

## PORTULACACEAE (R. Geesink, Leyden)

Annual to perennial, erect or creeping, mostly branched herbs or shrubs, occasionally woody at the base, often with a tuberous or swollen main root, occasionally rooting at the nodes. *Leaves* spirally arranged to opposite, sessile, occasionally with axillary hairs or scales (in Mal. only in *Portulaca*), nervation pinnate or reticulate. *Flowers* bisexual, actinomorphic (occasionally cleistogamous), in axillary and/or terminal thyrsi, dichasia, in terminal capitules or solitary (terminal or axillary). Bracts leaf-like or membranous. *Sepals* 2 (4-8 in extra-Mal. *Lewisia* and *Grahamia*), boat-shaped, deltoid to obovate at base shortly connate and confluent with petals and stamens. *Petals* (3-4)4-6(-8), mostly obovate and unequal, shortly connate. *Stamens* (1-)3- $\infty$ , in 1- $\infty$   $\pm$  distinct whorls; filaments basally shortly connate; anthers 2- or 4-celled, dorsifixed, dehiscent lengthwise. *Ovary* superior or half-inferior, originally 2-20-celled, soon becoming 1-celled; style with 2-20 mostly papillose arms. *Ovules* 4- $\infty$  on a central, dendroid placenta, campylotropous. *Capsule* 3-7-valved or with a caducous operculum, occasionally surrounded by the persistent calyx. *Seeds* 1- $\infty$ , smooth or ornamented, kidney-shaped to  $\pm$  globular, laterally compressed, mostly with a caruncle. Embryo curved, almost filling the ripe seed.

**Distribution.** About 15 genera with possibly 200 *spp.* Cosmopolitan, with some tropical species occurring as adventives in temperate regions. In *Malesia* 4 genera with 11 *spp.*

**Ecology.** The Malesian species are all more or less succulent herbs or semi-shrubs, the aquatic *Montia fontana* excepted. Only two genera are native, *Portulaca* and *Montia*.

All *Portulacas* occur at low altitude, preferably in disturbed vegetation, waste places, or on the coast. Most are indifferent to climate, only *P. macrorrhiza* and *P. pilosa ssp. sundaensis* are restricted to the seasonal climate of the Lesser Sunda Is. The sandy beach is tolerated by *P. oleracea*, *P. lutea*, and *P. pilosa ssp. pilosa (race tuberosa)*.

The occurrence of *Montia fontana* in the high mountain bogs of New Guinea is singularly interesting, as it is the only tropical montane occurrence in the Old World between its range in the temperate northern hemisphere and the southern counterpart in the SE. Australian Alps (at c. 36° SL), SE. Australia (Mt Lofty Ranges), Tasmania, and New Zealand, an almost bipolar type of distribution.

**Flower-biology.** As far as known all *Portulacaceae* are self-pollinating.

Whether cross-pollination occurs, deserves further study. Self-pollination results in genetically constant local populations, representing pure lines in nature.

The production of seeds is profuse; seeds can usually stand a long time of drought.

Man has doubtless been responsible for the dispersal of several *Portulacaceae*. Seed can be transported with cargo; some species are used as food or as ornamentals, and they easily escape as adventives and maintain in warm regions. For these reasons the native range of certain species cannot any longer be ascertained, notably of *Portulaca oleracea*, *P. pilosa*, *P. quadrifida*, *Talinum paniculatum*, and *T. triangulare*.

The structure of the inflorescence in this family is mostly, possibly always, of a cymose nature. Through contraction and reduction several modifications are represented; some derivations are schematically depicted in figures 1 & 2. *Talinum* has in principle a thyrs (fig. 1a, 1b & 2) of which a full explanation is given in the notes under the genus. At first sight *Calandrinia* would seem to possess a true raceme (fig. 1d) but this could also well be a reduced thyrs. *Montia* has also probably a reduced cymose inflorescence (fig. 1c). The inflorescences in *Portulaca* are in *subg. Portulacella* (Australia) the most primitive and are compound dichasia from which the structure in the capituliform inflorescences of the other subgenus can be derived, as I have explained in my precursor (Blumea 17, 1969, 277).

**Phytochemistry.** Red betacyanins (replacing anthocyanins) and yellow betaxanthins form an outstanding chemical character of the family. Such nitrogen-containing pigments (chromoalkaloids) were demonstrated to be present in members of the genera *Anacampseros*, *Calandrinia*, *Claytonia*, *Montia*, *Portulaca*, *Spraguea*, and *Talinum*. Saponins seem to occur frequently in the family; their chemistry, however, is not yet known. The seeds store starch in the perisperm and fatty oil in embryos; at the same time they contain appreciable amounts of protein. The chemical features known at present from this family confirm its intimate relationships with other members of the centrosperous alliance. A summary of phytochemical literature is to be found in HEGNAUER, Chemotax. d. Pfl. 5 (1969) 383-387.

— R. HEGNAUER.

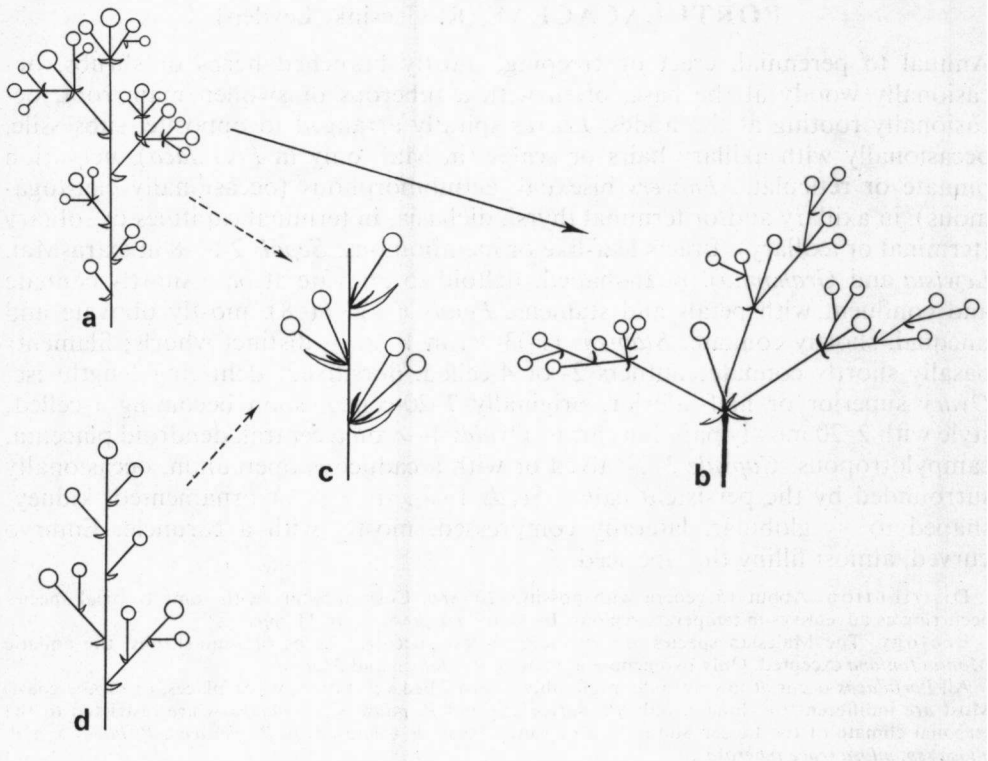


Fig. 1. Scheme of the inflorescences of some *Portulacaceae* and their morphological relations. *a.* Thyrus in *Talinum paniculatum*, *b.* corymboid thyrus, resembling a pleiochasium, in *Talinum triangulare*, *c.* raceme-like inflorescence, cymose or racemose, in *Montia fontana*, *d.* raceme with terminal flower in *Calandrinia grandiflora*.

**Morphology.** VON POELLNITZ (in Fedde, Rep. 37, 1934, 240, and other papers) called the sepals "Involucralblätter", suggesting their homology with the involucre leaves surrounding the capituli, the latter being called by him "falsche Involucralblätter". Also LEGRAND (in Com. Bot. Mus. Hist. Nat. Montevideo 31, 1, 1953, 1, and other papers) called the calyx lobes "pseudosepalos".

Taking into account, that the calyx normally is considered as (metamorphosed) leaves and that in *Portulacaceae* the phyllotaxal position of the sepals is so distinctly set off against the bracts, it seems to me that there is no morphological argument to accept the flower as being monochlamydeous.

