

# Identification of Polygonaceae Seed Units

*Emex, Fagopyrum, Fallopia, Koenigia, Persicaria, Polygonum, Reynoutria, Rheum, and Rumex*

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## Polygonaceae Seed Units

The fruit in Polygonaceae is an achene, which is generally 3-sided (occasionally 2-sided), ovoid and glabrous. At maturity, the achene may be enclosed within or subtended by a persistent perianth. During seed lot processing the perianth is usually removed. The seed coat is thin, and the bulk of the seed is comprised of hard and semitransparent or crystalline-granular endosperm (in *Rheum* the endosperm is soft to firm). The embryo is usually in a peripheral position and the cotyledons may or may not be expanded. The approximate number of species for the genera in this study are: *Fagopyrum* – 16; *Fallopia* – 6; *Koenigia* – 60; *Persicaria* – 100; *Polygonum* – 75; *Reynoutria* – 6; *Rheum* – 60; and *Rumex* – 200;. Several Polygonaceae species are considered noxious or objectionable weeds, not only in the United States but elsewhere in the world. Accurate identification of individual fruits may be difficult when the perianth has been removed.

Embryo position is an important character, particularly in the distinction between *Rumex* and *Fallopia*, *Koenigia*, *Persicaria*, *Polygonum*, or *Reynoutria*. In *Rumex* the embryo is located between two angles of the 3-sided fruit/seed, and in *Fallopia*, *Koenigia*, *Persicaria*, *Polygonum*, and *Reynoutria* the embryo is located along one angle.

## Key to Genera

- 1a. Fruit enclosed in woody perianth, with spines – ***Rumex*** (in part)
- 1b. Perianth membranous (see 2a and 2b)
  - 2a. Perianth reduced, mature fruit protruding well beyond the perianth
    - 3a. Fruit wings membranous, extending the entire length of the fruit – ***Rheum***
    - 3b. Fruit, if winged, wings do not extend the entire length – ***Fagopyrum***
  - 2b. Perianth enclosing fruit
    - 4a. Embryo located along angles of seed – ***Fallopia*, *Koenigia*, *Persicaria*, *Polygonum*, and *Reynoutria*** (see character chart)
    - 4b. Embryo located between angles of seed – ***Rumex*** (in part - see character table)

Measurements in the following character tables are based on an average range of individuals and may not include extremely large or small individuals. The width measurements represent the widest point of the fruit. The scale is in millimeters.

Diagnostic Characters for Fruits of *Fallopia*, *Koenigia*, *Persicaria*, *Polygonum*, and *Reynoutria*

