

A REVIEW OF THE CLASSIFICATION, DISTRIBUTION AND APPLICATION OF ARTEMISIA L. AND SERIPHIDIUM (BESS.) POLJAK. (COMPOSITAE) IN CHINA

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Abstract The paper is a review, in which author showed 1). A view of the classification, including history and taxonomic evidence of the genera, *Artemisia* L. and *Seriphidium* (Bess.) Poljak.; 2). the distribution, including migration in geological period, the speciation and present distributional mass center and so-called "3 oblique mass zones" in China, as well as the secondary speciation and developing centers in Hengduang-Himalayan Mts. and 3). the application, mainly in medicine, but also for herbage in steppe and for the windbreaks and assist to sand fixation at the desert and semi-desert areas.

In China there are 185 species and 44 varieties of *Artemisia* L., and 31 species and 3 varieties of *Seriphidium* (Bess.) Poljak. What both are sister genera are the important in classification, distribution and useful in the economic application.

1. A View of the Classification of the Genera

J. P. Tournefort^[47] was the 1st to distinguish 3 genera — *Absinthium*, *Abrotanum* and *Artemisia* using polynominal nomenclature. C. Linnaeus^[48] reduced above 3 genera into genus *Artemisia* L., included *A. absinthium* L., *A. abrotanum* L. and *A. vulgaris* L. by "binominal nomenclature", and he recorded 19 species of *Artemisia* in the world. Later, W. S. Besser^[1-5] and A. P. de Candolle^[6] were two early botanists to give *Artemisia* a good systemetic collation. They divided *Artemisia* into 4 sections — Sect. 1. *Dracunculus* Bess., which's the same as Gen. *Oligosporus* Cass. (1817)^[44] Sect. 2. *Seriphidium* Bess., Sect. 3. *Abrotanum* Bess. and Sect. 4. *Absinthium* DC. They regarded the sections, which contains only a few pistillate florets and a few sterile disk-florets (— Sect. *Dracunculus* Bess.) and those that contains a few bisexual florets only (— Sect. *Seriphidium* Bess.) are both primitives, but the sections, which contain more florets and in which the disk-florets fertile (— Sect. *Abrotanum* Bess.) or those even covered with the hairs on the receptacle (— Sect. *Absinthium* DC.) are advanced. P. A.

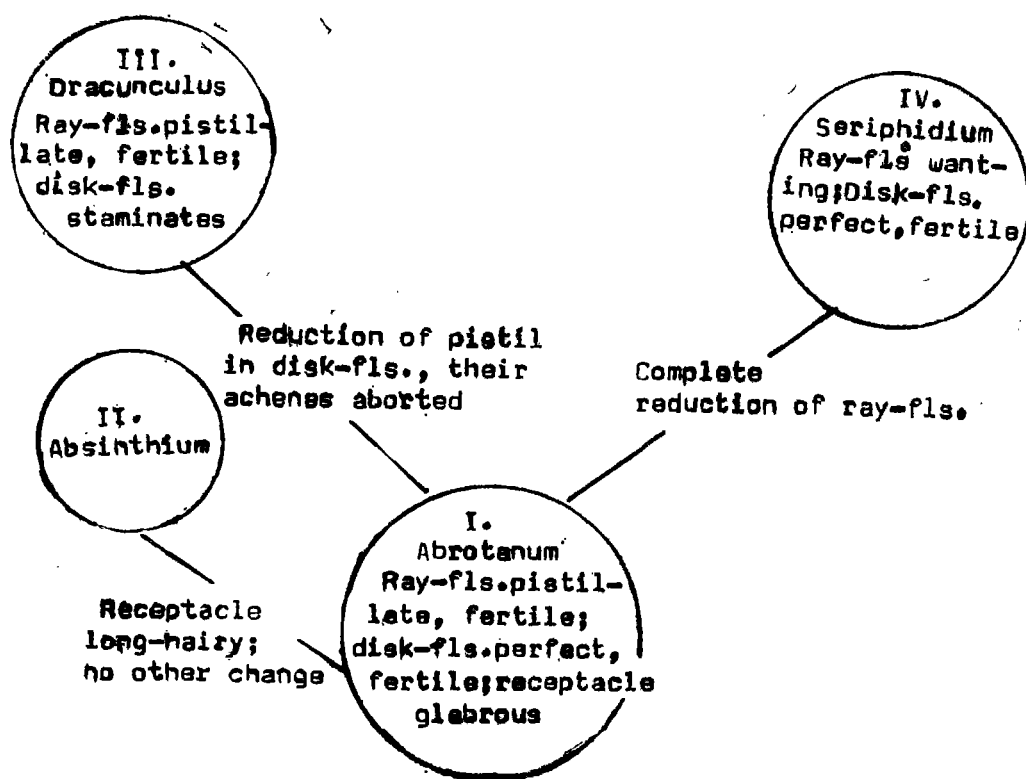
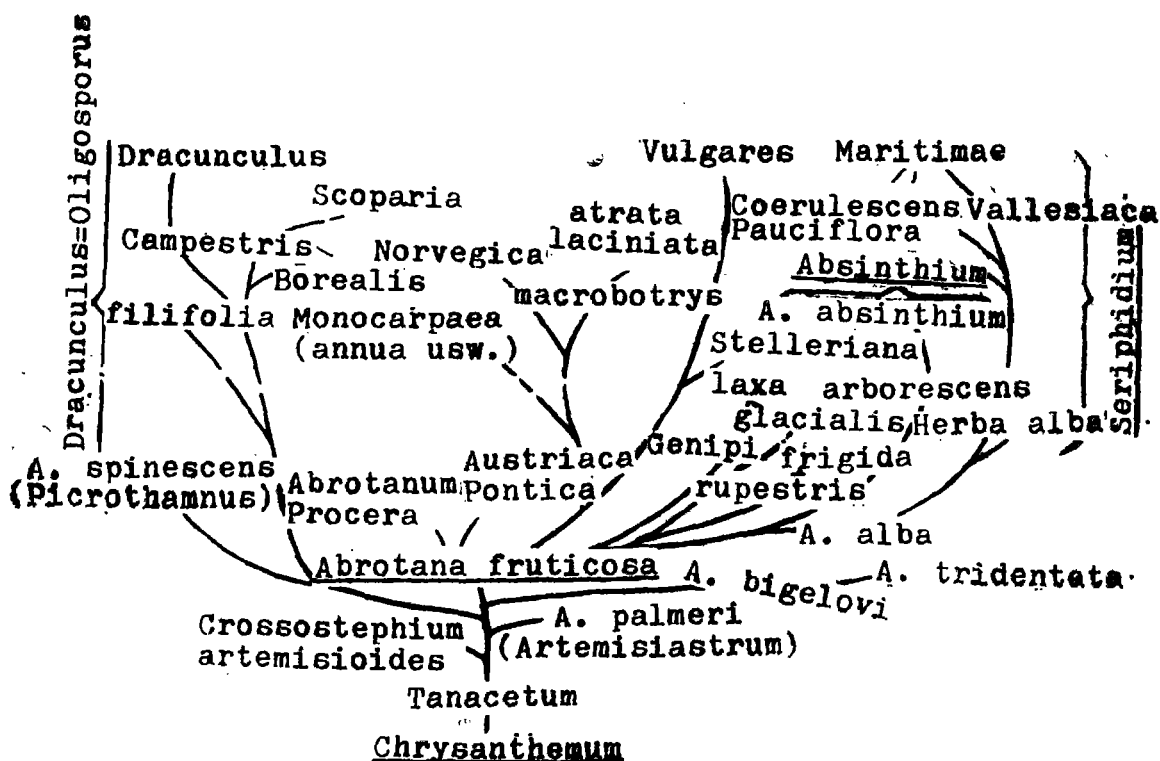


