

# Seed and Fruit Descriptions of Selected *Acmispon*, *Kummerowia*, *Lespedeza*, *Lotus*, *Medicago*, and *Melilotus*



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2021 Edition

The 2021 edition contains new information and revised common names as they appear in the AOSA Rules for Testing Seeds (AOSA 2019) and scientific nomenclature updates in accordance with the USDA GRIN Database (USDA ARS 2021). Both authors are retired from the California Department of Food and Agriculture, Plant Pest Diagnostics Center, Seed Science Laboratory.

Illustrations and photographs are by D. J. Lionakis Meyer

Originally published in 2006 under the title

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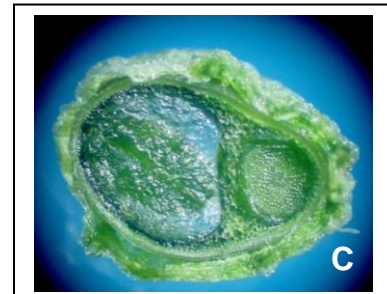
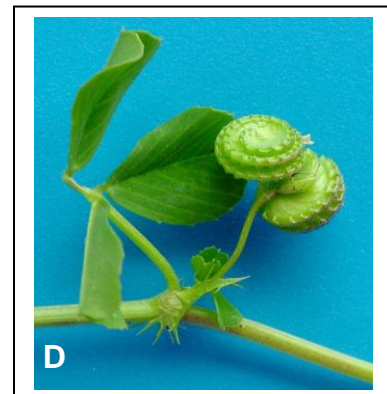
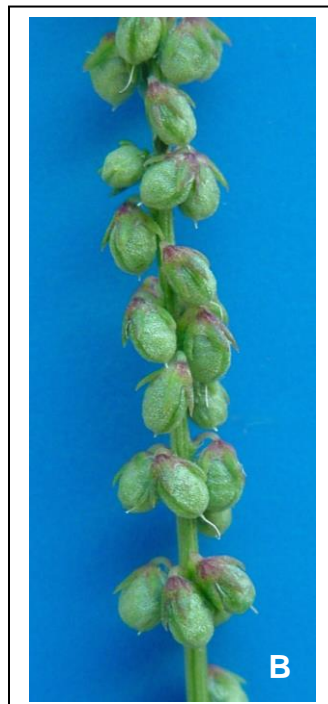
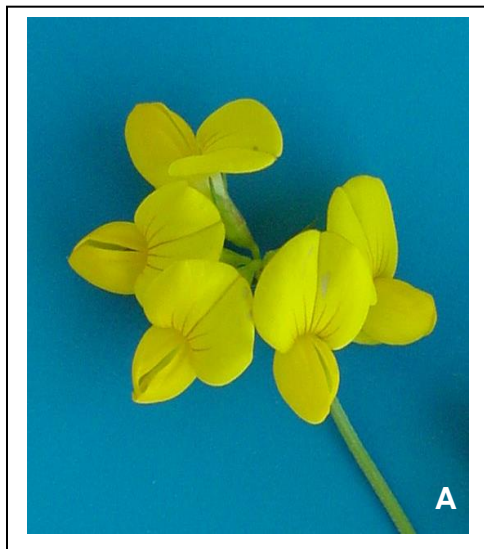
California Department of Food and Agriculture  
Plant Pest Diagnostics Center

# Seed and Fruit Descriptions of Selected *Acmispon*, *Kummerowia*, *Lespedeza*, *Lotus*, *Medicago*, and *Melilotus*

## Introduction

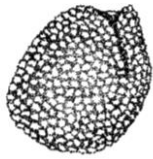
The species included here are generally considered forage legumes and are utilized primarily for pasture and hay. They may also be used for soil improvement and erosion control, particularly when used in combination with grasses. Some of these species have escaped from cultivation and become weed pests. Most notable is *Lespedeza cuneata*, sericea or Chinese lespedeza, which is considered a noxious weed in Kansas, Nebraska, and Oklahoma and an invasive species in some states (Stevens 2002; USDA AMS 2020). All the species included here, except for *Acmispon glaber* [formerly *Lotus scoparius*], deerweed, have been introduced to North America (i.e., non-native), although many have become widely naturalized.