**Anatomy.** See also my precursory paper (Blumea 17, 1969, 276-279) on the axillary hairs; METCALFE & CHALK, Anat. Dicot. 1 (1950) 153; KOWAL, Monogr. Bot. 12 (1961); CHORINSKI, Oest. Bot. Z. 80 (1931) 308.

**Uses.** See HEYNE, Nutt. Pl. (1927); OCHSE & BAKH. Ind. Groent. (1931) 615; BURKILL, Dict. Ec. Prod. Mal. Pen. (1935); CAIUS, J. Bomb. Nat. Hist. Soc. 41 (1939) 369. See also under the species.

KEY TO THE GENERA

- 1. Fruit dehiscent circumscissile with an operculum. Ovary half-inferior . . . . . 4. *Portulaca*
- 1. Fruit valved or irregularly dehiscent. Ovary superior.
- 2. Leaves c. 4 mm long, opposite . . . . . 3. *Montia*
- 2. Leaves more than 6 mm long, the middle cauline leaves spirally arranged.
- 3. Seed glabrous. Fruit globular, 3-5 mm ø. Calyx caducous or not. . . . . 2. *Talinum*
- 3. Seed hairy. Fruit obpyriform, c. 10 by 8 mm. Calyx persistent, distinctly accrescent.
- 1. *Calandrinia*

## 1. CALANDRINIA

H.B.K. Nov. Gen. Sp. 6 (1823) 77, *nom. cons.*; POELLN. in Fedde, Rep. 35 (1934) 161-173; D.C. AÑÓN SUÁREZ DE CULLEN, Bol. Soc. Arg. Bot. 5 (1953) 1-29.

Mostly succulents, occasionally with short stems, occasionally unbranched, glabrous, pubescent or glandular. *Leaves* spirally arranged and/or in a basal rosette, occasionally with axillary hairs. *Flowers* arranged in mostly terminal, occasionally axillary thyrse (corymboid or not), glomeruli or dichasia, or solitary. Bracts and bracteoles subulate or leaf-like, partly without an axillary axis. *Calyx* accrescent (caducous in the American *sp. C. punae*). *Sepals* glabrous, pubescent, spiny or glandular, occasionally with dentate, ciliate or glandular margin. *Petals* 5-7, persistent, twisted after anthesis. *Stamens* 3-∞, anthers linear to elliptic. *Ovary* superior; style 1 with 3-5 arms (seldom 3 simple styles). *Fruit* pyriform, globular, obpyriform or elliptic, 3-7-valved. *Seeds* at least occasionally without a caruncle.

Distr. About 150 *spp.*, native in tropical and subtropical America and Australia.

1. *Calandrinia grandiflora* LINDL. Bot. Reg. (1828) t. 1194; G. DON, Gard. Dict. 3 (1834) 80, t. 18; L. H. BAILEY, Man. Cult. Pl. (1949) 336; BACKER & BAKH. f. Fl. Java 1 (1963) 217. — Fig. 1d.

Erect, up to c. 30 cm. *Leaves* spirally arranged, obovate, up to 13 by 5 cm, without axillary hairs; petiole semi-amplexicaulous; apex acute to acuminate. *Flowers* in compound terminal racemes at least occasionally with a terminal flower; each raceme 1-6-flowered. Bracts and bracteoles ovate to elliptic, acute, up to c. 1 by ½ cm, apical ones

smaller. *Sepals* roundish, up to c. 1½ cm ø, acuminate in fruit. *Petals* 5-6, ± orbicular, up to c. 2 cm ø, purplish. *Stamens* c. 75; filaments up to 1 cm; anthers c. 2 by 0.8 mm. *Style* c. 2½ mm, with several short, thick lobes. *Fruit* obpyriform, c. 10 by 8 mm, 3-valved. *Seeds* ∞, c. 1 mm ø; testa cells about hexangular, with hair-like appendages.

Distr. Native of S. America, sometimes escaped from gardens.

## 2. TALINUM

JUSSIEU, Gen. (1789) 312, *nom. cons. prop.*; POELLN. in Fedde, Rep. 35 (1934) 1; DANDY, Taxon 18 (1969) 464. — Fig. 1a, b, 2.

Herbs or semi-shrubs (in Malesia glabrous). *Leaves* spirally arranged (the lowermost sometimes opposite), linear to obovate. *Flowers* in terminal whether or not corymboid thyrse, or cymosely arranged, seldom axillary or solitary. *Sepals* mostly caducous. *Petals* mostly 5. *Stamens* 5-∞. *Ovary* superior; style mostly with 3 arms. *Fruit* globular; mostly 3-valved or irregularly caducous.

Distr. About 50 *spp.*, native in S. and Central America and S. Africa, the two treated species now pantropically naturalized.

Morph. The inflorescences of the *Talinums* studied are explained in comparison with the vegetative ramifications, thus in agreement with C. TROLL, who assumes that there is no essential difference between the vegetative and the inflorescences. Their leaves are spirally arranged, the lowermost sometimes excepted. Specimens of *T. paniculatum* grown at Leyden in winter under low light intensity and short day light produced all opposite leaves and opposite primary inflorescences. The flowers of *T. paniculatum* are arranged in a wide thyrse with a terminal flower (fig. 1a). A change in phyllotaxis, in contrast with the rule of TROLL mentioned, is found in the ultimate dichasial ramifications.

Superficially, *T. triangulare* is trichasial in the first ramification of the inflorescence (fig. 1b, 2b). I have tried to bring this in agreement with the inflorescence of *T. paniculatum* by the following argumentation: the vegetative branches always have 2 basal cataphylls, each with a dormant axillary bud (fig. 2a C, B). The inflorescences lack these cataphylls and buds. The cataphylls easily fall, and mostly the scars are hardly to be found. The cataphylls are also present if the axillary axis is not developed (fig. 2a'). In the cultivated specimens these dormant buds developed after the axillary axis was pinched

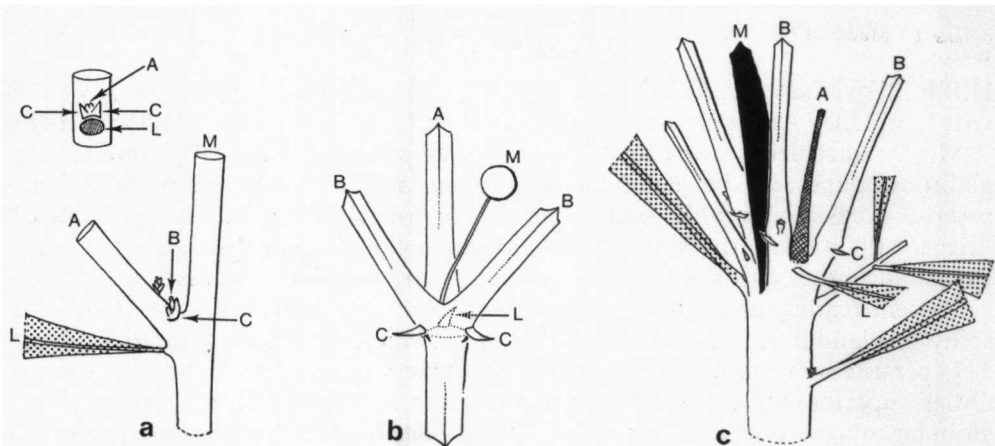


Fig. 2. *Talinum triangulare* (JACQ.) WILLD. Schematic demonstration of the homology of the vegetative ramifications and those of the inflorescence. In all three figures *L* means leaf bearing the lateral axis *A*. The main axis is indicated by *M*. Each lateral axis carries 2 cataphylls at the base indicated by *C*, each cataphyll having an axillary bud indicated by *B*, which remains normally dormant in the vegetative part (fig. a), but develops into an axis in the inflorescence (fig. b), but can by removal of the lateral axis also artificially be produced (as in fig. c). For further explanation see the text.

out (fig. 2c, A), but this only succeeded near the inflorescence. Now the inflorescence may be explained as follows: The main axis (fig. 2a, b, c *M*) forms the central flower. The axillary axis (fig. 2a, c *A*; fig. 2b *A*) of the leaf (fig. 2a, c *L*; fig. 2b *L*, not visible, cf. arrow), is branched cymosely. From the dormant buds (fig. 2a, c *B*) branches are developed, which are also branched cymosely, and are only slightly poorer than the axillary axis (fig. 2b *A*) is supposed to represent the first and single racemous ramification of a thyrus.