Scientific name	Sides of Achene	Greatest Achene Width Location	Achene Length (mm)	Achene Width (mm)	Achene Surface Texture	Achene Color
<b>Achenes mostly 2-sided, occasionally 3-sided</b>						
<i>Persicaria amphibia</i> (L.) Delarbre [ <i>Polygonum amphibium</i> L. var. <i>emersum</i> Michx.]	both convex	at midpoint	2 – 2.5	1.9 – 2.1	smooth & lustrous	reddish brown to nearly black
<i>Persicaria lapathifolia</i> (L.) Delarbre [ <i>Polygonum lapathifolium</i> L.]	concave	at midpoint or slightly below	1.9 – 2.1	1.5 – 2.1	smooth & glossy	light reddish brown to nearly black
<i>Persicaria maculosa</i> Gray [ <i>Polygonum persicaria</i> L.]	2-sided: plane or convex; 3-sided: concave	at midpoint	2 – 2.2	1.5 – 1.75	smooth & glossy	reddish brown to nearly black
<i>Persicaria pensylvanica</i> (L.) M. Gómez [ <i>Polygonum pensylvanicum</i> L.]	plane to slightly arched laterally	at midpoint or slightly below	2.8 – 3	2 – 3	smooth & glossy	dark brown to nearly black
<b>Achenes mostly 3-sided, occasionally 2-sided, 3 sides not equal</b>						
<i>Polygonum argyrocoleon</i> Steud. ex Kunze	plane	below midpoint	1.5 – 2	1.25 – 1.75	smooth & glossy	dark reddish brown
<i>Polygonum aviculare</i> L.	plane to slightly convex	below midpoint	2 – 2.75	1 – 1.75	dull, coarsely roughened, smooth & lustrous on angles; cleistogamous achenes: smooth & glossy	reddish brown
<b>Achenes mostly 3-sided, occasionally 2-sided, 3 sides nearly equal</b>						
<i>Persicaria hydropiper</i> (L.) Delarbre [ <i>Polygonum hydropiper</i> L.]	plane to convex	at midpoint	2.5	1.75 – 2	dull, minutely roughened	reddish brown to nearly black
<i>Persicaria hydropiperoides</i> (Michx.) Small [ <i>Polygonum hydropiperoides</i> Michx.]	plane to slightly concave	at midpoint	2 – 2.5	1.25 – 2	smooth & glossy	reddish brown to nearly black
<i>Persicaria punctata</i> (Elliott) Small [ <i>Polygonum punctatum</i> Elliott]	plane to slightly concave	at midpoint	1.5	1.5 – 1.9	mostly smooth & glossy	reddish brown to nearly black
<i>Koenigia polystachya</i> (Wall. ex Meisn.) T. M. Schust. & Reveal [ <i>Polygonum polystachyum</i> Wall. ex Meisn.; <i>Persicaria polystachya</i> (Wall. ex Meisn.) H. Gross; <i>Persicaria wallichii</i> Greuter & Burdet; <i>Rubrivena polystachya</i> (Wall. ex Meisn.) M. Král]	Not available	at midpoint	2.5	1.5	Not available	Not available
<i>Fallopia convolvulus</i> (L.) Á. Löve [ <i>Polygonum convolvulus</i> L.]	plane	at midpoint	2.8 – 3.5	1.8 – 2.25	mostly dull, minutely roughened, but smooth & glossy on angles	black
<i>Reynoutria japonica</i> Houtt. [ <i>Fallopia japonica</i> (Houtt.) Ronse Decr.; <i>Polygonum cuspidatum</i> Siebold & Zucc.; and others]	plane	at midpoint	2.5 – 3	1.2 – 1.4	smooth & glossy	dark brown to nearly black
<i>Reynoutria sachalinensis</i> (F. Schmidt) Nakai [ <i>Fallopia sachalinensis</i> (F. Schmidt) Ronse Decr.; <i>Polygonum sachalinense</i> F. Schmidt]	plane to slightly concave	at midpoint	3.4 – 3.8	1.5 – 1.75	smooth & glossy	reddish brown

Diagnostic Characters for Fruits of *Rumex*

Scientific name	Shape of Achene	Length (mm)	Width (mm)	Color
<b>Angles of achene obtuse</b>				
<i>Rumex acetosella</i> L.	broadly elliptic, ends blunt	1 – 1.5	1 – 1.25	reddish brown; perianth may remain attached
<b>Angles of achene acute</b>				
<i>Rumex conglomeratus</i> Murray	broadly ovate to triangular; apex tapered to a point	1.25 – 1.9	1 – 1.5	dark reddish brown
<i>Rumex hastatulus</i> Baldwin	elliptic; both ends equally short pointed	1 – 1.5	0.75 – 1	light brown; angles may be darker
<i>Rumex maritimus</i> L. var. <i>persicarioides</i> (L.) R. S. Mitch. [ <i>Rumex persicarioides</i> L.]	narrowly elliptic; both ends equally pointed	1 – 1.5	0.5 – 0.75	light brown
<i>Rumex pulcher</i> L.	broadly ovate to triangular; apex tapered to a point	2 – 2.5	1.2 – 1.9	dark brown; angles darker
<b>Angles of achene acute to narrowly winged</b>				
<i>Rumex acetosa</i> L.	elliptic; both ends equally pointed	1.5 – 2.25	0.75 – 1.5	dark reddish brown; angles lighter
<i>Rumex altissimus</i> Alph. Wood	broadly ovate; apex short pointed	1.8 – 2.8	1.2 – 1.5	dark brown
<i>Rumex crispus</i> L.	broadly ovate; base minutely stipate; abruptly tapered to a point at apex	2 – 2.75	1 – 1.75	reddish brown; angles darker
<i>Rumex obtusifolius</i> L.	broadly ovate; base minutely stipate; evenly tapered to a point at apex	2 – 2.5	1.25	brown
<i>Rumex salicifolius</i> Weinm.	ovate	1.8 – 2	1.2 – 1.75	dark brown
<b>Angles of achene winged</b>				
<i>Rumex occidentalis</i> S. Watson	elliptic; both ends equally pointed	3 – 4	1.5 – 2.25	reddish brown; angles darker
<i>Rumex venosus</i> Pursh	broadly ovate; tapered to a point at apex	6 – 6.75	3.5 – 4	light reddish brown
<b>Achene completely enclosed in hardened and spiny perianth</b>				
<i>Rumex hypogaeus</i> T. M. Schust. & Reveal [ <i>Emex australis</i> Steinh.]	Three sided, triangular to nearly round in cross-section; each face with 4 deep depressions; three straight, stout spines project outward from below the apex; apex usually not taller than the spines	4.5 – 11; not including spines	2.5 – 5.5; not including spines	dull, light to dark straw to brown
<i>Rumex spinosus</i> L. [ <i>Emex spinosa</i> (L.) Campd.]	Three sided, triangular to nearly round in cross-section; each face with 6 or more deep depressions; three straight or recurved, stout spines project outward from below the apex; apex pointed and taller than the spines	4 – 8; not including spines	2.4 – 5; not including spines	dull, light to dark straw to brown