The flowers are papilionaceous with superior ovaries that develop into one- to multi-seeded fruits. The fruits may be linear as in *Acmispon*, *Kummerowia*, *Lespedeza*, *Lotus* and *Melilotus*, or coiled as in many species of *Medicago*. Martin (1946) classifies the embryos in this group as foliate-bent; the bend in the hypocotyl allowing the radicle to lie next to the cotyledons in a jackknife formation. At maturity the embryo fills most of the seed and is surrounded by a thin layer of endosperm. Characteristics important for seed identification in this group include shape, radicle length relative to the cotyledon lobe, and longitudinal twisting of the embryo (Musil 1963). The seed coat is smooth in all but two of the species (i.e., *Melilotus indicus* and *Medicago orbicularis*). Seed coats can be dull to glossy and in some species the color is mottled (e.g., *Acmispon glaber*, *Lotus corniculatus*, *Melilotus officinalis*, etc.).



**A** – Papilionaceous flowers of *Lotus corniculatus*; **B** – linear one-seeded fruits of *Melilotus indicus*; **C** – cross-section of a fruit containing an immature seed in *M. indicus* showing the embryo surrounded by endosperm; **D** – coiled multi-seeded fruits of *Medicago polymorpha*.

### Radicle Length Relative to Cotyledon Lobe



Radicle equal to cotyledon lobe



Radicle greater than  $\frac{1}{2}$  the length of cotyledon lobe

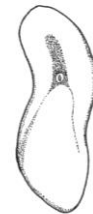


Radicle  $\frac{1}{2}$  or less the length of the cotyledon lobe

### Longitudinal Axis of Seed

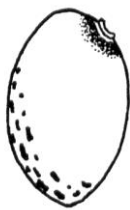


*Melilotus alba* - axis of seed straight



*Medicago sativa* – axis of seed twisted

### General Seed Shape in Lateral View



Oval



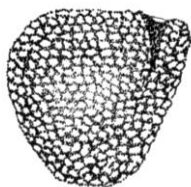
Ovate



Round



Oblong



Triangular



Reniform



Reniform



C-shaped

## Morphological Characters That Aid Identification

(See seed and fruit descriptions for the full range of these characters and others)

Species	# seeds per fruit	Seed surface texture	General seed shape	Long axis of seed	Radicle length relative to cotyledon lobe	Seed mottling
<i>Acmispon glaber</i> [ <i>Lotus scoparius</i> ]	1 – 2	Smooth	Narrowly oblong	Straight	Nearly ½	Most mottled
<i>Kummerowia stipulacea</i>	1	Smooth	Broadly oval	Straight	> ½ the length	None
<i>Kummerowia striata</i>	1	Smooth	Oval to ovate	Straight	> ½ the length	Most mottled
<i>Lespedeza cuneata</i>	1	Smooth	Oval to ovate	Straight	> ½ the length	Some mottled
<i>Lotus corniculatus</i>	>2	Smooth	Oval to round	Straight	½ to nearly equal	Some mottled
<i>Lotus uliginosus</i>	>2	Smooth	Oval to round	Straight	Nearly equal	Some mottled
<i>Medicago arabica</i>	>2	Smooth	Reniform, radicle tip divergent	Twisted	ca. 2/3 the length	None
<i>Medicago lupulina</i>	1	Smooth	Ovate, radicle tip divergent	Straight	ca. 2/3 the length	None
<i>Medicago orbicularis</i>	>2	Tuberculate	Broadly oval to triangular, radicle tip +/- divergent	+/- twisted	Equal	None
<i>Medicago polymorpha</i>	>2	Smooth	Reniform	+/- twisted	ca. ½ the length	None
<i>Medicago sativa</i>	>2	Smooth	Reniform to round, +/- angular	Twisted	ca. 2/3 the length	None
<i>Medicago scutellata</i>	>2	Smooth	C - shaped	Twisted	< ½ the length	None
<i>Medicago truncatula</i>	>2	Smooth	Reniform, cotyledon lobe +/- angular	Twisted	1/3 – ½ the length	None
<i>Medicago turbinata</i>	>2	Smooth	Reniform, cotyledon lobe rounded	Twisted	1/3 – ½ the length	None
<i>Melilotus albus</i>	1	Smooth	Oval	Straight	> ½ the length	None
<i>Melilotus indicus</i>	1	Tuberculate	Broadly oval	Straight	> ½ the length	None
<i>Melilotus officinalis</i>	1	Smooth	Oval	Straight	> ½ the length	Some mottled

