EFFECT OF PRECEDING CROPS, SEED-BED PREPARATION AND WEED CONTROL METHODS ON WHEAT PRODUCTIVITY IN NEWLY RECLAIMED CALCAREOUS SOILS UNDER GUN IRRIGATION SYSTEM

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ABSTRACT

Two field experiments were conducted during 1999/2000 and 2000/2001at modern Abo-Zaid Farm in Sadat City, El-Monofia Governorate. A split-split plot design in strip form was used in 4 replications. This experiments aimed to study the effect of a) preceding crops; potato-fallow and wheat-fallow, on wheat productivity, b) different tillage systems, i.e. no tillage, sub tiller, disk harrow, chisel plough followed by rotary, disk plough and chisel plough, it gave depth 0, 30, 25, 25, 25, and 20 cm, respectively. c) weed control; unweeding, hand weeding and chemical treatment with Brominal (3,5-dibromo-4-hydroxy benzoitrile) at one liter/fed, under gun irrigation system in newly reclaimed calcareous soils.

The results indicated that soil after potato-fallow contain higher content of N, P, K and organic matter. However, pH and E.C. were lower comparing to the contents of wheat-fallow. Also grain yield/fed increased significantly after potato-fallow with average 15.18% and decreased significantly fresh weight of weeds with average 31.41% comparing to after wheat-fallow.

The chisel plough followed by rotary tiller proved to be the suitable tillage system of seed-bed preparation for wheat, it gave highest yield and lowest fresh weight of weeds with average 19.59 and 33.71%, respectively comparing to no tillage.

Chemical treatment with Brominal one liter/fed gave the highest grain yield and lowest fresh weight of weeds with average 17.6 and 47.28%, respectively comparing to unweeding treatments.

Finally the recommendations from this study to obtained high grain yield of wheat under the conditions of this calcareous soil as following:

1- Preferable the preceding crop is its high fertilizer requirement specially manure, and machinery harvesting, as the digger for tuber crops.
2- The chisel plough followed by rotary tiller proved to be suitable tillage system of seed-bed preparation for maximum grain yield of wheat planting with seed-drill with low power requirements.
3- For good weed control, the chemical treatment with one liter/fed Brominal gave good results than the other treatments.

INTRODUCTION

Wheat is the most important cereal crop in the world. It is the main winter cereal crop in Egypt. Recently, the new reclaimed soil are considered the main area for the agricultural extension. The total area which planted wheat in the newly reclaimed areas during 1994/1995 season was estimated about 224.664 fed. (Eman and Abowarda, 1998), some area contain considerable amount of calcium carbonate, the highest productivity and high profit in this type of soil might be governed and depends on seed environment created by preceding crop, previous tillage, planting methods and tillage equipments.

The effect of preceding summer crops (maize, cotton, soybean, cowpea and alfalfa) as well as fallow on some successive winter crops (berseem, field bean and lentil) were studied by Shafshak *et al.* (1984), they reported that yield and its components of winter crops were markedly affected by the preceding summer crops. El-Hawary *et al.* (1994 a) reported that the micro and macro-nutrients affected the preceding crops and consequently affected the yield and its components of the successive crops. Abdel-All *et al*. (1996) stated that preceding summer crops had significant effects on yield and its components of wheat grown after cotton were superior to those after rice, also Haikel *et al*. (1996) reported that faba bean preceded by cotton gave higher yield than preceded by maize with 5.95 %. Bassal (1997) found that cultivation of wheat after forage sorghum improved wheat productivity compared with grown after rice. Samira *et al*. (1998) reported that the highest values of maize yield obtained when preceding crop was legume comparing to cereal and fodder crops.

Concerning tillage systems, Cannell and Ellis (1978) found that the different cultivation methods have an effect on soil conditions and both plant root and growth. Korayem *et al.* (1985) reported that using the developed plough (conventional chisel plough + disking) instead of conventional method did not affect the crop yield. The success or the failure crop production system often depends on seed-bed preparation, Abo-Habaga *et al*. (1990) found that chisel plough following with rotary gave the lowest soil surface roughness and highest grain yield of wheat. Also, Selim and El-Sergany (1995) reported that conventional tillage system significantly increased maize grain yield /fed compared to no-tillage system. Also, El-Ansary and El-Mallah (1986), Abo-Habaga (1989) and Awad (1996) found that crop yield was affected by the system of seed-bed preparation. Sidiras and Kendristakis (1997) reported that disk plough produced a better root system than the rotary hoe-sowing systems and the correlation coefficient between the soil physical properties and the root system was higher. However, Principi and Mattana (1992) mentioned that the highest grain yield of corn were obtained with conventional tillage and sowing system, followed by integral min. tillage and the 3 systems of min. tillage using the 1-way plough (Soil previously tilled with 1-way plough, duck foot or chisel plough). Abdel-All *et al*. (1996) stated that the estimated characters of wheat were greater with performing tillage compared with no tillage. However, El-Douby *et al.* (1996) mentioned that no tillage treatment of faba bean significantly increased in both seasons plant height and number of branches per plant but insignificantly increased other growth characters. From the other side Gill *et al*. (2000) reported that moldboard tillage resulted greater grain yield of wheat than the conventional cultivar or sub-soiling with 18%.

Controlling the weeds is one of the most laborious expensive, chemical weed control become on essential practice in wheat cultivation, Abdel-All (1986) reported that using Brominal at rate of one liter/feddan as post-emergence herbicide (at 4-5 leaf stage) gave the highest grain yield and lowest fresh weight of broad-leaves weeds. High cost of labours for hand weeding and preparation of seed-bed must be consider to chose the good system gives higher yield with lower cost. El-Moursy (1989) found that hand

weeding and chemical weed control treatments decreased the fresh weight of weeds per unit area as compared to unweeded plots. Daniel and Stephen (1990) reported that tillage directly affect the seed bank by physical mixing of the soil. Tillage and herbicide applications indirectly affect the seed bank by reducing the number of seed-producing plants.

