

Comparison of Flame Weeding With Other Methods in Vineyard Weed Control

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Abstract: In this study, carried out in Italia Table Grape vineyard of Tekirdag Viticulture Research Institute established using pergola trellis system, weed species were identified and "weed flaming" one of the alternative weed management strategies was assayed.

This study was conducted to evaluate the applicability of this worldwide newly recognized method in our region and country. Working principle of the available flaming machines were searched on literatures and prototype of flaming machine was developed to burn weeds using flame produced by propane gas. As a result of our study it has been determined that 81,1 % of narrow leaved weeds and 72,5 % of broad leaved weeds have been eliminated using flame applied with suitable method in favorable conditions.

Key words: Vineyard, weed, alternative management control, flaming, flame machine prototype

INTRODUCTION

The management of weeds is one of the processes that must be conducted to obtain the required yield per acre in agricultural production. Some of the management methods of weeds are pesticides, cultivation and hand-picking.

Nowadays as we consider that consumption habits towards organic production, we can see that chemical control of weeds was decreased. According to decrease of the chemical control alternative methods without herbicide application became more important and flame weeding is one of the most important of these methods. Studies on weed control using flame weeding had started in Amerika and Europe in maize, cotton, potato, vegetables and grape.

The aim of the flame weeding, thermal weed control method, is applying direct flame over the weed, withering the leaves with high temperature and leading to plant death. This method is based on the disruption of cell wall by expansion of cell sap after exposure of weed leaves to high temperatures for a short period and after all the death of the plant (Daar 2002).

This Project is important for the evaluation of local and national applicability and economy of this

method. On the other hand the determination of alternative weed control methods and holding a share in the rapidly growing organic farming market is the other reasons that making this Project important.

MATERIAL and METHOD

This Project is conducted in pergola trellis given high pruned Italia vineyard in Tekirdag Viticulture Research Institute.

Italia is mid-early maturing white grape variety having big clusters and berries. This variety is advised for the growers in Marmara, İç Anadolu, Güneydoğu Anadolu and Ege Regions (Çelik 2006; Boz and Avcı 2005).

Weeds in the experiment area including Couch-grass (*Agropyrum repens*), Johnsongrass (*Sorghum halepense*), smooth brome (*Bromus inermis*), wild parsnip (*Pastinaca sativa*), cockscomb (*Celosia argentea*), field bindweed (*Convolvulus arvensis*), golden dead nettle (*Lamium galeobdolon*), common groundsel (*Senecio vulgaris*) and mustard (*Brassica spp.*) were flamed with hand made flaming machine prototype.

Propane gas (LPG), which is more economic and flammable than the other gases was used to obtain the flame (Anik 1980).

Prototype that utilized in this project was hand made by using the equipments obtained from Tekirdag Viticulture Research Institute, Agriculture Faculty of Namik Kemal University and local markets. Different models and equipments were tried to develop the nozzle that allows the control of width of flame application nozzle, application distance and angle and by using data from literatures the suitable nozzle was determined and produced (Dong 1997).

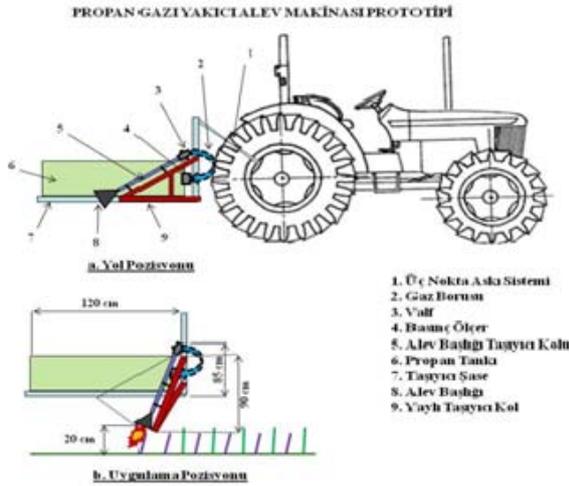


Figure 1a. Prototype of flaming machine



Figure 1b. Prototype of flaming machine

Weeds in the Italia vineyard was counted using 50 cm×50 cm square chamber (Durutan 1987). Weeds over the row was controlled by herbicide application using hand-picked battery powered applicator.

Method

Flame machine prototype, developed for flaming processes, is used by hanging to 3 point connection part. Weeds over the row in the parcel were exposed one time to flame under 5 km/h tractor forward speed, 2 bar gas pressure, 20 cm application high and 45° application angle.

Weeds from randomly chosen parts of the application parcel were counted using 50 cm×50 cm square chamber. The average of the number of weeds counted from 3 different parts of the each row were taken and average weed number per m² was evaluated. After 72 hours from flaming weed contents repeated again. Weeds that shows the symptoms of withering of all leaves were regarded as dead. Thus by comparison of weed numbers counted pre- flaming and post-flaming the suppression % rate of weeds were evaluated and statistically analysed (Durutan, 1987), (Bukhari et al 1989).

Herbicide application and standart field cultivation by rotatiller in weed control was also conducted to compare the effectivity of flaming in weed control.

