimea [E], s Russia (n Caucasus) [E]
ME/WASIA: Afghanistan [E], Anatolia [E], Azerbaijan [E], Armenia [E], Georgia [E], Iran [E], n Iraq [E], Israel/Jordan [E], Lebanon/Syria [E], Turkmenistan [E]
PHYTOGEO: Irano-Turanian

SPECIES: *Crambe parviflora* Huber-Morath & Reese
LIFE/FORM: perennial, herbaceous
ECOLOGY: plateaus to 900 m; steppes, fields, stony slopes
GEOGRAPHY:
ME/WASIA: Anatolia [E]
PHYTOGEO: Irano-Turanian

SPECIES: *Crambe persica* Boiss.
LIFE/FORM: perennial, herbaceous
ECOLOGY: montane
GEOGRAPHY:
ME/WASIA: se Azerbaijan [E], n Iran [E]
PHYTOGEO: Irano-Turanian

SPECIES: *Crambe scaberrima* Webb ex Bramwell
LIFE/FORM: perennial, suffrutescent
ECOLOGY: montane to 1250 m; rocks, barrancos, woods
GEOGRAPHY:
ATLANTIC: Canary Islands (Gomera [?], Tenerife) [E]
PHYTOGEO: Macaronesian

SPECIES: *Crambe schugnana* Korsh.
LIFE/FORM: perennial, herbaceous
ECOLOGY: montane to 2500 m; high stony slopes, cliffs
GEOGRAPHY:
ME/WASIA: ne Afghanistan [E], Tajikistan [E]
PHYTOGEO: Irano-Turanian

SPECIES: *Crambe scoparia* Svent.
LIFE/FORM: ?
ECOLOGY: no precise information
GEOGRAPHY:
ATLANTIC: Canary Islands (Gran Canaria) [E]
PHYTOGEO: Macaronesian

SPECIES: *Crambe sinuato-dentata* Hochst. ex Petri
LIFE/FORM: annual
ECOLOGY: tropical plateau (Abyssinian Highlands), montane to 1650 m; steppes; weedy in maize fields
GEOGRAPHY:
AFRICA: s Ethiopia [E], n Uganda [E]
PHYTOGEO: East African/Red Sea

SPECIES: *Crambe steveniana* Rupr.
LIFE/FORM: perennial, herbaceous
ECOLOGY: coastal, plains, foothills; grassy steppes
GEOGRAPHY:
EUROPE: Crimea [E], s Russia (n Caucasus) [E], s Ukraine [E?]
PHYTOGEO: Euro-Siberian

SPECIES: *Crambe strigosa* L'Hér.
LIFE/FORM: perennial, suffrutescent
ECOLOGY: montane to 1250 m; cliffs and rocks, rocky slopes, barrancos; brush, arborescent in euphorbia woods
GEOGRAPHY:
ATLANTIC: Canary Islands (Gomera, Gran Canaria, Hierro, Palma, Tenerife) [E]
PHYTOGEO: Macaronesian

SPECIES: *Crambe sventenii* B. Petters ex Bramwell & Sundell
LIFE/FORM: ?
ECOLOGY: no precise information
GEOGRAPHY:
ATLANTIC: Canary Islands (Fuerteventura) [E]
PHYTOGEO: Macaronesian

SPECIES: *Crambe tataria* Sebeók
LIFE/FORM: perennial, herbaceous
ECOLOGY: coastal, river valleys, high plateaus from 900-1400 m; sunny, grassy steppes and hills, stony slopes, pastures; weedy in roadsides and waste places, fields, vineyards; loam, sandy, sometimes saline soils
GEOGRAPHY:
EUROPE: Austria [E], Bulgaria [E], Crimea [E], Czech/Slovak Reps. [E], Hungary [E], nw Italy [E], Poland [E], Romania [E], sw & s Russia (n Caucasus) [E], s Ukraine [E], Yugoslavia [E]
ME/WASIA: Anatolia [E], e Kazakhstan [E], w Siberia [E]
PHYTOGEO: Euro-Siberian, Irano-Turanian

SPECIES: *Crambella teretifolia* (Batt. & Trabut) Maire
LIFE/FORM: annual
ECOLOGY: high plains, montane river basins; dry stony steppes, meadows, fields; clay soils
GEOGRAPHY:
AFRICA: ne Morocco (Middle Atlas) [E]
PHYTOGEO: Mediterranean

SPECIES: *Didesmus aegyptius* (L.) Desv.
LIFE/FORM: annual
ECOLOGY: semi-arid to arid coastal, plains, plateau to 650 m; beaches, grassy steppes, fields, brush, shaded sides of cliffs, chalk and stone rubble; sandy soil
GEOGRAPHY:
EUROPE: Aegean [E], Crete [E], Cyprus [E], Greece [E]
AFRICA: n Libya [E]
ME/WASIA: Egypt [E]
PHYTOGEO: Mediterranean

SPECIES: *Didesmus bipinnatus* (Desf.) DC.
LIFE/FORM: annual
ECOLOGY: desert to semi-arid coastal, high plateaus, foothills; beaches, grassy steppes, dry pastures, dry stream beds, fields; sandy, loam soils
GEOGRAPHY:
AFRICA: c Algeria [E], n Libya [E], Tunisia [E]
ME/WASIA: Egypt [E], Kuwait [E?], nw Saudi Arabia [E?]
PHYTOGEO: Saharo-Sindian

SPECIES: *Diplotaxis acris* (Forssk.) Boiss.
LIFE/FORM: annual, winter annual, rarely perennial
ECOLOGY: desert depressions, plateaus to 1200 m; steppes, dry stream beds, gullies, dry pastures, roadsides and waste places; sand, rubble, silt
GEOGRAPHY:
AFRICA: s Algeria [E], n & s Libya [E], Tunisia [E]
ME/WASIA: n & s Egypt [E], Iraq [E], Israel/Jordan [E], Kuwait [E], Saudi Arabia [E], Sinai [E], s Yemen [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Diplotaxis assurgens* (Del.) Gren.
LIFE/FORM: annual
ECOLOGY: semi-arid to arid plains, hills; steppes, dry pastures, sandy and stony fields
GEOGRAPHY:
EUROPE: France [A]
AFRICA: wc & sw Morocco [E]
PHYTOGEO: Mediterranean

SPECIES: *Diplotaxis berthautii* Braun-Blanq. & Maire
LIFE/FORM: annual
ECOLOGY: semi-arid to arid plains, hills; rocky dry pastures, stony fields
GEOGRAPHY:
AFRICA: wc Morocco [E]
PHYTOGEO: Mediterranean

SPECIES: *Diplotaxis brachycarpa* Godr.
LIFE/FORM: annual
ECOLOGY: semi-arid to arid plains, high plateaus; steppes, open woodlands, dry pastures, sandy fields, roadsides and waste places
GEOGRAPHY:
EUROPE: France [A]
AFRICA: n Algeria [E]
PHYTOGEO: Mediterranean

SPECIES: *Diplotaxis brevisiliqua* (Coss.) Martínez-Laborde
LIFE/FORM: annual
ECOLOGY: coastal
GEOGRAPHY:
AFRICA: nw Algeria [E], ne Morocco [E]
PHYTOGEO: Mediterranean

SPECIES: *Diplotaxis catholica* (L.) DC.
LIFE/FORM: annual, winter annual
ECOLOGY: non-arid to semi-arid coastal, plains, hills; beaches, sandy plains and cliffs, dry pastures, brush; weedy in roadsides and waste places and fields
GEOGRAPHY:
EUROPE: Balearic Islands [E?], w Spain (incl. Alboran Isl.) [E], Portugal [E]
ATLANTIC: Azores (S. Maria, S. Miguel) [E?], Canary Islands (Gran Canaria) [E?], Madeira [E?]
AFRICA: nw & wc Morocco [E]
PHYTOGEO: Mediterranean (Macaronesian)

SPECIES: *Diplotaxis cossoniana* (Reut. ex Boiss.) O.E. Schulz
LIFE/FORM: annual
ECOLOGY: semi-arid to arid coastal, plains, hills, montane to 1600 m; hilly steppes, rugged slopes, rubble, dry stony stream beds, dry pastures; weedy in fields and crops
GEOGRAPHY:
AFRICA: n Algeria [E]
PHYTOGEO: Mediterranean

SPECIES: *Diplotaxis cretacea* Kotov
LIFE/FORM: annual, biennial
ECOLOGY: hills of river basin (Donets R.); bare chalky slopes
GEOGRAPHY:
EUROPE: wc Russia [E], ne Ukraine [E]
PHYTOGEO: Euro-Siberian