The objectives of this study are to investigate the effect of different preceding crops and tillage systems on yield of wheat crop and associated weeds in newly reclaimed calcareous soil under gun irrigation system.

MATERIALS AND METHODS

Two field experiments were conducted at modern Abo-Zaid Farm in Sadat city, El-Monofia Governorate, during the two successive years of 1999/2000 and 2000/2001 to study the effect of preceding crops, seed-bed preparation and weed control methods on wheat productivity in newly reclaimed calcareous soils under gun irrigation system. The soil type was sandy loam with medium content of calcium carbonate, the mechanical characteristics and chemical analysis of the soil after preceding crops (before sowing the wheat) listed in Tables (1&2). A split-split plot design in strip form in four replications was used. The main plots were devoted to preceding crops; 1- Wheat-fallow (60 m x 24 m = 1440 m^2) 2- Potato-fallow (60 m x 24 m = 1440 m^2), total area = 2880.0 m^2 = 0.685 fed. Sub-plots were assigned to 6 tillage systems (no tillage, sub tiller, disk harrow, chisel + rotary, disk plough and chisel plough) each sub-plot 6 m x 10.0 m = 60.0 m^2, whereas the weed control treatments arranged in sub-sub plots (2.0 m x 10.0 m = 20.0 m^2) i.e. unweeding, hand weeding and chemical treatment with Brominal (3,5-dibromo-4-hydroxy benzoitrile) one liter with 200 liter water / fed. Two meters between each sub-plot (tillage systems) was lifted to avoid any overlapping from the machinery used.

Wheat was planted after wheat-fallow and potato-fallow in 24th and 28th November in the first and second seasons respectively.

The phosphorus fertilizer was applied at rate of 31 kg P_2O_5 /fed in the form of calcium super phosphate (15.5% P_2O_5) before plowing. Potassium sulphate (48.0% K_2O) at rate of 24 kg K_2O /fed was added in two equal doses, before sowing and during the milky stage. The nitrogen fertilizer at rate of 100 kg N/fed was applied as; 20 kg N was added before sowing in the form of ammonium sulphate (20.6% N) and the rest amount of N (80 kg N) was added in form of ammonium nitrate (33.5% N), divided to four equal doses; at complete of emergence, tillering, elongation and when starting the heading stages. The gun irrigation system used in this work and the plants received irrigation water every 3 days with the rate of 40 m^3/fed. Season length 165 days = 165 days ÷ 3 days = 55 time x 40 m^3 = 2200 m^3/season (Eid *et al.,* 1996). Wheat variety Sakha 69 was sowing by seed-drill machine at rate of 70 kg seed/fed. The soil was prepared with different ploughing equipments with different depth (no tillage, sub tiller 30 cm depth, disk harrow 25 cm depth, chisel + rotary 25 cm depth, disk plough 25 cm depth and chisel plough 25 cm depth).

Soil analysis

Soil sample was taken from 0 to 30 cm depth after preceding crops. Soil texture was determined according to methods of Bouyoucos (1951). Soil pH and E.C (Ds/m) were determined in 1 : 2.5 soil / water extract (Jackson, 1973). Amount of calcium carbonate in soil was determined by Calcimeter (Black, 1965). Organic matter was determined according to methods of Walkley - Black method taken from Hesse (1971). Phosphorus in soil was extracted by sodium carbonate (Olsen *et al*., 1954). Potassium determined quantitatively by Flam photometer as described by Eppendorf and Hinz (1970). Mechanical and chemical analysis of the soil in the experimental site in both seasons presented in (Tables 1 and 2).

Table 1: Mechanical analysis of the soil in the experimental site in both seasons.

Preceding crops	Particle size distribution %			
	Course sand	Fine sand	Silt	Clay
After wheat-fallow:				
1999/2000	30.0	37.0	18.0	15.0
2000/2001	28.0	39.0	18.5	14.5
After potato-fallow:				
1999/2000	29.0	38.0	17.0	16.0
2000/2001	27.0	40.0	19.0	14.0

Table 2: Chemical analysis of the soil in the experimental site in both seasons.

Preceding crops	pH	E.C. Ds/m	$CaCo_3$%	O.M %	Available macro nutrients (ppm)		
					N	P	K
After wheat-fallow:							
1999/2000	8.4	4.0	20.3	0.67	20	9	95
2000/2001	8.3	4.2	22.2	0.69	22	11	97
After potato-fallow:							
1999/2000	8.2	3.6	19.6	0.92	33	13	170
2000/2001	8.1	3.7	18.3	0.98	35	16	183

*** Water analysis; E.C= 2.1 Ds/m = 1344 ppm.**

Wheat characters:

a) Growth and yield components

At maturity, samples of ten plants were randomly taken from each sub-sub plot to estimate the following characters:

- Plant height (cm)
- Spike length (cm)
- Spike weight (g)
- Number of grains / spike
- Grains weight / spike (g)
- 1000-grain weight (g)

b) Grain and straw yields /fed

Wheat plants in the two inner square meters of each sub-sub plot were harvested at maturity, tied and left to dry, then it was threshed. Grain and straw ratio were estimated in kg and calculated to ardab/fed and ton/fed in grain and straw yields, respectively.

Weeds:

Weeds of each sub-sub plot were collected from one square meter at four weeks before harvest and estimated the fresh weight of weeds (g/m^2)

The obtained data in this study were subjected to the statistical analysis according to Gomez and Gomez (1984).

