

Confused by Crucifers?--A Mustard Identification Workshop

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WHAT DOES “MUSTARD” MEAN?

Mustard is the common household and food industry term for the yellow or brown table condiment so often eaten on hot dogs, as well as the agricultural term for the plant that produces the seeds from which that condiment is made. It is also the common name of the plant family known as Brassicaceae (also called Cruciferae). Any species within that family can be commonly (but loosely) called a “mustard” or a “crucifer.” Our word “mustard” comes from the Latin *mustum* and Old French *mustarde*, meaning “must” (a term for the fruit and skins of crushed grapes), perhaps a reference to the crushing of mustard seeds necessary to produce the pungent yellow powder.

Botanically speaking, what makes a mustard a mustard? Three major characteristics separate the mustard family from all other plant families:

1. The stamens are *tetradynamous*, meaning there are four long stamens and two short stamens in each flower (six in total).
2. Each flower bears four petals that form a cross, hence the alternate family name “Cruciferae,” from the Latin *cruciform* which means “cross-shaped.”
3. The seed pods each have a thin, translucent inner membrane, the *replum*, that separates the two chambers of the pod, and to which the seeds are attached.

Remember: although an unknown plant specimen may possess one or even two of these characteristics, that does not necessarily mean you are looking at a mustard species. It is the combination of all three characteristics that defines the mustard family.

HOW IMPORTANT IS THE MUSTARD FAMILY?

The mustard family is larger than most. Over 40 genera, including more than 200 wild and cultivated species, grow in the U.S. and Canada alone. Worldwide, over 1800 species from more than 100 genera comprise Brassicaceae.

The namesake for the mustard family, *Brassica*, is the genus from which current cultivated varieties of rapeseed and canola have been developed. These crops have been derived from two *Brassica* species: *B. napus* and *B. rapa* (formerly *B. campestris*). By far the largest (and most horticulturally important) *Brassica* group is *B. oleracea*, whose four major varieties include var. *acephala* (kale), var. *botrytis* (broccoli and cauliflower), var. *capitata* (cabbage), and var. *gemmifera* (Brussels sprouts). Other important Brassicas include *B. napobrassica* (rutabaga), *B. pekinensis* (Chinese cabbage), *B. chinensis* (Pak-choi), *B. juncea* (Chinese or Indian mustard), and *B. caulorapa* (Kohlrabi).

Some other crops in Brassicaceae include radish (*Raphanus sativus*), crambe (*Crambe maritima*), and horseradish (*Armoracia rusticana*). Other mustard genera are attractive and widely-planted ornamentals or herbs. Among these are *Alyssum*, rockcress (*Arabis*), wallflower (*Cheiranthus*), *Draba*, candy-tuft (*Iberis*), sweet Alyssum (*Lobularia*), money-plant (*Lunaria*), stock (*Mathiola*), and watercress (*Nasturtium*).

The origin of the agricultural term “rape” is not clear, but it likely comes from *rapa*, the Latin word for “turnip” (*B. rapa* is also the species of cultivated turnips). “Rapeseed” may refer to both the edible and high erucic acid industrial types. Since “canola” is used only for the edible types, common agricultural use of the words “rape” and “rapeseed” has come to mean the non-canola types. The word “canola” originated in Canada from a combination of two words: “Canada” and the Latin word *oleum* (which means “oil”), a marketing effort to avoid the negative connotations associated with the word “rape.”

HOW DO WE IDENTIFY THE MUSTARDS?

A plant “key” is designed to help the user quickly identify an unknown plant through the use of carefully selected choices. The choices often are in mutually exclusive pairs; that is, one plant can only be accurately described by one of the two statements. This is termed a *dichotomous* (“forking”) key. For example, the contrasting statements may be “flower petals purple” versus “flower petals yellow.” For a given plant, then, only one term applies: either flowers are purple or they are yellow, not both. But remember that plants are living things, and living things are always somewhat variable. To guard against possible error, always observe the character in question on several different organs or plants. By averaging your answers, you are more likely to choose the correct description.

