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Response of wild oat weeds to the mechanical methods and application time of control under EL-Bayda condition in Libya

Tayyeb Farag Hessain*

Crop Science Dep., Faculty of Agriculture, Omar Al-Mukhtar University, El-Bayda, Libya.
Email: Ashrafhz@yahoo.com

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Abstract

Field experiment were carried out during the two growing seasons (2007-08 and 2008-09) at the experiment station of Crop Science Department, Faculty of Agriculture, University of Omar Al-Mukhtar, El-Bayda, Libya to study the response of time of application and Mechanical control methods of wild oat (*Avenafatua* L.). The results revealed that, the wild oat density reduced by 76.54 and 85.63% because of soil solarization compared to unweeded and the best time reduced the weed density were before leveling in two seasons. Wild oats heights were reduced due to soloarization as a method of weed control by 64.38 and 75.77% compared to unweeded in both seasons respectively, and solarization before soil leveling gave the smallest height. Wild oat dry matter reduced by soil surface and before soil leveling by 68.88 and 86.46% compared to unweeded in both seasons respectively.

***Keywords*:** *Weeds mechanical control, Wild oat Avenafatua L , Solarization*

Introduction

Wild oat *Avenafatua*-L is the most prevalent winter annual grass in winter cereals of El-Jabal El-Akhdar in Libya. It germinates along with barley and wheat, grows quickly, establishes a deep and extensive root system, and responds dramatically to high levels of nitrogen (Milberg and Hallgren, 2004). It is a serious competitor in winter cereals and generally sheds seeds 2 to 3 weeks prior to wheat and barley harvest. Wild oat density of 40 and 160 plants/m² reduced wheat yield by 16 and 46%, respectively (Qasem, 2007). Several changes in agronomic practices in the cereals cropping-fallow cropping rotation areas have contributed to the spread of wild oat. Use some mechanical methods such as the retain crop residues during fallow periods create an environment favorable to wild oat because of a moist soil surface.

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Tillage operations are shallows and do not bury seeds deep enough to reduce emergence (Randy, 2003). The effect of primary tillage on weeds is mainly related to the type of implement used and to tillage depth. These factors considerably influence wild oat seeds distribution over the

Soil profile and the number of seeds that can emerge in a field (Barberi and Cascio, 2001). Soil solarization is a preventive method that exploits solar heating to kill weed seeds and therefore reduce weed emergence. The success of soil solarization as a weed control method does not depend on the actual value of peak temperature reached in the soil, but rather on temperature duration above a certain threshold (45°C) on a daily basis (Horowitz *et al*., 1983). Top soil tillage or call top-ridge mean soil cultivation in surface. Survival of these annual species depends on cultivations that return this seeds to, or near the 5-10 m of top soil surface due to remove the 5-10 cm of soil top and retained in a definite area 5-25 cm width. This has resulted in a collection of wild oat plants in specific areas in a field to facilitate controlling either chemically or by moving (Staricka *et al*., 1990). Out of crop irrigation which the objectives of this practice are promoted the wild oat seeds to germinate and the pre-seeding tillage are to prepare a seed bed so planting can occur at a control weeds that germinate prior to seeding (Mohler, 1996). The present investigation was conducted to study the mechanical methods and time of application to control wild oat weed under El-Bayda conditions of El-Jabel Al-Akhdar area.

Materials and Methods

Two field experiments were conducted at El-Baida, Libya during the winter seasons of 2007/2008 and 2008/2009. The soil was a clay loam soil with 0.4% organic matter and a pH of 7.9. Fertilizer 250 kg/ha (diammonium phosphate 18:46) was applied as recommended for cereals in the area. A seed bed was prepared by chisel plows in summer prior to wild oat sowing in mid of August by density of 50 seeds/m² were collected from the area of El-Baida during summer of 2006. Tested the viability which reach 95% and seeding. Experimental design was a split plot with three replications. Main plots were control (unweeded), out of crop irrigation, solarization by black polyester sheeth and Top-Ridge tillage. An area of each main plot was 16 m². Time of application i.e., before tillage: before leveling, and before seeding were the subplots (2X2m). The wild oats density, weed height (cm), and oven dry weight at 80°C after 24 h of wild oat weeds were recorded during four periods one month apart. Fields of the study was infested with medic Medicagoetaliksativa. L and controlled by hand weeding, during the growing season from November to March. The dry matter accumulation of wild oats was recorded 35, 70, 105 and 140 days after sowing by placing 50 by 50cm quadrant randomly at four areas in each plot in each period wild oat falling within the quadrant count the density, measure the height in cm and dried after harvest. Data on wild oat was averaged for 2007/2008 and then analyzed

by the analysis of various technique described by Pasqual (1994). Means were compared by LSD at 0.05.

