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WEED CONTROL IN EGYPTIAN CLOVER USING HERBICIDES AND THE EFFECTS ON QUALITY AND FORAGE YIELD OF *TRIFOLIUM ALEXANDREINUML.*

Ali1, I.H.H. and Rodaina A. Hassan[2]

1. Plant protection Dept., Fac. of Agric., Fayoum, Cairo Univ., Egypt.

2. Economic Entomology and Pesticide Dept., Fac. of Agric., Giza, Cairo Univ., Egypt.

ABSTRACT Two field experiments were carried out in the two successive seasons of 2001/02 and 2002/03 at Experimental Station of Faculty of Agriculture at Fayoum Governorate to study the efficiency of some pre-and post ñ emergence herbicides in weed control and their effects on forage yield and quality of Egyptian clover.

The dominant weeds in the two seasons were: Urtica urens L., Medicago hispida Gaerth, Euphorbia peplus L. and Emex spinous L. however, Cichorium pamilum Jacq, Beta vulgaris L. and Chenopodium murale L. were not present in major quantities. In pre-emergence applications, data showed that pendimethalin exhibited a higher herbicidal activity against broadleaf weeds in Egyptian clover.

In contrast, linuron herbicide reduced the forage yield and crude protein compared with the control. Besides, egyptian clover injury was observed in plots treated with linuron. In post-emergence applications, results revealed that metribuzin at the rates of 0.06 and 0.12 kg /fed.were the most effective for weed control and safe for use in Egyptian clover followed by bentazon while flauzifop ñ butyl was the least. Also, both metribuzin rates (0.06 and 0.12 kg/ fed.) caused a significant increases in forage yield and crude protein over the control. In addition, all herbicide treatments applied post emergence did not injure Egyptian clover.

INTRODUCTION

Egyptian clover (Trifolium alexandrinum L.) is the main forage crop in Egypt. Weeds are a major production problem in Egyptian clover. Weeds vigorously compete with Egyptian clover for light, water, nutrients and also may reduce forage quality. In addition, some of these weeds are toxic to animals which fed on forage green yield of Egyptian clover contaminated with these weeds such as spurge (Euphorbia peplus L.), nettle (Urtica urens L.), sweet clover (Melilotus indica L.) and wild mustard (Sinapis arvensis L.). The use of herbicides for weed control have been studied by many investigators. Harvey et al. (1976). observed that weed control using herbicides has increased alfalfa yields. Robinson et al. (1978); Swan (1978); Cosgrove and Barrett (1987) and Wilson (1989) reported similar results. Hammouda et al. (1989) showed that

applying pronamide herbicide as post-emergence significantly enhanced the forage green yield over the untreated control. In contrast, the pre-emergence application at the concentration injured established Egyptian clover and resulted in lower forage yield by 65%.

The present work aimed to study the effect of some herbicides on weed control, forage green yield and quality of Egyptian clover.

MATERIALS AND METHODS

Two field experiments were carried out at the Experimental Farm of the Faculty of Agriculture at Fayoum during two winter seasons of 2001/02 and 2002/03 using a complete randomized block design with four replicates. The plot size was 10.5 m^2. Egyptian clover, Giza 1 (Meskawi) was used.

Six herbicides were used in this investigation as shown in table 1.

Apre- emergence herbicides were applied after seeding and before irrigation while post- emergence herbicides were sprayed four weeks after sowing using a knapsack sprayer with one nozzle boom at a volume of 200 L/fed. All plots were irrigated immediately after treatment.

Data were recorded as follows:

1) Weeds :

Weeds were hand pulled and taken 60, 90 and 120 days after sowing and the fresh weight of weeds per one square meter chosen at random was collected in the swather and weighed in each plot. Percent weed control was calculated as 100 [1- (plant fresh weight / untreatred plant fresh weight)]

2) Egyptian clover :

The first, second and third cuttings were taken from both pre and post emergence herbicides treatments during each growth season to determine the forage yield of Egyptian clover. Also, protein was determined as total nitrogen by micro-kieldahal method and crude protein was obtained by multiplying nitrogen content by 6.25 (A.O.A.C. 1995).

Egyptian clover injury was evaluated 4 weeks after each treatment using a rating scale of 0-100, where 0 indicated no injury, 10-30 slight injury, 40-60 moderate injury, 70-90 severe injury and 100 complete kill. Germination rate and percentage were also recorded.

