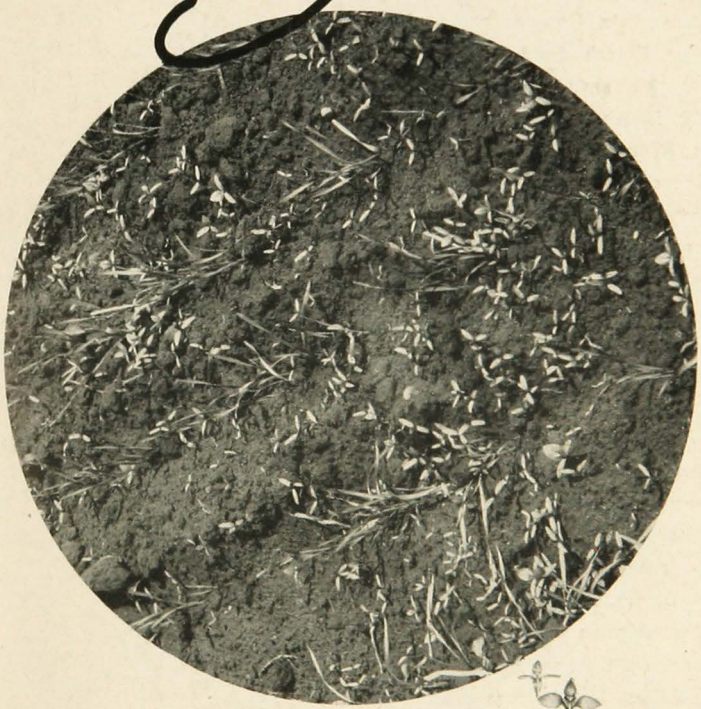
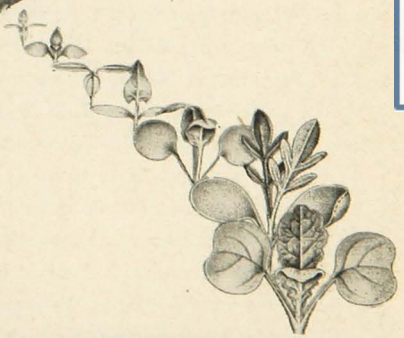
BULLETIN 397 DECEMBER 1947

WEED Seedlings





R. S. DUNHAM
A. H. LARSON
R. G. ROBINSON

Agricultural Experiment Station
UNIVERSITY OF MINNESOTA

List of Weed Seedlings

Submitted for publication June 3, 1947

5M—12-47

Weed Seedlings

R. S. Dunham,[1] A. H. Larson,[2] and R. G. Robinson[3]
Illustrations by Charles M. Arndt

The presence of weeds in croplands is becoming a greater limiting factor each year in the growing of field crops. In many cases they determine the kind of a crop to be planted or not to be planted in a definite field. Not infrequently they determine the cropping system on some farms. It is not always possible to determine the kinds of weeds and the amounts that infest fields until the seeds have germinated and their seedlings are well developed or in the stage where their control is not always practicable.

Among the most troublesome weeds on the farm are the annuals which each year grow from seeds in the spring or early summer, ripen large amounts of seeds before the crops with which they are growing, and then die before freezing time. These weeds are usually characterized by having seeds that are able to remain alive in the soil over several years and finally germinate, thus maintaining the species during unfavorable periods. Almost invariably this germination takes place after favorable weather sets in and continues for a few weeks, generally in time to permit resulting plants to ripen seeds normally. Often these plants need only a short growing season to mature seeds.

Perhaps the first consideration of weeds is their competition with the growth of the crop plant. The weeds use the same material that crop plants require, plant nutrients, moisture, sunlight, etc. Competition for these factors of growth sometimes reduces yields while at other times this competition may not be serious because environmental conditions are adequate for development of good crops in spite of the weeds. Tall weeds, such as marsh elder in small grains, may almost completely eliminate the crop. Weed seeds in threshed grain decrease its value for seed and market. Green weeds in crops delay ripening and drying. Weed stems in flax straw reduce its value for fiber.

Since weeds are most easily controlled in their seedling stages when the root systems are small and the reserve food meager, the identification of annual weeds in their early stages reduces the over-all cost of control. Some work has been done with grass seedlings which is quite satisfactory in the identification of most of the common grasses, both weedy and otherwise. Among these are:

The Identification of Grasses by Their Vegetative Characters, by Lyman Carrier. U.S.D.A. Bulletin 461, 1917.

The Identification of Certain Native and Naturalized Grasses by Their

[1] Professor of Agronomy.
[2] Assistant Professor of Agricultural Botany.
[3] Research Fellow in Agronomy.

The authors are indebted to Dr. W. W. Brookins, agronomist, Central Fibre Corporation, Pisgah Forest, North Carolina, for critical reading of the manuscript and suggestions, and to the Central Fibre Corporation for its support.

Vegetative Characters, by R. F. Copple and A. E. Aldous. Kansas State College of Agriculture and Applied Science Technical Bulletin 32, 1932.

The Identification of Certain Native and Naturalized Hay and Pasture Grasses by Their Vegetative Characters, by F. S. Nowosad, D. E. Newton Swales, and W. G. Dore. MacDonald College Technical Bulletin 16, 1936.

The Identification of Certain Native and Naturalized Grasses by Their Vegetative Characters, by S. E. Clarke, J. A. Campbell, and W. Shevkenek. Dominion of Canada Department of Agriculture Technical Bulletin 50, 1944.

Key to Some Colorado Grasses in Vegetative Condition, by H. D. Harrington and L. W. Durrell. Colorado Agricultural Experiment Station Technical Bulletin 33, 1944.

Grass, by Warren Whitman et al. North Dakota Agricultural Experiment Station Bulletin 300.

In the study of the vegetative characters of dicotyledonous plants the most comprehensive publications are the following:

Kansas Agricultural Experiment Station Bulletin 50, 1895, Kansas Weeds. 1. Seedlings by A. S. Hitchcock and J. B. S. Norton. Seeds and the First Stages in the Development of Plants, by Louis Francois, Annales des Epiphytes et de Phytogenetique, New Series V537-554, 1939.

Minnesota Weeds, Experiment Station Bulletins 129 and 139.

In a review of the above references by the authors, descriptions and illustrations were not found to be adequate for the identification of seedlings in the first true leaf stages. This study of weed seedlings developed from a definite need for such information in the weed investigations carried on at this station. The publication of drawings and descriptions of 28 weed species in cotyledon and first true leaf stages plus the descriptions of nine other species should serve as a useful tool to other investigators who must make seedling identifications in the field and from germination tests on blotters and other media that do not support growth for any considerable period. Even in greenhouse studies, early identification saves both time and space.

This material should also aid those high school instructors who are directing student weed projects in the field. Stand counts by species can be made in the spring while the plants are still young and late seedlings may be identified almost at emergence. Weed growth following postharvest cultivations can also be classified by species.

It is expected that this bulletin will also be used by county agents, weed inspectors, and farmers. Choice of land for flax and other poor competitors with weeds may be made more intelligently if the weed population of a field can be identified early. The decision of whether spraying with a selective herbicide would be advisable may rest on the early identification of weed seedlings. There may be other uses not now contemplated. No grass weeds have been included, since similar work for this group is already available, and since they are not controlled by present selective herbicides. The species included in this study are dicotyledonous annuals and biennials important in Minnesota crops, especially flax.

As the seedling emerges, two seed leaves are pushed or pulled through the soil by a slender stem. This pair of leaves is the cotyledons, and the stem is technically known as the hypocotyl. In some species this hypocotyl is very short and the cotyledons remain close to the soil surface, in others it lengthens to several inches. The cotyledons do not necessarily resemble the true leaves and are described independently of them. The seedling may change in color and other char-

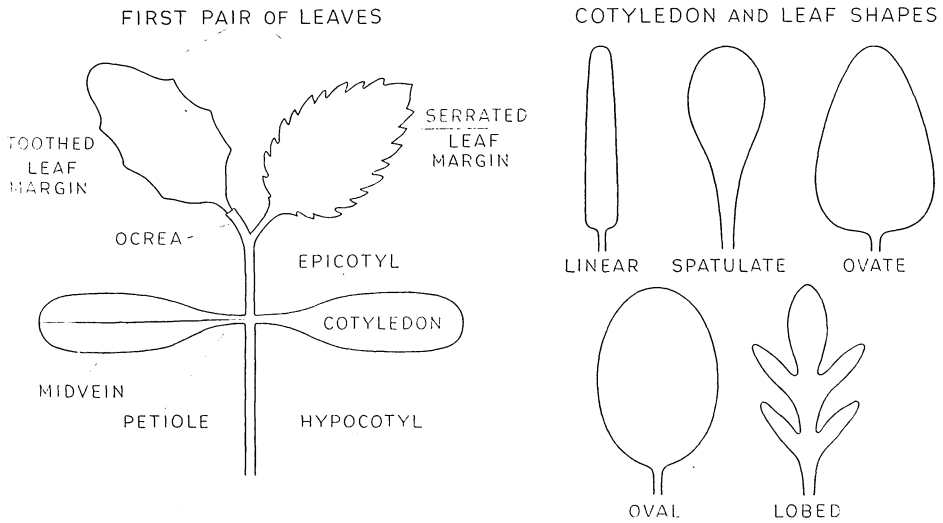
acters as it grows out of the cotyledon stage so that it is essential to check the description with the corresponding stage of growth.

Shortly after the cotyledon stage, the first true leaves appear. These may be in pairs borne opposite each other or they may appear singly and alternately. Sometimes the second leaf appears so closely after the first that they give the impression of being opposite but later leaves prove alternate. In such cases, a rosette of true leaves just above the cotyledons is often formed. The true leaves may be borne on a true stem, the epicotyl, which may be very short or relatively long and prominent. On certain species, particularly in the buckwheat family, a sheath encloses the lower part of the leaf petiole. This is technically known as the ocrea.

In the descriptions, some botanical accuracy has been sacrificed in the interest of simplicity. Technical terms have been used in their most comprehensive sense in order to reduce their number. The schematic drawings on this page illustrate the plant parts, leaf margins, and leaf shapes together with their technical names as used in this publication. The linear spread refers to the distance in millimeters between the tips of the cotyledons when spread out flat and when in the stage of growth illustrated in the drawing. One inch equals 25.4 mm. A trichome is any hairy, bristly, or fuzzy growth on the surface of the plant.

Since the bulletin includes only 37 species, it has not been set up as a key. It is not necessary, however, to hunt blindly for the drawing and description that match a plant to be identified. Gross characters that will serve to classify plants in groups are as follows:

(1) Size. No indication of size is furnished by the illustrations since they have not been drawn to scale, but the species have been arranged according to size, the



Schematic drawing to illustrate descriptive terms

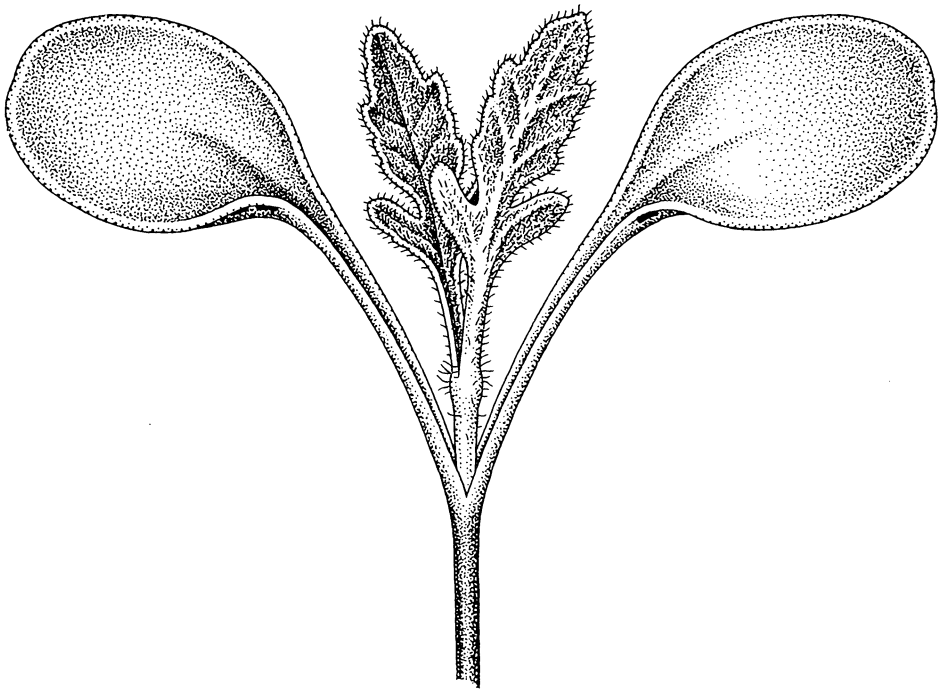
largest appearing first in the bulletin. The linear spread given in the description can be used for more definite size relationships.

