Misr J. Ag. Eng., 24(1): 18-41 FARM MACHINERY AND POWER

EFFECT OF MECHANICAL TILLAGE SYSTEM, WHEAT VARIETIES AND WEED CONTROL TREATMENTS ON WEEDS AND WHEAT (*TRITICUM AESTIVUM* L.) PRODUCTIVITY

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ABSTRACT

Pre sowing tillage systems during land preparation, the use of competitor cultivars and suitable herbicides can be considered as an essential keys for weed management in wheat crop. For this reason the present research was conducted during 2003 / 2004 and 2004 / 2005 winter seasons in clay soil in Sids Station, to evaluate the possible integrated effects of three pre sowing tillage systems [mouldboard plowing followed by rotary plowing, chisel plowing three passes followed by rotary plowing and chisel plowing two passes(Farmer treatment)], two wheat varieties (Beni suef3 and Sids1) and six weed control treatments i.e. tribenuron 6 g/fed., fenoxaprop 37.5 g/fed., isoproturon 300 g/fed., bromoxynil 240 g/fed. + clodinafop-propargyl 21 g / fed., handweeding twice and untreated check on weeds and wheat productivity. Results showed that tillage systems required energy for tillage irrespective from the interference from other studied factors which include mouldboard or chisel with rotary plowing were caused reduction of total weeds by 26 % and 29% with improving grain yield by 4 % and 3.4 %, respectively, and more economical in spite the highest required energy which estimated by 58.18 or 84.9 KW/h. as compared with 42.84 KW/hr. for farmer treatment in the same respective. Sids1 variety was considered more competitor than Beni Suef3 which was enable to suppress the fresh weight of total weeds by (34.2 %) and increased wheat grain yield by (3.4 %).

The application of tribenuron, fenoxaprop, isoproturon, bromoxynil + clodinafop-propargyl and handweeding twice decreased the fresh weight of total weeds by (72, 50, 77, 97 and 84%) and increased grain yield by

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(68, 65, 75, 93 and 68%), respectively, compared to unweeded control. The interaction between tillage system, wheat varieties and weed control treatments showed statistical significant effect on fresh weight of total weeds, number of spikes/m^2, 1000 - kernel weight and grain yield (ardab / fed.). Mouldboard plowing / rotary plowing under Sids1 variety and bromoxynil + clodinafop-propargyl application reduced the fresh weight of total weeds by (98.9%) and increased grain yield/fed. by (113.8%) compared to chisel plowing two passes only with Beni suef 3 and unweeded check.

These results suggest that the integration between tillage systems as a pre sowing measure such as using (mouldboard plowing followed by rotary plowing or chisel plowing followed by rotary plowing), use more competitor varieties of wheat such as (Sids1 variety) and weed control by herbicides such as (tribenuron, fenoxaprop, isoproturon, bromoxynil + clodinafop-propargyl) or by handweeding twice can be reduce significantly the fresh weight of total weeds and increase wheat productivity than the use of any individual method.

INTRODUCTION

There are many weed control measures applied either pre sowing as good land preparation through suitable tillage system or the use of competitor cultivars or herbicides or hand weeding as post sowing treatments for weed control in wheat crop. Reviewing the literature showed that tillage systems exert effects on weeds through distribution of weed seeds in the soil tillage layer. Fay and Olson (1978) Froud-Williams *et al* (1983), Roberts (1963), Ball and Miller (1993) and Yenish *et al* (1992) found that inversion tillage such as mouldboard plowing results in burial of a large proportion of weed seeds in tillage layer than in non inversion tillage methods such as chisel plowing which leave a greater proportion of weed seeds in soil surface which produce a greater potential for weed germination and establishment. There are another benefits from inversion tillage combined with non-inversion tillage systems in improving soil porosity and wheat productivity. El-Naggar and Tageldin (1997), Abd El Maksoud *et al* (1994), Helmy *et al* (2001), Hamad *et al* (1992), Abdou (1996), Abd Alla *et al* (1999) Zein Al – Din (1985) and Mosad and Foudy (2003) found that all systems; i.e., chisel, chisel + disk, mouldboard + disk, mouldboard + chisel,

subsoil + chisel, subsoil + chisel + disk, subsoil + mouldboard + disk and subsoil + mouldboard + chisel, especially those including mouldboard, gave the best soil physical preparation, best seedbed properties (bulk density, porosity, mean weight diameter and void ratio) and higher straw, grain yields of wheat. The rotary plowing gave the lowest fuel consumption and energy requirement compared with the chisel plowing (one pass), chisel plowing (two passes) and mouldboard plowing. Abdel-Gawad *et al* (1999) reported that Sids 1 cultivars possessed highest values of flag leaf area, number of spikes / m^2 and grain yield (17 and 19 ardab / fed.). About the use of herbicides many researchers e.g. Atalla *et al* (1998) showed that the combination of Brominal and Grasp gave better weed control for fresh weight of broadleaf and grassy weeds than Arelon. In both seasons, weed control treatments significantly increased the grain yield of wheat. The increase of wheat grain yield was attributed to the increase of spikes number and weight of 1000-grains. The highest grain yield was obtained by applying a mixture of Brominal and Grasp. Nowadays herbicides becoming of a common practice in wheat production due to the scarcity of labor in Egypt. The chemical control of weeds was reported previously by several workers (Al – Marsafy *et al*, 1992). Application of Topik (clodinafop) at the rate of 0.238 L / ha, Puma S at the rate of 1.191 L / ha. and hand weeding (twice) reduced significantly fresh weight of grassy weeds, (Strachan, 1995; Hassanein and Kholosy, 1996). Abd EL-Hamid (2002) indicated that Topik 15% plus Brominal 24%, handweeding (twice) and Topik applied alone reduced fresh weight of weeds by 87, 87, and 77%, respectively. Also, these treatments achieved the highest grain yield which was increased by 2.58 and 1.92 t/ha, and straw yield by 3.42 and 3.83 t/ha, respectively. El-Maghraby *et al* (1994) indicated that the effect of any herbicidal treatment dependes on the tillage treatment. They showed that either Arelon or a combination of Grasp / Brominal gave the highest grain yield under tillage system. The study of the integration between mechanical tillage systems, new vigour growth wheat varieties and weed control treatments is greatly required. Thus the present study aimed to estimate the role of tillage systems, wheat varieties, weed control treatments and their integration to impart them with each other on weed control and wheat productivity under Beni suef governorate