Keys are often numbered and/or lettered to aid in matching the dichotomous statements, so the correct comparisons are made by the user. For example, when using the enclosed key, be sure to compare the statement at 1a (Flower petals white, cream, pink, or purple) with the opposing statement at 1b (Flower petals yellow), or 23a (Opened flowers below the buds; leaves waxy, bluish-green) with 23b (Opened flowers not below the buds; leaves light green). Keys are powerful tools, but, like any road map, a key must be correctly used to arrive at the correct destination. A user who incorrectly answers the often technical choice is lost and will arrive at the wrong answer, or eventually arrive at a fork where neither statement accurately describes the unknown plant. Careful use of correct botanical information is a must to successfully key plants!

One last thing to consider about keys: they only allow you to identify species actually used when constructing the key. If, for example, you attempted to identify the mustard family plant watercress (*Nasturtium officinale*) using the enclosed key, you would either fail to find an accurate description at one of the forks, or (by using creative license on the couplets), key the plant to flaxweed (*Descurainia sophia*). This is because watercress, with its particular combination of characters, was not used when this key was constructed. So always compare your plant with a description and illustration or photo of the answer to eliminate the chance of incorrect identification.

Finally, while plants are most often identified using visual clues (size and color of flowers, shape of the leaves, size and shape of the seed pods, etc.), identifications of many mustards can be confirmed by smell and taste. This is because most members of the mustard family are well-endowed with sulfur-bearing compounds chemically known as *glucosinolates*. It is these compounds that give mustards the

biting, pungent aroma and flavor that is so desirable in products such as horseradish and Chinese mustard. If, after examining a plant, you suspect that it may be a mustard, it is often beneficial to crush some leaves or seeds and smell (or taste) them. If it gives off a “mustardy” odor (or has a “hot” taste), it’s a good indication that you’ve got a mustard. This is not foolproof, of course, since many plants have strong odors or flavors that are not mustards. But you may find that smelling or tasting a plant is helpful in your field identification of mustards, particularly early in the growing season when flowers and fruits are not available. **A word of caution, however:** it is a good practice to be reasonably sure of the identification before doing much tasting of unknown plants!

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WHICH MUSTARDS ARE WE CONCERNED ABOUT?

In this workshop, the focus is on identification of weedy mustards, or those crops which may persist as volunteers. The following is a list of 25 mustard family weeds that have been found in Washington, Oregon, and/or Idaho.

Weed	Scientific name	Distribution	Photo ¹
<u>Annual Mustards</u>			
Yellow rocket	<i>Barbarea vulgaris</i>	occasional	---
Hoary alyssum	<i>Berteroa incana</i>	rare	---
White mustard	<i>Brassica hirta</i>	volunteer	---
Chinese or Indian mustard	<i>Brassica juncea</i>	volunteer	---
Wild mustard	<i>Brassica kaber</i>	common	212
Rapeseed, canola	<i>Brassica napus</i>	volunteer	---
Black mustard	<i>Brassica nigra</i>	common	214
Birdsrape mustard, rapeseed	<i>Brassica rapa</i>	common	216
Smallseed falseflax	<i>Camelina microcarpa</i>	common (east)	218
Shepherdspurse	<i>Capsella bursa-pastoris</i>	common	220
Little bittercress	<i>Cardamine oligosperma</i>	common (west)	---
Blue mustard	<i>Chorispora tenella</i>	common (east)	224
Tansymustard	<i>Descurainia pinnata</i>	common (east)	226
Flixweed	<i>Descurainia sophia</i>	common (east)	226
Field pepperweed	<i>Lepidium campestre</i>	occasional	---
Clasping pepperweed	<i>Lepidium perfoliatum</i>	common (east)	232
Virginia pepperweed	<i>Lepidium virginicum</i>	rare	---
Wild radish	<i>Raphanus raphanistrum</i>	occasional	234
Tumble mustard	<i>Sisymbrium altissimum</i>	common (east)	236
Hedgemustard	<i>Sisymbrium officinale</i>	common (west)	---
Field pennycress	<i>Thlaspi arvense</i>	common (east)	240
<u>Biennial Mustards</u>			
Dyers woad	<i>Isatis tinctoria</i>	occasional	228
<u>Perennial Mustards</u>			
Hoary cress	<i>Cardaria draba</i>	occasional	222
Damesrocket	<i>Hesperis matronalis</i>	occasional	---
Perennial pepperweed	<i>Lepidium latifolium</i>	occasional	230

¹Page number in *Weeds of the West* (revised 1992).