RESULTS AND DISCUSSION

I. Soil fertility:

In general soil in experimental site is poor and have low available N, P and K as well as lowing organic matter. From the other side the soil has considerable content from calcium carbonate, this calcareous soil has hard surface specially when become dry, this important factor to select suitable tillage system and special water regime (Table 1).

Table (2) illustrated the chemical analysis of soils after wheat-fallow and potato-fallow in the two seasons. As seen from this table, soil have lower EC values after potato with average of 3.65 ds/m, while the average was 4.1 ds/m after wheat for the two seasons. Soil after wheat had lower available content of N, P, K and organic matter comparing to the soil after potato-fallow. This may be due to the high rate of manure fertilizer were added to potato field. Low organic matter in soil would considerably reduces the availability of most nutrients to plant (Mengel and Kirkby, 1982).

II. Growth, yield and its components:

Data obtained in Tables (3, 4 and 5) show the effect of preceding crops on growth, yield and yield components of wheat in both seasons. Preceding crop significantly affected plant height, spike weight, number of grains/spike, grains weight/spike, 1000-grain weight, grain yield, straw yield and weed fresh weight in both seasons, as well as spike length in the second season only. The values of these characters were higher when wheat was grown after potato-fallow than when grown after wheat-fallow.

In general these results revealed that the values of wheat characters grown after potato were superior to those after wheat. This may be due to that potato fields usually received higher amount of manure and mineral nitrogen than wheat fields (El-Hawary *et al*., 1994 b and Haikel *et al*., 2000).

Well preparation of the soil and suitable depth is very important to give higher yield, results presented in Tables (3, 4 and 5) also showed that using (chisel plough followed with rotary, 25 cm depth) was significantly increased all the studied wheat traits in both seasons, the increase of this traits due to the easy and the good distribution of the roots through the soil. Sidiras and Kendristakis (1997) found that the disk plough (twice) produced a better root system than the rotary sowing and found also the high positive correlation coefficient between the soil physical properties and the root system.

Table 3: Effect of preceding crop, tillage systems and weeding control methods on plant height, spike length and spike weight of wheat in 1999/2000 and 2000/2001 seasons.

Characters	Plant height (cm)		Spike length (cm)		Spike weight (g)	
Treatments	99/2000	2000/2001	99/2000	2000/2001	1999/2000	2000/2001
A : Preceding crops						
Wheat-fallow	94.28	93.70	8.65	8.66	3.40	3.42
Potato-fallow	99.00	99.80	8.61	8.74	3.59	3.62
F-test	**	**	NS	*	**	**
B : Tillage systems						
No tillage	85.40	85.06	6.24	6.46	3.26	3.24
Sub tiller	96.30	95.03	8.54	8.41	3.42	3.44
Disk harrow	105.31	104.64	10.09	10.25	3.60	3.64
Chisel Rotary	105.82	105.61	10.73	11.05	3.79	3.84
Disk plough	99.58	101.06	9.06	8.97	3.57	3.63
Chisel plough	88.65	88.97	7.10	7.06	3.31	3.33
F. Test	**	**	**	**	**	**
N-LSD (0.05)	1.60	1.11	0.27	0.19	0.08	0.07
(0.01)	2.13	1.48	0.36	0.25	0.11	0.09
C : Weeding control						
Unweeding	95.21	94.98	8.21	8.32	3.32	3.36
Manual	96.63	96.50	8.75	8.75	3.48	3.53
Chemical	98.69	98.72	8.93	9.03	3.68	3.68
F. Test	**	**	*	**	**	**
N-LSD (0.05)	0.85	1.20	0.13	0.11	0.02	0.05
(0.01)	1.24	1.75	---	0.15	0.02	0.07

Table 4: Effect of preceding crops, tillage systems and weeding control methods on no. of grains/spike, grains weight/spike (g) and 1000-grain weight (g) of wheat in 1999/2000 and 2000/2001 seasons.

Characters	No. of grains /spike		Grains weight /spike (g)		1000-grain weight (g)	
Treatments	99/2000	2000/2001	99/2000	2000/2001	1999/2000	2000/2001
A : Preceding crops						
Wheat-fallow	49.93	49.29	2.01	1.97	40.10	39.91
Potato-fallow	50.44	50.80	2.15	2.21	43.69	43.92
F-test	**	**	**	**	**	**
B : Tillage systems						
No tillage	47.59	47.14	1.76	1.72	39.79	39.57
Sub tiller	50.40	49.56	2.04	2.09	41.67	41.59
Disk harrow	51.09	50.63	2.26	2.29	43.12	42.96
Chisel Rotary	52.94	53.11	2.43	2.36	44.57	45.06
Disk plough	50.72	50.76	2.23	2.24	41.91	41.95
Chisel plough	48.38	49.07	1.88	1.84	41.60	40.38
F. Test	**	**	**	**	*	**
N-LSD (0.05)	0.56	0.56	0.07	0.07	0.37	0.37
(0.01)	0.75	0.74	0.09	0.10	0.50	0.50
C : Weeding control						
Unweeding	48.77	48.85	2.05	1.93	41.27	41.34
Manual	50.37	50.26	2.08	2.09	41.99	41.90
Chemical	51.42	51.03	2.12	2.25	42.43	42.50
F. Test	**	**	**	**	**	**
N-LSD (0.05)	0.32	0.26	0.03	0.03	0.11	0.14
(0.01)	0.46	0.37	0.04	0.04	0.16	0.21

Table 5: Effect of preceding crops, tillage systems and weeding control methods on grain yield (ardab/fed), straw yield (ton/fed) and weeds fresh weight (g/m^2) of wheat in 1999/2000 and 2000/2001 seasons.

