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EFFECT OF SOWING METHODS, N-FERTILIZATION (BIO AND MINERAL) AND SOME WEED CONTROL TREATMENTS ON WHEAT PRODUCTIVITY

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ABSTRACT

Two field experiments were conducted at Shandaweel Agricultural Research station, Agricultural Research Center, Sohag Governorate during the two successive growing winter seasons of 2006/07and 2007/08, to investigate the effect of three sowing methods (Afir drill, Afir broadcast and Afir in furrows methods), four N-fertilization treatments (50 kg N/fed., 75 kg N/fed., Serialin + 50 kg N/fed., and Serialin + 75 kg N/fed.) and five weed control treatments [(Derby 17.5% SC SC at 30 cc/ fed., Topik 15% WP at 140 g/ fed., Derby + Topik as herbicides), addition, hand weeding twice and unweeded (check)] on wheat associated weeds, yield and yield components and grain quality of (*Triticum aestivum* L.) cv. Giza 168. A split-split-plot design with three replicates was used.

Results revealed that Afir in furrows and Afir drill methods significantly reduced dry weight of broad-leaved weeds, grassy weeds and total annual weeds compared to Afir broadcast method in both seasons. Application of 50kg N/fed. and Serialin + 50 kg N/fed. gave the lowest values of dry weight of broad-leaved, grassy and total annual weeds compared to 75 kg N/fed. alone and with Serialin in both seasons. Hand weeding twice and Derby 17.5% SC at 30 cc/ fed. + Topik 15% WP at 140 g/ fed. gave the highest reduction of weeds compared to other weed control treatments. These treatments reflected highest values of

wheat yield and its components. However, a negative correlation was observed between grain yield ardab/fed., number of grains/spike, number of spikes/m^2 and 1000-grain weight and the presented annual weeds in this study.

INTRODUCTION

Wheat (*Triticum aestivum* L.) is the most important cereal crop in the world, as well as in Egypt since it is stable food for humans. The total consumption of wheat in Egypt is estimated at about 13* million tons, while total wheat production is about 8.27 million tons (produced from 3.00 million fed.) with average grain yield of 18.00 ardab/fed. in 2007 season, therefore, there is a gap between the national need and the local wheat production, which means that Egypt still imports about 4.73 million tons annually. So, it is extremely important to search for the best cultural practices, such as sowing methods, fertilization, weed control...etc. to increase wheat production.

Sowing methods play an important role in weed control and increasing wheat production. The short time between harvest summer crop and sowing wheat is not sufficient for using Herati sowing method. So, using Afir drill and Afir in furrows sowing methods are preferable for this purpose. Nassar (1998), noted that sowing methods (no-tillage, Herati, Afir drill and broadcast) significantly affected total plant weight, grain weight/plant, number of tillers/plant, number of spikes/m^2, 1000-grain weight and grain yield (ardab/fed.). Fakkar (1999), reported that sowing methods (Herati and afir drilling) had no significant effect on yield, yield components and grain quality except plant height in the second season. Anaam (2003) reported that drill method significantly decreased dry weight of grassy, broad leaved and total weeds. Also, drill method significantly increased plant height, number of spikes/m^2, 1000-grain weight, grain and straw yields/fed. compared to broadcast method. Abd El-Hamid (2004), demonstrated that Afir improved and Afir drilling sowing methods reduced fresh weight of grassy and board leaved weeds by 84.3, 84.1, 81.0 and 88.0 %, respectively, in both seasons compared to Afir broadcasting

method. He also found that highest grain yield was obtained by Afir drilling or Afir improved method compared with Afir broadcast method.

Nitrogen has a great role in the formation of protein, where it is an integral part of chlorophyll, needed to absorber solar energy during photosynthesis. Many investigators teported that wheat yield and quality are greatly affected by the applied levels of nitrogen. Kotb (1998), found that N-fertilization of wheat plants increased protein content in the grain. Abd El-Hameed (2002), noted that plant height, spike length, grain weight/spike, 1000-grain weight and spike number/m^2 showed positive gradual responses to inoculation of Serialin. Abd El-Razik (2002), estimated that inoculation with Serialin as the source of *Bacillus polymexa* bacteria significantly affected plant height (cm), number of spike/m^2, spike length (cm), number of spikletes/spike number of grains/spike. Acciaresi *et al.* (2003), recorded that the highest N fertilizer (0, 50 and 100 kg/ha) rate decreased weed biomass in wheat fields Ibrahim *et al.* (2004), found that inoculation of wheat grains with Serialin at the rate of 750 g /fed. gave the highest main values of plant height, flag leaf area, no. of tillers/m^2, spike length, no. of spikes/m^2, No. of grains/spike, grains weight/spike, 1000-grain weight as well as grain and straw yields/fed. El-Afandy *et al.,* (2006), indicated that increasing nitrogen fertilization levels significantly increased wheat growth, yield and yield components i.e. plant height, spike length, number of spikelets/spike, 1000- grain weight, number of spikes/m^2, grain, straw and biological yields. Shaban and Helmy (2006), illustrated that dry weight of straw and grain increased significantly as a result of applying different nitrogen rates and Serialin.

Weeds are considered a great constraint in agriculture, particularly in wheat. Wheat is often infested with numerous types of weeds, which compete with crop plants resulting in grain yield depression. Getting red of weeds is achieved through direct methods such as herbicides application or by hand weeding and other indirect measures, such as agricultural practices as crop rotation, land preparation and sowing methods. Fakkar (1999), mentioned that

application of Topik 24% EC at 100 cc/fed., and hand weeding twice(30 and 45 DAS) significantly reduced dry weight of grassy weeds (*Avena fatua, Lolium multiflorum* and *Phalaris spp.*) by 95.3-97.7 % and 89.1-93.0% at 90 days in both seasons, respectively. Abd El-Hamid and Ghalwash (2002), noted that Topik 15% WP at 333 g/ha. was effective against annual grassy weeds in wheat fields. Helal (2003), found that application of Topik 15% WP at 140 g/fed. and hand weeding at 30 and 45 days after sowing significantly increased plant height, spike length, 1000-grain weight number of spikes/m^2, grain, straw and biological yields /fed., in wheat. Nassar (2003), indicated that application of Topik 24% EC at 100cc/fed., and hand weeding at 30, 45 days after sowing significantly increased plant height, spike length, no. of grains/plant, weight of grains/plant, weight of grains/spike and grain yield. Megahed and Die (2006) noted that Topik 15% WP at rate of 140 g/fed. gave the lowest fresh weight (g/m^2) of weeds (84.6 reduction %). Ismail *et al.*, (2008), found that hand weeding twice reduced dry weight of annual broad leaved, grassy and total weeds by 92.9, 94.7 and 99.3%, respectively in the first season and by 98.8, 99.2 and 93.0%, respectively in second season, compared to unweeded treatment.

