

Death Camas—Early Grazing Can Be Hazardous

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It is important to understand species of *Zigadenus* (death camas) because they cause losses to livestock producers in the western United States. All death camas species are assumed to be toxic; however, variation in toxicity exists between species and even within species depending on season, climate, soils, and geographical location (Kingsbury 1964). Poisonings in sheep, cattle, horses, pigs, fowl, and humans have been reported (Kingsbury 1964, Wagstaff and Case 1987). The largest losses generally occur in sheep. Sheep are primarily affected because of their tendency to select forbs, particularly in early spring when they are turned onto range before grasses have had much growth.

Death camas is generally not palatable to livestock but is one of the earliest species to emerge in the spring. Poisoning most frequently occurs in spring when other more palatable forage is not available, or on overgrazed ranges where there is a lack of more desirable forage. Poisonings have resulted due to management errors in which hungry animals were placed in death camas infested areas (Panter et al. 1987).

Description, Habitat, and Geographical Distribution

Foothill death camas is typical of the 15-20 species of *Zigadenus* in North America and Asia. It is difficult to distinguish between species because they are taxonomically similar. A member of the lily family, death camas is a perennial, glabrous herb with basal V-shaped grass-like leaves growing from an onion-like bulb with a dark-colored outer coat. Stems produced at flowering are single, unbranched, sparingly leafed and terminated by a



Zigadenus paniculatus (foothill death camas).

terminal raceme of greenish-white, cream colored or pink inflorescence. The perianth is 6-membered, consisting of 3 lanceolate or ovate sepals and 3 petals separate or united below, with 1 or 2 glands just above the base; stamens 6; styles 3; floral parts are persistent but winter as the fruits develop. The seed is a 3-cavitated capsule, separating into 3 members and opening inwardly at maturity (Kingsbury 1964, Muenscher 1975). Death camas is easily confused with wild onion or mariposa lily, particularly before flowering. Wild onions are distinguished by tabular leaves and their odor. Mariposa lilies have leaves more U-shaped in cross-section.

Death camas is prevalent in the western part of North America and is native to the open plains and hills of the U.S. Table 1 lists ten species of death camas with available information about common name, geographical distribution, growth period and habitat.

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Toxicity of Death Camas for Livestock

Clinical signs of toxicity are similar in all livestock poisoned by *Zigadenus*, irrespective of the species of plant involved (Kingsbury 1964). Excessive salivation is noted first, with foamy froth around the nose and muzzle which persists, followed by nausea and occasionally vomiting in ruminants (Kingsbury 1964, Panter et al. 1987). Intestinal peristalsis is dramatically increased, accompanied by frequent defecation and urination. Muscular weakness with accompanying ataxia, muscular fasciculations, prostration and eventual death may follow. The pulse becomes rapid and weak, and the respiration rate increases but the amplitude is reduced. Some animals become cyanotic and the spasmodic struggling for breath may be confused with convulsions. The heart fails before respiration, and at necropsy the heart is always found in complete dias-

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Table 1. *Zigadenus* spp.; common name, distribution, habitat and growth periods.

Species	Common name	Distribution	Habitat	Growth period
<i>Z. venenosus</i>	Meadow death camas	Washington, Oregon, Idaho, Montana, and North Dakota, south to Nebraska, Utah, Colorado, Nevada, California and north into Western Canada	Plains, prairies, and open coniferous woods	May-July
<i>Z. nuttallii</i>	Nuttall's death camas	Tennessee, Arkansas, Oklahoma, Kansas, and Northern Texas	Prairies and rocky sites	April-June
<i>Z. gramineus</i>	Grassy death camas	Southwestern Canada, Montana, Idaho, Washington, south through Wyoming, Colorado, Utah, Nevada, Arizona, and New Mexico	Open hills and plains	April-July
<i>Z. elegans</i>	White camas	Alaska, Western Canada, Montana, south into Arizona and east into Minnesota and Iowa	Prairies and meadows	June-August
<i>Z. paniculatus</i>	Foothill death camas	Eastern Washington, Oregon, Idaho, Utah, Wyoming, Nevada, eastern California, northern Arizona and New Mexico	Foothills and benches	May-July
<i>Z. densus</i>	Black-snakeroot, crow poison	Southeastern United States	Damp soils, pine woods and bogs	May-June
<i>Z. fremontii</i>	---	Southwestern Oregon and California	Dry grassy or brushy slopes	---
<i>Z. glaberrimus</i>	---	Southeastern United States	Savannas and wet pine lands	July-Sept.
<i>Z. glaucus</i>	White camas	Quebec, Canada, south into Nebraska and east through Minnesota, New York, Ohio, Indiana, Illinois and Mountains of Virginia and North Carolina	Calcareous gravelly soils, cliffs, and bogs	July-Sept.
<i>Z. leimanthoides</i>	---	Southeastern United States and coastal plains of Delaware, New Jersey and Rhode Island	Sandy pine lands and bogs of the coastal plains	June-Aug.

