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NON CHEMICAL CONTROL OF WEEDS ACCOMPANIED WHEAT UNDER SALINE SOIL CONDITIONS

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ABSTRACT

Two field experiment were conducted in Tegzerte, Siwa Research Station; Desert Research Center during winter seasons of 2003 and 2004 to study the effect of phosphorus fertilization levels (0, 15.5, 31.0 and 46.5 kg/fed.), nitrogen fertilization levels (0, 80.0, 100.0 and 120.0 kg/fed.) and wheat grain rates (70.0, 80.0 and 90.0 kg/fed.) on weed control and relationship to wheat production. The experimental design was a split split-plot design with four replicates in both seasons, where the phosphorus fertilization treatments occupied the main plots, nitrogen fertilization treatments were arranged in the sup main plots and grain rates treatments in the sub-sub main ones, respectively. Weeds interference treatments were broad leaf weeds, grassy weeds and total annual weed.

Results showed that increasing phosphorus and nitrogen fertilization levels and wheat grain rates led to decrease significantly broad leaf weeds (*Chenopodium album, Malva parviflora, Cichorium pumpilum, Beta vulgaris, Convolvulus arvensis, Melilotus indicus* and *Medicago polymorpha*), grassy weeds (*Zygophyllum album, Phragmites australis, Setaria viridis* and *Echinochloa colonum*), while wheat biological, grain and straw yield were increased significantly as a results of applied the treatments.

Higher observation of biological, grain and straw yield were taken from the interaction between the three main factors, especially with (31.0 p kg./fed. & 100.0 N kg./fed. and 90.0 kg. wheat grains /fed.), which led to 6.0, 2.4 and 3.6 ton. /fed., respectively compared to other treatments

Keywords: phosphorus, nitrogen, fertilization, wheat grain rates, annual weeds, wheat.

INTRODCUTION

Wheat (*Triticum aestivum*) is the main human daily meal source of carbohydrates. In Egypt wheat is the most important cereals crop in terms of area and production. It provides the Egyptians with almost 35% of the total food calories. (El-Gizawy, 2005). Among all the promises areas available for the agricultural extension in Egypt, The Northern Western Coast may be ranked the first including Siwa Oasis in the southern part. Siwa oasis is considered one of those virgin environments in Egypt, which should be safe from any pollutant. So agriculture in this sector, especially Siwa prevent the use of pesticides for crops are clean, safe and fit for export.

Weeds are a major constraint that affected wheat yield. Wheat yield may be reduced significantly when weeds compete with wheat plants for light, water, and minerals. Weeds may also inhibit wheat growth through release of allelopathic chemicals that are toxic to wheat plants. Weeds or weed seeds contaminating harvested grain may reduce quality. In addition, weeds may interfere with harvesting or raise the moisture content of the harvested grain, leading to damage from heat and pests in storage Hassanein *et al*., (2005) reported that removal of all annual weeds significantly increased wheat grain yield. The losses due to weeds/wheat competition for all season ranged between 19.8 – 89.4% compared to weed free for all season due to various densities and species of weeds. The best grain yield was obtained by removal of weeds for all season. So, using integrated pest management systems (IPM) may have the potential to reduce herbicide use and may provide more robust weed management over the long term (Swanton and Weise, 1991)

Herbicides are major input costs in many cropping systems worldwide. Farmers are cognizant of these costs and thus are interested in alternative approaches to managing weeds. Integrated weed management systems have the potential to reduce herbicide use (and associated costs) and to provide more robust weed management over the long term (Swanton and Weise, 1991). Managing for increased competitive ability of crops with weeds is an important means of achieving improved weed management programs (Liebman *et al.*, 2001). Manipulation of crops fertilization is a promising agronomic practice in reducing weed interference in crops (Diatomic, 1995).

Nitrogen (N) is the major nutrient added to increase crop yield (Raun and Johnson, 1999 and Camara *et al.*, 2003). But it is not always recognized that altered soil N levels can affect crop-weed competitive interactions. Nitrogen fertilizer, as well as fresh and composted manure, can affect weed germination and establishment (Egley and Duke, 1985; Menalled *et al.*, 2002). Wild oat was slightly more competitive than wheat in terms of soil N uptake at all N fertilizer rates (Robert E. Blackshaw and Randall N. Brandt, 2008).

When N levels are increased up to optimum levels, crop vigor and grain yield increase (Johnson *et al.*, 1973). Exceeding this optimum level can result in excessive vegetation instead of higher grain yields. Components that can affect efficiency of N utilization by wheat are time of application, leaching of nitrate from the root zone, denitrification, volatilization and runoff (Clapp,1973&
Spratt, 1974). Crops grown in competition with weeds can be adversely affected through alteration of light intensity or loss of nutrients and water to unwanted plants (Buchanan and McLaughlin, 1975; Sexsmith and Pittman, 1963).