MATERIALS AND METHODS

Two field experiments were conducted at Sids agricultural research station, in clay soil (Table A) naturally infested with weeds, during the two growing seasons 2003/2004 and 2004/2005, to study the effect of tillage, varieties and some weed control treatments on wheat productivity and associated weeds.

Table (A) particle size distribution and soil textural class of the soil .

particle size distribution						
Clay %	Silt %	Clay + Silt %	Fine sand %	Coarse Sand %	Real density (g/cm^3)	Soil textural class
51.22	28.73	79.95	18.25	1.70	2.65	Clay

The experimental field included thirty six treatments. The treatments were arranged in a split – split plots design where tillage system laid in main plots, wheat varieties in sub plots and weed control treatments in sub – sub plots as follows:-

A : - Main plots : - Tillage system

A1 – Mouldboard plow followed by rotary plowing.

A2 – Chisel plow three passes followed by rotary plow.

A3 – Chisel plow two passes .

B : - Sub – plots (wheat varieties)

B1 – Beni suef 3. B2 – Sids1.

C : - Sub – sub plots (weed control treatments) : -

C1 – Tribenuron (2 – {{{{{ (4 – methoxy – 6 – methyl - 1,3,5 – triazin – 2 – yl) methylamino} carbonyl }amino } sulfonyl }benzoic acid) known commercially as Granstar 75 % Df sprayed after 2 weeks from sowing at the rate of 8 g / fed.

C2 – Fenoxyaprop – [p – ethyl ((±) – 2 – {4{(6 – chloro – 2 – benzox azolyl) oxy} phenoxy} propanoic acid] known commercially as Pama super 7.5 % Ew sprayed after 3 weeks from sowing at rate of 500 cm^3 / fed..

C3 – Panther (N – (2, 4 – difluorophenyl) – 2 – (3 – trifluoro methyl phenoxy) – 3 – pyridinecarbox amide) as 500 g / L isoproturon and 50 g

/ L diflufenican, sprayed after 3 weeks from sowing at rate of 600 cm^3 / fed..

C4 – Bromaxynil (3,5 dibromo – 4 – hydroxybenzonitrile) known commercially as Brominal 24 % EC, at the rate of 1.0 L / fed. for controlling broad – leaved weeds, plus clodinafop-propargyl (R) 2 – [5 – chloro – 3 – fluro – 2 – pyridyloxyl phenyl propanoic acid }) known commercially as Topik 15 % Wp at rate of 140 g / fed. tank mixtur sprayed after 45 days from sowing.

C5 – Hand weeding (twice) after 45 and 60 days from sowing.

C6 – Untreated (check plots).

Concerning plowing the average depth of plowing was 15 – 20 cm for chisel plow. 20 cm for mouldboard plow and 10 cm for rotary plow. The forward speed was 3.6 km/h. for chisel plow , 4.4 km/h. for mouldboard plow and 5.2 km/h. for rotary plow. The specifications of the different machinery used for seed bed preparation were as follows:

1 – Tractor: - Belarus type, four cylinders, diesel engine, four stroke, hydraulic system, water cooled and four wheels, had 54.68 kW engine power.

2 – Plows:-

a – A mounted chisel plowing consisted of seven shanks in two rows with 1.75 m width.

b – A mouldboard plowing; two blades with 1.00 m width.

c – A rotory plowing; total width 1.80 m.

Grains of wheat varieties were drilled in clay soil on 21^{th} and 12^{th} November in the first and second seasons, respectively. Super phosphate 15.5 % P_2O_5 at the rate of 150 kg / fed. was applied to all plots before seeding, sixty units of nitrogen fertilizer / fed. were added as ammonium nitrate (35.5 % N) in two split doses before the first and second irrigations in both seasons. An area of 2100 m^2, all agricultural practices, i.e., irrigations and diseases control, were carried out according to the local recommendation. The used herbicides were applied with a knapsack sprayer equipped with one nozzle boom. The water volume used was 200 L/fed.

Weed species in the experimental site were *Beta vulgaris* L., *Coronopus squmantus* (Forsk) Ascers, *Rumex dentatus* L., *Anagallis arvensis* L,

Euphorbia helioscopia L., as broad – leaved weeds and *Phalaris paradoxa* L., *Phalaris minor* Retz, as grassy weeds.

Data recorded: -

The following data were recorded in both seasons :

A – Machinery performance and energy measurements: -

The following measurements were determined to evaluate the seed bed preparation systems:

a – The effective field capacity (E.F.C.) was determined according to Kepner *et al* (1987) as follows :

$E.F.C = T^{-1}$ fed/h.

where:

T = actual plowing time / fed.

b - The field efficiency (ή) was calculated by using the following formula:

$$ή = E.F.C. / T.F.C.$$

where:-

T.F.C. is the theoretical field capacity

C – Energy requirments : - Estimation of the required engine power (EP) during seed bed preparation systems was caried out by accurately measuring decrease in fuel level in formula was used to estimate the engine power (Embaby, 1985):

$$EP = (Fc \times \frac{1}{60 \times 60}) \times P_f \times L.C.V. \times 427 \times ή_{th} \times ή_m \times \frac{1}{75} \times \frac{1}{1.36}, \text{ kW}$$

Where :

F.C. = The fuel consumption, (L/hr).