Key to 25 Mustards of Agricultural Importance in the Pacific Northwest

- 1a Flower petals white, cream, pink, or purple
 - 2a Flowers small (<1/4-inch wide)
 - 3a Leaf bases clasping the stem
 - 4a Leaves without hairs
 - 5a Pods longer than wide (silique)..... Little bittercress (*Cardamine oligosperma*)
 - 5b Pods nearly as wide as long (silicle)Field pennycress (*Thlaspi arvense*)
 - 4a Leaves with hairs
 - 6a Perennial, with creeping rootsHoary cress (*Cardaria draba*)
 - 6b Annual (biennial), no creeping roots
 - 7a Pods longer than wide (silique)..... Little bittercress (*Cardamine oligosperma*)
 - 7b Pods nearly as wide as long (silicle)
 - 8a Pods oval, winged Field pepperweed (*Lepidium campestre*)
 - 8b Pods triangular, not winged.....Shepherdspurse (*Capsella bursa-pastoris*)
 - 3b Leaf bases not clasping the stem
 - 9a Leaves finely dissected
 - 10a Leaves bi- or tri-pinnate; pods uniserate and slightly club-shaped
.....Tansymustard (*Descurainia pinnata*)
 - 10b Leaves bi-pinnate; pods biserate and linear
.....Flixweed (*Descurainia sophia*)
 - 9b Leaves simple, not lobed
 - 11a Perennial, with creeping rootsPerennial pepperweed (*Lepidium latifolium*)
 - 11b Annual (biennial), no creeping roots Virginia pepperweed (*Lepidium virginicum*)
 - 2b Flowers larger (>1/4-inch wide)
 - 12a Pods nearly as wide as long (silicle), oval; hairs stellate
..... Hoary Alyssum (*Berteroa incana*)
 - 12b Pods longer than wide (silique), hairs simple or forked
 - 13a Pods breaking apart lengthwise at maturity.....Damesrocket (*Hesperis matronalis*)
 - 13b Pods not breaking at maturity, or breaking crosswise
 - 14a Pods curved, thin, not pithy..... Blue mustard (*Chorispora tenella*)
 - 14b Pods thick, pithy Wild radish (*Raphanus raphanistrum*)
 - 1b Flower petals yellow
 - 15a Pods teardrop-shaped at maturity
 - 16a Pods black at maturity; midrib distinct Dyers woad (*Isatis tinctoria*)
 - 16b Pods yellow at maturity; midrib indistinct.....Smallseed falseflax (*Camelina microcarpa*)
 - 15b Pods otherwise
 - 17a Pods tightly appressed against the stem
 - 18a Flower petals pale yellow, < 1/4-inch wide Hedgemustard (*Sisymbrium officinale*)
 - 18b Flower petals bright yellow, 2/3-inch wide Black mustard (*Brassica nigra*)
 - 17b Pods spreading to ascending

- 19a Leaf bases clasping the stem
 - 20a Pods nearly as wide as long (silicle)..... Claspig pepperweed (*Lepidium perfoliatum*)
 - 20b Pods longer than wide (silique)
 - 21a Leaves with hairs..... Tumble mustard (*Sisymbrium altissimum*)
 - 21b Leaves without hairs
 - 22a Biennial (perennial); in wet places..... Yellow rocket (*Barbarea vulgaris*)
 - 22b Annual; habitat various
 - 23a Opened flowers below the buds; leaves waxy, bluish-green
 - Rapeseed, canola (*Brassica napus*)
 - 23b Opened flowers not below the buds; leaves light green
 -Birdsrape mustard, rapeseed (*Brassica rapa*)
- 19b Leaf bases not clasping the stem
 - 24a Leaves without hairs Chinese or Indian mustard (*Brassica juncea*)
 - 24b Leaves with hairs
 - 25a Leaves finely dissected
 - 26a Leaves bi- or tripinnate; pods uniserate and slightly club-shaped
 - Tansymustard (*Descurainia pinnata*)
 - 26b Leaves bipinnate; pods biserate and linear
 -Flixweed (*Descurainia sophia*)
 - 25b Leaves only lobed, not dissected
 - 27a Pods not breaking at maturity, or breaking crosswise
 - Wild radish (*Raphanus raphanistrum*)
 - 27b Pods breaking apart lengthwise at maturity
 - 28a Pods densely hairy, often curved..... White mustard (*Brassica hirta*)
 - 29b Pods not hairy, strongly nerved..... Wild mustard (*Brassica kaber*)

