



A study on the nutraceuticals from the genus *Rumex*

K.N.V.Rao*¹, Sunitha Ch¹, David Banji¹, Sandhya S¹, Mahesh V²

1. Department of Pharmacognosy, Nalanda College of Pharmacy, Nalgonda, Andhrapradesh, India.

2. Department of Pharmacology, NIPER, Guwahati, Assam, India.

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Abstract:

The genus *Rumex* is found to be distributed worldwide. This genus includes more than 250 species. Most of the species under this genus contain phytoconstituents like, flavonoids, anthraquinones and triterpenoids. Many species are herbs but shrubs also included. Roots are usually taproot but a few are having rhizomes. Very few of them are explored scientifically (*Rumex patens*, *Rumex japonicus*, *Rumex hymenosepalus*, *Rumex crispus*, *Rumex dentatus*). 80% methanolic extract of rhizome *Rumex abyssinicus* reported to have diuretic and analgesic activity. The triterpenoids which are isolated from the *Rumex japonicus* shows Rat lens Aldose reductase inhibitory activity. Leucodelphinidin and Leucopelargonidin isolated from the *Rumex hymenosepalus* identified as antitumourous substances. Neopodin which is isolated from the ethanolic extract of *Rumex japonicus* exhibited the inhibitory activity of osteoclast. This paper presents the morphological features, chemical constituents and uses of the different reported species and folklore uses of *Rumex* as these can be explored as potential Nutraceuticals.

Key words: Rumex species, anthraquinones, triterpenoids, flavonoids, diuretic, Nutraceuticals

1. Introduction:

About 200 species (Table-2) widely distributed in North and south temperate zones; 27 species (one endemic) in china¹, twelve species of *Rumex* occur in Texas² *Rumex acetosa*, *R. acetosella*, *R. alpestris* (*R. arifolius*), *R. auriculatus*, *R. aviculare*, *R. hastatus*, *R. lunaria*, *R. longifolius*, *R. montanus*, *R. patienta*, *R. polyanthemus*, *R. repens*, *R. scutatus*, *R. thyrsifolius*, *R. tuberosus*, *R. vesicarius*. grows in Africa: Libya, Morocco, and South Africa . Asia-Temperate: Azerbaijan, Republic of Georgia, Israel, Kazakhstan, Kirghizistan, Stavropol. Asia-Tropical: India. Australasia: New Zealand. Europe: Austria, Cyprus, Czechoslovakia, Denmark, Eire, Estonia, Faeroes, Finland, France, Germany, Hungary, Italy, Latvia, Norway, Poland, Romania, Russia (Novgorod, St. Petersburg, Smolensk, Yaroslavl), Serbia, Sweden, Switzerland, Ukraine, UK (England, Scotland), Yugoslavia³.

For Correspondence: raoknv@yahoo.co.in

Contact: +91 8106995849

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But in India many species of *Rumex* have been reported in Chattisgarh, among all the species *Rumex vesicarius* is most popular⁴. This paper is aimed to report the Morphology, Chemical constituents, Reported and traditional uses (Table-1) of some species of *Rumex*.

2. General Morphology¹

Herbs are perennial or less commonly annual, rarely shrubs, rarely dioecious. Roots are usually stout (taproots), or sometimes plants rhizomatous. Stems erect, ascending to prostrate, branched, not hollow or sulcate. Leaves simple, often dimorphic, fugacious or persisting, basal and cauline, alternate, margin entire or undulate; ocrea tubular, membranous, margin entire. Inflorescence is usually terminal, sometimes terminal and axillary, racemose or paniculate. Pedicel articulate (the functional pedicel consists of the true pedicel and, below the joint, the narrowed united basal parts of the outer tepals (pseudopedicel)). Flowers are bisexual or unisexual (unisexual in dioecious, and rarely in polygamo-monoecious plants). Perianth persistent, tepals 6, becoming enlarged and often hardened in fruit; valve (fruiting inner tepal) margin entire, erose, denticulate, or variously dentate, midvein often transformed into tubercles (tuberculate callosities). Stamens 6. Styles 3, elongate; stigmas penicillate. Achenes trigonous, elliptic to ovate.

Morphological Description of Some Species of *Rumex*¹

***Rumex acetosella*¹:** Herbs perennial, dioecious. Rhizomes horizontal, ligneous. Stems usually numerous from rhizome, erect or ascending, 15-35(-45) cm tall, slender, finely grooved, branched above middle. Basal leaves hastate, rarely without basal leaves, 2-4 cm × 3-6(-10) mm, glabrous, central lobe ovate-lanceolate, lanceolate, or linear, basal lobes spreading or curved, sometimes multifid, margin above basal lobes entire, apex acute or obtuse; cauline leaves smaller upward. Petiole short or in upper cauline leaves nearly absent; ocrea fugacious, white, membranous. Inflorescence terminal, paniculate. Flowers unisexual. Pedicel 2-2.5 mm, articulate near base of tepals. Male flower: outer tepals small; inner tepals elliptic, ca. 1.5 mm. Female flower: outer tepals lanceolate, ca. 1 mm, not reflexed in fruit; inner tepals slightly enlarged in fruit; valves ovate, 1-1.6 mm, without tubercles, net veined, base rounded to broadly cuneate, margin entire, apex acute. Achenes brown, shiny, broadly ovoid, trigonous, 1-1.5 mm

***Rumex hastatus*¹:** Shrubs 50-90 cm tall. Branches purple-brown, finely grooved; branchlets green, glabrous. Leaves solitary or fascicled; petiole 1.5-3.5 cm; leaf blade hastate, 1.5-3 cm × 1.5-2 mm, subleathery, central lobe linear or narrowly triangular, apex acute, basal lobes curved; ocrea fugacious, membranous. Inflorescence terminal, paniculate, lax. Pedicel slender, articulate below middle. Flowers polygamous. Male flowers: tepals nearly uniform. Female flowers: outer tepals elliptic, reflexed in fruit; inner tepals enlarged in fruit; valves pinkish, orbicular or reniform, membranous, nearly pellucid, with small tubercle at base, base deeply cordate, margin nearly entire, and apex obtuse or retuse. Achenes brown, shiny, ovoid, trigonous, ca. 2 mm.

***Rumex acetosa*¹:** Herbs perennial, dioecious, with a short and relatively thin horizontal or slightly oblique rootstock, usually not reaching deep into substrate and with rather crowded secondary roots. Stems erect, 40-100 cm tall, grooved, glabrous, usually simple.

