Comparison between four post-emergence herbicides and hand weeding for the control of annual narrow – leaved weeds (grasses) in wheat fields.

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ABSTRACT

To study the effect of four post-emergence herbicides beside hand weeding on annual narrow-leaved weeds in wheat field, experiments were performed during the two succeeding seasons (2004-2005 and 2005-2006). The field results, showed that the most annual narrow-leaved weeds were *Avena fatua L.* (Zommer), *Phalaris minor* Retz. (Shaeer elfaar) and *Polypogon monspeliensis* (L.) Desf. (Diel el – qoit). These weeds varied in weed density (average number of weeds /m^2), and weed biomass [average fresh weight of weeds (g/m^2)]. The results indicated that all the tested post-emergence herbicides significantly reduced weed biomass and increased wheat grain and straw yields in comparison with hand weeding and unweeded control in the two succeeding seasons. (Topic) (clodinafop propargyl) was relatively the most effective herbicide followed by Illoxan, (diclofop–methyl) Grasp (tralkoxydim) and Puma Super, (fenexaprop-p-ethyl).

Finally, it could be concluded that chemical weed control of grasses by the tested herbicides is an essential practice to reduce weed competition and to increase grain wheat production.

INTRODUCTION

In Egypt, wheat (*Triticum aestivum L.*) crop has been considered the main source for food to all Egyptian, and the wheat straw is important for animal feeding. Wheat production is not sufficient to our needs in Egypt. Therefore, improving cultural practices for wheat production are essential to inhance wheat production.

Narrow – leaved weeds (grasses) were dominant in wheat fields. These weeds caused great losses in wheat yield duto to by

competition with wheat plants for nutrients, water, space and light – etc. **(Hassanien *et al.*, 1993; Al-Marsafy *et al.*, 1997; Al-Marsafy *et al.*, 2001; Jitendra, 2002; Hassanein *et al.*, 2005 and El-Khanagry and Shaban, 2005).**

Weed control is one of the most effective cultural practices for increasing wheat yield **(Galal, 2003)**. Chemical weed control with herbicides play an important role in improving the plant growth and productivity of wheat, which is considered one of the most important crops in Egypt. Also, the evaluation of herbicides used in wheat fields deponds not only on the efficiency of these herbicides in weed control, but also on the effects on growth and yield of wheat plants **(Salama, 2004)**.

Previous reports demonstrated that post emergence herbicides was more effective for controlling annual narrow – leaved weeds in wheat fields **(Hassal, 1990; Raffel and Fluh, 1992; Hassanien *et al.*, 1993; Orlando *et al.*, 1993; Brar *et al.*, 1999; Malik *et al.*, 2000; Malik *et al.*, 2001; Saini and Singh, 2001; Singh and Singh, 2002; Khan and Haq, 2002; Galal, 2003; Tomar and Vivex, 2003; Kanoja and Nepalia, 2004; Hassanein *et al.*, 2005, and El-Khanagry and Shaban, 2005).**

This investigation was carried out to study the effect of four post – emergence herbicides and hand weeding on annual narrow – leaved weeds (grasses) in wheat in relation to wheat grain and straw yields in the field.

MATERIALS AND METHODS

Field trials were conducted to evaluate the efficiency of four post – emergence herbicides and hand weeding for controlling narrow – leaved weeds (grassy weeds) in wheat during the two succeeding seasons (2004-2005 and 2005-2006), respectively, in Itay El-Baroud, Beherah Governorate. Seeds were supplied by Central Administration of Seeds, ARC, Ministry of Agriculture and Land Reclamation. Wheat seeds (Sakha 93cv.) were seeded by broadcast method in 28 and 30 November during 2004 and 2005, respectively at the seed rate of 60Kg/feddan.

Table (1): Some characteristics of the post-emergence herbicides applied in wheat fields.

Trade name, concentration and formulation	Common name	Rate/feddan*	Chemical name	Soure of herbicide sample
Grasp 10% E.C.	tralkoxydim	1.0 L.	** 2-[1-(ethoxyimino) propyl] – 3- hydroxy - 5- mesitylcyclohex – 2 – enone.	Shoura Chemicals Co.
Illoxan 36% E.C.	diclofop –methyl	1.0 L.	*** methyl 2- [4-(2,4 – dichorophenoxy) phenoxy] propionate.	Samtrade Co.
Puma–Super 7.5%E.W.	fenoxaprop-p-ethyl	500 cm^3	*** ethyl (R) - 2- [4-[(6-chloro-2-benzoxazolyl) oxy] [phenoxy] propionate.	Samtrade Co.
Topik 15% W.P.	clodinafop-propargyl	140.0 g	** prop – 2 – yny (R) - 2- [4-(5-chloro – 3-fluropyridin – 2 – yloxy) phenoxy] propionate.	Syngenta Co.