Fig. 1. — Phylogenetic chart of the sections of *Artemisia* L. (by H. M. Hall & F. E. Clements)

Rydberg^[46] divided N. American *Artemisia* into 4 subgenera and 20 sections, but H. M. Hall & F. E. Clements^[13] considered the most primitive section in the genus should be Sect. *Abrotanum* and from it developed to Sect. 2. *Absinthium* by the receptacle covered with long hairs; to Sect. 3. *Dracunculus* by aborted achenes in disk-fls; and to Sect. 4. *Seriphidium* by complete reduction of ray-fls. G. Hegi^[18] gave an idea that *Artemisia* (fig. 1.) was evolved from *Tanacetum*, from the primitive ancestor *Artemisia* developed into 3 branches — 1. *Dracunculus*, 2. via "*Abrotana fruticosa*" to *Abrotanum* and another 2 branchlets, i.e. *Absinthium* and *Seriphidium* of Eurasia. That means *Absinthium* is close to *Seriphidium* of Eurasia, and both of them were from the same ancestor, and 3. solitary to *Seriphidium* of N. America (fig. 2.). I. V. Kraschenninikov^[20] researched on *Artemisia* of Eurasia and separated a new *Stilpnolepis* Krasch, from *Artemisia*. P. Poljakov^[43, 44] researched on *Artemisia* of USSR, and raised genera *Mausolea* Bge. ex Poljak., *Neopallasia* Poljak., *Kaschgaria* Poljak., *Turaniphytum* Poljak., and all of which were separated from *Artemisia*, sensu lato, and he divided *Artemisia*, sensu stricto, into

Fig. 2. — Phylogenetic chart of *Artemisia* L. (by G. Hegi).

3 subgenera and 7 sections, i.e. Subgen. I. *Artemisia*, incl. Sect. 1. *Artemisia*, Sect. 2. *Abrotanum* Bess., Sect. 3. *Absinthium* DC., Sect. 4. *Artanacetum* (Razad.) Poljak., Sect. 5. *Stellerianum* (Rydb.) Poljak., Subgen. II. *Dracunculus* (Bess.) Rouy, incl. Sect. 6. *Dracunculus* Bess. and Subgen. III. *Seriphidium* (Bess.) Rouy, incl. Sect. 7. *Seriphidium* Bess. Later, he changed the Subgen. *Dracunculus* (Bess.) Rouy into Genus *Oligosporus* Cass^[44], and raised a new Genus *Seriphidium* (Bess.) Poljak., based on the Subgen. *Seriphidium* (Bess.) Rouy.

I^[34] agreed with division to divide *Artemisia* sensu lato, into 2 genera, *Artemisia* sensu stricto, which include 9 sections, and 7 of them in China, and the *Seriphidium*, but 3 sections in the genus were divided in China. Besides, a new genus, *Elachanthemum* Y. Ling & Y. R. Ling^[31] had been raised based on *E. intricatum* (Franch.) Y. Ling & Y. R. Ling — *Artemisia intricata* Franch.

I have considered that^[31-33] there are the heterogamous florets in capitula of *Artemisia*, in which the outer or ray-fls, are pistillate and inner

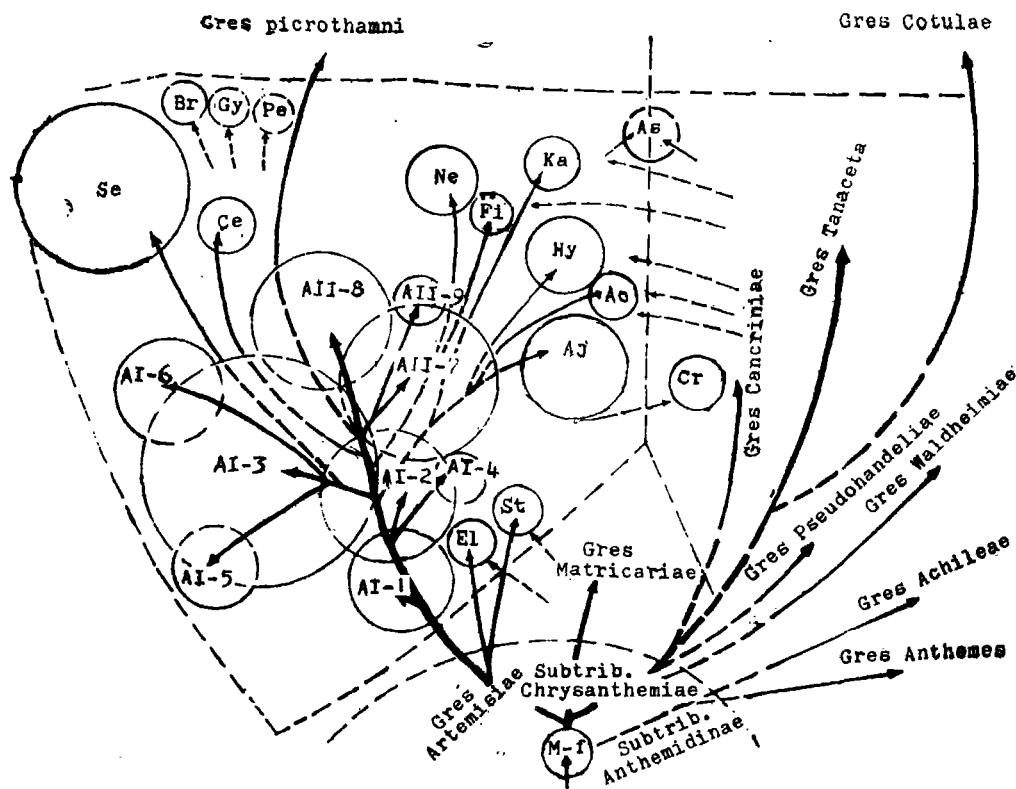


Fig. 3. — Phylogenetic chart of genera of Trib. Anthemideae (by Y. R. Ling)