Basal leaves ovate-lanceolate to lanceolate, base sagittate, 3-12 × 2-4 cm, margin entire, apex acute, basal lobes acute at apices; cauline leaves small; petiole short or nearly absent; ocrea fugacious, white, membranous. Inflorescence terminal, paniculate, lax; branches reddish green, slender, simple or with a few secondary branches. Flowers unisexual. Pedicel slender, articulate at middle. Male flowers: outer tepals erect, small; inner tepals elliptic, ca. 3 mm. Female flowers: outer tepals elliptic, reflexed in fruit; inner tepals enlarged in fruit; valves nearly orbicular (to broadly ovate), 3.5-4 mm in diam., with small recurved tubercles at base of valves, net veined, base cordate, margin entire, apex obtuse. Achenes blackish brown, shiny, Ellipsoid, trigonous, ca. 2 mm.

***Rumex thyriflorus*¹**: Herbs perennial, dioecious. Taproots large, thick, with remote secondary roots. Stems erect, 40-120 cm tall, glabrous, grooved. Basal leaves oblong-lanceolate to lanceolate, base sagittate, 4-13 × 1.5-4 cm, both surfaces glabrous or veins minutely papillate, margin entire, apex acute, basal lobes acute at apex; cauline leaves small; petiole short or nearly absent; ocrea fugacious, white, membranous. Inflorescence terminal, paniculate, dense, much branched. Flowers unisexual. Pedicel slender, articulate below middle. Male flowers: outer tepals erect, small; inner tepals elliptic, ca. 2 mm. Female flowers: outer tepals reflexed in fruit; inner tepals enlarged in fruit; valves orbicular to broadly ovate, 3-4 mm in diam., with small recurved tubercles at base of valves, base truncate to cordate, margin nearly entire, apex obtuse. Achenes brown, shiny, ellipsoid, trigonous, ca. 2 mm.

***Rumex longifolius*¹**: Herbs perennial. Stems erect, 60-120 cm tall, robust, glabrous, grooved, branched above middle. Basal leaves: petiole 5-15 cm; leaf blade oblong-lanceolate or broadly lanceolate, 20-35 × 5-10 cm, abaxially minutely papillate along veins, adaxially glabrous, base cuneate or rounded, margin slightly undulate to weakly crisped, apex acute or subacute; cauline leaves shortly petiolate, lanceolate, small, base narrowly cuneate, apex acute; ocrea fugacious, white, membranous. Inflorescence paniculate. Flowers bisexual. Pedicels slender, articulate below middle; articulation distinctly swollen in fruit. Inner tepals enlarged in fruit; valves broadly orbicular-reniform to orbicular-cordate, 5-6 × 6-7 mm, all without tubercles, sometimes 1 valve with small indistinct tubercle, net veined, base cordate, margin entire, apex obtuse. Achenes brown, shiny, narrowly ovoid, trigonous, 2-3.5 mm.

***Rumex angulatus*¹** : Herbs perennial. Stems erect, purple-red, 40-60 cm tall, glabrous, grooved. Basal leaves: petiole 3-5 cm; leaf blade oblong-lanceolate, 15-20 × 3-5 cm, both surfaces glabrous, base cuneate, apex acute; cauline leaves shortly petiolate, lanceolate; ocrea fugacious, membranous. Inflorescence terminal, paniculate, dense; rachis slightly zigzagged. Flowers bisexual. Pedicel filiform, slender, articulate below middle. Inner tepals enlarged in fruit; valves orbicular-cordate, ca. 5 × 4 mm, all without tubercles, net veined, base cordate, margin nearly entire or irregularly minutely crenate, and apex obtuse. Achenes yellow-brown, shiny, ovoid, trigonous, ca. 3 mm.

***Rumex pseudonatronatus*¹**: Herbs perennial. Roots vertical, large, 1.2 cm in diameter. Stems erect, 80-120 cm tall, simple or branched above, grooved, glabrous. Basal leaves lanceolate or narrowly lanceolate, sometimes lanceolate-linear, 15.30 × 1.5.4 cm, abaxially minutely papillate along veins, adaxially glabrous, base cuneate to narrowly cuneate, margin crisped or undulate, apex acute; cauline leaves shortly petiolate, narrowly lanceolate, small; ocrea fugacious, white,

thinly membranous. Inflorescence paniculate, dense in distal part, sometimes interrupted at base, 20.40 cm, narrow. Flowers bisexual. Pedicels slender, articulate below middle, articulation swollen in fruit. Inner tepals enlarged in fruit; valves nearly orbicular or orbicular-cordate, 3.5-4.5 mm, all without tubercles, sometimes 1 valve with 1 indistinct tubercle less than 1.1.3 mm, conspicuously net veined, base slightly cordate, margin entire or weakly erose, apex obtuse. Achenes brown, shiny, narrowly ovoid, trigonous, 2-2.5 mm.

***Rumex aquaticus*¹**: Herbs perennial. Stems erect, 30-120 cm tall, usually branched above (in inflorescence), glabrous, grooved. Basal leaves: petiole 9-28 cm, glabrous or minutely papillate; leaf blade oblong-ovate to ovate-lanceolate, 10-30 × 4-13 cm, both surfaces glabrous or abaxially minutely papillate along veins, base cordate to nearly truncate, margin undulate, apex acute to nearly obtuse; cauline leaves shortly petiolate, oblong or broadly lanceolate, small; ocrea fugacious, membranous. Inflorescence terminal, paniculate, narrow; branches suberect. Flowers bisexual. Pedicel filiform, articulation indistinct, not swollen in fruit. Inner tepals enlarged in fruit; valves ovate, 5-8 × 4-6 mm, all without tubercles, base subtruncate, margin nearly entire, and apex acute. Achenes brown, shiny, ellipsoid, trigonous, 3-4.5 mm, base narrow, apex acute

***Rumex popovii*¹**: Herbs perennial. Roots large, 0.8-1.5 cm in diameter. Stems erect, reddish, 60-100 cm tall, usually branched above, glabrous, grooved. Basal leaves: petiole 7-13 cm, stout; leaf blade oblong-ovate or narrowly ovate, 15-20 × 4-6 cm, both surfaces glabrous, base cordate, margin slightly undulate, apex acute; cauline leaves lanceolate; ocrea fugacious, membranous. Inflorescence paniculate; branches spreading. Flowers bisexual. Pedicel filiform, articulate below middle, articulation indistinct. Inner tepals enlarged in fruit; valves pinkish, nearly orbicular or orbicular-ovate, 4-5 mm in diam., all without tubercles, conspicuously net veined, base deeply cordate, margin inconspicuously denticulate. Achenes brown, shiny, ellipsoid, trigonous, ca. 2 mm.