P_f = The density of fuel, (kg/L), for diesel fuel = 0.85 kg / L

L.V.C = The lower calorific value of diesel fuel (10000 k.cal/kg)

427 = Thermo – mechanical equivalent, (kg. M/k. cal).

$ή_{th}$ = Thermal efficiency of the engine (About 80% for diesel engine).

$ή_m$ = Mechanical efficiency of the engine (About 80% for diesel engine).

EP = 3.16 Fc, kW

Energy requirement = (3.163 X FC) / E.F.C kW. h. / fed.

Where:-

E.F.C = Effective field capacity, fed /h.

B – Weeds : - weeds were hand pulled from one square -meter taken randomly from each plot after 75 days from sowing . Weeds were classified

into species and determining the fresh weight of broad – leaved, grassy and total weeds were calculated as g / m^2.

C – Yield and its components of wheat: -

1 – Flag leaf area in cm^2 :- at 90 days from sowing, samples of ten plants were taken randomly from each plots to estimate the flage leaf area was measured according to the method proposed by Montogamery (1911).

At harvest (last weeks in May) the following traits from each plots were recorded : -

2 – Number of spikes / m^2.

3 – Grain yield (ardab / fed.) was calculated from the weight of grains obtained from each plot.

4 –1000 - kernels weight (g).

5 – Energy requirement.

6 – Economic analysis: - Economic evaluation for the results by estimating the average of grain yield (ardab/fed.), total variable cost, Gross Income (GI), Gross Margin (GM), Benefit/Cost ratio (B/C) and profitability according to Heady and Dillon (1961), where: Gross Income (GI) = 165 L.E. X Yield (ardab/fed)

Gross Margin = Gross Income – Total cost

Benefit/Cost ratio = Gross Income / total cost.

Profitability = 100 X Gross Margin / total cost

Statistical analysis: -

All data were statistically analyzed (combined analysis) according to the procedures outlined by Steel and Torrie, 1981 and the treatments means were compared by least significant differences (L.S.D).

RESULTS AND DISCUSSION: -

A – Machinery performance and field applied energy requirements for implementing tillage systems: -

Data in Table (1) show that the highest actual field capacity was with farmer treatment and the lower actual field capacity with the two treatments (chisel plowing three pass followed by rotary) which is attributed to the increase in operations of tillage, but, the first treatment (mouldboard plowing followed by rotary) gave 0.53 fed./hr. actual field capacity and best seedbed preparation against seed weeds. Field applied energy required was higher in

both interventions of chisel + rotary plowing systems followed by mouldboard / rotary plowing system (58.18) and the lowest one by chisel plowing . Similar results were obtained by Abd El Maksoud *et al* (1994) stated that chisel plowing two passes followed by rotary tiller and mechanical leveling was the suitable recommended methods to obtain the best soil physical preparation and Abdou (1996) illustrated that the use of disk harrow or rotary tiller after chisel plowing gave higher yield of grain and straw compared with chisel plowing two passes for wheat crop.

Table (1) Machinery performance and field applied energy requirements for implementing tillage systems the mean of two seasons.

Treatments seedbed preparation systems	Depth of plowing cm	Machinery performance Thero. Field capacity (fed./ h)	Act. Field capacity (fed./h.)	Field efficiency %	fuel consumption L/h	Power KW	Field applied energy requirements KW h./fed.
Mouldboard plowing followed by rotary	20 + 10	0.68	0.53	77.50	9.76	30.84	58.18
Chisel plowing three pass followed by rotary	20 + 10	0.40	0.31	77.50	8.35	26.32	84.90
Chisel plowing two pass only (farmer treatment)	20	0.75	0.59	78.00	8.00	25.28	42.84

B - Effect of tillage systems on weeds and wheat productivity:-

Data in Table (2) show that the differences between the three tillage systems in this study were statistically significant concerning their effects on the fresh weight of broad-leaved, grassy and total weeds where both mouldboard followed by rotary or chisel plowing three passes followed by rotary exerted decreases estimated by 32.3% & 6.4%, 47.2% & 25.2% and

29% & 25.5% in fresh weight of broad-leaved, grassy and total weeds, compared to farmer treatment (chisel plowing two passes). The obtained data agreed with results obtained previously by Ball and Miller (1993) they reported that weed density decreased in mouldboared plowed treatments than chisel plow and Yenish *et al* (1992) showed that chisel plowing concentrated weeds seeds over 30% in 1 cm top meanwhile mouldboard plowing had uniform distribution of weeds in top 19 cm. Concerning the effect on yield, yield component and economic input mouldboard plowing/rotary plowing and chisel plowing three passes/rotary plowing treatment) increased significantly flag leaf area / plant, 1000 kernels weight, no. of spikes / m^2 and grain yield (ardab/fed.), compared to farmer treatment by 2.7%, 2.2%, 3.3% and 4.1% & 3%, 2.2%, 1.7% and 3.4%, respectivaly. The increase in yield may be attributed either to weed control by increasing tillage or improving soil porosity. These results agreed with those obtained by Abo El – Ees (1985), Gill and Aulakh (1990), El – Maghraby *et al* (1994) and Abd – Alla *et al* (1999). Economic analysis showed that the total cost was calculated by 2275 L.E./fed fixed cost (land preparation, sowing, post sowing activities, fertilization, irrigation, insect control, harvesting and rental per Fadden) and random cost mechanical tillage system about 40 L.E./fed for mouldboard plowing, 45 L.E./fed for rotary plowing 80 L.E./fed for chisel plowing three passes, 60 L.E./fed for chisel plowing two passes only and weed control treatments about 50 L.E/fed. for mean weed control treatments. The highest values for gross income of grain yield reached about, 2541 L.E./fed. with mouldboard plowing/rotary plowing. while, the lowest values with chisel plowing two passes only about 2442 L.E./fed. The highest values for gross margin of grain yield reached about, 130.5 L.E./fed. with mouldboard plowing/rotary plowing. while, the lowest values with chisel plowing two passes only about 56.5 L.E./fed.