3) Statistical analysis :

All data of each season were statistically analyzed according to Snedecor and

Table (1) : Common, trade and chemical names as well as ADI of the herbicides used.

Common name	Trade name	Rate/ fed.	Chemical name	ADI*
Metribuzin	Sencor 70% W.P.	0.3 kg 0.12 kg 0.06 kg	[4- amino –6- (1.1 – dimethylethyl) –3- (methylthio) –1,2,4 – triazin –5 (4H) – one].	0.013
Linuron	Afalon –S 47.5% W.P.	0.75 kg	3- (3,4 – dichlorophenyl)-1- methoxy –1- methylurea.	0.008
Pendimethalin	Stomp 50% E.C.	1.7 L	N- (1- ethylpropyl) – 3,4 – dimethyl – 2,6 – dinitrobenzenamine.	n.a.**
Butralin	Amex 48% E.C.	2.5 L	4- (1,1 – dimethyl) – N – (1-methyl propyl) – 2,6-dinitrobenzamide.	0.5
Bentazon	Basagran 48% A.S.	0.5 L	3- (1- methylethyl) – (1H) – 1,2,3 – benzothiadiazin – 4 (3H) – one 2,2 – dioxide.	0.1
Fluazifop-butyl	Fusilade super 12.5% E.C.	1.0 L	(±) –2- [4- [[5-(trifluoromethyl) –2- pyridinyl] oxy] phenoxy] propanoic acid.	0.01

* ADI = Acceptable daily intake.
** n.a. = Not available.

Cochrqn (1980). Means were compared using the least significant difference (L.S.D.) test at the 0.05 significance level.

RESULTS AND DISCUSSION

1- Weeds :

It is clear from Table 2 that nettle (37plants /m^2) burclover (64 plants /m^2) and spurge (20 plants /m^2) were the dominant weeds during both seasons. However, chicory (12 plants /m^2), goosefoot (9 plants /m^2) and wild beet (5 plants /m^2)were growing but were not present in major quantities, while dock (2 plants /m^2), sweet clover (1 plant /m^2) and thistle (<1 plant /m^2) were found but in negligible numbers. This populations of broad leaf weeds increased each year without control, some of these weeds were a very toxic to animals which fed on forage yield of Egyptian clover mixed with these weeds such as nettle and spurge. The only herbicides that controlled nettle and spurge were pendimethalin at 1.7L/fed. and metribuzin at 0.06 kg/ fed.

1-1 Pre-emergence herbicides.

Data presented in Table 3 indicate that pendimethalin at 1.7 L/fed. was the most effective for weed control where provided 64% control in both seasons whereas, metribuzin at 0.3 kg/fed. gave 52.8 - 60.5% control during 2001/02-2002/03 seasons respectively.

In this connection, Dawson (1987) mentioned that any program that controls broad leaf weeds can help to control cuscuta in alfalfa. He added that metribuzin and pendilmethalin herbicides can control cuscuta indirectly by eliminating seedlings of broad leaf weeds upon which cuscuta could first become attached. Also, butralin at 2.5 L/fed. provided 32% control in 2001/02 season and 18% control in 2002/03 season. In contrast, weed control was zero in plots treated with linuron at 0.75 kg/fed. Therefore, this herbicide failed to control weeds in Egyptian clover.

1-2 Post-emergence herbicides.

Data in Table 3 show that metribuzin at 0.06 and 0.12 kg/fed. were the most effective in controlling Egyptian clover weeds followed by bentazon at 0.5 L/ fed. while flauzifop- butyl at 1.0 L/fed. was the least. Metribuzin gave 75.2 ñ 90.3% control at 0.06 kg/ fed. and 86.0 - 92.6% control at 0.12kg /fed. in both studied seasons respectively. Also, bentazon at 0.5L/fed. resulted in 48.6-65.0% control in both seasons. However, flauzifop ñ butyl provide little weed control reached to 40% in the first season and 27% in the second season. The present findings are in accordance with those reported by Robinson et al. (1978), Winton and Stritzke (1985), Cosgrove and Barrett (1987) and Waddington (1990).