## Seed and Fruit Descriptions

### *Acmispon* Raf.

A genus of about 23 species of annual and perennial herbs and shrubs (Brouillet 2012a). Fruit is dehiscent or not, exserted from calyx or not, ovoid to oblong, with or without beak, containing from one to several seeds.

#### *Acmispon glaber* (Vogel) Brouillet [*Lotus scoparius* (Torr. & A. Gray) Ottley] Deerweed

**Seed Unit:** true seed and fruit with accessory structures.

**Seed:** narrowly oblong; hilum on side near midpoint, round, rim aril light colored; surface smooth, dull to lustrous, olive green with prominent dark mottling.

**Fruit:** one or two-seeded, sickle shaped, reddish-brown with light reticulum.



### *Kummerowia* Schindl. and *Lespedeza* Michx.

*Lespedeza* is a genus of approximately 35 species of annual or perennial herbs and shrublets, and *Kummerowia* is a genus of two species of annual herbs (Mabberley 2008). Seed identification is based primarily on color and shape (Musil 1963). The fruits are one-seeded and indehiscent, with the calyx and three scale-like bracts usually remaining attached (Musil 1963).



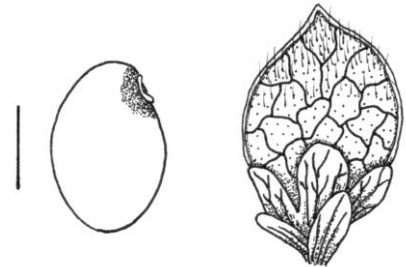
***Kummerowia stipulacea* (Maxim.) Makino**

[*Lespedeza stipulacea* Maxim.]

Korean Lespedeza

**Seed Unit:** true seed and fruit with accessory structures (AOSA 2019).

**Seed:** broadly oval; radicle not divergent; hilum near tip of cotyledon lobe, round, rim aril light colored; surface smooth, glossy, solid purple, pink, or greenish-yellow, lighter colored seed with dark ring around hilum.



**Fruit:** one-seeded, indehiscent; broadly oval, mucronulate, tan colored, sparsely pubescent, reticulum black, prominent, distinct orange glandular dots in interspaces; calyx one-half or less the length of the fruit, lobes broad, obtuse, glabrous.



***Kummerowia striata* (Thunb.) Schindl.**

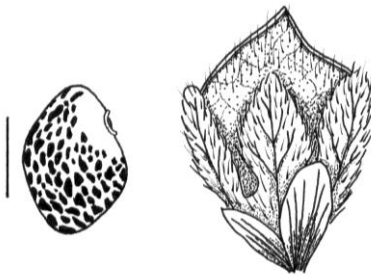
[*Lespedeza striata* (Thunb.) Hook. & Arn.]

Common Lespedeza, Striate Lespedeza

**Seed Unit:** true seed and fruit with accessory structures (AOSA 2019).

**Seed:** oval to ovate; radicle not divergent; hilum on side, round, rim aril light colored; surface smooth, glossy, green to yellow with heavy dark purple to black mottling.

**Fruit:** one-seeded, indehiscent; broadly obovate, acuminate, tan colored, sparsely pubescent, reticulum brown, prominent, distinct orange glandular dots in interspaces; calyx three-fourths the length of the fruit, lobes broad, obtuse, pubescent.