The present investigation was carried out to study the performance of Giza 168 wheat variety under different sowing methods, N-fertilizations (biological and mineral) and weed control treatments.

MATERIALS AND METHODS

Two Field experiments were conducted at Shandaweel Agricultural Research Station, Agricultural Research Center, Sohag Governorate during the two successive growing seasons of 2006/07and 2007/08, to investigate the effect of some sowing methods, fertilization and some weed control treatments on wheat productivity and associated weed species. The preceding summer crop was maize (*Zea mays* L.) in both seasons. Mechanical and chemical analysis of the experimental site are presented in Table 1 according to Jackson (1973).

Table 1: Mechanical and chemical properties of experiment soil site.

Property		Average 2006/2007 and 2007/2008
Physical analysis	Sand %	43.28
	Silt%	18.05
	Clay%	38.68
	Soil texture	clay loam
Chemical analysis	Organic mater %	1.61
	Total N(%)	1.03
	Soluble ions (meq/100g soil (1:5))	
	CO_3^-	2.29
	HCO_3^-	871
	Cl^-	4.40
	$SO_4^=$	1.25
	Ca^{++}	1.29
	Mg^{++}	1.95
	Na^+	5.80
	K^+	0.31
	EC (ds/m)(1:5)	0.62
	pH(1:1)	7.80

Wheat (*Triticum aestivum* L.) variety Giza 168 was sown at 30th and 26th of November and harvested on 15th and 13th of May in the first and second seasons, respectively.

Phosphorus fertilizer was applied as calcium super phosphate (15.5% P_2O_5) during soil preparation at the rate of 150 kg/fed. Other normal agricultural practices of wheat growing were carried out as recommended.

A split-split-plot design with three replicates was used. Sowing methods were allocated in the main plots, N-fertilizer in the sub-plots and weed control treatments in the sub-sub plots as follows: -

A-Main plots: three sowing methods:

1. Afir drill: soil was plowed twice then wheat grains were hand drilled in rows 15 cm apart rows and irrigation was followed.
2. Afir broadcast: soil was plowed twice then grains were broadcasting and compacting was done and irrigation was followed.
3. Afir in furrows method with 60 cm apart ridge. Planting on double rows sloping bed and the top of the ridge with 10cm between hills and 4-5 grain/ hill.

B-Sub plots: four systems of nitrogen fertilizer:

1. 50 kg N/fed.
2. 75 kg N/fed.
3. Serialin (biofertilizer) + 50 kg N/fed.
4. Serialin (biofertilizer) + 75 kg N/fed.

Nitrogen fertilizers were applied in the form of Urea (46.5 % N) in three portions (1/5) after planting and before irrigation, (2/5) before first irrigation (2/5) before the second irrigation in the mineral fertilization treatments and in two equal portions before the first and second irrigation in mineral + biofertilizer (Serialin) treatments.

Wheat grains were inoculated with Serealin (Azotobacter and Azospirillium bacteria as commercial packet) before sowing at rate of 1kg/ 60 kg of grains.

C- Sub-sub plots: five weed control treatments were used as follows:-

1. Derby 17.5% SC at rate of 30 cc/fed. one day before the first irrigation (21 days after sowing).
2. Topik 15 % WP at rate of 140 g/fed. at 40 days after sowing.
3. Derby 17.5% SC at rate of 30 cc/fed. one day before the first irrigation + Topik 15 % WP at rate of 140 g/fed. at 40 days after sowing .
4. Hand weeding twice (at 30 and 45 days after sowing.)
5. Unweeded (Control).

The experiment included 180 plots (experimental unit), the plot area was 10.5 m^2 (3.5 m length × 3 m width). Seeding rate was used as recommended (60 kg/fed.). Herbicides were sprayed by Cp3 knapsack sprayers with 200 litters of water/fed.

The following data were recorded:

Weed survey:-

Weed were hand pulled from one square meter randomly after 75 days after sowing (DAS), then identified into species and classified into three catogaris i.e annual grassy, broad-leaved and total weeds. After that weeds were air dried for 3 days then oven dried at 70 C° for 24 then, the dry weight of annual grassy leaved, broad-leaved and total weeds was estimated as g/m^2.

Table 2: Family, scientific and english names of weeds recorded in wheat crop during 2006/07 and 2007/08, survey in the field experiments.

No	Family	Scientific name	English name
Annual grassy-leaved weeds			
1	Poaceae	*Avena spp.*L.	Wild oat
2	Poaceae	*Lolium spp.* L.	Ryegrass
3	Poaceae	*Phalaris minor.*L.	Canary grass
Annual broad-leaved weeds			
4	Cruciferae	*Brassica nigra* L.	Kaber mustrad
5	Chenopodiaceae	*Chenopodium albam* L.	Lampsquarters
6	Asteraceae	*Sonchus oleraceus* L.	Annual sowthistle
7	Fabaceae	*Medicago polymorpha* L.	Toothed medik
8	Fabaceae	*Melilotus indica* L.	Sweet clover
9	Polygonaceae	*Emex spinosus* L.	Spiny emex
10	Umbelliferae	*Ammi majus* L.	Common bishop
11	Polygonaceae	*Rumex dentatus L.*	Sheep sorrel

Yield and yield attributes: -

At harvest, ten plants were taken at random from each plot to determine.

Plant height (cm), number of spikes/m^2, spike weight(g), number of grains/spike, grains weight/spike (g), 1000-grain weight (g), grain yield (ardab/fed.) and straw yield (ton /fed.)

Protein content:-

N content was determined by the improved Kjeldhal method of A.O.A.C (1990) Protein percentage was calculated by multiplying the total nitrogen in wheat meal × 5.7.