#### KEY TO THE SPECIES

1. Flowering axes sharply triangular in cross-section. Branches with 2 lateral, basal buds (scars!). Stamens 20-40. . . . . 1. *T. triangulare*  
 1. Flowering axes terete. Branches without basal buds. Stamens up to 15. . . . . 2. *T. paniculatum*

1. *Talinum triangulare* (JACQ.) WILLD. Sp. Pl. 2 (1799) 862; HEYNE, Nutt. Pl. (1927) 612; POELLN. in Fedde, Rep. 35 (1935) 15; W. H. BROWN, Useful Pl. Philip. (1950) 520; BACKER & BAKH. f. Fl. Java 1 (1963) 217. — *Portulaca triangularis* JACQ. Enum. Pl. Carib. (1760) 22. — *Portulaca racemosa* L. Mant. (1771) 242. — *T. racemosum* (L.) ROHRB. in Mart. Fl. Bras. 14, 2 (1872) 297; DEN BERGER, Trop. Natuur 7 (1918) 28, t. 1-3. — Fig. 1b, 2.

Erect semi-shrub up to c. 1 m. Leaves elliptic to obovate, up to 15 by 5 cm, acute to acuminate; nervation pinnate. Axillary buds with 2 subulate, small cataphylls; the latter always with a dormant axillary bud up to 1½ cm in the side-axes (caducous in dried specimens leaving a scar). Thyrsi terminal, corymbose, up to c. 12 cm ø, the axes sharply triangular with 8-c. 28 flowers. Bracts and bracteoles subulate. Sepals deltoid, c. 4.6 by 3½ mm, acuminate. Petals 5, obovate, up to 10 by 4 mm, emarginate, pink. Stamens 20-40; filaments up to 5 mm; anthers c. 0.7 by ½ mm. Style c. 2.7 mm,

2-3-fid. Fruit up to 5 mm ø, 2-3-valved, yellow. Seeds ∞, c. 1.2 mm ø; testa cells radially elongated, smooth, tubercled at the edge.

Distr. Pantropic weed, still extending its range, native of tropical America. According to Dr. LEUWENBERG it extends enormously along new-made ways in Africa.

Ecol. Waysides, waste places, edges of forests.

Uses. A commonly used vegetable, easily propagated by cuttings, profusely used in war prison camp gardens, in Java imported from Surinam (cf. HEYNE, Nutt. Pl. 1927, 612).

Vern. Surinam *purslane*. Malesia: *krokot blanda*, *poslèn*, S.

2. *Talinum paniculatum* (JACQ.) GAERT. Fruct. 2 (1791) 219, t. 128; HEYNE, Nutt. Pl. (1927) 612; POELLN. in Fedde, Rep. 35 (1935) 10; A. C. SMITH, Bull. Torr. Bot. Club 70 (1943) 537; GREENWOOD, J. Arn. Arb. 30 (1949) 75; BACKER & BAKH. f. Fl. Java 1 (1963) 217. — *Portulaca paniculatum* JACQ. Enum. Pl. Carib. (1760) 22. — *Portulaca*

*patens* L. Mant. (1771) 242. — *T. patens* (L.) WILLD. Sp. Pl. 2 (1799) 863; HASSK. Hort. Bog. (1858) 74; DRAKE DEL CAST. Ill. Fl. Ins. Mar. Pac. (1890) 111; F. M. BAILEY, Queensl. Fl. 1 (1899) 95; BACKER, Ann. Jard. Bot. Botz Suppl. 3 (1910) 416; Schoolfl. (1911) 84; CRAIB, Fl. Siam. Enum. 1 (1925) 110; MERR. & CHUN, Sunyatsenia 1 (1934) 56; F. B. H. BROWN, Bern. P. Bish. Mus. Bull. 130 (1935) 77. — Fig. 1a.

Erect semi-shrub up to c. 70 cm. *Leaves* elliptic to obovate, up to 11 by 5 cm, acute to acuminate; nervation pinnate. Axillary buds with 2 subulate cataphylls. Terminal *thyrsi* up to c. 18 by 15 cm, with up to c. 10 dichasia, each with up to 30 flowers. Bracts and bracteoles subulate. *Sepals* suborbicular, c. 1.1 mm, acute. *Petals* (4-)5(-6), obovate, c. 4 by 2 mm, pink, apex emarginate. *Stamens* (4-)15; filament c. 2.7 mm; anthers c. 0.4 mm. *Style* c. 1.6 mm, 3-fid. *Fruit* c. 3 mm  $\emptyset$ , yellow or pink, 3-valved. *Seeds* c. 1.2 mm  $\emptyset$ ; testa cells radially elongated, shortly tubercled or not, with small pits between the cells.

Distr. Pantropic weed, native of tropical America, still extending its range.

Ecol. Waysides, waste places, edges of forests.

Uses. Cultivated as an ornamental, and with edible leaves. According to HEYNE (Nutt. Pl. 1927, 611) a decoction of the roots is used by Chinese as a surrogate aphrodisiac.

Notes. 1. My cultivated specimens had pink sepals, petals, filaments, and style. According to

field-labels, there are in America also forms with white and yellow petals.

2. I received at the Leyden Hortus seed of obviously two strains (pure lines?) recognizable by the seed-coat; the one has small tubercles on the cells of the testa, the other has no such tubercles. Specimens raised from these two seed types in the glass-house of the Leyden Hortus on vegetable mould showed different characters, as tabulated below:

*Seed with tubercles:*

Leaves up to 7 by 4 cm.

Panicle c. 8 cm wide.

Dichasia with up to 15 flowers.

Fruit reddish.

*Seed without tubercles:*

Leaves up to 11 by 5 cm.

Panicle c. 15 cm wide.

Dichasia with up to 30 flowers.

Fruit yellowish to olivegreen.

From the herbarium it appears that these 2 seed types occur almost throughout the range of the species. The correlating characters are difficult to observe in the herbarium, and besides are liable to be influenced by the ecology of the locality (leaves and panicle). There are no transitions and obviously these two strains keep constant as a sort of pure lines.

### 3. MONTIA

LINNE, Sp. Pl. (1753) 87; SWANSON, Brittonia 18 (1966) 229. — Fig. 1c, 3.

Copiously branched, succulent herbs or waterplants. Basal rosette mostly absent. *Leaves* ovate to linear, occasionally parallel-veined, without axillary hairs.

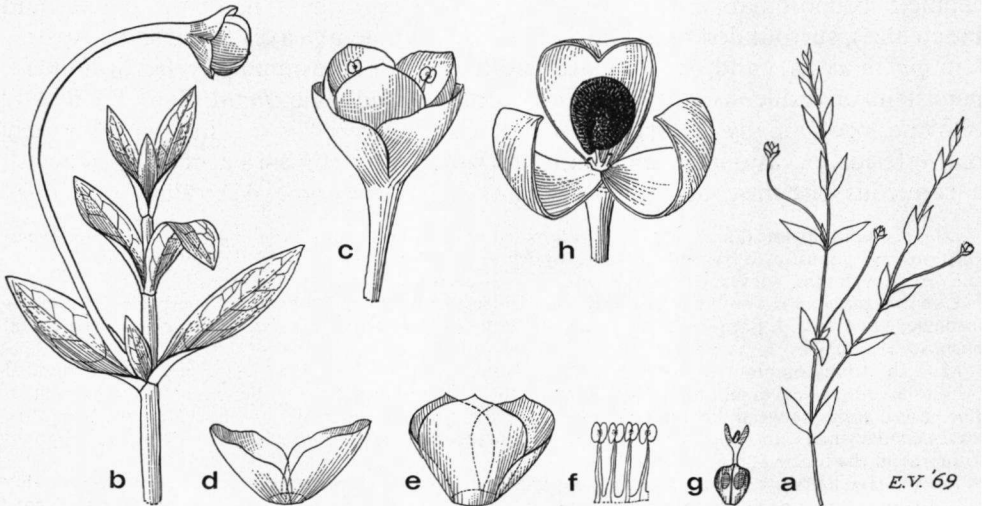


Fig. 3. *Montia fontana* L. a. Flowering branch,  $\times 1\frac{1}{2}$ , b. ditto,  $\times 5$ , c. flower,  $\times 10$ , d. sepals,  $\times 10$ , e. corolla,  $\times 10$ , f. stamens,  $\times 10$ , g. young fruit with style,  $\times 10$ , h. burst fruit with 1 seed,  $\times 20$  (a-h BRASS & MEIJER DRES 9972, L).