Research results on the effect of soil fertility on germination and growth of weed species has been variable (Banks et al., 1976; Fawoett *et al.*, 1978; Henson and Jordan, 1982 and Wells, 1979). Researchers in Europe (Roberts, 1968) observed that the number of viable weed seeds in soil did not change when N, P and K were applied in all possible combinations. Other researchers (Fawcett et al., 1978; Sexsmith and Pittman, 1963) reported that the rate and time fertilizer application, N in particular, influenced the number of germinating weed seeds in the soil. More weed seedlings were present when high rates of N were applied.

Phosphorus (P) is the second major nutrient that produces significant increment in wheat growth and productivity if added in appreciated dosages as a fertilizer. It is very important for most of the physiological processes of plant growth and metabolism. Applying phosphorus at the perfect time and quantity increased significantly wheat growth including wheat grain per plant(Sij *et al.*, 2006 and Sasha *et al.*, 2007). Application of increasing levels of phosphorus up to 60 kg P_2O_5 ha^{-1} significantly increased the grain and straw yields of wheat during both the years (Navin K. Jain; Anil K. Dahama, 2006).

Cultural management techniques, such as reduced crop row spacing, can increase a crop's ability to compete with weeds for incoming sunlight. Changes in raw spacing and plant population alter the spacing of plants between and within rows, which can influence crop yield. Seedlings grown in close proximity to each other express phytochrome-mediated responses by developing narrow leaves, long stems, and less massive roots (Kasperbauer and Karlen, 1994). Reduced row spacing's are thought to increase weed control by increasing the competitiveness of a crop with weeds and by reducing light transmittance to the soil surface (Tharp and Kells, 2001). Teasdale (1995) showed that reduced row spacing and increased corn populations decreased weed growth in the absence of herbicides and shortened the time of canopy closure by 1 week.

This study aimed to evaluate using nitrogen and phosphorus fertilization besides elevated grain rates as integrated weed management system elements in order to reduce weeds and increase wheat growth and productivity under Siwa Oasis conditions, towards saving the virgin environment from pollution.

Two field experiments were carried out at Tegzerte, Siwa Research Station; Desert Research Center during winter seasons of 2003 and 2004 to study the effect of nitrogen, phosphorus fertilizers and grain rates on weed control and relationship to wheat production.

Organic manure (20 m^3) was added during soil preparation. Phosphate fertilizer (15.5% P_2O_5) following the experimental scheme as (0, 15.5, 31.0 and 46.5 kg./fed.) were added. Nitrogen fertilizer was added as ammonium sulfate (20.6% N) following the experimental scheme as well as (0, 80,100 and 120 kg./fed.) in two equal dosages i.e just before the first and the second irrigation. Wheat cultivar grains (Sakha 93) which were obtained every year from Wheat Research Section, Agricultural Research Center , Giza, Egypt, were drilled at seed rates following the experimental scheme as (70, 80 and 90kg/fed.) on 15^{th} and 17^{th} November in the first and second seasons, respectively. The experimental design was a split split-plot design with four replicates in both seasons, where the phosphorus fertilization treatments occupied the main plots, nitrogen fertilization treatments were arranged in the sup main plots and grain rates treatments in the sub-sub main ones, respectively. The area of the experimental unit was 10.5 m^2 (3 × 3.5) with 15 rows, 20 cm apart and 4m length. Soil sandy loam with pH value of 7.49 and organic matter was 1.79 %. Soil samples were taken before planting to measure the chemical and physical soil properties as presented in tables (1 and 2).

Table (1): Mechanical and physical properties of Tegzerte soil.

Texture	Depth (cm)	$CaCo_3$ %	Coarse sand %	Fine sand %	Silt %	Clay %	pH	O.M.%
Sandy loam	0 - 30	37.72	7.97	77.04	14.99	0.00	7.49	1.79

Table (2): Chemical properties of Tegzerte soil.

Depth (cm.)	EC (ds/cm)	Soluble cations (meq/100 gm.)				Soluble anion (meq/100 gm.)			
		Na^+	K^+	Ca^{++}	Mg^{++}	Cl^-	SO_4^{--}	$CO3^{-}$	HCO_3^-
0 –30	8.92	43.48	1.15	35.2	4.80	63.90	18.73	0.00	2.00

Survey of weeds:

In both seasons, a survey of different weed species was made by collecting all species of weeds in one m^2 from each plot after 45 and 90 days from all treatments and estimates the fresh weight (gm.) for every species of weeds. These weeds were dried at 105°C to estimate the dry weight (gm.). Then estimate the reduction percent for fresh and dry weeds. Data were statistically analyzed of variance (ANOVA) and least significant difference (LSD) at 5%, method was used to least the differences between the treatment means as published by Gomez and Gomez (1984).