***Rumex yungningensis*¹**: Herbs perennial. Stems erect, 70-120 cm tall, branched, glabrous, grooved. Basal leaves elliptic, 7-15 × 3-5 cm, abaxially minutely papillate along veins, adaxially glabrous, base cuneate, margin entire, apex acute; cauline leaves small; petiole short or nearly absent; ocrea fugacious, brown, thinly membranous. Inflorescence terminal, paniculate; rachis erect. Flowers bisexual. Pedicel filiform, 6-8 mm, articulates at base. Inner tepals enlarged in fruit; valves triangular-cordate, ca. 5 × 4 mm, all without tubercles, net veined, base deeply cordate, margin nearly entire, and apex obtuse. Achenes brown, shiny, narrowly ovoid, ca. 2.5 mm, apex acute

***Rumex gmelinii*¹**: Herbs perennial. Stems 40-100 cm tall, robust, glabrous, grooved. Basal leaves: petiole to 30 cm; leaf blade broadly triangular-ovate, 8-25 × 5-20 cm, abaxially densely papillate along veins, adaxially glabrous, base deeply cordate, margin entire or slightly undulate, apex obtuse; cauline leaves shortly petiolate, oblong-ovate, small, base cordate, apex obtuse; ocrea fugacious, membranous. Inflorescence paniculate. Flowers bisexual. Pedicels slender, articulate at base. Outer tepals ca. 2 mm; inner tepals enlarged in fruit; valves elliptic, 5-6 mm, all with tubercles, net veined, base rounded, apex obtuse. Achenes dark brown, shiny, ovoid, trigonous, 2.5-3 mm.

***Rumex patientia*¹**: Herbs perennial. Roots vertical, large, to 3 cm in diameter. Stems erect, 80-150(-200) cm tall, robust, branched above, grooved. Basal leaves: petiole 5-15 cm, stout; leaf blade oblong or oblong-lanceolate, 15-30 × 5-10 cm, base rounded, broadly cuneate, or subcordate, margin undulate, apex acute to subacute; cauline leaves shortly petiolate or nearly sessile, lanceolate, small; ocrea fugacious, 2-4 cm, membranous. Inflorescence paniculate, large. Flowers bisexual. Pedicel slender, articulate below middle, articulation swollen and slightly inflexed in fruit. Outer tepals oblong, ca. 1.5 mm; inner tepals enlarged in fruit; valves broadly cordate, 6-7 mm, all or 1 or 2 valves with narrowly ovate tubercles (in *R. patientia* s.str. normally 1 valve has a large tubercle, and two other valves have smaller tubercles), net veined, base deeply cordate, margin entire or indistinctly erose, apex obtuse. Achenes brown, shiny, ovoid, trigonous, 2.5-3 mm, apex acuminate.

***Rumex thianschanicus*¹** : Herbs perennial. Stems erect, 70-130 cm tall, robust, branched, glabrous, grooved. Basal leaves shortly petiolate, broadly ovate, 14.28 × 7.17 cm, thin, both surfaces glabrous, abaxially with prominent veins, base cordate, margin slightly undulate, apex subacute; cauline leaves shortly petiolate, small; ocrea fugacious, membranous. Inflorescence paniculate, lax. Flowers bisexual. Pedicel filiform, 8.16 mm, slender, dilated upward, articulate near base. Inner tepals enlarged in fruit; valves broadly cordate, 5.7 × 6.8 mm, only 1 valve with a tubercle, net veined, base cordate, margin nearly entire, apex acuminate; tubercle elliptic, 2.3 mm. Achenes brownish, ovoid, trigonous, 2.3 mm, apex acuminate.

***Rumex crispus*¹**: Herbs perennial. Roots large. Stems erect, 50-120(-150) cm tall, simple or branched above, glabrous, grooved. Basal leaves shortly petiolate, lanceolate or narrowly lanceolate, 10-25 × 2-5 cm, glabrous or indistinctly papillose along veins below, base usually cuneate to truncate, margin strongly crisped and undulate, apex acute; cauline leaves shortly petiolate, narrowly lanceolate, small; ocrea fugacious, membranous. Inflorescence terminal, paniculate, narrow; branches erect or ascending. Flowers bisexual. Pedicel slender, articulate in proximal third, articulation distinctly swollen. Inner tepals enlarged in fruit; valves broadly ovate, 3.5-6 × 3-5 mm, all with tubercles, rarely only 1 valve bearing a tubercle, conspicuously net veined, base nearly truncate, margin entire, rarely weakly erose, apex obtuse to subacute; tubercle ovate, 1.5-2 mm. Achenes dark brown, shiny, ovoid, trigonous, ca. 2 mm, apex acute.

***Rumex confertus*¹**: Herbs perennial. Stems erect, 40-50 cm tall, branched above, grooved, papillose-pubescent. Basal leaves with petiole longer than leaf blade; leaf blade deeply cordate-triangular, 8-10 × 15-20 cm, slightly longer than wide, abaxially papillate, adaxially glabrous, margin undulate, basal lobes and apex rounded. Inflorescence paniculate, 5-6 × 18-20 cm; rachis flexuous; branches arcuate at base. Flowers bisexual. Pedicel slender, articulate below middle. Inner tepals enlarged in fruit; valves broadly cordate, acutely reniform, 5-6 × 7-8 mm, one valve with a small tubercle, conspicuously net veined, margin with indistinct teeth near base.

***Rumex japonicus*¹**: Herbs perennial. Stems erect, 50-100 cm tall, branched above, grooved, glabrous. Basal leaves: petiole 6-15 cm; leaf blade oblong or lanceolate-oblong, 8-25 × 3-8 cm, abaxially minutely papillate along veins, adaxially glabrous, base rounded, cordate, or broadly cuneate, margin slightly undulate, apex acute or obtuse; cauline leaves shortly petiolate, narrowly oblong, small; ocrea fugacious, white, membranous. Inflorescence paniculate. Flowers bisexual. Pedicel slender, articulate below middle, articulation distinct.

Inner tepals enlarged in fruit; valves broadly cordate, 4-5 × 5-6 mm, all valves with narrowly ovate tubercles, conspicuously net veined, base cordate, margin irregularly denticulate, apex acute; denticles 0.3-0.5 mm. Achenes dark brown, shiny, broadly ovoid, sharply trigonous, ca. 2.5 mm, base narrow, apex acute.