GLOSSARY:

- Appressed: Pressed flat against another plant part.
- Ascending: Growing at an angle upward.
- Bipinnate: Twice pinnate, with each main lobe also being pinnately divided.
- Biserate: Seed pod bearing two rows of seeds in each of the two chambers.
- Clasping: Having finger-like lobes at the base of a leaf that wrap around the stem.
- Dissected: Very finely divided.
- Lobe: A projecting segment of an organ (often a leaf blade).
- Midrib: The principal vein of a leaf, normally at the center of the blade.
- Nerve: A prominent ridge or vein running the length of the organ.
- Sessile: Leaf attached directly to the stem, no petiole.
- Silicle: Mustard seed pod less than 3 times longer than wide.
- Silique: Mustard seed pod greater than 3 times longer than wide.
- Spreading: Growing nearly at right angles to the main axis.
- Stellate: Three or more branches forming a star shape (much like an asterisk *).
- Tripinnate: Three times pinnate; with each main lobe being pinnately divided and each secondary lobe also being pinnately divided.
- Uniserate: Seed pod bearing one row of seeds in each of the two chambers.
- Wing: A thin, flat extension or projection from the side or tip of a structure.

Descriptions of 25 Mustards of Agricultural Importance in the Pacific Northwest

1. Yellow rocket (*Barbarea vulgaris*)

Life Cycle: Biennial (perennial).

Height: 2 to 3 feet.

Cotyledons: Round-oval, 0.5-inch long, notched, sharp mustard flavor.

Leaves: Lower leaves with a large terminal lobe, and two small lobes toward the base. Upper leaves smaller, clasping the stem and irregularly lobed. Leaves generally hairless.

Flowers: 0.5-inch wide; petals dark yellow.

Pods: Siliques to 1 inch long; beak to 0.1-inch long.

Key ID Features: Stem leaves wide with finger-like lobes.

2. Hoary alyssum (*Berteroa incana*)

Life Cycle: Annual.

Height: To 3.5 feet.

Cotyledons: ?

Leaves: Lower leaves wider at the tip, 2 inches long, and stalked. Upper leaves smaller and sessile. Leaves with stellate hairs.

Flowers: 0.3-inch wide; petals white.

Pods: Silicles to 0.25-inch long, covered with stellate hairs; style to 0.1-inch long.

Key ID Features: Stellate hairs, petals bi-lobed at the tips.

3. White mustard (*Brassica hirta*)

Life Cycle: Annual.

Height: To 2 feet.

Cotyledons: Large, heart- or kidney-shaped, prominent wide notch at tip, mustard flavor.

Leaves: Lower leaves stalked, with large coarsely toothed terminal lobes. Upper leaves not toothed or lobed, and sessile, but not clasping the stem. Leaves with sparse hairs.

Flowers: 0.67-inch wide; petals pale yellow.

Pods: Siliques to 1.5 inches long, densely hairy; beak to 1.5 inches long, curved and flattened, often bearing a seed.

Key ID Features: Densely hairy pods, spreading; vanilla-scented, pale yellow flowers.

4. Chinese or Indian mustard (*Brassica juncea*)

Life Cycle: Annual.

Height: To 3.5 feet.

Cotyledons: Heart- or kidney-shaped, prominent wide notch at tip, mustard flavor.

Leaves: Lower leaves stalked, with large coarsely toothed terminal lobes. Upper leaves not toothed or lobed, and sessile, but not clasping the stem. Leaves usually without hairs.

Flowers: 0.67-inch wide; petals pale yellow.

Pods: Siliques to 1.5 inches long, strongly constricted between the seeds; beak slender to 0.5-inch long.

Key ID Features: Pods strongly constricted between seeds, ascending.

5. Wild mustard (*Brassica kaber*)

Life Cycle: Annual.

Height: To 3.5 feet.

Cotyledons: Heart- or kidney-shaped, prominent wide notch at tip, mustard flavor.

Leaves: Lower leaves stalked, with a large terminal lobe and smaller lower lobes. Upper leaves toothed but not lobed, and sessile but not clasping the stem. Leaves with sparse hairs.

Flowers: 0.67-inch wide; petals bright yellow.