Statistical Analysis:-

All data were statistically analyzed according to the technique of analysis of variance (ANOVA) for the split-split plot design as described by Gomez and Gomez (1984) by means of "MSTAT-C" computer software package and least significant differences revised (L.S.D.) at 5% level of probability was calculated for comparison between treatments means.

RESULTS AND DISSCUSION

Effect of sowing methods, fertilization and weed control treatments on annual weeds.

a- Effect of sowing methods:

Data in Table 3 reveal that afir in furrows and Afir drill methods reduced dry weight of broad leaved, grassy and total annual weeds by 20.9, 12.5, 29.3, 26.6, 25.0 and 19.3 %, respectively, in the first season and by 22.0, 16.9, 29.7, 24.6, 25.0 and 19.9 %, respectively, in the second season as compared to Afir broadcast method. These results are in line with those obtained by Anaam (2003) and Abd El-Hamid (2004).

b- Effect of N-fertilization:

Application of 50 Kg N/fed. and Serialin + 50 Kg N/fed reduced dry weight of broad leaved, grassy and total annual weeds by 35.3, 22.6, 35.9, 24.3, 35.6 and 23.4 %, respectively, in the first season and by 28.9, 15.7, 33.5, 21.5, 30.6 and 17.9 %, respectively, in the second season as compared to Serialin+75 Kg N/fed (Table 3). These results are in line with those obtained by Acciaresi *et al.* (2003).

c- Effect of weed control:

Derby, Hand weeding twice and Derby + Topik reduced dry weight of annual broad-leaved weeds by 95.6, 95.9 and 93.7 %, respectively in the first season, and 96.0, 93.9 and 93.6 %, respectively, in the second season. While, Topik, Derby + Topik and

Wheat productivity

Hand weeding twice reduced dry weight of annual grassy weeds by 87.2, 85.8 and 84.2 %,respectively in the first season, and 92.3, 88.5 and 89.2 %, respectively, in the second season (Table 3). So, using hand weeding twice and Derby + Topik gave the best values of dry weight of total annual weeds by 90.6 and 90.1%, respectively, in the first season, and 91.9 and 91.4 %, respectively, in the second season compared to unweeded treatment. These results are in agreement with those obtained by Fakkar (1999), Abd El-Hamid and Ghalwash (2002), Megahed and Die (2006) and Ismail *et al* (2008).

Table 3: Effect of sowing methods, fertilization and weed control treatments on dry weight of annual weeds (g/m^2) in 2006/07 and 2007/08seasons.

Treatments	2006/07 season			2007/08 season		
	Broad leaved weeds (g/m^2)	Grassy weeds (g/m^2)	Total weeds (g/m^2)	Broad leaved weeds (g/m^2)	Grassy weeds (g/m^2)	Total weeds (g/m^2)
Sowing methods						
Afir drill	61.1	46.6	107.7	83.9	47.8	131.7
Afir broadcast	69.8	63.5	133.4	101.0	63.4	164.4
Afir in furrows	55.2	44.9	100.1	78.8	44.6	123.3
L.S.D $_{0.05}$	3.75	4.70	6.44	2.02	2.68	3.76
Fertilization						
50 Kg N/fed.	49.2	40.9	90.1	72.2	41.5	113.7
75 Kg N/fed.	64.2	53.8	118.0	92.3	54.8	147.1
Serialin + 50 Kg N/fed.	58.8	48.3	107.1	85.6	49.0	134.6
Serialin + 75 Kg N/fed.	76.0	63.8	139.8	101.5	62.4	163.9
L.S.D $_{0.05}$	4.37	1.29	4.53	1.86	1.44	1.77
Weed control						
Derby	6.8	110.0	116.8	7.8	117.1	124.9
Topik	134.1	14.1	148.2	209.8	9.0	218.8
Derby + Topik	9.7	15.6	25.3	12.7	13.5	26.2
Hand weeding twice	6.3	17.4	24.0	12.1	12.6	24.8
Untreated	153.3	101.0	254.4	196.9	107.4	304.3
L.S.D $_{0.05}$	3.32	2.43	4.30	2.37	1.64	2.90

Effect of sowing methods, fertilization and weed control treatments on yield, yield components and grain quality :

a- Effect of sowing methods:

Data in Table 4 show that afir drill method gave the highest values of number of spikes/m^2 by 405.6 and 381.8 spikes/m^2 in both seasons, respectively. While, Afir in furrows method gave the highest value of 1000-grain weight by 1.6 and 1.9 %, respectively, compared to Afir broadcast method in both seasons. Also, Afir drill gave the highest values of wheat grain yield (ard./fed.) by 19.4 and18.2 ard./fed. in both seasons, respectively. For straw yield (ton/fed.), the highest values were obtained from Afir drill method by 4.1 and 4.7 ton/fed. in both seasons, respectively. So, Afir drill method gave the highest and equal values of protein by 12.3 % in both seasons, respectively. In general Afir drill method gave the best values from yield, yield components and grain quality because this method reduce weeds and gave the crop chance to grow and compete weeds. These results are in agreement with those obtained by Nassar (1998), Fakkar(1999), Anaam (2003) and Abd El-Hamid (2004).

b- Effect of N-fertilization:

Application of Serialin + 75 Kg N/fed. and 75 Kg N/fed gave the highest values of yield, yield components and grain quality compared to 50 Kg N/fed. in both seasons. Serialin + 75 Kg N/fed. and 75 Kg N/fed gave the highest increases of number of spikes/m^2 and 1000-grain weight by 13.9, 9.4, 4.2 and 3.3 %, respectively, in the first season and by 17.9, 12.2, 4.7 and 2.4 %, respectively, in the second season. For grain yield (ard./fed.) and straw yield (ton/fed.), the highest values were obtained from Serialin + 75 Kg N/fed. and 75 Kg N/fed by 12.4, 8.5, 7.7 and 5.1 %, respectively, in the first season and by 19.6, 11.4, 11.6 and 4.7 %, respectively in the second season (Table 4). Also, the highest values of protein were obtained from Serialin + 75 Kg N/fed. and 75 Kg N/fed by 12.1, 5.2, 13.0 and 6.1 %, respectively, in both seasons.

These results are in line with those obtained by Kotb (1998), Abd El-Hameed (2002), Abd El-Razik (2002), Ibrahim *et al.* (2004), El-Afandy *et al.*, (2006) and Shaban and Helmy (2006).