SPECIES: *Diplotaxis erucoides* (L.) DC.
LIFE/FORM: annual, winter annual
ECOLOGY: non-arid to semi-arid plains, plateaus, hills to 1000 m; dry pastures, dry stream beds; weedy in roadsides and waste places, fields, crops, vineyards, oases
GEOGRAPHY:
EUROPE: Albania [E], Balearic Islands [E], Corsica [E], Crete [E?], France [E], Italy [E], Malta [E], Portugal [?], Romania [A], Sardinia [E], Sicily [E], Spain [E], Yugoslavia [E?]
AFRICA: n Algeria [E], s Algeria [A], Morocco [?], Tunisia [E]
ME/WASIA: n Egypt [E], sw Iran [E], Iraq [E], Israel/Jordan [E], Lebanon/Syria [E], Oman [A], Saudi Arabia [A], Sinai [E], Yemen [A]
AMERICAS: Canada [A]
PHYTOGEO: Mediterranean, Irano-Turanian

SPECIES: *Diplotaxis gomez-campoi* Martínez-Laborde
LIFE/FORM: annual
ECOLOGY: coastal to inland hills; riparian, dry sandy or stony fields, pastures
GEOGRAPHY:
EUROPE: se Spain [E]
PHYTOGEO: Mediterranean

SPECIES: *Diplotaxis gracilis* (Webb) O.E. Schulz
LIFE/FORM: perennial, suffrutescent
ECOLOGY: montane valleys to 1740 m; rocks
GEOGRAPHY:
ATLANTIC: Cape Verde (Brava, S. Antão, S. Nicolau) [E]
PHYTOGEO: Macaronesian

SPECIES: *Diplotaxis griffithii* (Hook f. & Thomson) Boiss.
LIFE/FORM: annual
ECOLOGY: foothills (Salt Range), montane valleys to 1900 m; fields, dry pastures, roadsides and waste places
GEOGRAPHY:
ME/WASIA: ne Afghanistan [E], nw Pakistan [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Diplotaxis harra* (Forssk.) Boiss.
LIFE/FORM: annual to perennial, suffrutescent
ECOLOGY: desert to semi-arid hills, plateaus, montane to 2200 m; rocks, cliffs, rubble, dry stream beds, desert wastelands; chalky soils
GEOGRAPHY:
EUROPE: Sicily [E], se Spain [E]
ATLANTIC: Cape Verde (all islands except Maio, S. Antão, S. Luzia) [E]
AFRICA: Algeria [E], Ethiopia [E], Libya [E], Morocco [E], Tunisia [E]
ME/WASIA: Afghanistan [E], Bahrain [E], Egypt [E], Iran [E], Iraq [E], Israel/Jordan [E], Kuwait [E], Lebanon/Syria [E], Oman [E], w Pakistan [E], Saudi Arabia [E], Sinai [E], United Arab Emirates [E], Yemen [E]
PHYTOGEO: Saharo-Sindian, East African/Red Sea (Mediterranean)

SPECIES: *Diplotaxis ibicensis* (Font Quer) Gómez-Campo
LIFE/FORM: perennial, suffrutescent to suffruticose
ECOLOGY: coastal; calcareous rocks, islets
GEOGRAPHY:
EUROPE: s & w Balearic Islands [E], se Spain [E]
PHYTOGEO: Mediterranean

SPECIES: *Diplotaxis kerakensis* Kasapligil
LIFE/FORM: perennial, suffruticose
ECOLOGY: montane to 1000 m; crevices in castle wall
GEOGRAPHY:
ME/WASIA: Jordan (Kerak district) [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Diplotaxis muralis* (L.) DC.
LIFE/FORM: annual, biennial, rarely perennial, herbaceous
ECOLOGY: non-arid to semi-arid low valleys, plateaus, rarely hills; pastures, open woodlands and brush; weedy in roadsides and waste places, fields, crops, vineyards, gardens, oases; clay, sandy, peaty and chalky soil
GEOGRAPHY:
EUROPE: Adriatic [E], Albania [E], Austria [A], Balearic Islands [E], Belgium [A], Bulgaria [E], Corsica [E], Crimea [E], Denmark [A], France [E], Germany [E], Great Britain [A], Greece [E], Hungary [E], Ireland [A], Italy [E], Malta [E], Netherlands [A], Poland [E], Romania [E], Sardinia [?], Sicily [E?], Spain [E], Sweden [A], Switzerland [E], Turkey [E], Yugoslavia [E]
ATLANTIC: Azores (S. Miguel) [A]
AFRICA: n Algeria [E], n Libya [?], n Morocco [?], South Africa [A], Tunisia [E]
AMERICAS: Canada [A], United States [A]
AUST/ASIA: Australia [A]
PHYTOGEO: Euro-Siberian, Mediterranean

SPECIES: *Diplotaxis nepalensis* Hara
LIFE/FORM: perennial, suffruticose
ECOLOGY: montane, 1200 m; steep cliffs
GEOGRAPHY:
AUST/ASIA: w Nepal [E]
PHYTOGEO: Irano-Turanian

SPECIES: *Diplotaxis ollivieri* Maire
LIFE/FORM: annual
ECOLOGY: arid low hills; dry pastures, dry stream beds (Tensift R.); clay, stony or sandy soil
GEOGRAPHY:
AFRICA: sw Morocco [E]
PHYTOGEO: Mediterranean

SPECIES: *Diplotaxis pitardiana* Maire
LIFE/FORM: annual
ECOLOGY: arid sub-desert plains, hills; dry pastures, dry stream beds
GEOGRAPHY:
AFRICA: nw Algeria [E], n Mauritania [E], ec & ne Morocco [E], Western Sahara [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Diplotaxis siettiana* Maire
LIFE/FORM: annual
ECOLOGY: sandy soils
GEOGRAPHY:
EUROPE: Spain (Alboran Island) [E]
PHYTOGEO: Mediterranean

SPECIES: *Diplotaxis siifolia* G. Kunze
LIFE/FORM: annual
ECOLOGY: coastal; sandy plains, dry stream beds; weedy in roadsides and waste places, fields, vineyards, wall and roof crevices
GEOGRAPHY:
EUROPE: sw Portugal [E], sw Spain [E]
ATLANTIC: Madeira [E]
AFRICA: n Algeria [E], w Morocco [E]
PHYTOGEO: Mediterranean

SPECIES: *Diplotaxis simplex* (Viv.) Spreng.
LIFE/FORM: annual
ECOLOGY: semi-arid to arid sub-desert coastal, plains, hills to 1100 m; beaches, sandy plains, steppes, dry pastures, dry stream beds
GEOGRAPHY:
AFRICA: n Algeria [E], n Libya [E], sw Morocco [?], Tunisia [E]
ME/WASIA: n Egypt [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Diplotaxis tenuifolia* (L.) DC.
LIFE/FORM: perennial, suffrutescent
ECOLOGY: coastal, plains, montane to 1100 m; beaches, dunes, chalk hills, rocky slopes, crevices in rocks; weedy in roadsides and waste places, fields, crevices in walls; sandy and chalky soils
GEOGRAPHY:
EUROPE: Albania [E], Austria [E], Balearic Islands [E], Baltic [A], Belgium [E], Bulgaria [E], Corsica [E], Crimea [E], Czech/Slovak Reps. [E], Denmark [A], Faeröe Islands [A], France [E], Germany [E], Great Britain [A], Hungary [E], Italy [E], Malta [E], Netherlands [E], Norway [A], Poland [E], Romania [E], Sardinia [E], Sicily [E], Spain [E], Sweden [A], Turkey [E], Yugoslavia [E]
AFRICA: n Algeria [A], n Morocco [A?]
ME/WASIA: Anatolia [E], Armenia [E], Georgia [E], Lebanon/Syria [E]
AMERICAS: Argentina [A], Canada [A], United States [A]
AUST/ASIA: Australia [A]
PHYTOGEO: Euro-Siberian, Mediterranean

SPECIES: *Diplotaxis tenuisiliqua* Del.
LIFE/FORM: annual
ECOLOGY: semi-arid coastal, plains, hills to 500 m; dunes, sandy fields, open woodlands, brush, dry pastures, dry stream beds, rocks, rubble, scree, roadsides and waste places; nitrous soil
GEOGRAPHY:
AFRICA: nw Algeria [E], n & c Morocco [E], Tunisia [A]
PHYTOGEO: Mediterranean

