Evaluation of post-emergence herbicides and hand weeding treatments for the control of annual broad-leaved weeds in wheat

El-Koly, R. M. A. and A.E. Abdelmonem
Department of Plant Protection, Fac. of Agric. (Cairo), Al-Azhar Univ.

ABSTRACT

Field experiments were conducted in two seasons (2004-2005 and 2005-2006) to evaluate the efficiency of seven post-emergence herbicides and hand weeding for controlling annual broad-leaved weeds in wheat fields. Seeds (Sakha 93cv.) were sown in 28 and 30 Nov. in both seasons, respectively. The post – emergence herbicides were applied at 30 days after sowing (DAS), and hand weeding was applied twice (20 and 40 DAS). Results were recorded after 60 DAS. and at harvest, the wheat grain and straw yields were determined. The results clearly indicate that the most predominant broad-leaved weeds in wheat were *Beta vulgaris L.* (Salq); *Chicorium pumpilum* Jacq., (Chikoria); *Medicago intertexta* (L.) Mill. (Nafal) and *Melilotus indica* L. (Hundaqooq). The dentated dock *Rumex dentatus* L. (Hommeid) was found in the second season only. These weeds varied in density (average number of weed m^{-2}) and biomass [average fresh weight of weed ($g.m^{-2}$)], in both seasons. The results indicated that all post-emergence herbicides significantly reduced weed biomass in comparison with hand weeding or with unweeded check. Also, these herbicides increased wheat grain yield by 11.65 to 16.05% in the first season and by 5.86 to 12% in the second season, and straw yield by 10.78 to 14.61 and 6.98 to 13.05% in the first and second season, respectively. Granstar, Brominal W and Sinal gave significantly best control of these weeds and increased wheat grain by 16.05, 15.43, 13.58% and 12, 11.31, 9.34 in the first and second season, respectively, and straw yield by 15.23, 14.61, 12.74 in first season and 13.05, 12.37, 10.42%, in second season, respectively. Other treatments such as Harmony M, Derby and Ecopart gave sufficient control against these weeds. The Kodstar herbicide gave the lowest effect on weeds and on yield.

INTRODUCTION

Wheat (*Triticum aestiuum* L.) is one of the most important cereal crops in the world especially in Egypt. It is the major main food crop for

the Egyptians. Nowadays, the total production of wheat is not sufficient to local consumption; consequently it is receiving major attention in the current efforts to minimize the gap between the total production and consumption.

One of the most serious problems of modern agriculture is crop losses caused by weeds (**Abou-Khadrah *et al.*, 2001**). Weed competition is one of the most important limiting factors in wheat production. Broad-leaved weeds were dominant in wheat fields and reduced wheat grain yield by competition with the wheat plants for nutrients, water, space, light during the growing season (**Khan and Haq, 2002; Mishra *et al.*, 2002; Banga *et al.*, 2003 and Hassanien *et al.*, 2005**).

Today, the aim of weed control management is to keep the weed community at an acceptable level rather than to keep the crop totally free of weeds (**Bostrom and Fogelfors, 2002**). The chemical weed control is considered to be an essential practice in wheat cultivation. Previous investigations showed that several post–emergence herbicides effectively controlled broad-leaved weeds in wheat fields (**Helalia, 1993; Abou – Donia *et al.*, 1994; Mabuchi and Ohtsuka, 1999; Popescu *et al.*, 2000; Stefan *et al.*, 2001; Kassai *et al.*, 2002, Covarelli, 2003 and Hassanien *et al.*, 2005**).

The present study was conducted to evaluate the efficiency of seven post-emergence herbicides and hand weeding for controlling the annual broad – leaved weeds in wheat and the effect of these treatments on wheat grain and straw yields under field conditions.

MATERIALS AND METHODS

Field experiments were performed during two consecutive seasons (2004-2005 and 2005-2006) at wheat field in Itay El-Baroud, Beherah Governorate. Wheat seeds (Sakha 93cv.) were supplied by Central Administration of Seeds, ARC, Ministry of Agriculture and Land Reclamation. Wheat seeds were sown at seeding rate of 60Kg feddan^{-1} by broadcast method both in the 28th and 30th November in the first and second season. The experimental design for this study was randomized complete block design (RCBD) with four replicates per treatment, and the plot size was 175m^2 (10.0m in wide and 17.5m in long). The normal agricultural practices for wheat were applied. The preceding summer crop was rice in both seasons.