(2) Leaf arrangement. Leaves appear either opposite or alternate on the stem, a character easily observed.

(3) Trichomes. The difference between trichomatous and glabrous* cotyledons, leaves, petioles, and stems is readily determined.

(4) Color. The red to purple color occurring on some species serves as a simple identification character.

* Glabrous is the absence of any surface hairs.

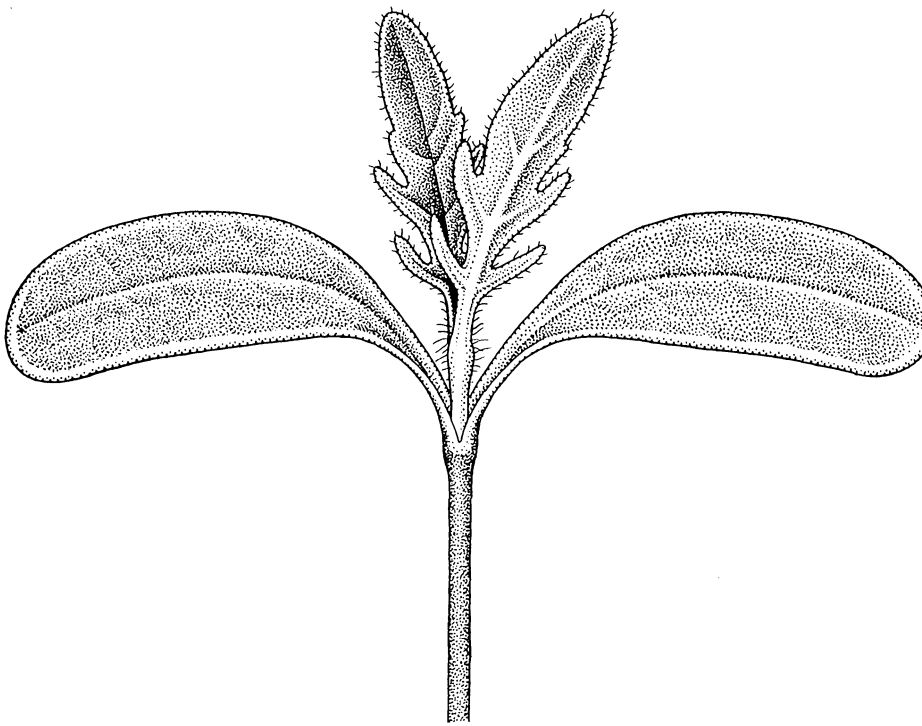


1. *Ambrosia trifida* Kinghead

Cotyledons: Linear spread 50 mm., broadly spatulate to oval with broad petioles, three veined at base on lower surface, midvein on upper, thick and waxy, spotted on margin of lower surface.

Leaves: Opposite, three lobed with terminal lobes toothed; branched midvein, petioles and leaves covered with short trichomes.

Hypocotyl: Purple; epicotyl becomes prominent, purple, and trichomatous.

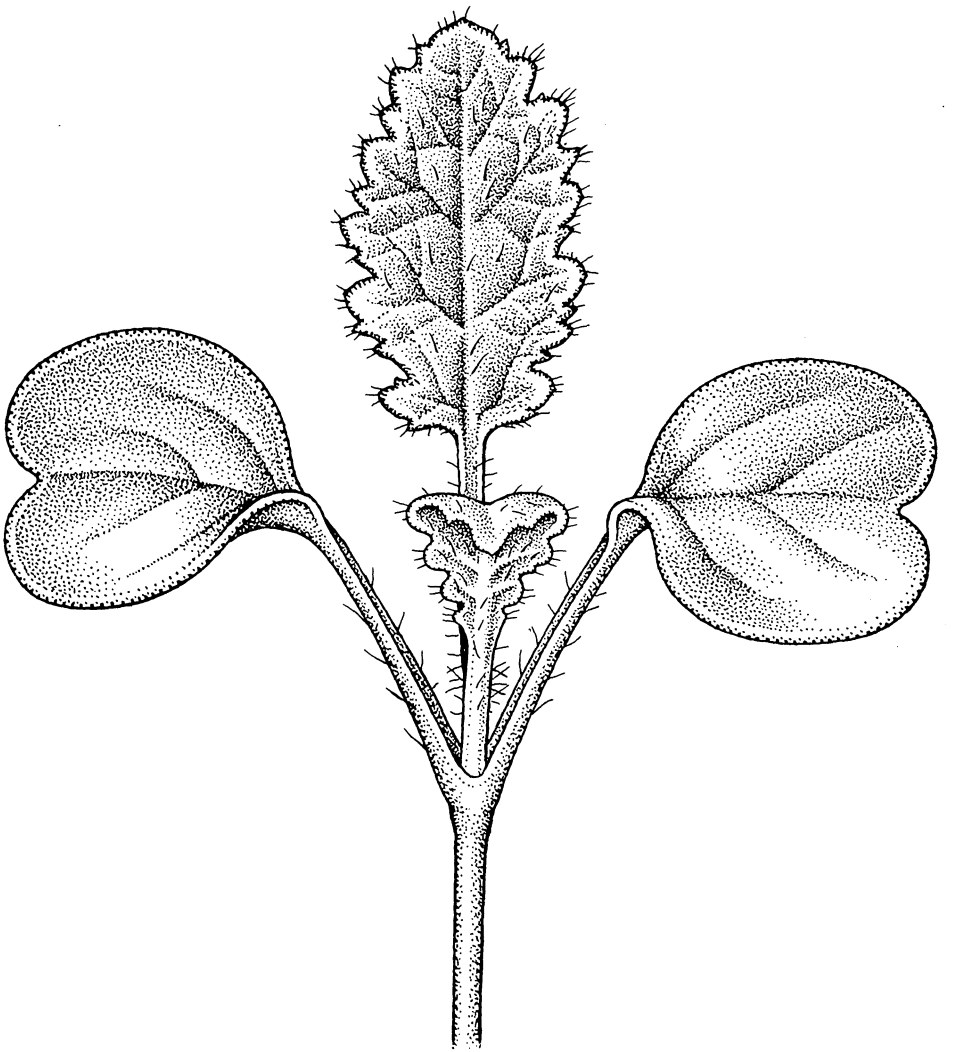


2. *Bidens frondosa* Beggarticks

Cotyledons: Linear spread 38 mm., broadly linear with medium-long petioles, faintly net veined on upper surface.

Leaves: Opposite, three to five lobed with terminal lobes usually toothed, branched midvein, long petioles; leaf margins and petioles trichomatous but leaf surface glabrous.

Hypocotyl and epicotyl red.

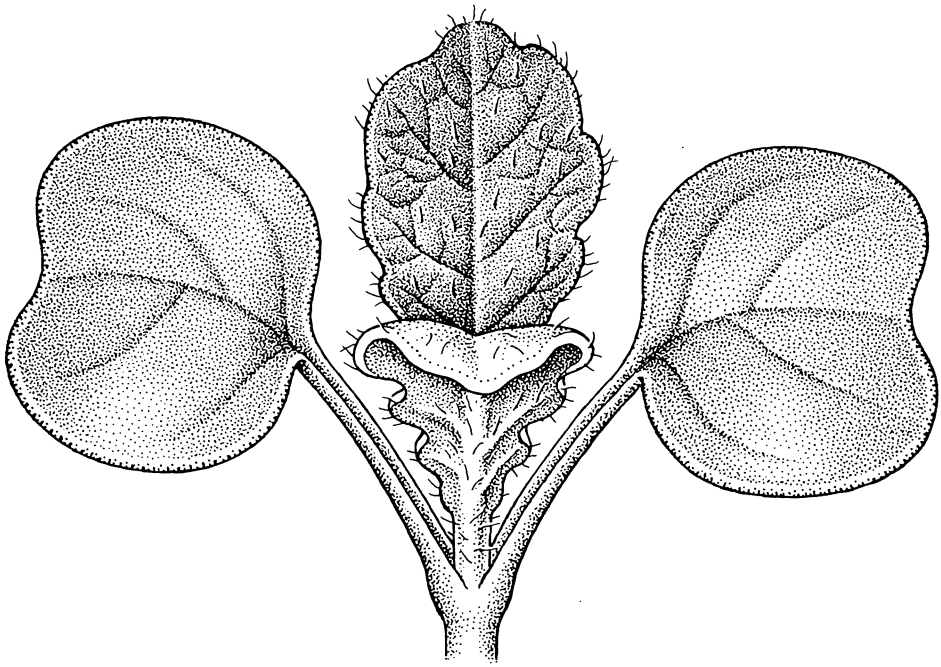


3. *Raphanus raphanistrum* Wild radish

Cotyledons: Linear spread 38 mm., two parted with tips deeply indented, long trichomatous petioles, branched midvein.

Leaves: Alternate, oval with prominently and irregularly serrated margins, prominent and branched midvein; long petioles; leaves and petioles trichomatous.

Hypocotyl and epicotyl sometimes red.

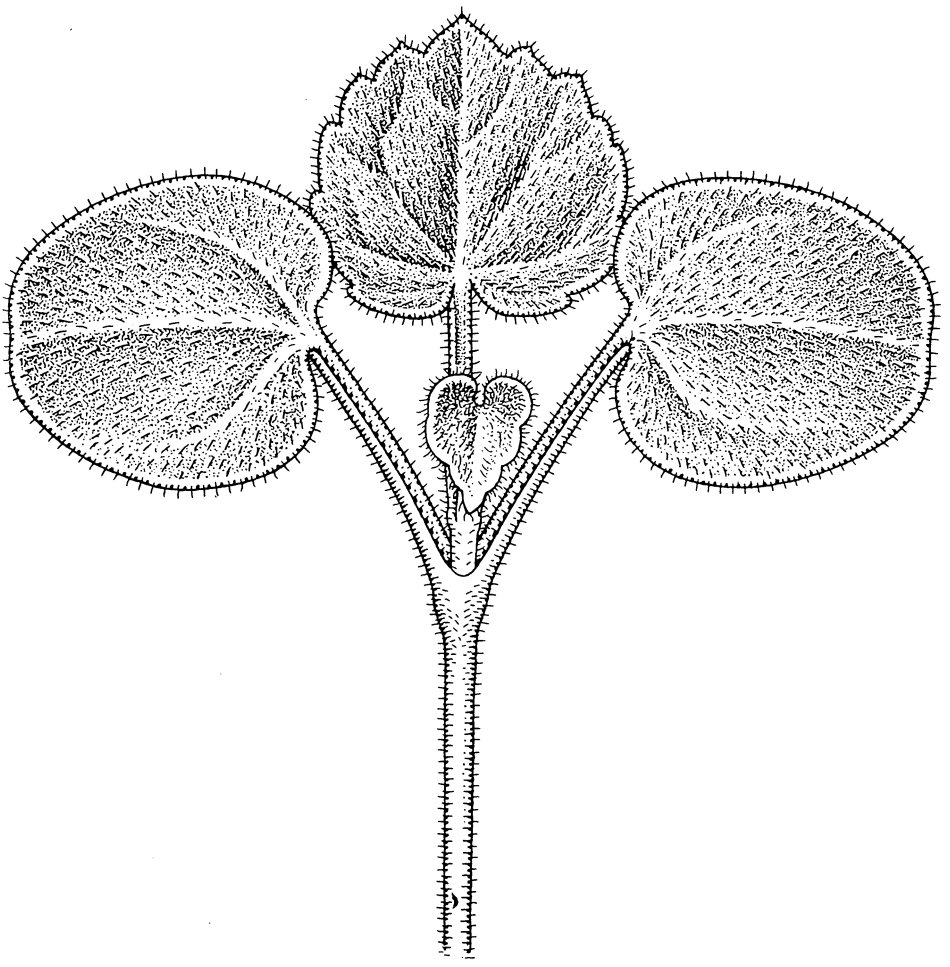


4. *Brassica arvensis* Wild mustard

Cotyledons: Linear spread 26 mm., two parted, wider than long with wide shallow indentation, long glabrous petioles, branched midvein.