## References

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Musil, A. F. 1963. Agriculture Handbook No. 219. Identification of Crop and Weed Seeds. Sup. of Documents, Washington, D.C. 215 pp.

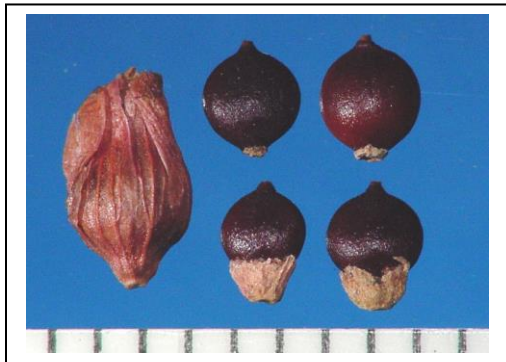
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USDA, NRCS. 2024. The PLANTS Database. National Plant Data Team, Greensboro, NC, USA. <http://plants.usda.gov> [Accessed March 18, 2024].

***Persicaria amphibia* (L.) Delarbre [*Polygonum amphibium* L. var. *emersum* Michx.]**  
**kelp, water smartweed, swamp smartweed**

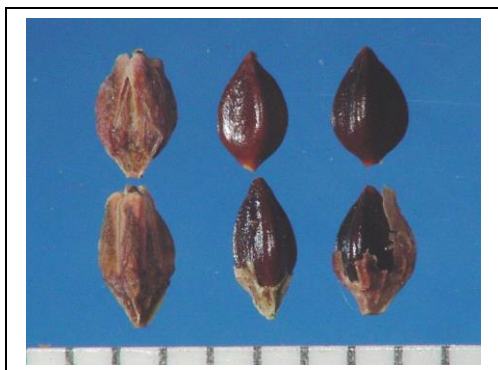


fruit enclosed in perianth (left)  
 achenes, some with perianth remnants (right)

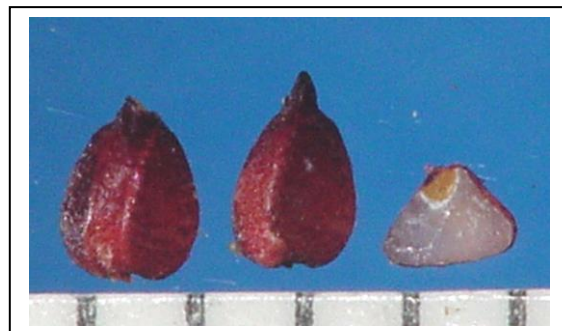


seed (left); cross-section of seed (right)

***Polygonum argyrocoleon* Steud. ex. Kunze**  
**silversheath knotweed**



fruit enclosed in perianth (left)  
 achenes, some with perianth remnants (right)



seed (left); cross-section of seed (right)

***Polygonum aviculare* L.**  
**prostrate knotweed, knotgrass, knotweed**



fruit enclosed in perianth (left)  
 achenes, some with perianth remnants (middle)  
 cleistogamous achenes (right)



seed (left); cross-section of seed (right)

***Polygonum hydropiper* (L.) Delarbre**  
 common water smartweed, redleaf, water-pepper



achenes, some with perianth remnants (top)  
 fruit enclosed in perianth (bottom)



seed (left); cross-section of seed (right)