Table (1): Some characteristics of the used post – emergence herbicides

Trade name, concentration and formulation	Common name	Rate/fed.*	Chemical name (IUPAC)	Source of herbicide sample
Brominal W 24%EC	bromoxynil octanate	1.0L.	2,6 – dibromo – 4 – cyanophenyl octanoate	Framchem Co.
Derby 17.5% SC	florasulam 75 + flumetsulam 100g/L.	30.0cm^3	2',6',8 – triflouro – 5 – methoy [1,2,4] tria zolo[1,5-c] pyrimidine-2- sulfonanilide. + 2',6' -diflouro – 5-methoxy [1,2,4] triazolo [1,5a] pyrimidine – 2-sulfonanilide.	Shoura Chemicals Co.
Granstar 75% DF	tribenuron-methyl	8.0g.	Methyl 2-[4-methoxy – 6.methyl – 1,3,5-triazin – 2-yl[(methyl) carbamoyl sulfamoyl] benzoate.	Du-Pont – Egypt Co.
Harmony M 75% WG	thifensulfuron methyl+metsulforun methyl (68.2+6.8%)	24.0 g.	methyl 3-(4-methoxy – 6-methyl-1,3,5-triazin – 2-ylcarbamoyl sulfamoyl) thiophen – 2-carboxylate. + methyl 2-(4-methoxy – 6 – methyl – 1,3,5-triazin – 2-ylcarbamoyl sulfamoyl) benzoate.	Dupont - Egypt Co.
Ecopart 2% SC	pyraflufen – ethyl	250.0cm^3	ethyl 2-chloro – 5 – (4-chloro – 5 – diflouro methoxy – 1 – methyl pyrazol – 3 – yl) – 4 – flourophenoxyacetate.	Shoura Chemicals Co.
Kodstar 75% DF	tribenuron methyl	8.0 g.	as granstar	Egyptian for Seeds, Oils and Chemicals Co.
Sinal 10% SC	metosulam	40.0 cm^3	2',6' – dichloro – 5,7 – dimethoxy – 3'-methyl [1,2,4] triazolo [1,5a] pyrimidine – 2-sulfonanilide.	Shoura Chemicals Co.

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

The effect of seven post-emergence herbicides (Table 1) and hand weeding on broad-leaved weeds were evaluated using wheat grain and straw yields (Kg plot^{-1}) as criteria for comparison. The hand weeding was applied twice at 20 and 40 days after sowing (DAS). The herbicide treatments were applied at 30 DAS by using Knapsack sprayer CP3 at the rate of 200L, feddan^{-1}. Sixty days after sowing, for each treatment, eight m^2 areas were observed and growing broad-leaved weeds within these areas were hand pulled, identified, counted and weighed [by using woody frame 1.0 x 1.0m.] at two times for each plot. The vernacular (arabic), english, scientific and family names of the identified weeds were listed in Table (2). The weed density (average number of each weed m^{-2}), Percent of weed density (for each weed from the total weeds), weed biomass (av. fresh weight of weed ($g.m^{-2}$), weed biomass % (for each weed from total weeds) were recorded during the two seasons (Tables 3, 4).

In all treatments, 60 DAS, the weed biomass was determined. Also, the weed control efficiency % (% reduction in weed biomass) was calculated according to the following formula.

Weed control efficiency % (WCE) (% reduction in weed biomass)

$$= \frac{C-T}{C} \times 100$$

Where:

C = The weed biomass in the unweeded check.

T = The weed biomass in the treatment.

At maturity, the wheat plants were harvested and left to air dried (3 days) under natural conditions in the field. The wheat grain yield and straw yields were calculated by the following formula.

$$\% \text{ increase in grain or straw yield} = \frac{T-C}{T} \times 100.$$

Where:

T = wheat grain or straw yield in treatment.

C = wheat grain or straw yield in unweeded check

The data were statisticaly analyzed by using ANOVA-test. The mean values were tested after **Duncan's (1955)** Multiple Range test at *P=0.05 and 0.01*.

RESULTS AND DISCUSSION

Weeds.