* = According to the recommendations of Ministry of Agriculture and Land Reclamation.

** = According to IUPAC name.

*** = According to chemical abstract name.

The herbicidal treatments were recorded in Table (1) beside hand weeding and unweeded check were arranged in randomized complete block design (RCBD) with four replicates for each treatment. The plot size was 175m^2 (10m in wide and 17.5m in long). The other agricultural practices used for wheat growing were followed. The preceding summer crop was rice in the two seasons.

The herbicide treatments were applied at 30 days after sowing (30 DAS) by knapsack sprayer (CP3) with volume 200 L./ feddan. The hand weeding treatment was applied (twice) at 20 and 40 DAS. After two months (60 DAS) from sowing, for each treatment, eight woody frame 1.0x1.0m (m^2) were thrown randomelly in the hole area. The germinated weeds (grasses) in each m^2 were hand pulled, identified (**Hassanein *et al.* 2000**), counted and weighed. Some information of the identified grassy weeds are found in Table (2). In unweeded plots, the density, percent of weed density, weed biomass and percent weed biomass for each weed type were recorded (Table 3). These parameters were calculated as follow:

1- Weed density = average number of each weed/m^2.
2- Percent of weed density = percentage of average number of each species of weed/ m^2 from the total number, of weeds in m^2.
3- Weed biomass = average fresh weight of each weed (g/m^2).
4- Percent of weed biomass = percentage of average fresh weight of each species of weed from the total weeds.

In all treatments, 60 DAS, The following results were recorded.

1- weed biomass (g/m^2).
2- Weed control efficiency % (% reduction in weed biomass).

$$\% \text{ weed control efificiany} = \frac{C - T}{C} \times 100$$

Where:

C = The weed biomass in the unweeded control.

T = The weed biomass in the treatment.

At harvest, the wheat plants were left to dry in the field for 3 days, then, the wheat grain and straw yields were calculated (Kg/plot^1) for each plot. Percent increase in the grain and straw yields were calculated by the following formula.

$$\% \text{ increase in wheat grain and/or straw yields} = \frac{T - C}{T} \times 100.$$

Where:

T = Wheat grain yield or straw yield in the treatment.

C = Wheat grain yield or straw yield in the unweeded control.

The present data in this study were statistical, analyzed by using ANOVA – test and the mean values were tested after Duncan's Multiple Range Test (1955) at *P=0.05 and 0.01*.

RESULTS AND DISCUSSION

Weeds:

A- Weed identification:

The annual narrow-leaved weeds (grassy weeds) were identified as follows (Table 2):

1- *Avena fatua* L. (wild oat, Zommeyr).
2- *Phalaris minor* Retz. (Little seed canary grass, lesser canary grass, Sha'eer effaar).
3- *Polypogon menspeliensis* (L.) Desf. (Beard grass, Deil el-qott).

B – Weed density:

Weed density and percent of weed density of the grassy weeds were recorded during the two succeeding seasons (2004-2005 and 2005-2006) at 60 days after sowing (60 DAS). The results in Table (3) showed that little seed canary grass gave the highest density and percent of weed density in the two succeeding seasons [3(60%) and (3 (50%] respectively.

The Beard grass and Wildoat gave the same weed density and percent of weed density in the first season (1(20%)) for each weed. In the second season, the Beard grass weed was [2(33.33%)] followed by wild oat [1(16.67%) for the weed density and percent of weed density, respectively.

Table (2): Common annual narrow-leaved (grasses) in wheat fields (Sakha93cv.) during the both seasons.

Weed Type	Vernacular name Arabic name	English name	Scientific name	Family name
Narrow-Leaved Or Grasses	Zommeyr	Wild oat	*Avena fatua* L.	Gramineae
	Shaeerelfaar	Little seed canary, lesser canary grass	*Phalaris minor* Retz.	Gramineae
	Deil el-qott	Beard grass	*Polypogon monspeliensis* (L.) Desf.	Gramineae

Table (3): Some characteristics of the identified grassy weeds at 60 DAS in the wheat fields (Sakha 93cv.).