Table (2) The effect of tillage system on fresh weight (g/m^2) of broad leaved, grassy and total weeds, crop yield of wheat and economic analysis

seedbed preparation systems	Broad leaved Weeds (g/m^2)	Grassy weeds (g/m^2)	Total annual Weeds (g/m^2)	Flag Leaf area (Cm^2)	Number of Spikes / m^2	1000 kernel weight (g)	Grain yield (ardab / fed.)	Total cost (L.E.)	Gross income (L.E.)	Gross Margin (L.E.)
Mouldboard plowing followed by rotary	371.2	187.4	558.6	33.9	382.3	47.2	15.4	2410.5	2541.0	130.5
Chisel plowing three pass followed by rotary	268.4	267.3	533.6	34.0	376.3	47.2	15.3	2450.5	2524.5	74.0
Chisel powing two pass only (farmer treatment	396.3	354.8	751.1	33.0	370.0	46.2	14.8	2385.5	2442.0	56.5
LSD at level 5%	33.0	40.5	51.6	1.2	9.8	0.6	0.3		48.92	48.9

C –Effect of wheat varieties on fresh weight of weed Species (g/m^2) and wheat yield: -

Data in Table (3) show that the effect of wheat varieties (Beni suef 3 and Sids1) on fresh weight of broad – leaved, grassy and total weeds caused significant reduction in these weed categories under Sids1, compared to Beni suef 3 variety. Where Sids1 variety suppressed the fresh weight of broad – leaved, grassy and total weeds by (45.11%, 17.75% and 34.21%) respectively, compared to Beni suef 3 variety. These decreases are attributed to the increase in leaf area and growth vigor of Sids1 variety, compared to Beni suef3 variety which increase canopy shade. Sids1 variety excelled significantly in leaf area, number of spikes / m^2, 1000 kernels weight and grain yield, compared to Beni suef 3 variety. Grain yield (ardab / fed.) increased significantly by sowing Sids1 variety, compared to Beni suef3

variety this increase percentage in grain yield was (3.42 %) . This increase in grain yield due to the increase in flag leaf area which may be increase the interspecific competition between Sids1 variety plants and weeds than in the case of Beni Suef3 which caused increases in number of spikes/m^2 and 1000 kernels weight. Abdel-Gawad *et al* (1999) reported that Sids 1 cultivar possessed the highest values of flag leaf area, number of spikes / m^2 and grain yield (17 and 19 ardab / fed.).

Table (3) Effect of wheat varieties on fresh weight of broad-leaved, grassy, total annual weeds(g/m^2), yield and its components of wheat in mean of two seasons)

Treatments	Broad leaved weeds (g/m^2)	Grassy weeds (g/m^2)	Total annual weeds (g/m^2)	FlageLeaf area (cm^2)	Number of spikes/m^2	1000 kernel weight (g)	Grain yield ardab/fed
Beni suef3	445.9	295.3	741.2	30.1	363.0	45.3	14.9
Sids1	244.7	242.9	487.6	37.2	389.4	48.4	15.4
LSD at level 5%	49.4	36.3	63.6	0.88	7.7	0.5	0.36

D – Effect of weed control treatments on fresh weight of weeds (g/m^2) and wheat yield:-

Table (4) showed that all weed control treatments (Granstar, Puma super, Panther, Brominal plus Topik and Hand weeding twice) reduced significantly the fresh weight of broad – leaved, grassy and total weeds. The highest efficacy on fresh weight of broad – leaved weeds were obtained by Brominal and Topik combination followed by Granstar, Panther and Hand weeding twice which gave 96.2, 95.1, 93.5 and 87.9 % control, respectively as compared with unweeded check. The greatest reduction percentage in fresh weight of grassy weeds were obtained by Brominal plus Topik followed by Puma super, Hand weeding twice and Panther which were (97.9, 97.3, 78.4 and 52.9%), respectively, compared to unweeded control. The highest reduction percentage in total weeds were obtained from Brominal plus Topik followed by Hand weeding, Panther, Granstar and

Puma super which were (96.89, 84.00, 76.77, 72.10 and 50.14%) respectively, compared to unweeded control. These results agreed with those obtained to Al – Marsafy *et al* (1992) Hassanein and Kholosy (1996) and Abd El – Hamid (2002).

Data in Table (4) showed that all weed control treatments under study increased significantly leaf area, number of spikes/m^2 and weight of 1000 kernels than unweeded control. The greatest number of spikes / m^2 and 1000 kernel weight was resulted from combination of Brominal and Topik treatment. The lowest value of leaf area, number of spikes/m^2 and weight of 1000 kernel was obtained from unweeded control. Grain yield (ardab / fed.) tended to increased significantly by weed control treatments under study than unweeded control plots.

The highest increase percentage in grain yield (92.6 %) was obtained from combination of Brominal and Topik followed by Panther (74.47 %), Granstar, Hand weeding twice (68.1%) and Puma super (64.89%) compared to unweeded control.