Table 4: Effect of sowing methods, fertilization and weed control treatments on yield, yield components and grain quality in 2006/07 and 2007/08 seasons.

Treatments	Plant height (cm)	Spike weight (g)	No of grains / spike	grain weight /spike (g)	No of spikes/ m^2	1000-grain weight (g)	Grain yield (ard/fed)	Straw yield (ton/fed)	Protein %
2006/2007season									
Sowing methods									
Afir drill	105.5	2.86	42.72	1.97	405.6	43.5	19.42	4.12	12.33
Afir broadcast	107.0	2.76	41.34	1.89	361.4	43.2	18.24	3.96	12.04
Afir in furrows	106.2	3.06	43.72	2.12	383.2	43.9	18.92	4.00	12.27
L.S.D $_{0.05}$	0.42	0.03	0.41	0.04	17.43	0.33	0.10	0.09	0.15
Fertilization									
50 Kg N/fed.	103.5	2.61	40.32	1.88	399.8	42.6	17.72	3.90	11.58
75 Kg N/fed.	106.5	2.98	43.04	2.02	437.3	44.0	19.20	4.08	12.20
Serialin+50 Kg N/fed.	105.8	2.85	41.85	1.96	429.4	43.2	18.61	3.94	12.07
Serialin + 75 Kg N/fed.	109.2	3.14	45.15	2.11	455.5	44.4	19.90	4.19	13.00
L.S.D $_{0.05}$	0.71	0.06	0.32	0.03	8.93	0.42	0.14	0.09	0.11
Weed control treatments									
Derby	106.1	2.70	40.92	1.90	364.9	42.7	18.01	3.84	12.09
Topik	105.7	2.76	41.78	1.95	385.0	43.2	18.46	3.95	12.28
Derby + Topik	103.1	3.25	46.58	2.23	448.2	45.3	21.00	4.56	12.72
Hand weeding	102.9	3.33	47.61	2.27	461.3	45.7	21.22	4.61	12.78
Untreated	113.6	2.43	36.08	1.61	258.2	41.0	15.60	3.18	11.19
L.S.D $_{0.05}$	0.57	0.07	0.43	0.03	8.95	0.44	0.17	0.08	0.10
2007/2008 season									
Sowing methods									
Afir drill	105.1	2.88	43.52	1.88	381.8	43.2	18.19	4.68	12.31
Afir broadcast	107.4	2.72	40.91	1.79	347.8	42.7	16.39	4.43	11.98
Afir in furrows	106.5	3.01	42.50	1.93	365.6	43.5	17.48	4.40	12.22
L.S.D $_{0.05}$	0.27	0.08	0.78	0.05	11.52	0.29	0.20	0.05	0.03
Fertilization									
50 Kg N/fed.	103.7	2.63	38.89	1.76	375.2	42.2	15.78	4.26	11.49
75 Kg N/fed.	106.9	2.90	43.02	1.89	420.9	43.2	17.61	4.54	12.15
Serialin+50 Kg N/fed.	105.7	2.82	41.58	1.83	405.5	42.9	17.17	4.44	12.05
Serialin + 75 Kg N/fed.	108.8	3.13	45.73	1.97	442.3	44.2	18.85	4.76	13.0
L.S.D $_{0.05}$	0.71	0.08	0.26	0.05	3.36	0.40	0.32	0.10	0.06
Weed control treatments									
Derby	106.9	2.61	40.21	1.80	340.7	41.9	16.73	4.16	12.08
Topik	105.8	2.67	41.68	1.82	361.4	42.2	17.13	4.34	12.24
Derby + Topik	102.6	3.34	46.51	2.10	438.4	45.0	18.95	5.08	12.62
Hand weeding	102.0	3.38	47.13	2.11	452.2	45.1	19.08	5.19	12.69
Untreated	114.2	2.35	36.00	1.47	232.2	41.4	14.88	3.74	11.24
L.S.D $_{0.05}$	0.60	0.07	0.82	0.05	13.13	0.53	0.37	0.09	0.09

c- Effect of weed control:

Hand weeding and Derby plus Topik gave the highest values of yield and its components compared to the untreated plot (Table 4). Hand weeding twice and Derby plus Topik increased number of spikes/m^2 by 78.7, 73.6, 94.7 and 88.8, respectively in both seasons. Hand weeding and Derby plus Topik increased 1000-grain weight by 11.5, 10.5, 8.9 and 8.7%, respectively, in both seasons. The highest wheat grain yield (ard./fed.) was obtained from hand weeding twice and Derby plus Topik by 11.5, 10.5, 8.9 and 8.7 %, respectively, in both seasons. The highest wheat straw yield (ton/fed.) was obtained from application of hand weeding twice and Derby plus Topik by 43.8, 43.8, 40.5 and 37.8 %, respectively, in both seasons. Hand weeding and Derby plus Topik increased protein % by 14.3, 13.4, 13.4 and 12.5, respectively, in both seasons. That could be attributed to the role of weed control methods in providing wheat plants with better growth conditions in the absence of weed competition at the critical growth stages. Appleby *et al.* (1976) indicated that weed control decreases the removal of nutrients from soil by weeds, thus stimulating crop growth, and that depends on the competitive ability of the crop species which determined by time of emergence, rate of growth and ability to obtain growth requirements. Similar findings were reported by Helal (2003) and Nassar (2003).

Effect of interactions

a- Effect of the interactions between sowing methods and fertilization on weeds, yield, yield components and grain quality :-

Data in Table 5 reveal that the interaction between sowing methods and fertilization was significant on dry weight of grassy weeds (g/m^2) in both seasons and

Broad-leaved weeds (g/m^2) in the second season only. The interaction between Afir in furrows method with 50 Kg N/fed gave the highest reduction on the dry weight of grassy weeds by 54.4 and 53.8 %, respectively in both seasons compared to Afir broadcast method with 75 Kg N/fed. (gave the lowest value).The lowest values of dry weight of broad -leaved weeds (g/m^2) were recorded from Afir drill with 50 Kg N/fed by 63.4% in the second season compared to Afir in furrows

method with 75 Kg N/fed. (gave the lowest value). Also, data in Table 5 reveal that all interactions between sowing methods and fertilization were not significant on yield, yield component and grain quality in both seasons. The interaction between Afir drill and Afir in furrows with serialin + 75 Kg N/fed increased yield, yield component and grain quality compared Afir broadcast and Afir in furrows methods with 50 Kg N/fed .