***Persicaria hydropiperoides* (Michx.) Small** [*Polygonum hydropiperoides* Michx.]  
 false water-pepper, mild water-pepper



fruit enclosed in perianth (left)  
 achenes, some with perianth remnants (right)



seed (left); cross-section of seed (right)

***Persicaria lapathifolia* (L.) Delarbre** [*Polygonum lapathifolium* L.]  
 pale smartweed



fruit enclosed in perianth (left)  
 achenes, some with perianth remnants (right)



seed (left); cross-section of seed (right)

***Persicaria pensylvanica* (L.) M. Gómez [*Polygonum pensylvanicum* L.]**  
**Pennsylvania smartweed**



fruit enclosed in perianth (left)  
 achenes, some with perianth remnants (right)



seed (left); cross-section of seed (right)

***Persicaria maculosa* Gray [*Polygonum persicaria* L.]**  
**ladysthumb, lady's-thumb**

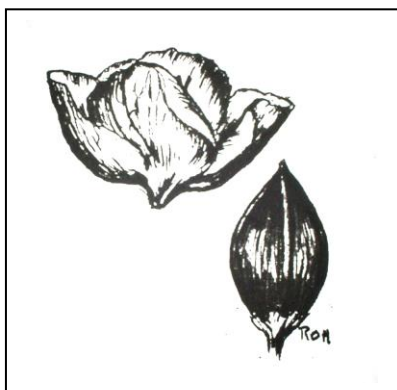


fruit enclosed in perianth (left)  
 achenes, some with perianth remnants (right)



2-sided seed (left); cross-section of seeds middle);  
 3-sided seed (right)

***Koenigia polystachya* (Wall. ex Meisn.) T. M. Schust. & Reveal**  
 [*Polygonum polystachyum* Wall. ex Meisn.]  
**Himalayan knotweed**



fruit enclosed in perianth (top);  
 achene with perianth remnants (bottom)  
 (drawing from USDA Agriculture Handbook  
 No. 498, page 234)



***Persicaria punctata* (Elliott) Small [*Polygonum punctatum* Elliott]**  
**dotted smartweed**



fruit enclosed in perianth (left)  
 achenes, some with perianth remnants (right)

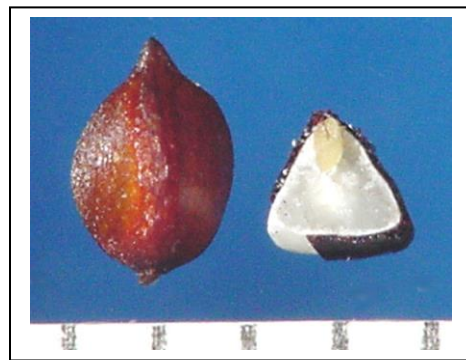


seed (left); cross-section of seed (right)

***Fallopia convolvulus* (L.) Á. Löve [*Polygonum convolvulus* L.]**  
**black bindweed, wild buckwheat**



fruit enclosed in perianth (left)  
 achenes, some with perianth remnants (right)



seed (left); cross-section of seed (right)

***Reynoutria japonica* Houtt.**  
 [*Fallopia japonica* (Houtt.) Ronse Decr.; *Polygonum cuspidatum* Siebold & Zucc.]  
**Japanese knotweed, Mexican-bamboo**



fruit enclosed in perianth (left)  
 achenes, some with perianth remnants (right)



seed (left); cross-section of seed (right)

***Reynoutria sachalinensis* (F. Schmidt) Nakai**

[*Fallopia sachalinensis* (F. Schmidt) Ronse Decr.; *Polygonum sachalinense* F. Schmidt]  
giant knotweed, Sakhalin knotweed



fruit enclosed in perianth (left)  
achenes, some with perianth remnants (right)



seed (left); cross-section of seed (right)

***Rumex acetosa* L.**

sorrel, garden sorrel, sorrel dock, sour dock



achenes



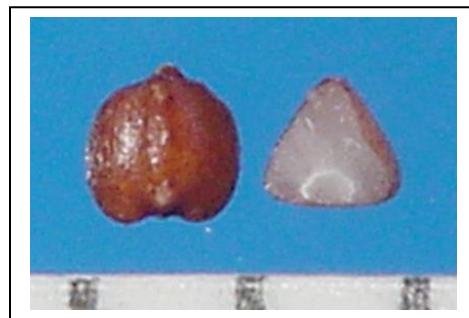
seed (left); cross-section of seed (right)

