# Using Big Game Repellant[1] To Protect *Acacia Koa* Seedlings From Cattle

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*In three different trials, Big Game Repellant provided an effective spray period of only about 3 weeks, an insufficient time to make the treatment practical.*

Acacia koa, Hawaii's most valuable native timber tree, grows to large sizes, with some trees reaching 150 feet in height and about 10 feet in diameter. The technical wood properties of koa are similar to those of black walnut (*Juglans nigra*) (*1*).

Koa forests are not as extensive as they once were. Since the early 1920's, an estimated 100,000 acres of koa forests have been cleared for range. Cattle in the forests or in partially wooded pastures prevent koa regeneration by eating all the seedlings and sprouts that they can reach.

Ranchers realize that having koa on their land is an asset, not only because of its timber value, but also because of the increase in shade, soil moisture, and nitrogen that results. Koa is a legume and so adds nitrogen to the soil, which benefits the grass. Koa is also effective in intercepting moisture from the clouds that sweep through forests during many afternoons. Water falls from the koa leaves as fog drip and this water also benefits the grass. One rancher estimates that the carrying capacity of much of this range could be doubled if koa forests were reestablished.

Koa stands have been reestablished by planting seedlings and by natural regeneration within fenced areas. Fences, however, are expensive to build and maintain.

This paper describes three trials designed to assess whether or not Big Game Repellant (BGR), an animal repellant used in California and elsewhere to protect forest tree seedlings from deer and elk, could protect koa seedlings from cattle browsing.

## Methods

All the koa seedlings used in the three trials were grown at the Hawaii Division of the Forestry Central Tree Nursery on the Island of Hawaii. The containerized seedlings, averaging about 14 inches in height, were dibble-planted. Test sites in the pastures of the Kukaiau Ranch, Island of Hawaii, were located at about 4,500 feet elevation where annual rainfall averages about 72 inches. Rainfall during the trials, however, was about 175 percent of normal. Ample grass was available to the Hereford cattle to sustain them, so that browsing of koa seedlings resulted from the animals' preference for koa.

The BGR formulation, consisting of putrescent whole egg solids and a carrier, was sprayed on the seedlings with a backpack sprayer. The seedlings in all three trials were dry and the weather was such that the BGR dried rapidly on the leaves. Seedlings were sprayed to the point of runoff. During all three trials, it was obvious to those applying the spray that the active ingredients were potent because of the offensive odor during spraying.

The first trial consisted of 100 sprayed and nonsprayed seedlings. These seedlings were sprayed in the nursery and planted within 2 hours after spraying. Twenty-five of each of the sprayed and nonsprayed seedlings were planted in a fenced exclosure to assess the effects of BGR on the survival and growth potential of koa seedlings. The remainder of the seedlings were planted in a pasture. Because cattle were not scheduled to be moved to that pasture for about a month, a second trial was established 2 days later in a pasture with cattle present. This trial consisted of 30 of each of the sprayed and

[1]Big Game Repellant is manufactured by McLaughlin Gormley King Company, Minneapolis, Minn.

nonsprayed seedlings. These were randomly selected, sprayed, and planted as were the seedlings in the first trial. About a month later, in a third trial, 100 seedlings were planted in a pasture with cattle. After planting, 50 seedlings were randomly selected and sprayed. Once the BGR had dried on the seedlings, they were resprayed to ensure good coverage. The potency of the active ingredient was again obvious.

Seedlings in the first trial were examined 1 month after planting to assess survival and growth, then examined weekly after cattle were put into the area. Seedlings in the second and third trials were examined weekly for cattle damage.

**Results and Discussion**

Initial seedling survival, growth, and vigor were not affected by treatment with BGR. After 1 month, both sprayed and nonsprayed seedlings had about the same survival rate of 95 percent, about the same number of stems with new growth (about 55 percent), and about the same number of stems with average or better vigor (about 80 percent).

Initially, BGR protected the koa seedlings from cattle. In the second and third trials, almost all nonsprayed seedlings were damaged—tops eaten or broken, or plants uprooted, within a week after planting. Sprayed trees were not damaged; however, this protection was short-lived. After only about 3 weeks, 99 percent of the sprayed seedlings had been damaged too. At this time, odor from the spray was no longer noticeable on the seedlings. Perhaps the rain, or the high level of ultraviolet radiation at the study sites' elevation, or both, diminished the effective lifespan of the BGR. About a month after the first trial seedlings were planted, cattle were put in the pasture. Within several days, 99 percent of the sprayed and nonsprayed trees were damaged. The few undamaged seedlings were apparently overlooked by the cattle. No odor from the spray was apparent on either the damaged or undamaged sprayed trees.

Because its effectiveness in protecting koa seedlings from cattle is short-lived, BGR is not a practical treatment. An ideal treatment should last 8 to 10 weeks. By then, new growth should make retreatment necessary anyway. If cattle were moved to a new pasture after another 8 to 10 weeks, only two sprayings would be necessary to protect seedlings successfully. Such a spray system might be more economical than building fences. Other chemical repellants need to be tested to assess their potential as aids to successful establishment of koa seedlings.

**Literature Cited**

1. Skolmen, Roger. Wood of koa and black walnut similar in most prop erties. U.S. Dep. Agric. For. Serv. Res. Note PSW-164. Honolulu, HI: Pac. Southwest For. and Range Exp. Stn. 1968; 4 p.