Measurement of yield wheat:

One square meter plants were harvested then converted into ton per feddan to determine biological , grain and straw yields ton/fed.

RESULTS AND DISCUSSiON

It should be noted that the experimental site was heavily infested by both grassy and broad leaf weed spices, the most abundant weed species included *Chenopodium album, Malva parviflora, Cichorium pumpilum, Beta vulgaris, Convolvulus arvensis, Melilotus indicus* and *Medicago polymorpha* (as broad leaf weeds) and *Zygophyllum album, Phragmites australis, Setaria viridis* and *Echinochloa colonum* (as annual grassy weeds).

Data in all tables were obtained highly significant improvement on weed species and % weeds reduction as results of increasing each of phosphorus fertilization levels from 0, 15.5 and up to 31.0 P kg/fed. and nitrogen fertilization levels from 0, 80.0, 100.0 and up to 120.0 N kg/fed. as well as grain rates from 70.0, 80.0 and up to 90 kg/fed., respectively. However, higher biological , grain and straw yield

I- Effect of main factors:

1. Effect of Phosphorus fertilizer rates on weed species and % weeds reduction :

Result in table (3, 4 and 5) indicate that increasing phosphorus, nitrogen fertilizer rates and grain rates applied to winter wheat decreased green weeds population and weed yields. The reduction of broad leaf weeds and annual grassy weeds at 31.0 kg/fed. was the best rate than 15.5 and 46.5 kg/fed. fresh weight of annual grassy weeds at 31.0 kg/fed. (table 3) caused reduction of 8.60, 25.27, 23.67 and 25.86% with *Zygophyllum album*, Phragmites australis, Setaria viridis and Echinochloa colonuma, respectively. While fresh weight of broad leaf weeds at the same rate caused reduction of 28.40, 23.57, 23.39, 24.81, 18.15, 24.87 and 25.87% with *Chenopodium album, Malva parviflora, Cichorium pumpilum, Beta vulgaris, Convolvulus arvensis, Melilotus indicus* and *Medicago polymorpha*, respectively. Table (6) showed that wheat biological yield (ton/fed.) at 15.5 p kg/fed. was the best rate, while, grain and straw yield (ton/fed.) were observed at 31.0 p kg/fed.

Table (3): Influence of phosphorus fertilization rates (kg f $^{-1}$) applied to winter wheat on fresh annual weeds (gm/m^2) and % reduction.

Annual weeds	Phosphorus rate (kg f $^{-1}$) and % reduction						
	0.0	15.5	Reduction %	31.0	Reduction %	46.5	Reduction %
	Means 2003 and 2004 seasons						
Chenopodium album	220.09 a	197.90 b	10.08	157.58 d	28.40	188.59 c	14.31
Zygophyllum album	147.52 a	136.41 b	7.53	134.84 b	8.60	125.99 c	14.59
Malva parviflora	132.65 a	114.29 b	13.84	101.39 d	23.57	108.91 c	17.90
Phragmites australis	19.71 a	16.77 b	14.92	14.73 d	25.27	15.91 c	19.28
Cichorium pumpilum	75.59 a	65.21 b	13.73	57.91 d	23.39	62.17 c	17.75
Setaria viridis	62.45 a	53.77 b	13.90	47.67 d	23.67	51.23 c	17.97
Beta vulgaris	37.25 a	31.82 b	14.58	28.01 d	24.81	30.23 c	18.85
Convolvulus arvensis	9.42 a	8.42 b	10.62	7.71 d	18.15	8.12 c	13.80
Echinochloa colonuma	25.14 a	21.32 b	15.19	18.64 d	25.86	20.20 c	19.65
Melilotus indicus	15.68 a	13.39 b	14.60	11.78 d	24.87	12.72 c	18.88
Medicago polymorpha	12.41 a	10.64 b	14.26	9.20 d	25.87	10.12 c	18.45

Table (4): Influence of Nitrogen fertilization rates (kg f $^{-1}$) applied to winter wheat on fresh annual weeds (gm/m^2) and % reduction.