The broad-leaved weeds were identified according to **Hassanien *et al.*, (2000)**, during the two seasons (2004-2005 and 2005-2006). The identified weeds were, *Beta vulgaris* L.; *Chicorium Pumpilum* Jacq.; *Medicago intertexa* (L.) Mill.; and *Melilotus indica* L.. The weed *Rumex dentatus* L. was found only in the second season (Table2).

The weed density and Percent of weed density were recorded in both seasons (Table 3). The data indicate that Medic weed gave the high weed density in the two tested seasons [5(33.33%)] in the first and [6(71.58) in the second] followed by Sweet clover [5(33.33)] in the first season, and by Seabeet [4(21.05%)] in the second season. The Chicory weed was the lowest in density in both seasons, [2(13.34%)] in the first and [3(15.79)] in the second. Also, Sweet clover in second season [3(15.79%)], Seabeet (3(20%) in the first, Dentated dock was found only in the second season (3(15.79%).

The weed biomass and Percent of weed biomass were recorded during the two tested seasons. From the data in Table (3), Medic weed gave the highest weed biomass in both seasons and % biomass [(20.55(31.95)] in the first, and [4.60(29.987)]. in the second season. Chicory weed was the lowest in biomass in both seasons [13.22(20.58%)], [16.66(11.72%)], respectively, Seabeet weed [15.92(24.78%) and [28.11(19.78%), Sweet clover [14.52(22.69%) and [25.11(17.84%)]; in the first and second seasons, respectively. The Dentated dock weed was found only in the second season [29.39(20.98%)]. The identified weed(s) varied between years, and in weed density and weed biomass.

Table (2): Common annual broad – leaved weed species in wheat field.

Weed Type	Vernacular name	English name	Scientific name	Family name
Broad - Leaved	Salaq	Seabeet, Wild beet	*Beta vulgaris* L.	Chenopodiaceae
	Shikoria, Sirees	Chicory	*Chicorium Pumpilum* Jacq.	Compositae
	Nafal	Medic	*Medicago intertexta* (L.). Mill.	Leguminosae
	Handaqooq	Sweet clover, India melilot	*Melilotus indica* L.	Leguminosae
	Hommeid*	Dentated dock	*Rumex dentatus* L.	Polygonaceae

* This weed was found in the second season only.

Table (3): Some characteristics of the identified broad-leaved weeds in the wheat field (Sakha93cv.)

Weed name	Season 2004-2005				Season 2005-2006			
	* Weed (A) density	% of (B) weed density	weed (C) biomass	% of (D) weed biomass	Weed density	% of weed density	Weed biomass	% of weed biomass
Chicory	02.00	13.34	13.22	20.58	03.00	15.79	16.66	11.72
Dentaed dock	00.00	00.00	00.00	00.00	03.00	15.79	29.39	20.68
Medic	05.00	33.33	20.59	31.95	06.00	31.58	42.60	29.98
Seabeet	03.00	20.00	15.92	24.78	04.00	21.05	28.11	19.78
Sweet clover	05.00	33.33	14.52	22.69	03.00	15.79	25.35	17.84
Total Weeds	15.00	100.00	64.25	100.00	19.00	100.00	142.11	100.00

A = Weed Density = Average number of weed plant m^{-2}.
B = % of weed density - % of each weed density from total weeds.
C = Weed biomass = Average fresh weight of weed plant [g. m^{-2}].
D = % of weed biomass = % of each weed biomass from total weeds.

* These results were recorded at 60 DAS (days after sowing).

Weed Control Treatments:

1. Effect on weed biomass:

The results in Tables (4,5) showed the effect of the tested weed control treatments on weed biomass [average number of fresh weight (g. m^{-2})] of annual broad-leaved weeds, and % of weed control efficiency (% reduction in fresh weight of weeds) during the tested seasons (2004-2005 and 2005-2006). The results revealed that unweeded check significantly contained the highest weed biomass than the herbicide treatments. Also, hand weeding treatment plots contained high weed biomass than herbicide treatments. Granstar significantly was the most effective herbicide in reducing the weed biomass followed by Brominal W and Sinal. The herbicides Harmony M, Ecopart and Derby gave sufficient control of broad-leaved weeds. The herbicide Kodstar gave satisfactory control but this herbicide significantly gave the lowest effect than the other herbicides. This findings are in harmony with those reported by several authors. **Mekhail *et al.*, (1987)** showed that application of Brominal W 24% EC, at the rate of 1.0L/fed. (post-emergence), gave the best control of broad-leaved weeds including *Beta vulgaris* and *Sonchus oleraceus*. **Abou-Donia *et al.*, (1994)** found that, among post – emergence herbicidal treatments, Brominal W and Koril DS gave significant weed control compared to hand weeding in two wheat varieties. The application of Brominal as post-emergence herbicides gave good control and controlled nearly all the broad–leaved weeds in wheat **(Bahariani – Nejad and Khajehpour, 1999)**. Similar trend of results with Brominal was obtained by **Kassai *et al.* (2002), Fenni *et al.*, (2002) and Hassanien *et al.*, (2005)**.