***Rumex stenophyllus*¹**: Herbs perennial. Roots vertical, large, to 1 cm in diameter. Stems erect, 40-80(-120) cm tall, usually branched above, glabrous, grooved. Basal leaves shortly petiolate, lanceolate or narrowly lanceolate, 10-18 × 1.5-4 cm, glabrous or indistinctly papillose along veins below, base cuneate, margin crisped, occasionally nearly flat and entire, apex acute; cauline leaves shortly petiolate or nearly sessile, narrowly lanceolate, small; ocrea fugacious, membranous. Inflorescence paniculate, narrow. Flowers bisexual, dense. Pedicel slender, articulate below middle (in proximal third). Inner tepals enlarged in fruit; valves triangular, 3-4(-5) mm × ca. 3.5 mm, all valves with narrowly ovate tubercles, base truncate to indistinctly cordate, margin denticulate, apex acute; denticles 0.5-1.5 mm, 4-10 at each side. Achenes brown, shiny, ellipsoid, 2.5-3 mm, sharply trigonous, base narrow, apex acute.

***Rumex obtusifolius*¹**: Herbs perennial. Roots vertical, large, to 1.5 cm in diameter. Stems erect, 60-120(-150) cm tall, grooved, branched above middle or in upper 2/3, glabrous. Basal leaves: petiole 6-12 cm, minutely papillate; leaf blade broadly ovate to oblong-ovate or narrowly ovate, 15-30 × 6-15 cm, base cordate, abaxially sparsely minutely papillate, adaxially glabrous; cauline leaves shortly petiolate, narrowly ovate, small; ocrea fugacious, membranous. Inflorescence broadly paniculate, large; branches ascending. Flowers bisexual, dense. Pedicel filiform, slender, articulate below middle (in proximal third, rarely near middle). Inner tepals enlarged in fruit; valves narrowly triangular-ovate, 4-6 × 2-3 mm, usually 1 valve with tubercles, sometimes 3 valves with tubercles, but then 1 tubercle distinctly larger than other 2, base truncate, each margin with 2 or 5 teeth, apex obtuse to subacute; teeth 0.8-1.5 mm, apex straight. Achenes dark brown, shiny, ovoid, sharply trigonous, ca. 2.5 mm.

***Rumex chalepensis*¹**: Herbs perennial. Roots black-brown, large, to 2.5 cm in diameter. Stems erect, 30-60 cm, grooved, branched. Basal leaves: petiole 3-4 cm; leaf blade oblong, 5-20 × 3-8 cm, both surfaces glabrous, midvein prominent abaxially, base rounded or subcordate, margin slightly undulate, apex obtuse or acute; cauline leaves shortly petiolate, small; ocrea fugacious, membranous. Inflorescence paniculate, large. Flowers bisexual. Pedicel articulates below middle. Outer tepals elliptic; inner tepals enlarged in fruit; valves triangular-cordate, 5-6 mm, all valves with tubercles, conspicuously net veined, base subcordate, margin denticulate, apex acute; denticles 1-1.5 mm; tubercles oblong, ca. 2 mm. Achenes brown, shiny, ellipsoid, sharply trigonous, 2.5-3 mm, base narrow, apex acute.

***Rumex nepalensis*¹**: Herbs perennial. Roots large. Stems erect, 50-100 cm tall, branched above, glabrous, grooved. Basal leaves: petiole 4-10 cm; leaf blade broadly ovate, 10-15 × 4-8 cm, both surfaces glabrous or abaxially minutely papillate along veins, base cordate, margin entire, apex acute; cauline leaves shortly petiolate, ovate-lanceolate; ocrea fugacious, membranous. Inflorescence paniculate. Flowers bisexual. Pedicel articulates below middle. Outer tepals elliptic, ca. 1.5 mm; inner tepals enlarged in fruit; valves broadly ovate, 5-6 mm, valves all or 1 or 2 with tubercles, base truncate, each margin with 7 or 8 teeth, apex acute; teeth 1.5-3 mm, apex hooked or straight. Achenes brown, shiny, ovoid, sharply trigonous, ca. 3 mm, base truncate, apex acute.

***Rumex dentatus*¹**: Herbs annual, rarely biennial. Stems erect, 30-70 cm tall, branched from base, grooved; branches ascending to nearly divaricate, glabrous. Lower leaves: petiole 3-5 cm; leaf blade oblong to narrowly elliptic, 4-12 × 1.5-3 cm, both surfaces glabrous, or papillose along veins below, base rounded, truncate, or subcordate, margin slightly undulate, apex obtuse or acute; cauline leaves smaller; ocrea fugacious, membranous. Inflorescence racemose, several racemes aggregated and panicle-like. Flowers bisexual. Pedicel articulates below middle (in proximal third). Outer tepals elliptic, ca. 2 mm; inner tepals enlarged in fruit; valves triangular-ovate, 4-5 × 2.5-3 mm, all valves with tubercles 1.5-2 mm (in some infraspecific taxa of *R. dentatus* only 1 or 2 valves with tubercles), conspicuously net veined, base rounded, each margin with 2-4 teeth, apex acute to subacute; teeth 1.5-2 mm. Achenes yellow-brown, shiny, ovoid, sharply trigonous, 2-2.5 mm, base narrow, apex acute.

***Rumex trisetifer*¹**: Herbs annual. Roots large. Stems erect, 30-80 cm tall, grooved, glabrous; branches spreading. Lower leaves: petiole 3-5 cm; leaf blade oblong or lanceolate-oblong, 8-20 × 2-5 cm, both surfaces glabrous, base cuneate, margin undulate, apex acute; cauline leaves shortly petiolate, narrowly lanceolate, smaller than basal ones; ocrea fugacious, membranous. Inflorescence terminal or axillary, racemose, several racemes aggregated and large panicle-like. Flowers bisexual. Pedicel slender, articulate near base. Outer tepals lanceolate, small; inner tepals enlarged in fruit; valves narrowly trigonous-ovate, 3-4 × 1.5-2 mm, all valves with tubercles, base truncate, margin with 1 pair of narrow teeth, apex narrowly acute; teeth 3-4 mm, straight. Achenes yellow-brown, shiny, ellipsoid, sharply trigonous, 1.5-2 mm, base narrow, apex acute.

