

- A. Seeds rufous (with a white coating), small ($0.82-1.00^{\text{mm}}$ long), one angle acute, the others mostly obtuse: capsule small (1.25^{mm} long), ovate, rather acutely angled, glabrous or hairy: flowers in lateral clusters: stems prostrate (or erect in *E. glyptosperma*).

Seeds strongly furrowed, angles usually crenate: stems and capsule glabrous, the latter acutely angled: appendages white. *E. glyptosperma*.
Seeds lightly furrowed: stems and capsule hairy.

Leaves elliptical ($12-14^{\text{mm}}$ long): seeds nearly without furrows, granulate: involucre cleft down one side. - *E. humifusa* Engelm.

Leaves oblong-linear (9^{mm} or less): seeds transversely furrowed, slightly cellular-papillose: involucre not cleft; appendages usually pink.

E. maculata L.

- B. Seeds black (with a white coating), larger ($1.12-1.25^{\text{mm}}$ long): capsule larger ($1.75-2.25^{\text{mm}}$ long), glabrous: flower clusters terminal: stems erect, ascending or decumbent.

Capsule ovate (2.25^{mm} long), rather sharply angled, rounded at summit: seeds oval, very obtusely angled (1.77^{mm} wide), covered with short and sharp irregular ridges: stems erect or ascending, stout, glabrous or nearly so ($25-40^{\text{cm}}$ long): leaves $20-35^{\text{mm}}$ long, dark-green, usually with a central red spot - - - - - *E. nutans* Lag.

Capsule very broadly oblong or broadly oval, smaller (1.75^{mm} long, 2^{mm} wide), retuse, very obtusely angled: seeds oblong, more acutely angled ($0.67-0.70^{\text{mm}}$ wide) and with a few shallow furrows or nearly even: stems slender, diffusely much branched, decumbent, hirsute: leaves smaller ($8-18^{\text{mm}}$ long), light-green, rarely with a central red spot.

E. hirsuta (Torr.)

— KARL MCKAY WIEGAND, *Cornell University*.

EXPLANATION OF PLATE III. — Fig. 1, *E. hirsuta*, plant natural size. Fig. 2, involucre. Fig. 3, capsule. Fig. 4, same in cross section, Fig. 5, seeds. Figs. 6 and 7, capsule of *E. nutans*. Fig. 8, seeds of the same.

CEDEMA IN ROOTS OF SALIX NIGRA.

MANY species of *Salix* when growing along streams or ponds will form masses of roots differing much from those growing in the soil. The roots arise, as a rule, from near the base of the trunk. They are long and straight and have but few branches. Their structure is somewhat modified because of their unusual environment. Around the central cylinder is a loose cortex of parenchymatous cells supplied with



EUPHORBIA HIRSUTA (Torr.) Wiegand.

numerous intercellular spaces. In roots of this kind, particularly of ash and *Gleditschia*, one oftentimes finds water lenticels. While looking over a mass of such roots of *Salix nigra* for lenticels I found some white structures which were taken for lenticels. At points from 5 to 10^{mm} from the root tips, small white protuberances occurred, sometimes as many as four on one root tip. The root at this point has a cortex particularly well supplied with intercellular spaces. Sections made through the white cushions presented a condition reproduced in the accompanying figures. At *a* the cortex is seen in its normal condition. *Fig. 1b* shows some of the inner cells radially elongated, and at one point the elongation has been sufficient to burst the epidermis. In *fig. 2* this condition is still more marked. Some of the cells have increased to many times their normal size, leaving large spaces between them. It is evident that these structures have nothing in common with lenticels, but partake of the nature of oedemata, resembling those described by Atkinson for the tomato and apple.¹

In those cases the oedema was ascribed to a high turgor brought about by too great root absorption and lowered transpiration. The willow, from which the affected roots were taken, stands at the edge of a pond and has but few of its roots in the water. There had been a week of very warm weather, followed by almost freezing temperature. The leaves had all fallen some two weeks before. The roots were collected during the cold weather, and when examined the oedemata appeared to have been but recently formed. In seeking for an explanation for these oedemata I am inclined to ascribe them to causes similar to those given for the apple, brought about by different conditions. During the week of warm weather, with a soil tem-

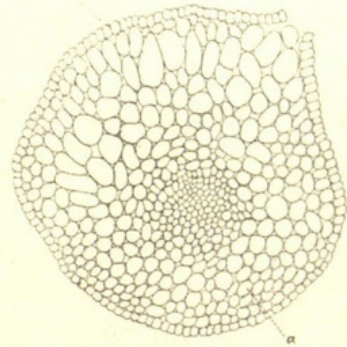


FIG. 1. Transection through root of *Salix nigra* 5^{mm} from the tip; *a*, normal cortex; *b*, elongated cells.

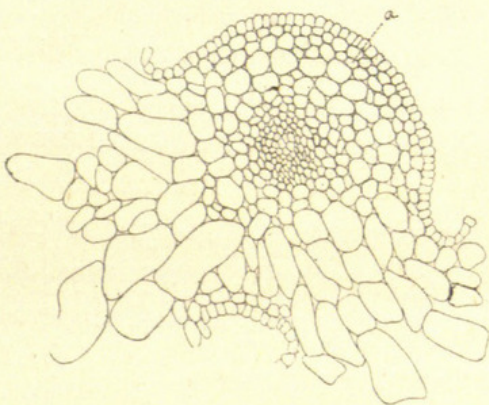


FIG. 2. Transection through advanced stage of a cushion 5^{mm} from the tip.

¹ Cornell University Exp. St. Bull. no. 53, May 1893, and no. 61, Dec. 1893.



Von Schrenk, Hermann. 1897. "Ædema in Roots of Salix Nigra." *Botanical gazette* 24(1), 52–54. <https://doi.org/10.1086/327553>.

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