SPECIES: *Diplotaxis villosa* Boulos & Jallad
LIFE/FORM: annual
ECOLOGY: high desert valley, 500 m; dry stream beds
GEOGRAPHY:
ME/WASIA: s Jordan (El-Jafr) [E]
PHYTOGEO: Irano-Turanian

SPECIES: *Diplotaxis viminea* (L.) DC.
LIFE/FORM: annual
ECOLOGY: coastal, plains, hills; dry plains, rubble; weedy in roadsides and waste places, fields, crops, gardens, vineyards; sandy, chalky, often damp, rich soil
GEOGRAPHY:
EUROPE: Aegean [E], Austria [A], Balearic Islands [E], Bulgaria [E], Crete [E], Crimea [E], Cyprus [E], France [E], Germany [A], Greece [E], Italy [E], Malta [E], Netherlands [A], Portugal [E], Romania [E?], Sardinia [E], Sicily [E], Spain [E], Turkey [E], Yugoslavia [E]
ATLANTIC: Azores [E?]
AFRICA: n Algeria [E?], n Morocco [E], Tunisia [E?]
ME/WASIA: Anatolia [E], Egypt [E], Israel/Jordan [E], Lebanon/Syria [E]
PHYTOGEO: Euro-Siberian, Mediterranean

SPECIES: *Diplotaxis virgata* (Cav.) DC. [data for ssp. *virgata* only]
LIFE/FORM: annual
ECOLOGY: semi-arid to arid coastal, plains, hills; beaches, sandy plains, dry pastures, brush; weedy in roadsides and waste places, fields, crops; loam, sandy, or gypsaceous soils
GEOGRAPHY:
EUROPE: Portugal [E], Spain [E]
PHYTOGEO: Mediterranean

SPECIES: *Diplotaxis virgata* f. *sahariensis* Coss.
LIFE/FORM: annual
ECOLOGY: desert to arid sub-desert plateaus, montane; dry pastures, rocks and rubble
GEOGRAPHY:
AFRICA: nw Algeria [E], ec to ne Morocco [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Diplotaxis vogelii* (Webb) O.E. Schulz
LIFE/FORM: perennial, herbaceous
ECOLOGY: coastal rocks to montane to 1300 m; damp crevices in rocks, walls, roofs; lava rock
GEOGRAPHY:
ATLANTIC: Cape Verde (S. Antão, S. Nicolau, S. Vincente) [E]
PHYTOGEO: Macaronesian

SPECIES: *Dolichorhynchus arabicus* Hedge & Kit Tan
LIFE/FORM: perennial, suffrutescent
ECOLOGY: desert hills to 610 m; dry stream beds, sandstone buttes and ledges in narrow ravines, rocky rubble, roadsides and waste places
GEOGRAPHY:
AFRICA: nw Saudi Arabia [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Douepia tortuosa* Cambess.
LIFE/FORM: perennial, suffrutescent
ECOLOGY: desert plains, foothills from 700-900 m; steppes; saline soils
GEOGRAPHY:
ME/WASIA: nw India [E], w Pakistan [E]
PHYTOGEO: Irano-Turanian

SPECIES: *Enarthrocarpus arcuatus* Labill.
LIFE/FORM: annual
ECOLOGY: sea level to coastal hills; littoral sands, rocks, rubble, slopes, fields, crevices in walls
GEOGRAPHY:
EUROPE: Aegean [E], Crete [E], Cyprus [E], Greece [E], Turkey [E]
ME/WASIA: Anatolia [E], Israel [E], Lebanon/Syria [E]
PHYTOGEO: Mediterranean

SPECIES: *Enarthrocarpus clavatus* Del. ex Godr.
LIFE/FORM: annual
ECOLOGY: arid plateaus, foothills; steppes, lower slopes, dry pastures, dry stream beds; weedy in roadsides and waste places, grazed and cultivated areas; sandy, loam soils
GEOGRAPHY:
AFRICA: n Algeria [E], nw Libya [E], ne Morocco [E], Tunisia [E]
PHYTOGEO: Mediterranean

SPECIES: *Enarthrocarpus lyratus* (Forssk.) DC.
LIFE/FORM: annual
ECOLOGY: coastal, plains, lowland valleys; steppes, riparian, dry sandy stream beds; weedy in roadsides and waste places, fields, crops, oases
GEOGRAPHY:
EUROPE: Cyprus [E, extinct?], s Greece [?]
AFRICA: Algeria [A]
ME/WASIA: Egypt [E], Israel/Jordan [E], Lebanon [E], Pakistan [?], Saudia Arabia [E?], Sinai [E], n Yemen [A]
PHYTOGEO: Mediterranean

SPECIES: *Enarthrocarpus pterocarpus* (Pers.) DC.
LIFE/FORM: annual
ECOLOGY: desert coastal, plains, plateaus to 660 m; rubble, stony plains, dry pastures, dry stream beds, brush; weedy in roadsides and waste places, fields, gardens
GEOGRAPHY:
EUROPE: Malta [?]
AFRICA: n Libya [E]
ME/WASIA: Egypt [E], Sinai [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Enarthrocarpus strangulatus* Boiss.
LIFE/FORM: annual
ECOLOGY: desert plains; steppes, dry pastures, brush; weedy in roadsides and waste places, fields, crops; clay, stony and sandy soils
GEOGRAPHY:
AFRICA: n Libya [E]
ME/WASIA: Egypt [E], Israel/Jordan [E], Sinai [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Eremophyton chevallieri* (Barr.) Bég.
LIFE/FORM: annual
ECOLOGY: desert plains, foothills; calcareous and sandstone rocks, rubble, dry sandy stream beds
GEOGRAPHY:
AFRICA: c & s Algeria [E], w Libya [E?], n Mauritania [E], s Morocco [E], Western Sahara [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Eruca loncholoma* (Pomel) O.E. Schulz
LIFE/FORM: perennial, herbaceous, caespitose
ECOLOGY: plateau, montane to 2300 m; esparto-grass steppes, high meadows, fields, stony pastures
GEOGRAPHY:
AFRICA: ne Algeria [E], w Tunisia [E]
PHYTOGEO: Mediterranean

SPECIES: *Eruca setulosa* Boiss. & Reut.
LIFE/FORM: perennial, herbaceous, caespitose
ECOLOGY: non-arid montane to 1600 m; high fields, meadows, stony and clay pastures; calcareous soils
GEOGRAPHY:
AFRICA: nw Algeria [E], ne Morocco [E]
PHYTOGEO: Mediterranean

SPECIES: *Eruca vesicaria* (L.) Cav.
LIFE/FORM: annual
ECOLOGY: coastal, plateaus, montane to 2600 m; wild, cultivated, and weedy escape; beaches, steppes, dry pastures, dry stream beds, rubble; weedy in roadsides and waste places, fields, crops, oases, palm and olive groves; sandy, chalky, loam, or saline soils
GEOGRAPHY:
EUROPE: Adriatic, Aegean, Balearic Islands [E], Bulgaria, Corsica, Crete, Crimea, Cyprus, France, Greece, Hungary, Italy, Portugal, Romania, s Russia, Sardinia, Sicily, Spain [E], Switzerland, Turkey, Yugoslavia (spp. *sativa* widely naturalized and also cultivated in Europe)
ATLANTIC: Canary Islands (all except Gran Canaria, Palma), Madeira (Madeira, Porto Santo)
AFRICA: Algeria [E], n Chad [E], Ethiopia, Libya [E], Morocco [E], South Africa, Sudan, Tunisia [E]
ME/WASIA: Afghanistan, Anatolia, Armenia, Azerbaijan, Bahrain, Egypt [E], Georgia [E], nw India, Iran, Iraq, Israel/Jordan, Kuwait, Lebanon/Syria, Oman, nw Pakistan, Qatar, Saudi Arabia, Turkmenistan, United Arab Emirates, Yemen
AMERICAS: Canada [A], Mexico [A], United States [A]
AUST/ASIA: Australia [A], China [A], Mongolia, New Zealand [A]
PHYTOGEO: Mediterranean, Irano-Turanian (Saharo-Sindian, Euro-Siberian) [Native range of ssp. *sativa* is uncertain]

SPECIES: *Erucaria bornmuelleri* O.E. Schulz
LIFE/FORM: annual
ECOLOGY: valleys, hills; steppes, dry wastelands, fields
GEOGRAPHY:
ME/WASIA: nw Iraq [E], Syria [E]
PHYTOGEO: Irano-Turanian

SPECIES: *Erucaria cakiloidea* (DC.) O.E. Schulz
LIFE/FORM: annual, biennial
ECOLOGY: hills to 400 m; grassy steppes, dry pastures, gypsum slopes
GEOGRAPHY:
ME/WASIA: w Iran [E], Iraq [E], n Syria [E]
PHYTOGEO: Irano-Turanian