*Flowers* in axillary and/or terminal cymes or solitary. *Calyx* persistent. *Petals* 5. *Stamens* 3 or 5; anthers 4-celled. *Ovary* superior; style arms 3. *Fruit* pyriform to globular, 3-valved, after dehiscence occasionally twisted. *Seeds* 1-5.

Distr. About 50 *sp.* Temperate and warm-temperate in Europe, Northern Asia, N. & S. America, Central Africa, and in Tasmania and New Zealand (the present species only!); the sole tropical localities in the Old World are on Mt Kilimanjaro in Central Africa and the high mountains of New Guinea. Generic delimitation, e.g. against *Claytonia*, is not very satisfactory.

1. *Montia fontana* LINNÉ, Sp. Pl. (1753) 87. — *M. lamprosperma* CHAM. Linnaea 6 (1831) 565; MERR. & PERRY, J. Arn. Arb. 23 (1942) 386; GEESINK, Pac. Pl. Areas map 184 (*inedit.*). — Fig. 1c, 3.

Aquatic herb, in patches up to c. 6 cm high. *Leaves* opposite, elliptic, up to 4 by 2 mm, not caducous but decaying. *Flowers* solitary or 2-3 together with a membranaceous bract, inserted in the axil of a leaf. *Sepals* suborbicular, c. 1.2 mm  $\emptyset$ , acute to mucronate. *Petals* 5, obovate to spatulate, 2 larger, up to 1.6 by 1 mm, 3 smaller, up to 1.6 by 0.6 mm, the latter each with an epipetalous stamen. *Filaments* up to c. 1 mm; anthers c. 0.34 by 0.17 mm. Style arms 3, sessile, c. 0.1 mm long. *Fruit* globular, c. 1.2 mm

$\emptyset$ ; the 3 valves twisted after dehiscence. *Seeds* 2-3, c. 1.2 mm  $\emptyset$ ; testa cells radially elongated.

Distr. Northern hemisphere in temperate localities, Americas (Rocky Mts, Andes), Central Africa (Mt Kilimanjaro), SE. Australia (Alps and Mt Lofty Ranges, south of 36° SL), Tasmania, and New Zealand; in *Malesia*: West New Guinea (Mt Wilhelmina) and East New Guinea (between Mt Dickson and Kuputivava). This peculiar distribution in Australasia reminds of that of *Hydrocotyle vulgaris* L. (*cf.* Fl. Mal. I, 4, 1949, 116).

Ecol. Stream banks, 3500-3650 m.

Note. A variable species of which several infraspecific taxa are distinguished, which to some have the status of species.

#### 4. PORTULACA

LINNÉ, Sp. Pl. (1753) 445; PAX & HOFFM. in E. & P. Nat. Pfl. Fam. ed. 2, 16a (1934) 246; POELLN. in Fedde, Rep. 37 (1934) 240; LEGRAND, Com. Bot. Mus. Hist. Nat. Montevideo 31, 1 (1953) 1; *ibid.* 34, 1 (1958) 1; GEESINK, Blumea 17 (1969) 275. — Fig. 4-6.

Mostly succulent, copiously branched herbs. *Leaves* linear to orbicular, in most species with axillary hairs. *Flowers* in (1-)2-30-flowered, terminal capituli; receptacle infundibular, mostly with hairs or scales in the axils of the bracts (and bracteoles), surrounded by a whorl of c. 3-30 involucreal leaves (or in some Australian *spp.* in axillary and/or terminal dichasia). *Sepals* occasionally keeled or hooded, persistent or caducous with the petals, stamens and style. *Petals* 4-6(-8), mostly obovate, occasionally emarginate or mucronate. *Stamens* 4- $\infty$ , in 1 whorl. *Ovary* half-inferior, occasionally apparently inferior; style with 2-18 arms. *Capsule* with a caducous circumscissile operculum. *Seeds*  $\infty$  (in some Australian *spp.* 1-4).

Distr. Mainly tropical and subtropical all over the world, not more than c. 40 *spp.*, possibly several very polymorphous, a few worldwide anthropochorous weeds.

Ecol. Savannahs, shores, in pastures and ruderal places, along waysides, etc.

Uses. *P. oleracea* is a well known vegetable with cultivars, *P. quadrifida* and other species are used as medicine (see CAIUS, J. Bomb. Nat. Hist. Soc. 41, 1939, 369), *P. pilosa sens. lat.* cultivated for ornamental purpose.

Morph. In my opinion (Blumea 17, 1969, 277) the capitulum is a condensed cyme. It is surrounded by 3-18 involucreal leaves, not to be confused with the "Involukrallblätter" in the sense of VON POELLNITZ. The nerved scales between the flowers are considered bracts and bracteoles and have, like the vegetative leaves, axillary hairs. In *P. quadrifida* the small white tubercles at the base of a tuft of hairs are supposed to represent the bracts and bracteoles.

The axillary hairs are mostly homologized with stipulae, but in my opinion (*l.c.*) they are probably not of stipular nature. They are mostly found in 2 tufts in the leaf-axils. In Malesian *spp.* they are confluent at the base. In *P. quadrifida* they are present in a whorl around each node.

Taxon. In my precursor (*l.c.*) I have modified and simplified the infrageneric subdivision of the genus. Of the two subgenera, one is confined to Australia (*subg. Portulacella*).

As to the species concept, the one adopted here is distinctly larger than currently accepted, including that used by VON POELLNITZ and LEGRAND. As I have shown, and experimentally checked in all four genera, selfing in bud seems the rule in the family, which explains that in nature pure lines are formed, and that populations may consist of several pure lines keeping distinct for the small characters in which they differ. For those who want to give a name and rank to any constant difference there is hence ample opportunity for distinguishing varieties, subspecies, and even species, especially in variable complexes such as those of *P. oleracea* and *P. pilosa*. In view of this genetical situation it seems that according to a normal specific concept there are far less good species than distinguished by VON POELLNITZ and LEGRAND who recorded some 130 for the world and c. 62 (+21 varieties) for the Americas only respectively.

## KEY TO THE SPECIES

1. All leaves opposite. Hairs intra- and interpetiolar. 1. SECT. NEOSSIA . . . . . 1. *P. quadrifida*
1. At least the middle-cauline leaves spirally arranged. Hairs if present only axillary. 2. SECT. PORTULACA.
2. The largest leaves obovate to spatulate. Axillary hairs inconspicuous. Sepals distinctly carinate (20× magn.). 1. *Subsect. Portulaca*.
3. Mostly 1-3 involucrel leaves with an axillary axis. Capituli (2-)3-30-flowered. Stamens 7-15. Fruit c. 4 mm long. . . . . 2. *P. oleracea*
3. Involucrel leaves mostly without axillary axes. Capituli (1-)2-3(-6)-flowered. Stamens 18-50. Fruit c. 7 mm long. . . . . 3. *P. lutea*
2. The largest leaves linear to elliptic (obovate to spatulate in *P. macrorrhiza* from Timor). Hairs mostly conspicuous. Sepals not carinate (20× magn.), occasionally with an apical, dorsal, about dome-shaped hood. 2. *Subsect. Stelulato-tuberculatae*.
4. Largest leaves obovate to spatulate, c. 8 mm wide. Timor. . . . . 4. *P. macrorrhiza*
4. Largest leaves linear to elliptic, less than 4 mm wide. Pantropic . . . . . 5. *P. pilosa*

1. Subgenus *Portulaca*

GEESINK, *Blumea* 17 (1969) 288. — *Subg. Euportulaca* SPEGAZZINI, *Ann. Soc. Ci. Argent.* 82 (1917) 17; POELLN. in *Fedde, Rep.* 37 (1934) 242.

Leaves opposite or spirally arranged. Flowers sessile, solitary or in glomeruli.

Note. The single other subgenus *Portulacella* is exclusively Australian, and has peduncled flowers in cymes.

1. Section *Neossia*

LEGRAND, *Com. Bot. Mus. Hist. Nat. Montevideo* 34, 1 (1958) 3; GEESINK, *Blumea* 17 (1969) 289. — *Subsect. Tuberculatae* POELLN. in *Fedde, Rep.* 37 (1934) 243. — *Subg. Enantiophylla* LEGRAND, *Com. Bot. Mus. Hist. Nat. Montevideo* 31, 1 (1953) 5.