***Lespedeza cuneata* (Dum. Cours.) G. Don**  
 Chinese Lespedeza, Sericea Lespedeza

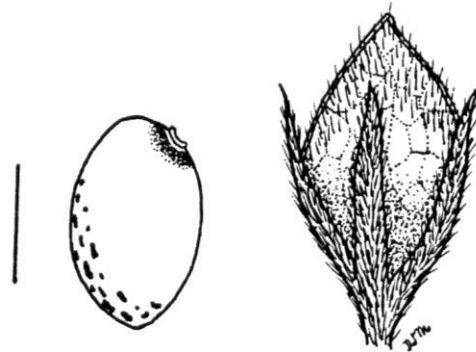


**Seed Unit:** true seed and fruit with accessory structures (AOSA 2019).

**Seed:** oval to slightly ovate; radicle not divergent; hilum on side, round, rim aril light colored; surface smooth, glossy, light green, green or terra cotta with purple or brownish-purple mottling, dark ring around hilum.

**Fruit:** one-seeded, indehiscent; ovate, acuminate, reddish-brown, reticulum faint, white pubescence at apex and along edges; calyx three-fourths the length of the fruit, lobes narrow, acuminate.

**Note:** This species is considered a noxious weed in Kansas, Nebraska and Oklahoma (USDA 2020) and an invasive species by some states.

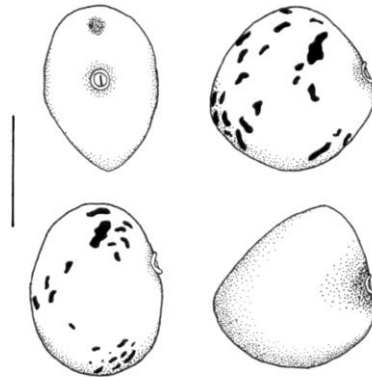


***Lotus* L.**

A genus of approximately 125 species of annual and perennial herbs and shrubs (Brouillet 2012b). Seed size, shape, radicle length relative to the cotyledon lobe, color and presence or absence of a rim aril are major distinguishing characteristics. Fruits are dehiscent or indehiscent, linear to narrowly oblong, with or without beak, and one to many-seeded (Brouillet 2012b).



***Lotus corniculatus* L.**  
Bird's-foot Trefoil

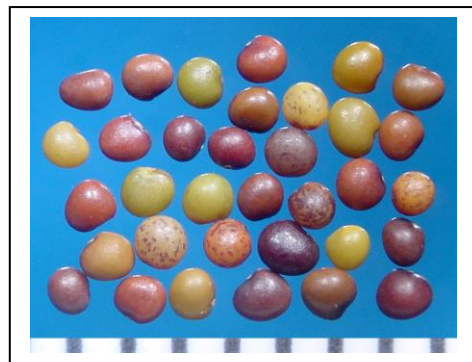
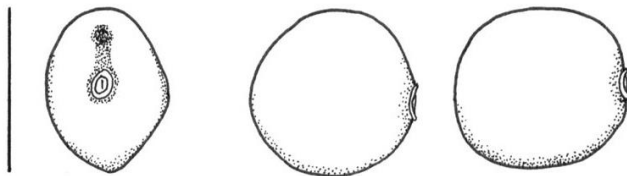


**Seed Unit:** true seed (AOSA 2019).

**Seed:** oval to round; hilum punctiform, rim aril lighter in color than seed coat; surface smooth, dull to lustrous, brown, dark mottled.

**Fruit:** multi-seeded legume.

***Lotus uliginosus* Schkuhr**  
Big Trefoil



**Seed Unit:** true seed (AOSA 2019).

**Seed:** oblong to oval; surface smooth, glossy, tan to brown or green, occasionally mottled; hilum punctiform, rim aril light colored when present.

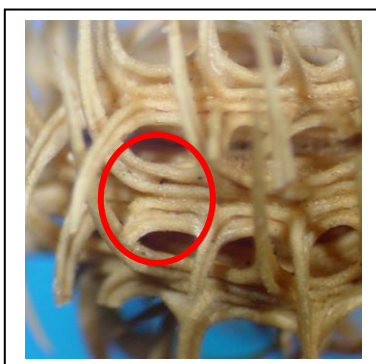
**Fruit:** multi-seeded legume.

