Comparative Performance of Wheat Post-Emergence Herbicides In Relation To Their Effect on Wheat Yield

Saad, A. S. A.; E. H. M. Tayeb; M. A. Masoud and R. A. A. Shawer[1]

ABSTRACT

Two field experiments were conducted in a research experimental farm in Rasheed region, Behaira Governorate during two wheat growing seasons of 2007 and 2008 winter to evaluate the performance of certain herbicides namely: bromoxynil-octanoate (Brominal® 24% EC), tribenuron-methyl (Granstar® 75% DF), diflufenican+isoproturon (Panther® 55% SC) and florasulam+flumetsulam (Derby® 17.5 % SC) at rates of 1000 ml, 8 g, 600 ml and 30 ml, respectively/feddan. The evaluated herbicides are selected against the broad leaved weeds and therefore they have been used to overcome the most harmful weeds[wild beet (*Beta vulgaris*), nettleleaf goosefoot (*Chenopodium murale*) and toothed bur clover (*Medicago hispida*)] found in the fields of wheat (*Triticum aestivum* var. Sakha 61). Furthermore the effect of the evaluated compounds on wheat yield was considered. The data showed that the superior effect was achieved by tribenuron-methyl (Granstar®). Meanwhile it is also recorded the highest percentage of wheat yield increase, followed by bromoxynil-octanoate (Brominal®), florasulam + flumetsulam (Derby®) and diflufenican + isoproturon (Panther®). All the applied treatments increased the weight of 1000-grains over the weedy check treatment in both seasons of 2007 and 2008.

INTRODUCTION

Wheat (*Triticum aestivum* L.) ranks the second crop after maize in the world cereal outputs and it is a staple food for billions of people all over the world. Wheat is the most important among food cereals in Egypt. The flour of wheat is the major dietary for people and its straw is used as a major animal feed. There are many factors responsible for low yield. One of the major causes of low yield is weed infestation.

Weeds reduce the crop yield and deteriorate the quality of the product which reflected on the market value of wheat. Weed management increases the cost of production and thus it is necessary to devise such methods which could reduce not only the cost of production but also save time and labor. One of the methods is chemical weed control, which is one of the recent origins that are being emphasized in modern agriculture (Taj *et al*., 1986).

Donald and Easten (1995) reported that weeds are considered to be a serious problem in wheat in Egypt. Weeds compete with wheat plants for soil moisture, water and sun light and nutrients. This competation lead to grain yield reduction estimated by 7% (Shah *et al*. 2005), 52% (Khan *et al.*, 2003), 92% (Tiwari and Parihar, 1997), 42-56% (Abdel-Hamid *et al*., 1998), 41% (Abouziena *et al.*, 2008). In serious cases complete crop failure may be happened (Abdul-Khaliq and Imran, 2003).

Competition with weeds decreased both the yield and the content of grain protein of wheat. Most agricultural weed problems however require the destruction of weeds without simultaneous damage to the crop amongest which the weeds are growing. Herbicides are used in agriculture to remove weeds that would otherwise compete with the crop.

Broadleaved that infesting wheat fields represent an increasing problem in many growing areas in Egypt. Among the most troublesome weeds are beet (*Beta vulgaris*), nettleleaf goosefoot (*Chenopodium murale*) and toothed bur clover (*Medicago hispida*). To obtain maximum wheat yield, weeds should be controlled at proper time in right manner. It is very important to determine the critical period of weed-crop competition to plan an effective weed control method (Chaudhary *et al*., 2008).

The availability of selective herbicides during the last 30 years has enabled farmers to grow high-yielding wheat varieties bred successfully to achieve optimal yields in weed-free conditions (Powles *et al.*, 1997). Nevertheless, full-season control of broadleaved weeds is difficult to obtain. Some weeds escape control with the broadleaved herbicides because of their resistance to herbicides and the change in weed flora due to the repeated applications of these herbicides (Zand, 2004).