Results and Discussion

Wild oat density/m²: Effect on wild oat density during both seasons showed significant differences. Maximum density occurred in unweeded plots. The solarization treatment decreased the density compared to unweeded (Table1). Wild oat density differed significantly with time during the 4 stages of this trial, highest recorded due to application of mechanical control methods before the tillage comparing to the other times (Table 1). This result might be attributed the heat accumulation during summer and that heat reach the site of weed seeds reducing the viability to emergence, similar discussion was showed by (Andujar, 2005). Data presented in mentioned table exhibited independent response the wild density to the interaction of the trial factors in first season and opposite in second season (Tables 2 and 3). The largest was due to unweeded comparing to solarization.

Table 1. Effects of Methods and Time of Application of Mechanical wild oats controlling and the interaction on density/ m² during the seasons 2007/2008 and 2008/2009 at El-Baida conditions.

	Periods of counting from seeding (a month interval)							
	First Period		Second Period		Third Period		Fourth Period	
	1st Season	2nd Season	1st Season	2nd Season	1st Season	2nd Season	1st Season	2nd Season
	Methods of Mechanical Controlling							
Control	9.51	6.56	19.19	19.03	20.19	28.33	21.19	29.89
Irrigation	5.96	3.37	6.33	6.07	9.78	7.48	9.29	8.01
Solarization	4.41	2.03	4.41	3.11	3.85	4.01	3.78	2.88
Top-ridge	6.01	4.25	5.18	4.51	8.59	9.04	8.19	9.52
F	*	*	*	*	*	*	*	*
LSD	1.39	1.25	0.75	1.04	0.88	0.83	0.41	0.48
	Time of Mechanical Methods Applications (Before)							
B.Tillage	6.97	4.33	9.14	7.91	11.03	11.86	10.78	12.52
B. Levelling	5.83	4.13	8.55	8.19	10.36	11.13	9.83	11.75
B. Seeding	6.61	3.77	8.64	8.44	11.17	12.89	10.47	13.44
F	*	*	*	*	*	*	*	*
LSD	0.68	0.56	0.78	0.74	0.41	0.59	0.57	0.42
	Interaction (Methods * Time)							
F	*	*	*	*	*	*	*	*

Table 2. Effects of the interaction between Mechanical weed control Methods and time of application after two months from seeding in the wild oats density/m² during the First season 2007/2008 and the Second season 2008/2009 under El-Baida conditions.

	Control		Irrigation		Solarization		Top-ridge	
	First season	Second season	First season	Second season	First season	Second season	First season	Second season
Before Tillage	18.55	17.33	8.22	7.22	3.56	3.44	4.22	5.78
Before Levelling	19.66	20.44	5.11	4.33	7.44	3.11	4.33	3.78
Before Seeding	19.33	19.33	5.67	6.67	2.22	2.78	6.00	4.00
LSD for First Season		1.7						
LSD for Second Season		1.4						

Table 3. Effects of the interaction between Mechanical weed control Methods and Time of Application in the dry weight of wild oat weeds after 3 months under El-Baida conditions during 2nd Season 2008/2009.

	Control	Irrigation	Solarization	Top-ridge
Before Tillage	27.90	5.11	3.77	7.68
Before Levelling	24.67	5.22	4.66	6.46
Before Seeding	31.02	4.66	4.71	4.56
LSD 1.8				

Wild oats height (cm): It is noticeable during both seasons of this study that the height of wild oats decreased significantly in the two months and highly significant in remain two months due to solarization. Meanwhile, the highest was recorded from unweeded (control), (Table 4). This result may be due to the accumulation of heat which effects in seed respiration leading to decrease seedling vigour of wild oat. This result was emphasized by (Sinden and Garry, 2006). It is clear that time of application presented in the (Table 4) that is, except second season after two months, the wild oat height was decreased due to solarization before soil leveling. This decrease in weed height was attributed to interaction of environments due to heat solarization. This discussion was compatible with Young and Thorne, 2004. The same table showed a significant effect of the interaction (Method x Time of application) in the first seasons during second, third and fourth months from seeding (Table 5) and vice versa during second season during all stages of this study.