Characters	Grain yield (ardab/fed)		Straw yield (ton/fed)		Weeds fresh weight (g/m^2)	
Treatments	99/2000	2000/2001	99/2000	2000/2001	1999/2000	2000/2001
A : Preceding crops						
Wheat-fallow	7.54	7.68	2.68	2.67	35.82	37.93
Potato-fallow	8.68	8.85	2.87	3.12	25.76	24.94
F-test	**	**	**	**	**	**
B : Tillage systems						
No tillage	7.43	7.79	2.31	2.32	37.07	36.04
Sub tiller	7.98	7.92	2.52	2.58	32.62	35.14
Disk harrow	8.53	8.48	3.00	2.97	26.75	29.01
Chisel Rotary	9.09	9.20	3.51	3.49	24.46	23.81
Disk plough	8.26	8.37	2.65	2.72	29.79	30.26
Chisel plough	7.60	7.87	2.56	2.56	33.99	34.36
F. Test	**	**	**	**	**	**
N-LSD (0.05)	0.13	0.13	0.07	0.12	1.31	2.51
(0.01)	0.17	0.17	0.10	0.17	1.75	3.35
C : Weeding control						
Unweeding	7.48	7.62	2.57	2.58	43.81	43.80
Manual	8.04	8.19	2.76	2.79	24.33	26.63
Chemical	8.80	9.00	2.92	2.93	26.63	23.88
F. Test	**	**	**	**	**	**
N-LSD (0.05)	0.09	0.09	0.04	0.02	1.49	3.04
(0.01)	0.13	0.13	0.05	0.04	2.16	4.42

From the same Tables, data showed that the highest yield obtained from treatment which gave soil surface with less roughness and suitable depth to grow root of the plant, this was realize from (chisel plough followed with rotary). The same results obtained exactly when Abo-Habaga *et al.* (1990) studied the effect of 7 ploughing systems on crop production, they found that chisel plough followed with rotary tiller proved to be suitable tillage system of seed-bed preparation for wheat to give higher yield among the other ploughing systems.

From the other side, Korayem *et al.* (1985) found that using the developed plough (conventional chisel plough+disking) instead of conventional method did not affect the crop yield however, El-Ansary and El-Mallah (1986), Abo-Habaga (1989) and Awad (1996) found that the crop yield was affected by the system of seed-bed preparation.

III. Weed control:

Weed control is the major factor limiting adoption of both conservation tillage and solid seeding. Combining these two production practices complicates weed management because is difficult (Douglas and Oblinger, 1990).

The dominance annual weeds (broad leaves) in the experimental site in the two seasons were *Medicago polymorpha, Sonchus oleraceas* L and *Chomomilla recutita* L.

Data in Table (5) showed significant differences between all tested factors on weed growth. Data in this table indicated that the plots which preceding crop was potato-fallow gave lower weed fresh weight than that which the preceding crop was wheat-fallow, this may be due to potato

harvester remove most or all the weeds from the soil and mixed it with the soil. Daniel and Stephen (1990) mentioned that tillage directly affects the seed bank by physical mixing of the soil. Tillage and herbicide applications indirectly affect the seed bank by reducing the number of seed-producing plants. Generally cultivation reduced seed bank densities of most species compared to uncultivated plots. Recent ecological and economical research is showing that small amounts of mechanical cultivation will allow greatly reduced herbicide application (Richard, 1994).

Data in Table (5) showed that (chisel plough followed with rotary) gave lower fresh weight of weeds, this results may be due to the tillage directly effects the seed bank by physical mixing of the soil, this results were reported by Daniel and Stephen (1990). Also, the chemical weeding treatment gave lower fresh weight followed by hand weed control. Abdel-All (1986) reported that the lowest fresh weight was recorded with chemical weeding treatments followed with the hand treatments in wheat farm. Whereas, when used chisel plough or no tillage as well as unweeding gave higher fresh weight of weeds in following wheat crop.

IV. Interaction:

Table (6), shows that differences between the highest and lowest values of the characters significantly affected by the interaction between preceding crops and tillage systems which had significant effects, on plant height, Spike length, grains weight/spike, 1000-grain weight, grain yield, straw yield and weed-fresh weight in both seasons. Grain yield was increased after potato and tillage the soil by chisel plough followed with rotary with 2.83 and 2.62 ard/fed in the first and second seasons, respectively comparing to no tillage after wheat-fallow. This due to the soil after potato is rich in organic and mineral elements and less roughness (Abo-Habaga *et al*., 1990).

Data presented in Table (7) shows the interaction between preceding crops and weed control treatments which had significant effect on plant height, spike weight, grains weight /spike, 1000-grain weight, grain yield, straw yield and weed fresh weight in both seasons, while the other characters not significantly affected. Grain yield was increased after potato and chemical weed control with 2.53 and 2.55 ard/fed in the first and second seasons, respectively comparing to after wheat and un-weeding treatments. This due to tillage, harvesting potato and herbicide application reduce seed bank by reducing the number of seeds, producing plants which competitive wheat plants (Daniel and Stephen, 1990).

Data in Table (8) shows the interaction between tillage systems and weeding control treatments which had significantly effect on plant height, number of grains/spike, spike weight, grains weight /spike, 1000-grain weight, grain yield, straw yield and weed fresh weight in both seasons. Grain yield was increased with 3.06 and 4.52 ard/fed in the first and second seasons, respectively when using chisel plough followed by rotary and chemical weed control treatments but lowest fresh weight of weeds came from chisel plough followed by rotary and hand weeding. This due to Brominal as a herbicide was release quickly in sandy soil and gave chance for weeds to grow again nearly from the end of season.

Table (7): Number of grains / spike as affected by the interaction between preceding crops and weeding control in 1999/2000 and 2000/2001 seasons.