Table (4) Effect of weed control treatments) on fresh weight of broad-leaved, grassy, total annual weeds(g/m^2), yield and its components of wheat in the mean of two seasons

Treatments	Broad leaved weeds (g/m^2)	Grassy weeds (g/m^2)	Total annual weeds (g/m^2)	Flag Leaf area (cm^2)	Number of spikes/m^2	1000 kernel Weight (g)	Grain yield ardab/fed
Granstar	48.6	418.8	467.4	35.0	375.0	48.1	15.8
Puma super	816.6	18.6	835.2	35.2	371.6	47.2	15.5
Panther	64.5	324.6	389.1	35.5	397.4	47.2	16.4
Brominal + Topik	37.5	14.5	52.0	34.9	431.5	48.8	18.1
Hand weeding	118.9	149.2	268.1	35.1	404.7	48.5	15.8
Untreated check	985.8	689.2	1675.0	26.2	277.0	41.3	9.4
LSD at level 5%	119.4	52.6	130.0	1.32	11.0	1.1	0.4

These results are attributed to preventing various competition between weed species and wheat due to the decreases in fresh weight of broad – leaved, grassy and total weeds. These results agree with those obtained by (Strachan, 1995; Hassanein and Kholosy, 1996) and Ebd El – Hamid (2002), Pardo *et al* (1990) found that the effects of weeds may be related to inter and intra specific between weeds and crop plant.

E – Effect of the interaction between tillage systems, wheat varieties and weed control methods: - All significant effect of the interactions between tillage systems, wheat varieties and weed control treatments on weeds and wheat yield are shown in Tables (5, 6, 7, 8).

Data in Table (5) showed the lowest fresh weight of broad leaf weeds was obtained from the interventions of two tillage systems (chisel plowing three passes followed by rotary plowing) than the other treatments which gave (64.4%) reduction, compared to farmer treatments as will as the lowest fresh weight of grassy weeds were obtained intervention on 2 of tillage system (mouldboard plowing follwed by rotary plowing), compared to the other treatments which gave (45.1%). The same trend as broad leaf weeds which gave the highest reduction in the total weeds. These results refer to the accumulated effect between tillage system where rotary plowing integrated with Sids1 variety in suppressing weed growth of different weed categories. The greatest number of spikes/m^2, weight of 1000 - kernel and grain yield was obtained from the mouldboard plowing/rotary plowing and sowing sids 1 variety followed by chisel plowing three passes/rotary plowing and Sids1 variety and the lowest values were resulted from chisel plowing two passes only and sowing Beni suef 3 variety. These results are attributed to the increase in both number of spikes/m^2 and 1000 - kernel weight.

Table (6) reported that the interaction between tillage treatments and weed control treatments were statistically significant on its effect on fresh weight of broad – leaved, grassy, total weeds and wheat yield. The greatest reduction in fresh weight of broad – leaved and total weeds were obtained from chisel plowing two passes only with Brominal and Topik combination, but, the greatest reduction in fresh weight of grassy weeds were obtained from mouldboard plowing combined with rotary plowing with Puma super followed by chisel plowing three passes plus rotary plowing with Brominal and Topik combination, while, the greatest fresh weight of broad – leaved,

grassy and total weeds were obtained from chisel plowing two passes only with unweeded control. The greatest number of spikes/m^2 and grain yield was resulted from mouldboard plowing/rotary plowing with Brominal and Topik combination followed by chisel plowing three passes/rotary plowing with Brominal and Topik combination, but, the lowest value was obtained from chisel plowing two times only with unweeded control.

Table (5) The interaction effect between tillage system and varieties on fresh weight of broad-leaved, grassy, total annual weeds, yield and its components of wheat in the mean of two seasons.

Tillage System treatments	Wheat varieties	Broad leaved weeds(g/m^2)	Grassy weeds (g/m^2	Total annual weeds (g/m^2	Number of spikes s/m^2	1000 kernel weight	Grain yield ardab/fed
Mouldboard plowing followed by rotary	Beni suef3	450.2	230.2	680.4	372.9	45.2	15.1
	Sids1	292.1	144.5	436.6	391.8	49.1	15.6
Chisel plowing three pass followed by rotary	Beni suef3	343.1	333.2	676.3	363.2	46.0	15.2
	Sids1	193.8	201.4	395.2	389.3	48.3	15.3
Chisel plowing two pass only (farmer treatment)	Beni suef3	544.3	322.6	866.9	353.0	44.6	14.5
	Sids1	248.3	387.0	635.3	387.1	47.8	15.2
LSD at level 5%		85.6	62.8	110.0	13.2	0.9	0.6

These increases are attributed to increase in number of spikes/m^2 and 1000-kernel weight due to the decrease in the fresh weight of broad leaf, grassy and total weeds. These results agree with those obtained by El-Maghraby *et al* (1994) They showed that either Arelon or a combination of Grasp / Brominal gave the highest grain yield under tillage system. These results also referred that using herbicides combinations or hand weeding masked the effect of tillage system on weeds.

Table (6) The interaction effect between tillage system and weed control treatments on fresh weight of broad-leaved, grassy, total annual weeds, yield and its components of wheat in the mean of two seasons.