Leaves: Alternate, oval to spatulate with blunt serrated margins, prominent and branched midvein; leaves and petioles trichomatous.

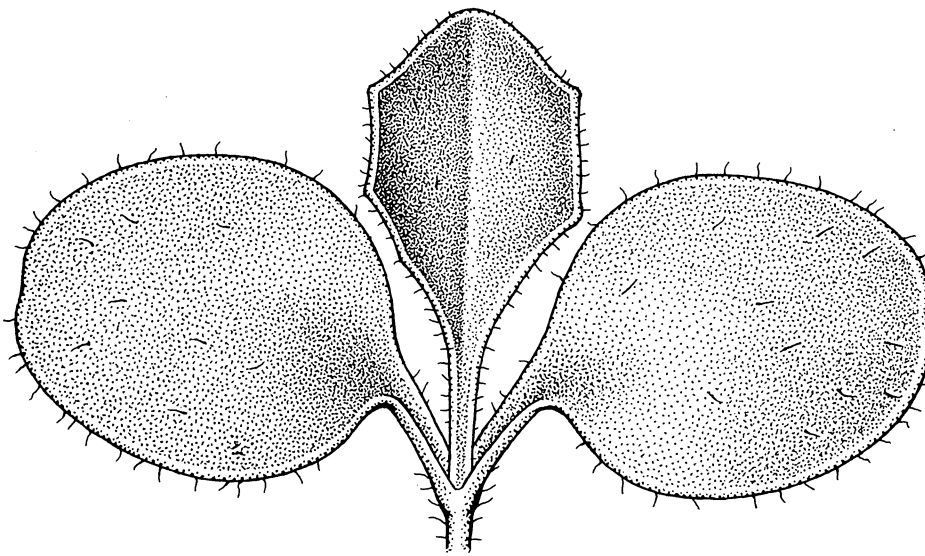
Hypocotyl and epicotyl sometimes red.



5. *Abutilon theophrasti* Velvetweed

Cotyledons: Linear spread 32 mm., short ovate with long petioles, prominent and branched midvein, velvety green; entire plant trichomatous.

Leaves: Alternate, ovate with serrated margins and long petioles, branched midvein, trichomatous.

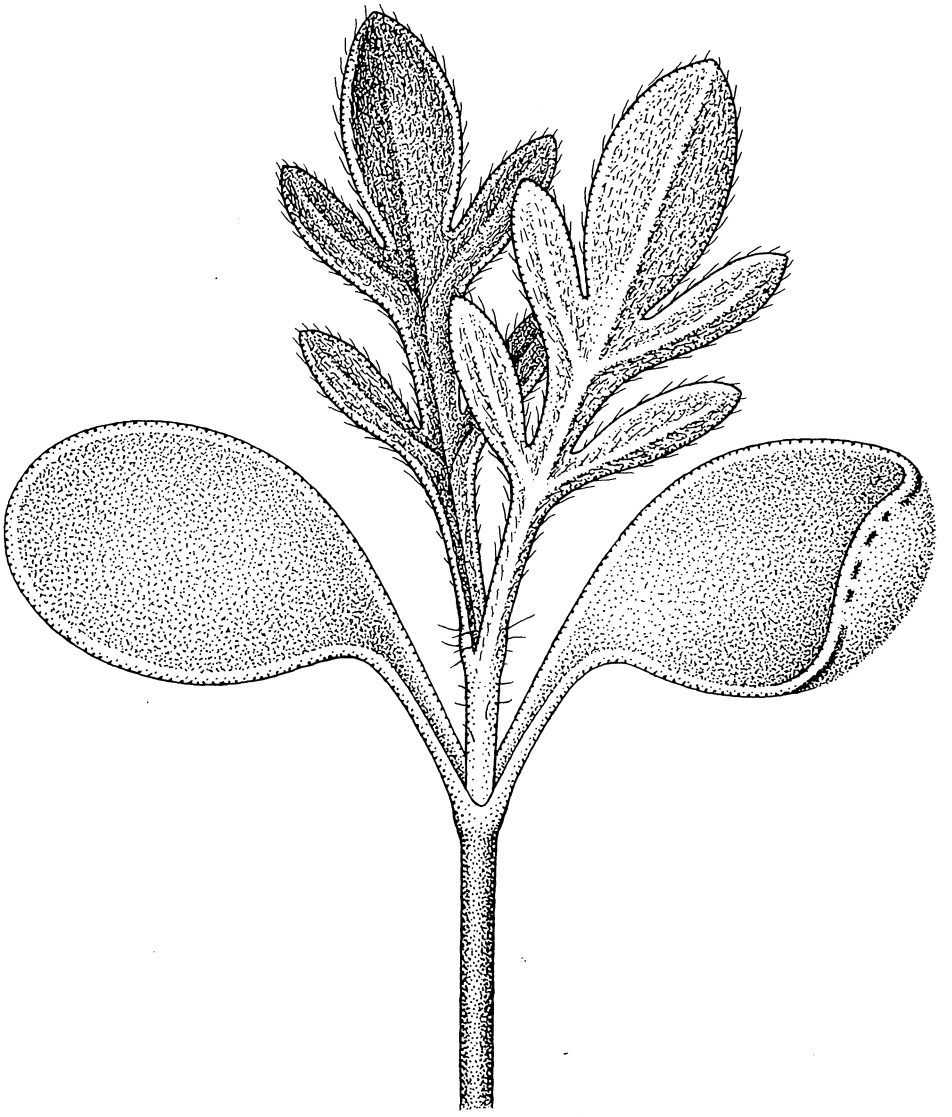


6. *Lactuca scariola* Prickly lettuce

Cotyledons: Linear spread 19 mm., broadly spatulate to oval with broad petioles, midvein on lower surface; entire plant trichomatous.

Leaves: Alternate, spatulate with shallow, toothed margins, long and slender petioles resembling the dandelion, midvein, sparsely trichomatous.

Hypocotyl: Short, sometimes red.

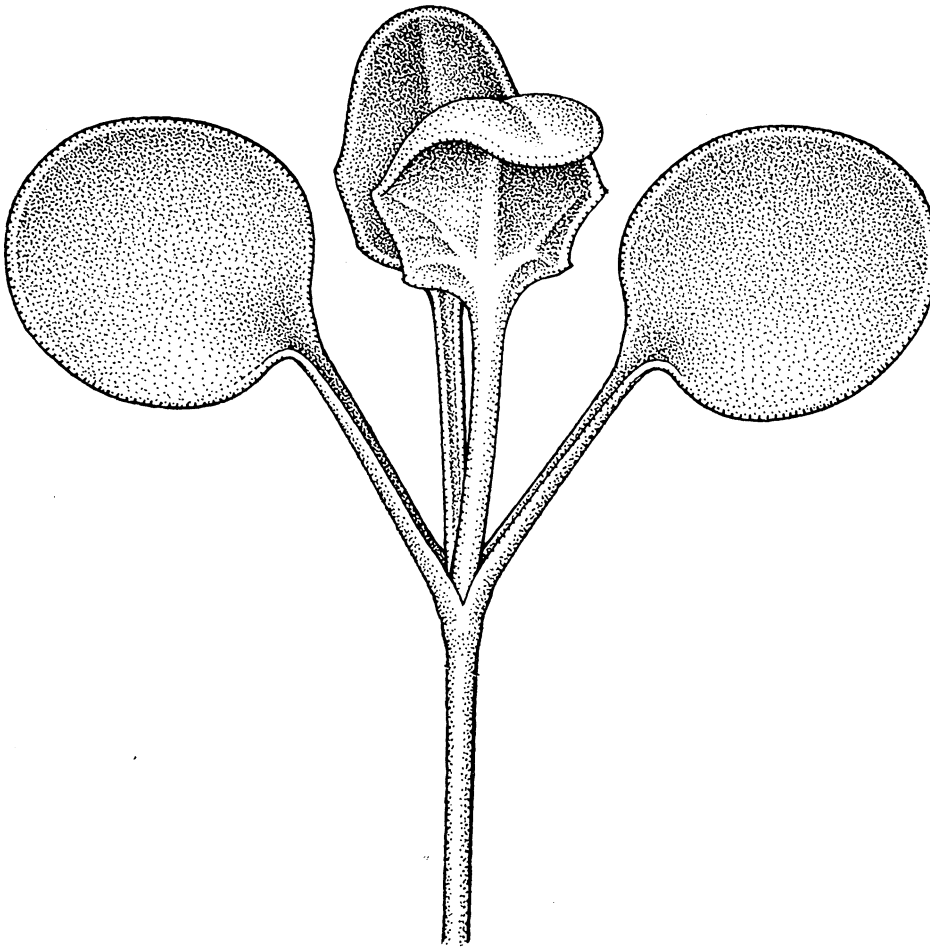


7. *Ambrosia artemisifolia* Common ragweed

Cotyledons: Linear spread 21 mm., broadly spatulate to short oval with broad petioles, veined at base on lower surface and not veined to faintly veined on upper surface, thick and waxy with dark spots on margin of lower surface and sometimes on upper surface.

Leaves: Opposite, five lobed with terminal lobe sometimes toothed, branched midvein, long petioles, leaves and petioles trichomatous.

Hypocotyl: Purple to dark green, epicotyl prominent, colored, and trichomatous.

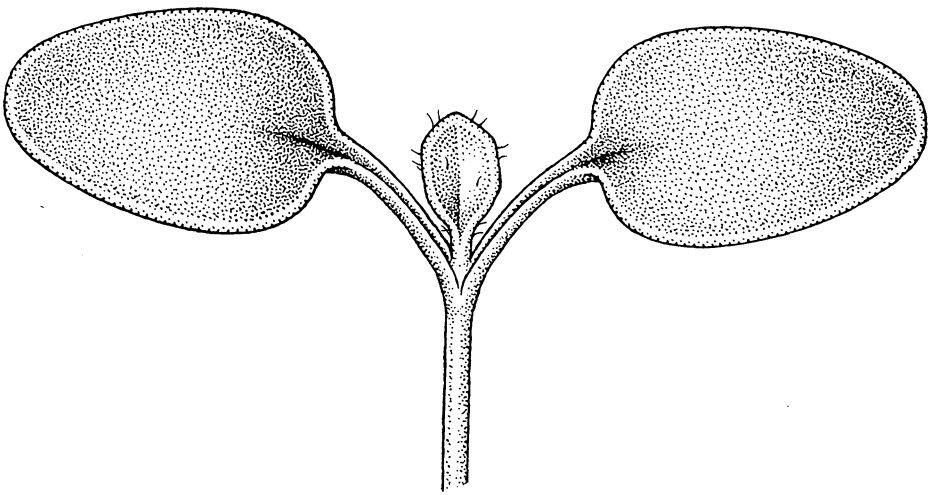


8. *Thlaspi arvense* French weed

Cotyledons: Linear spread 19 mm., short oval with long and slender petioles.

Leaves: First leaves appear opposite, becoming a rosette, short ovate to short oval with very slightly toothed margins and long petioles, lightly branched midvein.

Annual or winter annual: Garlicky odor when crushed.