Characters	Seasons	1999/2000				2000/2001			
		Weed control				Weed control			
	Preceding crops	Un-weeding	Hand weeding	Brominal	N-LSD at 5% at 1%	Un-weeding	Hand weeding	Brominal	N-LSD at 5% at 1%
Plant height (cm)	Wheat	92.83	94.22	94.22	**95.79**	92.54	93.44	95.12	**1.20**
	Potato	97.59	99.04	99.04	**101.6**	97.41	99.56	102.3	**1.45**
Spike weight (g)	Wheat	3.25	3.39	3.39	**3.55**	3.29	3.43	3.56	**0.07**
	Potato	3.38	3.57	3.57	**3.81**	3.43	3.62	3.80	**0.10**
Grains weight /spike (g)	Wheat	1.83	2.05	2.65	**2.19**	1.80	1.97	2.14	**0.41**
	Potato	2.03	2.15	2.15	**2.28**	2.06	2.21	2.35	**0.59**
1000-grain weight (g)	Wheat	39.62	40.24	40.24	**40.44**	39.38	39.92	40.44	**0.20**
	Potato	42.92	43.74	43.74	**44.41**	43.30	43.89	44.56	**0.29**
Grain yield ardab/fed	Wheat	6.91	7.54	7.54	**8.16**	7.17	7.62	8.28	**0.16**
	Potato	8.05	8.55	8.55	**9.44**	8.07	8.77	9.72	**0.23**
Straw yield (ton/fed)	Wheat	2.46	2.71	2.71	**2.88**	2.43	2.71	2.86	**0.35**
	Potato	2.67	2.81	2.81	**2.97**	2.73	2.87	3.01	**0.51**
Weeds fresh weight (g/m^2)	Wheat	54.48	24.22	24.22	**28.75**	55.94	27.71	30.13	**4.29**
	Potato	33.14	20.38	20.38	**23.34**	31.66	20.04	23.13	**6.01**

Tables 9, 10 and 11 show number of grains/spike, grain weight/spike and 1000-grain weight, respectively as affected by the interaction among preceding crops, tillage systems and weed control in both seasons. These characters behaved the same trend, the highest values were after potato and tillage the soil with chisel plough followed with rotary and chemical weed control. This is due to the soil after potato become rich in organic matter and mineral elements and the calcareous surface layer of the soil was crushed during harvesting potato, good preparation of the seed-bed produce a better root system and chemical weed control prevent the weeds from competition of wheat plant special in first stages.

Tables 12 and 13 show grain yield (ard/fed) and straw yield (ton/fed) as affected by the interaction among preceding crops, tillage systems and weed control in both season. Both of the characters behaved the same trend. The highest grain yield (10.93 ard/fed) and straw yield (3.83 ton/fed) were obtained from planting after potato, tillage with chisel plough followed by rotary and used chemical weed control with Brominal (1.0 L/fed), comparing to the lowest grain yield (6.33 ard/fed) and straw yield (2.10 ton/fed) after wheat-fallow, no tillage and un-weeding.

From the other side Table (14) shows that the lowest fresh weight of weeds (15.43 g/m^2) as affected by the interaction among preceding crops, tillage systems and weed control treatments was obtained after potato and soil was tillage by chisel plough followed with rotary and hand weeding.

Table (9): Number of grains /spike as affected by the interaction among preceding crops, tillage systems and weeding control in 1999/2000 and 2000/2001 seasons.

Preceding crops	Tillage systems	1999/2000			2000/2001		
		Weed control			Weed control		
		Un-weeding	Hand weeding	Brominal	Un-weeding	Hand weeding	Brominal
Wheat-fallow	No tillage	44.73	48.33	49.57	44.63	46.47	46.90
	Sub tiller	48.23	50.53	51.70	47.13	48.13	49.07
	Disk harrow	49.17	51.33	52.00	48.37	50.33	51.47
	Chisel + Rotary	51.40	53.27	53.77	51.57	54.07	53.90
	Disk plough	48.97	50.77	50.97	48.90	50.80	51.13
	Chisel plough	46.97	47.10	49.97	46.30	48.43	49.57
Potato-fallow	No tillage	45.03	47.93	49.93	46.77	47.97	50.10
	Sub tiller	50.10	50.77	51.07	50.80	51.00	51.23
	Disk harrow	50.87	51.33	51.81	50.77	51.10	51.73
	Chisel + Rotary	52.57	52.97	53.70	52.77	53.00	53.57
	Disk plough	50.57	51.20	51.87	50.63	51.33	51.77
	Chisel plough	46.67	48.99	50.63	47.73	50.43	51.93
N-LSD at 5%		0.94			0.75		
N-LSD at 1%		1.34			0.99		

Table (10): Grain weight /spike (g) as affected by the interaction among preceding crops, tillage systems and weeding control in 1999/2000 and 2000/2001 seasons.

Preceding crops	Tillage systems	1999/2000			2000/2001		
		Weed control			Weed control		
		Un-weeding	Hand weeding	Brominal	Un-weeding	Hand weeding	Brominal
Wheat-fallow	No tillage	1.53	1.77	1.87	1.50	1.67	1.77
	Sub tiller	1.87	1.87	2.07	1.80	1.93	2.20
	Disk harrow	1.97	2.20	2.33	1.87	1.33	2.30
	Chisel + Rotary	2.03	3.37	2.50	2.00	2.23	2.33
	Disk plough	1.87	2.03	2.30	1.93	2.13	2.33
	Chisel plough	1.73	1.87	2.10	1.70	1.73	1.93
Potato-fallow	No tillage	1.63	1.78	1.97	1.67	1.77	1.93
	Sub tiller	2.03	2.13	2.27	2.03	2.20	2.37
	Disk harrow	2.30	2.37	2.40	2.40	2.50	2.53
	Chisel + Rotary	2.40	2.50	2.67	2.40	2.53	2.67
	Disk plough	2.13	2.27	2.37	2.13	2.37	2.53
	Chisel plough	1.67	1.87	2.03	1.73	1.87	2.07
N-LSD at 5%		0.10			0.12		
N-LSD at 1%		0.13			0.16		

Table (11): 1000-grain weight (g) as affected by the interaction among preceding crops, tillage systems and weeding control in 1999/2000 and 2000/2001 seasons.