Tillage systems	Weed Control treatments	Broad leaved weeds (g/m^2)	Grassy weeds (g/m^2)	Total annual weeds (g/m^2)	Number of spikes/ m^2	1000 kernel weight (g)	Grain yield ardab/fed
Mouldboard plowing followed by rotary	Granstar	32.2	194.3	226.5	376.4	48.1	15.6
	Puma super	1028.8	8.6	1037.4	375.8	47.9	15.7
	Panther	58.7	202.1	260.8	401.3	49.0	16.6
	Brominal + Topik	70.0	13.1	83.1	440.6	48.8	18.4
	Hand weeding	148.3	117.3	265.5	414.1	46.6	16.0
	Untreated check	889.0	588.9	1477.9	285.8	42.8	10.1
Chisel plowing three pass followed by rotary	Granstar	63.8	432.8	496.6	363.0	48.3	15.6
	Puma super	528.3	27.4	555.7	359.3	47.0	15.6
	Panther	81.4	429.8	511.2	393.4	47.1	16.5
	Brominal + Topik	32.8	11.9	44.7	431.9	49.3	18.2
	Hand weeding	117.4	208.3	325.7	394.9	49.5	16.3
	Untreated check	786.9	481.2	1268.1	277.8	41.6	9.4
Chisel plowing two pass only (farmer treatment	Granstar	49.9	629.2	679.1	385.5	47.9	16.1
	Puma super	892.6	19.6	912.2	379.8	46.8	15.2
	Panther	53.4	341.8	395.2	397.4	45.4	16.1
	Brominal + Topik	9.7	18.6	28.3	422.1	48.3	17.8
	Hand weeding	90.9	121.9	212.8	405.1	49.3	15.0
	Untreated check	1281.4	997.6	2279.0	267.6	39.4	8.8
LSD at level 5%		206.8	91.0	225.1	19.1	1.9	0.6

Table (7) inducted that the interaction between wheat varieties and weed control treatments were significantly effective on fresh weight of broad – leaved, grassy, total weeds and wheat yield. The highest reduction in fresh weight of broad – leaved and total weeds were obtained from the interaction between Sids1variety with mixture of Brominal and Topik, but, the greatest fresh weight of broad – leaved and total weeds were obtained from Beni suef3 with unweeded control. The greatest reduction in fresh weight of

grassy weeds were obtained from Beni suef 3 with mixture of Brominal and Topik followed by Beni suef3 with Puma super, but, the greatest fresh weight of grassy weeds were resulted from Sids1 with unweeded control followed by Beni suef3 with unweeded control.

Table (7) The interaction effect between wheat varieties and weed control treatments on fresh weight of broad-leaved, grassy, total annual weeds, yield and its components of wheat in the mean of two seasons.

Wheat variety	Weed Control treatments	Broad leaved Weeds (g/m^2)	Grassy weeds (g/m^2)	Total annual Weeds (g/m^2)	Number of spikes/m^2	1000 kernel weight (g)	Grain yield ardab/fed
Beni suef 3	Granstar	53.4	451.8	505.2	366.3	45.3	15.4
	Puma super	1013.9	14.5	1028.4	354.8	46.2	15.2
	Panther	95.4	442.5	537.9	389.0	44.8	16.0
	Brominal + Topik	62.8	9.9	72.7	418.2	47.9	17.9
	Hand weeding	139.0	227.5	366.5	389.1	47.5	15.8
	Untreated	1310.7	625.9	1936.6	260.8	40.0	9.4
Sids1	Granstar	43.8	385.7	429.5	383.7	50.9	16.2
	Puma super	619.3	22.7	642.0	388.4	48.3	15.8
	Panther	33.6	206.6	240.2	405.8	49.6	16.8
	Brominal + Topik	12.1	19.2	31.3	444.9	49.7	18.4
	Hand weeding	98.7	70.8	169.5	420.3	49.4	15.7
	Untreated	660.8	752.5	1413.3	293.3	42.5	9.4
LSD at level 5%		168.9	47.3	183.8	15.62	1.5	0.5

The greatest number of spikes/m^2 and 1000 kernel weight was resulted from the interaction between Sids1 variety with mixture of Brominal and Topik, but, the lowest value was resulted from Beni suef 3 variety with unweeded control. These increase due to the decrease in fresh weight of broad – leaved, grassy and total weed. The highest grain yield was obtained from the interaction between Sids1 variety with mixture of Brominal and Topik

followed by Beni suef 3 variety with mixture of Brominal and Topik, but, the lowest grain yield was resulted from Beni suef 3 variety with unweeded control followed by Sids1 variety with unweeded control. These increase due to increased number of spikes/m^2 and 1000-kernel weight. These results agree with those obtained by El-Maghraby *et al* (1994) indicating that the effect of any herbicidal treatment depended on the tillage treatment. They showed that combination of Grasp / Brominal gave the highest grain yield under tillage system.

Data in Table (8), show that tillage systems intervention by combining mouldboard / rotary, chisel / rotary plowing intervention under untreated check gave pronounced decrease in the total weeds compared to farmer treatment (chisel plowing two passes only) by 16.57, 31.83% and 54.22 and 57.22% either under Beni suef3 or Sids1, respectively accompanied with increase in grain yield and vice versa the highest weed control and grain yield obtained with the use of integration between Brominal + Topik combination with chisel plowing two passes with Beni suef 3 variety, Brominal + Topik combination with chisel plowing three passes/rotary plow with Sids 1 variety and Brominal + Topik combination with mouldboard plow/rotary plow with Sids 1 variety. The greatest number of spikes/m^2 was obtained from chisel plowing three passes/rotary plowing with Sids1 and mixture of Brominal and Topik followed by Mouldboard plowing/rotary plowing with Sids1 and mixture of Brominal and Topik, but, the lowest number of spikes/m^2 was resulted from Chisel plowing two passes only with Beni suef 3 and unweeded control followed by chisel plowing three passes/rotary plowing with Beni suef 3 and unweeded control. Concerning the effect of interaction on yield and its components the highest increased percentage of grain yield i.e. 113.8% & 111.5% was obtained from mouldboard plowing/rotary plowing with Sids1 and the use of the combination Brominal + Topik & chisel plowing three passes/rotary plowing with Sids1 and mixture of Brominal + Topik compared to chisel plowing two passes only with Beni suef 3 and unweeded control

Table (8) The interaction effect between tillage system, varieties and weed control treatments on fresh weight of broad-leaved, grassy, total annual weeds and wheat yield mean of two seasons