***Rumex maritimus*¹**: Herbs annual, rarely biennial, especially in South regions. Stems erect, 15-60 cm tall, branched below middle, grooved, glabrous or weakly shortly papillose. Lower leaves: petiole 1-2.5 cm; leaf blade lanceolate or lanceolate-oblong, 4-15(-20) × 1-3(-4) cm, both surfaces glabrous or shortly papillose below, base narrowly cuneate, margin entire and smooth, or occasionally slightly undulate, apex acute, cauline leaves shortly petiolate or nearly sessile, smaller than basal ones; ocrea fugacious, membranous. Inflorescence paniculate. Flowers bisexual. Pedicel filiform, articulate at base or slightly above base, articulation indistinctly swollen. Outer tepals elliptic, ca. 2 mm; inner tepals enlarged in fruit; valves narrowly triangular-ovate, 2.5-3.5 × 0.8-1.5 mm wide, all valves with tubercles, base truncate, each margin with 2 or 3 (or 4) teeth, apex acute; teeth 2.5-3 mm, narrow; tubercles oblong, ca. 1.5 mm. Achenes yellowbrown, shiny, ellipsoid, sharply trigonous, 1.5-2 mm.

***Rumex similans*¹**: Herbs annual. Stems erect, purplish red, 15-30 cm tall, branched from base, finely grooved. Lower leaves: petiole 1-3 cm; leaf blade oblong or lanceolate-oblong, 3-7 × 0.8-2 cm, both surfaces glabrous, with conspicuous midvein, base rounded or broadly cuneate, margin slightly crisped, apex acute, cauline leaves shortly petiolate or nearly sessile, small, upper ones linear-lanceolate; ocrea fugacious, membranous. Inflorescence terminal, racemose, leafy. Flowers bisexual. Pedicel articulates at base. Outer tepals lanceolate, ca. 0.5 mm; inner tepals enlarged in fruit; valves triangular-ovate, 2-2.5 × 1-1.5 mm, all valves with tubercles, base rounded, each margin with 3 or 4 pairs of narrow teeth, apex narrowly acute; teeth 1-1.5 mm. Achenes shiny, ovoid, 1-1.5 mm, sharply trigonous, apex acute.

***Rumex marschallianus*¹**: Herbs annual. Stems erect, 10-30(-50) cm tall, branched from base, glabrous, finely grooved.

Lower leaves: petiole 1-1.5 cm, slender; leaf blade lanceolate or elliptic-lanceolate, 1.5-5 × 0.7-1.5 cm, both surfaces glabrous, midvein conspicuous, base cuneate or rounded, margin slightly crisped, apex acute;cauline leaves small, with short petiole 3-5 mm. Inflorescence racemose, several racemes aggregated and panicle-like, leafy. Flowers bisexual. Pedicel slender, articulate at base. Outer tepals elliptic; inner tepals enlarged in fruit; valves ovate-triangular, 2.5-3 mm, only 1 valve with tubercle, base rounded, each margin with 2 or 3 narrow teeth (ca. 1.5 or)4-5 mm, apex narrowly acute; others without tubercles, with shorter teeth, or all valves with subequal teeth. Achenes brown, shiny, ovoid, sharply trigonous, ca. 1 mm, base truncate, apex acute.

3. Chemical Constituents of Different Species of *Rumex*:

Six C-glucosyl anthrones are identified as Rumejaposide E (10*R*-C-β-d-glucosyl-10-hydroxyemodin-9-anthrone) and Rumejaposide F (10*S*-C-β-d-glucosyl-10-hydroxyemodin-9-anthrone), rumejaposide G (10*R*-C-β-d-glucosylemodin-9-anthrone) and Rumejaposide H, (10*S*-C-β-d-glucosylemodin-9-anthrone), Cassialoin, (10*S*-C-β-d-glucosyl-10-hydroxychrysophanol-anthrone) and Rumejaposide I (10*R*-C-β-d-glucosyl-10-hydroxychrysophanol-9-anthrone) isolated from the roots of *Rumex dentatus* by column chromatography⁵. Ten compounds were obtained and identified as Helonioside A, Gallic acid, Isonivallic acid, p-hydroxycinnamic acid, Succinic acid, n-butyl-beta-D-fructopyranoside, Quercetin, Hexadecanoic acid 2, 3-dihydroxy propyl ester, beta-sitosterol and Daucosterol from the roots of *Rumex dentatus*⁶.

Two stilbene-O-glycosyl derivatives were Piceid (5,4'-dihydroxystilbene-3-O-beta-D-glucopyranoside) and Rumexoid (5,4'-dihydroxystilbene-3-O-alpha-arabinopyranoside) in addition to Resveratrol (3,5,4'-trihydroxystilbene) isolated from roots of *Rumex bucephalophorus*⁷. Two stilbene-O-methyl derivatives were 5,4'-dihydroxy-3-methoxystilbene and 3,5-dihydroxy-4'-methoxystilbene in addition to resveratrol (3,5,4'-trihydroxystilbene) isolated from the same plant⁸.

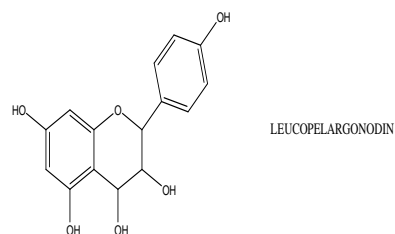
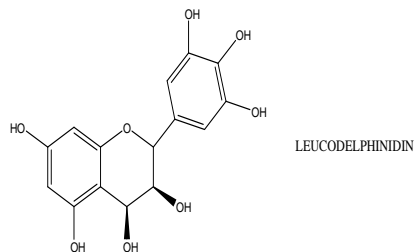
1,5-Dihydroxyanthraquinones and an Anthrone from Roots of *Rumex Crispus*⁹. The separation of 1,5-dihydroxy-3-methyl anthraquinone; 1,3,5-trihydroxy-6-hydroxymethyl anthraquinone; 1,5-dihydroxy-3-methoxy-7-methyl anthraquinone by micellar electrochromatographic method from the root of *Rumex crispus*¹⁰.