El — *Elachanthemum* Ling & Y. R. Ling; St — *Stilpnolepis* Krasch.; A — *Artemisia* L.
 (AI — Subgen. I. *Artemisia*; AI—I. Sect. 1. *Absinthium* DC., AI—2. Sect. 2. *Abrotanum* Bess., AI—3. Sect. 3. *Artemisia*, AI—4. Sect. 4. *Artanacetum* Poljak., AI—5. Sect. 5. *Viscidipubes* Y. R. Ling, AI—6. Sect. 6. *Albibractea* Y. R. Ling; AII—Subgen. II. *Dracunculus* Peterm., AII—7. Sect. 7. *Dracunculus* Bess., AII—8. Sect. 8. *Latilobus* Y. R. Ling, AII—9. Sect. 9. *Turaniphytum* (Poljak.) Y. R. Ling); Aj— *Ajania* Poljak., Hy—*Hippolytia* Poljak., Ao—*Ajaniopsis* Shih, Ka—*Kaschgaria* Poljak., Fi—*Filifolium* Kitam., Ne—*Neopallasia* Poljak., Ce—*Centipeda* Lour., Se—*Seriphidium* Poljak., Cr—*Crossostephium* Lour., Br—*Brachymeris* DC., Gy—*Gymnopentizia* Benth., Pe—*Peyrousea* DC. As—*Asaemia* Harv., M-f—*Matricaria*-form plant.

or disk-florets are bisexual, which different from *Seriphidium*, and in above genera the most primitive group possibly is Sect. 1. *Absinthium* DC. not being Sect. *Abrotanum* Bess., such as *A. macrocephala* Jacq ex Bess. etc. (fig. 3 & 4). Because the capitula of Sect. *Absinthium* DC. are often bigger than that of other sections, usually with hemispherical and contain 60—100 or more florets, and some florets in the centre usually haven't matured before the end of anthesis. The corolla of pistillate florets are more or less similar to the inners, vase-form, 4-toothed, which had been evolved from inner 5-toothed

and tubular corolla, unlike the narrow tubular and 2(-3)-toothed corolla in the species of other sections. Besides, the reduced marks of the vascular bundles of filaments, sometimes, can be found inside the corolla, as in *A. macrocephala* Jacq. ex Bess. and *A. rupestris* L. etc. The hairs on the receptacle, which should be evolved from the pales covering on the receptacle in other primitive ancestor species of *Compositae*, are the common character in this section, but, sometimes, they are deciduous. Lobes or lobules of leaves are filiform, narrow lanceolate or serrulate. Distribute at N., C. and W. Asia, N. Europe, N. America or at alpine and subalpine in S. Asia. (44 spp. in the Old World, and 23 spp. and 4 vars. in China.)*

Although Sect. 2. *Abrotanum* Bess. is another one of more primitive section, with such species as *A. annua* L., *A. macrantha* Ledeb. etc., the capitula smaller than those of Sect. *Absinthium* DC. and they are spherical or ovoid and contain less than 100 florets, usually 50—80 (—100), the lobes or lobules of leaves are serrulated, serrated or filiform. Perhaps it developed from Sect. *Absinthium* DC. and is still actively evolving, and the advanced sections of *Artemisia* and even *Seriphidium* were derived from it. (fig. 3 & 4). N. hemisphere and N., E. & S. Africa distribution. (66 spp. in the Old World, 31 spp, and 3 vars, in China.)

Except some species, which are probably secondary primitive species and raised from Hengduang-Himalayan Mts., most of species of Sect. 3. *Artemisia*, such as *A. lavandulaefolia* DC. and *A. argyi* Lévl. & Van. etc., have smaller capitula, ellipsoid or oblong, which contained less than 20, rarely 30—50 florets, the corolla of pistillate florets are narrow tubular and the lobes or lobules of the leaves are broadly lanceolate, linear-lanceolate or serrated, or leaves entire. Arachnoid or tomentose hairs usually covered on branches, both or abaxial surfaces of leaves and involucre bracts, but some species covered hairless. N. hemisphere distribution, but mainly in temperate and subtropical areas. (73 spp. in the Old World, and 55 spp. and 9 vars. in China.)

Sect. 4. *Viscidipubes* Y. R. Ling is highly specialized, which is characterized by covering more or less glandular or viscid hairs on stem, branches, leaves or involucre-bracts, e.g. *A. viscida* Pamp., *A. matfeldii* Pamp. and *A. erlangshanensis* Ling & Y. R. Ling etc. Perhaps that character was evolved in the special area, by the view-points of Plant Floristics "The Hengduang-

*Y. R. Ling & C. J. Humphries, 1986. The Old World *Artemisia* L.