Weed name	Season 2004 – 2005				Season 2005 – 2006			
	Weed density Number/m^2	% of weed density	Weed biomass (g/m^2)	% of Weed biomass	Weed density Number/m^2	% of Weed density	Weed biomass ($g.m^2$)	% of Weed biomass
Beard grass	01.00	20.00	07.60	25.54	02.00	33.33	07.60	38.64
Little seed canary grass	03.00	60.00	19.61	65.92	03.00	50.00	07.54	38.33
wild oat	01.00	20.00	02.54	08.54	01.00	16.67	04.53	23.03
Total weeds	05.00	100.00	29.75	100.00	06.00	100.00	19.67	100.00

C- Weed biomass:

During the two succeeding seasons, weed biomass and percent of weed biomass were recorded. The data showed in (Table 3) indicated that little seed canary grass gave the highest weed biomass and percent weed biomass in the first season followed by Beard grass and wild oat. The weed biomass and percent of weed biomass were [19.61(65.92%)], [(7.60(25.54%)] and [2.54(8.54%)] for the previously mentioned weeds, respectively. In the second season, Beard grass gave the highest weed biomass and percent of weed biomass followed by little seed canary grass and wild oat. The weed biomass and percent weed biomass were [7.60(38.64%)], [7.54(38.33%)] and [4.53(23.03%)], respectively.

Weed control treatments:

1- Effect on weed biomass.

The effect of the tested weed control treatments on weed biomass and percent of weed control efficiency are listed in Tables (4 and 5) for the two succeeding seasons (2004-2005 and 2005 – 2006). From these data, the results indicated that, in general, all herbicides treatments caused significant differences of weed biomass than hand weeding and unweeded check. No significant differences were observed between herbicide treatments, but Topic (clodinafop propargyl) followed by Grasp (tralkoxydim) Illaxan (diclofop-methyl), and Puma Super (fenoxaprop-p-ethyl) gave the higher effect on weed biomass, respectively. The unwedded treatments contained the maximum weed biomass than weed control treatments, also, hand weeding plots were observed with high biomass of weeds than

Table (4): Effect of post – emergence herbicides and hand weeding on weed biomass and percent of weed control efficiency at 60 DAS in wheat fields (Sakha 93cv) during season 2004-2005.

Treatments	Rate/Feddan	Weed biomass (g/m^2)				percent of weed control efficiency
		A*	B	C	D	
Grasp 10% E.C. (tralkoxydim)	1.0 L.	03.21 b	03.21 b	03.21 bc	03.21 b	89.21
Illoxan 36% E.C. (diclofop – methyl)	1.0 L.	02.50 b	02.50 b	02.50 c	02.50 b	91.60
Puma Super 7.5 E.W. (fenoxaprop-p-ethyl)	500 cm^3	03.75 b	03.75 b	03.75 bc	03.75 b	87.40
Topic 15% W.P. (clodinafop-propargyl)	140 g.	02.00 b	02.00 b	02.00 c	02.00 b	93.28
Hand weeding	2 times	06.75 a	06.75 a	06.75 b	06.75 b	77.31
Untreated (check)	-	-	-	29.75 a	29.75 a	-

A = *P* at 5% of treatments without untreated control.

B = *P.* at 1% of treatments without untreated control.

C = *P.* at 5% of treatments including untreated control.

D = *P.* at 1% of treatments including untreated control.

* Values followed by the same litter(s) within the columns are not significantly different [(*P=0.05 or 0.01*), Duncan's multiple Range Test (1995).

Table (5): Effect of post – emergence herbicides and hand weeding on weed biomass and percent of weed control efficiency at 60 DAS in wheat fields (Sakha 93cv.) during season (2005-2006).