2. Egyptian clover:

2.1. Pre-emergence herbicides.

Data in Table 4 indicate that application of pendimethalin at 1.7 L/fed. Significantly enhanced the forage yield by 18.3 - 21.6% over the control during the two experimental seasons respectively. Also, the increase in crude protein reached about 25.0 - 28.2% above the control at the same rate in both seasons. Applying metribuzin at 0.3 kg/fed. showed slight increment in forage yield followed by butralin at 2.5 L/fed. this increase is not significant for both herbicides. The increase gained by metribuzin at 0.3 kg/fed. were 10.1 - 15.3 % in forage yield and 17.4 - 20.6% in crude protein compared with the control in the two seasons respectively. In contrast, linuron at 0.75 kg/ fed. decreased the crude protein by 9.5 - 13.4 % under the control in the first and second seasons respectively. In this respect, Wilson (1989). Found that forage crude protein was lower than the untreated control in plots treated with diuron and trifluralin herbicides.

Also, visible Egyptian clover injury consisting of leaf and stem chlorosis and plant stunting was present only in plots treated with linuron at 0.75 kg /fed. as shown in Table 5. Seed germination percentage was not significantly affected by any of herbicide treatments used pre-emergence compared with the control in both seasons. However, linuron at 0.75 kg/ fed. was the only herbicide which gave delaying in germination rate up to 4.5 and 4.0 days while control were 3.2 and 2.8 days during 2001/02 and 2002/03

Table (2) : Broad leaf weeds (no./m²) found in Egyptian clover during both seasons.

Species	*Latin names*	*Density of weed* (no. / m²)*
Dock	*Rumex dentatus L.*	2
Nettle	*Urtica urens L.*	37
Spiny	*Emex spinous L.*	18
Chicory	*Cichorium pamilum Jacq*	12
Wild beet	*Beta vulgaris L.*	5
Rocket	*Sisymbrium irio L.*	1
Sweet clover	*Melilotus indica L.*	1
Wild mustard	*Sinapis arvensis L.*	1
Spurge	*Euphorbia peplus L.*	20
Burclover	*Medicago hispida, Gaerth*	64
Goose foot	*Chenopodium murale L.*	9
Purslane	*Portulaca oleracea L.*	3
Thistle	*Silybium marianum Gaerth*	< 1

* Broad leaf weed species and their densities in the untreated control.

Table (3) : Fresh weight of broad leaf weeds and its control as affected by herbicide treatments in Egyptian clover.

Herbicide	Rate/ fed.	Broad leaf weeds fresh weight (g/m^2)			Total	Weed control (%)
		60 ---- * DAS	90 ---- DAS	120 ---- DAS		
2001/02						
Pre-emergence**						
Pendimethalin	1.7 L	200.35	306.19	140.27	646.81	64.0
Metribuzin	0.3 kg	468.62	297.33	82.65	848.60	52.8
Butralin	2.5 L	604.95	415.19	201.73	1221.87	32.0
Linuron	0.75kg	1379.46	709.82	257.11	2346.39	00.0
Post-emergence***						
Metribuzin	0.06kg	215.06	163.24	67.19	445.49	75.2
	0.12kg	86.12	104.71	59.78	250.61	86.0
Bentazon	0.5 L	494.10	309.71	120.36	924.17	48.6
Flauzifop-butyl	1.0 L	650.97	234.78	193.01	1078.76	40.0
Control		1106.28	527.46	164.27	1798.01	-
$LSD_{0.05}$		219.48	27.01	45.26	330.92	12.72
2002/03						
Pre-emergence						
Pendimethalin	1.7 L	180.97	155.90	179.52	516.39	64.0
Metribuzin	0.3 kg	274.93	139.10	152.64	566.67	60.5
Butralin	2.5 L	608.05	240.14	327.31	1175.50	18.0
Linuron	0.75kg	1036.24	324.79	520.57	1881.60	00.0
Post-emergence						
Metribuzin	0.06kg	0.0	48.25	90.83	139.08	90.3
	0.12kg	0.0	32.46	73.57	106.03	92.6
Bentazon	0.5 L	196.73	141.65	163.40	501.78	65.0
Flauzifop-butyl	1.0 L	530.49	217.01	299.56	1047.06	27.0
Control		831.51	296.36	306.82	1434.69	-
$LSD_{0.05}$		136.86	18.90	32.64	255.23	10.51

* DAS = days after sowing.
** Pre-emergence = after seeding and before irrigation.
*** Post – emergence = four weeks after sowing (4WAS).

seasons respectively.

2.2. Post-emergence herbicides.

Data in Table 4 reveal that metribuzin at 0.06 kg/fed. caused a significant increase by 24.8 - 30.4 % in forage yield and 30.9 - 32.0% in crude protein over the control in the first and second seasons respectively. Also, Table 4 show that metribuzin at the rate of 0.12 kg/ fed. produces a higher yield than the rate of 0.06 kg / fed. However, this difference is not significant even at the 0.01 level. Since the efficiency of both metribuzin rates is more or less the same.