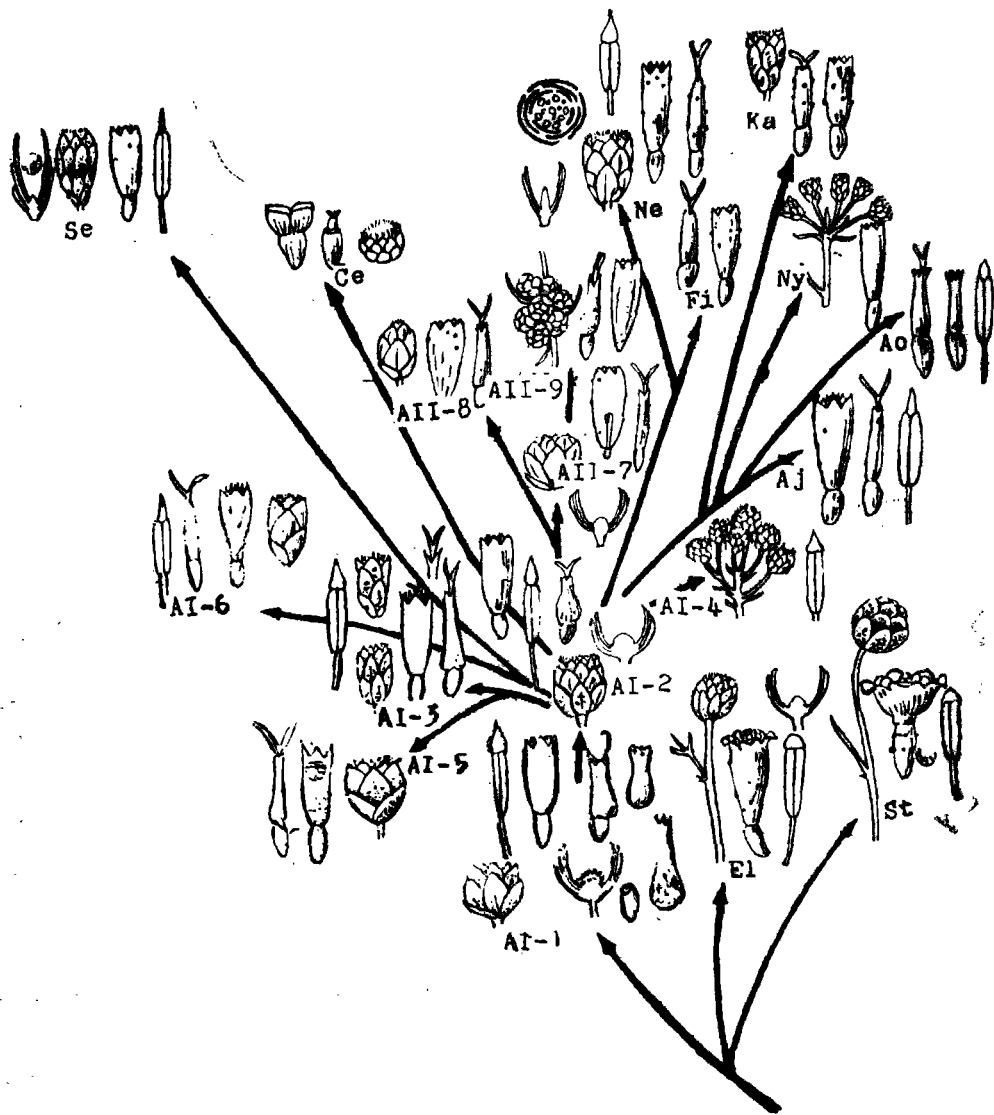


Fig. 4. —Phylogenetic chart of genera of the subfamily Artemisiae [(by Y. R. Ling, 1982)]

Himalayan Mts. forest subkingdom", where the temperature are with a big changes either between the days and nights or between the summer and winter. The capitula in the section usually contain 30—50(—80) florets. In addition, the puberulent or tomentose hairs are usually found in the species of the section. Most species in Hengduang-Himalayan Mts., a few are expanded to C., S. & S.-E. China. (21 spp. in the Old World, and 20 spp. and 5 vars. in China.)

Sect. 5. *Albibractea* Y. R. Ling is a typical style evolved from warm environment, and the species are found at S. and S.-E. Asian countries in the subtropical, a few towards tropical, and moist areas. The section is characterized by the membranaceous involucre bracts and without green midrib and hairless on the abaxial of it, as well as lacking or reduced bracteoles under the capitula. Besides, only a few, about 15—30, florets in capitula, such as *A. lactiflora* Wall. ex DC., *A. anomala* S. Moore etc. (5 spp. and 3 vars. in China and S. & S.-E. Asia.)

Subgen. *Dracunculus* (Bess.) Petermn. is an advanced subgenus with sterility of the bisexual florets (fig. 3 & 4). It contains two sections in China: Sect. 6. *Dracunculus* Bess. growing in dry areas — steppe, forest-steppe, semidesert or desert areas of N. & S.-W. China, Besides, in Eurasia, N. Africa and N. America, only a few are widely distributed. Their capitula usually contain (20—) 30—80 florets, the aborted ovaries are usually present, rarely absent and the lobes or lobules of the leaves are filiform or linear or serrulated or with entireleaves, as in *A. dracunculus* L. (54 spp. in the Old World and 34 spp. and 10 vars. in China); Sect. 7 *Latilobus* Y. R. Ling is distributed in moist areas of Eurasia and the capitula contain 15—30(—40) florets, the aborted ovaries are usually absent, rarely present, and the lobes and lobules of leaves broad, usually lanceolate or serrated, as in *A. japonica* Thunb. and *A. dubia* Wall ex Bess. etc. (23 spp. in the Old World and 17 spp. and 10 vars. in China.)

Sect. *Artanacetum* (Rzazad.) Poljak.^[43] and Sect. *Turaniphytum* (Poljak.) Y. R. Ling^[34] are not represented in China, but in N., W. & S.-W. Asia and N. America. The former contains 9 species, but the latter 3 species only.

Seriphidium is an advanced genus^[34] (fig. 3 & 4). There are 4—7 series of involucre bracts, less than 10 florets in capitula, the appendage above the anther linear or lanceolate, unlike the triangular and acute in *Artemisia* and triangular, but obtuse in *Elachanthemum* and *Stilpnolepis* (107 spp. in the Old World and 31 spp. and 3 vars. in China)** (Tab. 2.).

Compared the *Seriphidium* with *Elachanthemum* and *Stilpnolepis*, although all of 3 genera contain homogamous florets in capitula, latter two genera contain more than 100 florets in their capitula, and just as in the Sect.