Preceding crops	Tillage systems	1999/2000			2000/2001		
		Weed control			Weed control		
		Un-weeding	Hand weeding	Brominal	Un-weeding	Hand weeding	Brominal
Wheat-fallow	No tillage	38.67	39.83	39.97	38.23	39.00	39.53
	Sub tiller	39.53	40.53	40.40	39.40	40.03	40.47
	Disk harrow	40.07	40.53	41.07	40.00	40.67	41.17
	Chisel + Rotary	40.37	40.60	40.47	40.10	40.50	41.07
	Disk plough	40.07	40.27	40.00	39.93	40.10	40.50
	Chisel plough	39.30	39.70	40.00	38.63	39.23	39.87
Potato-fallow	No tillage	39.73	40.20	40.37	40.03	40.20	40.40
	Sub tiller	42.73	43.00	43.80	42.80	43.07	43.77
	Disk harrow	44.70	45.87	46.47	44.80	45.17	45.97
	Chisel + Rotary	47.37	48.77	49.53	48.93	49.57	50.17
	Disk plough	42.70	43.40	44.50	43.07	43.67	44.47
	Chisel plough	40.30	41.23	41.80	40.17	41.63	42.57
N-LSD at 5%		0.40			0.39		
N-LSD at 1%		0.53			0.51		

Table (12): Grain yield (ardab/fed) as affected by the interaction among preceding crops, tillage systems and weeding control in 1999/2000 and 2000/2001 seasons.

Preceding crops	Tillage systems	1999/2000			2000/2001		
		Weed control			Weed control		
		Un-weeding	Hand weeding	Brominal	Un-weeding	Hand weeding	Brominal
Wheat-fallow	No tillage	6.33	6.73	7.43	6.50	6.99	7.57
	Sub tiller	6.70	7.03	7.67	6.80	7.97	7.97
	Disk harrow	7.20	7.40	8.80	7.30	7.53	8.63
	Chisel + Rotary	8.07	8.43	9.03	8.03	8.40	9.53
	Disk plough	7.07	8.20	8.67	7.40	8.13	8.50
	Chisel plough	6.60	7.00	7.33	7.00	7.17	7.47
Potato-fallow	No tillage	7.50	7.80	8.77	7.40	8.50	9.10
	Sub tiller	7.87	8.27	9.00	8.00	8.57	9.40
	Disk harrow	8.57	9.20	10.00	8.40	8.03	9.97
	Chisel + Rotary	8.63	9.43	10.93	8.53	9.30	11.40
	Disk plough	8.00	8.40	9.20	8.13	8.67	9.37
	Chisel plough	7.70	8.20	8.73	7.93	8.57	9.07
N-LSD at 5%		0.25			0.29		
N-LSD at 1%		0.34			0.38		

Table (13): Straw yield (ton/fed) as affected by the interaction among preceding crops, tillage systems and weeding control in 1999/2000 and 2000/2001 seasons.

Preceding crops	Tillage systems	1999/2000			2000/2001		
		Weed control			Weed control		
		Un-weeding	Hand weeding	Brominal	Un-weeding	Hand weeding	Brominal
Wheat-fallow	No tillage	2.10	2.23	2.37	2.00	2.13	2.23
	Sub tiller	2.27	2.57	2.73	2.00	2.60	2.77
	Disk harrow	2.70	2.93	3.07	2.73	2.93	3.10
	Chisel + Rotary	3.10	3.47	3.67	3.10	3.50	3.70
	Disk plough	2.40	2.67	2.87	2.40	2.70	2.80
	Chisel plough	2.20	2.40	2.57	2.13	2.37	2.53
Potato-fallow	No tillage	2.27	2.37	2.47	2.40	2.53	2.63
	Sub tiller	2.37	2.53	2.67	2.50	2.63	2.80
	Disk harrow	2.93	3.10	3.27	2.87	3.03	3.17
	Chisel + Rotary	3.27	3.47	3.83	3.30	3.53	3.80
	Disk plough	2.53	2.63	2.80	2.70	2.80	2.93
	Chisel plough	2.67	2.73	2.77	2.63	2.70	2.73
N-LSD at 5%		0.03			0.12		
N-LSD at 1%		0.17			0.16		

Table (14): Weeds fresh weight (g/m^2) as affected by the interaction among preceding crops, tillage systems and weeding control in 1999/2000 and 2000/2001 seasons.

Preceding crops	Tillage systems	1999/2000			2000/2001		
		Weed control			Weed control		
		Un-weeding	Hand weeding	Brominal	Un-weeding	Hand weeding	Brominal
Wheat-fallow	No tillage	70.40	25.73	34.07	70.80	28.03	34.90
	Sub tiller	57.00	25.93	31.40	58.80	42.73	30.63
	Disk harrow	48.37	19.51	22.67	51.53	22.60	26.97
	Chisel + Rotary	38.43	19.67	22.87	38.47	18.27	23.30
	Disk plough	51.87	25.73	28.40	53.50	26.13	29.50
	Chisel plough	60.83	28.70	33.10	62.53	28.47	35.50
Potato-fallow	No tillage	40.07	24.87	27.77	38.43	20.90	23.17
	Sub tiller	34.80	22.03	24.53	33.03	22.07	23.57
	Disk harrow	28.43	19.43	22.07	27.63	20.70	24.60
	Chisel + Rotary	28.07	15.43	19.30	28.33	16.37	18.10
	Disk plough	30.87	19.63	22.43	28.57	19.27	24.60
	Chisel plough	36.60	20.87	23.83	33.93	20.97	24.73
N-LSD at 5%		1.54			2.02		
N-LSD at 1%		2.03			2.67		

This due to the weeds under hand control many time during the season and remove it directly but Brominal was analyzed quickly in sandy soil and weeds may be grown again from the seed in the sub-surface soil.

