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The effects of some mulch applications and irrigation intervals on weed control in grafted vine production

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Abstract

In this study, the effects of some mulch applications and different irrigation intervals on weed control were investigated in the production of Alphonse Lavallée grafted on Kober 5BB, 140 Ruggeri, 41B rootstocks during 2007 and 2008. Black plastic, grass clippings, rose oil processing wastes for mulching and three different irrigation intervals (4 days, 7 days, 10 days) were used in the study. The effects of mulch applications on weed control were significant in both two years ($p<0.01$). Among mulch applications black plastic mulch were more effective than grass clippings and rose oil processing wastes in weed control. Irrigation intervals had no significant effects on weed control. As a result, it was determined that mulch applications were efficient in weed control in grafted vine production.

Key words: grafted vine, irrigation interval, mulch, weeds

Introduction

Weed control is one of major problems in nursery production. Weeds share in nutrition, water and light of plants. They decrease soil temperature, inhibite growing and maturing, drop quality of crops and host plenty of plant diseases and pest. Chemical method (herbicide) is widely used for weed control in world. Herbicides have the highest using rate in pesticide in Turkey and world. Unfortunately, rate of using herbicides have been increasing day by day (Delen, 2002). Herbicides have negative effects on soil fertility, cops quality and human nervous system. Thus new growing techniques must be developed in agricultural production for decreasing herbicides using. There are plenty methods including mulch for weed control. Mulch is a good practice for environment and contributes to weed control, soil water protection, steady soil temperature, increasing organic matter and facility of microorganism. It was informed that when mulches are used in nursery production, nursery quality and success rate increased (Kelen, 1994).

In the last years using harvest residual (straw, greenhouse plants residuals, grass clippings etc.) and industrial wastes (rose oil processing wastes, beet molasses etc.) have been spreadly using in agricultural production. Thus, product wastes obtained from agricultural production is provided to reusing in agricultural. Besides, negative effects on environment of wastes decreases (Özenç, 2004; Benito et al., 2006). Some of researchers informed that mulching with plants residuals (straw, grass clippings etc.) and synthetic materials (plastic, fabric etc.) are generally used in agriculture and it is a good technique that has positive effects on growth and development (Duranti and Cuocolo, 1989; Gimenez et al., 2002). Irrigation in agricultural production is a significant technique and application that has positive effects on growth, development, crops yield and quality. Because water sources are limited we have to be careful about irrigation. Therefore irrigation time and water amount are very important subjects.

In this study, it was aimed to determine the effects of some mulch applications and different irrigation intervals on weed control in the production of Alphonse Lavallée grafted on Kober 5BB, 140 Ruggeri, 41B rootstocks.

Material and methods

This study was carried out at Eğirdir Horticultural Research Institute in 2007 and 2008. Soil chemical and physical analyses were presented on Table 1.

Table 1. Soil property of research area

Depth (cm)	γ (g/cm^3)	FC (%)	WP (%)	EC ($ECx10^6$)	pH	Lime (%)	Saturation (%)	Organic matter (%)	P (ppm)	K (ppm)	Structure
0-30	1.48	27	13	150	8.1	2.2	48	1.61	13.2	214	Clay loam
30-60	1.39	29	15	147	8.2	8.6	45	2.44	6.3	127.2	Clay loam

γ: Unit Weight of Soil; FC: Field Capacity; WP Wilting Point; P: Phosporus; K: Potassium

Kober 5 BB, 140 Ru, 41 B as rootstocks and Alphonse Lavallée as variety were used in this study. There were three different irrigation intervals, 4, 7 and 10 days, and four mulch applications, black plastic, grass clippings, rose oil processing wastes and non-mulch.
Grafted scions were planted at 0.90m x 0.10 m spacing on May both 2007 and 2008. This research was planned three replication and each replications has twenty five grafted vine. Distance between plots was two meters and plot area was 6.75 m^2. Grafted nurseries were removed on November in both 2007 and 2008 after the whole leaves of nurseries were shredded.
Irrigation water was applied up to field capacity at 0-60 cm at each irrigation intervals. Soil water contents were measured by gravimetrically methods (oven dry basis) at 0-30 cm and 30-60 cm depths before one day at each irrigation intervals. Mulch materials laid out each side for grafted nurseries and they have 80 cm width and each side has 40 cm. Drip irrigation system was used for irrigation in this study. Fertilizers were applied in the irrigation water through a drip system.
Weeds were counted two times for both years for determining weed population by using Equation (1) (Güncan, 2006). After each counting weeds were pulled out and hoed.

Weeds density average in certain area (m^2);

$$\text{Weeds density} : B / N \quad (1)$$

Where B is the total number of weeds in taken sample, N is the number of taken sample.

Statistical analysis of the data was performed using a randomized block design with three replications. The analysis variance (ANOVA) also accounted for factors. The level of the significant difference (LSD at $p<0.01$) was used in the ANOVA. Data were evaluated by JMP (Jump) software program. Differences between treatments were determined with LSD.