Therefore, the present study was directed to evaluate four herbicides namely: [bromoxynil-octanoate (Brominal® 24% EC), tribenuron-methyl (Granstar® 75% DF), diflufenican+isoproturon (Panther® 55% SC) and florasulam+flumetsulam (Derby® 17.5 % SC)] against the most important wheat weeds. Furthermore, their effect on yield was studied.

MATERIALS AND METHODS

2.1. Herbicides

The common, chemical and trade names, as well as formulation and the rates of the herbicides are shown in Table (1).

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[1]Plant Protection Dept., Faculty of Agric., Alexandria Univ., Egypt
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Table 1. Common, chemical, Trade names, formulation and the rates of post-emergence herbicides application during the seasons of 2007 and 2008

Common name	Chemical name	Trade name	Formulation	Appl. Rate /fed.
Bromoxynil-octanoate	2,6-dibromo-4-cyanophenyl octanoate	Brominal®	EC 24%	1000 ml
Diflufenican + isoproturon	*N*-(2,4-difluorophenyl)-2-[3-(trifluoro methyl)phenoxy]-3-pyridine carboxamide; *N,N*-dimethyl-*N*'-[4-(1-methylethyl) phenyl]urea	Panther®	SC 55%	600 ml
Tribenuron-methyl	Methyl-2-[[[[(4-methoxy-6-methyl-1,3, 5-triazin-2-yl)methyl-amino]carbonyl] amino]sulfonyl]benzoate	Granstar®	DF 75%	8 g
Florasulam + flumetsulam	*N*-(2,6-difluorophenyl)-8-fluoro-5-methoxy[1,2,4]triazolo[1,5-*c*]-pyrimidine-2-sulfonamide; *N*-(2,6-difluoro-phenyl)-5-methyl[1,2,4]-triazolo[1,5-*a*]pyrimidine-2-sulfonamide	Derby®	SC 17.5 %	30 ml

2.2. Agricultural practices

Agricultural practices (soil preparation, tillage, irrigation and fertilization) were applied according to Egyptian Ministry of Agriculture recommendations. Sowing process was done on the second week of November in both seasons at recommended rates at a research experimental farm. Then, the post-emergence herbicide treatments were applied after 30 days from sowing (stage 2 to 4 leaves) with a knapsack sprayer (CP3) at a volume rate of 200 l/fed as indicated in Table 1.

2.3. Weed assessments

From each experimental plot, one square meter (1 m^2) was selected randomly to identify and collect the three selected broad leaved weeds [wild beet (*Beta vulgaris*), nettleleaf goosefoot (*Chenopodium murale*) and toothed bur clover (*Medicago hispida*)]. The number of these selected weeds/ m^2 was recorded 7, 14 and 21 days post-spraying. The reduction percentage of weed numbers (R %) was calculated according to the following equation:

$$R\% = \frac{\text{No. of weeds in the weedy check} - \text{No. of weeds in the treatment}}{\text{No. of weeds in the weedy check}} * 100$$

2.4. Determination of yield

At harvest time, plants in an area of 1 m^2 were collected from each experimental plot to determine the grain yield of wheat (g). The yield expressed as ardab/feddan was calculated. Also, 1000 grains of those wheat plants grown in each plot were counted and weighted (g).

2.5. Statistical analysis

Data were subjected to the analysis of variance test (ANOVA) as complete randomized block design (CRB). The least significant differences (LSD) at the 5% level were determined using a computer program (Costat) and Duncan's Multiple Range testes modified by Steel and Torrie (1981) and LSD values were used to compare the average numbers of the all studied characters.

RERSULTS AND DISCUSSION

3.1. Weed identification

Ten weeds belonging to six different families were detected and surveyed in the experimental fields. The prevalent weed species in wheat experimental fields of this running study were the wild beet (*Beta vulgaris*), nettleleaf goosefoot (*Chenopodium murale*), toothed bur clover (*Medicago hispida*), sour grass (*Rumex dentatus*), spring vetch (*Vicia sativa*), sow-thistle (*Sonthus oleraceus*), black mustard (*Brassica nigra*), wild oast (*Afina fatua*), darnel (*Lolium temulentum*) and bermuda grass (*Cynodon dactylon*).