Table 5: Effect of interaction between sowing methods and fertilization on weeds, yield and yield components in 2006/07 and 2007/08 seasons.

Treatments		2006/07 season				2007/08 season		
		Grassy weeds (g/m^2)	Spike weight (g)	No. of Grains/ spike	Grain weight /spike (g)	Broad-leaved weeds (g/m^2)	Grassy weeds (g/m^2)	Protein %
Afir drill	50 Kg N/fed.	35.3	2.57	40.64	1.86	66.2	38.5	11.64
	75 Kg N/fed.	50.2	2.97	43.44	1.99	88.4	50.3	12.35
	Serialin + 50 Kg N/fed.	41.0	2.83	41.60	1.94	81.0	45.2	12.22
	Serialin + 75 Kg N/fed.	60.1	3.08	45.18	2.09	100.0	57.2	13.05
Afir broadcast	50 Kg N/fed.	53.6	2.55	39.29	1.81	87.7	50.8	11.40
	75 Kg N/fed.	65.3	2.80	41.64	1.93	105.5	66.2	11.87
	Serialin + 50 Kg N/fed.	61.0	2.73	40.74	1.86	98.6	61.0	11.80
	Serialin + 75 Kg N/fed.	74.3	2.97	43.70	1.96	111.9	75.8	12.87
Afir in furrows	50 Kg N/fed.	33.9	2.71	41.04	1.98	160.7	35.0	11.45
	75 Kg N/fed.	46.0	3.17	44.04	2.13	180.8	47.9	12.22
	Serialin + 50 Kg N/fed.	42.7	2.99	43.22	2.07	77.0	41.0	12.14
	Serialin + 75 Kg N/fed.	57.0	3.36	46.56	2.28	92.6	54.3	13.80
L.S.D 0.05		2.23	0.23	0.56	0.05	3.23	2.50	0.10

b- Effect of the interactions between sowing methods and weed control treatments on weeds, yield, yield components and grain quality :-

Data in Tables (6 and 7) show that the interaction between sowing methods and weed control treatments was significant on dry weight of annual weeds (g/m^2) in both seasons. Afir drill and Afir in furrows method with Derby plus Topik and with Hand weeding twice gave the high reduction of annual weeds compared to Afir broadcast method with unweeded in both seasons.

Table 6: Effect of the interaction between sowing methods and weed control treatments on yield and yield components in 2006/2007season.

Treatments		Broad leaved weeds (g/m^2)	Grassy weeds (g/m^2)	Total weeds (g/m^2)	Plant height (cm)	Spike weight (g)	No of grains / spike	grain weight /spike	No.of spikes /m^2	Grain yield (ard./fed)	Straw yield (ton./fed)	Protein %
Afir drill	Derby	7.3	103.2	110.5	105.6	2.72	40.78	1.89	385.0	18.48	3.94	12.20
	Topik	133.5	10.2	143.6	104.3	2.79	42.15	1.95	406.0	18.95	4.01	12.33
	Derby + Topik	8.8	123	21.0	102.8	3.11	46.50	2.18	466.3	21.68	4.59	12.83
	H.W twice	7.2	14.8	22.0	102.4	3.28	47.78	2.23	495.9	22.17	4.67	13.00
	Untreated	148.7	92.7	241.4	112.5	2.40	36.38	1.60	275.0	15.83	3.37	11.30
Afir broadcast	Derby	5.2	135.6	140.8	107.1	2.60	40.58	1.79	249.9	17.41	3.81	11.68
	Topik	157.0	17.3	174.2	106.1	2.62	41.13	1.83	364.4	17.80	3.92	12.11
	Derby + Topik	5.4	13.8	19.1	102.9	3.18	45.38	2.15	427.3	20.40	4.54	12.64
	H.W twice	6.5	21.0	27.5	104.1	3.09	44.90	2.13	420.8	20.23	4.48	12.45
	Untreated	175.2	130.0	305.2	114.9	2.31	34.73	1.56	244.6	15.36	3.05	11.13
Afir in furrows	Derby	7.9	91.2	99.0	105.5	2.78	41.40	2.02	359.8	18.13	3.75	12.22
	Topik	111.8	15.0	126.7	106.7	2.86	42.05	2.09	382.7	18.63	3.93	12.39
	Derby + Topik	15.1	20.7	35.8	105.5	3.45	47.85	2.37	451.1	20.93	4.54	12.70
	H.W twice	5.1	17.5	22.6	102.2	3.61	50.15	2.44	467.3	21.28	4.67	12.90
	Untreated	136.1	80.4	216.5	113.3	2.58	37.13	1.66	254.9	15.63	3.13	11.14
$LSD_{0.05}$		5.77	4.21	2.45	0.99	0.12	0.75	0.05	15.50	0.29	0.14	0.12

Also, in Tables (6 and 7) show that the interaction between sowing methods and weed control treatments was significant on some yield, characteristics yield component and grain quality in the first season and some characters in the second season. Afir drill and Afir in furrows method with Derby plus Topik and hand weeding twice gave the best values of yield, yield components and grain quality in both seasons. These results are in agrement with those obtained by Thomas and Doll (1993) who concluded that combination of cultural methods with herbicide application gave more efficient weed control than the use of each method alone.

Table 7: Effect of the interaction between sowing methods and weed control treatments yield and yield components in 2007/2008 season.