Results and discussion

Weeds species - The names of weeds on trial plots are on Table 2. The weeds species which were determined in trial plots were same species both 2007 and 2008. As two of weeds are narrow leaves, eleven of them are wide leaves.

Table 2. Weeds on trial plots

Turkish names	Latin names	Narrow/wide leaves
Tarla sarmaşığı	*Convolvulus arvensis L.*	Wide leaves
Domuz pıtrağı	*Xanthium strumarium L.*	Wide leaves
Sirken	*Chenopodium album L.*	Wide leaves
Yabani havuç	*Daucus carota L.*	Wide leaves
Yapışkan ot	*Galium aparina L.*	Wide leaves
Semiz otu	*Portulace oleracea L.*	Wide leaves
Köy göçüren	*Circium arvense L.*	Wide leaves
Aslan dişi	*Taraxacum officinale spp.*	Wide leaves
Rumeks	*Rumeks crispus spp.*	Wide leaves
Ebegümeci	*Malva neglecta spp.*	Wide leaves
Horoz ibiği	*Amaranthus camelorum spp.*	Wide leaves
Ayrık	*Cynodon dactylon (L) Pers.*	Narrow leaves
Kanyaş	*Sorghum halepense (L) Pers.*	Narrow leaves

Weeds density - Weed densities which was determined in the study in 2007 were presented in Table 3.

Table 3. The effects of different mulches and irrigation intervals on weed density (item/m^2) in 2007

Mulch	Irrigation interval			Mean
	4 days	7 days	10 days	
Non-mulch	44.6	42.0	45.9	44.2 A**
Rose oil processing wastes	11.8	10.7	13.2	11.9 B
Grass clippings	9.8	10.0	9.6	9.8 C
Black plastic	1.4	2.3	0.9	1.6 D
Mean	16.9	16.3	17.4	

** mean separation within columns by LSD Multiple Range Test, p<0.01

LSD_{Mulch} = 1.923

The effects of mulch applications were significant (p<0.01). Black plastic mulch was determined the most effective application with 1.6 item/m^2. Grass clippings and rose oil processing wastes followed black plastic mulch, 9.8 item/m^2 and 11.9 item/m^2, respectively. Weed density was determined 44.2 item/m^2 in non-mulch applications. The effects of irrigation intervals on weed density were insignificant in 2007.
Weed densities which was determined in the study in 2008 were presented in Table 4.

Table 4. The effects of different mulches and irrigation intervals on weed density (item/m^2) in 2008

Mulch	Irrigation interval			Mean
	4 days	7 days	10 days	
Non-mulch	42.6 a**	34.2 b	30.9 b	35.9 A**
Rose oil processing wastes	9.0 cd	8.0 d	12.1 cd	9.7 B
Grass clippings	8.6 cd	13.9 c	9.7 cd	10.7 B
Black plastic	1.8 e	0.0 e	0.9 e	0.9 C
Mean	15.5	14.0	13.4	

** mean separation within columns by LSD Multiple Range Test, p<0.01

LSD_{Mulch} = 3.268 $LSD_{Mulch * irrigation\ interval}$ = 5.661

According to results of weed density in 2008, while the effects of mulches applications were determined significant, the effect of irrigation intervals was not significant. Among mulch applications, while the highest weed density was determined in non-mulch applications with 35.9 item/m^2, the least weed density was determined in black plastic mulch with 0.9 item/m^2. Rose oil processing wastes and grass clippings followed black plastic mulch with 9.7 item/m^2 and 10.7 item/m^2, respectively. Differences between rose oil processing wastes and grass clippings were determined not significant.

There were very big differences about weed density between mulch and non-mulch applications in the research. It was determined that mulch applications significantly decreased weed density. The results of this study corresponded with results of Ossom et al. (2001) and Ramakrishna et al. (2006). It was determined that the most effective weed control was in black plastic applications among mulch applications. Hembry and Davies (1994) found similar results in their study.

According to weed control, rose oil processing wastes and grass clippings mulches have the same effects and they follow plastic mulch. Non-mulch applications were the last. Ramakrishna et al. (2006) and Abouziena et al. (2008) reported that black plastic and organic mulches (grass clippings, straw, rice straw etc.) have very effective on weed control. Because rose oil processing wastes has been not used in any study up to now, we have not any results. According to weed density values obtained from 2007 and 2008, it was observed that some interactions have effects on weed control among mulch applications. This state may be because weed density is different in area

Conclusions

As a result, mulch applications are successful for weed control. Because mulch applications inhibited weed growth completely or largely, they were determined an alternative method for weed control. Besides irrigation water conservation, it was determined that mulch applications have positive effects on nursery quality and success rate. It was determined that black plastic mulch has more effective than rose oil processing wastes and grass clippings. But, when black plastic is used in heavy soils, it has negative effects on soil structure. Therefore, rose oil processing wastes and grass clippings can be chosen because they are biodegradable materials. These materials have positive effects on soil structure besides weed control and irrigation water conservation.

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