Pods: Siliques to 1.5 inches long, prominently ribbed; beak to 0.5-inch long, often bearing a seed.

Key ID Features: Strongly nerved pods and beaks, slightly constricted between seeds.

6. Rapeseed, canola (*Brassica napus*)

Life Cycle: Annual, biennial.

Height: To 5 feet.

Cotyledons: Heart- or kidney-shaped, prominent wide notch at tip, mustard flavor.

Leaves: Lower leaves stalked, with large coarsely toothed terminal lobes. Upper leaves not toothed or lobed, and sessile, loosely clasping the stem. Leaves without hairs.

Flowers: 0.67-inch wide; petals yellow.

Pods: Siliques to 4 inches long; beak slender to 0.5-inch long.

Key ID Features: Opened flowers below the buds; leaves waxy, bluish-green; 4 to 6 main branches.

7. Black mustard (*Brassica nigra*)

Life Cycle: Annual

Height: To 6 feet.

Cotyledons: Heart- or kidney-shaped, prominent wide notch at tip, sharp mustard flavor.

Leaves: Lower leaves stalked, with large coarsely toothed terminal lobes. Upper leaves not toothed or lobed, and sessile, but not clasping the stem. Leaves with sparse, stiff hairs on a conical base.

Flowers: 0.67-inch wide; petals bright yellow.

Pods: Siliques to 0.5-inch long, appressed to the stem; beak 0.2-inch long.

Key ID Features: Leaves puckered between veins; pods tightly appressed to the stem.

8. Birdrape mustard, rapeseed (*Brassica rapa*)

Life Cycle: Annual, biennial

Height: To 5 feet.

Cotyledons: Heart- or kidney-shaped, prominent wide notch at tip, mustard flavor.

Leaves: Lower leaves stalked, with large coarsely toothed terminal lobes. Upper leaves not toothed or lobed, and sessile, clasping the stem. Leaves without hairs.

Flowers: 0.67-inch wide; petals yellow.

Pods: Siliques to 3 inches long; beak slender to 0.5-inch long.

Key ID Features: Opened flowers not below the buds; leaves light green; up to 20 main branches.

9. Smallseed falseflax (*Camelina microcarpa*)

Life Cycle: Winter annual

Height: To 3 feet.

Cotyledons: Round to 0.25 inch long and half that wide, petioles short and with 2 to 3 marginal hairs, slight mustard flavor.

Leaves: Lower leaves coarsely toothed, not lobed, sessile. Upper leaves not toothed, clasping the stem. Leaves with forked and/or stellate hairs.

Flowers: 0.33-inch wide; petals pale yellow, fading to white.

Pods: Silicles to 0.33-inch long, teardrop-shaped attached at the narrow end, slightly winged; style sharp, 0.1-inch long.

Key ID Features: Teardrop-shaped pods, stellate hairs.

10. Shepherdspurse (*Capsella bursa-pastoris*)

Life Cycle: Winter annual

Height: To 2 feet.

Cotyledons: To 0.1-inch, round, petiolate, mustard flavor.

Leaves: Lower leaves pinnately lobed, stalked, to 6 inches long. Upper leaves sessile, not lobed, clasping the stem. Hairs on lower leaves simple above, stellate on underside; upper leaves not hairy.

Flowers: 0.1-inch wide; petals white.

Pods: Silicles to 0.33-inch long, triangular or heart-shaped; style absent.

Key ID Features: Flat, triangular pods; stellate hairs underneath the leaves.

11. Little bittercress (*Cardamine oligosperma*)

Life Cycle: Winter annual.

Height: To 1 foot.

Cotyledons: Heart- or kidney-shaped, to 0.25-inch wide, sparsely hairy, sharp mustard flavor.

Leaves: Lower leaves pinnately lobed, to 4 inches long, stalked with large terminal lobe and rounded lateral lobes. Upper leaves smaller, pinnately lobed with nearly linear lobes, not clasping the stem.

Leaves sparsely hairy or hairless.

Flowers: 0.1-inch wide; petals white.

Pods: Silicles to 1-inch long, “snap” apart at maturity; beak absent.

Key ID Features: Pinnately lobed leaves; pods that “snap” apart at maturity.

12. Hoary cress (*Cardaria draba*)

Life Cycle: Perennial

Height: To 3 feet.

Cotyledons: ?

