

Vines and Ovines: Using SHEEP with a trained AVERSION to grape leaves for spring VINEYARD floor management.

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Traditional vineyard floor management practices have limitations and potentially undesirable consequences. Herbicide applications can reduce surface and ground water quality, especially when applications are made during the rainy season. Volatilization and drift can damage developing grape buds and shoots if applications are made after bud emergence. Mowing and tillage are commonly utilized in late winter or early spring, but can be delayed if excessive rain prevents tractor access into the vineyard. Such delays can affect vine development by allowing vegetation to compete with the vines for soil nutrients and by increasing the risk of frost damage.

Sheep grazing is a cultural practice to manage the vineyard floor that is growing in use and acceptability. Several vineyards in California's wine growing regions have been experimenting with sheep grazing and have adopted the practice to supplement other floor management practices. Sheep can eliminate the need for herbicides, and they can be used in vineyards rain or shine. Currently, the biggest impediment to their use is the fact that sheep like to browse the spring growth of grapevines. Some vineyards work around this problem by using Babydoll Southdown sheep, which are too short to reach the vines. Vineyard managers are pleased with the results, but the use of these miniature sheep is very limited due to their rarity and consequent high price. Other vineyards are using normal commercial sheep, but only by placing electric fencing around each vine row or by limiting grazing to times of the year when the vines are not susceptible to sheep damage, such as between the time of harvest and the emergence of new spring growth.

Training sheep to have a dietary aversion to grape leaves will extend the time sheep can graze in vineyards through the spring months when weed and cover crop vegetation grow most vigorously. Expanding the time during which sheep can graze in vineyards should make this practice attractive to more growers. Sheep grazing is a reduced risk alternative to herbicide applications and is an attractive option for sustainable, organic and biodynamic grape production programs, which are becoming more popular among wine grape producers and consumers.

Our project team conducted two research trials from June 2006 through June 2007 at the University of California Hopland Research and Extension Center. The first trial tested the persistence of a grape leaf aversion induced by two different methods of orally administering lithium chloride (LiCl) to sheep. In the second trial we grazed vineyard plots with the trained and untrained sheep in the spring of 2007 and compared the browsing impacts on the vines.

Aversion Trial

The aversion training was conducted in barn corrals and followed the procedures and recommendations obtained from Dr. Fred Provenza and his colleagues at Utah State University and their BEHAVE program. In June 2006, sixty ewe lambs were divided into three groups of twenty. Sheep in each group were presented with fresh grape leaves for ten minutes, which was sufficient time to consume an average of 135 bites per sheep. Immediately following the grape leaf consumption, one group of sheep was orally administered LiCl (150 mg/kg body weight) in gelatin capsules (Capsule group), the other group was orally administered the same dose of LiCl in a liquid solution (Drench group), and sheep in the third group were orally administered either an empty gelatin capsule or water (Control group).

We tested the aversion at intervals of one day, one week, one month, two months and nine months after the initial aversion training. The one-day test revealed a very weak aversion in the trained groups. We then allowed the “trained” sheep to consume more grape leaves, followed by a second and larger dose of LiCl (175 mg/kg body weight). All the subsequent aversion tests indicated a very strong aversion in both the capsule and drench groups and normal grape leaf consumption in the control group.

Vineyard Grazing Trial

The vineyard grazing trial occurred between the months of March, April and May of 2007, with one grazing event per month. The trial was structured as a complete randomized block design with four treatments and four replicates per treatment.

- Treatment 1: No vine row or middle management.
- Treatment 2: Normal vine row and middle management (chemical and mechanical).

- Treatment 3: Vine row and middle grazed by untrained sheep.
Treatment 4: Vine row and middle grazed by trained sheep.

Each replicate plot was approximately 0.05 acres and included 16 or 17 grape vines. Sheep from the capsule and drench groups in the aversion trial were comingled and randomly assigned into two equal groups of trained sheep and used for the vineyard grazing treatments along with the control group as the untrained sheep.

A strategy of high density and short duration grazing was used to quickly graze the vineyard floor. Approximately 16 ewes (100 lb. average weight) grazed each plot for a 10 to 12 hour period, equaling a stocking density of 53 animal units (AU) per acre. The stocking period did vary according to the amount of floor vegetation. Sheep were removed once they appeared to have consumed all the palatable forages.

Although the data analysis for the grazing trial is not complete, we do have some preliminary results and anecdotal observations to present in this paper. An important finding we learned with the March grazing event is that the trained sheep were not averted to developed grape buds. Damage to the very small buds was minimal, but increased as the size and maturity of the buds increased. We suspect that the buds have a different flavor than mature grape leaves, to which the sheep were averted, leaving the buds vulnerable to damage by trained and untrained sheep. This can be avoided by grazing the sheep well before bud emergence and not returning the sheep to the vineyard until mature leaves are present on the vines.

The April and May grazing events demonstrated that the trained sheep had almost no impact on the grape vines while the untrained sheep removed much of the foliage within reach. We estimated that an average of 50% of the combined length of all vine shoot material was damaged by the untrained sheep. This trial also showed that the amount of vineyard floor vegetation in the grazed treatments at the end of the May grazing event was comparable to the treatment with normal floor management.

This project demonstrates that sheep with a trained aversion to grape leaves can be used for spring vineyard floor vegetation management without damaging the grape vines. Also revealed are many factors that must be addressed in future research before developing a complete set of recommendations to commercial practitioners. Some of the more salient topics that deserve future investigation include the determination of forage conditions that cause sheep to lose the aversion, regulations on the use of LiCl in livestock consumed by humans, a cost analysis on the use of sheep for vineyard floor vegetation management, the long-term effect of sheep grazing on soil quality and on grape vine health.

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