SPECIES: *Erucaria crassifolia* (Forssk.) Del.
LIFE/FORM: annual
ECOLOGY: low-lying desert plains; sandy or stony plains; weedy in roadsises and waste places, gardens, oases
GEOGRAPHY:
ME/WASIA: Egypt [E], w & s Iraq [E], Israel/Jordan [?], Qatar [E], Saudi Arabia [E], Sinai [E], United Arab Emirates [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Erucaria erucarioides* (Coss. & Durieu) C. Mueller
LIFE/FORM: annual
ECOLOGY: desert plains, hills; steppes, dry pastures, dry stream beds, gullies, rocks; sand and sandy loam soils
GEOGRAPHY:
ME/WASIA: w & c Algeria [E], n Mauritania [E], ne & s Morocco [E], Western Sahara [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Erucaria hispanica* (L.) Druce
LIFE/FORM: annual or biennial
ECOLOGY: semi-arid plains, hills, montane to 1800 m; weedy in roadsides and waste places, fields, grain crops, vineyards, olive groves; sandy, clay soils
GEOGRAPHY:
EUROPE: Aegean [E], Crete [E], Cyprus [E], Greece [E], Italy [E?], s Spain [E?], Turkey [E]
AFRICA: Algeria [A]
ME/WASIA: Anatolia [E], Bahrain [E], Egypt [E], Iran [E], Iraq [E], Israel/Jordan [E], Kuwait [E], Lebanon/Syria [E], Qatar [E], Saudi Arabia [E], Sinai [E], United Arab Emirates [E]
PHYTOGEO: Mediterranean, Irano-Turanian

SPECIES: *Erucaria microcarpa* Boiss.
LIFE/FORM: annual
ECOLOGY: desert to semi-arid plains, plateaus to 1100 m; steppes, dry pastures, dry stream beds, roadsides and waste places; sandy soil
GEOGRAPHY:
AFRICA: Libya [E]
ME/WASIA: Egypt [E], Iraq [E], Israel/Jordan [E], Sinai [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Erucaria ollivieri* Maire
LIFE/FORM: annual
ECOLOGY: desert plains; argillaceous or sandy saline soils
GEOGRAPHY:
AFRICA: sw Morocco [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Erucaria pinnata* (Viv.) Täckh. & Boulos
LIFE/FORM: annual
ECOLOGY: desert plains, hills; dry steppes, dry stream beds, roadsides and waste places; sand, clay, rubble
GEOGRAPHY:
AFRICA: Algeria [E], Libya [E], Morocco [E], Tunisia [E]
ME/WASIA: Egypt [E], Israel/Jordan [E], Saudia Arabia [E], Sinai [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Erucaria rostrata* (Boiss.) Greuter & Burdet
LIFE/FORM: annual
ECOLOGY: desert plains, hills; dry steppes; weedy in fields, crops
GEOGRAPHY:
ME/WASIA: Israel/Jordan [E], Lebanon/Syria [E], Sinai [E]
PHYTOGEO: Saharo-Sindian, Irano-Turanian

SPECIES: *Erucastrum abyssinicum* (A. Rich.) O.E. Schulz
LIFE/FORM: annual
ECOLOGY: non-arid tropical montane from 1000-3100 m; fields, damp grassy places
GEOGRAPHY:
AFRICA: Ethiopia [E]
PHYTOGEO: East African/Red Sea

SPECIES: *Erucastrum arabicum* Fischer & C.A. Meyer
LIFE/FORM: annual
ECOLOGY: non-arid coastal lowlands, plains, hills, tropical montane to 2200 m; steppes; weedy in fields, coffee plantations, maize crops; occasionally cultivated
GEOGRAPHY:
AFRICA: Ethiopia [E], Kenya [E], Namibia [E], Ruanda [E], South Africa [E], Tanzania [E], Uganda [E]
ME/WASIA: Egypt [E], Oman [E], Qatar [E], Saudi Arabia [E], United Arab Emirates [E], Yemen [E]
PHYTOGEO: East African/Red Sea, South African

SPECIES: *Erucastrum brevirostre* (Maire) Gómez-Campo
LIFE/FORM: annual
ECOLOGY: non-arid to arid coastal plains, hills; fields, dry pastures; sand, rubble
GEOGRAPHY:
AFRICA: c & w Morocco [E]
PHYTOGEO: Mediterranean

SPECIES: *Erucastrum canariense* Webb & Berthel.
LIFE/FORM: annual
ECOLOGY: roadsides and waste places, fields; volcanic soil
GEOGRAPHY:
ATLANTIC: Canary Islands (all except Hierro) [E]
PHYTOGEO: Macaronesian

SPECIES: *Erucastrum cardaminiodes* (Webb) O.E. Schulz
LIFE/FORM: annual
ECOLOGY: rocky places, fields; volcanic rock and soil
GEOGRAPHY:
ATLANTIC: Canary Islands (all) [E]
PHYTOGEO: Macaronesian

SPECIES: *Erucastrum elatum* (Ball) O.E. Schulz
LIFE/FORM: perennial, suffrutescent to suffruticose
ECOLOGY: foothills, montane from 1100-2500 m; rock, rubble, brush, meadows, chalk cliffs
GEOGRAPHY:
AFRICA: w & wc Morocco (Middle and High Atlas) [E]
PHYTOGEO: Mediterranean

SPECIES: *Erucastrum elgonense* Jonsell
LIFE/FORM: annual? to perennial, herbaceous
ECOLOGY: tropical montane from 3050-3400 m; open woodlands and brush
GEOGRAPHY:
AFRICA: Uganda (Mt. Elgon) [E]
PHYTOGEO: East African/Red Sea

SPECIES: *Erucastrum gallicum* (Willd.) O.E. Schulz
LIFE/FORM: annual or biennial, herbaceous
ECOLOGY: river valleys, hills; riparian, alluvium of rivers and lakes, rubble; weedy in roadsides and waste places, fields; sandy to argillaceous and nutrient-rich loam soils
GEOGRAPHY:
EUROPE: Austria [E], Balearic Islands [E], Baltic [A], Crimea [E], Czech/Slovak Reps. [E], Denmark [A], France [E], Germany [E], Great Britain [A], Hungary [E], Ireland [A], Italy [E], Netherlands [E?], Norway [A], Poland [A], Portugal [E], Romania [E], Spain [E], Sweden [A], Switzerland [E], Yugoslavia [E]
AMERICAS: Canada [A], United States [A]
PHYTOGEO: Euro-Siberian

SPECIES: *Erucastrum griquense* (N.E. Brown) O.E. Schulz
LIFE/FORM: annual
ECOLOGY: plateaus, valleys, hills; steppes (high veld), sandy places, along rivers; limestone soils
GEOGRAPHY:
AFRICA: Botswana [E], w South Africa [E]
PHYTOGEO: South African

SPECIES: *Erucastrum ifniense* Gómez-Campo
LIFE/FORM: annual
ECOLOGY: arid sub-desert Atlantic coastal plain; roadsides and waste places
GEOGRAPHY:
AFRICA: sw Morocco (Sidi Ifni region) [E]
PHYTOGEO: Macaronesian

SPECIES: *Erucastrum leucanthum* Coss. & Durieu ex Coss.
LIFE/FORM: perennial, herbaceous
ECOLOGY: semi-arid to arid high plateaus, montane to 1600 m; open woodlands, grassy steppes, dry rocky pastures and stony meadows, alluvium, shale, rubble; calcareous soils
GEOGRAPHY:
AFRICA: n Algeria [E], n & c Morocco [E]
PHYTOGEO: Mediterranean

SPECIES: *Erucastrum littoreum* (Pau & Font Quer) Maire
LIFE/FORM: perennial, herbaceous
ECOLOGY: coastal rocks, hills below 800 m; rock crevices, dry slopes
GEOGRAPHY:
AFRICA: n & c Morocco (Rif, Middle Atlas) [E]
PHYTOGEO: Mediterranean

SPECIES: *Erucastrum meruense* Jonsell
LIFE/FORM: perennial, suffruticose to shrubby
ECOLOGY: tropical montane from 2500-2700 m; volcanic crater; parkland, brush
GEOGRAPHY:
AFRICA: n Tanzania (Mt. Meru) [E]
PHYTOGEO: East African/Red Sea