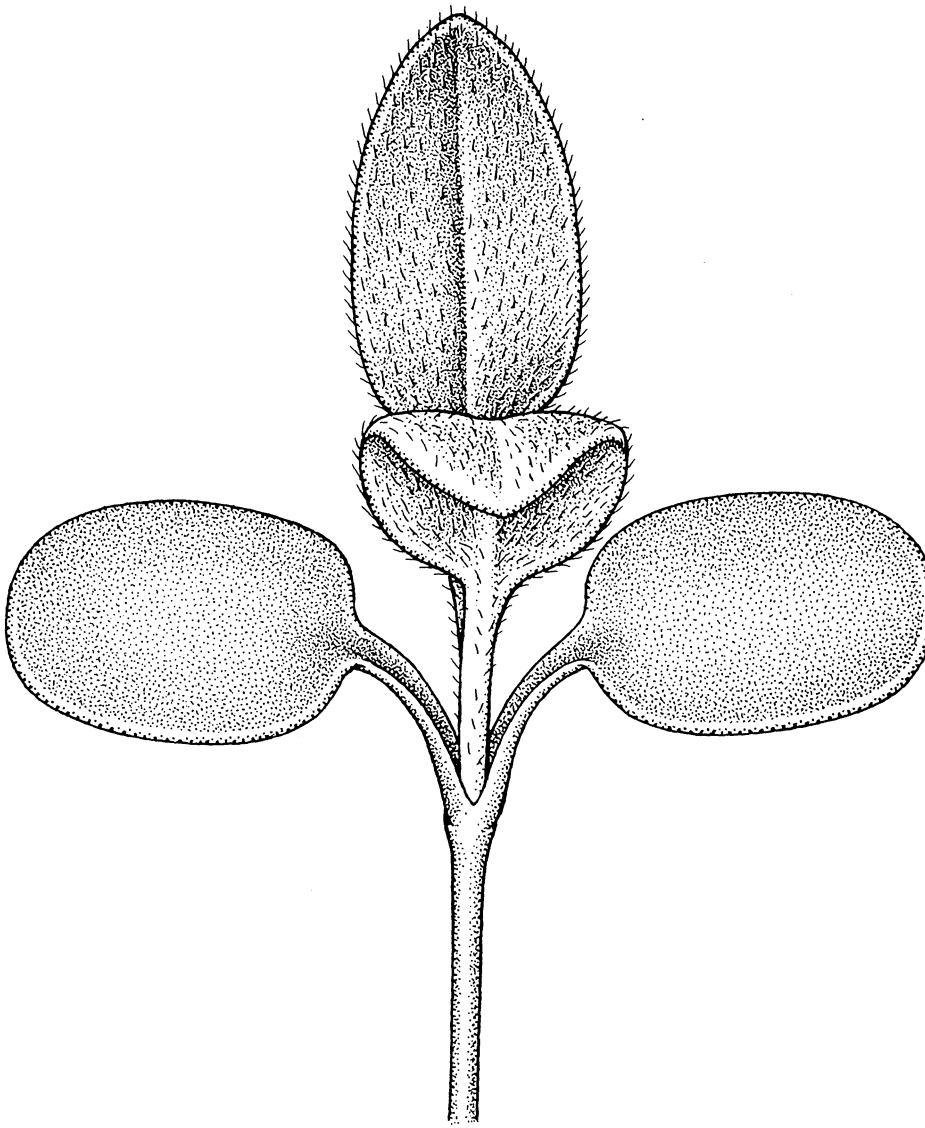


9. *Oenothera biennis* Evening primrose

Cotyledons: Linear spread 20 mm., ovate, midvein indicated by dark brown extension of petiole.

Leaves: Alternate, becoming a rosette, oval to spatulate with sharp tip, very slightly toothed margins and long petioles, lightly branched midvein, sparsely trichomatous, petioles may be red at base.

Hypocotyl: Short and sometimes red; biennial.

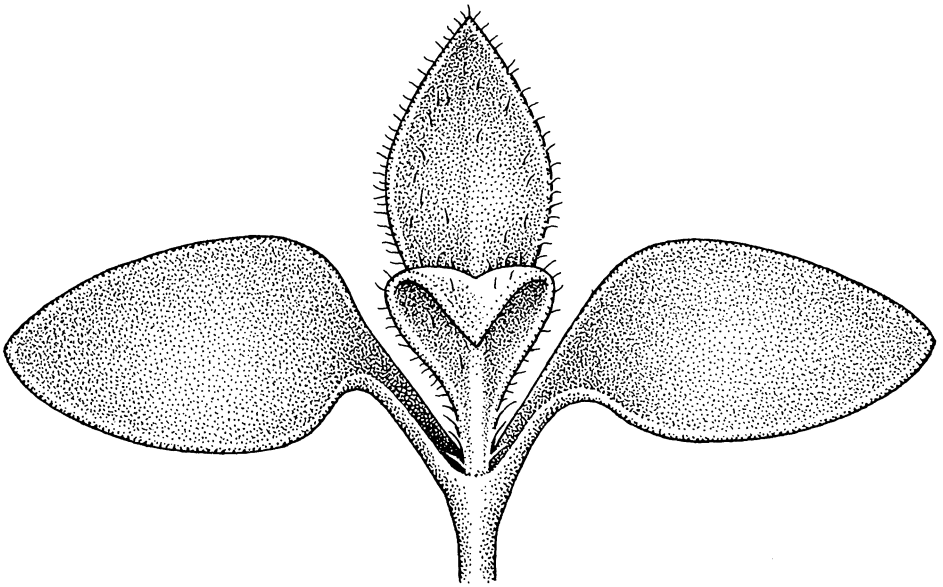


10. *Iva xanthifolia* Marsh elder

Cotyledons: Linear spread 11 mm., short oval with broad petioles and blunt tips.

Leaves: Opposite, narrow ovate to linear and sharp tipped, branched midvein, leaves and petioles thickly covered with long trichomes.

Hypocotyl: May become red; epicotyl prominent, thickly trichomatous, and may become red.

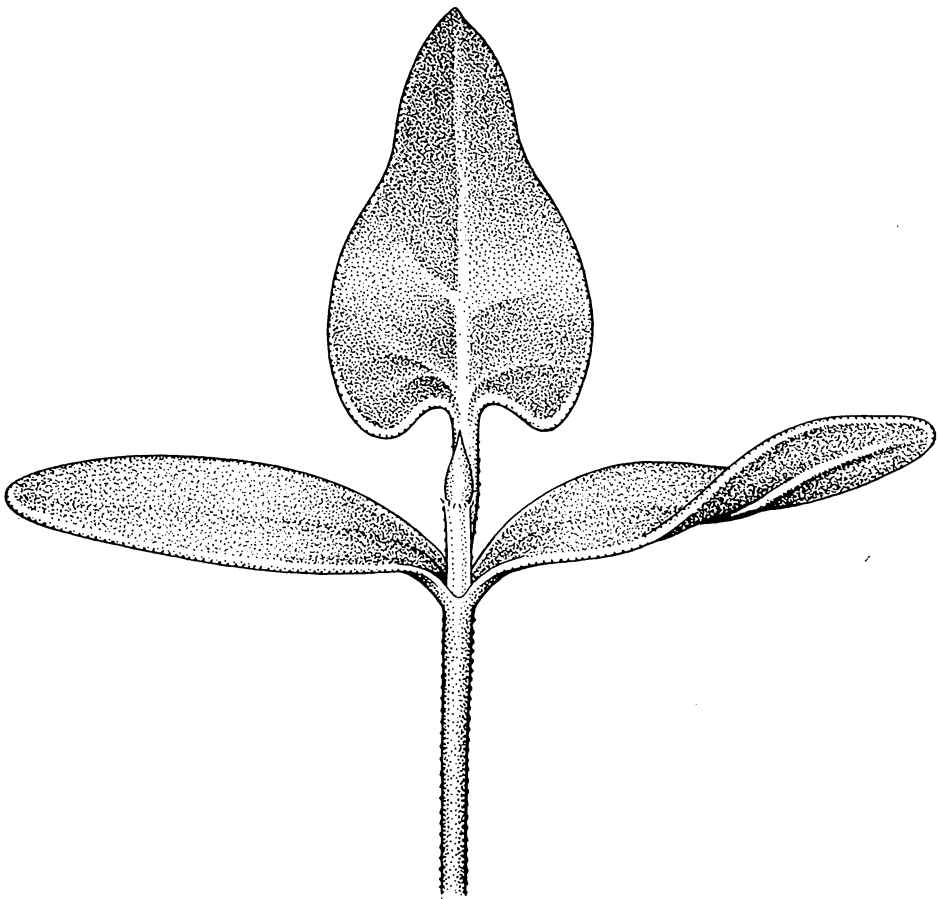


11. *Lychnis alba* White cockle

Cotyledons: Linear spread 22 mm., ovate.

Leaves: Opposite, oval to spatulate with sharp tips, midvein on lower surface and absent or faint on upper, leaves and petioles trichomatous.

Hypocotyl: Short.

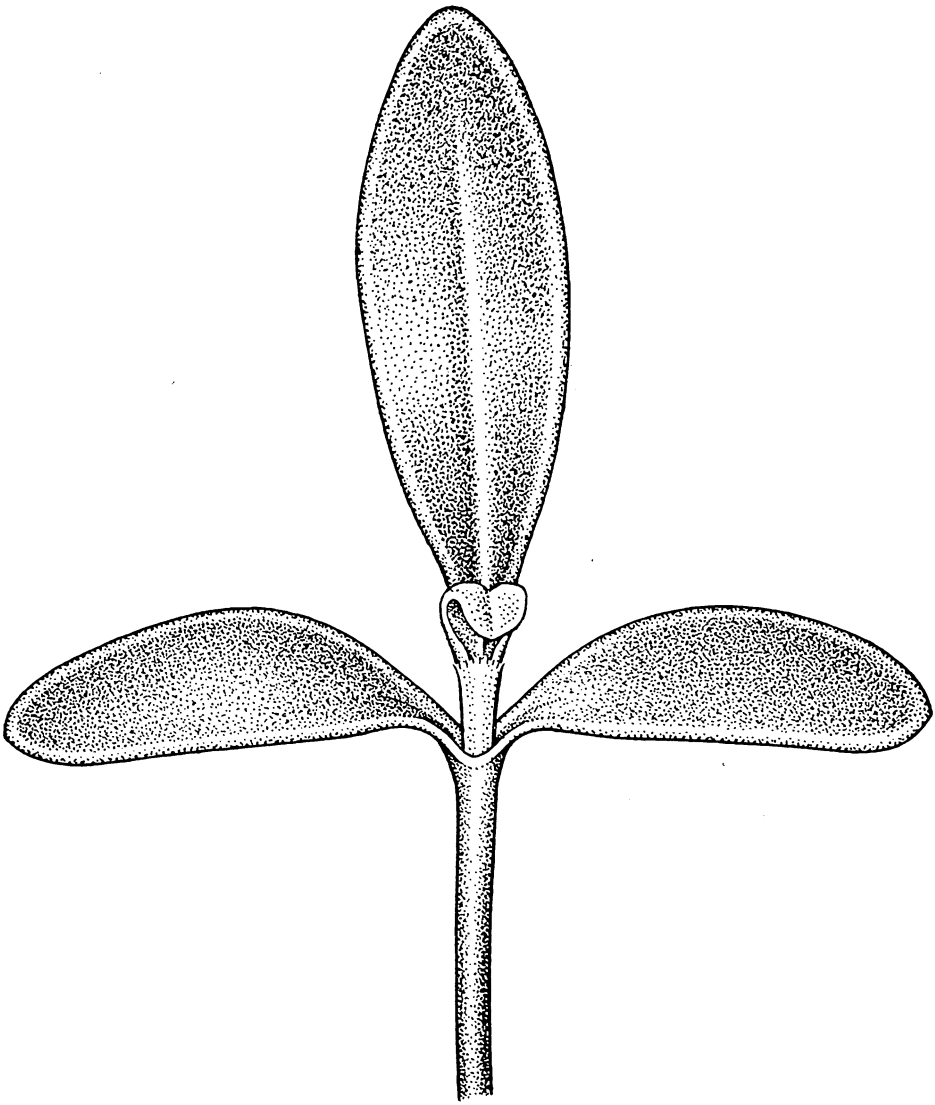


12. *Polygonum convolvulus* Wild buckwheat

Cotyledons: Linear spread 25 mm., linear with short petioles, prominent midvein on lower surface and sometimes on upper.