It could be recommend that the chisel plough followed by rotary resulted less roughness and fine soil surface with lower fresh weight of weeds and higher grain yield which obtained from potato as a preceding crop and use Brominal as a chemical weed control with rate of one liter per feddan.

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تأثير المحصول السابق وإعداد مرقد البذرة وطرق مقاومة الحشائش على انتاجية القمح فى الأراضى الجيرية حديثة الإستصلاح تحت نظام الرى المدفعى

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أقيمت تجربتان حقليتان خلال عامى 2000/1999 و 2001/2000 بمزرعة أبو زيد الحديثة بمدينة السادات محافظة المنوفية وقد تم استخدام تصميم القطع المنشقة مرتين فى شكل شرائح فى أربع مكررات وتهدف هذه الدراسة إلى:

أ) تأثير المحصول السابق:ـ بطاطس ثم بور و قمح ثم بور على انتاجية محصول القمح .

ب) استجابة محصول القمح لنظم مختلفة لخدمة التربة بمعدات مختلفة وهى: بدون خدمة ، المحراث الحفار العميق ، المحراث متعدد الأقراص ، المحراث الحفار يعقبه عزاقة دورانية ، المحراث القرصى ، المحراث الحفار العادى وكان عمق الخدمة هو صفر ، 30 ، 25 ، 25 ، 25 و 20 سم على الترتيب.

جـ) تأثير مقاومة الحشائش : بدون مقاومة ، مقاومة يدوية ومقاومة كيمائية باستخدام مبيد البرومينال بمعدل واحد لتر للفدان ، وذلك تحت نظام الرى المدفعى فى الأراضى الجيرية.

وقد أوضحت النتائج الآتى:

ـ بعد محصول البطاطس ثم بور احتوت التربة على نسبة أعلى من النيتروجين والفوسفور والبوتاسيوم ، والمادة العضوية وانخفاض نسبى فى الأملاح الكلية بالتربة والـ pH على عكس ما كان بعد محصول القمح ثم بور وقد ارتفع محصول الحبوب وانخفض وزن الحشائش معنويا بنسبة 15.18 و 31.41% على التوالى بعد محصول البطاطس ثم بور عما هو بعد محصول القمح ثم بور.

ـ كما وجد أن استخدام المحراث الحفار يعقبه العزاقة الدورانية كان أفضل نظم الخدمة وأعطى زيادة فى محصول الحبوب وأقل وزن من الحشائش بمعدل 19.95 % و 33.71 % على التوالى بالمقارنة بدون خدمة.

ـ كما أدت المقاومة الكيماوية للحشائش باستخدام البرومينتال بتركيز واحد لتر للفدان إلى زيادة محصول الحبوب وانخفاض وزن الحشائش مقارنة بعدم المقاومة بمعدل 17.66 و 47.28% على التوالى.

لذلك توصى هذا الدراسة أنه للحصول على أعلى محصول من الحبوب لمحصول القمح فى مثل هذا النوع من الأراضى الجيرية بالآتى:ـ

1ـ يفضل أن يكون المحصول السابق من المحاصيل التى احتياجاتها السمادية عالية خاصة المادة العضوية وأن يكون حصادها بالآلات التى تعمل على تقليب التربة كالمحاصيل الدرنية.

2ـ لتجهيز مرقد بذرة جيد قليل القلاقيل لزراعة القمح بالسطارة فى الأراضى الجيرية يفضل استخدام المحراث الحفار ثم يتبعه العزاقة الدورانية وكلاهما تحتاج إلى قوة جر متناسبة مع معظم إن لم يكن كل الجرارات المنتشرة فى المزارع المصرية.

3ـ مقاومة الحشائش المصاحبة لمحصول القمح باستخدام المقاومة الكيماوية بالرش بمبيد الحشائش البرومينال بمعدل واحد لتر للفدان.

Table (6): The interaction between preceding crops and tillage systems in 1999/2000 and 2000/2001 seasons.