SPECIES: *Erucastrum nasturtiifolium* (Poiret) O.E. Schulz
LIFE/FORM: annual to perennial, herbaceous
ECOLOGY: montane valleys to 1300 m; slopes, riparian, high meadows; weedy in roadsides and waste places, fields, occasionally crops; sandy, stony, or rich calcareous soils, usually lacking in humus, damp sites
GEOGRAPHY:
EUROPE: Albania [?], Austria [A], Czech/Slovak Reps. [A], France [E], Germany [E], Great Britain [A], Hungary [E?], Italy [E], Norway [A], Poland [A], Portugal [E], Romania [A], Russia [A], Sicily [A], Spain [E], Switzerland [E], Yugoslavia [E?]
PHYTOGEO: Euro-Siberian (Mediterranean)

SPECIES: *Erucastrum pachypodum* (Chiov.) Jonsell
LIFE/FORM: annual
ECOLOGY: tropical plateau, montane from 2700-3550 m; steppes, fields, parkland
GEOGRAPHY:
AFRICA: Ethiopia [E]
PHYTOGEO: East African/Red Sea

SPECIES: *Erucastrum palustre* (Pirona) Vis.
LIFE/FORM: perennial, herbaceous
ECOLOGY: swampy lowland
GEOGRAPHY:
EUROPE: n Italy (n Adriatic) [E]
PHYTOGEO: Mediterranean

SPECIES: *Erucastrum rifanum* (Emb. & Maire) Gómez-Campo
LIFE/FORM: biennial, perennial, herbaceous
ECOLOGY: non-arid to semi-arid coastal to montane from 1100-2100 m; sands, rocks, rubble, open woodland, brush
GEOGRAPHY:
AFRICA: n & c Morocco (Rif and Middle Atlas) [E]
PHYTOGEO: Mediterranean

SPECIES: *Erucastrum strigosum* (Thunb.) O.E. Schulz
LIFE/FORM: annual
ECOLOGY: coastal, river valleys, tableland plateau, hills, montane to snow line; fields, riparian, stream beds, grassy and chalky slopes, among rubble, scrub desert (karroo)
GEOGRAPHY:
AFRICA: sw South Africa [E]
PHYTOGEO: South African

SPECIES: *Erucastrum varium* Durieu
LIFE/FORM: annual, biennial
ECOLOGY: semi-arid plains, plateaus, hills to 800 m; esparto grass steppes, dry pastures, chalk slopes, rubble, gorges, dry stream beds; weedy in fields
GEOGRAPHY:
EUROPE: France [A], Spain [A], Switzerland [A]
ATLANTIC: Canary Islands [?]
AFRICA: n Algeria [E], n Libya [E], Morocco [E]
PHYTOGEO: Mediterranean

SPECIES: *Erucastrum virgatum* (J.C. Presl.) C. Presl.
LIFE/FORM: annual (rare) to perennial, suffruticose
ECOLOGY: coastal plains to low hills; rocks, rubbles, sandhills, brush, dry fields, meadows; weedy in roadsides and waste places, vineyards; sand and chalky soils
GEOGRAPHY:
EUROPE: s Italy [E], ne Sicily [E], s & se Spain [E]
AFRICA: Morocco [?]
PHYTOGEO: Mediterranean

SPECIES: *Euzomodendron bourgaeanum* Coss.
LIFE/FORM: perennial, suffrutescent
ECOLOGY: dry hills to 500 m; saline scree; calcareous or gypsaceous soils
GEOGRAPHY:
EUROPE: s Spain [E]
PHYTOGEO: Mediterranean

SPECIES: *Fezia pterocarpa* Pitard
LIFE/FORM: annual, winter annual
ECOLOGY: semi-arid plains, hills; steppes, low slopes; viscous clay fields, roadsides and waste places; bare clay
GEOGRAPHY:
AFRICA: nc Morocco [E]
PHYTOGEO: Mediterranean

SPECIES: *Foleyola billotii* Maire
LIFE/FORM: perennial, suffruticose to shrubby
ECOLOGY: desert plains; stony plains, dry stream beds and gullies, riparian after rains; sandy soil
GEOGRAPHY:
AFRICA: sw Algeria [E], se Morocco [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Fortuynia bungei* Boiss.
LIFE/FORM: perennial, suffruticose
ECOLOGY: desert plateaus, montane to 2200 m; sandy soil
GEOGRAPHY:
ME/WASIA: sw Afghanistan [E], s,c,e Iran [E], w Pakistan [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Fortuynia garcinii* (Burm.) Shuttl. ex Boiss.
LIFE/FORM: perennial, suffruticose
ECOLOGY: desert plains, hills to 900 m; stony plains; sandy soils
GEOGRAPHY:
ME/WASIA: s, c & e Iran [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Guiraoa arvensis* Coss.
LIFE/FORM: annual
ECOLOGY: coastal plains, montane to 1300 m; sandy fields, calcareous slopes, weedy in roadsides and waste places; saline to calcareous soils
GEOGRAPHY:
EUROPE: se Spain [E]
PHYTOGEO: Mediterranean

SPECIES: *Hemicrambe fruticosa* (C.C. Townsend) Gómez-Campo
LIFE/FORM: perennial, shrub
ECOLOGY: coastal montane from 600-1000 m; rock ledges on sheer cliff face, mountain rocks, brush [?]
GEOGRAPHY:
AFRICA: Socotra [E]
PHYTOGEO: East African/Red Sea

SPECIES: *Hemicrambe fruticulosa* Webb
LIFE/FORM: perennial, suffruticose to shrubby
ECOLOGY: montane from 400-1500 m; calcareous rock crevices in cliff face
GEOGRAPHY:
AFRICA: n Morocco (Tangier Peninsula) [E]
PHYTOGEO: Mediterranean

SPECIES: *Henophyton deserti* (Coss. & Durieu) Coss. & Durieu
LIFE/FORM: perennial, suffruticose
ECOLOGY: desert plains, hills; steppes, dry pastures (forage for camels and mules), dry stream beds, gullies; sand, rubble, limestone, gypsum, or loam soils
GEOGRAPHY:
AFRICA: s Algeria [E], w & sw Libya [E], s Morocco [E], s Tunisia [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Hirschfeldia incana* (L.) Lagrèze-Fossat
LIFE/FORM: annual, winter annual, biennial, perennial (rare)
ECOLOGY: coastal, plateaus, high valleys, montane; rocks and dunes, sunny slopes, alluvium of streams and gorges; weedy in roadsides and waste places, fields, crops, oases, olive and palm groves, open cork woodlands; calcareous and nitrous soils
GEOGRAPHY:
EUROPE: Adriatic [E], Aegean [E], Albania [E], Austria [A], Balearic Islands [E], Belgium [A], Corsica [E], Crete [E], Crimea [E], Cyprus [E], Denmark [A], s France [E], Germany [A], Great Britain [A], Greece [E], s Italy [E], Malta [E], Netherlands [A], Portugal [E], Sardinia [E], Sicily [E], Spain [E], Switzerland [A], Turkey [E], Yugoslavia [E]
ATLANTIC: Azores [E?], Canary Islands [E?], Madeira [E?]
AFRICA: n Algeria [E], n Libya [E], n Morocco [E], South Africa [A], Tunisia [E]
ME/WASIA: Anatolia [E], Iran [E], Iraq [E], Israel/Jordan [E], Lebanon/Syria [E], n Yemen [A]
AMERICAS: United States [A]
AUST/ASIA: Australia [A]
PHYTOGEO: Mediterranean, Irano-Turanian

SPECIES: *Hirschfeldia rostrata* (Balf. f) O.E. Schulz
LIFE/FORM: annual
ECOLOGY: hills; shaded rock and cliff faces
GEOGRAPHY:
AFRICA: Socotra [E]
PHYTOGEO: East African/Red Sea

SPECIES: *Kremeriella cordylocarpus* (Coss. & Durieu ex Coss.) Maire
LIFE/FORM: annual
ECOLOGY: semi-arid inland coastal hills; shaded rocks, crevices of calcareous rocks, open woodlands, brush
GEOGRAPHY:
AFRICA: nw Algeria [E], ne Morocco [E]
PHYTOGEO: Mediterranean

SPECIES: *Moricandia arvensis* (L.) DC. [data for ssp. *arvensis* only]
LIFE/FORM: annual to perennial, suffruticose
ECOLOGY: coastal to inland hills; sandstone cliffs, dry pastures, dry stream beds, rubble, brush; weedy in roadsides and waste places, fields, crops, oases, palm groves; argillaceous, gypsaceous, chalky, or sandy saline soil
GEOGRAPHY:
EUROPE: Balearic Islands [E], Corsica [?], s France [E], Greece [E], Italy [E], Malta [E], Portugal [A], Sicily [E], Spain [E], Yugoslavia [A]
ATLANTIC: Canary Islands (Gran Canaria) [A]
AFRICA: n Algeria [E], n Libya [?], s Morocco [E], Tunisia [E]
PHYTOGEO: Mediterranean