Leaves: Alternate, pointed ovate with long petioles and an ocrea, prominent and branched midvein; minute trichomes on entire plant except leaf surfaces.

Hypocotyl: Short, minutely trichomatous and red; epicotyl minutely trichomatous and red.

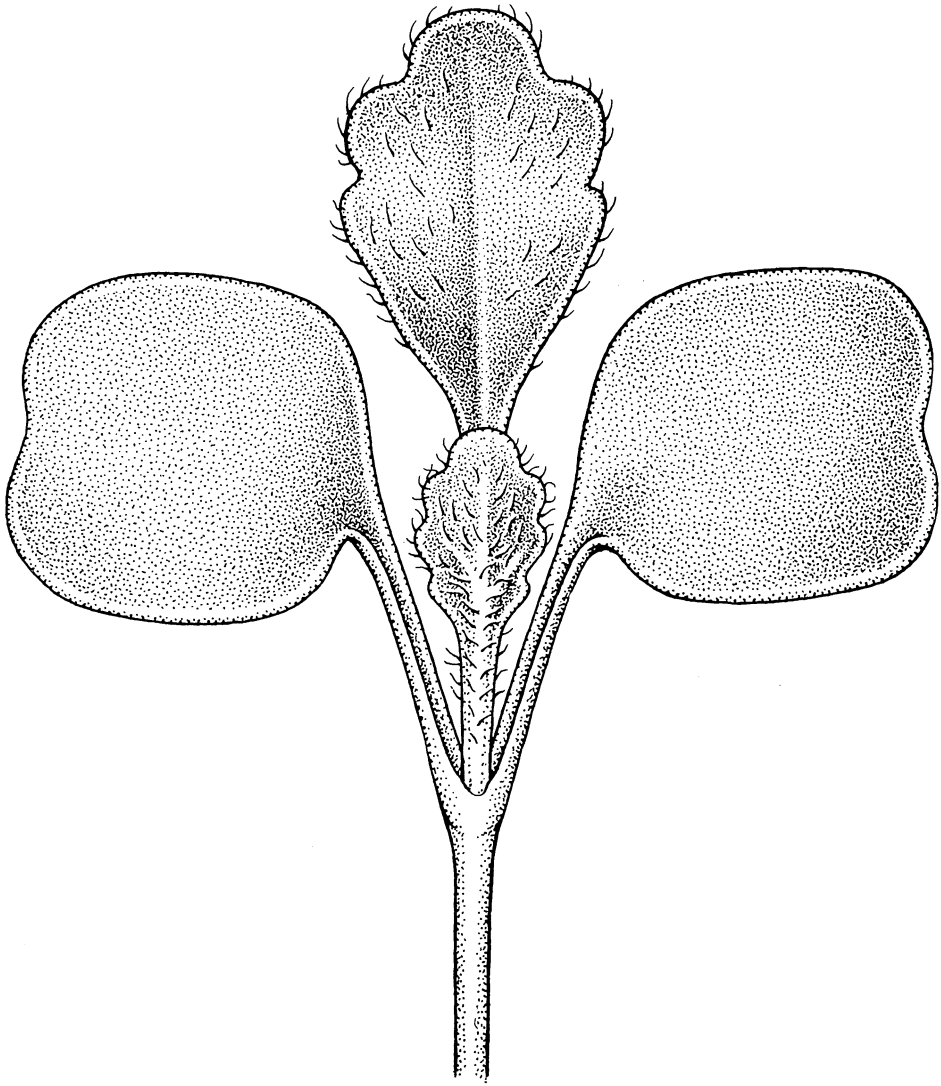


13. *Polygonum pennsylvanicum* Pennsylvania smartweed

Cotyledons: Linear spread 41 mm., linear with one curved margin, red blotch on lower surface, sparsely trichomatous on margins.

Leaves: Alternate, long oval to spatulate with ocrea, midvein, very sparsely trichomatous on margins.

Hypocotyl: Red.

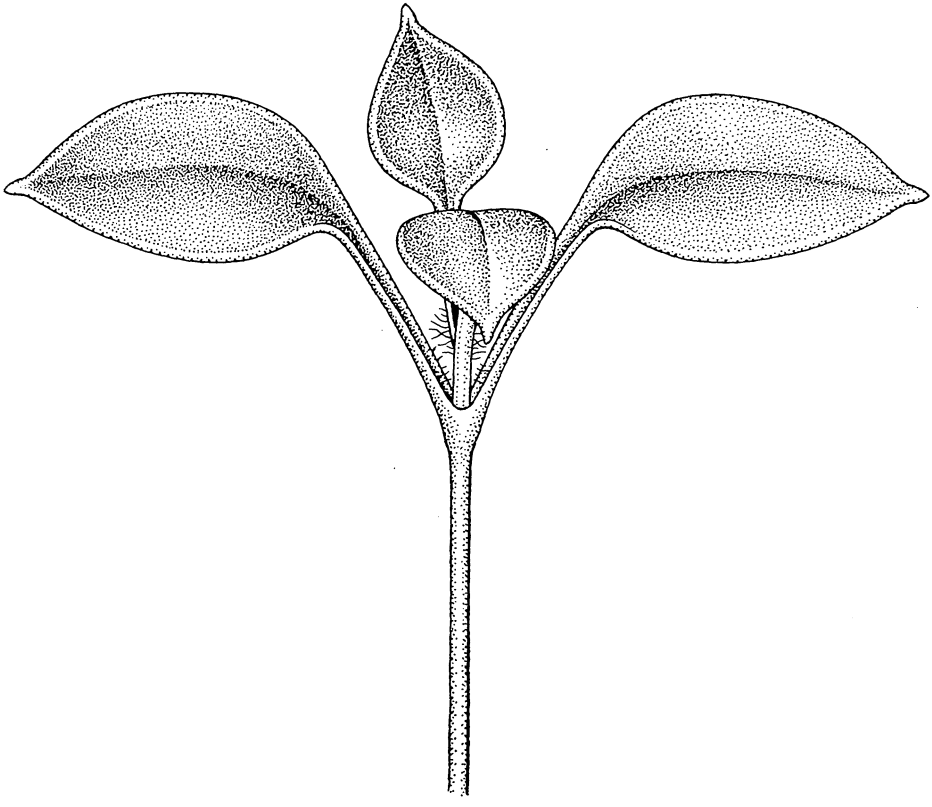


14. *Erucastrum pollichii* Dog mustard

Cotyledons: Linear spread 22 mm., nearly square with indented tips, medium to long petioles.

Leaves: Alternate, spatulate to oval with bluntly serrated margins, branched midvein, leaves and petioles trichomatous.

Hypocotyl: May become weakly red.

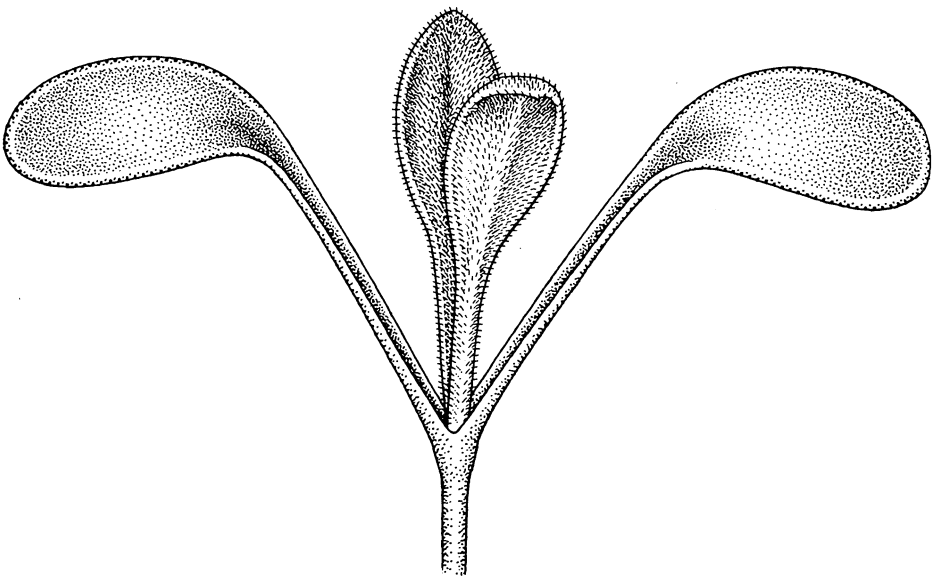


15. *Stellaria media* Common chickweed

Cotyledons: Linear spread 25 mm., ovate and sharp tipped, long and slender petioles, prominent midvein.

Leaves: Opposite, short ovate and sharp tipped with medium long petioles, midvein, petioles trichomatous; a few trichomes appear on cotyledon petioles when first leaves are well formed.

Epicotyl: Prominent and glabrous.

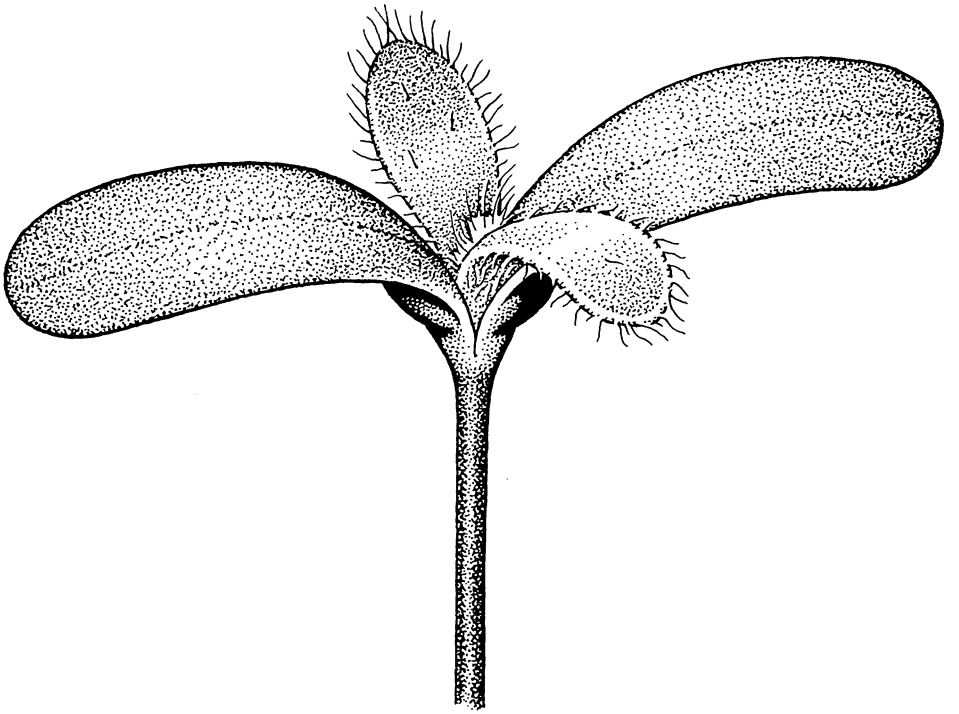


16. *Lepidium apetalum* Common peppergrass

Cotyledons: Linear spread 17 mm., spatulate.

Leaves: First leaves appear opposite, becoming a rosette; spatulate with sharp tip, midvein, covered with very short trichomes.

Hypocotyl: Short.