Seasons		1999/2000							2000/2001						
		Tillage systems							Tillage systems						
Preceding crops / Characters		1	2	3	4	5	6	N-LSD at 5% at 1%	1	2	3	4	5	6	N-LSD at 5% at 1%
Plant height (cm)	Wheat	77.52	95.08	104.1	105.5	99.98	83.47	**1.72**	76.87	92.54	102.9	105.1	100.4	84.44	**1.57**
	Potato	93.28	97.52	106.3	106.3	99.18	93.83	**2.30**	93.26	97.52	106.4	106.1	101.7	93.50	**2.10**
Spike weight (g)	Wheat	3.16	3.30	3.44	3.69	3.61	3.29	**0.11**	3.18	3.38	3.44	3.74	3.54	3.27	**0.09**
	Potato	3.35	3.55	3.76	3.96	3.63	3.33	**0.15**	3.30	3.51	3.84	3.93	3.72	3.40	**0.13**
Grains weight /spike (g)	Wheat	1.72	1.93	2.77	2.30	2.07	1.90	**0.09**	1.64	1.98	2.10	2.19	2.13	1.79	**0.11**
	Potato	1.79	2.14	2.36	2.52	2.39	1.86	**0.12**	1.78	2.20	2.48	2.53	2.34	1.89	**0.14**
1000-grain weight (g)	Wheat	39.49	40.16	40.56	40.58	40.27	39.67	**0.55**	38.92	39.96	40.61	40.57	40.17	39.24	**0.23**
	Potato	40.10	43.18	45.68	48.56	43.56	43.53	**0.43**	40.21	43.21	45.31	49.56	43.74	41.52	**0.70**
Grain yield ardab/fed	Wheat	6.83	7.13	7.80	8.51	7.98	6.98	**0.18**	7.12	7.32	7.82	8.66	8.01	7.21	**0.23**
	Potato	8.02	8.83	9.26	9.66	8.53	8.21	**0.24**	8.46	8.53	9.13	9.74	8.72	8.52	**0.30**
Straw yield (ton/fed)	Wheat	2.27	2.52	2.96	3.41	2.64	2.39	**0.10**	2.12	2.51	2.92	3.43	2.63	2.43	**0.18**
	Potato	2.37	2.52	3.10	3.62	2.66	2.72	**0.13**	2.52	2.64	3.02	3.54	2.81	2.69	**0.23**
Weeds fresh weight (g/m^2)	Wheat	43.40	38.11	30.16	26.99	35.33	40.88	**1.85**	44.58	44.06	33.70	26.68	36.38	42.17	**3.55**
	Potato	30.90	27.12	23.31	21.93	24.25	27.10	**2.47**	27.50	26.22	24.31	20.93	24.14	26.54	**4.74**

1= No tillage, 2= Sub tiller, 3= Disk harrow, 4= Chisel + Rotary, 5= Disk plough and 6= Chisel plough.

Table (8): The interaction between tillage systems and weeding control in 1999/2000 and 2000/2001 seasons.

Seasons		1999/2000							2000/2001						
Characters	Weed control	Tillage systems							Tillage systems						
		1	2	3	4	5	6	N-LSD at 5% at 1%	1	2	3	4	5	6	N-LSD at 5% at 1%
Plant height (cm)	Un-weeding	84.09	93.68	103.3	104.3	98.32	86.60	**1.11**	83.62	91.55	102.8	101.2	99.75	92.95	**1.42**
	Hand weeding	85.25	96.01	105.3	105.5	99.04	88.60	**1.43**	84.73	95.82	104.7	105.5	101.1	87.85	**1.89**
	Brominal	86.87	98.19	107.3	107.7	101.4	90.73		86.84	96.52	106.4	107.2	102.3	91.02	
No. of grains /spike	Un-weeding	44.88	49.16	50.02	51.91	49.77	46.85	**0.66**	45.67	48.96	49.57	52.17	49.77	47.02	**0.53**
	Hand weeding	48.18	50.65	51.33	53.09	50.99	48.04	**0.88**	47.22	49.57	50.72	53.54	51.07	49.43	**0.70**
	Brominal	49.75	51.39	51.90	53.74	51.42	50.30		48.50	50.15	51.35	53.74	51.45	50.75	
Grains weight /spike (g)	Un-weeding	1.58	1.95	2.14	2.22	1.15	1.71	**0.07**	1.57	1.92	2.14	2.20	2.03	1.71	**0.07**
	Hand weeding	1.78	2.00	2.28	2.64	2.15	1.95	**0.09**	1.72	1.93	2.06	2.26	2.23	2.00	**0.10**
	Brominal	1.92	2.17	2.87	2.89	2.34	2.07		1.86	2.29	2.42	2.47	2.42	2.01	
1000-grain weight (g)	Un-weeding	39.20	40.88	42.38	43.87	41.38	39.80	**0.28**	39.13	41.10	42.40	44.52	41.48	39.40	**0.27**
	Hand weeding	40.02	41.77	43.20	44.69	41.84	40.46	**0.37**	39.60	41.55	42.92	45.04	41.88	40.43	**0.36**
	Brominal	40.15	42.10	43.77	45.00	42.25	40.90		39.96	42.12	43.57	45.62	42.49	41.22	
Grain yield ardab/fed	Un-weeding	6.92	7.29	7.89	8.35	7.54	7.15	**0.18**	6.95	7.40	7.65	8.28	7.76	7.46	**0.20**
	Hand weeding	7.21	7.15	8.30	8.93	8.30	7.60	**0.24**	7.75	8.54	8.28	8.85	8.40	7.87	**0.27**
	Brominal	8.11	8.34	9.40	9.98	9.93	8.03		8.34	8.69	9.30	11.47	8.94	8.27	
Straw yield (ton/fed)	Un-weeded	2.18	2.32	2.82	3.19	2.46	2.43	**0.09**	2.20	2.25	2.80	3.20	2.55	2.39	**0.09**
	Hand weeding	2.30	2.55	3.06	3.47	2.65	2.56	**0.12**	2.33	2.62	2.98	3.52	2.82	2.51	**0.16**
	Brominal	2.44	2.70	3.17	3.75	2.84	2.64		2.34	2.79	2.14	3.75	2.87	2.63	
Weeds fresh weight (g/m^2)	Un-weeded	55.54	45.96	38.40	33.36	41.37	48.72	**2.42**	54.62	45.92	39.58	33.40	41.30	48.23	**5.70**
	Hand weeding	25.30	23.98	20.77	20.57	22.68	24.78	**3.20**	24.47	32.40	21.65	17.72	22.70	24.72	**7.55**
	Brominal	30.92	27.96	22.37	21.08	25.42	28.46		29.04	27.10	25.74	20.70	27.05	30.12	

1= No tillage, 2= Sub tiller, 3= Disk harrow, 4= Chisel + Rotary, 5= Disk plough and 6= Chisel plough.