

## TOXIC EFFECTS AND IDENTIFICATION OF TOXIC WEEDS

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**Abstract:** One of the potential problems that can affect the quality of forage is toxic weeds. In California, the two weeds which cause the greatest concern are fiddleneck (*Amsinckia intermedia*) and common groundsel (*Senecio vulgaris*). These plants contain pyrrolizidine alkaloids which can have deleterious effects on livestock. The most sensitive livestock species is the horse. Ruminants are less sensitive to the toxic effects. The toxic effects to animals are cumulative, thus prevention of toxicity is the only cure. Both of these potentially hazardous weeds can be readily identified in fresh forage and in hay.

**Keywords:** Fiddleneck; Groundsel; Livestock; Toxic; Identification.

### INTRODUCTION

The presence of toxic weeds in forages is of concern because they decrease forage quality and have the potential to cause livestock toxicity. The most common toxic weed problems in California are caused by plants which contain substances known as pyrrolizidine alkaloids (PA's). The two plants that are of greatest concern are fiddleneck (*Amsinckia intermedia*) and common groundsel (*Senecio vulgaris*). The PA content of these plants ranges from less than 0.5% up to 1.2% dry weight. The concentration of PA's differs in the plant parts such that flowers and seeds > leaves > stems > roots. The plants contain PA's at all stages of growth, and the PA's are resistant to heat and drying. Thus, these plants are potentially toxic if they appear in sufficient quantity in hay.

### TOXIC EFFECTS IN ANIMALS

The PA's toxic action is mainly exerted in the liver, but depending on the animal, the kidney and lungs may also be affected. The toxic effects of the PA's are due to their metabolism by the liver. When they are metabolized in the liver, they are activated to a more toxic product that is responsible for damaging the liver cells. The PA's are considered to be carcinogenic and also have the ability to cause reproductive toxicity. Most of the toxic effects of the PA's can be traced to their primary effect on liver cells. The clinical signs of PA intoxication of animals are signs of progressive liver failure.

Cattle and horses are the most sensitive species to the toxic effects of the PA's. Pigs and chickens are less sensitive than cattle and horses, and sheep, goats and turkeys are the least sensitive. Young animals are more sensitive than mature ones. Numerous feeding trials have been conducted in livestock and the results of these trials are somewhat confusing. It is clear that the PA's produce a classical time-dose-response toxicity picture. Thus a high dose of PA containing plants will produce toxicity within a short time period, and lower doses will take longer to produce the same effects. Animals which have been poisoned by PA's show characteristic pathology when tissues are examined. The effects on the liver are easily recognized by a veterinary pathologist. Because of the long delay between exposure and the appearance of toxicity, it is often difficult to tell just when an animal was exposed. The toxic effects are not reversible thus prevention is the only cure.

The clinical signs of PA intoxication vary from species to species. In cattle, common signs are dull haircoat, dry muzzle, poor conditioning, photosensitization, diarrhea, rectal prolapse, and depression. In horses, the neurological signs predominate as they gradually lose condition, lose their appetites, become depressed and wander aimlessly (Walk-about Disease). In sheep, acute deaths are rare, but the liver damage may predispose them to copper toxicity. In goats, the clinical signs are similar to those in cattle, but the amounts required to cause toxicity are much greater.

It is presumed that there is a no-effect-level for PA containing plants, and it is felt to be about 5% of the total ration. Because the PA content of PA containing plants varies so much due to weather conditions and other factors, a lower level of less than 2.5%

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is felt to be safe for the more sensitive species (cattle and horses). Because of the cumulative toxic effect of the PA's, many owners of horses will not accept any noticeable contamination. The goat is one of the most resistant species and must consume a quantity of PA containing plants equal to its body weight before poisoning is seen.

Another concern with the PA containing plants is that the PA's are excreted into milk. Studies have shown that small quantities of PA's are excreted into milk by cattle and goats that are fed PA containing plants. It is also known that the PA's can cause toxic effects in humans. PA's are not found in muscle tissues from animals fed PA containing plants before slaughter and thus are not a meat residue concern.

#### IDENTIFICATION OF FIDDLENECK AND GROUNDSEL

Both fiddleneck and groundsel are easily identified when the plants are mature and fresh. Identification at an earlier stage of growth is slightly more difficult, but still easily achieved. Seedling fiddleneck has forked cotyledons which are characteristic, and as the plant becomes larger, the leaves and stems are covered with coarse hairs. Seedling groundsel is more difficult to identify, but has a strong taproot and a narrow leafed cotyledon. The first true leaves have step-like, shallow teeth, and the later leaves are more deeply lobed. Control of these weeds is necessary when they are young, so early identification is necessary.

Identification of fiddleneck and groundsel in hay is surprisingly, quite easy even though the plants tend to break up after drying. The stems of fiddleneck have a raspy feel, and small hairs can easily be seen with a hand lens. In addition, the bristle bases are whitish, and the dried leaves are a cinnamon color. The coiled flower heads are also a diagnostic sign. To identify groundsel in hay it is necessary to use a hand lens. The fuzzy seed heads are the first indication, and when viewed with a hand lens, they have tarry bracts at the base of the seedhead. These black bracts can be readily identified even in badly crushed specimens. One plant that looks similar to groundsel when it is dried in hay is sowthistle. Sowthistle does not have tarry bracts at the base of the seedheads, and the leaves partially wrap around the stems where they meet. The seed heads of sowthistle are also larger than those of groundsel.

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