Table adapted from Kartesz and Kartesz 1980; Kingsbury 1964; and Fernald 1950.

tole. A comatose period may range from a few hours to a few days before death.

Pathological lesions are those of pulmonary congestion. Gross lesions of sheep include severe pulmonary congestion, hemorrhage, edema, and subcutaneous hemorrhage in the thoracic regions. Microscopic lesions include severe pulmonary congestion with infiltration of red blood cells in the alveolar spaces and edema. Diagnosis of poisoning may be established by clinical signs of toxicity, evidence of death camas being grazed, histopathological analysis of tissues from necropsied animals, and identification of death camas in the rumen or stomach contents (Panter et al. 1987).

Similarity in clinical signs of toxicity between certain species of these plants suggest the same alkaloids are present; however, differences in concentrations can explain the differences in relative toxicity of different species (Table 2).

Table 2. Relative toxicity of 5 *Zigadenus* spp. to sheep.

<i>Zigadenus</i> Species	Average Minimum Toxic Dose*	Average minimum Lethal Dose*
<i>Z. gramineus</i>	0.4	0.6
<i>Z. paniculatus</i>	1.0	2.5
<i>Z. venenosus</i>	0.4	2.0
<i>Z. elegans</i>	2.0	6.0
<i>Z. nuttallii</i>	0.2	0.5

Table adapted from Kingsbury (1964).

*Pounds of green plant per 100 pounds of body weight.

Management and Prevention

Conditions conducive to poisoning by death camas include driving animals through death camas infested ranges; not allowing animals to graze selectively, unloading hungry animals in infested areas; lambing, bedding, watering or salting livestock in death camas-infested

areas; or placing animals on range where little forage is available. Poisoning generally occurs in the early spring when death camas is the first green forage available and the young immature foliage is the most toxic. One-time losses of 500 sheep have been reported (Kingsbury 1964). A recent case was reported in which over 250 sheep died from death camas poisoning (Panter et al. 1987). Eighty percent of the dead sheep were 80-90 pound lambs. Losses involving fewer animals may occur. In the case reported by Panter et al. (1987), three important factors contributed to the loss: (1) ewes with lambs were driven through a death camas area when the sheep were hungry; (2) the sheep were bedded down for the night near the death camas area so that the death camas was the first available forage in the morning; and (3) the herder, on finding the sick sheep, panicked and rapidly drove the animals from the area. This additional stress on the affected animals probably exacerbated the effects and increased the losses.

Important factors to consider in plant poisoning include:

1. Understand and recognize plants on your range and know the potential hazards of grazing where poisonous plants grow. Know the conditions under which poisoning may occur.
2. Don't introduce unfamiliar animals onto ranges where poisonous plants may present a hazard.
3. Avoid introducing animals to poisonous plant-infested ranges when adequate, good quality forage is not available.
4. Don't overstock your range.

5. Avoid bedding, lambing, watering, or salting livestock near heavy stands of poisonous plants.

6. Avoid excess stress to those animals showing clinical signs of poisoning.

7. Control poisonous plants if economically feasible.

Death camas can be controlled using 2,4-D at rates of 4 and 6 pounds per acre early in the growth stage (6-8 inches) before bloom. Prevention of poisoning from death camas is a matter of good management practices. Determine if death camas is present and abundant on your range, identify the conditions contributing to poisoning, and avoid these situations. If the problem is persistent and severe, spraying, or altered grazing programs may be implemented to prevent future losses.

Literature Cited

- Barkley, T.M., R.E. Brooks, and E.K. Schofield. 1986.** Flora of the Great Plains, University Press of Kansas, Lawrence, KS. p. 1257-1258.
- Fernald, M.L. 1950.** Gray's Manual of Botany, American Book Co. New York, NY. p. 426-427.
- Kartesz, J.T., and R. Kartesz. 1980.** A Synonymized Checklist of the Vascular Flora of the United States, Canada and Greenland. Vol II The Biota of North America, University of NC Press, Chapel Hill, NC, p. 280.
- Kingsbury, J.M. 1964.** Poisonous Plants of the United States and Canada. Prentice Hall Inc., Englewood Cliffs, NJ. p. 461-466.
- Muenschner, W.C. 1975.** *Poisonous Plants of the United States*, Collier Books, NY p. 44-47.
- Panter, K.E., M.H. Ralphs, R.A. Smart, and B. Duelke. 1987.** Death camas poisoning in sheep: A case report. *Vet. and Human Tox.* 29:45-48.
- Wagstaff, D.J., and A.A. Case. 1987.** Human Poisoning by *Zigadenus*. *Clin. Tox.* 25:361-367.

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