## ***Medicago* L.**

A genus of more than 80 species of annual or perennial herbs or shrubs (Mabberley 2008). Identification of *Medicago* seed is primarily dependent upon seed shape, radicle length relative to the cotyledon lobe, degree of radicle divergence, and surface texture (e.g., smooth, rugose or papillose, etc.). Fruits may be one to multi-seeded, short to long, straight, curved or coiled, terete, compressed or flat, spiny, tuberculate, winged, fringed or without appendages. For a detailed description of the seeds and fruits of this genus see Small and Jomphe (1989). Seeds from coiled fruit may be variously compressed and therefore misshapen. Seeds of *Medicago sativa* may be difficult to distinguish from seeds of *Melilotus alba* and *M. officinalis*. The distinction may be made when seeds are viewed on edge along the long axis. *M. sativa* seeds are usually twisted along the long-axis, *Melilotus* seeds are straight (Musil 1963).

### ***Medicago arabica* (L.) Huds.**

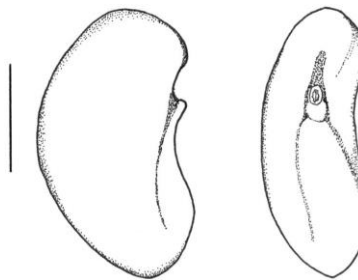
Spotted Burclover, Spotted Medic



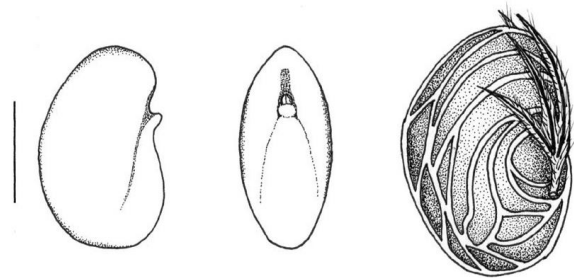
**Seed Unit:** true seed and fruit with attached accessory structures (AOSA 2019).

**Seed:** reniform, slightly twisted in long axis; radicle nearly two-thirds the length of the cotyledon lobe, divergent only at tip, forming a pointed bump below the hilum; hilum punctiform, in marginal notch above midpoint; surface smooth, dull to lustrous, yellow to terra cotta.

**Fruit:** multi-seeded, coiled, coil edge with four ridges alternating with three grooves (circled in red above).



***Medicago lupulina* L.**  
Black Medic

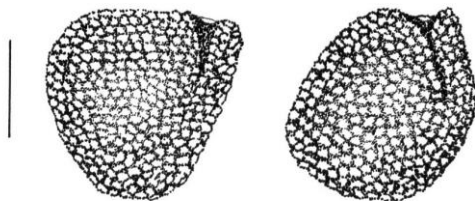


**Seed Unit:** true seed or fruit with attached accessory structures (AOSA 2019).

**Seed:** ovate, both sides smoothly rounded; radicle two-thirds the length of the cotyledon lobe, divergent only at tip, forming a pointed bump below the hilum; hilum punctiform, in marginal notch above mid-point; surface smooth, dull to lustrous, golden-yellow.

**Fruit:** one-seeded, indehiscent, compressed; dull, black, concentrically ribbed, tip twisted in a small coil; calyx usually attached.

***Medicago orbicularis* (L.) Bartal.**  
Buttonclover



**Seed Unit:** true seed (AOSA 2019).

**Seed:** broadly oval to triangular, radicle equal to cotyledon lobe, +/- divergent, surface depressed between radicle and cotyledon lobe; surface tuberculate, dull, reddish-tan to tan; hilum punctiform, in notch between apex of cotyledon lobe and radicle tip, hidden by funicular remnant.