Thus metribuzin rates of 0.06 or 0.12 kg/fed. is recommended and safe for use in

Egyptian clover without inducing any injury. The increase obtained by bentazon at 0.5L/fed. were 19.3 ñ 23.5% in forage yield above the control in both seasons.

Also, it increased the crude protein by 12.2 % in 2001/02 season and 8.6% in 2002/ 03 season at the same rate. Likewise, flauzifop ñ butyl at 1.0 L/fed. enhanced the forage yield by 13.6 % in the first season and 5.9% in the second season compared with the control.

In addition to, Egyptian clover was not injury by all herbicide treatments when applied post-emergence.

Results in Table 5 indicate also that all herbicide treatments had no significant effect on seed germination rate of Egyptian clover as well as the percentage of germination. These results are in agreement with those obtained by Wilson (1981) and Peters et al. (1984) on alfalfa and Hammouda et al. (1989) on Egyptian clover.

From the above results it can be concluded that all herbicide treatments either pre- or post - emergence applications did not injure Egyptian clover with the exception of linuron herbicide which decreased the yield and crude protein content. Unlike, pendimethalin at 1.7 L/fed. pre-emergence and metribuzin at 0.06 kg/ fed. post- emergence were the most effective for weed control and caused a significant increases in forage yield and crude protein above the control. Generally, these treatments controlled annual

Table (4) : Forage yield and crude protein of Egyptian clover as affected by given herbicides.

Herbicide	Rate/ fed.	Forage yield (kg)			Mean	Crude protein (%)			Mean
		1st cut	2nd cut	3rd cut		1st cut	2nd cut	3rd cut	
		2001/02							
Pre-emergence*									
Pendimethalin	1.7 L	72.5	65.0	58.8	65.4	22.90	25.74	26.45	25.03
Metribuzin	0.3 kg	68.3	60.5	54.0	60.9	20.76	24.81	24.90	23.49
Butralin	2.5 L	63.0	55.0	50.0	56.0	18.34	18.95	23.16	20.15
Linuron	0.75kg	57.0	53.0	49.0	53.0	16.22	17.08	21.00	18.10
Post-emergence**									
Metribuzin	0.06kg	75.8	70.3	61.0	69.0	25.95	25.86	26.76	26.19
	0.12kg	79.0	71.0	64.8	71.6	23.70	26.93	28.18	26.27
Bentazon	0.5 L	75.0	64.0	59.0	66.0	19.84	22.90	24.61	22.45
Flauzifop-butyl	1.0 L	73.5	62.0	53.0	62.8	19.90	20.88	20.96	20.58
Control		60.0	54.8	51.0	55.3	18.62	19.32	22.09	20.01
LSD 0.05		3.47	4.70	2.59	4.89	2.26	3.90	1.83	1.88
		2002/03							
Pre-emergence									
Pendimethalin	1.7 L	65.8	63.0	57.3	62.0	21.76	25.49	25.56	24.27
Metribuzin	0.3 kg	62.5	59.0	54.8	58.8	23.00	22.10	23.39	22.83
Butralin	2.5 L	54.0	50.0	46.0	50.0	17.20	18.03	18.53	17.92
Linuron	0.75kg	50.0	48.5	46.0	48.2	16.00	16.15	17.05	16.40
Post-emergence									
Metribuzin	0.06kg	76.5	68.0	55.0	66.5	22.80	25.91	26.30	25.00
	0.12kg	76.0	73.0	62.3	70.4	21.07	27.01	25.00	24.36
Bentazon	0.5 L	69.0	63.0	57.0	63.0	19.00	21.46	21.23	20.56
Flauzifop-butyl	1.0 L	57.0	54.0	51.0	54.0	17.34	20.10	22.18	19.87
Control		53.0	52.0	48.0	51.0	17.35	19.28	20.16	18.93
LSD 0.05		6.25	4.41	3.06	5.32	2.73	1.58	2.16	1.97

* Pre-emergence = after seeding and before irrigation.
** Post – emergence = four weeks after sowing (4WAS).

Table (5) : Visual injury and seed germination of Egyptian clover as affected by herbicide treatments.