3.2. Effect of herbicide application on broad leaved weeds population

3.2.1.The wild beet weed (*Beta vulgaris*)

The effect of the tested herbicides was evaluated against the most common aboundant weeds. Data in Table (2) illustrate the effect of the evaluated herbicides on the mean numbers and reduction percentages of the wild beet weed in both seasons of 2007 and 2008. The herbicidal effect due to evaluated compounds against wild beet weed population was determined under field conditions. Most of the evaluated treatments were found to have an effect on population of wild beet.

Table 2. The performance of certain post-emergence herbicides against wild beet weed (*Beta vulgaris*) during growing seasons of wheat

Season / Treatment	Application rate /fed.	Pre-treatment	Mean No. of the wild beet weed and reduction % after treatment at different intervals (days)						Total mean	
			7		14		21			
		M.N*	M.N	R*	M.N	R	M.N	R	M.N	R
Season 2007										
Tribenuron-methyl	8 g	1.50	3.25^{bc}**	80.88	6.25^{b}	86.84	4.25^{b}	92.64	4.58	86.79
Bromoxynil-octanoate	1000 ml	1.25	2.00^{c}	88.24	9.75^{b}	79.47	6.25^{b}	89.18	6.00	85.63
Diflufenican+isoproturon	600 ml	1.75	4.00^{bc}	76.47	14.25^{b}	70.00	8.50^{b}	85.71	8.92	77.39
Florasulam+flumetsulam	30 ml	1.75	5.00^{b}	70.59	12.50^{b}	73.68	7.75^{b}	86.58	8.42	76.95
Untreated (weedy check)	-	2.50	17.00^{a}	00.00	47.50^{a}	00.00	57.75^{a}	00.00	40.75	00.00
$L.S.D_{5\%}$			**2.72**		**11.19**		**13.29**			
Season 2008										
Tribenuron-methyl	8 g	1.00	4.00^{b}	82.22	8.50^{b}	84.55	6.00^{b}	89.43	6.17	85.40
Bromoxynil-octanoate	1000 ml	1.25	4.25^{b}	81.11	13.75^{b}	75.00	8.75^{b}	84.58	8.92	80.23
Diflufenican+isoproturon	600 ml	2.00	6.50^{b}	71.11	14.50^{b}	73.64	12.50^{b}	77.97	11.17	74.24
Florasulam+flumetsulam	30 ml	2.00	6.50^{b}	71.11	15.25^{b}	72.27	9.50^{b}	83.26	10.41	75.55
Untreated (weedy check)	-	2.75	22.50^{a}	00.00	55.00^{a}	00.00	56.75^{a}	00.00	44.75	00.00
$LSD_{5\%}$			**4.89**		**12.89**		**12.34**			

* M.N= Mean number of the wild beet weed individuals/ m^2 and R= Reduction percent

** Means followed by the same letter(s) are not significantly different at 5%level

Generally, all the tested herbicides significantly decreased weed population over the weedy check treatment throughout the whole inspection intervals during 2007 and 2008 seasons. In the first season (2007), the general mean of reduction percentages throughout the whole inspection intervals revealed that tribenuron-methyl exhibited the highest mean of reduction estimated by 86.79%, followed by bromoxynil - octanoate (85.63%), diflufenican + isoproturon (77.39%) and florasulam+flumetsulam (76.95%).

Regarding the second season of 2008, the general mean of reduction percentages throughout the whole inspection intervals proved that tribenuron-methyl exhibited the highest mean of reduction which estimated by 85.40%, followed by bromoxynil-octanoate (80.23%), florasulam+flumetsulam (75.55%) and diflufenican+isoproturon (74.24%).