Granstar is recommended for use by aerial application at 15-20g.ha^{-1} to control annual weeds, at 20 -25g.ha^{-1} to control annual weeds resistant to 2,4.D and field thistle (*Cirsium arvense*). **(Agarkov *et al.*, 2000). Walia *et al.*, (2000)** found that tribenuron – methyl at 10g.ha^{-1} provided excellent control of hardy broadleaf weeds. **Abd El-Samie (2001)** reported that Granstar herbicide was the most effective treatment against the broad-leaved and total weeds causing 92.5% and 87.7% reduction in their dry weight, respectively, compared to the unweeded control. Similar trend of results was also obtained by **Dilraj *et al.*, (2000), Stefan *et al.*, (2001)** and **Hassanein *et al.*, (2005)**. Also, **Popescu *et al.*, (2000)** reported that metosulam + 2,4 – D at 1 L. ha^{-1} when applied at tillering to first internode setting, resulted in 90-95% weed control on dicotyledonous weeds. **Hassanein *et al.*, (2005)**

Table (4): Effect of post – emergence herbicides and hand weeding on weed biomass ($g.m^{-2}$) and weed control efficiency % at 60 DAS in wheat (Sakha 93cv.) (season 2004-2005).

Treatments	Rate/feddan	Mean fresh weight of weeds ($g.m^{-2}$)				(percent weed control efficiency)
		A*	B	C	D	
Brominal W 24% E.C.	1.00 L.	03.25 e	03.25 cd	03.25 d	03.25 cd	94.95
Derby 17.5% S.C	30 cm^3	08.67 bc	08.67 bc	08.67 cd	08.67 cd	86.51
Harmony M 75% W.G.	24.0 g	07.13 cd	07.13 bcd	07.13 cd	07.13 cd	88.90
Ecopart 2% S.C.	250 cm^3	07.59 cd	07.59 bcd	07.59 cd	07.59 cd	88.19
Granstar 75% D.F.	8.0 g	02.21 e	02.21 d	02.21 d	02.21 d	96.56
Kodstar 75% D.F	8.0 g	12.25 b	12.25 b	12.25 c	12.25 c	80.94
Sinal 10% S.C.	40 cm^3	04.13 de	04.13 cd	04.13 d	04.13 cd	93.58
Hand weeding	2 times	24.75 a	24.75 a	24.75 b	24.75 b	61.48
Untreated (check)	-	-	-	64.25 a	64.25 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 letter(s) within the columns are not significantly different at ***p=0.05 and 0.01***, Duncan's Multiple Range Test (1955).

Table (5): Effect of post – emergence herbicides and hand weeding on weed biomass ($g.m^{-2}$) and weed control efficiency % at 60 DAS in wheat (Sakha 93cv.) (season 2005-2006).

Treatments	Rate/feddan	Mean fresh weight of weeds ($g./m^2$)				(Percent weed control efficiency)
		A*	B	C	D	
Brominal W 24% E.C.	1.00 L.	05.95 de	05.95 d	05.95 de	05.95 cd	95.81
Derby 17.5% S.C	30 cm^3	15.26 bc	15.26 bc	15.26 cd	15.26 cd	89.26
Harmony M 75% W.G.	24.0 g	10.82 cd	10.82 cd	10.82 cde	10.82 cd	92.39
Ecopart 2% S.C.	250 cm^3	12.11 cd	12.11 bcd	12.11 cde	12.11 cd	91.48
Granstar 75% D.F.	8.0 g	04.39 e	04.39 d	04.39 e	04.39 d	96.91
Kodstar 75% D.F	8.0 g	19.84 b	19.84 b	19.84 c	19.84 bc	86.04
Sinal 10% S.C.	40 cm^3	06.64 de	06.64 d	06.84 de	06.64 cd	95.33
Hand weeding	2 times	30.33 a	30.33 a	30.33 b	30.33 b	78.66
Untreated (check)	-	-	-	142.11 a	142.11 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 letter(s) within the columns are not significantly different at *p=0.05 and 0.01*, **Duncan's** Multiple Range Test (1955).