**Y. R. Ling & C. J. Humphries, 1986. The Old World *Seriphidium* (Bess.) Poljak.

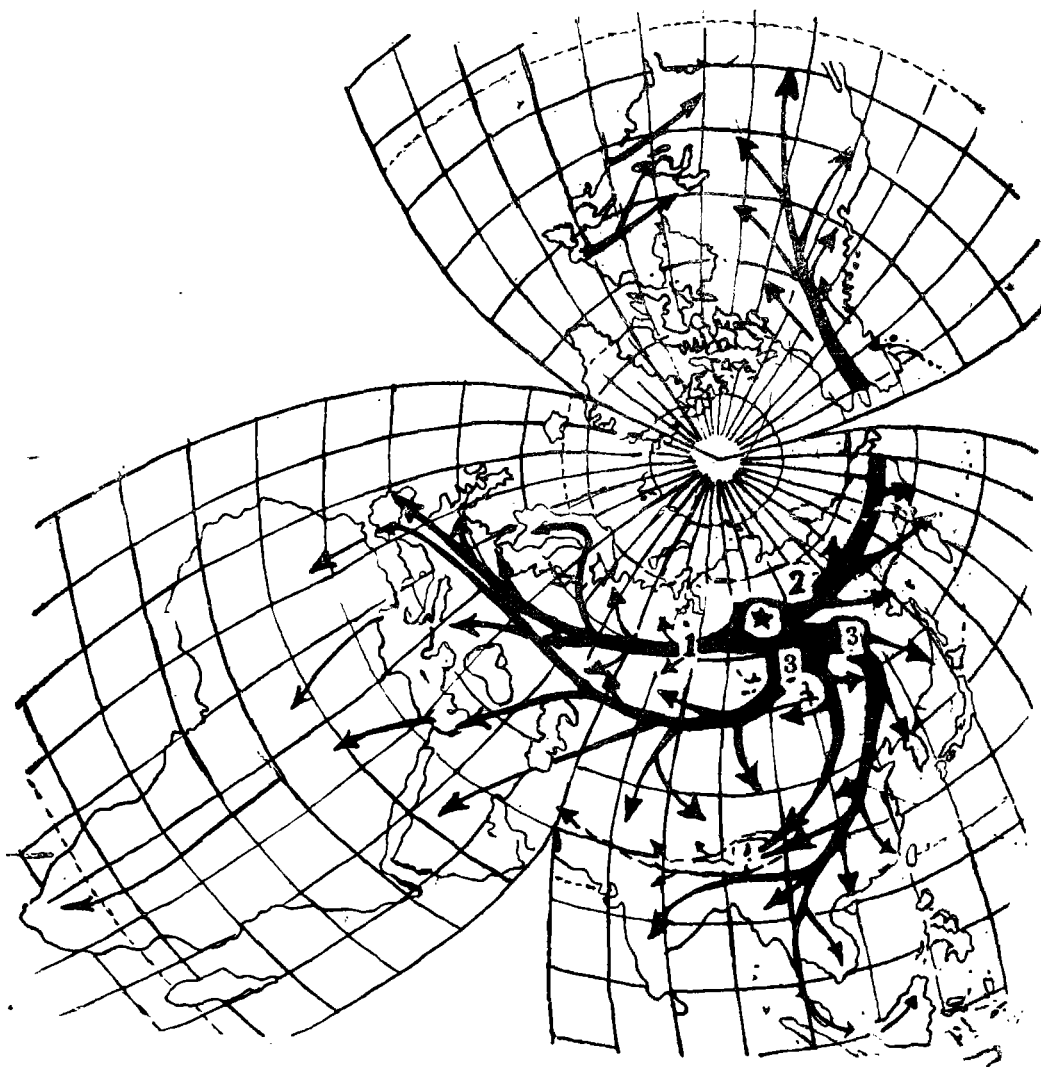


Fig. 5. Chart of extended distribution of *Gres Artemisiae* (by Y. R. Ling)

★: Speciation centers;

→: Migrated routes: 1. Western direction, 2. Eastern direction, 3. Southern directions;

! : Refuge of *Artemisia* L. in Ice age of Quaternary and the secondary Speciation and developing center

Absinthium DC. of *Artemisia*, some florets in the centre of both genera haven't been matured before the cessation of flowering. Besides, long peduncles attacked at the base of capitula.

The evidence of the pollen grains for above genera are that: All of them are 3-colporate, but with the exine densely spinulose, and the columellae reticulate in *Elachanthemum*, the exine is spiny in *Stilpnolepis* and the outer layer of the exine of above 2 genera obvious and a little thick; but

in *Artemisia* the exine of the pollen grains contains 3 distinct thin layers and its sculpture is granulate; and in *Seriphidium* the exine of pollen grains is indistinct with 3 thin layers and its sculpture minute-columnar. As the result of the evidence, incl. pollen grains, perhaps *Elachanthemum* and *Stilpnolepis*, just like the Sect. *Absinthium* DC. in *Artemisia*, are primitive, but *Seriphidium* more advanced.

2. On the Distribution of the Genera

Paleobotanical evidence and fossil pollen grains showed the ancestor of both genera occurring in N. Asia during the middle (Neogene) of Tertiary era, and there is an indication that the centre of speciation was in N. Asia, but the present center of geographic distribution is in the N. Eurasia^[34] (fig. 5.), where there are about 290 species of *Artemisia* and 97 species of *Seriphidium*, and N. America, where about 110 species of *Artemisia* and 15 species of *Seriphidium*. But the mass center of them in N. Asia, between N. China and C., S. & E. USSR, where there are about 260 species of *Artemisia* and 65 species of *Seriphidium*. The margin of distribution of *Artemisia* extended to S. Asia, C. America, and a few species to N., E. & S. Africa and *Seriphidium*

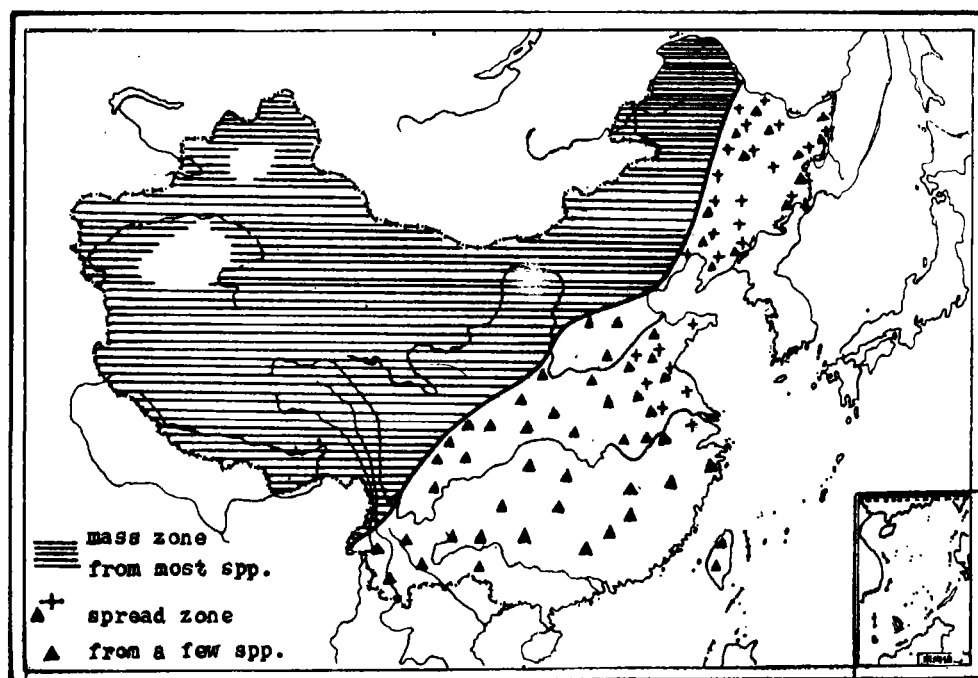


Fig. 6. Chart of the 1st oblique line and mass zone of the distribution of *Artemisia* L. and its allies in China (by Y. R. Ling)