Treatments	Rate/feddan	Weed biomass (g/m^2)				Percent of weed control efficiency
		A*	B	C	D	
Grasp 10% E.C. (tralkoxydim)	1.0 L.	01.80 c	01.80 c	01.80 c	01.80 c	90.46
Illoxan 36% E.C. (diclofop – methyl)	1.0 L.	01.67 c	01.67 c	01.67 c	01.67 c	91.15
Puma Super 7.5 E.W. (fenoxaprop-p-ethyl)	500 cm^3	02.75 b	02.75 b	02.75 c	02.75 bc	85.43
Topic 15% W.P. (clodinafop-propargyl)	140 g.	01.60 c	01.60 c	01.60 c	01.60 c	91.57
Hand weeding	2 times	04.90 a	04.90 a	04.90 b	04.9 b	74.03
Untreated (check)	-	-	-	19.69 a	19.69 a	-

A = *P.* at 5% of treatments without untreated control.
B = *P.* at 1% of treatments without untreated control.
C = *P.* at 5% of treatments including untreated control.
D = *P.* at 1% of treatments including untreated control.
* Values followed by the same litter(s) within the columns are not significantly different [(*P=0.05 or 0.01*) Duncan's multiple Range Test (1955).

herbicide treatments. The same trend of results was observed in the two succeeding seasons. Topic (clodinafop propargyl) gave the best weed control efficiency followed by Illoxan (diclofop-methyl), Grasp (tralkoxydim) and Puma-Super (fenoxaprop-p-ethyl), respectively. Such results are in accordance with those obtained by **Saini and Singh (2001)**. They demonestrated that the lowest total weed population was observed in plots with clodinafop (Topic) followed by diclofop methyl (Illoxan) and tralkoxydim (Grasp).

The effect of clodinafop-propargyl (Topic) on grassy weeds was reported by several authors. **Raffel and Fluh (1992)** cited that clodinafop as post – emergence herbicide at 30-60g/ha^1 have givin reliable control of wild oat in winter wheat. **Hassanein *et al.*, (1993)** revealed that application of Topic (clodinafop propargyl) 24%WP. at 0.23-0.80 kg/ha was the most effective herbicide against the annual grassy weeds. Similar trend of results was reported by **Hassanein *et al.*, (2005)**. Topic (clodinafop-propargy) was more effective against wildoat weed in wheat fields at 50-80 g/ha **(Ormeno and Diaz, 1995; Malik *et al.* 2001)**. **El-Khanagry and Shaban (2005)** reported that Topic (clodinafop-propargy) gave the best results on wild oat followed by Puma-Super (fenoxoprop-p-ethyl) and Grasp (tralkoxydim). Investigations on the effect of Topic on *Phalaris minor* weed showed that the Topic was more effective on this weed at 50-70g/ha **(Brar *et al.* 1999; Malik *et al.*, 2000, Malik *et al.*, 2001; Kanoja and Nepalia, 2004)**, at 120g/ha **(Tomar and Vivex, 2003)**.

Illoxan (diclofop-methyl) herbicide was effective in controlling grassy weeds. **Saini and Singh (2001)** used diclofop-methyl at 0.8kg/ha to control grasses and they faund that this herbicide significantly reduced weed population and dry weight of grasses. **Malik *et al.*, (2001)** reported that Illoxan applied at 1.0Kg/ha with or without surfactant provided complete control of wildoat (*Avena* spp.). **Tomar and Vivex (2003)** mentioned that diclofop-methyl at 675-875g/ha effectively controlled *phalaris minor* in wheat field. Similar trend of results was obtained by **Hassal (1990)**.

Several reports also showed the effect of Grasp (tralkoxydim) on grasses. Grasp at 300-400g/ha caused significant reduction of weed density and dry weight of grasses such as *Avena* spp. and *P. minor* **(Hassanein *et al.* (1993); Al-Marsafy and Hassanein, (1998); Brar *et al.* 1999; Malik, 2000; Saini and Singh, 2001; Malik *et al.* 2001 and Galal, (2003).**

Fenoxaprop-p-ethyl (Puma-Super), was effective in controlling grasses at rates 80-120g/ha, caused significant reduction in weed density and dry weight of grasses especially *Avena* spp. and *P. minor* (**Orlando *et al.*, 1993**); **Hassanein *et al.*, 1993; Brar *et al.*, 1999; Malik *et al.*, 2000; Malik *et al.* 2001; Saini and Singh (2001); Singh and Singh, 2002; Shaban *et al.* 2002; Tomar and Vivex, 2003; Kanoja and Nepalia, 2004, Hassanein *et al.*, 2005**).

The results in Tables (4 and 5) indicated that their was differences between the tested herbicides in controlling the grassy weeds, and this was true in the two tested seasons. The differences between herbicide treatments may be due to differences in the efficiciencіy against these weeds. Also, grasses may be more susceptible to certain herbicde than other one. These findings are in harmony with **Saini and Singh (2001)** and **El-Khanagry and Shaban (2005)**. Hand weeding treatment showed the lowest effect on grasses weed biomass than herbicide treatments in both seasons, which indicates that heribicdal treatments were more efficient than hand weeding in controlling the grassy weeds. The similar trend was found by **Galal, 1993, Omar *et al.*, (1997); Hassanein *et al.* (2005)**.