Two known compounds as 1-O-beta-D-glucopyranosyl chrysophanol and 1-O-beta-D-glucopyranosyl emodin were isolated from the methanol extract of root of *Rumex gmelini*¹¹. From the same plant ten compounds were identified as Nepodin, Emodin, Citreorosein, Chrysophanol 8-O-β-(6'-acetyl) glucopyranoside, Chrysophanol 8-O-β-D-glucopyranoside,

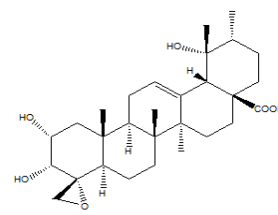
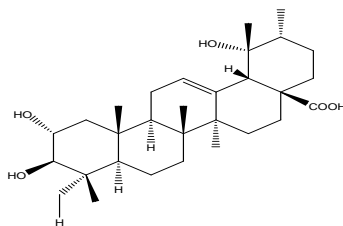
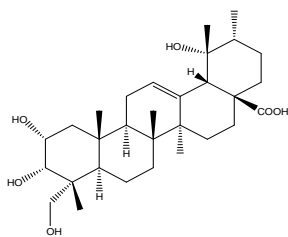
Resveratrol, 9,9'-dianthranone-2,2'-dimethyl-5,5'-bis (β-D-glucopyranose)-9,9',10,10'-tetrahydro-4,4'-dihydroxy-10,10'-dioxo (trivial name: rumoside A), Emodin-8-O-β-D-glucopyranoside, Resveratrol-3-O-β-D-glucoside and Rutin¹².

A new chromone glucoside 2,5-dimethyl-7-hydroxychromone-7-O-β-glucopyranoside isolated from the 75% EtOH extract of the roots of *Rumex gmelini* Turcz., together with five known compounds, nepodin-8-O-β-D-glucopyranoside, 10-hydroxyaloin A, 10-hydroxyaloin B, 5-methoxy-1(3H)-benzofuranone-7-O-β-D-glucopyranoside,

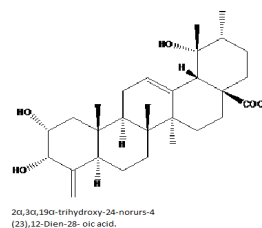
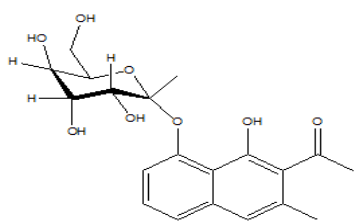
phenylethyl-O- α -L-arabinopyranosyl- (1 \rightarrow 6)- O- β -D-glucopyranoside¹³ . The identification of leucodelphinidin and leucopelargonidin from *Rumex hymenosepalus* from the antitumour fraction of ethanolic extract.¹⁴



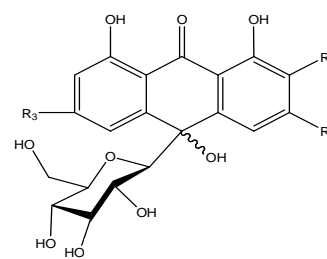
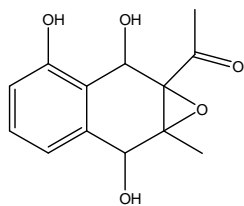
Four ursane-type triterpenoids, 2 α ,3 α ,19 α -trihydroxy-24-norurs-4(23),12-dien-28-oic acid , 4(R),23-epoxy-2 α ,3 α ,19 α -trihydroxy-24-norurs-12-en-28-oic acid , myrianthic acid and tormentic acid , were isolated from an EtOAc soluble extract of the stems of *Rumex japonicus*¹⁵ .



Musizin-8-O- β -D-glucoside isolated from the same plant¹⁶ .



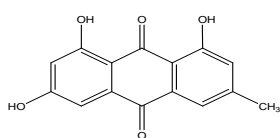
Five oxanthrone C-glycosides, namely rumejaposide A–E, and an epoxynaphthoquinol were isolated from roots of *Rumex japonicus*¹⁷



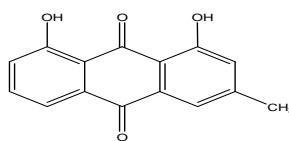
Epoxynaphthoquinol

Rumexoside	R ₁	R ₂	R ₃
A (10R)	COOH	CH ₃	H
B (10S)	COOH	CH ₃	H
C (10R)	COOH	CH ₃	OH
D (10R)	H	CH ₂ OH	OH
E (10R)	H	CH ₃	OH

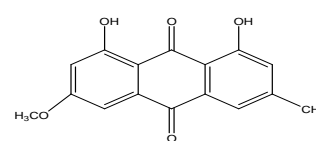
Three anthraquinones—emodin, chrysophanol, and physcion—were successfully Purified from the dichloromethane extract of the Chinese medicinal herb *Rumex japonicus* By high-speed counter-current chromatography¹⁸



Emodin

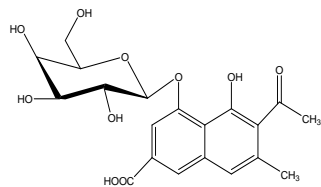


Chrysophanol

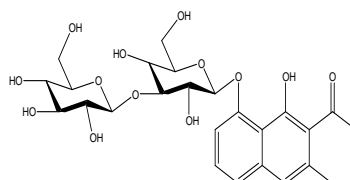


Physcion

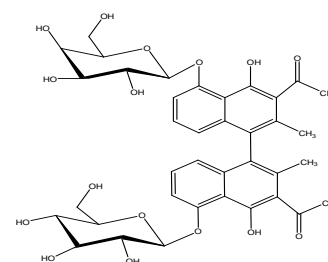
The structures of the new compounds were established, respectively as rumexoside (2-acetyl-3-methyl-6-carboxy-1,8 dihydroxynaphthalene-8-O-β-D-glucopyranoside), labadoside (4,4''-binaphthalene-8,8''-O,O-di-β-D-glucopyranoside) and orientalose (2-acetyl-3-methyl-1,8-dihydroxynaphthalene-8-O-β-D-glucopyranosyl (1→3) β-D-glucopyranoside) on the basis of spectral analysis were isolated from the roots of *Rumex patientia* L¹⁹.