SPECIES: *Moricandia foetida* Bourgeau ex Coss.
LIFE/FORM: biennial, suffrutescent
ECOLOGY: coastal hills; argillaceous, chalky or saline calcareous soils
GEOGRAPHY:
EUROPE: s & se Spain [E]
PHYTOGEO: Mediterranean

SPECIES: *Moricandia foleyi* Batt.
LIFE/FORM: annual
ECOLOGY: desert plains, valleys; dry stream beds, fields and crops; muddy, sandy alluvium, sandstone and shale
GEOGRAPHY:
AFRICA: n Algeria [E], ne Morocco [E]
PHYTOGEO: Mediterranean

SPECIES: *Moricandia longirostris* Pomel
LIFE/FORM: perennial, suffruticose
ECOLOGY: river plains, hills; rocky slopes, riparian, dry stream beds; clayey alluvium, granite
GEOGRAPHY:
EUROPE: s Italy [E], Sicily [E]
AFRICA: n Algeria [E]
PHYTOGEO: Mediterranean

SPECIES: *Moricandia moricandioides* (Boiss.) Heywood
LIFE/FORM: perennial, suffrutescent to suffruticose
ECOLOGY: semi-arid low valleys and hills; riparian, stream beds, cliffs and crevices, rubble, scree, stony alluvium; sandy, siliceous, calcareous, viscous, or gypsaceous soils
GEOGRAPHY:
EUROPE: sc & e Spain [E]
PHYTOGEO: Mediterranean

SPECIES: *Moricandia nitens* (Viv.) Durieu & Barr.
LIFE/FORM: perennial, suffruticose
ECOLOGY: coastal, desert montane to 2800 m; sands and cliffs, dry river beds, rubble, wastelands
GEOGRAPHY:
AFRICA: nc Algeria [E], Libya [E], Tunisia [E]
ME/WASIA: n Egypt [E], Israel/Jordan [E], Sinai [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Moricandia sinaica* (Boiss.) Boiss.
LIFE/FORM: annual to perennial, suffrutescent to suffruticose
ECOLOGY: desert plains, hills; dry stream beds, escarpments, rocky places, chalky slopes
GEOGRAPHY:
ME/WASIA: Egypt [E], Iran [E], Israel/Jordan [E], Kuwait [E], Oman [E], sw Pakistan [E], Saudi Arabia [E], Sinai [E], n Yemen [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Moricandia spinosa* Pomel
LIFE/FORM: perennial, suffrutescent
ECOLOGY: desert plains, hills; dry stream beds, gullies, rocks, rubble, scree; prefers chalky soil
GEOGRAPHY:
AFRICA: s Algeria [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Moricandia suffruticosa* (Desf.) Coss. & Durieu
LIFE/FORM: perennial, suffruticose
ECOLOGY: desert plains, plateaus, hills; dry sunny slopes, bases of rocks, cliffs, stony sands
GEOGRAPHY:
AFRICA: nc Algeria [E], w Libya [E], s Morocco [E], s Tunisia [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Morisia monanthos* (Viv.) Asch.
LIFE/FORM: perennial, herbaceous, caespitose, acaulescent
ECOLOGY: coastal, high plains, montane to 1200 m; damp grassy or sandy places, high rock crevices, sandy sub-soil
GEOGRAPHY:
EUROPE: Corsica [E], Sardinia [E]
PHYTOGEO: Mediterranean

SPECIES: *Muricaria prostrata* (Desf.) Desv.
LIFE/FORM: annual
ECOLOGY: desert plains, arid plateaus, foothills to 1075 m; dry steppes, fields, rubble, dry stream beds, gullies, roadsides and waste places; sandy or muddy alluvial soil
GEOGRAPHY:
AFRICA: n Algeria [E], Libya [E], c Morocco (Saharan High Atlas) [E], Tunisia [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Otocarpus virgatus* Durieu
LIFE/FORM: annual
ECOLOGY: semi-arid high plateaus, hills; dry fields and clay pastures, gullies, roadsides and waste places
GEOGRAPHY:
AFRICA: nw Algeria (High Plateau) [E]
PHYTOGEO: Mediterranean

SPECIES: *Physorrhynchus brahuicus* Hook.
LIFE/FORM: perennial, suffrutescent
ECOLOGY: coastal deserts and hills; waste places, around hot springs, salt ranges; sandy or gypsaceous soils
GEOGRAPHY:
ME/WASIA: Afghanistan [E], s & e Iran [E], w Pakistan [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Physorrhynchus chamaerapistrum* (Boiss.) Boiss.
LIFE/FORM: perennial, suffrutescent
ECOLOGY: coastal deserts and hills to 700 m; waste places; sandy or gypsaceous soils
GEOGRAPHY:
ME/WASIA: s & sw Iran [E], Kuwait [A], Oman [E], w Pakistan [E], United Arab Emirates [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Pseuderucaria clavata* (Boiss. & Reut.) O.E. Schulz
LIFE/FORM: annual
ECOLOGY: desert plains below sea level, plateaus, hills; stream and lake beds, alluvium, rock crevices; argillaceous, gypsaceous, calcareous, coarse sandy, or saline soils
GEOGRAPHY:
AFRICA: c & s Algeria [E], c Libya [E], n Niger [E], s Tunisia [E]
ME/WASIA: Egypt [E], Israel/Jordan [E], Sinai [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Pseuderucaria teretifolia* (Desf.) O.E. Schulz
LIFE/FORM: annual
ECOLOGY: desert plains, plateaus, montane; dry steppes, dry pastures, dry stream beds, gullies, rubble, scree; calcareous, gypsaceous, or damp sandy soils
GEOGRAPHY:
AFRICA: n & nc Algeria [E], w Libya [E], s Morocco [E], s Tunisia [E]
ME/WASIA: w Egypt [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Pseudofortuynia esfandiarii* Hedge
LIFE/FORM: perennial, suffruticose
ECOLOGY: semi-arid montane from 1500-2430 m
GEOGRAPHY:
ME/WASIA: s & w Iran [E]
PHYTOGEO: Irano-Turanian

SPECIES: *Psychine stylosa* Desf.
LIFE/FORM: annual
ECOLOGY: semi-arid to arid plateaus, foothills; steppes, brush, dry pastures, dry stream beds, roadsides and waste places, fields; argillaceous and gypsaceous soils
GEOGRAPHY:
AFRICA: n Algeria [E], nw to ne Morocco [E], Tunisia [E]
PHYTOGEO: Mediterranean

SPECIES: *Quezeliantha tibestica* (H. Scholz) H. Scholz
LIFE/FORM: annual? to perennial, suffruticose
ECOLOGY: desert montane, 800 m; dry stream beds
GEOGRAPHY:
AFRICA: n Chad (Tibesti Mountains) [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Quidproquo confusum* Greuter & Burdet
LIFE/FORM: annual
ECOLOGY: coastal to inland hills; dry cliffs, rocky places, warm valleys; chalk soil
GEOGRAPHY:
ME/WASIA: Israel [E], Lebanon [E]
PHYTOGEO: Mediterranean

SPECIES: *Raffenaldia platycarpa* (Coss.) Stapf
LIFE/FORM: perennial, herbaceous, caespitose, acaulescent
ECOLOGY: high plateau, montane from 3000-3750 m; steppes and calcareous slopes; scree, snowy depressions; clay to argillaceous to soils
GEOGRAPHY:
AFRICA: c Morocco (High Atlas) [E]
PHYTOGEO: Mediterranean

SPECIES: *Raffenaldia primuloides* Godr.
LIFE/FORM: perennial, herbaceous, caespitose, acaulescent
ECOLOGY: high plateaus, montane to 3200 m; grassy steppes, dry stony pastures, open woodland, occasionally weedy in crops; caly to argillaceous soils
GEOGRAPHY:
AFRICA: c & w Algeria [E], n & e Morocco [E]
PHYTOGEO: Mediterranean