It was found that there was a relationship between the herbicidal effect of tribenuron-methyl and the post-application time where the efficacy of this compound (tribenuron-methyl) was increased with the time after application gradually. In the first season, the reduction of this weeds population due to tribenuron-methyl application was 80.88 % after 7 days post-treatment and his reduction percentage increased to 86.84% after 14 days, then it was increased to 92.64% after 21 days. In the 2nd season, this trend was assured whereas; the reduction percentages of tribenuron-methyl were estimated by 82.22%, 84.55% and 89.43 after 7, 14 and 21 days post-application, respectively. Twenty one days post-treatment was the most effective period for controlling wild beet weed by herbicides tribenuron-methyl and florasulam+flumetsulam, and it is worth to mention that tribenuron-methyl and florasulam+flumetsulam have the same mode of action. There were no significant differences among the applied herbicides against *Beta vulgaris* and it could be said that it is better for the farmer to choose the cheapist herbicide to reduce the costs of weeds control in case of having a problem of *Beta vulgari* spreading. From the environment point view, it would be better to choose the more safe and friendly herbicide among those tested compounds.

3.2.1. The toothed bur clover weed (*Medicago hispida*)

The effect of the tested herbicides on the mean numbers and reduction percentages of the toothed bur clover weed in both seasons of 2007 and 2008 was presented in Table (3). Despite, there were no significant differences among treatments sometimes; all herbicides decreased the toothed bur clover weed population significantly over the weedy check in both 2007 and 2008 wheat growing seasons.

The general mean of reduction percentages throughout the whole inspection intervals showed that tribenuron-methyl exhibited the highest mean of reduction that estimated by 89.10%, followed by bromoxynil-octanoate (87.71%), florasulam + flumetsulam (83.53%) and diflufenican + isoproturon (82.47%).

Most of the second season (2008) results had more or less the same trend as that of the first season (2007). It is obvious that the general mean of reduction percentages throughout the whole inspection intervals cleared that tribenuron-methyl exhibited the highest mean reduction that reached 87.30%, followed by bromoxynil-octanoate (84.36%), florasulam + flumetsulam (80.21%) and diflufenican + isoproturon (76.04%).

3.2.2.The nettleleaf goosefoot weed (*Chenopodium murale*)

Data in Table (4) represent the effect of the applied herbicides on the mean numbers and reduction percentages of the nettleleaf goosefoot weed during both seasons of 2007 and 2008. The results show that there were no significant differences among the mean numbers of the weed in whole intervals of inspection (7, 14 and 21 days post-application) of the applied treatments through both seasons and all the tested herbicides significantly decreased weed population over the weedy control in both seasons.

According to the general mean reduction percentages throughout the whole inspection intervals (1, 2 and 3 weeks post-treatment) during season 2007, the most effective reduction was obtained by the application of tribenuron-methyl giving the highest reduction percentage of 91.00% followed by bromoxynil-octanoate, florasulam + flumetsulam and diflufenican+isoproturon giving reductions of 90.73%, 88.00% and 82.29%, respectively. The least efficacy was showed by diflufenican+isoproturon compared with the other tested compounds.

Regarding the results of the second season (2008) after one-week post-treatment, the treatments could be arranged due to their efficacy as follows tribenuron-methyl (78.26%), bromoxynil-octanoate (69.57%), florasulam + flumetsulam (62.31%) and diflufenican + isoproturon (56.52%). According to the mean numbers of the nettleleaf goosefoot individuals/m^2, the highest mean number of the weed was observed in diflufenican + isoproturon treatment (7.50 weed individuals/m^2) indicating less efficacy, while the most efficient one was tribenuron-methyl (3.75) showing the superior effect.

Table 3. The performance of certain post-emergence herbicides against toothed bur clover weed (*Medicago hispida*) during growing seasons of wheat