***Rumex acetosella* L.**

red sorrel, sheep sorrel



fruit enclosed in perianth (left)  
achenes (right)



seed (left); cross-section of seed (right)

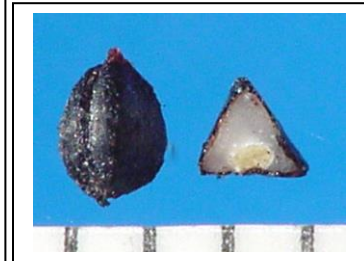
***Rumex altissimus* Alph. Wood**  
pale dock, smooth dock, tall dock



fruit enclosed in perianth



achenes

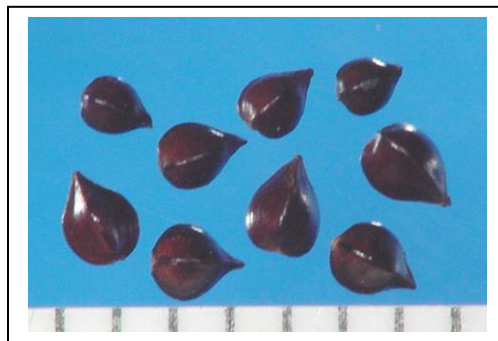


seed (left); cross-section of seed (right)

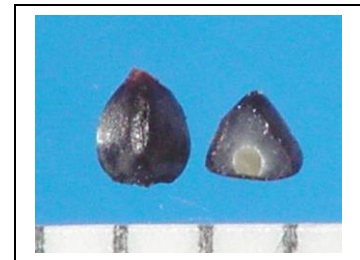
***Rumex conglomeratus* Murray**  
cluster dock, green dock, sharp dock



fruit enclosed in perianth



achenes

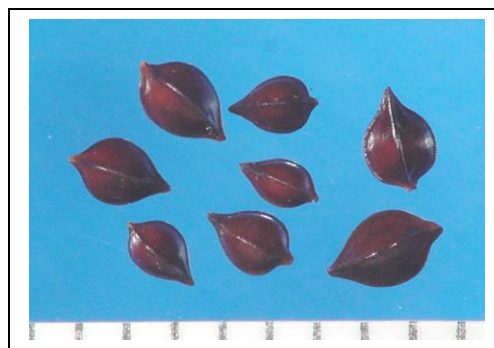


seed (left); cross-section of seed (right)

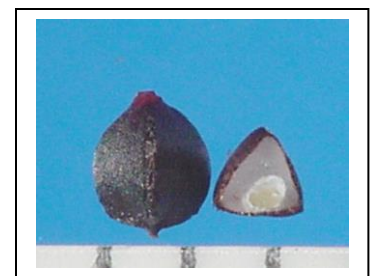
***Rumex crispus* L.**  
curly dock, sour dock, yellow dock



fruit enclosed in perianth



achenes

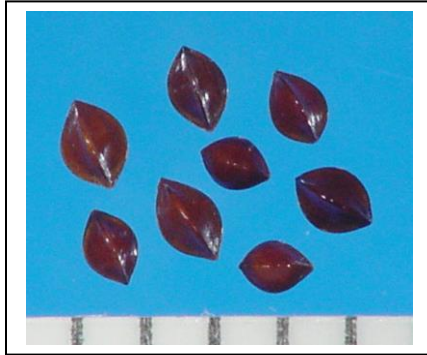


seed (left); cross-section of seed (right)

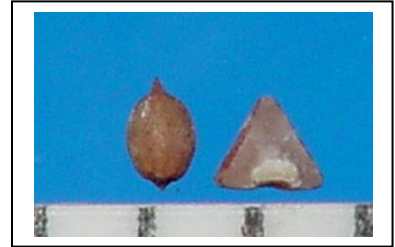
***Rumex hastatulus* Baldwin**  
heartwing sorrel



fruit enclosed in perianth



achenes



seed (left); cross-section  
of seed (right)

***Rumex obtusifolius* L.**  
bitter dock, broadleaf dock



fruit enclosed in perianth



achenes



seed (left); cross-section  
of seed (right)