Wheat varieties		Total annual weeds (glm^2)		Number of spikes/m^2		Grain yield ardab/fed	
Tillage system treatments	Weed Control treatments	Beni Suef 3	Sids 1	Beni Suef 3	Sids 1	Beni Suef 3	Sids 1
Mouldboard plowing followed by rotary	Granstar	269.3	183.5	372.0	380.8	14.9	16.3
	Puma super	1045.2	1029.6	364.0	387.5	15.3	16.0
	Panther	369.1	152.5	398.3	404.4	16.3	16.9
	Brominal + Topik	140.3	26.0	430.3	451.0	18.1	18.6
	Hand weeding	332.5	198.5	392.5	435.8	16.0	16.0
	Untreated check	1926.4	1029.4	280.3	291.3	10.2	9.9
Chisel plowing three pass followed by rotary	Granstar	565.8	427.4	381.0	390.0	15.4	15.9
	Puma super	666.6	444.9	358.3	401.3	15.5	15.7
	Panther	660.6	361.9	386.9	408.0	16.2	16.8
	Brominal + Topik	68.8	20.5	409.0	435.3	18.1	18.4
	Hand weeding	521.9	129.5	397.4	412.8	17.1	15.5
	Untreated check	1574.1	962.0	246.8	288.5	9.1	9.6
Chisel plowing two pass only (farmer treatment	Granstar	680.6	677.6	345.8	380.3	15.9	16.3
	Puma super	1373.2	451.2	342.0	376.5	14.7	15.8
	Panther	584.0	206.3	381.8	405.0	15.6	16.7
	Brominal + Topik	9.1	47.5	415.3	448.5	17.5	18.2
	Hand weeding	245.0	180.6	377.5	412.3	14.5	15.3
	Untreated check	2309.1	2248.8	255.5	300.0	8.8	8.7
L.S.D at level 5%		318.4		27.1		0.85	

Data in Table (9) show that tillage systems intervention by combining mouldboard / rotary, chisel / rotary plowing intervention under untreated check gave pronounced increase in the total cost 2360, 2400 and energy requirements 58.2, 84.9, compared to farmer treatment (chisel plowing two passes only) by 2335 and 42.8 KWhr/fed. either under Beni suef3 or Sids1, respectively accompanied with increase in Profitability and vice versa the highest % reduction of weeds and % increased of grain yield obtained with the use of integration between Brominal + Topik combination with chisel plowing two passes with Beni suef 3 variety, Brominal + Topik combination with chisel plowing three passes/rotary plow with Sids 1 variety and Brominal + Topik combination with mouldboard plow/rotary plow with Sids 1 variety.

In Egypt their is no or little work about the role of machinery tillage system on weed densities in wheat crop . For this reason this study was conducted including different weed control measures is to protect the crop until its canopy can tolerate weeds. This can be achieved either by tillage practices as pre sowing treatment or by herbicides or varieties which had rapid growth. These results agree with those obtained by El-Maghraby et al (1994) which indicated that the integration between mechanical tillage systems, new high vigor growth wheat varieties and weed control treatments is very needed.

Useful and can be recommended for wheat growers .

Table (9) The interaction effect between tillage system, varieties and weed control treatments on reduction % of total weeds, increased % of grain yield, total cost and profitability.

Wheat varieties		Field applied	reduction % of total weeds		Increased % of grain yield		Total cost (L.E.)		Profitability	
Tillage system treatments	Weed Control treatments	Energy requirements KW h./fed.	Sids 1	Beni Suef 3	Sids 1	Beni Suef 3	Sids 1	Beni Suef 3	Sids 1	Beni Suef 3
Mouldboard plowing followed by rotary	Granstar	58.18	92.1	88.3	85.2	69.3	2398	2398	12.2	2.5
	Puma super		55.4	54.7	81.8	73.9	2400	2400	10.0	5.2
	Panther		93.4	84.0	92.0	85.2	2405	2405	15.9	11.8
	Brominal + Topik		98.9	93.9	113.4	105.7	2480	2480	23.8	20.4
	Hand weeding		91.4	85.6	81.8	81.8	2420	2420	9.1	9.1
	Untreated check		55.4	16.6	12.5	15.9	2360	2360	-21.3	-8.3
Chisel plowing three pass followed by rotary	Granstar	84.90	81.5	75.5	80.7	75.0	2438	2438	7.6	4.2
	Puma super		80.7	71.1	78.4	76.0	2440	2440	6.2	4.8
	Panther		84.3	71.4	90.9	84.1	2445	2445	13.4	9.3
	Brominal + Topik		99.1	97.0	109.1	105.7	2520	2520	20.5	18.5
	Hand weeding		94.4	77.4	76.1	94.3	2460	2460	4.0	14.7
	Untreated check		58.4	31.8	9.1	3.4	2400	2400	-30.0	-22.7
Chisel plowing two pass only (farmer treatment	Granstar	42.84	70.7	70.5	85.2	80.7	2373	2373	13.3	10.6
	Puma super		80.5	40.5	79.5	67.0	2375	2375	9.8	2.1
	Panther		91.1	74.7	89.8	77.3	2380	2380	9.7	8.2
	Brominal + Topik		97.9	99.6	106.8	98.9	2455	2455	22.3	17.6
	Hand weeding		92.2	89.4	73.9	64.8	2395	2395	7.5	-17.5
	Untreated check		2.6	0.0	-0.99	0.00	2335	2335	-38.5	-37.8

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الملخص العربى

تأثير معاملات الخدمة الأولية والأصناف ومعاملات مقاومة الحشائش علي إنتاجية محصول القمح والحشائش المصاحبة له