SPECIES:	*Raphanus raphanistrum* L.
LIFE/FORM:	annual to perennial, herbaceous
ECOLOGY:	coastal, plains, hills, montane to 1640 m; shingle, cliffs and dunes, grasslands, meadows, riparian; weedy in roadsides and waste places, fields, crops; sandy, chalky, saline, or rich nitrous soil; ssp. *maritima* tidal seed dispersal
GEOGRAPHY:	
EUROPE:	Aegean [E], Albania [E], Balearic Islands [E], Belgium [E], Bulgaria [E], Corsica [E], Crete [E], Crimea [E], Cyprus [E], France [E], Great Britain [E], Greece [E], Italy [E], Malta [E], Netherlands [E], Portugal [E], Romania, s Russia, Sardinia [E], Sicily [E], Spain [E], Turkey [E], Yugoslavia [E] (also adventive or naturalized in most of Atlantic, northern and central Europe)
ATLANTIC:	Azores [E?], Canary Islands [E?], Madeira [E?]
AFRICA:	n Algeria [E], n Libya [E], n Morocco [E], Namibia [A], South Africa [A], Tunisia [E]
ME/WASIA:	Afghanistan [E], Anatolia [E], Armenia [E], Azerbaijan [E], n Egypt [E], Iran [E], Iraq [E], Israel/Jordan [E], Lebanon/Syria [E], Pakistan [E]
AMERICAS:	Argentina [A], Brazil [A], Canada [A], Ecuador [A], Mexico [A], Paraguay [A], United States [A]
AUST/ASIA:	Australia [A], Japan [A], Korea [A]
PHYTOGEO:	Mediterranean, Euro-Siberian, Irano-Turanian

SPECIES:	*Raphanus sativus* L.
LIFE/FORM:	annual, biennial
ECOLOGY:	coastal, plains, hills, montane to 2200 m; cultivated and weedy escape; weedy in roadsides and waste places, fields, gardens; prefers rich nitrous soils
GEOGRAPHY:	
EUROPE:	Cultivated and/or weedy in most countries except very cold regions.
ATLANTIC:	Canary Islands, Madeira
AFRICA:	Cultivated and/or weedy in North and South Africa.
ME/WASIA:	Cultivated and/or weedy in most countries of Middle East and Arabian peninsula
AMERICAS:	Canada, United States (Cultivated and/or weedy in warm temperate regions)
AUST/ASIA:	Cultivated and/or weedy in Australia and most of Asia.
PHYTOGEO:	Unknown as a wild plant, suggested to be derived from *Raphanus raphanistrum* ssp. *landra* which is endemic to the Mediterranean

SPECIES:	*x Rapistrella ramosissima* Pomel
LIFE/FORM:	annual
ECOLOGY:	Hybrid between *Rapistrum rugosum* and *Cordylocarpus muricatus* that is found among parental plants. Habitats for the latter include: montane; dry pastures, dry stream beds, roadsides and waste places, fields; loam, clay or calcareous soils
GEOGRAPHY:	
AFRICA:	n Algeria [E], n Morocco [E]
PHYTOGEO:	Mediterranean

SPECIES: *Rapistrum perenne* (L.) All.
LIFE/FORM: biennial, perennial, herbaceous
ECOLOGY: plains, hills; steppes, dry slopes, fields, occasionally among crops, roadsides and waste places
GEOGRAPHY:
EUROPE: Austria [E?], Belgium [?], Bulgaria [E], Crimea [E], Czech/Slovak Reps. [E], France [?], Germany [A], Great Britain [A], Hungary [E], Italy [E], Netherlands [?], Poland [?], Romania [E], s Russia [E], Switzerland [A?], Yugoslavia [E]
ATLANTIC: Azores [?]
AMERICAS: Canada [A]
PHYTOGEO: Euro-Siberian

SPECIES: *Rapistrum rugosum* (L.) All.
LIFE/FORM: annual, rarely ? biennial to perennial, herbaceous
ECOLOGY: plains, montane valleys and slopes to 2200 m; steppes, sand and gravel alluvium; weedy in roadsides and waste places, fields, crops, vineyards, olive groves; rich nitrous, usually argillaceous or calcareous soils
GEOGRAPHY:
EUROPE: Adriatic [E], Aegean [E], Albania [E], Balearic Islands [E], Bulgaria [E], Corsica [E], Crete [E], Crimea [E], Cyprus [E], France [E], Great Britain [A], Greece [E], Italy [E], Malta [E], Portugal [E], se Russia [E], Sardinia [E], Sicily [E], Spain [E], Turkey [E], Yugoslavia [E]
ATLANTIC: Azores [E], Canary Islands [E], Madeira [E]
AFRICA: Algeria [E], Libya [E], Morocco [E], South Africa [A], Tunisia [E]
ME/WASIA: Anatolia [E], Azerbaijan [E], Egypt [E], Iran [E], Iraq [E], Israel/Jordan [E], Lebanon/Syria [E], Saudi Arabia [E], Sinai [E], Turkmenistan [E], n Yemen [A?]
AMERICAS: Canada [A], United States [A]
AUST/ASIA: Australia [A]
PHYTOGEO: Mediterranean, Irano-Turanian (Macaronesian)

SPECIES: *Rytidocarpus moricandioides* Coss.
LIFE/FORM: annual, biennial
ECOLOGY: hills; uncultivated slopes, fields; clay soils
GEOGRAPHY:
AFRICA: n Morocco [E]
PHYTOGEO: Mediterranean

SPECIES: *Savignya parviflora* (Del.) Webb
LIFE/FORM: annual
ECOLOGY: desert plains, hills; steppes, dunes, dry pastures, dry stream beds; sandy or chalky soil
GEOGRAPHY:
AFRICA: s Algeria [E], n & s Libya [E], s Morocco [E], s Tunisia [E], Western Sahara [E]
ME/WASIA: sw Afghanistan [E], Bahrain [E], Egypt [E], Iran [E], Iraq [E], Israel/Jordan [E], Kuwait [E], Oman [E], Pakistan [E], Qatar [E], Saudi Arabia [E], Sinai [E], United Arab Emirates [E], s Yemen [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Schouwia purpurea* (Forssk.) Schweinf.
LIFE/FORM: annual
ECOLOGY: semi-arid coastal plains, hills, inland deserts; steppes, rubble, sand, sandy rock crevices, scree, dry stream beds; fields, damp loamy places after rains in arid regions
GEOGRAPHY:
AFRICA: n & s Algeria [E], Libya [E], n Mali [E], n Mauritania [E], n & s Morocco, n Niger [E], Sudan [E], Western Sahara [E]
ME/WASIA: Egypt [E], Saudi Arabia [E], Sinai [E], Yemen [E]
PHYTOGEO: Saharo-Sindian

SPECIES: *Sinapidendron angustifolium* (DC.) Lowe
LIFE/FORM: perennial, suffrutescent
ECOLOGY: hills from 500-1000 m; steep rocks and cliffs
GEOGRAPHY:
ATLANTIC: Madeira [E]
PHYTOGEO: Macaronesian

SPECIES: *Sinapidendron frutescens* (Aiton) Lowe
LIFE/FORM: perennial, suffrutescent
ECOLOGY: coastal to inland montane valleys to 1400 m; coastal and inland rocks, barrancos, crevices and gullies
GEOGRAPHY:
ATLANTIC: Madeira [E]
PHYTOGEO: Macaronesian

SPECIES: *Sinapidendron palmense* (Kuntze) O.E. Schulz
LIFE/FORM: perennial, suffruticose
ECOLOGY: rocky roadsides
GEOGRAPHY:
ATLANTIC: Canary Islands (Palma) [E]
PHYTOGEO: Macaronesian

SPECIES: *Sinapidendron rupestre* Lowe
LIFE/FORM: perennial, suffruticose
ECOLOGY: coastal to inland montane valleys to 1500 m; coastal and inland rocks, rocky slopes, ravines
GEOGRAPHY:
ATLANTIC: Madeira [E]
PHYTOGEO: Macaronesian

SPECIES: *Sinapis alba* L.
LIFE/FORM: annual
ECOLOGY: coastal plains, hills, montane; wild, cultivated and weedy escape; chalk, gypsum slopes, open woodlands, brush, alluvium, damp steep rock faces; weedy in roadsides and waste places, fields, crops, vineyards, olive groves; calcareous, nitrous soils
GEOGRAPHY:
EUROPE: Aegean [E], Albania [A], Balearic Islands [E], Bulgaria [E], Austria [A], Corsica [E], Crete [E], Crimea [E], Cyprus [E], France [E], Germany [A], Great Britain [A], Greece [E], Hungary [A], Italy [E], Malta [E], Netherlands [A], Poland [A], Portugal [E], Romania, s Russia [E], Sardinia [E], Sicily [E], Spain [E], Switzerland [A], Turkey [E], Ukraine [A], Yugoslavia [E]
ATLANTIC: Azores [A], Canary Islands [A], Madeira [A]
AFRICA: n Algeria [E], n Libya [E], Morocco [E], South Africa [A], Tunisia [E]
ME/WASIA: Anatolia [E], n Egypt [E], Iran [E], n Iraq [E], Israel/Jordan [E], Lebanon/Syria [E]
AMERICAS: Canada [A], United States [A]
AUST/ASIA: India [A], Japan [A]
PHYTOGEO: Mediterranean (Irano-Turanian, Euro-Siberian)