***Rumex occidentalis* S. Watson**  
western dock



fruit enclosed in perianth

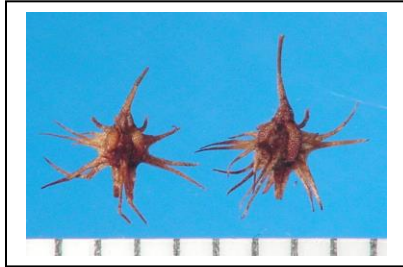


achenes



seed (left); cross-section  
of seed (right)

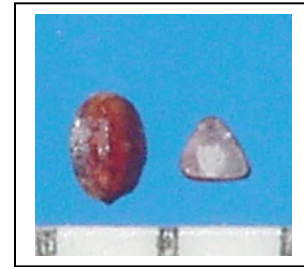
***Rumex maritimus* L. var. *persicarioides* (L.) R. S. Mitch. [*Rumex persicarioides* L.]  
golden dock**



fruit enclosed in perianth



achenes

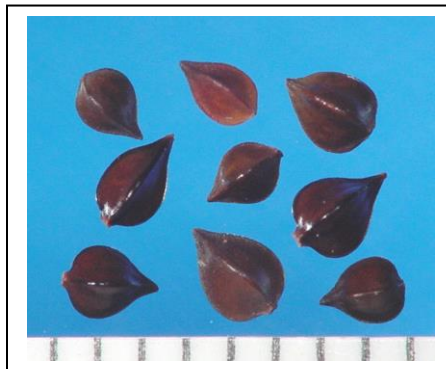


seed (left); cross-section  
of seed (right)

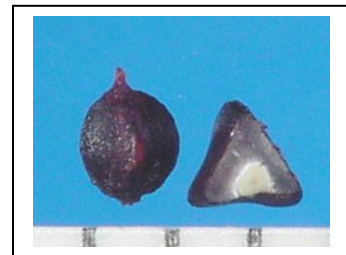
***Rumex pulcher* L.  
fiddleleaf dock, fiddle dock**



fruit enclosed in perianth



achenes



seed (left); cross-section  
of seed (right)

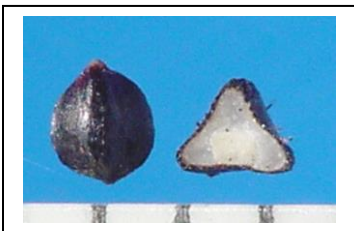
***Rumex salicifolius* Weinm.  
willowleaf dock**



fruit enclosed in perianth



achenes



seed (left); cross-section  
of seed (right)

***Rumex venosus* Pursh**  
wild begonia, veiny dock, winged dock, wild hydrangea



achene (left); seed (right)

***Fagopyrum esculentum* Moench**  
buckwheat



achenes, some with perianth remnants



seed (left); cross-section of seed (right)

***Fagopyrum tataricum* (L.) Gaertn.**  
Tartary buckwheat, duckwheat



achenes, some with perianth remnants



seed (left); cross-section of seed (right)

***Rheum xrhubarbarum* L. [*Rheum xhybridum* Murray; *R. rhaponticum* auct.]**  
rhubarb, pieplant



winged fruit enclosed with perianth attached



cross-section of winged fruit

***Rumex hypogaeus* T. M. Schust. & Reveal [*Emex australis* Steinh.]**  
emex, three-cornered Jack, spiny emex, doublegee



fruit enclosed in woody perianth tube

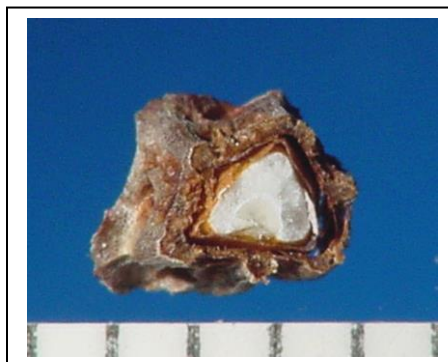


cross-section of fruit enclosed in woody perianth tube

***Rumex spinosus* L. [*Emex spinosa* (L.) Campd.]**  
spiny emex, devil's-thorn, lesser Jack



fruit enclosed in woody perianth tube



cross-section of fruit enclosed in woody perianth tube