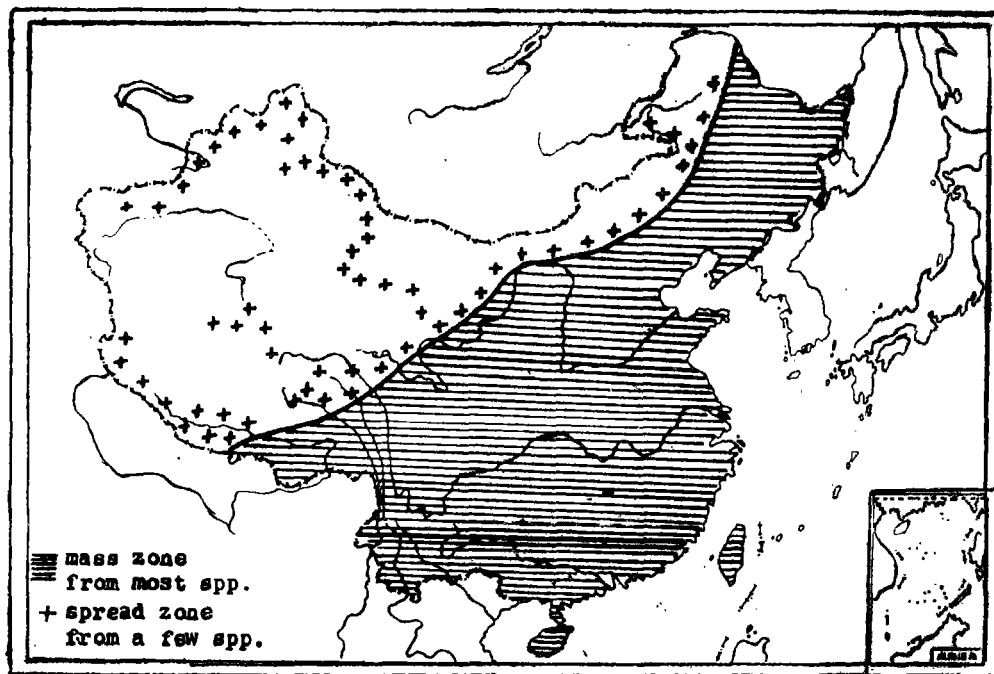


Fig. 7. Chart of the 2nd oblique line and mass zone of the distribution of *Artemisia* L. and its allies in China (by Y. R. Ling)

dium to N.-W. Xizang in China, W. Asia, S. Europe, and a few to N. Africa. (fig. 5.).

The evolution of species of both genera and their present distribution were accompanied by the migration of the species during the later Tertiary and Quaternary eras by the advancing Polar Ice Age cap. At that time the primitive species from the original center migrated perhaps along 3 important lines^[34] (fig. 5.): 1. Western direction, where species from the original center migrated to Europe and gradually trended towards eastern America, a part of them throughout central and towards western Asia, Asia Minor and the Mediterranean area and extended to Africa, such as *A. absinthium* L. etc.; 2. Eastern direction, throughout Siberia and Far East of USSR into western America and some of them getting towards central America, as in *A. frigida* Willd. etc.; 3. Southern direction, that's an important route, where the species were spread to Asia.

In Southern direction, the migration of the species of both genera in China, except the wide-distributional species, perhaps follows 3 oblique lines, which accompanied the 3 mass zones during the later Tertiary and Quaternary eras. The areas and distributed species in the areas are as follows^[34]:

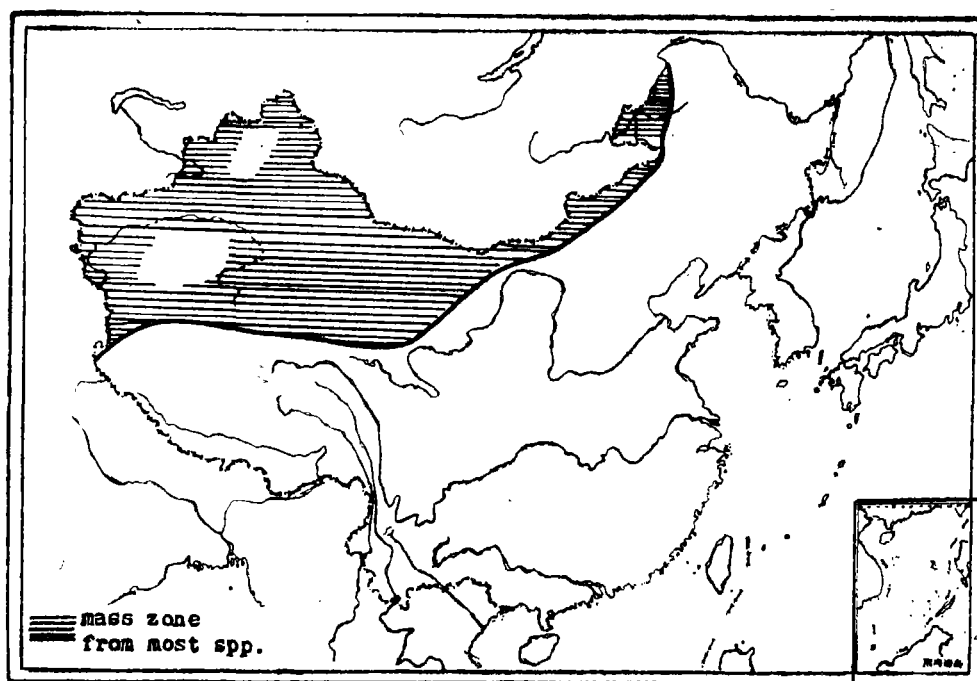


Fig. 8. Chart of the 3rd oblique line and mass zone of the distribution of *Artemisia* L. and its allies in China (by Y. R. Ling)

The 1st one is located at the west area of the line from W. Hsingan Mts. running obliquely throughout N. China near the E. of Qingling Mts. to E. Hengduang Mts. The species of Sect. *Absinthium* DC. and Sect. *Abro-tanum* Bess. of *Artemisia* are in the area (fig. 6.); the 2nd one is at the east area of the line from W. Hsingan Mts. throughout N. and C. -W. China, but into W. Hengduang Mts. The species of Sect. *Artemisia*, Sect. *Viscidipubes* Y. R. Ling, Sect. *Albibractea* Y. R. Ling and Sect. *Latilobus* Y. R. Ling of *Artemisia* are in the area, but most species from Sect. *Viscidipubes* are in the S.-W. of the area, only a few species extended to S. or S.-E. of the area and those of Sect. *Albibractea* Y. R. Ling are in the S. & S.-E. of the area (fig. 7.); the 3rd one is at the west area of the line from W. Hsingan Mts. throughout obliquely N. China to W. Kunlun Mts. It reflects distribution of the species of Sect. *Dracunculus* Bess. of *Artemisia* and *Seriphidium*. (fig 8.)