mentioned that Brominal, Granstar or Sinal were more affective in controlling broad-leaved weeds in wheat. Sereval reports concluded that Harmony M gave good control of broad-leaved weeds at low rates (**Walia *et al.*, 2000** and **Dilraj *et al.*, 2000, Stefan *et al.*, 2001**). The effect of Ecopart was also reported by **Mabuchi and Ohtsuka (1999)**, they mentioned that Ecopart can quickly control various trublesome broad – leaved weeds in cereals at extremely low use rates. Also, Ecopart provides high activity even at 10 to 20 g.a.iha^{-1} against a wide range of broad-leaved weeds. **Mabuchi *et al.*, (2002)** demonstrated that pyraflufen – ethyl possessed high potentially as post – emergence cereal herbicide for controlling broad-leaved weeds selectively at rates of 6-12g. a.i.ha^{-1}. Similar trend was also reported by **Decoin (2002)** and **Covarelli (2003)**. The effect of Derby herhicide was also reported. **Stachecki *et al.*, (1999)** reported that florasulam is a new triazole pirimidine herbicide safe to cereals and provides a good level of control of a wide range of weeds when used at 0.4-0.6L. ha^{-1} at tillering stage gave a very good level of broad-leaved weed control. Also, the effect of Derby (florasulam) for the control of dicotyledonous weeds was reported by **Decoin (2002); Rapparini (2003)** and **Covarelli (2003)**.

Therefore, the significant differences among the tested herbicides in controlling the total broad-leaved weeds may be attributed to the differences in the efficiency against these weeds. Similar findings were also found by **Helalia (1989), Salama (2004)** and **Hassanien *et al.*, (2005)**. Hand weeding treatment contained a significantly large weed biomass than herbicidal plots in both seasons (2004-2005 and 2005-2006), which indicates that weed control with herbicides was more efficient than hand weeding. These results are in harmony with the findings of **Helalia (1993) and Omar *et al.*, (1997)**. The significant differences among the tribenuron -methyl formulations (Granstar and Kodstar) in the efficiency against the broad-leaved weeds may be due to formulation type used and the accessory substances in each formulation.

2- Effect of weed control treatments on wheat yield.

The data in Tables (6 and 7) indicate the effect of the tested treatments on wheat grain yield (kgplot^{-1}). Granstar significantly was the most effective in increasing wheat grain yield, followed by Brominal, Sinal, Harmony = Derby = Ecopart = Kodstar > hand weeding, respectively. All herbicide treatments significantly gave

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

Treatments	Rate/feddan	Wheat grain yield [Kg/plot (175m2)]				Percent increase in grain yield
		A*	B	C	D	
Brominal W 24% E.C.	1.00 L.	145.83 ab	145.83 a	145.83 ab	145.83 a	15.43
Derby 17.5% S.C	30 cm^3	139.98 ab	139.98 a	139.98 ab	139.98 ab	11.89
Harmony M 75% W.G.	24.0 g	140.71 ab	140.71 a	140.71 ab	140.71 ab	12.36
Ecopart 2% S.C.	250 cm3	140.93 ab	140.93 a	140.93 ab	14093 ab	12.49
Granstar 75% D.F.	8.0 g	146.90 a	146.90 a	146.90 a	146.90 a	16.05
Kodstar 75% D.F	8.0 g	139.58 ab	139.58 a	139.58 ab	139.58 ab	11.65
Sinal 10% S.C.	40 cm^3	142.71 ab	142.71 a	142.71 ab	142.71 ab	13.58
Hand weeding	2 times	131.25 b	131.25 a	131.25 bc	131.25 ab	06.03
Untreated (check)	-	-	-	123.33 c	123.33 b	--

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 letter(s) within the columns are not significantly different at *p=0.05 and 0.01*, Duncan's Multiple Range Test (1955).