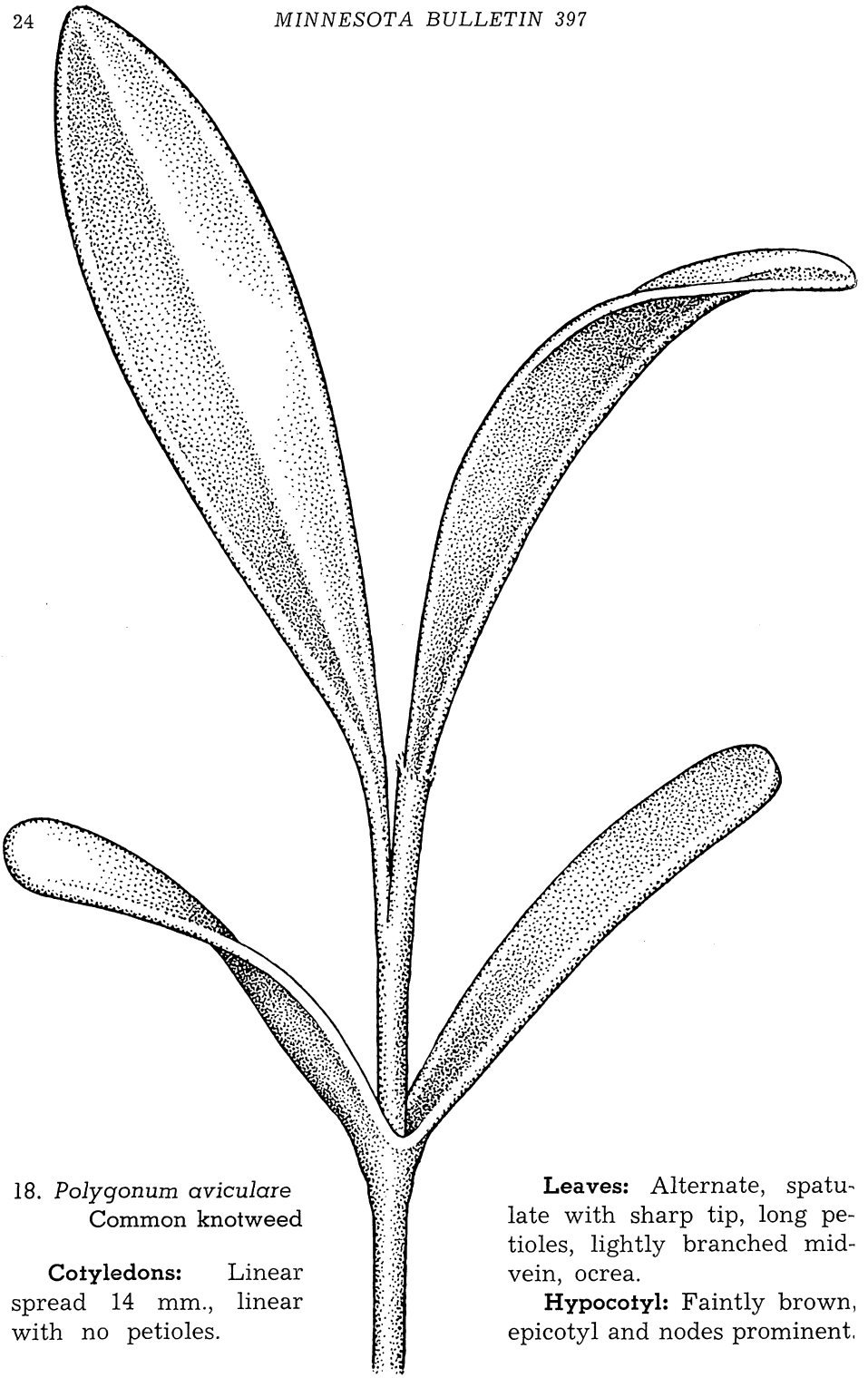


17. *Kochia scoparia* Kochia

Cotyledons: Linear spread 11 mm., linear with no petioles, sometimes faintly veined, gray or frosty green on upper surface and red on lower; circular swelling at growing point between cotyledons.

Leaves: Appear opposite, forming a small rosette of several pairs between cotyledons, linear with no petioles, trichomatous.

Hypocotyl: Weakly red.

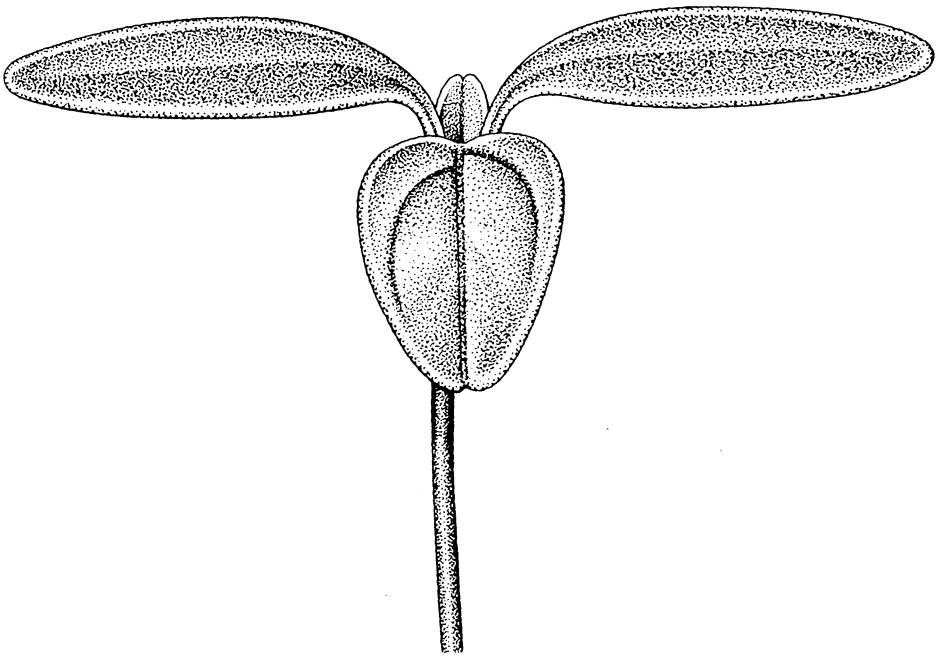


18. *Polygonum aviculare*
Common knotweed

Cotyledons: Linear spread 14 mm., linear with no petioles.

Leaves: Alternate, spatulate with sharp tip, long petioles, lightly branched midvein, ocrea.

Hypocotyl: Faintly brown, epicotyl and nodes prominent.

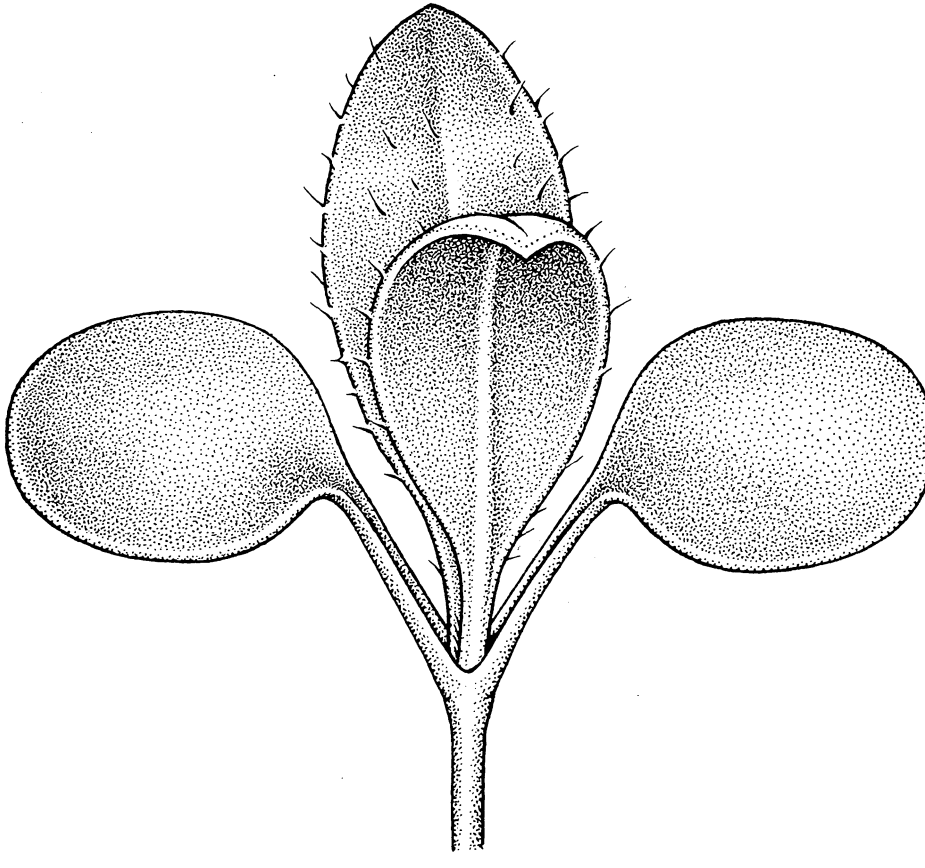


19. *Amaranthus retroflexus* Rough pigweed

Cotyledons: Linear spread 14 mm., linear with short petioles, lower surface and midvein on upper surface red.

Leaves: Alternate, ovate to oval with indented tips and medium-long, sparsely trichomatous petioles, branched midvein.

Hypocotyl and epicotyl weakly red; epicotyl short and sparsely trichomatous.

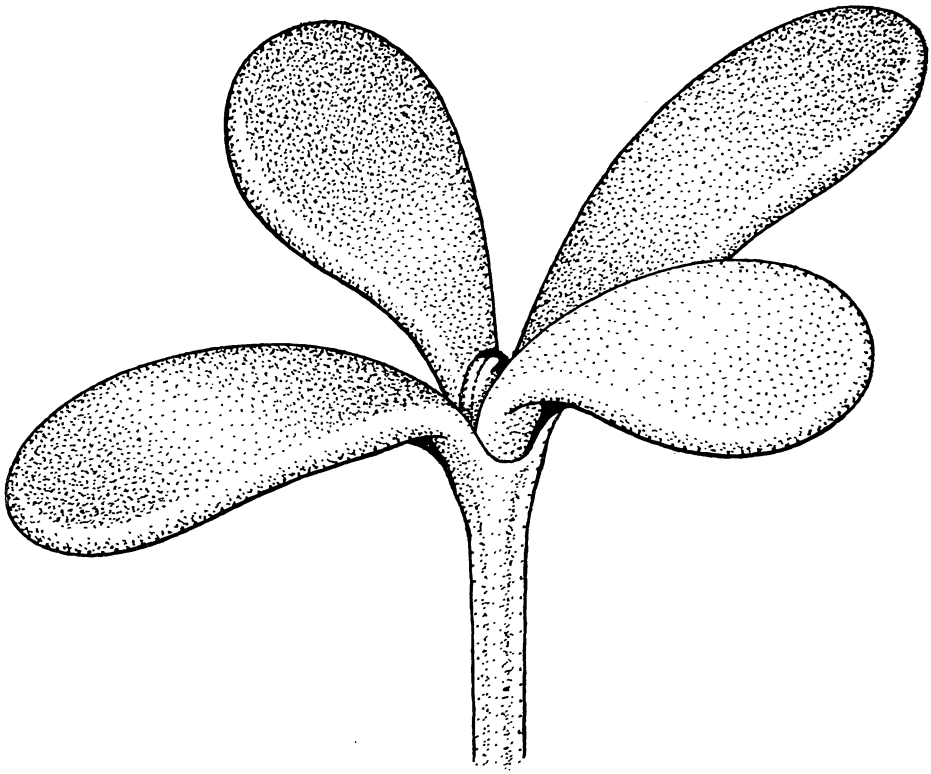


20. *Sisymbrium officinale* Hedge mustard

Cotyledons: Linear spread 12 mm., short oval with medium-long petioles.

Leaves: Almost opposite, since second leaf soon equals the first, spatulate with sharp tip and with slightly toothed margins, midvein, margins and upper surface sparsely trichomatous.

Hypocotyl: Short.