Leaves opposite. Hairs or scales intra- and interpetiolar. Bracts and bracteoles reduced to small, white tuberculi at the base of a tuft of hairs or scales (in the capitulum).

Distr. About 7 spp., pantropic, 5 in Africa, 1 in South India and Ceylon.

1. *Portulaca quadrifida* L. *Mant. Pl.* 1 (1767) 73; DC. *Prod.* 3 (1828) 354; DECNE, *Herb. Timor. Descr.* (1835) 120; HASSK. *Pl. Jav. Rar.* (1848) 437; MIQ. *Pl. Jungh.* (1855) 396; *Fl. Ind. Bat.* 1, 1 (1858) 1061; DYER, *Fl. Br. Ind.* 1 (1874) 246; KING, *J. As. Soc. Beng.* 59, ii (1890) 145; BACKER, *Fl. Bat.* 1 (1907) 79; Voort. (1908) 18; Schooff. (1911) 84; MERR. *Fl. Manila* (1912) 200; Int. Rumph. (1917) 217; GIBBS, *Arfak* (1917) 211; MERR. *Sp. Blanc.* (1918) 142; RIDL. *Fl. Mal. Pen.* 1 (1922) 151; MERR. *En. Philip.* 2 (1923) 136; RIDL. *Fl. Mal. Pen.* 5 (1925) 289; HEYNE, *Nutt.*

*Pl.* (1927) 613; BACKER, *Onkr. Suiker.* (1930) 242, *Atlas t.* 255; POELLN. in *Fedde, Rep.* 37 (1934) 275; BACKER & BAKH. *f. Fl. Java* 1 (1963) 216; GEESINK, *Blumea* 17 (1969) 290. — *P. meridiana* L. *f. Suppl.* (1781) 248; BL. *Bijdr.* (1826) 1136; BLANCO, *Fl. Filip. ed.* 3, 2 (1878) 162. — *P. quadrifida* var. *meridiana* DC. *Prod.* 3 (1828) 354; DECNE, *Herb. Timor. Descr.* (1835) 120; BOERL. in *Veth. Midd. Sumatra* 4 (1884) 17. — Fig. 4.

Creeping herb, rooting at the nodes; nodes with a whorl of hairs. Leaves elliptic to cordate,

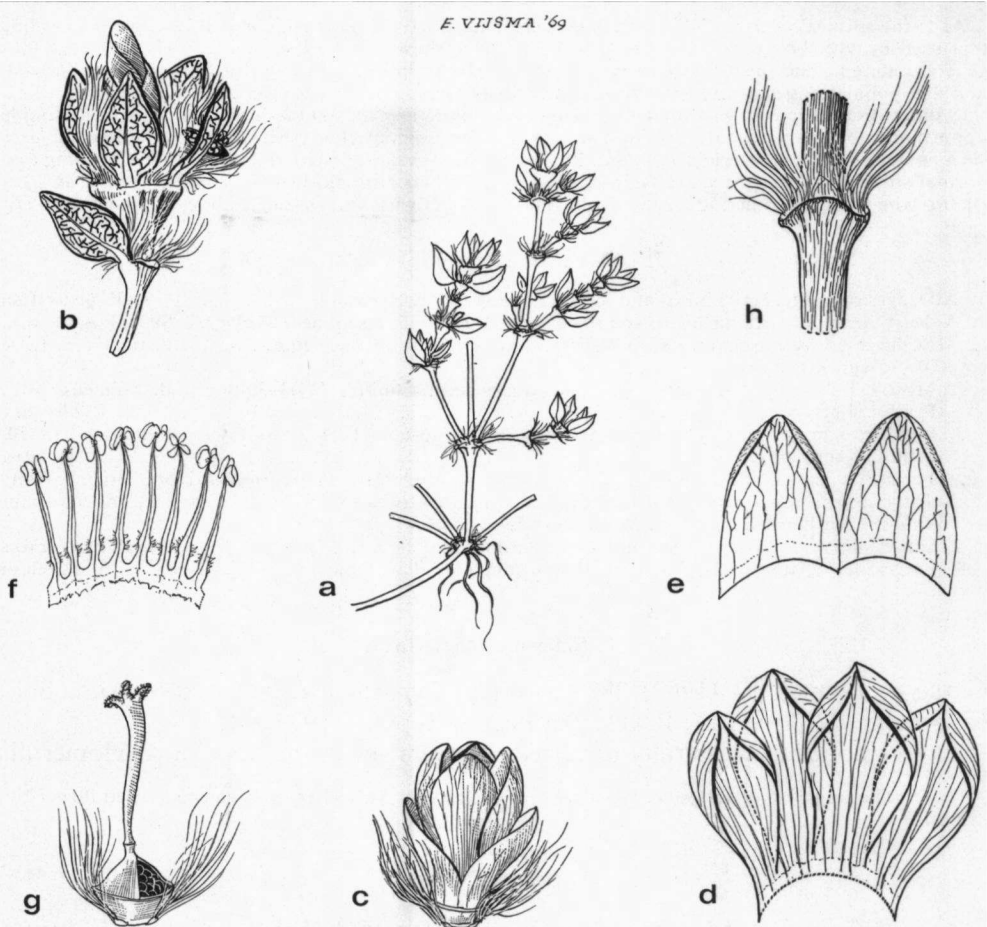


Fig. 4. *Portulaca quadrifida* L. a. Habit of part of a plant,  $\times 1\frac{1}{2}$ , b. flowering end of a branch,  $\times 5$ , c. flower,  $\times 5$ , d. corolla,  $\times 7$ , e. sepals,  $\times 7$ , f. stamens,  $\times 7$ , g. young fruit, operculum partly removed,  $\times 7$ , h. node with a whorl of hairs,  $\times 5$  (a-h WEBER s.n.).

2–20 by 0.8–7 mm with c. 5 mm long axillary hairs. Flowers terminal, 1(–3) on an infundibuliform, profusely hairy stem-apex, at edge with 4, seldom more leaves. Sepals c. 3 mm long. Petals 4, obovate, up to 5 by 4 mm, yellow. Stamens 8 or 12; filaments up to  $3\frac{1}{2}$  mm; anthers c. 0.30 by 0.30 mm. Style up to c. 4 mm with (3–)4(–5) arms. Fruit  $\pm$  obovate, up to c. 2– $3\frac{1}{2}$  by 3 mm; operculum c.  $\frac{2}{3}$  the height, shining, straw-yellow. Seeds  $\infty$ , 0.8–1 mm  $\varnothing$ , dull; testa cells elliptic, radially arranged, the surface either convex or with a pyramidal tubercle.

Distr. Pantropic, except Australia and the Pacific east of Samoa, throughout Malesia.

Ecol. Waysides, deforested land, ruderal places, often between gravel or in sand, not on the sandy beach, below c. 300 m. Fl. fr. Jan.–Dec.

Uses. A native vegetable and used as a medicine. See HEYNE, Nutt. Pl. (1927) 613; CAIUS, J. Bomb. Nat. Hist. Soc. 41 (1939) 369; QUISUMBING, Med. Pl. Philip. (1951) 284; BURKILL, Dict. ed. 2, 2 (1966) 1833.

Vern. Rumpot ségan, Mal. Pen.; gèlang pasir, krémi, J; Philip.: marañgalok, Ilk., Ib., sayikan, Tag.; djalu djalu bubudo, Ternate.

Note. Several authors have determined specimens of *P. pilosa* as *P. quadrifida*, especially in New Caledonia and in the rest of the Pacific.

## 2. Section *Portulaca*

### 1. Subsection *Portulaca*

GEESINK, Blumea 17 (1969) 291. — Sect. *Carinatae* POELLN. in Fedde, Rep. 37



(1934) 242. — *Sect. Portulaphiton* LEGRAND, Com. Bot. Mus. Hist. Nat. Montevideo 31, 1 (1953) 6.

At least the middle-cauline leaves spirally arranged. Hairs, if present, only axillary. Bracts and bracteoles membranous.