2- Effect of weed control treatments on wheat yield

The results in Tables (6 and 7) showed the effect of weed control treatments on wheat grain yield (Kg/plet) and % increase in wheat grain yield. All the tested herbicides significantly increased wheat grain yield than hand weeding or unweeded treatment. Topic (Clodinafop-propargyl) gave the highest yield than all other treatments followed by Illoxan (diclofop-methyl), Grasp (tralkoxydim) and Puma-Super (fenaxaprop-p-ethyl). In the first season. Topic significantly was the most effective herbicide followed by Illoxan > Grasp ≥ Puma Super, while in the second season, no significant differences between herbicides was observed, but Topic ≥ Illoxan ≥ Grasp ≥ Puma Super. Also, these treatments increased wheat grain yield in the following descending order Topic > Illoxan > Grasp > Puma-Super. This trend of results was true in almost the same in the two seasons.

The data in Tables (8 and 9) showed the effect of weed control treatments on wheat straw yield. In general, the same trend of results in Tables (6 and 7) was also found in Tables (8 and 9). Topic was the most effective herbicide followed by Illoxan, Grasp and Puma-Super. This results was in agreement with several authors e.g. (**Mirkamali,**

Table (6): Effect of post – emergence herbicides and hand weeding on wheat (Sakha 93cv.) grain yield (Kg/plot) firest season (2004-2005).

Treatments	Rate/feddan	Wheat grain yield [Kg/plot (175m²)]				Percent of increase in wheat grain yield
		A*	B	C	D	
Grasp 10% E.C. (tralkoxydim)	1.0 L.	137.52 b	137.52 b	137.52 b	137.52 ab	09.74
Illoxan 36% E.C. (diclofop – methyl)	1.0 L.	139.38 b	139.38 ab	139.38 ab	139.38 ab	10.94
Puma Super 7.5 E.W. (fenoxaprop-p-ethyl)	500 cm3	136.67 b	136.67 b	136.67 b	136.67 b	09.18
Topic 15% W.P. (clodinafop-propargyl)	140 g.	142.71 a	142.71 a	142.71 a	142.71 a	13.02
Hand weeding	2 times	132.25 c	132.25 c	132.25 c	132.25 c	06.35
Untreated (check)	-	-	-	124.13 d	124.13 d	-

A = *P.* at 5% of treatments without untreated control.
B = *P.* at 1% of treatments without untreated control.
C = *P.* at 5% of treatments including untreated control.
D = *P.* at 1% of treatments including untreated control.
* Values followed by the same litter(s) within the columns are not significantly different [(*P=0.05 or 0.01*), Duncan's multiple Range Test (1955).

Table (7): Effect of post – emergence herbicides and hand weeding on wheat (Sakha 93cv.) grain yield (Kg/plot) second season (2005-2006).

Treatments	Rate/feddan	Wheat grain yield [Kg/plot (175m^2)]				Percent of increase in wheat grain yield
		A*	B	C	D	
Grasp 10% E.C. (tralkoxydim)	1.0 L.	140.32 a	140.32 ab	140.32 a	140.32 ab	09.11
Illoxan 36% E.C. (diclofop – methyl)	1.0 L.	142.77 a	142.77 a	142.77 a	142.77 a	10.67
Puma Super 7.5 E.W. (fenoxaprop-p-ethyl)	500 cm^3	139.06 a	139.06 ab	139.06 ab	139.06 ab	08.28
Topic 15% W.P. (clodinafop-propargyl)	140 g.	143.92 a	143.92 a	143.92 a	143.92 a	11.38
Hand weeding	2 times	134.90 b	134.90 b	134.90 b	134.90 bc	05.45
Untreated (check)	-	-	-	127.54 c	127.54 c	-

A = *P.* at 5% of treatments without untreated control.
B = *P.* at 1% of treatments without untreated control.
C = *P.* at 5% of treatments including untreated control.
D = *P.* at 1% of treatments including untreated control.
* Values followed by the same litter(s) within the columns are not significantly different [*(P=0.05 or 0.01)*, Duncan's multiple Range Test (1955).