Treatments		Broad leaved weeds (g/m^2)	Grassy weeds (g/m^2)	Total weeds (g/m^2)	Plant height (cm)	Spikes weight (g)	No.of spikes /m^2	Grain yield (ard./fed)	Straw yield (ton./fed)	Protein %
Afir drill	Derby	7.2	108.0	115.2	105.9	2.62	352.0	17.65	4.35	12.22
	Topik	201.7	8.7	210.4	104.9	2.68	369.0	18.18	4.49	12.35
	Derby + Topik	12.4	12.4	24.8	101.6	3.32	449.3	19.75	5.20	12.76
	H.W twice	10.9	10.5	21.4	99.9	3.42	486.0	20.05	5.41	12.91
	Untreated	187.4	99.5	286.9	113.0	2.34	252.5	15.33	3.94	11.32
Afir broadcast	Derby	10.0	125.7	135.7	107.7	2.52	332.5	15.58	4..09	11.84
	Topik	237.6	11.0	248.5	106.4	2.57	353.3	16.20	4.28	12.04
	Derby + Topik	14.1	13.8	27.9	103.3	3.18	428.3	18.03	5.17	12.49
	H.W twice	15.7	15.9	31.6	104.1	3.11	414.3	17.58	4.99	12.33
	Untreated	227.5	132.9	360.3	115.4	2.24	210.5	14.30	3.62	11.21
Afir in furrows	Derby	6.3	99.5	105.8	107.0	2.69	338.3	16.70	4.05	12.17
	Topik	190.2	7.5	197.7	106.0	2.75	362.0	17.03	4.24	12.32
	Derby + Topik	11.6	14.3	26.0	103.0	3.52	437.8	19.08	4.87	12.61
	H.W twice	9.8	11.5	21.3	102.0	3.62	456.3	19.60	5.17	12.82
	Untreated	175.8	90.0	265.9	114.3	2.46	223.5	15.0	3.67	11.18
L.S.D $_{0.05}$		4.10	2.84	5.02	1.05	0.12	22.7	0.64	0.16	0.16

c- Effect of the interactions between fertilization and weed control treatments on weeds, yield, yield components and grain quality:

The interaction between fertilization and weed control treatments significantly affected the dry weight of annual weeds (g/m^2) in both seasons (Table 8).

Table 8: Effect of the interaction between fertilization and weed control treatments on yield and yield components in 2006/07 and 2007/08 seasons.

Treatments		2006/2007 season							2007/2008 season						
		Broad leaved weeds (g/m^2)	Grassy weeds (g/m^2)	Total weeds (g/m^2)	Plant height (cm)	Spike weight (g)	No of grains/ spike	1000-grain weight (g)	grain yield (ard/fed)	Straw yield (ton/fed)	Protein %	Broad – leaved weeds (g/m^2)	Grassy weeds (g/m^2)	Total Weeds (g/m^2)	Spike weight
50 Kg N/fed	Derby	2.8	91.4	94.2	103.7	2.4	38.9	42.1	17.2	3.8	11.3	3.4	102,1	105.5	2.5
	Topik	108.2	8.5	116.7	103.0	2.5	40.0	42.4	17.5	3.9	11.6	177.3	3.7	181.0	2.5
	Derby + Topik	4.2	10.7	14.9	100.2	2.8	44.3	43.8	19.6	4.4	12.2	7.6	6.2	13.8	3.0
	H.W twice	5.3	11.5	16.8	99.4	3.0	44.5	44.1	20.0	4.4	12.2	6.9	6.0	12.9	3.1
	Untreated	125.4	82.5	207.9	111.1	2.3	33.9	40.7	14.3	3.0	10.6	165.8	89.2	255.1	2.2
75 Kg N/fed	Derby	6.8	112.2	119.0	105.5	2.8	41.3	42.7	18.2	3.9	12.1	8.3	120.4	128.7	2.7
	Topik	138.0	14.9	152.9	105.5	2.8	42.4	43.5	18.8	3.9	12.2	218.8	10.0	228.9	2.7
	Derby + Topik	7.6	18.6	26.2	103.6	3.4	47.2	46.2	21.4	4.6	12.7	13.8	15.0	28.8	3.4
	H.W twice	10.0	18.1	28.1	103.5	3.4	47.6	46.5	21.6	4.7	12.8	13.7	15.2	28.9	3.4
	Untreated	158.4	105.4	263.8	114.4	2.5	36.6	41.1	16.0	3.2	11.2	206.6	113.4	320.0	2.4
Serialin + 50 Kg N/fed.	Derby	6.2	102.0	108.2	105.2	2.6	40.3	42.5	17.8	3.8	12.0	7.0	110.1	117.0	2.6
	Topik	130.1	13.0	143.1	105.2	2.7	41.1	42.9	18.1	3.9	12.2	205.8	8.6	214.3	2.7
	Derby + Topik	5.6	14.8	20.4	103.0	3.2	46.0	44.5	20.7	4.4	12.6	11.2	12.6	23.8	3.3
	H.W twice	7.7	14.2	21.8	102.6	3.3	46.1	45.3	20.9	4.5	12.6	10.7	11.9	22.6	3.3
	Untreated	144.7	97.4	242.1	112.9	2.4	35.7	41.0	15.5	3.1	11.0	193.0	102.1	295.1	2.3
Serialin + 75Kg N/fed.	Derby	11.3	134.4	145.7	109.9	2.9	43.1	43.3	18.7	3.9	13.0	12.6	135.7	148.3	2.8
	Topik	159.9	20.2	180.1	108.9	3.0	43.6	43.8	19.4	4.1	13.1	237.4	13.8	251.1	2.8
	Derby + Topik	9.7	23.6	33.3	105.5	3.6	48.8	46.5	22.3	4.8	13.4	17.9	19.2	37.2	3.7
	H.W twice	13.9	21.9	35.8	105.9	3.6	52.1	46.3	22.4	4.9	13.5	17.5	18.3	35.8	3.8
	Untreated	184.9	118.9	303.8	115.9	2.6	38.1	41.4	16.6	3.4	12.0	222.1	125.0	347.1	2.6
$LSD_{0.05}$		6.66	4.52	8.61	1.14	0.14	0.87	0.88	0.33	0.16	0.13	4.73	3.28	5.80	0.14

The highest reduction of annual weeds was obtained from 50 Kg N/fed with Derby plus Topik and with hand weeding twice in both seasons compared to Serialin + 50 Kg N/fed. With the untreated (the lowest reduction).

Most interaction between fertilization and weed control treatments was significant on yield, yield components and grain quality in the first season and not significant in the second season (Table 8). The highest values of yield, yield component and grain quality were obtained from Serialin + 75 Kg N/fed. and 75 Kg N/fed. with Derby plus Topik and hand weeding twice in both seasons compared to 50 Kg N/fed. with the untreated.

d- Effect of the interactions between sowing methods, fertilization and weed control treatments on weeds, yield, yield components and grain quality :-

Data in Table 9 show that interaction between sowing methods, fertilization and weed control treatments had significant effect on dry weight of broad-leaved and total annual weeds (g/m^2) in the first season only. The lowest values of broad-leaved weeds (2.2 g/ m^2) were obtained from Afir in furrows method under 50 Kg N/fed. with Derby. Afir drill method under 50 Kg N/fed. with Derby + Topik gave the highest reduction of total annual weeds (g/m^2) by 96.8 % compared to Afir broadcast method under Serialin + 75 Kg N/fed. with the unweeded (the lowest reduction).