**Fruit:** multi-seeded, coiled, coil edges papery thin, spineless.



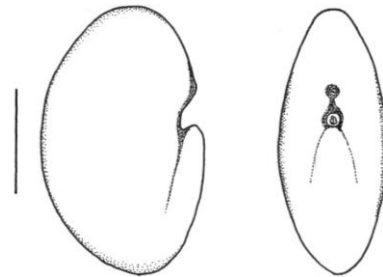
***Medicago polymorpha* L.** [*Medicago hispida* Gaertn.]  
California Burclover



**Seed Unit:** true seed and fruit with attached accessory structures (AOSA 2019).

**Seed:** reniform, +/- twisted in long axis; radicle ca. one-half the length of the cotyledon lobe, not divergent; punctiform hilum, in marginal notch near mid-point; surface smooth, dull to lustrous, yellow to terra cotta; lens a prominent brown bump on cotyledon lobe.

**Fruit:** multi-seeded, coiled, with or without spines; +/- hard at maturity.



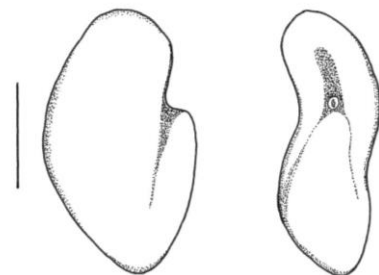
***Medicago sativa* L.**  
Alfalfa, Lucerne



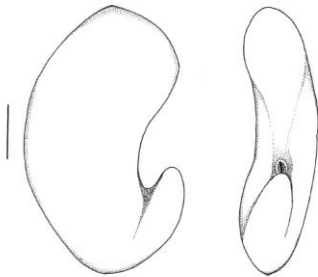
**Seed Unit:** true seed (AOSA 2019).

**Seed:** shape variable, reniform to angular at one or both ends to nearly circular, lumpy on one or both sides, twisted in long axis; radicle nearly two-thirds the length of the cotyledon lobe, tip +/- divergent forming a point below the hilum; hilum punctiform, in marginal notch at or above midpoint; surface smooth, dull, yellow; lens inconspicuous.

**Fruit:** multi-seeded, straight, falcate (sickle-shaped) or coiled.



***Medicago scutellata* (L.) Mill.**  
Snail Medic

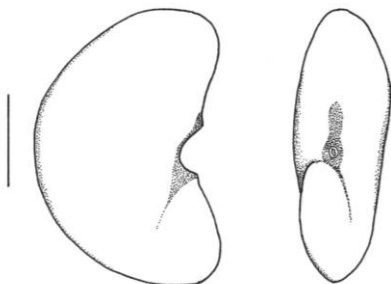


**Seed Unit:** true seed.

**Seed:** C-shaped, twisted in long-axis; radicle less than one-half the length of the cotyledon lobe, widely divergent; hilum punctiform, in deep indentation between radicle and cotyledon lobe; surface smooth, dull, yellow to terra cotta; lens conspicuous.

**Fruit:** multi-seeded, coiled, coils imbricate (overlapping), spineless.

***Medicago truncatula* Gaertn.**  
Barrelclover



**Seed Unit:** true seed.

**Seed:** reniform, cotyledon lobe +/- angular, slightly twisted in long-axis; radicle nearly one-half the length of the cotyledon lobe, widely divergent; hilum punctiform, in deep marginal notch near mid-point; lens dark colored; surface smooth, dull to lustrous, yellow.

**Fruit:** multi-seeded, coiled, spines at right angles to the coil edge; becoming extremely hard at maturity.



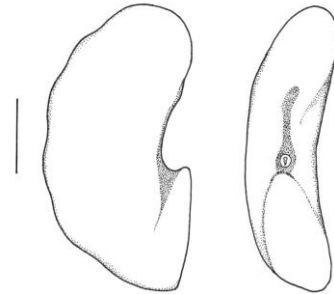
***Medicago turbinata* (L.) All.**  
Cogwheel Medic



**Seed Unit:** true seed.

**Seed:** reniform, cotyledon lobe rounded, twisted in long-axis; radicle nearly one-half the length of the cotyledon lobe, widely divergent; hilum in deep indentation between radicle and cotyledon lobe; surface smooth, dull to lustrous; yellow to orange-yellow, lens +/- dark colored.

**Fruit:** multi-seeded, coiled, spines (when present) sometimes inclined opposite to the direction of coiling; becoming hard at maturity.