Herbicide	Rate/fed.	2001/02			2002/03		
		Egyptian clover injury (%)	Seed germination		Egyptian clover injury (%)	Seed germination	
			Rate	(%)		Rate	(%)
Pre-emergence							
Pendimethalin	1.7 L	0	2.1	91.3	0	2.5	94.2
Metribuzin	0.3 kg	0	3.3	95.0	0	2.6	92.0
Butralin	2.5 L	3	2.8	90.0	10	2.3	88.5
Linuron	0.75 kg	25	4.5	87.5	40	4.0	86.8
Post-emergence							
Metribuzin	0.06 kg	0	2.7	92.3	0	1.9	93.5
	0.12 kg	0	3.2	90.2	0	1.9	93.0
Bentazon	0.5 L	0	3.0	94.0	0	3.5	92.0
Flauzifop-butyl	1.0 L	0	2.6	86.5	7	2.4	90.7
Control		0	3.2	91.8	0	2.8	94.0
$LSD_{0.05}$		0.86	0.61	N.S	1.04	0.93	N.S.

broad leaf weeds but with different degrees. On the contrary, linuron was not effective in controlling weeds on Egyptian clover.

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مكافحة الحشائش في البرسيم المصري باستخدام مبيدات الحشائش وتأثيرها علي جودة ومحصول العلف الأخضر

إبراهيم حامد حسين علي ١ ـ ردينة أحمد حسن ٢

١، قسم وقاية النبات ـ كلية الزراعة ـ جامعة القاهرة ـ الفيوم ـ مصر .

٢، قسم الحشرات الاقتصادية والمبيدات ـ كلية الزراعة ـ جامعة القاهرة ـ الجيزة ـ مصر.

أقيمت تجارب حقلية بمحطة البحوث الزراعية التابعة لكلية الزراعة بالفيوم خلال موسمي الزراعة ٢٠٠١/٢٠٠٢ ، ٢٠٠٢/2003 بغرض دراسة تأثير ست مبيدات حشائش وهي البندميثالين ـ الميتريبوزين ـ البيوترالين ـ البنتازون ـ اللينيورون ـ الفلازيفوب بيوتايل . علي مكافحة الحشائش ومحصول العلف الأخضر في البرسيم المصري.

ويمكن تلخيص أهم النتائج المتحصل عليها فيما يلي :-

١- حصر الحشائش المصاحبة للبرسيم المصري.

أوضحت الدراسة أن الحشائش العريضة الأوراق هي السائدة فقط وأن أكثر الحشائش انتشاراً هي الحريق ـ ضرس العجوز ـ اللبينة ـ النفل ـ الشيكوريا كما كانت هناك مجموعة من الحشائش ولكنها قليلة الانتشار وهي الرمرام ـ السلق ـ الحميض ، كذلك شمل الحصر مجموعة من الحشائش المعروفة بسميتها للحيوان مثل اللبينة والحريق والتي نجحت مكافحتها تماماً بمبيدي الحشائش البندميثالين والميتريبوزين.

٢- مبيدات الحشائش قبل الإنبات .

أظهرت المعاملة بمبيد البندميثالين كفاءة عالية في مكافحة الحشائش العريضة الأوراق وبصفة خاصة الحريق والكبر والشيكوريا حيث أدي تطبيق البندميثالين بمعدل ٧.١ لتر / فدان إلي زيادة محصول العلف الأخضر والبروتين الخام زيادة معنوية عن معاملة المقارنة وعلي العكس من ذلك فقد أدي استعمال مبيد اللينيورون بعد الزراعة وقبل الري بمعدل ٧٥.٠ كجم / فدان إلي نقص في كل من محصول العلف الأخضر والبروتين الخام علي السواء مقارنة بمعاملة الكنترول مع حدوث ضرر واضح على نباتات البرسيم المصري ، كذلك لم يلاحظ أي تأثير يذكر على الحشائش بهذه المعاملة.

٣- مبيدات الحشائش بعد الإنبات

أظهرت النتائج أن الميتريبوزين من أكثر مبيدات الحشائش تأثيراً علي الحشائش العريضة الأوراق مثل السلق والنفل في حين كان مبيد الفيلازفوب بيوتايل أقلها تأثيراً حيث أدي تطبيق الميتريبوزين بمعدل ٠.٦٠ كجم / فدان إلي زيادة معنوية في محصول العلف الأخضر والبروتين الخام عن معاملة المقارنة وبصفة عامة لم يؤدي التطبيق بمبيدات الحشائش في جميع المعاملات بعد الإنبات إلي حدوث أضرار ملحوظة علي البرسيم المصري أثناء النمو.