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

Treatments	Rate/feddan	Wheat grain yield [Kg/plot(175m^2)]				Percent increase In grain yield
		A*	B	C	D	
Brominal W 24% E.C.	1.00 L.	142.11 ab	142.11 a	142.11 a	142.21 a	11.31
Derby 17.5% S.C	30 cm^3	133.98 c	133.98 c	133.98 bc	133.98 b	05.93
Harmony M 75% W.G.	24.0 g	134.72 c	134.72 bc	134.72 bc	134.72 b	06.45
Ecopart 2% S.C.	250 cm^3	135.10 c	135.10 bc	135.10 bc	135.10 b	06.71
Granstar 75% D.F.	8.0 g	143.23 a	143.23 a	143.23 a	143.23 a	12.00
Kodstar 75% D.F	8.0 g	133.38 c	133.38 c	133.38 bc	133.38 b	05.86
Sinal 10% S.C.	40 cm^3	139.01 b	139.01 ab	139.01 ab	139.01 ab	09.34
Hand weeding	2 times	133.30 c	133.30 c	133.30 c	133.30 b	05.45
Untreated (check)	-	-	-	126.03 d	126.03 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 letter(s) within the columns are not significantly different at *p=0.05 and 0.01*, Duncan's Multiple Range Test (1955).

higher grain yield than hand weeding. In the first season, no significant differences were observed between Brominal, Sinal, Ecopart, Harmony M, Derby and Kodstar, but in the second season, Brominal and Sinal were significantly superior to the other herbicides. Granstar was the most effective herbicides in increasing wheat grain yield, followed by Brominal, Sinal, Ecopart, Harmony M, Derby, Kodstar and hand weeding, respectively. From Tables (8, 9) the data reported that similar trend of efficacy of the tested treatments on the wheat straw yield (kg plot^{-1}) was observed.

Generally, post – emergence herbicides gave a significant increase in wheat grain yield (Tables 6,7) and in wheat straw yield (Tables 8,9) compared to hand weeding and / or unweeded check. Similar trend of results was obtained by several authors. **Abou-Donia *et al.*, (1994)** reported that Brominal and Koril DS gave significant weed control compared to hand weeding and they gave satisfactory grain yield. **Dilraj *et al.*, (2000)** cited that sulfonylurea herbicides. i.e. metsulfuron – methyl and tribenuron – methyl provided excellent control of *Rumex spinosus* and significantly improved grain yield over control treatment during 1996 – 1997 and 1997 – 1998 seasons. **Walia *et al.*, (2000)** observed similar trend for metsulforun and tribenuron – methyl. **Stefan *et al.*, (2002)** reported that potential yield loss from weed competition was recouped from herbicides application (sulfonylurea) of tribenuron-methyl and thifensulfuron. Similar trend of results was observed by **Fenni *et al.*, (2002)**, and **Hassanien *et al.*, (2005)**.

Yield reduction in unweeded check may be due to weed competition with wheat for nutrients, water, space and light. Similar trend of results observed by **Mishra *et al.* (2002)**; **Khan *et al.*, (2002) Villasana *et al.*, (2003)**. The superiority of growh and yield of wheat may be attributed to the reduction in broad-leaved weeds associated with wheat under field conditions. The post – emergence herbicidese gave the best weed control efficiency such as Granstar, Brominal and Sinal. They minimized weed competition with the wheat, at the critical early period, and that giving good chance for wheat growth, increased the tillering, number of spikes/m^2, improved the filling of grains and resulting in heavier grains. These findings are in harmony with **El-Desoki *et al.*, (1993)** and **Metwally *et al.*, (1999)**. The differences between the weed control treatments for increasing the wheat grain or straw yields may be due to the differences in the efficiency of these treatments against the weeds.

Table (8): Effect of post – emergence herbicides and hand weeding on wheat straw yield (Kg plot^{-1}) (Sakha 93cv.) (season 2004-2005).