Leaves: All leaves grayish-green, clasping the stem, lightly hairy, to 4 inches long, reduced upwards.

Flowers: 0.25-inch wide; petals white. Inflorescence dense, appears flat-topped early in bloom.

Pods: Silicles to 0.25-inch long, heart-shaped, inflated; style 0.1-inch long, persistent.

Key ID Features: Heart-shaped pods; flat-topped flower clusters in early spring.

13. Blue mustard (*Chorispora tenella*)

Life Cycle: Winter annual

Height: To 2.5 feet.

Cotyledons: Oval, to 0.25-inch long.

Leaves: Lower leaves deeply and irregularly lobed and stalked. Upper leaves sessile, not clasping the stem, with wavy to toothed margins. Leaves with simple, glandular hairs.

Flowers: 0.5-inch wide; petals bluish-purple and narrow.

Pods: Siliques to 1.5 inches long, curved, not breaking apart or breaking crosswise. Beak to 0.75-inch long, curved.

Key ID Features: Blue-purple flowers; pods not breaking at maturity, or breaking crosswise.

14. Tansymustard (*Descurainia pinnata*)

Life Cycle: Winter annual.

Height: To 3.5 feet.

Cotyledons: Oblong, to 0.3-inch long, with hairs on the petiole.

Leaves: Lower leaves bipinnately dissected, gray-green, to 6 inches long, and stalked. Upper leaves reduced, bipinnate, not clasping the stem. Leaves with dense, stellate hairs; distinctly aromatic, but not “mustardy.”

Flowers: 0.1-inch wide; petals pale yellow to greenish to nearly white.

Pods: Siliques to 0.75-inch long; beak absent.

Key ID Features: Bipinnately divided leaves; pods uniserate and slightly club-shaped.

15. Flixweed (*Descurainia sophia*)

Life Cycle: Winter annual.

Height: To 3.5 feet.

Cotyledons: Oblong, to 0.3-inch long, with hairs on the petiole.

Leaves: Lower leaves bi- to tripinnately dissected, gray-green, to 6 inches long, and stalked. Upper leaves reduced, bipinnate, not clasping the stem. Leaves with dense, stellate hairs; distinctly aromatic, but not “mustardy.”

Flowers: 0.1-inch wide; petals pale yellow to greenish to nearly white.

Pods: Siliques to 0.75-inch long; beak absent.

Key ID Features: Bi- or tripinnately divided leaves; pods biserate and linear.

16. Damesrocket (*Hesperis matronalis*)

Life Cycle: Perennial.

Height: To 4.5 feet.

Cotyledons: ?

Leaves: Lower leaves ovate to lanceolate, sharply toothed, stalked, to 8 inches long. Upper leaves reduced, sessile but not clasping the stem. Leaves with longer hairs (both simple and forked), and shorter hairs (forked).

Flowers: 1-inch wide; petals nearly white to rose and purple; fragrant; style deeply cleft.

Pods: Siliques to 4 inches long, constricted between the seeds; beak absent.

Key ID Features: Large brightly-colored flowers in mid-spring; style deeply cleft.

17. Dyers woad (*Isatis tinctoria*)

Life Cycle: Biennial (winter annual, perennial).

Height: To 4 feet.

Cotyledons: ?

Leaves: Lower leaves are generally smooth-margined, stalked, and up to 8 inches long. Upper leaves are reduced, sessile, and clasping the stem. Lower leaves are lightly hairy, upper leaves are smooth; all have a prominent white midrib.

Flowers: 0.25-inch wide; petals bright yellow.

Pods: Silicles to 0.75-inch long, teardrop-shaped attached at the narrow end, and black at maturity; style absent.

Key ID Features: Prominent white midribs; clasping upper leaves; a weed of dry places.

18. Field pepperweed (*Lepidium campestre*)

Life Cycle: Annual (biennial).

Height: To 2 feet.

Cotyledons: ?

Leaves: Lower leaves oblong, sometimes lobed, to 3 inches long. Upper leaves reduced, smooth or toothed, and clasping the stem. Leaves densely pubescent with stellate hairs.

Flowers: 0.1-inch wide; petals white.

Pods: Silicles to 0.2-inch long, oval, rough, broadly winged and notched at the tip; style absent.

Key ID Features: Clasping upper leaves with stellate hairs; small pods winged and notched.