DISCUSSIONS

Counting of weeds over the rows before all applications indicates that narrow leaved weed number is highest with 46,67 plant/m² in the hand hoed second parcel and this number is lowest in the control parcel number 5 with 20 plants/m².

According to broad leaved weed numbers over the rows before all applications weed number is highest with 48 plant/m² in the hand hoed second parcel and this number is lowest in the flaming parcel number 3 with 21.33 plants/m². Results of the weed countings pre application were shown in Table 1 while post application weed numbers were shown in Table 2.

Parts of the parcel that weeds were counted pre application were marked and after applications weeds were counted in the same parts again. After all countings the lowest narrow leaved weed number was reached in parcel 4 with 4 plant/m² and the lowest number in broad leaved weeds were in herbicide application parcel number 1 and hoeing parcel number 2 with 4 plant/m². When the total weed number except control parcel is counted the highest weed number was detected in over the row flaming and between the row cultivation parcel 3.

Results of the weed suppression pre and post application were shown in Table 3. According to these results the highest narrow leaved weed suppression

was achieved in hand hoed parcel 2 with 83,84%. On the other hand the lowest suppression rate was achieved in hand hoed parcel number 2 with 92,7 %.

When average rates were taken into consideration it can be seen that hand hoed parcel number 2 is taken the first place with 87,4 %, herbicide application parcel number 1 taken the second place

and tractor cultivated and flamed parcel taken 3 place. 71,8% success was achieved in all other application.

According to statistical analysis no statistical differences were found between all application. Flamin application took the third place in the point of total leaf number.

Table 1. Applications before the specified number of grass

Applications	Practice Section	Narrow Leaved		Broad Leaved		Total	
		Number	Average	Number			Number
1 Herbicide	1	36	41.33	44	45.33	80	86.67
	2	40		52		92	
	3	48		40		88	
2 Hoeing	1	52	46.67	36	48.00	88	94.67
	2	48		56		104	
	3	40		52		92	
3 Flame	1	32	45.33	28	21.33	60	66.67
	2	52		12		64	
	3	52		24		76	
4 Flame+Only Tillage	1	24	20.00	32	29.33	56	49.33
	2	16		40		56	
	3	20		16		36	
5 Control	1	24	20.00	16	22.67	40	42.67

Table 2. Applications after the specified number of grass

Applications	Practice Section	Narrow Leaved		Broad Leaved		Total	
		Number	Average	Number			Number
1 Herbicide	1	4	8.00	0	4.00	4	12.00
	2	12		12		24	
	3	8		0		8	
2 Hoeing	1	12	8.00	0	4.00	12	12.00
	2	8		8		16	
	3	4		4		8	
3 Flame	1	8	12.00	12	6.67	20	18.67
	2	16		0		16	
	3	12		8		20	
4 Flame+Only Tillage	1	4	4.00	4	6.67	8	10.67
	2	0		8		8	
	3	8		8		16	
5 Control	1	24	20.00	16	22.67	40	42.67
	2	20		32		52	
	3	16		20		36	

Table 3. According to the application as to destroy the incidence of weeds (%)

Applications	Practice Section	Narrow Leaved		Broad Leaved		Total	
		% Percentage	Average % Perc.	% Perc.			% Percentage
1 Herbicide	1	88.9	80.7	100.0	92.3	95.0	86.6
	2	70.0		76.9		73.9	
	3	83.3		100.0		90.9	
2 Hoeing	1	76.9	83.4	100.0	92.7	86.4	87.4
	2	83.3		85.7		84.6	
	3	90.0		92.3		91.3	
3 Flame	1	75.0	73.7	57.1	74.6	66.7	71.8
	2	69.2		100.0		75.0	
	3	76.9		66.7		73.7	
4 Flame+Only Tillage	1	83.3	81.1	87.5	72.5	85.7	75.7
	2	100.0		80.0		85.7	
	3	60.0		50.0		55.6	
5 Control	1	0.0	0.0	0.0	0.0	0.0	0.0
	2	0.0		0.0		0.0	
	3	0.0		0.0		0.0	

RESULTS

The results of the experiments indicated that 71,8% of weeds of total number 66,7 plant/m² were suppressed in rotatiller and flaming applied parcel. Lanini (2004) obtained the similar results in his experiment in which 4 times flaming controled 95% of the perennial weeds and 3 times controled the 95% of annual weeds. Application of flaming in appropriate time is important to achieve the highest control. Thus is discussed that delayed flaming application would have less effect on weeds higher than 5-8 cm and so more tolernt.

This experiment proved that flaming can be used as an alternative method in the over the row weed control. When legal procedures and background formed and gas use in agriculture is supported economically by methods such as discounts of tax

rates, environmentally safe and economic weed control can be applied by flaming.

Higher LPG prices in Turkey than other countires is an economic parameter that limits the utilization of the flaming method. But turn of the consumers preferences to roganic farming and general tendency on prevention of air pollution increases the preferability of the flaming.

The prototype that we used in the experiment can be developed for beter results.

Further researches including plant vegetative growth, yield, berry quality, affect on water and soil in bigger areas must be conducted to obtain more extensive results.

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