Since the Indian Continent of Gondwana stroke the S. Eurasia Continent of Laurasia at the later Tertiary era and accompanied with the Himalayan Mts. orogenic movement, uplifting and folding Hengduang Mts. occurred,

and there had made the environment and temperature changes. The so-called the "Hengduang-Himalayan Mts. forest subkingdom" is a special one by view-points of Plant Floristics^[34]*** (fig. 5.). It's not only the refuge of *Artemisia* in Ice Age of Quaternary era, but also the secondary speciation and developing centers after the Ice Age. Besides, it is the 2nd present distributional mass center too, where distributed 116 species and 21 varieties of *Artemisia*, incl. either some Tertiary relics and primitive species, such as *A. sieversiana* Ehrh. ex Willd., *A. macrocephala* Jacq. ex Bess. etc., or many regional endemic species, especially the species of mentioned Sect. *Viscidipubes* Y. R. Ling and secondary primitive species, such as *A. minor* Jacq. ex Bess., *A. younghusbandii* Drumm. ex Pamp., *A. stracheyi* Hemsl. & Pears ex Deasy, *A. hedinii* Ostenf. & Pauls., *A. smithii* Matf., *A. speciosa* (Pamp.) Ling & Y. R. Ling etc. were occurred there, and many species have gradually migrated into the neighbouring areas. (fig. 5.).

3. On the Application of the Genera in China

Both *Artemisia* and *Seriphidium* are important and useful in the economical application. Most *Artemisia* species contain the essential oils, alkaloids, vitamins, fats etc., in which the medicinal elements — lectones, polyacetylenes, flavonoides, terpenoides, coumarins had been found. Besides, the elements, artabsin, absinthin, cineole, pinene, camphene, cadinene, yomogi alcohol, eugenol, borneol, artemisia ketone, thujyl alcohol, camphor and oxytocin have also been found in the genus, and α - or β -santonin have been found in *Seriphidium*.

Now, in China more than 61 species and 11 varieties of *Artemisia* and 6 species of *Seriphidium* have been used for the drugs among the people^[35]. According to the property, function and utility of the drugs, 8 groups of the Chinese medicinal *Artemisia* and 1 group of *Seriphidium* can be arranged:

1. *A. argyi* group, including 24 spp., such as *A. argyi* Lévl. & Van., *A. vulgaris* L., *A. indica* Willd., *A. princeps* Pamp., *A. lavandulaefolia* DC., *A. verlotorum* Lamotte, *A. gilvescens* Miq., *A. roxburghiana* Bess., *A. yunnanensis* Jeffery ex Diels, *A. qinlingensis* Ling & Y. R. Ling, *A. moorcroftiana* Wall. ex DC., *A. leucophylla* Turcz. ex Bess., *A. mongolica* (Fisch. ex Bess.) Nakai, *A. verbenacea* (Komar.) Kitag., *A. rubripes* Nakai, *A. igniaria* Maxim., *A. orientali-hengduangensis* Ling & Y. R. Ling, *A. lancea* Van., *A. integrifolia* L.,

***Y. R. Ling 1986, Hengduang-Himalayan Mts. (HH), a special area by view-points of Plant Floristics for *Artemisia* L.

A. selengensis Turcz. ex Bess., *A. keiskeana* Miq., *A. sylvatica* Maxim., *A. atrovirens* Hand.-Mazz. and *A. myriantha* Wall. ex Bess. etc., are neutral or slightly warm in property, and they are the common, but important for antiphlogistic drug, dispelling internal chill and curing gynaecological disorders, treating menorrhagia. In addition, they are also used for the relief of coughs and suppressing asthma, especially for the cough due to bronchitis, loosing sputum. Sometimes, they are used for curing diarrhea, dysentery, enterogastritis, hernia, and even cholera. What leaves of *Artemisia*, especially those of *A. argyi* Lévl. & Van., boiled in water are used for lying-in-woman and infant bathing. Besides, most of them, especially the leaves of *A. argyi* Lévl. & Van. are the famous drugs for moxibustion curing many troubles, e. g. rheumatism, arthritis, headache, stiffneck, diarrhea, stomach-ache etc.

2. *A. anomala* group, includes *A. anomala* Moore and *A. lactiflora* Wall. ex DC. They are with neutral or slightly warm property, usually used for antiphlogistic and detoxifying drugs, relieving fever and as an expectorant for curing coughs or for curing hepatitis, nephritis, cholecystitis or for external applications, curing skin diseases, bleeding wound and even for expelling parasites in the blood — blood fluke. Besides, they can also be used as the auxiliary drug for curing snake bite etc.

3. *A. sieversiana* group includes *A. sieversiana* Ehrh. ex Willd., *A. macrocephala* Jacq. ex Bess., *A. absinthium* L., *A. frigida* Willd. and *A. rupestris* L. etc. They are slightly cool in property, usually used for diminishing inflammation and relieving fever, treating blood disorders and curing arthritis, dysentery and diseases due to sun's or x-ray radiation on the plateau, steppe or desert areas etc.

4. *A. sacrorum* group, those are *A. sacrorum* Ledeb., *A. gmelinii* Web. ex Stechm., *A. vestita* Wall. ex Bess., *A. austriaca* Jacq. ex Bess. and *A. brachyloba* Franch. The species are neutral in property and used for diminishing inflammation, dispelling internal wetness and treating rheumatism. Sometimes, used as the substitutions of *A. capillaris* Thunb. and *A. scoparia* Waldst. & Kit. for curing hepatitis when both latters are not available etc.

5. *A. annua* group includes *A. annua* L., *A. carvifolia* Buch.-Ham. ex Roxb. and *A. hedinii* Ostenf. They are in cool property and well-known as the drugs of antifebrile agents and for the detoxifying, and diuretics, especially *A. annua* L., which contains "Qing Hao Su, $C_{15}H_{22}O_8$ ", is a famous drug for treating the malaria etc. All of 3 species are well for. curing

hepatitis, nephritis, cholecystitis and other urosis. Besides, they are also for curing bronchitis, and used as the auxiliary medicine for curing snake-bite, insect-bite and other skin diseases.