Data in Table 9 reveal that interaction between sowing methods, fertilization and weed control treatments had significant effect on number of grains/spike and grain yield (ard./fed.) in first season only. The highest value of number of grains/spike (57.3) was resulted by Afir in furrows method under serialin + 75 Kg N/fed. with hand weeding twice. Whereas, the lowest value of number of grains/spike (32.7) was obtained from Afir broadcast method under 50 Kg N/fed. with unweeded plots. The greatest value of grain yield ardab/fed.(23.3 ardab/fed.), was obtained from hand weeding twice with serialin + 75 Kg N/fed. under Afir drill method. Meanwhile, the lowest value of grain yield ardab/fed.(14.1 ardab/fed.), resulted from unweeded plots with 50 Kg N/fed.under Afir broadcast method.

Table 9: Effect of interaction between sowing methods, fertilization and weed control treatments on dry weight of broad –leaved, total annual weeds (g/m2), no. of grains/spike and grain yield (ard./fed.) in 2006/2007 season.

Treatments		Broad -leaved weeds					Total annual weeds				
Sowing methods	Fertilization	Weed control treatments					Weed control treatments				
		Derby	Topik	Derby + Topik	H.W	Control	Derby	Topik	Derby + Topik	H.W	Control
Afir drill	1- 50 Kg N/fed.	3.9	111.6	5.1	3.7	126.3	87.1	116.2	11.8	12.4	199.5
	2- 75 Kg N/fed.	7.3	123.5	9.6	7.9	161.2	115.6	135.1	23.8	26.0	259.8
	3- Serialin + 50 Kg N/fed.	5.7	135.7	6.90	6.4	146.8	97.4	142.3	15.4	17.5	234.1
	4- Serialin + 75 Kg N/fed.	12.1	163.0	13.5	10.8	160.5	141.8	180.9	33.1	32.2	272.3
Afir broadcast	1- 50 Kg N/fed.	2.4	127.7	2.3	3.3	142.1	123.7	139.3	12.0	16.5	254.2
	2- 75 Kg N/fed.	6.6	169.1	5.3	7.9	177.8	142.3	287.5	20.1	31.3	311.8
	3- Serialin + 50 Kg N/fed.	5.1	148.3	4.7	5.1	163.0	134.3	165.6	16.9	24.6	289.9
	4- Serialin + 75 Kg N/fed.	6.9	182.7	9.1	9.5	217.9	163.0	204.5	27.4	37.5	365.0
Afir furrows	1- 50 Kg N/fed.	2.2	82.3	9.8	4.1	107.7	71.9	91.5	25.9	16.2	170.0
	2- 75 Kg N/fed.	6.6	121.5	16.9	5.2	136.3	99.1	136.1	38.2	23.5	219.8
	3- Serialin + 50 Kg N/fed.	7.7	106.2	11.9	4.9	124.3	92.8	121.3	31.1	21.3	202.2
	4- Serialin + 75 Kg N/fed.	14.9	134.1	21.9	6.3	176.2	132.3	155.0	47.9	29.4	274.0
L.S.D $_{0.05}$		11.5					14.9				
		No of grains/spike					Grain yield (ard./fed.)				
Afir drill	1- 50 Kg N/fed.	38.20	40.40	44.70	45.50	34.40	17.60	18.00	20.40	21.23	14.30
	2- 75 Kg N/fed.	41.40	42.80	47.50	48.10	37.40	18.70	19.20	22.10	22.40	16.30
	3- Serialin + 50 Kg N/fed.	39.50	40.90	45.60	46.30	35.70	18.40	18.60	21.30	21.70	15.80
	4- Serialin + 75 Kg N/fed.	44.00	44.50	48.20	51.20	38.00	19.23	20.00	22.90	23.30	16.90
Afir broadcast	1- 50 Kg N/fed.	38.43	39.30	43.30	42.70	32.70	16.63	16.90	18.90	18.73	14.13
	2- 75 Kg N/fed.	41.10	41.80	45.50	45.30	34.50	17.60	18.20	20.80	20.67	15.70
	3- Serialin + 50 Kg N/fed.	40.30	40.70	44.50	43.70	34.50	17.10	17.30	20.20	20.10	15.20
	4- Serialin + 75 Kg N/fed.	42.50	42.70	48.20	47.90	37.20	18.30	18.80	21.70	21.40	16.40
Afir furrows	1- 50 Kg N/fed.	40.10	40.30	44.80	45.40	34.60	17.40	17.70	19.60	19.90	14.40
	2- 75 Kg N/fed.	41.50	42.60	48.70	49.50	37.90	18.43	18.90	21.20	21.70	16.10
	3- Serialin + 50 Kg N/fed.	41.20	41.80	47.80	48.40	36.90	18.00	18.40	20.60	21.00	15.50
	4- Serialin + 75 Kg N/fed.	42.80	43.50	50.10	57.30	39.10	18.70	19.50	22.30	22.50	16.50
L.S.D $_{0.05}$		1.50					0.57				

Wheat productivity

Data in Table 10 indicate that the highest value of spike weight (4.1 g) was obtained by Afir in furrows method with serialin + 75 Kg N/fed. under hand weeding twice. While, the lowest value of spike weight (2.2 g) was obtained from Afir broadcast with 50 Kg N/fed. under unweeded plots.

Table 10 : Effect of sowing methods, fertilization and weed control treatments Spike weight in 2006/2007 season.