19. Perennial pepperweed (*Lepidium latifolium*)

Life Cycle: Perennial.

Height: To 6 feet tall.

Cotyledons: ?

Leaves: Lower leaves generally smooth-margined, stalked, and up to 8 inches long. Upper leaves reduced with short petioles. Leaves waxy and smooth.

Flowers: 0.1-inch wide; petals white.

Pods: Silicles to 0.1-inch long, round, and slightly hairy; style is absent.

Key ID Features: Creeping perennial roots; waxy, stalked leaves; tiny white flowers.

20. Clasping pepperweed (*Lepidium perfoliatum*)

Life Cycle: Winter annual.

Height: To 1.5 feet.

Cotyledons: ?

Leaves: Lower leaves bi- or tripinnately dissected and stalked. Upper leaves heart-shaped, sessile, clasping the stem (the stem appears to be growing through the blade). Leaves smooth, with occasional hairs.

Flowers: 0.1-inch wide; petals yellow.

Pods: Silicles to 0.2-inch long, oval, with a slight wing; style <0.1-inch long.

Key ID Features: Stem appears to grow through the upper leaf blades; lower leaves finely dissected.

21. Virginia pepperweed (*Lepidium virginicum*)

Life Cycle: Annual.

Height: To 2 feet.

Cotyledons: ?

Leaves: Lower leaves lobed to merely toothed, wider at the tip, and stalked. Upper leaves reduced, sessile but not clasping the stem. Leaves smooth to lightly hairy.

Flowers: 0.1-inch wide; petals white.

Pods: Silicles to 0.1-inch long, oval, broadly winged and notched at the tip; style absent.

Key ID Features: Tiny white flowers; pod tiny; stem leaves smooth and not clasping.

22. Wild radish (*Raphanus raphanistrum*)

Life Cycle: Annual, biennial.

Height: To 3.5 feet.

Cotyledons: Heart- or kidney-shaped, prominent wide notch at tip, radish flavor.

Leaves: Lower leaves heavily veined, deeply lobed, and stalked. Upper leaves reduced, sharply toothed, and sessile but not clasping the stem. Leaves sparsely hairy.

Flowers: 0.75-inch wide; petals white to pink or purple (rarely yellow), with distinctive veins.

Pods: Siliques to 1.5 inches long, pithy, not breaking apart at maturity, or breaking crosswise. Beak to 0.75-inch long, conical.

Key ID Features: Pods not breaking at maturity, or breaking crosswise into pithy segments.

23. Tumble mustard (*Sisymbrium altissimum*)

Life Cycle: Annual.

Height: To 4 feet.

Cotyledons: Oblong, 0.25-inch long, mustard flavor.

Leaves: Lower leaves pinnately lobed, to 8 inches long, and stalked. Upper leaves reduced and often pinnately dissected, and stalked. Leaves densely pubescent with simple hairs on lower leaves, not hairy on upper leaves.

Flowers: 0.3-inch wide; petals pale yellow.

Pods: Siliques to 4 inches long, very narrow, widely spreading; beak absent.

Key ID Features: Pinnately-dissected upper leaves; long pods don't overtop the flowers.

24. Hedge mustard (*Sisymbrium officinale*)

Life Cycle: Annual.

Height: To 3 feet.

Cotyledons: ?

Leaves: Lower leaves pinnately lobed, to 8 inches long, and stalked. Upper leaves reduced, often arrowhead-shaped, and stalked. Leaves with stiff hairs, rarely smooth.

Flowers: 0.2-inch wide; petals pale yellow.

Pods: Siliques to 0.5-inch long, very narrow, tightly appressed to the stem; beak <0.1-inch long.

Key ID Features: Short pods tightly appressed to the stem; small pale yellow flowers.

25. Field pennycress (*Thlaspi arvense*)

Life Cycle: Winter annual.

Height: To 2.5 feet.

Cotyledons: Round to oval, 0.3-inch long, mustard flavor.

Leaves: Lower leaves very slightly toothed and shortly stalked. Upper leaves reduced, sessile, and clasping the stem. Leaves without hairs; distinctly aromatic, but not “mustardy.”

Flowers: 0.1-inch wide; petals white.

Pods: Silicles to 0.5-inch long, oval, broadly winged and notched at the tip; style absent.

Key ID Features: Flat, oval pods are winged; plant smells “onionlike” when crushed.