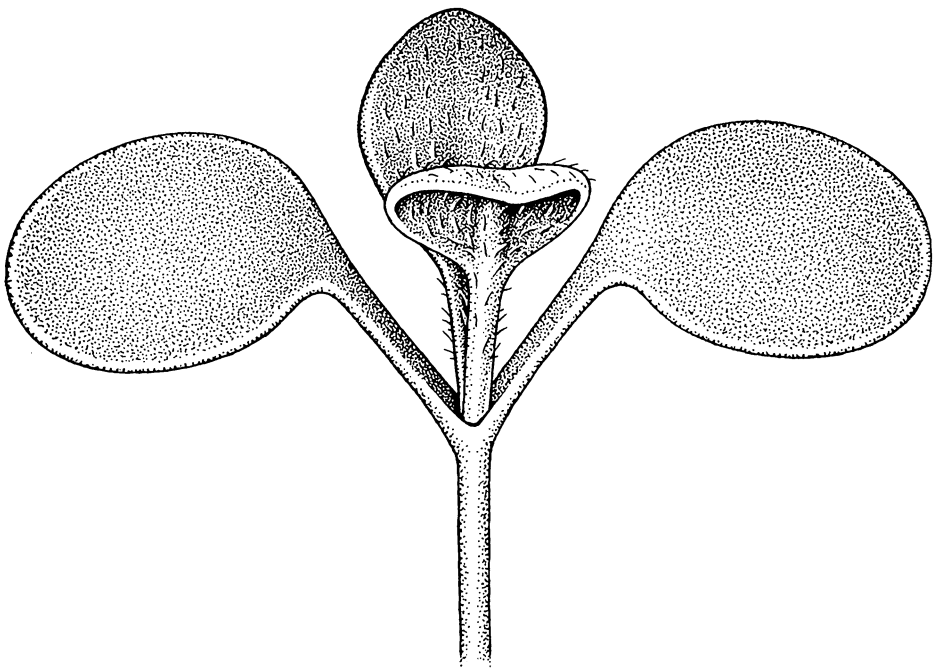


21. *Portulaca oleracea* Purslane

Cotyledons: Linear spread 11 mm., linear with very short petioles, waxy green upper surface, lower surface and margin around upper surface and junction of cotyledons red.

Leaves: Opposite, spatulate with no petioles, upper surfaces waxy green and lower surfaces red.

Hypocotyl: Red.

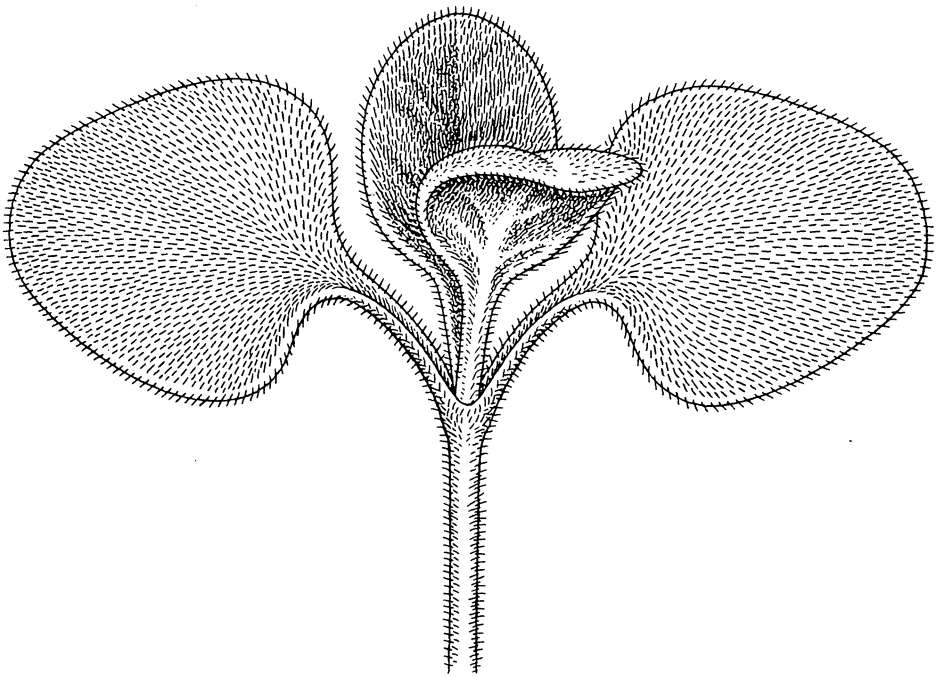


22. *Capsella bursa-pastoris* Shepherd's-purse

Cotyledons: Linear spread 10 mm., oval to ovate with medium-long petioles, midvein none to faint on lower surface.

Leaves: First leaves appear opposite, becoming a rosette, oval to ovate, midvein on lower surface, trichomatous.

Hypocotyl: Short; annual or winter annual.

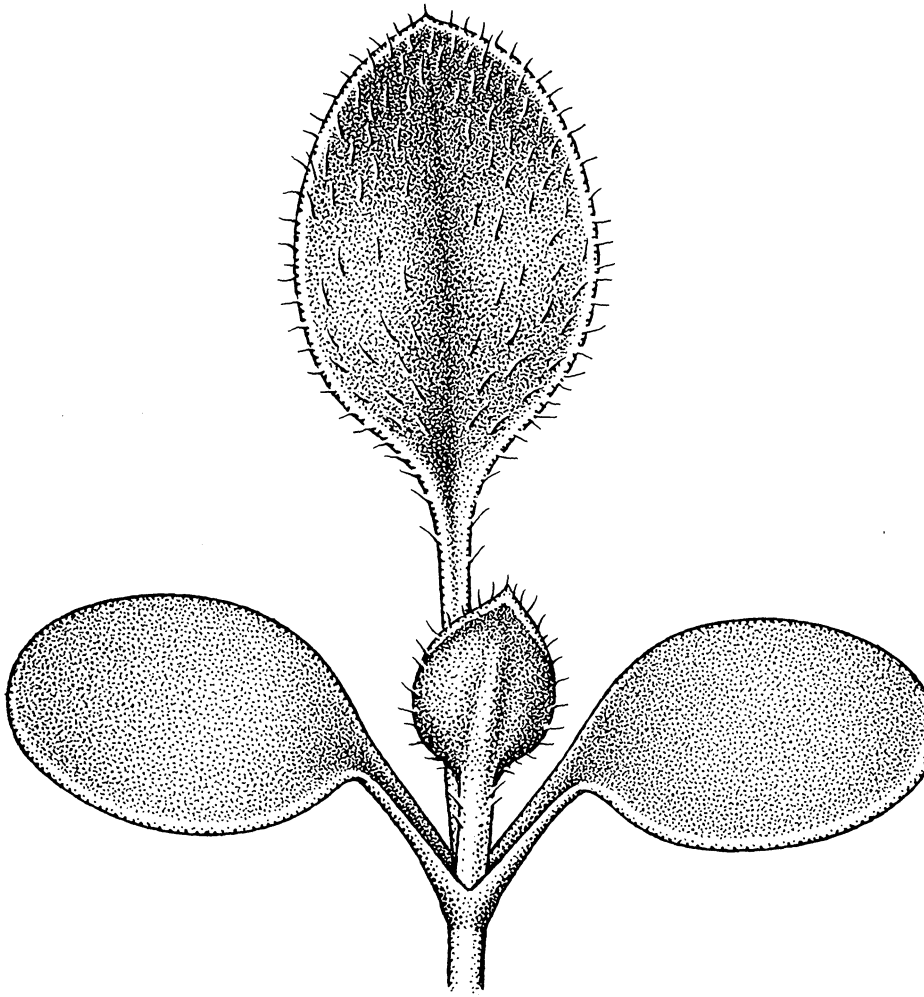


23. *Verbascum thapsus* Mullein

Cotyledons: Linear spread 6 mm., short ovate with short petioles; entire plant trichomatous.

Leaves: Opposite, oval to ovate with short petioles, branched midvein, trichomatous.

Biennial.

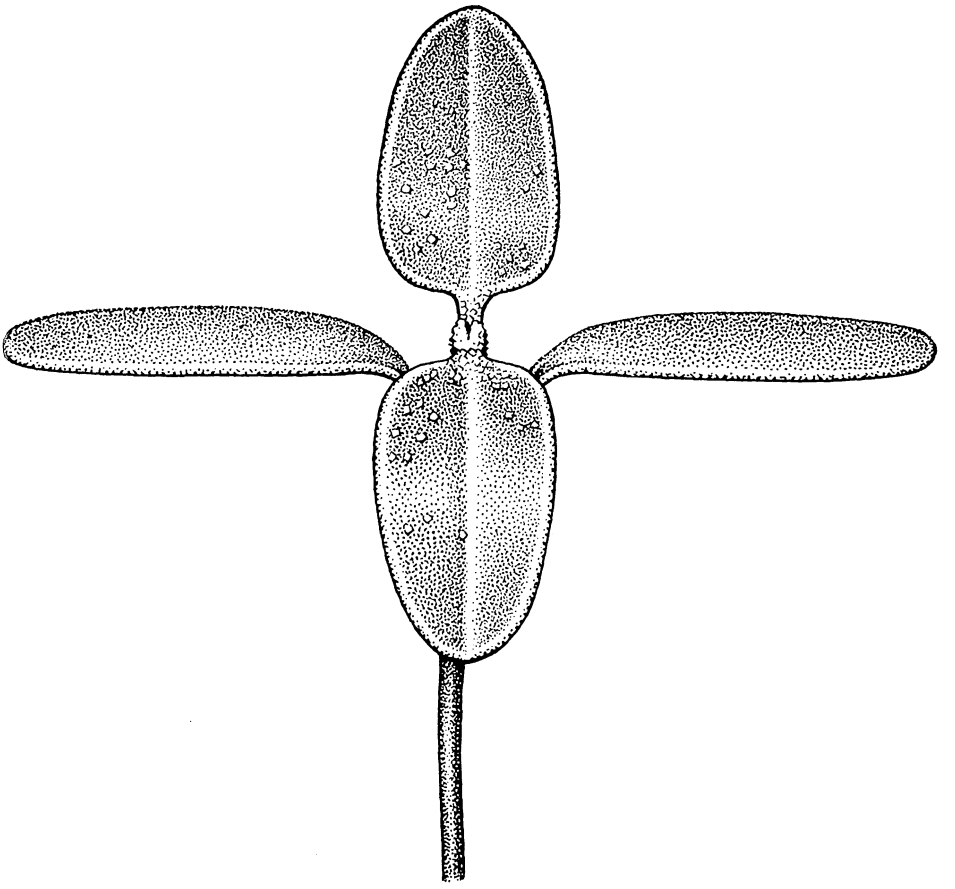


24. *Erigeron canadensis* Canada fleabane

Cotyledons: Linear spread 7 mm., ovate to oval with short petioles.

Leaves: Alternate, forming a rosette, oval and sharp tipped; leaves and petioles trichomatous with trichomes on lower surfaces short and sparse.

Hypocotyl: Very short, may become red.