Season / Treatment	Application rate/fed.	Pre-treatment	Mean No. of the toothed bur clover weed and reduction % after treatment at different intervals (days)						Total mean	
			7		14		21			
		M.N*	M.N	R*	M.N	R	M.N	R	M.N	R
Season 2007										
Tribenuron-methyl	8 g	3.00	5.25[cd]**	92.08	12.50[b]	84.42	8.50[b]	90.81	8.75	89.10
Bromoxynil-octanoate	1000 ml	2.00	4.00[d]	93.96	16.50[b]	79.44	9.50[b]	89.73	10.00	87.71
Diflufenican+isoproturon	600 ml	3.25	8.25[b]	87.55	20.50[b]	74.45	13.50[b]	85.41	14.08	82.47
Florasulam+flumetsulam	30 ml	3.50	7.25[bc]	89.06	20.25[b]	74.77	12.25[b]	86.76	13.25	83.53
Untreated (weedy check)	-	3.00	66.25[a]	00.00	80.25[a]	00.00	92.50[a]	00.00	79.67	00.00
$LSD_{5\%}$			**2.67**		**9.96**		**8.19**			
Season 2008										
Tribenuron-methyl	8 g	2.00	4.50[b]	93.59	10.25[c]	87.19	12.50[b]	81.13	9.08	87.30
Bromoxynil-octanoate	1000 ml	2.00	6.25[b]	91.10	10.50[c]	86.88	16.50[b]	75.09	11.08	84.36
Diflufenican+isoproturon	600 ml	2.50	11.00[b]	84.34	23.25[b]	70.94	18.00[b]	72.83	17.42	76.04
Florasulam+flumetsulam	30 ml	2.75	8.25[b]	88.26	14.25[bc]	82.19	19.75[b]	70.19	14.08	80.21
Untreated (weedy check)	-	3.25	70.25[a]	00.00	80.00[a]	00.00	66.25[a]	00.00	72.17	00.00
$LSD_{5\%}$			**6.98**		**9.37**		**6.85**			

* M.N= Mean number of the toothed bur clover weed individuals/ m^2 and R= Reduction %

** Means followed by the same letter(s) are not significantly different at 5%level

Table 4. The performance of certain post-emergence herbicides against nettleleaf goosefoot weed (*Chenopodium murale*) during growing seasons of wheat

Season / Treatment	Application rate/fed	Pre-treatment	Mean No. of the nettleleaf goosefoot weed and reduction % after treatment at different intervals (days)						Total mean	
			7		14		21			
		M.N*	M.N	R*	M.N	R	M.N	R	M.N	R
Season 2007										
Tribenuron-methyl	8 g	2.75	1.00^{b}**	90.24	4.50^{b}	87.23	2.75^{b}	94.05	2.75	91.00
Bromoxynil-octanoate	1000 ml	2.75	2.00^{b}	80.49	4.25^{b}	87.94	2.25^{b}	95.24	2.833	90.73
Diflufenican+isoproturon	600 ml	1.75	3.00^{b}	70.73	7.25^{b}	79.43	6.00^{b}	87.03	5.417	82.29
Florasulam+flumetsulam	30 ml	2.25	3.00^{b}	70.73	5.00^{b}	85.82	3.00^{b}	93.51	3.667	88.00
Untreated (weedy check)	-	2.00	10.25^{a}	00.00	35.25^{a}	00.00	46.25^{a}	00.00	30.58	00.00
$LSD_{5\%}$			**4.31**		**6.34**		**7.14**			
Season 2008										
Tribenuron-methyl	8 g	1.50	3.75^{b}	78.26	6.00^{b}	86.96	3.75^{b}	93.39	4.5	86.20
Bromoxynil-octanoate	1000 ml	2.00	5.25^{b}	69.57	8.50^{b}	81.52	6.50^{b}	88.55	6.75	79.88
Diflufenican+isoproturon	600 ml	2.25	7.50^{b}	56.52	13.25^{b}	71.20	14.50^{b}	74.45	11.75	67.39
Florasulam+flumetsulam	30 ml	2.00	6.50^{b}	62.31	11.00^{b}	76.09	10.50^{b}	81.50	9.33	73.30
Untreated (weedy check)	-	3.50	17.25^{a}	00.00	46.00^{a}	00.00	56.75^{a}	00.00	40.00	00.00
$LSD_{5\%}$			**4.51**		**14.27**		**10.08**			

*M.N= Mean number of the nettleleaf goosefoot weed individuals/m^2 and R= Reduction%.