Table (8): Effect of post – emergence herbicides and hand weeding on wheat (Sakha 93cv.) straw yield (Kg/plot) firest season (2004-2005).

Treatments	Rate/feddan	Wheat straw yield [Kg/plot (175m^2)]				Percent of increase in wheat straw yield
		A*	B	C	D	
Grasp 10% E.C. (tralkoxydim)	1.0 L.	458.40 b	458.40 abc	458.40 ab	458.40 abc	10.69
Illoxan 36% E.C. (diclofop – methyl)	1.0 L.	463.75 ab	463.75 ab	463.75 ab	463.75 ab	11.73
Puma Super 7.5 E.W. (fenoxaprop-p-ethyl)	500 cm^3	449.81 bc	449.81 bc	449.81 bc	449.81 bc	08.99
Topic 15% W.P. (clodinafop-propargyl)	140 g.	475.70 a	475.70 a	475.70 a	475.70 a	13.94
Hand weeding	2 times	439.50 c	439.50 c	439.50 c	439.50 c	05.55
Untreated (check)	-	-	-	415.11 d	415.11 d	-

A = *P.* at 5% of treatments without untreated control.
B = *P.* at 1% of treatments without untreated control.
C = *P.* at 5% of treatments including untreated control.
D = *P.* at 1% of treatments including untreated control.
* Values followed by the same litter(s) within the columns are not significantly different [(*P=0.05 or 0.01*), Duncan's multiple Range Test (1955).

Table (9): Effect of post – emergence herbicides and hand weeding on wheat (Sakha 93cv.) straw yield (Kg/plot) second season (2005-2006).

Treatments	Rate/feddan	Wheat straw yield [Kg/plot (175m^2)]				Percent of increase in wheat straw yield
		A*	B	C	D	
Grasp 10% E.C. (tralkoxydim)	1.0 L.	467.73 a	467.73 ab	467.73 a	467.73 ab	07.24
Illoxan 36% E.C. (diclofop – methyl)	1.0 L.	475.90 a	475.90 a	475.90 a	475.90 a	08.83
Puma Super 7.5 E.W. (fenoxaprop-p-ethyl)	500 cm^3	463.52 a	463.52 ab	463.52 ab	463.52 ab	06.39
Topic 15% W.P. (clodinafop-propargyl)	140 g.	479.72 a	479.72 a	479.72 a	479.72 a	09.56
Hand weeding	2 times	444.98 b	444.98 b	444.98 bc	444.98 bc	02.49
Untreated (check)	-	-	-	433.89 c	433.89 c	-

A = *P.* at 5% of treatments without untreated control.
B = *P.* at 1% of treatments without untreated control.
C = *P.* at 5% of treatments including untreated control.
D = *P.* at 1% of treatments including untreated control.
* Values followed by the same litter(s) within the columns are not significantly different [(*P=0.05 or 0.01*), Duncan's multiple Range Test (1955).

1993; Malik *et al.* 2001; Bhullar and Walia, 2004; Kanoja and Nepalia, 2004). Since they found that clodinafop – propargyl (Topic) herbicide was very effective at 48-60g/ha, caused increase in wheat growth and wheat yield significantly compared to untreated control. **Tomar and Vivex (2003)** mentioned that clodinafop treatment resulted in 28% more grain yields than the control treatment, wheat growth and yields was significantly enhanced with Topic, Similar finding was noticed by other investigators **(Hassanein *et al.*, (1993); Brar *et al.*, 1999; Saini and Singh (2001).**

Dicloflop–methyl (Illoxan) herbicide also significantly increased wheat grain and straw yield **(Saini and Singh; 2001; Fenni *et al.*, 2002; Tomar and Vivex, 2003).** Also, Grasp was increased wheat grain yield **(Hassanein *et al.*, 1993; Mirkamali, 1993; Saini and Singh, 2001; Malik *et al.*, 2001).**

Puma-Super (fenoxaprop-p-ethyl) significantly increased wheat grain yield at 50 or 60 g/ha **(Kanoja and Nepalia, 2004)**, at 40 to 90 g/ha **(Singh and Singh (2002)**, at 75g/ha **(Mirkamali 1993)** and at 100 g/ha **(Malik *et al.*, 2001)** compared to the unweeded control. Similar trend of results was obtained by **Hassanein *et al.*, (1993); Brar *et al.*, (1999); Saini and Singh (2001) and Tomar and Vivex (2003). Khan and Haq (2002)** cited that wheat grain yield was increase 10 to 20% more than did the untreated control.