2. *Portulaca oleracea* LINNÉ, Sp. Pl. (1753) 445; BL. Bijdr. (1826) 1136; DC. Prod. 3 (1828) 353; MIQ. Pl. Jungh. (1855) 396; Fl. Ind. Bat. 1, 1 (1858) 1061; Sum. (1860) 150; BENTH. & F. v. M. Fl. Austr. 1 (1863) 169; DYER, Fl. Br. Ind. 1 (1874) 247; BLANCO, Fl. Filip. ed. 3, 2 (1878) 162, t. 164; KING, J. As. Soc. Beng. 59, ii (1890) 144; BACKER, Fl. Bat. 1 (1907) 80; Voorl. (1908) 18; Schooff. (1911) 84; MERR. Fl. Manila (1912) 200; Int. Rumph. (1917) 217; Sp. Blanc. (1918) 142; RIDL. Fl. Mal. Pen. 1 (1922) 151; MERR. En. Philip. 2 (1923) 136; BACKER & SLOOT. Theoonkr. (1924) 110, t. 110; HEYNE, Nutt. Pl. (1927) 612; BACKER, Onkr. Suiker. (1930) 243, Atlas t. 254; POELLN. in Fedde, Rep. 37 (1934) 258; BACKER & BAKH. f. Fl. Java 1 (1963) 216; GEESINK, Blumea 17 (1969) 292. — *P. diptera* ZIPP. ex SPAN. Linnaea 15 (1841) 207, *nom. nud.*

Herb, up to c. 40 cm. *Leaves* spirally arranged to subopposite, obovate to spatulate, up to 40 by 20 mm, with inconspicuous, up to c. 1 mm long axillary hairs. Capituli 2–30-flowered. Mostly 1–2(–3) of the 2–8 involucre leaves with an axillary axis. *Flowers* surrounded by up to c. 5 by 6 mm long bracteoles and inconspicuous hairs. *Sepals* up to c. 6 by 6 mm, carina up to c. 3 by 2 mm. *Petals* (4–)5, broadly obovate, up to 7 by 6 mm, yellow. *Stamens* 7–10(–15); filaments up to 4 mm; anthers 0.2–0.5 by 0.2–0.4 mm. *Style* up to c. 5 mm with (4–)5 arms. *Fruit* ovate, c. 4 by 3 mm; operculum  $\frac{1}{2}$ – $\frac{1}{2}$ , as high as the fruit, shining, straw-yellow. *Seeds*  $\infty$ ,  $\frac{1}{2}$ –1.2 mm  $\emptyset$ , granulate; testa cells stellulate, with many fine tubercles.

Distr. Pantropic, throughout *Malesia*.

Ecol. Waysides, deforested and ruderal places, sandy shores, even on exposed rocks, up to 1800 m. *Fl. fr.* Jan.–Dec.

Uses. Eaten as a vegetable and used as a medicine. See HEYNE, Nutt. Pl. (1927) 612; OCHSE & BAKH. Ind. Groent. (1930) 615; BURKILL, Dict. (1935) 1833; CAIUS, J. Bomb. Nat. Hist. Soc. 41 (1939) 369; W. H. BROWN, Useful Pl. Philip. 1 (1950) 520.

Vern. *Purslane*, E, *postelein*, *porselein*, D; *gèlang*, S, M, J, *gèlang pasir*, *sesegan*, M, *krokot*, J, *rè-sèrèjan*, Mad., *silobar pinggan*, M (Sum.),

*segan jantan*, *rumpit béremi*, M (Mal. Pen.); Philip.: *alustman*, *austman*, *galusiman*, Bik., *olasiman*, *sahikan*, *ulistman*, Bik., Tag., *golasiman*, *kolasiman*, *makablang*, Tag., *bakbakad*, *luñgum*, If., *dubdupil*, Bon., *ngalug*, Ilk., *kantatába*, Pangasinan; *djalu djalu kiki*, Ternate.

Notes. Several authors distinguished the subspecies (or varieties) *oleracea* (syn. *sylvatica*) and *sativa*, the latter is the cultivated form. The difference is probably caused by a different chromosome number (according to a letter of G. TISCHLER to O. DEGENER) added to the Hawaiian specimen in the Bishop Museum: "*sativa*" would be a hexaploid with  $2n = 54$ , "*sylvatica*" a diploid with  $2n = 18$ . In the herbarium these two taxa cannot sharply be separated: "*sativa*" is generally tall, with large seeds, "*sylvatica*" is smaller, with smaller seeds, but they are connected by transitional specimens also.

For an anatomical comparison of the seeds of these two forms, see KOWAL, Monogr. Bot. 12 (1961) 1, who also found the characters overlapping.

3. *Portulaca lutea* FORSTER [Pl. Esc. (1786) 72, *nomen*] ex SEEMANN, Fl. Vit. (1865) 9; GEESINK, Blumea 17 (1969) 291.

Herb, up to 70(?) cm. *Leaves* spirally arranged to subopposite, obovate to orbicular, up to c. 30 mm long, not translucent in the dried state, with up to 6 mm long axillary hairs. Capituli 1–6-flowered. *Flowers* surrounded by up to 4 by 2 mm long bracteoles and up to c. 2 mm long hairs. *Sepals* suborbicular up to c. 9 mm long, fleshy in centre, with an up to 4 by 1½ mm long, dorsal, apical keel. *Petals* 5, broadly obovate to obovate, up to c. 10 mm, emarginate to mucronate, yellow. *Stamens* 18–c. 50; filaments up to c. 4 mm; anthers up to c. 0.7 by ½ mm, at least occasionally red. *Style* up to c. 5 mm with (4–)5 arms. *Fruit*  $\pm$  ovate, c. 7 by 5 mm; operculum  $\frac{2}{3}$  as high as the fruit, shining, straw-yellow. *Seeds*  $\infty$ , up to c. 1 mm  $\emptyset$ ; testa cells stellulate, flat, convex, whether or not with tubercles or spines.

Distr. Pacific Islands, from Samoa and New Caledonia to the Marquesas, not yet recorded from *Malesia*.

## 2. Subsection *Stellulato-tuberculatae*

POELLN. in Fedde, Rep. 37 (1934) 242; GEESINK, Blumea 17 (1969) 293. — *Sect. Rotundatae* POELLN. in Fedde, Rep. 37 (1934) 242. — *Sect. Pseudohipsoclasia* LEGRAND, Com. Bot. Mus. Hist. Nat. Montevideo 31, 1 (1953) 7. — *Sect. Catoclasia* LEGRAND, Com. Bot. Mus. Hist. Nat. Montevideo 31, 1 (1953) 8; *ibid.* 34, 1 (1958) 10, *excl. subsect. Squamosae*.