** Means followed by the same letter(s) are not significantly different at 5%level.

Also, the general mean of reduction percentages throughout the whole inspection intervals (1, 2 and 3 weeks) post - treatment during the season of 2008 showed that the most effective compound was tribenuron-methyl giving the highest reduction percentage of 86.51%, followed by bromoxynil - octanoate, florasulam + flumetsulam and diflufenican + isoproturon which gave reduction percentages of 79.88%, 73.30% and 67.39%, respectively. Diflufenican + isoproturon proved to be the least efficient evaluated compound when it was compared with the other tested compounds against *C. murale*.

Data in Table (5) illustrate the cumulative performance of certain post-emergence herbicides against three weeds; wild beet, toothed bur clover and nettleleaf goosefoot during growing seasons of 2007 and 2008. According the total mean numbers and the general mean reduction percentages of all three tested weeds during both seasons of 2007 and 2008, the most effective reduction was obtained by the application of tribenuron-methyl compound followed by the application of bromoxynil-octanoate.

These results in general are in agreement with those obtained by Sabra *et al*. (1999) who found that tribenuron-methyl gave 97.3% reduction of the broad leaved weeds population. Also, they found that Sinal® (Metosulam) recorded 100% reduction in broad leaved weeds and that compound have the same mode of action as that of tribenuron-methyl as they inhibit acetolactate synthase (ALS).

Also, the presented results are in agreement with those obtained by Fenni *et al*. (2001) who proved that tribenuron-methyl was the most efficient treatment, as it reduced weed densities by 85 and 88% at 25 and 51 days, respectively after transplanting.

Kalsi *et al*. (1998) stated that tribenuron-methyl at 20g/ha showed an excellent level of weed control and significantly improved grain yield compared to the control (no weeding) during a two years study. The presented results agreed with those results of El-Metwally and El-Rokiek (2007) who reported that Harmony-extra® (tribenuron-methyl+thifensulfuron-methyl at 24g/fed. as active ingredient) which have the same tribenuron-methyl mode of action showed an acceptable control of broad leaved weeds but failed to control completely narrow-leaved weeds. Also, Zand *et al*. (2007) showed that metsulfuron methyl+sulfosulfuron at 36 g/ha is a suitable option for the post-emergence control of the broadleaved and grass weeds in wheat.

For bromoxynil-octanoate, Marwat *et al*. (2006) recorded a high reduction in weed density ($16.20/m^2$) obtained by its application compared with the high density ($142.25/m^2$) in the weedy control plots.

3.3.The effect of the tested herbicides on yield of wheat and 1000-grains weight

3.3.1. Wheat grain yield

The effect of the evaluated herbicides on wheat yield during both seasons of 2007 and 2008 are presented in Table 6. The results indicated that all chemical treatments increased the yield of wheat significantly compared with the weedy check treatment in both seasons of 2007 and 2008.

Data of the first season showed that the application of tribenuron-methyl led to the highest percentage of wheat yield increase estimated by 19.49% followed by bromoxynil-octanoate, florasulam+flumetsulam and diflufencan+isoproturon that give increases of 13.15%, 8.37% and 5.14%, respectively. There was a significant difference between tribenuron-methyl and diflufencan+isoproturon. On the other hand, there was no significant difference between bromoxynil-octanoate and florasulam+flumetsulam. The lowest yield was obtained by the application of diflufencan + isoproturon (17.59 ardab/fed.) compared with the other applied herbicides.

The presented data in Table 6 revealed that the results of the 2nd season had the same trend as that of the 1st season. Tribenuron-methyl showed the highest percentage of wheat yield increase estimated by 64.86% followed by bromoxynil-octanoate, florasulam + flumetsulam and diflufencan + isoproturon that gave 47.60%, 41.73% and 15.57%, respectively. It was found that there were no significant differences between the all applied treatments, however the lowest yield was obtained by diflufencan+isoproturon (12.99 ardab/fed.).

In fact, there were many factors which decrease wheat yield at an alarming rate. The most essential one is weed population. It obvious that there was a relationship between wheat yield and weed population and as the weeds population increases, the yield decreases. In this respect tribenuron-methyl (Granstar®) achieved the highest reduction of the broad leaved weeds population in both 2007 and 2008 growing seasons. On the other hand, the least reduction of the population of broad leaved weeds and the least percentage of wheat yield increase in both 2007 and 2008 seasons were obtained by diflufencan+isoproturon (Panter®).

