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Grass Cover Crops in Oregon Vineyards

Steve Price, Porter Lombard, and Jean Doty
Department of Horticulture, Oregon State University

Introduction

Perennial grass cover crops are frequently grown between the vines in non-irrigated Oregon vineyards. The primary reasons for using cover crops are erosion control and to allow machinery access in wet weather. Grass cover crops may also have an effect on vine performance. These effects, however, are not always clear. In addition, management options are available which can moderate or intensify the effect of a cover crop on the vines.

At OSU, a research project was initiated to determine the effects of grass cover crops on grape vines. Our major concern was the degree of competition between the grass and the vines. In a vineyard with a sparse canopy and very poor growth, little or no competition is desired. However, in a vigorous vineyard with excessive vine growth, maximum competition could be desirable. The degree of competition is affected by several management options, such as choice of grass species and variety, width of the grass strip, and the year the grass strip is established.

To better understand the relationships between grass and grapevine growth, our research concentrated on three areas: 1) vineyard establishment, 2) grass vs. no grass in mature vineyards, and 3) water use of different grass species.

Vineyard Establishment

A critical factor in vineyard profitability is the time it takes to bring a vineyard into full production. Nonirrigated vineyards are often slow coming into production because of poor vine growth du ring the first few years. A trial was planted in 1984 to determine the effect of grass on young vine growth. Chardonnay vines were planted with three different grass treatments: 1) Total grass cover (grass planted right up to the vines), 2) A one meter wide grass-free strip (with grass 0.5 meters from the vines), and 3) A three meter wide grass-free strip (grass within 1.5 meters of the vines). The grass and the grapes were planted at the same time.

Total grass cover dramatically reduces vine growth (Table 1). Shoot growth was less than a tenth of the other two treatments. The one meter wide grass-free strip has less shoot growth and lower pruning weights than the three meter wide strip, but the difference was not significant at the 5% level.

Table 1. Grass cover effects on two year old Chardonnay vine growth and root distribution, 1986

Treatment	Total Shoot length (m/vine)	Cane pruning weight (kg/vine)	No. of roots/m^2
Complete sod	0.13	0.023	------
Grass free strip (1m)	13.02	0.540	16.7
Grass free strip (3m)	15.83	0.680	148.0

Grape roots were counted in a trench one meter from the vines on the two treatments with grass-free strips. Roots were counted on the face of the trench from the surface to a depth of 40 cm. On the treatment with a one meter wide grass-free strip, this trench was in the sod. On the wider strip, the trench was in bare ground. The presence of the grass significantly reduced grape root density. There were eight times as many roots under bare ground as there were under the sod (Table 1). The grape roots were inhibited from growing in the grass root zone. Despite the large differences in surface root growth, there was relatively little difference in shoot growth between the strip treatments.

Two greenhouse trials were set up with potted vines to determine if the low density of grape roots under sod was due to competition for water and nutrients, or due to some chemical interaction between the grass and grape roots.

In the first trial, grape cuttings and grass were planted simultaneously in one liter pots. Several different grass species were used in the trial. All the pots were watered and fertilized to ensure that these factors would not be limiting. After six months there was no difference in root growth and very little difference in shoot growth between any of the treatments.

In the second trial, Elka perennial ryegrass was planted in 20 liter pots. The grape cuttings were planted after the grass stand had become established. The controls were planted in pots with no grass. In this case, the grass almost completely prevented rooting of the cuttings and very few of the cuttings in the pots with grass broke bud. Cuttings planted in soil with no grass rooted and grew well.

In the first trial, the grass had no effect on root growth of the grapes when compared to the controls. In the second trial, when the grass roots were established first, the grass had a profound effect on grape rooting. There is obviously a strong interaction between the grass roots and the grape roots that is important at the time of grape root initiation. It is not clear if this effect on initiation is causing the low root densities observed in the field trials.

All of these trials indicate that growers should wait until the vines are well established before planting a cover crop. The time to seed a grass cover crop should depend on the performance of the vines. Growers who have vineyards with poor vine growth should consider delaying cover crop establishment until the vines have filled the canopy. In all establishing vineyards, the grass should be kept away from the vines. The total grass cover treatment reported above is extreme and was only included to illustrate that grass can be very competitive. Not many growers would actually consider planting a sod right up to a young vine, but many growers let weeds grow around young vines, creating an equally competitive situation.

Grass in Established Vineyards

To determine the effects of perennial grass cover crops in established vineyards, a trial was established in a mature Pinot noir vineyard. The vineyard had a vigorous perennial ryegrass cover crop grown in 1.5

meter strips between the vine rows. This system was compared to a control where the grass was eliminated with Round-up.

Shoot growth was reduced by the grass cover crop in 1984 and 1986 (Table 2). Total growth, as measured by pruning weights, was reduced by the grass treatments only in 1986, a low rainfall year. Despite the reduction in growth, the grapes were still very vigorous. Cane pruning weights on both the grass and bare ground treatments were high. Nelson Shaulis, during his visit to Oregon in 1986, recommended that pruning weights per meter of canopy not exceed 0.75 kg (0.5 lbs/foot of row). Pruning weights on the grass treatment in 1986 were still above that level.