Table 4. Effects of the interaction between Mechanical Methods of weed control and Time of Application in wild oat density/m² during the second season of 2008/2009 under El-Baida conditions.

	Control		Irrigation		Solarization		Top-ridge	
	M1	M4	M1	M4	M1	M4	M1	M4
Before Tillage	5.33	27.44	3.54	9.45	2.55	5.11	3.66	9.55
Before Levelling	7.56	28.89	3.11	5.11	1.66	3.66	5.00	9.78
Before Seeding	6.77	28.67	3.44	4.88	1.89	3.22	4.11	7.76

M1= One month from seeding: LSD = 1.2, M4= Four months from seeding: LSD = 1.5

Table 5. Effects of Methods and Time and their interaction in the wild oat weeds height (cm) due to Mechanical Controlling during the seasons 2007/2008 and 2008/2009 at El-Baida conditions.

	Periods of counting from seeding (a month interval)							
	First Period		Second Period		Third Period		Fourth Period	
	1st Season	2nd Season	1st Season	2nd Season	1st Season	2nd Season	1st Season	2nd Season
	Methods of Mechanical Controlling							
Control	3.71	4.74	16.65	12.18	25.60	21.42	29.94	37.01
Irrigation	3.41	2.47	5.78	4.36	7.93	9.58	9.91	11.78
Solarization	3.01	1.86	3.18	2.95	5.94	4.96	6.11	8.48
Top-ridge	3.56	2.71	4.98	4.55	9.06	8.58	9.11	12.31
F	*	*	*	*	*	*	*	*
LSD	0.44	0.77	0.72	0.57	0.80	1.17	0.83	0.98
	Time of Mechanical Methods Applications (Before)							
B.Tillage	3.71	2.31	7.20	6.10	12.39	11.73	14.55	17.01
B. Levelling	3.55	2.67	7.25	6.03	11.42	10.57	12.91	18.38
B. Seeding	3.13	3.11	6.89	5.89	12.59	12.73	14.13	17.35
F	*	*	*	*	*	*	*	*
LSD	0.45	0.61	0.51	0.00	0.67	1.12	0.29	1.01
	Interaction (Methods * Time)							
F	N.S	N.S	*	N.S	*	N.S	*	N.S

Dry weight of wild oat (gr): Dry matter accumulation of wild oat plants at different stages varied significantly and highly significant due to mechanical methods and time of application, (Table 6). As the seed viability and seedling vigor due to effect of heat accumulation in the soil surface from solarization, the dry matter was reduced compared to control. Similar was showed by (Antonio, 2000). Maximum dry matter accumulation for time of application was before the tillage treatment. Least and significantly lower dry matter of wild oat was in the before leveling treatment (Table 6) at the second season during first and second month from seeding, first season of third month and both seasons of the fourth month seeding the wild oat. In this concept during the time-course of the study during 2007/2008 and 2008/2009 seasons, the Method of control x Time of application was significant regarding this character in second season in third period (Table 3) and in both seasons during the fourth period (Table 7). This finding may have occurred owing to the plastic response of wild oat and the largest degree of the effect of solarization before soil leveling. Similar was obtained by Pannel and Gurjeet (1994).

Table 6. Effects of interaction between Mechanical Weed control Methods and Time of Application in the height (cm) of wild oat weeds under El-Baida conditions during the season 2007/2008.

	Control			Irrigation			Solarization			Top-ridge		
	M2	M3	M4	M2	M3	M4	M2	M3	M4	M2	M3	M4
Before Tillage	**15.37**	**24.08**	**29.48**	**3.77**	**10.33**	**10.58**	**3.47**	**5.93**	**6.78**	**5.28**	**10.03**	**9.66**
Before Levelling	**16.09**	**25.21**	**30.42**	**4.18**	**7.33**	**10.06**	**3.82**	**6.94**	**8.03**	**4.72**	**9.07**	**9.67**
Before Seeding	**18.05**	**27.51**	**29.95**	**3.39**	**6.11**	**9.08**	**2.26**	**3.97**	**3.53**	**4.84**	**8.11**	**9.09**

M2= Two months from seeding and LSD = 1.35
M3= Three months from seeding and LSD = 1.90
M4= Four months from seeding and LSD = 1.01

Table 7. Effects of Mechanical Methods and Time of Application and their interaction in the wild oat weeds dry weight kg/m² during the seasons 2007/2008 and 2008/2009 under El-Baida conditions.