Treatments	Rate/feddan	Wheat straw yield [Kg/plot(175m^2)]				Percent increase In straw yield
		A*	B	C	D	
Brominal W 24% E.C.	1.00 L.	786.12 ab	486.12 a	486.12 ab	486.12 a	15.43
Derby 17.5% S.C	30 cm^3	466.61 ab	466.61 a	466.61 ab	466.61 ab	11.89
Harmony M 75% W.G.	24.0 g	469.05 ab	469.05 a	469.05 ab	469.05 ab	12.35
Ecopart 2% S.C.	250 cm^3	469.78 ab	469.78 a	469.78 ab	469.78 ab	12.49
Granstar 75% D.F.	8.0 g	489.67 a	489.67 a	489.67 a	489.67 a	16.04
Kodstar 75% D.F	8.0 g	465.28 ab	465.28 a	465.28 ab	465.28 ab	11.64
Sinal 10% S.C.	40 cm^3	475.72 ab	475.72 a	475.72 ab	475.72 ab	13.58
Hand weeding	2 times	437.50 b	437.50 a	437.50 bc	437.50 ab	06.03
Untreated (check)	-	-	-	411.11 c	411.11 b	--

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 letter(s) within the columns are not significantly different at ***p=0.05 and 0.01***, **Duncan's** Multiple Range Test (1955).

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

Treatments	Rate/feddan	Wheat straw yield [Kg/plot(175m2)]				Percent increase in wheat straw yield
		A*	B	C	D	
Brominal W 24% E.C.	1.00 L.	473.71 ab	473.71 a	473.71 a	473.71 a	12.37
Derby 17.5% S.C	30 cm^3	446.59 c	446.59 c	446.59 bc	446.59 b	07.05
Harmony M 75% W.G.	24.0 g	449.08 c	449.08 bc	449.08 bc	449.08 b	07.56
Ecopart 2% S.C.	250 cm^3	450.33 c	450.33 bc	450.33 bc	450.33 b	07.82
Granstar 75% D.F.	8.0 g	477.42 a	477.42 a	477.42 a	477.42 a	13.05
Kodstar 75% D.F	8.0 g	446.28 c	446.28 c	446.28 bc	446.28 b	06.98
Sinal 10% S.C.	40 cm^3	463.38 b	463.38 ab	463.38 ab	463.38 ab	10.42
Hand weeding	2 times	444.32 c	444.32 c	444.32 c	444.32 b	06.58
Untreated (check)	-	-	-	415.12 d	415.12 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 letter(s) within the columns are not significantly different at ***p=0.05 and 0.01***, Duncan's Multiple Range Test (1955).

In conclusion, Granstar, Brominal W and Sinal were the most effective than other tested treatments for controlling broad-leaved weeds and increasing the wheat grain and straw yields. Also, chemical weed control treatments were more efficient than hand weeding. These results support the view that herbicide treatments is essential in controlling the broad-leaved weeds in wheat field.

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الملخص العربي

تقييم مبيدات الحشائش المطبقة بعد الإنبثاق والنقاوة اليدوية لمكافحة الحشائش الحولية عريضة الأوراق في القمح