Rumexoside

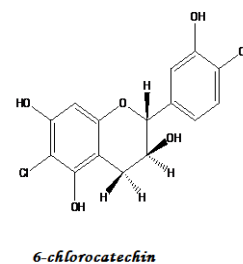
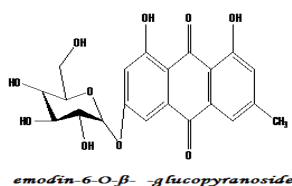


Orientaloside

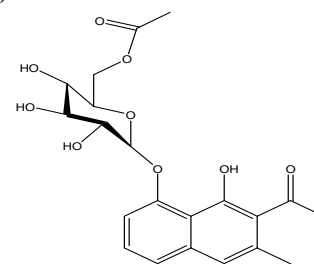
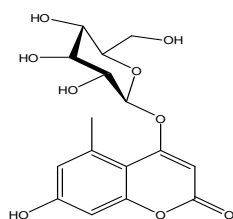


Labadoside

Two new naphthalene derivatives, named patientsides A and B were isolated from the roots of *Rumex patientia*²⁰. An anthraquinone glycoside, emodin-6-O-β-D-glucopyranoside and a simple halogenated flavan-3-ol, 6-chlorocatechin have been isolated from the same plant²¹.



Anhydrolutein I (= (all-E,3R,6'R)-3',4'-didehydro-beta,gamma-caroten-3-ol; 2) and anhydrolutein II (= (all-E, 3R,6'S)-2',3'-didehydro-beta,epsilon-caroten-3-ol; 3) have been isolated and characterized from the extract of steam-cooked sorrel. (*Rumex rugosus*)²².



Hastatusides A and B: Two New Phenolic Glucosides from *Rumex hastatus*²³

Table-1:-Traditional and Medicinal Uses: ²⁴⁻²⁸

Plant	Part used	Uses
<i>Rumex vesicarius</i>	Leaf	Stomachic,Diuretic,Astringent,Aperient
<i>Rumex acetosella</i>	Leaf,Fresh plant juice	Cancer,Antiscorbutic,Refrigerant,Diuretic
<i>Rumex crispus</i>	Root and Seed	Dentifrice,Chronic dysentery and nausea,Hepatic disorders
<i>Rumex dentatus</i>	leaf Stem and Root	Antibacterial,Cytotoxicity,Antitumour,Antiscorbutic,Cutaneous disorders and used as dye
<i>Rumex maritimus</i>	Leaf and root	Cathartic,PurgativeAntipruritic,CNSdepressant, Antidiarrhoeal and applied to burns
<i>Rumex nepalensis</i>	Infusion of leaves	Syphilitic ulcersand purgative
<i>Rumex scutatus</i>	Leaf	Astringent,Refringent and Antiscorbutic
<i>Rumex acetosa</i>	Leaf and infusion of roots	Refringent,Diuretic and skin troubles
<i>Rumex bucephalophorus</i>	Roots	Antioxidant
<i>Rumex confertus</i>	Whole plant or Root	Detoxification,Defaecation and Insecticide
<i>Rumex ecklonianus</i>	Leaves	Purgative,Treatment of chlorosis and anemia
<i>Rumex gmelini</i>	Leaves	Anti-asthmatic,Antitussive,Antitumour and Antioxidant
<i>Rumex japonicus</i>	Aerial parts,Root	Antioxidant and Antimicrobial,Apoptosis
<i>Rumex patertia</i>	Seeds,Root	Antihyperglycemic,Antihyperlipidemic, Antiinflammatory
<i>Rumex abyssinicus</i>	Root	Antiinflammatory,Analgesic and Antihelminthic

4. Conclusion:

There are many species of *Rumex* which grow in different parts of the world of which only a few of them were reported based on the chemical constituents and activities . The reviews indicated that *Rumex* Sps. consist mostly of flavonoids and anthraquinones which are responsible for the different pharmacological activities of the members of this genus.