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تعتبر خدمة الأرض قبل الزراعة أو استعمال أصناف ذات قدرة تنافسية عالية أو مبيدات الحشائش بعد الإنبات عناصر أساسية للمكافحة المتكاملة للحشائش في محصول القمح . من أجل ذلك تم تنفيذ هذا البحث خلال الموسمين الشتويين ٢٠٠٣/٢٠٠٤ ، ٢٠٠٤/٢٠٠٥ تحت ظروف التربة طينية بمحطة بحوث سدس لتقييم تأثير ثلاث معاملات خدمة قبل الزراعة وهي استخدام محراث القلاب والدوراني أو محراث حفار ٣ سكة متبوعا بالمحراث الدوراني مقارنة بمعاملة المزارع وهي استخدام المحراث الحفار سكتين متعامدتين وكذا استخدام صنفين من القمح وهي سدس١ ، بني سويف٣ وست معاملات لمكافحة الحشائش وهي تراى بينيرون بمعدل ٦ جم مادة فعالة للفدان ، فينوكس برب بمعدل ٣٧,٥ جم مادة فعالة للفدان ، ايزوبرتيرون بمعدل ٣٠٠ جم

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للفدان ، بروموكسينيل بمعدل ٢٤٠ جم مادة فعالة للفدان + كلودينافوب بمعدل ٢١ جم مادة فعالة للفدان ومقارنة ذلك بمعاملة النقاوة اليدوية والكنترول (بدون معاملة) علي الطاقة المستخدمة في عمليات الخدمة ومكافحة الحشائش والمحصول في القمح.

أوضحت النتائج أن استخدام نظامي الخدمة محراث قلاب / دوراني، محراث حفار ٣ سكة / دوراني أحدث خفضا في أوزان الحشائش بمقدار (٢٩%، ٢٦%) وزيادة في محصول الحبوب بنسبة (٤ % ، ٣,٤%) مقارنة بمعاملة المزارع (محراث حفار سكتين) ويعود ذلك إلي دور المحراث القلاب في دفن بذور الحشائش السطحية إلي أعماق ٣٠ سم حيث تصبح نسبة كبيرة منها غير قادرة علي الإنبات ، وأعطت النظم المختلفة من الخدمة أكبر عائد اقتصادي للفدان والتي كانت ١٣٠جنية للقلاب، ٧٤جنية للحفار ٣ سكة مقابل ٥٦,٥ جنية لمعاملة المزارع برغم أن كمية الطاقة المطلوبة لإجراء الخدمة كان أعلي من معاملة المزارع ٥٨,١٨ كيلو وات/ ساعة للمحراث القلاب مع الدوراني، ٨٤,٩ كيلو وات / ساعة للمحراث الحفار ٣ سكة مع الدوراني ، ٤٢,٨٤ لمعاملة المزارع. كما أظهر الصنف سدس١ قدرة تنافسية عالية من حيث مساحة ورقة العلم مما أدي لنقص الحشائش بنسبة(٣٤,٢%) وزيادة في محصول الحبوب بنسبة (٣,٤%) مقارنة بالزراعة بصنف بني سويف٣ .

كما أدت معاملات مقاومة الحشائش (وهي تراى بينيرون ، فينوكس برب، ايزوبرتيرون، بروموكسينيل + كلودينافوب ، نقاوة يدوية مرتين) ا إلي إنقاص الوزن الغض للحشائش الكلية بنسبة (٧٢، ٥٠، ٧٧، ٩٧، ٨٤%) وزيادة في محصول الحبوب بنسبة (٦٨، ٦٥، ٧٥، ٩٣، ٦٨%) مقارنة بالكنترول (بدون معاملة).

كان تأثير التفاعل المشترك بين نظم الخدمة والأصناف ومعاملات مقاومة الحشائش معنويا في التأثير علي الوزن الغض للحشائش وعدد السنابل/م٢ ووزن ال ١٠٠٠ حبة ومحصول الحبوب (اردب / ف). وخدمة الأرض باستخدام المحراث القلاب ثم الدوراني مع الزراعة بصنف سدس١ والرش بمبيدي (بروماينال + توبيك) كان فعال في إنقاص الوزن الغض للحشائش عريضة وضيقة الأوراق والحشائش الكلية وزيادة معنوية في محصول حبوب القمح حيث كان نقص وزن الحشائش الكلية بنسبة٩٨,٩% وزيادة في المحصول بنسبة ١١٣,٨% وذلك مقارنة بمعاملة المزارع وزراعة صنف بني سويف ٣ وبدون استخدام أي معاملة لمقاومة الحشائش بالرغم من زيادة التكاليف ولكن أعطت أعلي ربحية.

من هذه النتائج التي تم التوصل إليها في هذه الدراسة يمكن استخلاص أن اتباع أسلوب المكافحة المتكاملة للحشائش مثل معاملات خدمة الأرض قبل الزراعة وهي (المحراث القلاب + الدوراني أو المحراث الحفار ٣ سكة + الدوراني) ، الأصناف ذات القدرة العالية علي المنافسة مثل (صنف سدس١)، ومبيدات الحشائش المتخصصة في مكافحة الحشائش مثل (تراى بينيرون بمعدل ٦ جم مادة فعالة للفدان ، فينوكس برب بمعدل ٣٧,٥ جم مادة فعالة للفدان، ايزوبرتيرون بمعدل ٣٠٠ جم للفدان، بروموكسينيل بمعدل ٢٤٠ جم مادة فعالة للفدان + كلودينافوب) أو النقاوة اليدوية للحشائش متكاملة معا يمكن أن تؤدي إلي نقص معنوي في الحشائش وزيادة في محصول الحبوب لمحصول القمح عن استخدام أي من العوامل المذكورة منفردة.