These results (tables 6,7,8 and 9) in this study indicated that herbicidal treatments caused significant increase of wheat grain and straw yield. Topic (clodinafop-propargyl) herbicide gave relatively the best results followed by Illoxan, (diclofop–methyl), Grasp (tralkoxydim) and Puma Super (fenoxaprop-p-ethyl). Also, hand weeding increased wheat grain and straw yield compared to the unweeded control. This findings are in harmony with several authors. **El-Khanagry and Shaban, (2005)** found that Topic increased grain yield than Puma Super and Grasp. **Brar *et al.* (1999)** mentioned that Grasp at 0.35Kg/ha and Illoxan at 0.90Kg/ha gave similar yield to the new herbicides (Topic and Puma Super). Also, **Tenaw (2000)** reported that hand weeding (twice) reduced weed population and increased grain yield of wheat.

Reduction in wheat grain yield in the unweeded check may be due to the competition with wheat plants for nutrients, water, sunlight and space, consequently reduced number of tillers/plant, No. of spikes/m^2, spike length, No. of grains/spike, grain weight and final hight of wheat plants. These findings are in agreement with **Omar *et***

al., 1997, Pedreros (2001), and Galal, (2003). Al-Marsafy *et al.*, (2001) who mentioned that the continued competition between wheat plants and wild oat to harvest decreased wheat grain yield by 47%. **Pedreros (2001)** reported that every additional wild oat at one plant/m^2 reduced grain yield by approx. 100 kg/ha. **Khan and Haq (2002)** demonstrated that grassy weeds reduced grain yield by 30%,. **Jitendra (2002)** found that reduction in wheat grain yield due to *P.minor* competition average was 36%.

The superiority of herbicide treatments may be attributed to the higher weed control efficiency, also to their significant effects on number of tillers/plant, No. of spikes/m^2 and weight of the plant and 1000 kernel weight since leading to the maximum grain and straw yield of wheat (**Al-Marsafy et al. 1997, Nassar, 1998, Galal, 2003**).

The results of this experiments indicate that post-emergence herbicides applied to wheat crop at 30 DAS minimize the risk of crop injury and reduction of wheat plants by competition with annual narrow-leaved weeds. Topic (clodinafop-propargyl) was the most effective in this respect, followed by Illoxan, (diclofop–methyl), Grasp (tralkoxydim) and Puma Super (fenoxaprop-p-ethyl). Topic and Illoxan with sufficient crop saftey, and caused significant weed reduction and increase of wheat yield.

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الملخص العربى

المقارنة بين أربعة من مبيدات الحشائش المطبقة بعد الإنبثاق والنقاوة اليدوية في مكافحة الحشائش الحولية النجيلية في حقول القمح

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لدراسة تأثير أربعة من مبيدات الحشائش المطبقة بعد الإنبثاق والنقاوة اليدوية على الحشائش الحولية النجيلية في القمح، تمت دراسة حقلية لمدة موسمين متتاليين (٢٠٠٤-٢٠٠٥ و٢٠٠٥-٢٠٠٦). من النتائج الحقلية تبين أن الحشائش الحولية النجيلية الموجودة هى أفينا فاتوا (زمير) – فلارس ماينور [(شعير الفار فلارس)] وبولى بوجون مونسبيلينسيس (ديل القط). وكانت هذه الحشائش تختلف فيما بينها فى الكثافة (العدد/م٢) والوزن (وزن طازج للحشائش مقدراً بالجرام/م٢) وتكرر ذلك فى الموسمين ولقد بينت النتائج أن كل مبيدات الحشائش المختبرة قد سببت نقص معنوى فى وزن الحشائش معنوياً وأدى ذلك لزيادة محصول الحبوب والقش في القمح بالمقارنة بالنقاوة اليدوية والغير معامل وذلك خلال موسمى الدراسة.

أعطى مبيد توبيك أحسن النتائج في مكافحة الحشائش وزيادة محصول الحبوب والقش نسبياً متبوعاً بمركب الأيلوكسان ثم الجراسب ثم بوما سوبر. ومن هذه النتائج يمكن القول أن مكافحة الحشائش الحولية باستخدام مبيدات الحشائش عملية ضرورية وأساسية لتقليل الضرر من هذه الحشائش وزيادة إنتاجية القمح.