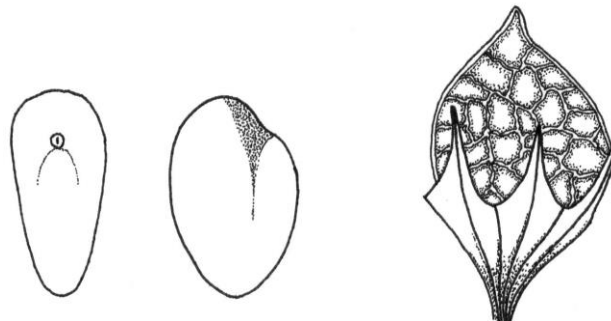


***Melilotus* Mill.**

A genus of twenty annual or biennial herbs (Mabberley 2008). Identification of *Melilotus* seed is primarily dependent upon seed shape, radicle length relative to the cotyledon lobe, degree of radicle divergence, and surface texture (e.g., smooth or tuberculate). The fruits are one or two-seeded and indehiscent, with varying amounts of surface sculpturing (Steele and Isely 2012). The calyx usually remains attached to the mature fruit (Delorit & Gunn 1986).

***Melilotus albus* Medik.**

White Sweetclover, Hubam Sweetclover



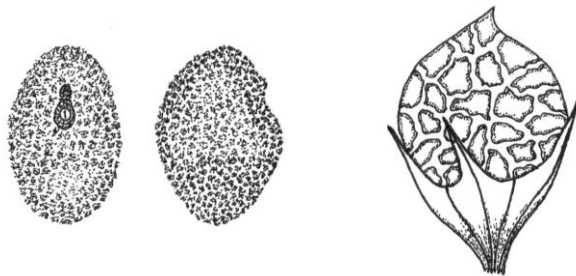


**Seed Unit:** true seed and fruit with attached accessory structures (AOSA 2019).

**Seed:** oval, straight in long-axis; radicle slightly shorter than cotyledon lobe, not divergent; hilum marginal, slightly indented; surface smooth, dull, yellowish-green, prominent light line between radicle and cotyledon lobe; seeds may be indistinguishable from unmottled seed of *M. officinalis*.

**Fruit:** one-seeded, indehiscent; broadly oval, apex mucronate, coarsely reticulate; calyx, when present, covering nearly one-half of the fruit.

***Melilotus indicus* (L.) All.**  
Sourclover



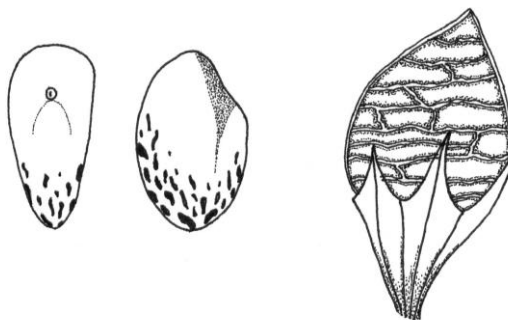
**Seed Unit:** true seed and fruit with accessory structures (AOSA 2019).

**Seed:** broadly oval, straight in long-axis; radicle shorter than cotyledon lobe; hilum in marginal notch, above mid-point, indented; surface tuberculate, dull, dark olive green to terra cotta.

**Fruit:** one-seeded, indehiscent; broadly oval, apex mucronate, very coarsely reticulate, sometimes adherent to seed; calyx, when present, covering nearly one-half of the fruit.



**Melilotus officinalis (L.) Lam.**  
Yellow Sweetclover



**Seed Unit:** true seed and fruit with attached accessory structures (AOSA 2019).

**Seed:** oval, straight in long-axis; radicle slightly shorter than cotyledon lobe, not divergent; hilum marginal, slightly indented; surface smooth, dull, yellowish green with or without varying amounts of purple mottling, prominent light line between radicle and cotyledon lobe; unmottled seed may be indistinguishable from seeds of *M. alba*.

**Fruit:** one-seeded, indehiscent; broadly oval, apex mucronate, transversely ridged; calyx, when present, covering nearly one-half of fruit.

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