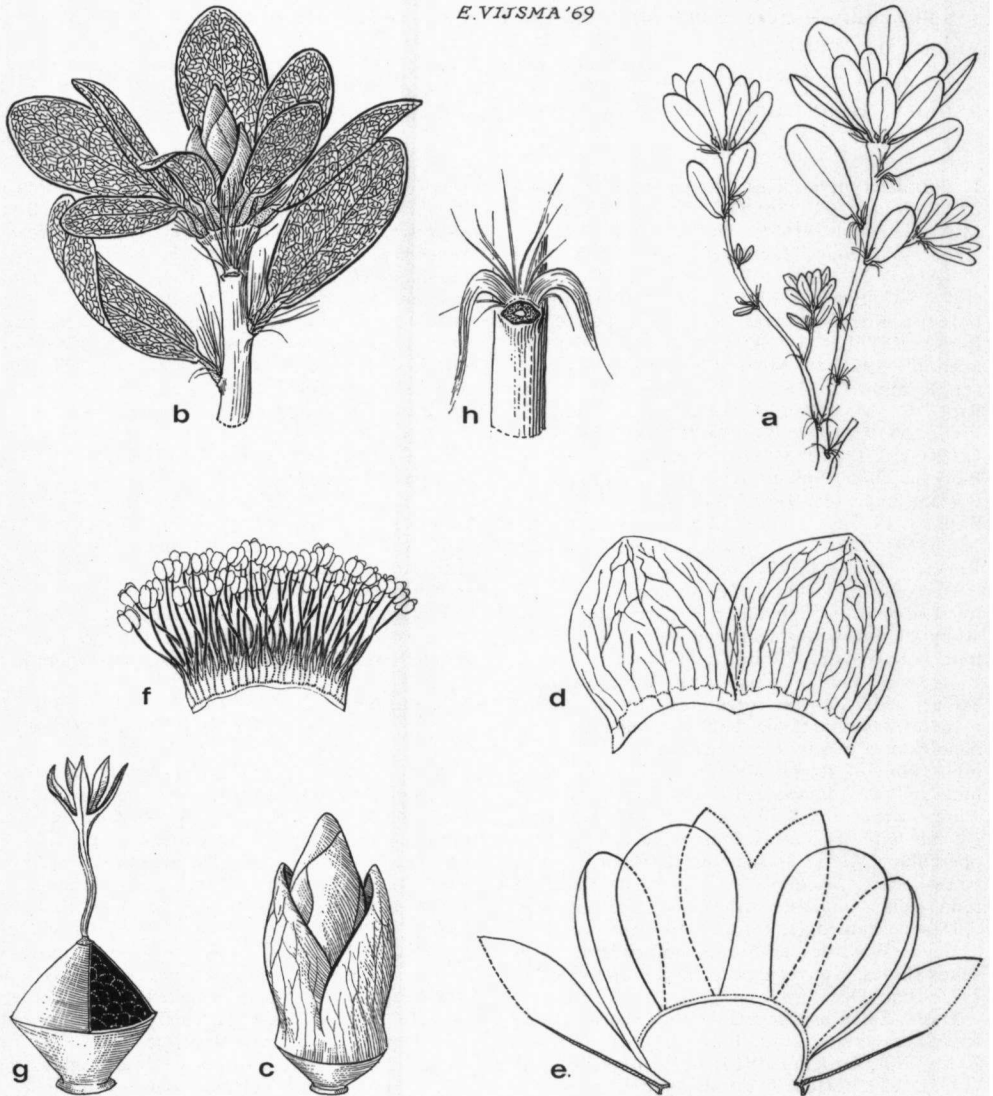


Fig. 5. *Portulaca macrorhiza* GEESINK. a. Branch, nat. size, b. flowering end of a branch,  $\times 2$ , c. flower,  $\times 5$ , d. sepals,  $\times 5$ , e. corolla, the frontal petal halved,  $\times 5$ , f. stamens,  $\times 7$ , g. young fruit, the operculum partly removed,  $\times 7$ , h. node with axillary hairs,  $\times 5$  (a-h ZIPPELIUS s.n., type, HLB 200, 850, L).

4. *Portulaca macrorhiza* [ZIPP. ex SPAN. *Linnaea* 15 (1841) 207; MIQ. *Fl. Ind. Bat.* 1, 1 (1858) 1060; PAX & HOFFM. in *E. & P. Nat. Pfl. Fam.* ed. 2, 16c (1934) 247, *nom. nud.*] GEESINK, *Blumea* 17 (1969) 293. — Fig. 5.

Herb, up to 10 cm. *Leaves* spirally arranged, obovate to spatulate, up to c. 30 by 8 mm, obtuse to truncate; axillary hairs up to c. 4 mm. Capituli 2–3-flowered. *Flowers* surrounded by up to c. 3 mm long hairs and c.  $1\frac{1}{2}$  by 1.7 mm long bracteoles. *Sepals* c. 5.3 mm. *Petals* broadly

obovate, c. 7 (by 5?) mm, yellow. *Stamens* c. 60; filaments up to c. 4 mm; anthers c. 0.6 by 0.4 mm. *Style* c. 4 mm with 5 arms. *Fruit* globose, c. 3 mm  $\phi$ ; operculum about half as high as the fruit, shining, straw-yellow. *Seeds*  $\infty$ , elliptic, c. 0.7 by  $\frac{1}{2}$  mm; testa cells elliptic,  $\pm$  stellulate, shining.

*Distr. Malesia*: Lesser Sunda Islands (W. and E. Timor).

*Ecol.* On limestone karst, c. 350 m, in E. Timor (Baucau), only once noted. *Fl. fr.* Dec. (one record).

Uses. As a medicine against gonorrhoea.  
Vern. *Nati bitii*, Timor.

5. *Portulaca pilosa* LINNÉ, Sp. Pl. (1753) 445; BACKER, Schoolfl. (1911) 84; MERR. Fl. Manila (1912) 235; En. Philip. 2 (1923) 136; RIDL. Fl. Mal. Pen. 5 (1925) 289; HEYNE, Nutt. Pl. (1927) 612; POELLN. in Fedde, Rep. 37 (1934) 261; HENDERSON, Mal. Wild Fl. 4 (1949) 33; BACKER & BAKH. f. Fl. Java 1 (1963) 216; GEESINK, Blumea 17 (1969) 294.

Variable herb. *Leaves* spirally arranged, obovate to linear, 2–30 mm long, with axillary hairs. *Capituli* 1–12-flowered. *Flowers* surrounded by bracteoles and hairs. *Petals* 4–6. *Stamens* (6–)10–75. *Style arms* 4–8. *Fruit* ovate, globular or obovate; operculum  $\frac{1}{2}$  to  $\frac{3}{4}$  as high as the fruit. *Seeds* ∞; testa cells elliptic to stellulate.

#### KEY TO THE SUBSPECIES

1. Ripe seeds bluish, grey, or dull black.
2. Cells of the testa convex to pyramidal, without a nipple. *Petals*  $2\frac{1}{2}$ –12 by 1.8–11 mm.
  1. *ssp. pilosa*
2. Cells of the testa flat, but at seed-edge nipped. *Petals* larger, up to c. 25 mm ∅.
  2. *ssp. grandiflora*
1. Ripe seeds dark brown or shining black.
3. Cells of the testa stellate, in shape orbicular, sometimes nipped. *Flowers* orange to red.
  3. *ssp. sundaensis*

1. *ssp. pilosa*. — GEESINK, Blumea 17 (1969) 295. — *P. tuberosa* ROXB. Fl. Ind. ed. Carey 2 (1832) 464; DYER, Fl. Br. Ind. 1 (1874) 246; BACKER, Voorl. (1908) 19; Schoofl. (1911) 85; POELLN. in Fedde, Rep. 37 (1934) 312; BACKER & BAKH. f. Fl. Java 1 (1963) 216 (*race tuberosa*). — *P. australis*

ENDL. Atakta Bot. (1833) 7, t. 6; ? J. J. SMITH, Teysmannia 10 (1899) 92 (*race australis*). — *P. helianthemoides* ZIPP. ex SPAN. Linnaea 15 (1841) 207, *nomen (race tuberosa)*. — *P. cincta* FENZL, Nat. Tijd. N. I. 14 (1857) 162; MIO. Fl. Ind. Bat. 1, 1 (1858) 1061; BOERL. Handl. 1 (1890) 85; POELLN. in Fedde, Rep. 37 (1934) 312 (*race tuberosa*). — *P. filifolia* F. v. M. Fragm. 1 (1859) 169 (*race filifolia*). — *P. sclerocarpa* [non GRAY, Bot. U.S. Expl. Exp. 1 (1854) 141] KOORD. Minah. (1898) 345; KOORD.-SCHUM. Syst. Verz. 3 (1914) 40, record corrected to *P. pilosa (race pilosa)*. — *P. pachyrrhiza* [non GAGN. Bull. Soc. Bot. Fr. 56 (1909) 41] MERR. En. Philip. 2 (1923) 136 (*race tuberosa*). — *P. samoensis* POELLN. in Fedde, Rep. 33 (1933) 163; *ibid.* 37 (1934) 300 (*race tuberosa*). — *P. javanensis* POELLN. Rev. Sudamer. Bot. 7 (1943) 273, *incl. var. grisea* POELLN. (*race tuberosa*).

Herb, 10–c. 30 cm. *Leaves* elliptic to linear, 4–28 by  $\frac{1}{2}$ –4 mm; axillary hairs 1–18 mm long. *Capituli* (1–)2–10-flowered; more or less congested with adjacent quasi-axillary capituli. *Flowers* surrounded by 0.7–2 $\frac{1}{2}$  by 0.7–2.2 mm long bracteoles and 3–18 mm long hairs. *Sepals* 2–6 by 1–4 mm, occasionally inconspicuously hooded at apex. *Petals* 4–6, obovate,  $2\frac{1}{2}$ –12 by 1.8–11 mm, yellow or pink. *Stamens* (7–)20–30(–35?); filament 1–5 mm; anthers globose to elliptic, 0.35–0.7 mm. *Style* 2–8 mm, 3–7-fid. *Fruit* ± globose, c. 2–3(–4) mm ∅; operculum  $\frac{1}{2}$  to  $\frac{2}{3}$  as high as the fruit, shiny, straw-yellow to olive green. *Seeds* 0.4–0.7 mm ∅, dull light to dark grey, or bluish; testa cells elliptic, elliptic with lobes or stellate; pyramidal all over the seed, or not.

Distr. Pantropical, throughout *Malesia*.

Taxon. A subspecies consisting of several 'races', which are easy to distinguish as shown in the following table.