6. *A. capillaris* group includes *A. capillaris* Thunb., *A. scoparia* Waldst. & Kit., *A. edgeworthii* Blakr., *A. demissa* Krasch., *A. pubescens* Ledeb., *A. anethifolia* Web. ex Stechm., *A. anethoides* Mattf. and *A. fauriei* Nakai. All of them are also in cool property and well for detoxifying and diuretic drugs. Their basal leaves, seedlings and young plants contain rich in chlorogenic acid, scoparone and caffeic acid, for curing hepatitis, cholecystitis, nephritis, cystitis and other urinary troubles well. In addition, they are also used for diminishing inflammations and for eliminating internal fever, reducing blood pressure, relieving cough, suppressing asthma or preventing influenza, treating malaria and skin diseases.

7. *A. japonica* group contains *A. japonica* Thunb., *A. manshurica* (Komar.) Komar., *A. eriopoda* Bge., *A. angustissima* Nakai, *A. littoricola* Kitam., *A. parviflora* Buch.-Ham. ex Roxb., *A. dubia* Wall ex Bess., *A. giraldii* Pamp. and *A. conaensis* Ling & Y. R. Ling. The species in property are slightly cool and usually used for treating laryngitis, tonsillitis, parotitis, hepatitis and urosis, eliminating internal wetness, reducing blood pressure, and for curing gynaecological diseases. Besides, they also for external applications to treat snake-bite, skin-diseases and bleeding wound.

8. *A. halodendron* group, e. g. psammophytes, *A. halodendron* Turcz. ex Bess., *A. sphaerocephala* Krasch., *A. ordosica* Krasch., *A. wellbyi* Hemsl. & Pears. ex Deasy and *A. dracunculus* L. All of them are distributing in desert or semidesert-steppe areas, and with property in warm, for the antiphlogistic drug, dispelling chill, curing bronchitis by cool, relieving cool cough, suppressing asthma and eliminating internal wetness.

The medicinal *Seriphidium* in China have only be included 1 group and 6 species, which contain α - or β -santonin and used for manufacturing anthelmintics for treating ascariasis well. The species are *S. cinum* (Berg. ex Poljak.) Poljak., *S. finitum* (Kitag.) Ling & Y. R. Ling, *S. transiliense* (Poljak.) Poljak., *S. amoenum* (Poljak.) Poljak., *S. compactum* (Fisch. ex Bess.) Poljak. and *S. junceum* (Kar. & Kir.) Poljak. etc.

Secondly, for the economic application, more than 37 species of both genera, which grow at the steppe area, such as *Artemisia frigida* Willd., *A. sieversiana* Ehr. ex Willd., *A. sericea* Web. ex Stechm., *A. macrocephala* Jacq. ex Bess., *A. aschurbajewii* C. Winkl., *A. xerophytica* Krasch., *A. obtusiloba* Ledeb., *A. minor* Jacq. ex Bess., *A. anethifolia* Wehm. ex Stechm., *A. anethoides*

Mattf., *A. sacrorum* Ledeb., *A. gmelinii* Web. ex Stechm., *A. vestita* Wall. ex Bess., *A. tanacetifolia* L., *A. annua* L., *A. dalai-lamae* Krasch., *A. palustris* L., *A. austriaca* Jacq., *A. mongolica* (Fisch. ex Bess.) Nakai, *A. dracunculus* L., *A. sphaerocephala* Krasch., *A. oxycephala* Kitag., *A. campestris* L., *A. marschalliana* Spreng., *A. pubescens* Ledeb. and *A. scoparia* Waldst. & Kit., and *Seriphidium nitrosum*, (Web. ex Stechm.) Poljak., *S. schrenkianum* (Ledeb.) Poljak., *S. transiliense* (Poljak.) Poljak., *S. finitum* (Kitag.) Ling & Y. R. Ling, *S. sawanense* Y. R. Ling & C. J. Humphries, *S. fedtschenkianum* (Krasch.) Poljak., *S. issykkulense* (Poljak.) Poljak., *S. gracilescens* (Krasch. & Iljin) Poljak., *S. terrae-albae* (Krasch.) Poljak., *S. lehmanianum* (Berg.) Poljak., *S. minchunense* Y. R. Ling etc. are the good herbages feeding the live-stocks at pastoral area.

The third, about 23 species of genera, psammophytes, shrubs or subshrubs, such as *Artemisia xerophytica* Krasch., *A. sphaerocephala* Krasch., *A. wudanica* Liou & W. Wang, *A. halodendron* Turcz. ex Bess., *A. globosoides* Ling & Y. R. Ling, *A. dracunculus* L., *A. songarica* Schrenk, *A. ordosica* Krasch., *A. oxycephala* Kitag., *A. prattii* (Pamp.) Ling & Y. R. Ling, *A. klementze* Krasch., *A. marschalliana* Spreng., *A. campestris* L., *A. waltonii* J. R. Drumm. ex Pamp. and *A. wellbyi* Hemsl. & Pears. ex Deasy and *Seriphidium sublessingianum* (Kell.) Poljak., *S. amoenum* (Poljak.) Poljak., *S. karatavicum* (Krasch. & Abol. ex Poljak.) Ling & Y. R. Ling, *S. terrae-albae* (Krasch.) Poljak., *S. santolinum* (Schrenk) Poljak., *S. semiaridum* (Krasch. & Lavr.) Ling & Y. R. Ling, *S. heptapotamicum* (Poljak.) Ling & Y. R. Ling and *S. junceum* (Kar. & Kir.) Poljak. etc., which are distributed in desert or semidesert areas, are good auxiliaries of the windbreaks and assist sand-fixation.

Besides, some seedling or fleshy young leaves from *Artemisia*, such as *A. annua* L., *A. carvifolia* Buch.-Ham. ex Roxb., *A. argyi* Lévl. & Van., *A. lavandulaefolia* DC., *A. verlotorum* Lamotte, *A. mongolica* (Fisch. ex Bess.) Nakai, *A. indica* Willd. *A. lactiflora* Wall. ex DC. and *A. selengensis* Turcz. ex Bess., *A. scoparia* Waldst. & Kit. and *A. capillaris* Thunb. etc., are used as the vegetables or made the salt-vegetables or for condiments. Some essential oils, isolated from *Artemisia* or *Seriphidium*, are used in manufacture of toilet goods, or for the manufacture of substances to extend the life of southern fruits.

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