Table 2. Grass cover effects on shoot growth and cane pruning weights of mature Pinot noir vines

	Shoot growth (m)		Pruning Weight (kg/m-row)	
Ground Cover	1984	1986	1984	1986
Grass	2.10	1.52	1.07	0.85
No grass	2.60	1.63	1.07	1.12
Significant at 5% level	*	*	NS	*

To estimate the effects of these growth differences on canopy environment, we evaluated the vine canopy using Richard Smart's canopy rating system. Vines grown with a grass cover crop had reduced layers of leaves, lower nitrogen content as determined by foliage color, and fewer active growing tips at veraison. The rating for cluster exposure was unaffected. There was a slight reduction in yield in 1986 in the grass treatment, primarily caused by a reduced number of clusters on secondary shoots. There was no difference in berry composition between treatments at harvest.

Changes in soil water content were monitored with a neutron probe in 1984. Total water use of the grass treatment was greater than the control. It was estimated that the grass treatment used 66 mm (2.6 in.) more water during the summer of 1984 than the control. This was further verified in several grassed and non-grassed vineyards in the summer of 1985.

Grape root distribution was measured by counting roots in a trench 1 meter from the vines in 1987. In the top 30 cm of soil, graperoot numbers were much lower under the grass than under bare ground. There were 124 roots/m^2 in the grass treatment compared to 498 roots/m^2 in the control. This reduction in surface roots was similar to that found in the trial on young Chardonnay.

A nutrient analysis of petioles showed little difference between treatments in 1984. However, in 1986, nitrogen, potassium, and boron were lower in the grass treatments. This could be due to the low rooting in the surface soil horizons. The surface soils are often richer in many nutrients. It is also possible that the grass was competing for uptake of these nutrients.

The effects of the grass cover crop in this trial were measurable, but not striking. The sod was not competitive enough to greatly reduce vine growth or to change grape brix, TA, or pH. There were effects on shoot growth rate, root growth, leaf layers in the canopy, total water availability, and vine nutrient levels. In a situation where vine growth is marginal and competition is not desired, these effects could be far more important. When vine growth is marginal, grass management becomes far more important.

Water Use of Different Grass Species

There is a wide range in grass types suitable for use as cover crops in Oregon vineyards. Most of the available information on the water use of these grasses applies to irrigated situations such as lawns and irrigated orchards. In a non-irrigated, dry summer environment, these grasses behave quite differently. The major period of growth occurs in early Spring and they are dormant during the Summer. The grass species and varieties differ from each other in Spring growth rates, the time of dormancy, and in root distribution.

To study these differences, plots 5 x 5 meters of six different grasses were planted in 1985 and grown without irrigation. The grass plots were fertilized in the first year only. Water use was measured with a neutron probe during 1986 and 1987. Grasses were mowed twice each year until July 1, when most growth had stopped. Complete browning generally occurred by the end of July.

There were no observable differences between the grass species in total water depletion in either 1986 or 1987 (Table 3). The only difference was between grass and bare ground plots. In both years, the grass plots used 50 to 55 mm (2.0-2.25 inches) more water than the bare ground.

Table 3. Total water depletion of various grass species, Corvallis.

Treatment	Soil water depletion (mm) 1986	1987
Bare ground	77	66
'Pomar' orchard grass	132	110
'Highland' bentgrass	141	117
'Olympic' tall fescue	138	109
'Manhattan II' ryegrass	133	110
'Elka' ryegrass	132	113
'Derby' ryegrass	140	126

Root densities were different between the species. The ryegrass had a higher concentration of roots in the upper soil horizons (0-50 cm). The bentgrass and tall fescue had a deeper root system with more roots between 50 and 80 cm. All the grasses had a small number of roots below 1 meter.

Conclusions

Grass cover crops are an important part of a vineyard management program. Their use in erosion control and to improve machinery access in wet weather is very important in many areas of the state. However, they do influence vine growth. The most striking result of these studies was the effect of grass on young vines. Growers should be very cautious seeding grass in young vineyards. Even with deep soils and irrigation, grass close to young vines will reduce vine growth and delay vineyard productivity.

The effect of grass on grape roots was also dramatic. We saw a reduction in grape root growth under grass in the trial on young Chardonnay, in the mature Pinot noir vines, and in one of the greenhouse trials. In all three cases, the effective rooting area of the vines was reduced. This might be desirable in vigorous vineyards, but in a vineyard with inadequate growth it could have serious consequences.

The final point is that grass uses water. In these studies, the grass used about 2 inches of water a year. Two acre inches is more than 50,000 gallons of water per acre! However, there was little difference in water use between the different grass species. In vineyard planning, the potential water use of the grass should be considered along with the total water holding capacity of the soil and the demands of the

vines.

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