	Periods of counting from seeding (a month interval)							
	First Period		Second Period		Third Period		Fourth Period	
	1st Season	2nd Season	1st Season	2nd Season	1st Season	2nd Season	1st Season	2nd Season
	Methods of Mechanical Controlling							
Control	3.71	4.74	16.65	12.18	25.60	21.42	29.94	37.01
Irrigation	3.41	2.47	5.78	4.36	7.93	9.58	9.91	11.78
Solarization	3.01	1.86	3.18	2.95	5.94	4.96	6.11	8.48
Top-ridge	3.56	2.71	4.98	4.55	9.06	8.58	9.11	12.31
F	*	*	*	*	*	*	*	*
LSD	0.44	0.77	0.72	0.57	0.80	1.17	0.83	0.98
	Time of Mechanical Methods Application (Before)							
B.Tillage	3.71	2.31	7.20	6.10	12.39	11.73	14.55	17.01
B. Levelling	3.55	2.67	7.25	6.03	11.42	10.57	12.91	18.38
B. Seeding	3.13	3.11	6.89	5.89	12.59	12.73	14.13	17.35
F	*	*	*	*	*	*	*	*
LSD	0.45	0.61	0.51	0.00	0.67	1.12	0.29	1.01
	Interaction (Methods * Time)							
F	N.S	N.S	N.S	N.S	N.S	*	*	*

Table 8. Effects of the interaction between Mechanical weeds control Methods and time of application in the dry weight kg/m² of wild oat, weed after 4 months during the First season 2007/2008 and the Second season 2008/2009 under El-Baida conditions.

	Methods							
	Control		Irrigation		Solarization		Top-ridge	
Time	First season	Second season	First season	Second season	First season	Second season	First season	Second season
Before Tillage	3.356	5.098	1.355	1.142	0.951	0.544	1.601	1.188
Before Levelling	3.437	5.604	1.580	1.277	0.787	0.489	1.552	1.178
Before Seeding	3.270	5.694	1.589	1.078	0.232	0.540	1.427	1.167
LSD for First Season		0.21						
LSD for Second Season		0.18						

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استجابة الشوفان البري للطرق الميكانيكية لمكافحة الحشائش وزمن تطبيقها تحت ظروف البيضاء/ ليبيا

طيب فرج حسين

قسم المحاصيل – كلية الزراعة - جامعة عمر المختار

الملخص

أجريت تجربة حقلية خلال موسمين على التوالي (2007–08 و 2008–09) في محطة تجارب قسم المحاصيل بكلية الزراعة، جامعة عمر المختار، البيضاء، ليبيا, لدراسة استجابة زمن التطبيق وطرق المكافحة الميكانيكية علي الشوفان البري (Avenafatua L.). أظهرت النتائج أن كثافة الشوفان البري انخفضت بنسبة 76.54 و85.63% نتيجة تشميس التربة بالبلاستيك المعقم مقارنة بالشاهد (عدم مكافحة الحشائش) وافضل فترة في تخفيض كثافة الحشائش كانت قبل التسوية في موسمين. كما لوحظ انخفاض ارتفاع الشوفان البري نتيجة التشميس كطريقة لمكافحة الحشائش 64.38 و 75.7% مقارنة بعدم المكافحة في كلا الموسمين علي التوالي وتشميس التربة قبل التسوية أعطي أقل ارتفاع في الوزن الجاف لحشيشة الشوفان الناتجة من تشميس سطح التربة قبل التسوية بنحو 68.88 و 86.46% مقارنة بعدم مكافحة الحشائش في موسمي الدراسة على التوالي.

مفتاح الكلمات: المكافحة الميكانيكية للحشائش، الشوفان البرى، *Avenafatua* L ، التعقيم الشمسى.