These results are in agreement with those obtained by Zand *et al*. (2007), Fenni *et al*. (2001) and Kalsi *et al*. (1998) who stated that tribenuron-methyl showed the highest grain yield compared to the control. Also, Abouziena *et al.* (2008) observed that in the absence of

Table 5. The cumulative performance of certain post-emergence herbicides against three weeds; wild beet, toothed bur clover and nettleleaf goosefoot during growing seasons of wheat

Season / Treatment	Application rate/fed	Total mean and reduction% of three weeds					
		Wild beet		Toothed bur clover		Nettleleaf goosefoot	
		M.N*	R	M.N	R	M.N	R
Season 2007							
Tribenuron-methyl	8 g	4.58	86.79	8.75	89.10	2.75	91.00
Bromoxynil-octanoate	1000 ml	6.00	85.63	10.00	87.71	2.833	90.73
Diflufenican+isoproturon	600 ml	8.92	77.39	14.08	82.47	5.417	82.29
Florasulam+flumetsulam	30 ml	8.42	76.95	13.25	83.53	3.667	88.00
Untreated (weedy check)	-	40.75	00.00	79.67	00.00	30.58	00.00
Season 2008							
Tribenuron-methyl	8 g	6.17	85.40	9.08	87.30	4.5	86.20
Bromoxynil-octanoate	1000 ml	8.92	80.23	11.08	84.36	6.75	79.88
Diflufenican+isoproturon	600 ml	11.17	74.24	17.42	76.04	11.75	67.39
Florasulam+flumetsulam	30 ml	10.41	75.55	14.08	80.21	9.33	73.30
Untreated (weedy check)	-	44.75	00.00	72.17	00.00	40.00	00.00

*M.N= Total mean number of weed individuals/m^2 and R= Reduction%.

Table 6. The performance of certain post-emergence herbicides on wheat yield, wheat increase percentage and the weight of 1000 grains during growing seasons of wheat

Treatments	Season 2007			Season 2008		
	Yield (ardab/fed.)	% increase*	1000-grains weight (g)	Yield (ardab/fed.)	% increase	1000-grains weight (g)
Tribenuron- methyl	19. 99[a]**	19.49	58.70[a]	18.53[a]	64.86	62.49[a]
Bromoxynil-octanoate	18.93[ab]	13.15	55.21[b]	16.59[ab]	47.60	56.34[b]
Diflufenican+isoproturon	17.59[bc]	5.14	55.69[b]	12.99[ab]	15.57	56.75[b]
Florasulam+flumetsulam	18.13[abc]	8.37	58.41[a]	15.93[ab]	41.73	59.91[a]
Untreated (weedy check)	16.73[c]	00.00	53.79[b]	11.24[b]	00.00	55.46[b]
$LSD_{5\%}$	**1.97**		**2.14**	**5.66**		**2.99**

* % increase = percentage of wheat yield increase over the weedy check treatment.

** Means followed by the same letter(s) are not significantly different at 5%level.

hand weeding and the application of tribenuron-methyl led to a significant increase of grain and biological yields by 51 and 48% over the un-weeded check.

In both seasons of 2007 and 2008, the weight of 1000- grains was considered for all running chemical treatments compared with the weedy check treatment as shown in Table 6. The results showed that all treatments increased the weight of 1000-grains over the weedy check treatment in both seasons of 2007 and 2008.

Tribenuron-methyl achieved the high weight of 1000-grains during the 1st season giving a weight of 58.70 g/1000-grains, followed by florasulam + flumetsulam (58.41), diflufenican + isoproturon (55.70) and bromoxynil-octanoate (55.21 g/1000 grains). Also, the highest weight of 1000-grains during the 2nd season was recorded by tribenuron-methyl (62.50), followed by florasulam + flumetsulam, diflufenican + isoproturon and bromoxynil-octanoate showing means of 59.91, 56.75 and 56.34 g, respectively.