رمضان مصطفي عبده الخولى ، عبد الله الحسين عبد المنعم

قسم وقاية النبات – كلية الزراعة بالقاهرة – جامعة الأزهر

تم إجراء التجارب الحقلية خلال موسمى الزراعة (٢٠٠٤-٢٠٠٥ و٢٠٠٥-٢٠٠٦) وذلك بهدف تقييم فاعلية سبعة من مبيدات الحشائش المطبقة بعد الإنبثاق والنقاوة اليدوية في مكافحة الحشائش الحولية عريضة الأوراق في حقول القمح. تم زراعة بذور القمح (صنف سخا ٩٣) في ٢٨ و٣٠ نوفمبر فى كلا الموسمين، وتم تطبيق مبيدات الحشائش بعد ٣٠ يوم من الزراعة كذلك تم إجراء النقاوة اليدوية مرتان (٢٠ و٤٠ يوم من الزراعة)، وبعد ٦٠ يوم من الزراعة تم أخذ النتائج وكذلك في نهاية الموسم تم تقدير محصول الحبوب والقش فى المعاملات المختلفة. أوضحت النتائج أن الحشائش الحولية العريضة الأوراق في التجربة هي بيتا فولجارس (السلق) والشيكوريوم بومبليوم (شيكوريا) والميديكاجو إنترتكستا (النفل) والميليلوتس إنديكا (الحندقوق). وقد وجدت حشيشة رومكس دينتاتس (الحميض) فى الموسم الثاني فقط. اختلفت هذه الحشائش في كثافتها (عدد الحشيشة/م٢) وأيضاً في وزنها (وزن طازج مقدراً بالجرام/م٢) وأيضاً بين موسمى الدراسة. بينت النتائج أيضاً أن كل معاملات مبيدات الحشائش قد أثرت معنوياً على وزن الحشائش وقد أنقصت هذا الوزن وذلك عند مقارنتها بالنقاوة اليدوية أو غير المعاملة، أيضاً أدت هذه المعاملات إلى زيادة محصول الحبوب (١١,٦٥ – ١٦,٠٥% و٥,٥٦ إلى ١٢% في الموسم الأول والثاني على الترتيب) والقش (١٠,٧٨ إلى ١٤,٦١ و٦,٩٨ إلى ١٣,٥% في الموسم الأول والثاني على الترتيب) بالمقارنة مع النقاوة اليدوية وغير المعاملة. كانت مبيدات جرانستار ثم برومينال دبليو ثم سينال هى أحسن المبيدات المستخدمة في تأثيرها وقد أعطت أحسن مكافحة للحشائش وأحسن زيادة في محصول الحبوب (١٦,٠٥، ١٥,٤٣ و١٣,٥٨% و١٢، ١١,٣١ و٩,٣٤ في الموسم الأول والثاني على الترتيب) والقش (١٥,٢٣، ١٤,٦١، ١٢,٧٤% و١٣,٠٥، ١٢,٣٧، ١٠,٤٢ في الموسم الأول والثاني على الترتيب)، وأعطت المبيدات المستخدمة مثل هارموني-م ودربي وإيكوبارت نتائج جيدة أيضاً في هذا الشأن وكان مبيد كودستار هو أقل المبيدات المستخدمة تأثيراً على الحشائش الموجودة وأيضاً على المحصول الناتج.

STUDIES ON EGYPTIAN HONEY

M.BAHGAT SHAWER, RAMADAN M.HELAL, OWON,M.A, FARYD SHOKY AHMED, ASHARF SHEREF FATEHE

This study was carried out at Economic Entomology, Dept., Faculty of Agric., Kafr-Elshekh univ., during the period from 2002 to 2004 to study the physical, chemical ,Microscopically analysis and biological characters of Egyptian honeys collected from different locations of Egypt. Most of the tested honey samples recorded high values of moisture content particularly in cotton honey while clover honey samples showed a lower values. Water content in Egyptian honeys was 16.2-19.6%;**Nour (1998)**. The T.S.S values indicated also low values in cotton honey while the clover honey recorded the highest values. **Ibrahim *et al.* (1977)** reported that T.S.S % in Egyptian honey ranged from 80.5% to 82%.. The highest mean value of viscosity was recorded in clover while the lowest mean value was recorded in cotton honey. The estimated granulation value in the tested honey (D/L) indicated high values in cotton honey while the mean lowest value was recorded in unusual honey samples. Concerning the E.C value the mean highest value was recorded in cotton honey and lowest mean value was indicated in citrus honey. The higher values of color as optical density was recorded in cotton honey while the lowest mean value showed in citrus honey. The free acidity in cotton showed higher mean values among the tested samples. While the lower mean values of free acidity were recorded in clover honey. The high values of lacton content were recorded in clover honey while the low values of lacton content were recorded in cotton honey samples which indicated the highest values of total acidity and the lowest values were recorded

in citrus honey samples Egyptian honeys ranged from 0.0252 to 0.0717. **Ibrahim et al (1977)** reported that percentage of acidity (as formic acid) in. Citrus samples showed the lowest H.M.F content while cotton samples indicated the highest values Whereas The results Indicated that unusual honey samples recorded the highest percentage of maltose content while the lowest values were recorded in cotton honey. In contrast, the highest percentage of glucose was recorded in cotton honey whereas the lowest percentage was recorded in citrus. The lowest percentage was recorded in cotton honey while the highest percentage in fructose was recorded in citrus. The highest percentage of sucrose content was recorded in unusual honey while the lowest percentage was recorded in cotton honey. **Ibrahim et al. (1977)** reported that They determined 73.47%, 72.52%, 75.26% and 75.79% reducing sugars in citrus, Clover, cotton and oasis honeys, respectively.

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