SPECIES: *Sinapis arvensis* L.
LIFE/FORM: annual
ECOLOGY: coastal, plains, montane to 1800 m; dry stream beds; weedy in roadsides and waste places, fields, irrigated farmland, crops, oases; mainly calcareous soils
GEOGRAPHY:
EUROPE: Aegean [E], Albania [E], Balearic Islands [E], Belgium [A], Bulgaria [E], Corsica [E], Crete [E], Crimea [E], Cyprus [E], Czech/Slovak Reps. [A], Denmark [A], Finland [A], France [E], Germany [A], Great Britain [A], Greece [E], Hungary [A], Iceland [A], Ireland [A], Italy [E], Malta [E], Netherlands [A], Norway [A], Poland [A], Portugal [E], Romania [A], s Russia [E?], Sardinia [E], Sicily [E], Spain [E], Sweden [A], Switzerland [A], Turkey [E], Yugoslavia [E] (recently naturalized in many countries)
ATLANTIC: Azores [A], Canary Islands [A], Madeira [A]
AFRICA: n Algeria [E], n Libya [E], n Morocco [E], South Africa [A], Tunisia [E]
ME/WASIA: Afghanistan [E?], Anatolia [E], Armenia [E?], Azerbaijan [E?], n Egypt [E], Iran [E?], Iraq [E?], Israel/Jordan [E], Kuwait [E?], Lebanon/Syria [E], Pakistan [E?], Qatar [E?], Saudi Arabia [E?], Sinai [E], Turkmenistan [E?], United Arab Emirates [E?]
AMERICAS: Argentina [A], Canada [A+E?], Caribbean [A], Central America [A], Columbia [A], Peru [A], United States [A+E?]
AUST/ASIA: Australia [A], China [A?], India [A], Japan [A?], New Zealand [A]
PHYTOGEO: Mediterranean, Irano-Turanian, Saharo-Sindian (Euro-Siberian? American?)

SPECIES: *Sinapis aucheri* (Boiss.) O.E. Schulz
LIFE/FORM: annual
ECOLOGY: plains, hills to 800 m; rocky places, dry pastures, grassy places
GEOGRAPHY:
ME/WASIA: Iran [E], Iraq [E]
PHYTOGEO: Irano-Turanian

SPECIES: *Sinapis flexuosa* Poir.
LIFE/FORM: annual
ECOLOGY: non-arid to semi-arid coastal, plains, montane to 1600 m; cliffs, beaches, sandy fields and plains, dry pastures, open woodlands, brush; chalky soil
GEOGRAPHY:
EUROPE: s Spain [E]
ATLANTIC: Canary Islands (Tenerife, Gomera) [E?]
AFRICA: nw Algeria [E], n & w Morocco [E]
PHYTOGEO: Mediterranean

SPECIES: *Sinapis pubescens* L.
LIFE/FORM: perennial, suffrutescent
ECOLOGY: non-arid to semi-arid coastal, plateau, hills, montane to 2300 m; rocks, cliffs, shaded grassy slopes, gullies, rubble, scrub, open woodlands and brush, dry pastures, fields, meadows, crops; chalky soil
GEOGRAPHY:
EUROPE: se France [?], Germany [A], Italy [E], Sardinia [E], Sicily [E], Switzerland [A]
ATLANTIC: Canary Islands [A]
AFRICA: n Algeria [E], Libya [E], Tunisia [E]
ME/WASIA: Egypt [A]
PHYTOGEO: Mediterranean

SPECIES: *Succowia balearica* (L.) Medik.
LIFE/FORM: annual
ECOLOGY: non-arid to semi-arid coastal lowlands to inland montane; grassy slopes, shaded rocks, open woodlands and brush
GEOGRAPHY:
EUROPE: Balearic Islands [E], Corsica [E], s Italy [E], Sardinia [E], Sicily [E], Spain [E]
ATLANTIC: Canary Islands (Tenerife) [E?]
AFRICA: n Algeria [E], n Morocco [E], Tunisia [E]
PHYTOGEO: Mediterranean

SPECIES: *x Trachycnemum mirabile* Maire & Sam.
LIFE/FORM: annual
ECOLOGY: Hybrid between *Ceratocnemum rapistroides* and *Trachystoma ballii* that is found among parental plants. Habitats for the latter include: semi-arid to arid foothills and high valleys to 1400 m; fields, crops, scree, open woodlands and brush
GEOGRAPHY:
AFRICA: nc Morocco (High Atlas) [E]
PHYTOGEO: Mediterranean

SPECIES: *Trachystoma aphanoneurum* (Maire & Weiller) Maire & Weiller
LIFE/FORM: annual
ECOLOGY: semi-arid valleys in low hills; dry stream beds, scree and clay fields and slopes, dry pastures, open woodlands and brush
GEOGRAPHY:
AFRICA: nc Morocco [E]
PHYTOGEO: Mediterranean

SPECIES: *Trachystoma ballii* O.E. Schulz
LIFE/FORM: annual
ECOLOGY: high valleys, foothills to 1400 m; open woodland, brush and scree, fields, crops
GEOGRAPHY:
AFRICA: nc Morocco (High Atlas) [E]
PHYTOGEO: Mediterranean

SPECIES: *Trachystoma labasii* Maire
LIFE/FORM: annual
ECOLOGY: non-arid to semi-arid foothills to montane; open woodlands and brush, rocks, scree
GEOGRAPHY:
AFRICA: nc Morocco (Middle Atlas) [E]
PHYTOGEO: Mediterranean

SPECIES: *Vella anremerica* (Litard. & Maire) Gómez-Campo
LIFE/FORM: perennial, shrub
ECOLOGY: montane above 2000 m; dry pastures
GEOGRAPHY:
AFRICA: c Morocco (High Atlas) [E]
PHYTOGEO: Mediterranean

SPECIES: *Vella lucentina* M.B. Crespo
LIFE/FORM: perennial, shrub
ECOLOGY: semi-arid low coastal hills; scrub, waste places; dry, argillaceous soil
GEOGRAPHY:
EUROPE: se Spain [E]
PHYTOGEO: Mediterranean

SPECIES: *Vella mairei* Humbert
LIFE/FORM: perennial, shrub
ECOLOGY: montane from 2400-3100 m; brush; limestone, rarely granite
GEOGRAPHY:
AFRICA: Morocco (High Atlas) [E]
PHYTOGEO: Mediterranean

SPECIES: *Vella pseudocytisus L.*
LIFE/FORM: perennial, shrub
ECOLOGY: semi-arid to arid high plains, montane; stony somewhat saline steppes, dry pastures; clay, argillaceous, calcareous, gypsaceous, or sandy loam soils
GEOGRAPHY:
EUROPE: c & s Spain [E]
AFRICA: n Algeria [E], n Morocco [E]
PHYTOGEO: Mediterranean

SPECIES: *Vella spinosa* Boiss.
LIFE/FORM: perennial, shrub
ECOLOGY: semi-arid to arid coastal montane, 1400-2300 m; rocks and stony places; limestone
GEOGRAPHY:
EUROPE: s & se Spain [E]
PHYTOGEO: Mediterranean

SPECIES:	*Zilla spinosa* (L.) Prantl
LIFE/FORM:	perennial, suffruticose to shrubby
ECOLOGY:	desert plains, arid plateaus, montane to 2500 m; dry steppes, fields, rocky and sandy wastelands and embankments, ravines, dry stream beds, silty alluvium; sand, mica-slate, granite and volcanic rock; sandy, loamnigra, calcareous, or argillaceous soils
GEOGRAPHY:	
AFRICA:	n & s Algeria [E], n Chad [E], Libya [E], n & s Morocco [E], Tunisia [E], Western Sahara [E]
ME/WASIA:	Egypt [E], Iraq [E], Israel/Jordan [E], Kuwait [E], Lebanon/Syria [E], Oman [E], Qatar [E], Saudi Arabia [E], Sinai [E], United Arab Emirates [E], s Yemen [E]
PHYTOGEO:	Saharo-Sindian

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