The wheat yield increase can be due to two factors, the first is caused by increasing the number of yield grains and the other one is due to the increase of the grain weights and its components (straw, carbohydrates, protein and starch). Hence getting rid of weeds would increase the available nitrogen in soil which will led to elevate nitrogen uptake by plants and releases its amount (expressed as protein) in grains and therefore, the increasing of yield components and wheat yield could be achieved.

CONCLUSION

It could be concluded that the superior effect was achieved by tribenuron-methyl (Granstar®) since it is the most effective compound used against the population of all three selected broad leaved weeds (*Beta vulgaris*, *Chenopodium murale* and *Medicago hispida*) giving the highest general mean of reduction percentage of all weeds population and the highest percentage of wheat yield increase, followed by bromoxynil-octanoate (Brominal®), florasulam + flumetsulam (Derby®) and diflufenican + isoproturon (Panter®). The application of tribenuron-methyl also increased the weight of 1000-grains as florasulam + flumetsulam did in both seasons of study.

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الملخص العر

أداء بعض مبيدات الـ شائش ما بعد الانبثاق وتأثـ ها على إنتاجية صول القمح

عبدالفتاح سيد عبدالكر سعد، السيد حسن مد تايب، دي عبدالظاهر مسعود، راضي عبدالـيد شاور

أجريت التجارب الـ قلية خلال مو ي شـتاء ٢٠٠٧، ٢٠٠٨ زرعة ثية تقع دينة رشيد، افظة البحـ ة وذلك لدراسة تـأث بعض مبيدات حشائش القمح عريـضة الأوراق [بروموكـسينيل (برومينـال®)، ترايبينيـورون- ميثيـل (جرانـستار®)، داي فلوفنكان+أيزوبروتيورون(بانتر®)، فلوراسـيولام+ فلومتـسيولام (دير ®)] عدلات ١٠٠٠ مل، ٨ جم، ٦٠٠ مل، ٣٠ مل/فدان (على التوا) على بعض حشائش القمح عريضة الأوراق [الـسلق الـ ي، النفل، الزربيح]، هذا بالإضافة إ تأثـ ها علـى صول القمح (الإنتاج) وذلك مقارنةً عاملة الكنترول (غ الـ عاملة). وقد تطبيق هذه الـ ركبات منفردة مرة واحدة بعد الإنبثاق مرحلـة ظهور٢-٤ ورقة/نبات قمح أي بعد حوا ٢٠-٣٠ يـوم مـن الزراعة. ولقد حصر الـ شائش الـ وجودة حقل التجربة وكانت هذه الـ شائش هي حشيشة السلق، الزربيح (أبوعفـ)، النفل، الـ ميض، الدحريج، الـ عضيض، الكـ كحشائش حوليـة شـتوية عريضة الأوراق، هذا بالإضافة إ الـ شائش الـ ولية الشتوية رفيعـة الأوراق وهى: حشيشة الزمـ ، الصامة، أيضاً حشيـشة النجيـل كحشيشة معمرة. تقدير نسبة الـ فـض أعـداد الـ ـشائش العريضة (السلق، الزربيح، النفل) بعد أسبوع وأسـبوع وثلاثـة أسـابيع مـن الـ عاملـة وقـد أظهـر مركـب ترايبنيـورون- ميثيل(جرانستار®) بشكل عام أعلى كفاءة هذا الـصدد يليـه مركـ ـب بروموكـ ـسينيل (برومينـ ـال®) مركـ ـب فلوراسيولام+فلومتـسيولام (ديـر ®) وأخـ اً مركـب داي فلوفينيكان+أيزوبروتيورون (بانتر®). وقد أوضـحت النتـائج أن مركب جرانستار® قد أدى إ قيـق أعلـى كميـة صول (إنتاجية)، وأعلى نسبة زيادة صول حبوب القمـح وكـذلك أعلى متوسط وزن ١٠٠٠حبة قمـح خـلال مـو ي ٢٠٠٧ و ٢٠٠٨ بالـ قارنة مع الـ عاملات الأخرى و معاملة الكنترول.