Race	Range	Petals	Stamens	Length anthers	Seed ∅	Colour seed	Shape testa cells	Surface testa cells
<i>pilosa</i>	pantrop., excl. Austr.	pink	(7–)20–30	0.5	0.4–0.6	blue	stellate	pyramidal
<i>tuberosa</i>	E. Asia, Malesia, W. Pacific	yellow	(17–)25–30	0.7	0.6–0.7	dark grey	elliptic, lobed, stellate at seed edge	convex
<i>filifolia</i>	Australia, Java: in Hort. Bogor	yellow	12–30	0.4	0.6–0.7	bright grey	stellate	pyramidal

*P. australis* ENDL. is entered in the synonymy, but it remains uncertain whether this race was indeed represented by the material J. J. SMITH identified from the island Groot Kombuis (Bay of Djakarta), as no specimen is available. The Australian *race filifolia* is only represented by specimens collected in the Botanic Gardens at Bogor.

Uses. A native vegetable and used as a medi-

cine. See OCHSE & BAKH. Ind. Groent. (1931) 615, and CAIUS, J. Bomb. Nat. Hist. Soc. 41 (1939) 369.

Vern. *Rose-flowered purslane*, E, *pénawar*, M (Mal. Pen.), *rebha ledkah*, Mad.; Philip.: *romrukú*, Ilk.; *njalé njalé wolanda*, Ternate.

2. *ssp. grandiflora* (HOOK.) GEESINK, Blumea 17 (1969) 297. — *P. grandiflora* HOOK. Bot. Mag. n.s. 3 (1829) t. 2885; BACKER, Voorl. (1908) 19;

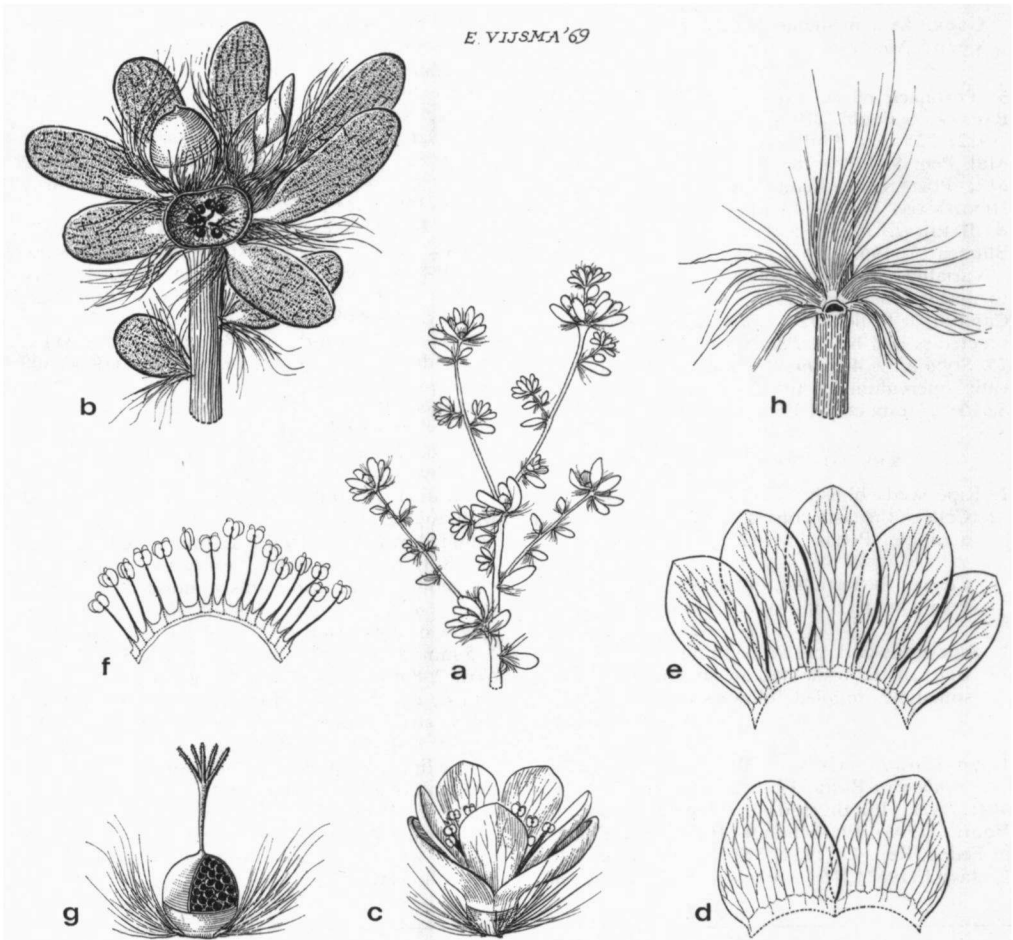


Fig. 6. *Portulaca pilosa* L. ssp. *sundaensis* (POEHLN.) GEESINK. a. Habit,  $\times 1\frac{1}{2}$ , b. flowering end of a branch  $\times 5$ , c. flower,  $\times 5$ , d. sepals,  $\times 7$ , e. corolla,  $\times 7$ , f. stamens,  $\times 7$ , g. young fruit,  $\times 7$ , h. node with axillary hairs,  $\times 5$  (a-h JAAG 799, L).

Schoolf. (1911) 85; BRUGGEMAN, Ind. Tuinb. (1938) 84, t. 55; STEEN. Fl. Sch. Indon. (1949) 176; BACKER & BAKH. f. Fl. Java 1 (1963) 216.

Herb, up to c. 30 cm? *Leaves* linear, up to 25 by 3 mm, with c. 5 mm long axillary hairs. *Flowers* in each capitulum up to c. 5, flowering succedaneously, each surrounded by up to 10 mm long hairs and deltoid, up to 4.7 by 2 mm long bracteoles; transitions between leaves and bracteoles present. *Sepals* c. 8 mm long, with a very small apical keel. *Petals*  $\pm$  obovate, c. 2.5 mm  $\varnothing$ , pink, red, orange or yellow (cultivated in many colours). *Stamens* c. 40-75; filaments up to c. 6 mm; anthers elliptic, c. 1.4 by 0.3 mm, 2- and 4-celled. *Style* up to c. 1.3 mm, with 5-18 arms. *Fruit*  $\pm$  globose, c. 5 mm  $\varnothing$ ; operculum  $\frac{2}{3}$  to  $\frac{1}{2}$  as high as the fruit, shining, straw-yellow. *Seeds* c. 0.7

mm  $\varnothing$ , shining; testa cells  $\pm$  stellate, those at the edge of the seed with a central tubercle.

*Distr.* Native of tropical America, cultivated as an ornamental and occasionally escaped elsewhere.

3. ssp. *sundaensis* (POEHLN.) GEESINK, Blumea 17 (1969) 298. — *P. sundaensis* POEHLN. in Fedde, Rep. 50 (1941) 105. — Fig. 6.

Herb, up to c. 10 cm. *Leaves* oblong to obovate, up to 7 by 3 mm, with up to 6 mm long hairs. Capituli 2-3-flowered. *Flowers* surrounded by up to 0.7 by 1 mm long bracteoles and c. 6 mm long hairs. *Sepals* 5, c. 2.6 by 2.2 mm. *Petals* obovate, subacute, c. 2.3 by 1.7 mm, orange. *Stamens* (6-)10-15; filaments c. 1.5 mm; anthers c. 0.4 by 0.35 mm. *Style* c. 1.6 mm, with 5 arms. *Fruit*  $\pm$  globose, c. 2.5 mm  $\varnothing$ ; operculum  $\frac{3}{4}$  as high as

the fruit, dull, grey-brown. *Seeds* c. 0.55 mm  $\varnothing$ ,  $\pm$  shining; testa cells stellulate.

*Distr. Malesia:* Lesser Sunda Islands (Sumbawa, Flores, Wetar, Alor), from each island one specimen.

*Ecol.* Close to the coasts, along roads, between rocks.

*Vern.* *Tamásiang áta*, Alor.

#### Excluded

*Portulaca axilliflora* (non PERS.) BLANCO, Fl. Filip. ed. 2, 2 (1845) 285 and *P. toston* BLANCO, Fl. Filip. (1837) 408 are both, according to MERRILL, En. Philip. 2 (1923) 136, *Trianthema portulacastrum* L. (*Aizoac.*).

*Portulaca teretifolia* L.; F.-VILL. Nov. App. (1880) 15, an American species, probably an incorrect identification.