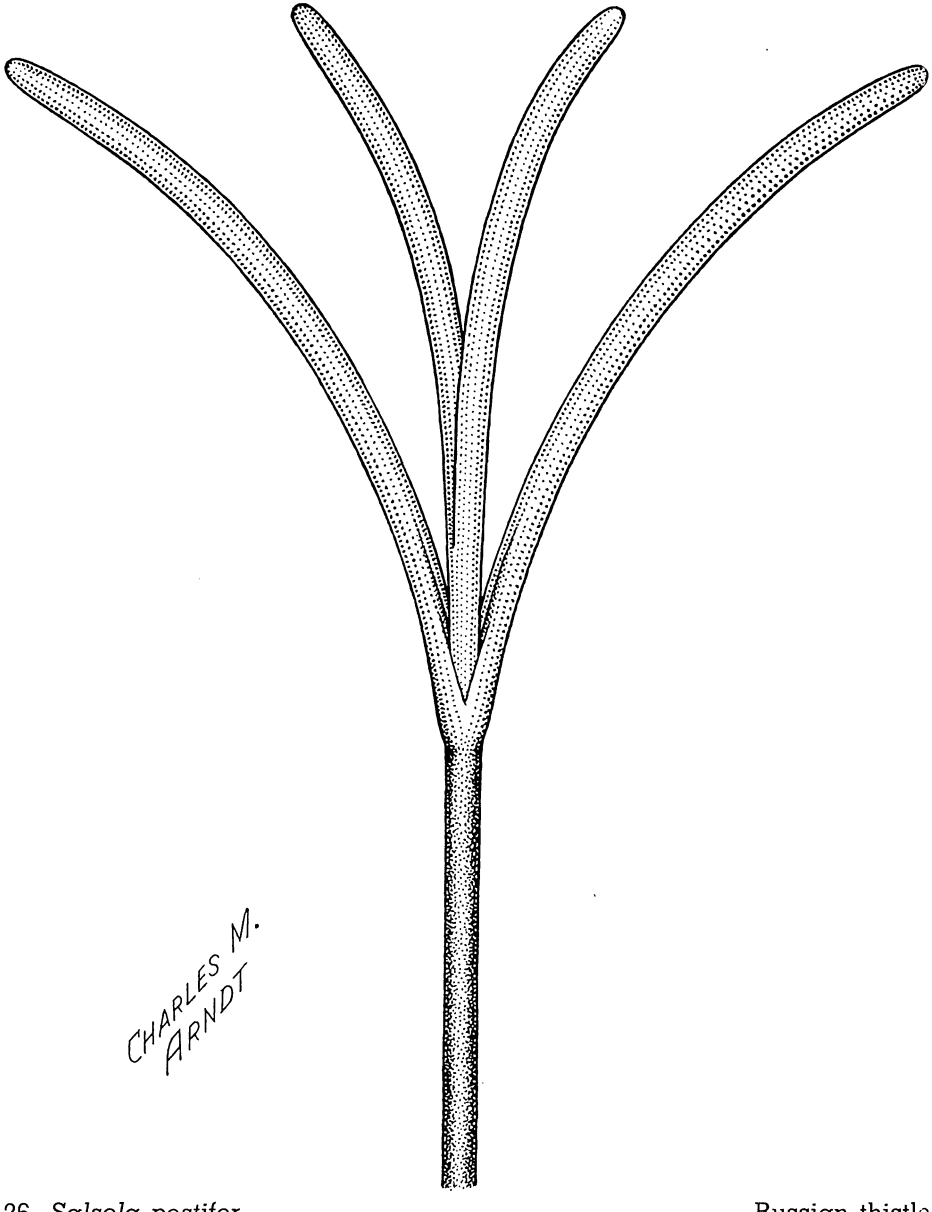


25. *Chenopodium album* Lamb's-quarters

Cotyledons: Linear spread 13 mm., linear, red on lower surface, light green on upper.

Leaves: Opposite, oval to ovate, light green with frosty appearance and short petioles, midvein.

Hypocotyl: Weakly red.

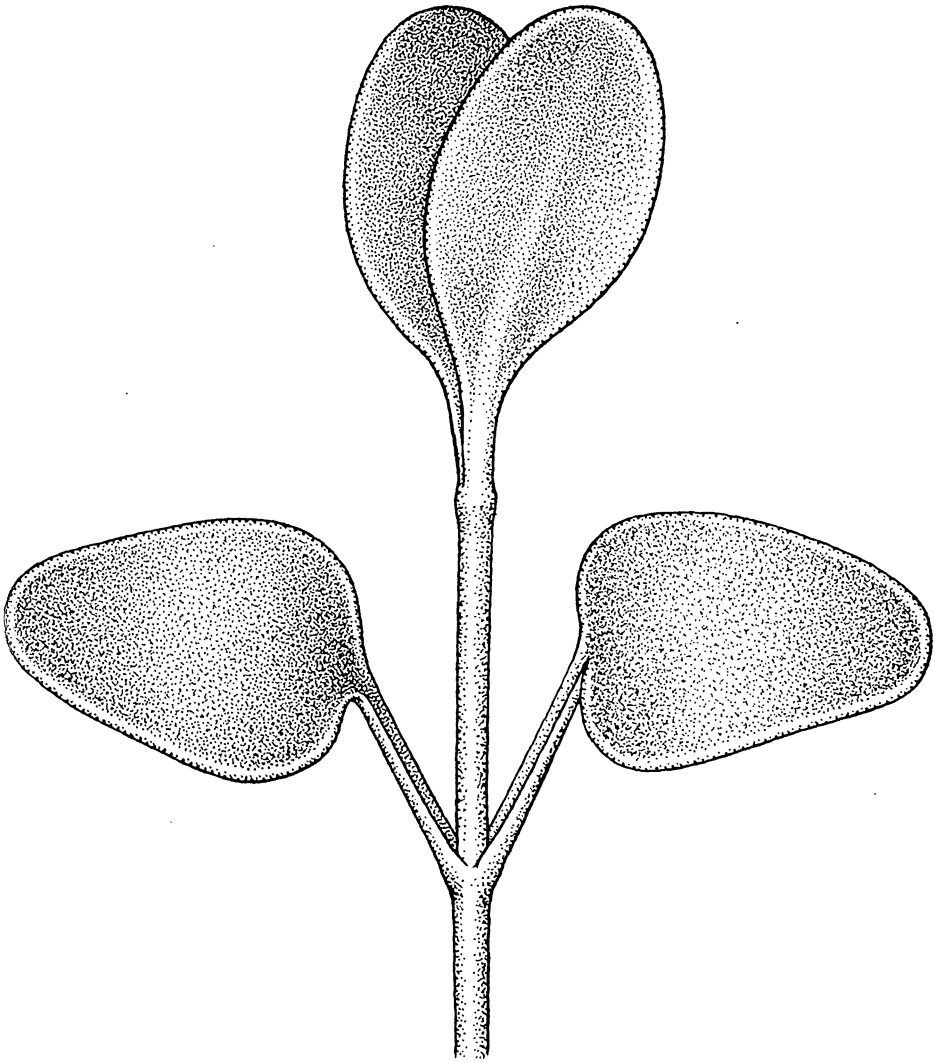


26. *Salsola pestifer* Russian thistle

Cotyledons: Linear spread 25 mm., extremely long linear with no petioles.

Leaves: Opposite, extremely long linear.

Hypocotyl: Red.

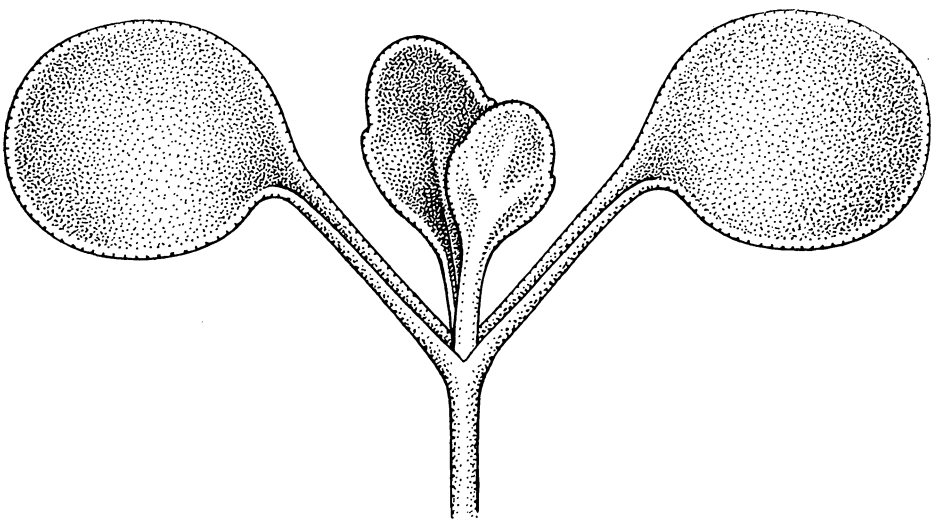


27. *Veronica peregrina* Common speedwell

Cotyledons: Linear spread 6 mm., ovate.

Leaves: Opposite, ovate to oval, midvein absent to faint.

Epicotyl: Becomes prominent.



28. *Radicula sessiliflora* Marsh cress

Cotyledons: Linear spread 6 mm., round with long petioles.

Leaves: Alternate, oval with one prominent tooth on each side, mid-vein.

Hypocotyl: Short; annual or winter annual.

Additional Species Described But Not Illustrated

29. *Amaranthus blitoides* Prostrate pigweed

Cotyledons: Linear spread 25 mm. linear with short petioles, lower surface and midvein on upper surface red.

Leaves: Alternate, spatulate with indented tips, glabrous petioles, branched midvein.

Hypocotyl and epicotyl weakly red and glabrous. Epicotyl long.

Resembles No. 19, *Amaranthus retroflexus,* and is just above it in size rank.

30. *Cirsium lanceolatum* Bull thistle

Cotyledons: Linear spread 32 mm., broadly spatulate to oval with broad petioles, midvein on lower and frequently upper surfaces, thick and waxy.

Leaves: Alternate, broadly spatulate, midvein, spiny trichomatous.

Hypocotyl: Short; biennial.

Resembles No. 6, *Lactuca scariola,* and is just above it in size rank.

31. *Conringia orientalis* Hare's-ear mustard

Cotyledons: Linear spread 22 mm., ovate to oval with petioles becoming long.

Leaves: Alternate, short ovate frequently wider than long, with serrated margins, branched midvein, leaves and petioles covered with barb-like trichomes.

Resembles No. 8, *Thlaspi arvense,* and is just above it in size rank.

32. *Daucus carota* Wild carrot

Cotyledons: Linear spread 55 mm., extremely long linear with petiole longer than cotyledon, midvein.

Leaves: Alternate, resembling carrot leaves, sparsely trichomatous on margins, lower surface, and petioles.

Hypocotyl: Brown; biennial.

Somewhat resembles No. 26, *Salsola pestifer,* in cotyledons but is considerably larger.

33. *Malva rotundifolia* Common mallow

Cotyledons: Linear spread 32 mm., ovate with long and frequently sparsely trichomatous petioles, branched midvein.

Leaves: Alternate, short oval with indented base, pleated, serrated margins, branched midvein, leaves and petioles sparsely covered with short trichomes; biennial.

Resembles No. 5, *Abutilon theophrasti,* and is just below No. 6, *Lactuca scariola,* in size rank.

34. *Silene noctiflora* Nightflowering catchfly

Cotyledons: Linear spread 25 mm., ovate.

Leaves: Opposite, oval to spatulate with sharp tips, midvein on lower surface and absent or faint on upper, leaves and petioles trichomatous.

Hypocotyl: Long.

Resembles No. 11, *Lychnis alba,* but cotyledons and leaves are

slightly longer with longer petioles on leaves.

35. *Solanum nigrum*
Black nightshade

Cotyledons: Linear spread 24 mm., ovate and sharp tipped, midvein; petioles and cotyledons trichomatous.

Leaves: Alternate, ovate, prominent and branched midvein, trichomatous, and dark purple blotched on lower surface.

Hypocotyl: Purple and trichomatous.

Resembles No. 15, *Stellaria media,* and is just above No. 8, *Thlaspi arvense,* in size rank.

36. *Tragopogon pratensis*
Yellow goatsbeard

Cotyledons: Linear spread 125 mm., extremely long linear with no petioles.

Leaves: Alternate, extremely long linear with sparsely trichomatous margins and no petioles, three veined with midvein prominent; first leaf encloses second leaf in sheath at base.

Hypocotyl: Sometimes brown; biennial.

Resembles No. 26, *Salsola pestifer,* though very much larger. Very grasslike in appearance.

37. *Xanthium canadense* Cocklebur

Cotyledons: Linear spread 75 mm., linear ovate with broad petioles, three veined at base on upper and faintly on lower surface, thick and waxy.

Leaves: Opposite, ovate with serrated margins and trichomatous petioles, branched midvein, velvety; each serration has a black tip on young leaves.

Hypocotyl: Slightly brown, stout; epicotyl prominent and covered with short trichomes.

Larger than No. 1, *Ambrosia trifida.*