Table: 2:- Different Species of Rumex through Worldwide

<i>Rumex acetosa</i>	<i>Rumex balcanicus</i>	<i>Rumex densiflorus</i>	<i>Rumex lorentzianus</i>
<i>Rumex acetosella</i>	<i>Rumex brownie</i>	<i>Rumex dentatus</i>	<i>Rumex x lousleyi</i>
<i>Rumex x acutus</i>	<i>Rumex brownie</i>	<i>Rumex diclinis</i>	<i>Rumex ludovicianus</i>
<i>Rumex albescens</i>	<i>Rumexbucephalophorus</i>	<i>Rumex digynus</i>	<i>Rumex lugdunensis</i>
<i>Rumex x alexidis</i>	<i>Rumex chrysocarpus</i>	<i>Rumex dimidiatus</i>	<i>Rumex lunaria</i>
<i>Rumex alpestris</i>	<i>Rumex confertus</i> Willd.	<i>Rumex dimorphophyllus</i>	<i>Rumex luxurians</i>
<i>Rumex alpinus</i>	<i>Rumex x confusus</i>	<i>Rumex x dissimilis</i>	<i>Rumex x lycheanus</i>
<i>Rumex altissimus</i>	<i>Rumex conglomeratus</i>	<i>Rumex x dobrogensis</i>	<i>Rumex maderensis</i>
<i>Rumex angiocarpus</i>	<i>Rumex costaricensis</i>	<i>Rumex x dolosus</i>	<i>Rumex magellanicus</i>
<i>Rumex aquaticus</i>	<i>Rumex crispus</i>	<i>Rumex dregeanus</i>	<i>Rumex maritimus</i>
<i>Rumex aquitanicus</i>	<i>Rumex cristatus</i>	<i>Rumex drobovii</i>	<i>Rumex polycarpus</i>
<i>Rumex azoricus</i>	<i>Rumex crystallinus</i>	<i>Rumex drummondii</i>	<i>Rumex polygamous</i>
<i>Rumex x duffii</i>	<i>Rumex flexicaulis</i>	<i>Rumex gussonii</i>	<i>Rumex polyklonos</i>
<i>Rumex dumosiformis</i>	<i>Rumex flexuosiformis</i>	<i>Rumex x gusuleacii</i>	<i>Rumex x promiscuous</i>
<i>Rumex dumosus</i>	<i>Rumex foliosus</i>	<i>Rumexhadmocarpus</i>	<i>Rumex x propinquus</i>
<i>Rumexdumulosus</i>	<i>Rumexfontanopaludosus</i>	<i>Rumex halophilus</i>	<i>Rumex protractus</i>
<i>Rumexdurispissimus</i>	<i>Rumex foveolatus</i>	<i>Rumex hararensis</i>	<i>Rumex pseudonatronatus</i>
<i>Rumex ecklonianus</i>	<i>Rumex x franktonis</i>	<i>Rumex hasslerianus</i>	<i>Rumex x pseudopulcher</i>
<i>Rumexecuadoriensis</i>	<i>Rumex fraternus</i>	<i>Rumex hastatulus</i>	<i>Rumex pseudoscutatus</i>
<i>Rumex elbrusensis</i>	<i>Rumexfringillimontanus</i>	<i>Rumex hastatus</i>	<i>Rumex pseudoxyria</i>
<i>Rumex ellenbeckii</i>	<i>Rumex frutescens</i>	<i>Rumex hayekii</i>	<i>Rumex pulcher</i>
<i>Rumex engelmanni</i>	<i>Rumex fueginus</i>	<i>Rumexhazslinszkyanus</i>	<i>Rumex quarrei</i>
<i>Rumexephedroides</i>	<i>Rumex gamsii</i>	<i>Rumex x heimerlii</i>	<i>Rumex raulini</i>
<i>Rumex erosus</i>	<i>Rumex gangotrianus</i>	<i>Rumex hellenicus</i>	<i>Rumex rechingerianus</i>
<i>Rumex erubescens</i>	<i>Rumex gieshueblensis</i>	<i>Rumex henrardi</i>	<i>Rumex rectinervius</i>
<i>Rumexerythrocarpus</i>	<i>Rumex giganteus</i>	<i>Rumex hesperius</i>	<i>Rumex recurvus</i>
<i>Rumex esquirolii</i>	<i>Rumex gini</i>	<i>Rumex heteranthos</i>	<i>Rumex x rhaeticus</i>
<i>Rumex euxinus</i>	<i>Rumex gmelini</i>	<i>Rumex heterophyllus</i>	<i>Rumex rhodesius</i>
<i>Rumexevenkiensis</i>	<i>Rumex gombae</i>	<i>Rumex hexagynus</i>	<i>Rumex x romanicus</i>
<i>Rumexexpectatus</i>	<i>Rumex gracilescens</i>	<i>Rumex hippiatricus</i>	<i>Rumex romassa</i>
<i>Rumex fallacinus</i>	<i>Rumex gracilipes</i>	<i>Rumex hirsutus</i>	<i>Rumex x rosemurphyae</i>
<i>Rumexfascicularis</i>	<i>Rumex graminifolius</i>	<i>Rumex horizontalis</i>	<i>Rumex roseus</i>
<i>Rumex fascilobus</i>	<i>Rumex granulatus</i>	<i>Rumex hoschedei</i>	<i>Rumex rossicus</i>
<i>Rumex fimbriatus</i>	<i>Rumex x griffithii</i>	<i>Rumex hostilis</i>	<i>Rumex rothschildianus</i>
<i>Rumex finitimus</i>	<i>Rumex x grintzeskui</i>	<i>Rumex hultenii</i>	<i>Rumex rugosus</i>
<i>Rumexhungaricus</i>	<i>Rumex x hybridus</i>	<i>Rumexhydrolapathum</i>	<i>Rumex rupestris</i>
<i>Rumex hymenosepalus</i>	<i>Rumex interruptus</i>	<i>Rumex kaschgaricus</i>	<i>Rumex ruwenzoriensis</i>
<i>Rumex x impurus</i>	<i>Rumex x inundatus</i>	<i>Rumex x kaschmirianus</i>	<i>Rumex sagittatus</i>
<i>Rumex inconspicuous</i>	<i>Rumex iseriensis</i>	<i>Rumex kernerii</i>	<i>Rumex x sagorski</i>
<i>Rumex integer</i>	<i>Rumex jacutensis</i>	<i>Rumex khekii</i>	<i>Rumex salicetorum</i>
<i>Rumex integrifolia</i>	<i>Rumex japonicas</i>	<i>Rumex x khorasanicus</i>	<i>Rumex salicifolius</i>
<i>Rumex x intercedens</i>	<i>Rumex x johannis-moorei</i>	<i>Rumex x knaftii</i>	<i>Rumex salinus</i>
<i>Rumex intermedius</i>	<i>Rumex kamtschadalis</i>	<i>Rumex komarovii</i>	<i>Rumex samuelssonii</i>
<i>Rumex krausei</i>	<i>Rumex marschallianus</i>	<i>Rumex obovatus</i>	<i>Rumex sanguineus</i>
<i>Rumex lachanus</i>	<i>Rumex maximus</i>	<i>Rumex obtusifolius</i>	<i>Rumex sanninensis</i>
<i>Rumex lacustris</i>	<i>Rumex megalophyllus</i>	<i>Rumex occidentalis</i>	<i>Rumex suzukianus</i>
<i>Rumex lanceolatus</i>	<i>Rumex meyeri</i>	<i>Rumex occultans</i>	<i>Rumex vesceritensis</i>
<i>Rumex langloisii</i>	<i>Rumex x mezei</i>	<i>Rumex ochotensis</i>	<i>Rumex vesicarius</i>
<i>Rumex lanuginosus</i>	<i>Rumex microcarpus</i>	<i>Rumex orbiculatus</i>	<i>Rumex violascens</i>
<i>Rumex lapponicus</i>	<i>Rumex microdon</i>	<i>Rumex orientalis</i>	<i>Rumex wachterii</i>
<i>Rumex lanuginosus</i>	<i>Rumex x mirabilis</i>	<i>Rumex orthoneurus</i>	<i>Rumex x weberi</i>
<i>Rumex latifolius</i>	<i>Rumex mixtus</i>	<i>Rumex x oryzetorum</i>	<i>Rumex longifolius</i>
<i>Rumex leptocaulis</i>	<i>Rumex moedlingensis</i>	<i>Rumex osswaldii</i>	<i>Rumex longisetus</i>
<i>Rumex leptophyllus</i>	<i>Rumex x monistrolensis</i>	<i>Rumex oxysepalus</i>	<i>Rumex x nankingensis</i>
<i>Rumex limoniastrum</i>	<i>Rumex montanus</i>	<i>Rumex x pakistanicus</i>	<i>Rumex natalensis</i>
<i>Rumex linearis</i>	<i>Rumex monticola</i>	<i>Rumex pallidus</i>	<i>Rumex neglectus</i>
<i>Rumex x lingulatus</i>	<i>Rumex muelleri</i>	<i>Rumex palustris</i>	<i>Rumex nematopodus</i>
<i>Rumex litoralis</i>	<i>Rumex x munshii</i>	<i>Rumex x palustroides</i>	<i>Rumex nemorosus</i>
<i>Rumex lonaczewskii</i>	<i>Rumex muretii</i>	<i>Rumex pamiricus</i>	<i>Rumex nepalensis</i>
	<i>Rumex muricatus</i>	<i>Rumex x pannonicus</i>	<i>Rumex nervosus</i>

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