Treatments		2006/2007 season				
		Spike weight				
Sowing methods		Weed control treatments				
	Fertilization	Derby	Topik	Derby + Topik	H.W	Control
Afir drill	1- 50 Kg N/fed.	2.43	2.60	2.47	3.10	2.27
	2- 75 Kg N/fed.	2.83	2.87	3.33	3.33	2.47
	3- Serialin + 50 Kg N/fed.	2.70	2.73	3.13	3.23	2.33
	4- Serialin + 75 Kg N/fed.	2.93	2.97	3.50	3.47	2.53
Afir broadcast	1- 50 Kg N/fed.	2.37	2.33	2.97	2.93	2.23
	2- 75 Kg N/fed.	2.77	2.60	3.17	3.13	2.33
	3- Serialin + 50 Kg N/fed.	2.53	2.63	3.13	3.07	2.27
	4- Serialin + 75 Kg N/fed.	2.83	2.90	3.47	3.23	2.40
Afir Afir in furrows	1- 50 Kg N/fed.	2.57	2.63	3.00	3.03	2.30
	2- 75 Kg N/fed.	2.83	2.87	3.70	3.77	2.68
	3- Serialin + 50 Kg N/fed.	2.70	2.73	3.40	3.57	2.53
	4- Serialin + 75 Kg N/fed.	3.03	3.20	3.70	4.07	2.81
L.S.D $_{0.05}$		0.23				

H.W = hand weeding

Correlation analysis

Data presented in Table 11 indicate that grain yield ardab/fed. was positively and significantly correlated with number of grains/spike, 1000-grain weight, number of spikes/m^2, However, it was. negatively and significantly correlated with broad leaved weeds, grassy weeds and total annual weeds in both seasons.

Anaam (2003), revealed that grain yield ardab/fed. was positively and significantly correlated with the number of spikes/m^2, number and weight of grains/spike. He also, added that grain yield ardab/fed. was negatively highly significant, correlated with dry weight of broad-leaved weeds, grassy weeds and total annual weeds.

Table 11: Correlation analysis 2006/2007 and 2007/2008 seasons.

Characters	Broad-leaved weeds	Total weeds	No. of grains /spike	No. of spike/m^2	1000-grain weight	Grain yield
Correlation analysis 2006/2007 season						
Grassy weeds	0.192**	0.663**	- 0.544**	-0.593**	- 0.055**	- 0.589**
Broad-leaved weeds		0.862**	- 0.573**	-0.593**	- 0.546**	- 0.597**
Total weeds			- 0.718**	-0.759**	- 0.701**	- 0.759**
No. of Grains/spike				0.912**	0.880**	0.936**
No. of Spike/m^2					0.834**	0.950**
1000-grain weight						0.877**
Correlation analysis 2007/2008 season						
Grassy weeds	0.095	0.535**	- 0.517**	- 0.594**	- 0.466**	- 0.452**
Broad- leaved weeds		0.892**	- 0.448**	- 0.537**	- 0.445**	- 0.417**
Total weeds			- 0.616**	- 0.726**	- 0.590**	- 0.559**
No. of Grains/spike				0.892**	0.805**	0.891**
No. of Spike/m^2					0.780**	0.865**
1000-grain weight						0.746**

Similar results were also obtained by Ismail *et al.*, (2008), who indicated that grain yield/fed. was positively and significantly correlated with number of grains/spike, 1000-grain weight, number of spikes/m^2, Moreover, it was negatively highly significant correlated with dry weight of broad-leaved weeds, grassy weeds and total annual weeds.

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تأثير طرق الزراعة، التسميد النيتروجيني (حيوي و معدني) و بعض معاملات مقاومة الحشائش على إنتاجية محصول القمح

جمعه جمعه درويش*، أبوبكر عبد الوهاب طنطاوي*
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* قسم المحاصيل – كلية الزراعة – جامعة المنيا – المنيا – مصر و ** المعمل الفرعي لبحوث الحشائش- معهد بحوث المحاصيل الحقلية – مركز البحوث الزراعية – الجيزة – مصر.

أقيمت تجربتان حقليتان بالمزرعة البحثية بمحطة البحوث الزراعية بشندويل بمحافظة سوهاج خلال موسمي شتوي ٢٠٠٦/٢٠٠٧و ٢٠٠٧/٢٠٠٨م لدراسة تأثير ثلاثة طرق زراعة (عفير تسطير، عفير بدار و عفير في جور على خطوط)، أربعة معاملات تسميد نيتروجيني (تسميد آزوتي بمعدل ٥٠ كجم نيتروجين/فدان – تسميد آزوتي بمعدل ٧٥ كجم نيتروجين/فدان – سماد حيوي سيريالين + التسميد الآزوتي بمعدل ٥٠ كجم نيتروجين/فدان – سماد حيوي سيريالين + التسميد الآزوتي بمعدل ٧٥ كجم نيتروجين/فدان) و خمسة معاملات مقاومة الحشائش (دربي ١٧,٥ % SC بمعدل ٣٠سم^{٣} /فدان ، توبيك ١٥ % WP بمعدل ١٤٠جم /فدان ، دربي + توبيك كمبيدات حشائش)،بالإضافة إلي معاملة النقاوة اليدوية مرتين و بدون معاملة) على الحشائش المصاحبة للقمح وكذا محصول القمح ومكوناته ونسبة البروتين في قمح الخبز صنف جيزة ١٦٨. أستخدم في هذه الدراسة تصميم القطع المنشقة مرتين فى ثلاثة مكررات.

أوضحت النتائج أن طريقتي الزراعة العفير تسطير وعفير في جور علي خطوط أدت إلي خفض الوزن الجاف الكلى للحشائش وكذلك الحشائش الضيقة والعريضة مقارنة بطريقة الزراعة البدار في كلا الموسمين. كما أعطى استخدام التسميد الآزوتي بمعدل ٥٠ كجم ن/فدان و سيريالين + التسميد الآزوتي بمعدل ٥٠ كجم ن /فدان أقل قيم من الوزن الجاف للحشائش الحولية العريضة، الضيقة و الكلية مقارنة باستخدام٧٥ كجم ن/فدان بمفردة و كذلك مع السماد الحيوي سيريالين في الموسمين. أعطت معاملات

النقاوة اليدوية مرتين عند ٣٠، ٤٥ يوم من الزراعة والمعاملة بمبيدي الدربي بمعدل ٣٠سم^{٣} /فدان + توبيك بمعدل ١٤٠جم /فدان أعلى انخفاض في الوزن الجاف للحشائش مقارنة بالمعاملات الأخرى. وقد إنعكست هذه النتائج علي المحصول ومكوناته حيث أعطت هذه المعاملات أعلى القيم من المحصول و مكوناته.

علاوة على ذلك ، يوجد هناك ارتباط معنوي سالب بين كل من محصول الحبوب (إردب /فدان) ، عدد الحبوب / سنبلة، عدد السنابل / م^{٢} و وزن الألف حبة و الحشائش الموجودة في هذه الدراسة.