Annual weeds	Nitrogen rates (kg f $^{-1}$) and % reduction						
	0.0	80.0	Reduction %	100.0	Reduction %	120.0	Reduction %
	Means 2003 and 2004 seasons						
Chenopodium album	220.09 a	219.62 b	0.21	185.91 c	15.53	128.01 d	41.84
Zygophyllum album	147.52 a	135.52 b	8.13	130.24 c	11.71	130.83 c	11.31
Malva parviflora	132.65 a	126.84 b	4.38	112.90 c	14.89	93.90 d	29.21
Phragmites australis	19.71 a	18.79 b	4.67	16.55 c	16.03	10.32 d	47.64
Cichorium pumpilum	75.59 a	72.30 b	4.35	64.42 c	14.78	42.37 d	43.95
Setaria viridis	62.45 a	59.70 b	4.40	53.11 c	14.97	34.68 d	44.47
Beta vulgaris	37.25 a	35.54 b	4.59	31.41 c	15.68	19.88 d	46.63
Convolvulus arvensis	9.42 a	9.10 b	3.40	8.34 c	11.46	6.21 d	34.18
Echinochloa colonuma	25.14 a	23.93 b	4.81	21.03 c	16.35	12.93 d	48.57
Melilotus indicus	15.68 a	14.96 b	4.59	13.22 c	15.69	8.36 d	46.68
Medicago polymorpha	12.41 a	11.85 b	4.51	10.51 c	15.31	6.76 d	45.53

The increasing reduction with increasing phosphorus fertilizers due to that phosphorus fertilization stimulates nitrogen fixation and increases inorganic nitrogen concentrations, Sasha et al. (2007) shown that both N and P availability can regulate rates of N fixation: increased N availability often suppresses rates, while increased P availability frequently stimulates rates (Madigan *et al.*, 2003). Because both nutrients affect the process, N-to-P ratios may be more effective predictors of rates of N fixation than the absolute concentration of either nutrient alone (Guilford and Hecky, 2000). However studies of natural ecosystems have found varied results when assessing how N and P availability control soil N fixation. Hartley and Schlesinger (2002) investigated a variety of possible constraints on soil N fixation and found P fertilization had no affect on rates. Moreover, a concurrent field soil survey performed by Hartley and Schlesinger (2002) did not reveal the hypothesized inverse relationship between soil N-to-P ratios and rates of N fixation. In contrast, Eisele et al. (1989) used a fertilization experiment to show that P did limit N fixation rates of some tall grass prairie soils, and that decreased soil N-to-P ratios correlated with N fixation rates in a log-linear fashion.

Table (5): Influence of wheat grain rates (kg f^{-1}) on fresh annual weeds (gm/m^2) and % reduction.

Annual weeds	wheat grain rates (kg f^{-1}) and % reduction				
	70.0	80.0	Reduction %	90.0	Reduction %
		Means 2003 and 2004 seasons			
Chenopodium album	219.67 a	191.10 b	13.01	175.86 c	19.94
Zygophyllum album	138.01 a	134.31 b	2.68	106.25 c	23.01
Malva parviflora	126.87 a	114.51 b	9.74	101.55 c	19.96
Phragmites australis	18.78 a	16.81 b	10.49	14.75 c	20.39
Cichorium pumpilum	72.32 a	65.33 b	9.71	58.00 c	19.80
Setaria viridis	59.71 a	53.87 b	9.78	47.75 c	20.03
Beta vulgaris	35.54 a	31.89 b	10.27	28.06 c	21.05
Convolvulus arvensis	9.10 a	8.43 b	7.36	7.72 c	15.16
Echinochloa colonuma	23.94 a	21.37 b	10.74	18.67 c	21.97
Melilotus indicus	14.96 a	13.42 b	10.29	11.80 c	21.12
Medicago polymorpha	11.85 a	10.66 b	10.04	9.42 c	20.51

2. Effect of Nitrogen fertilizer rates on weed species and % weeds reduction:

Data in Table (4) indicate that increasing nitrogen fertilizer rates applied to winter wheat decreased green weeds population and weed yields after 45 and 90 days from sowing. Nitrogen rate of 120 kg/fed., caused hight reduction of fresh weeds weight as compared to nitrogen rate of 100 and 80 kg/fed. In two seasons fresh weight of broad leaf weeds at the rate of 120.0 kg/fed. leds to 41.84, 29.21, 43.95, 46.63, 34.18, 46.68 and 45.53% reduction with *Chenopodium album, Malva parviflora, Cichorium pumpilum, Beta vulgaris, Convolvulus arvensis, Melilotus indicus* and *Medicago polymorpha*, respectively. At annual grassy weeds, fresh weight at 120.0 kg/fed. caused reduction of 11.31, 47.64, 44.47 and 48.57% with *Zygophyllum album, Phragmites australis, Setaria viridis* and *Echinochloa colonum, respectively.* Table (7) indicated that the rate of 100 kg/fed was the best rate for wheat biological, grain and straw yield (ton/fed.).

I think that, the reduction in annual weeds by the increasing in nitrogen fertilization due to increasing vegetation growth of the wheat plants, which led to increased competition between wheat plants and weeds on Light, nutrients and other components of the soil. Wicks et al. (1986) found that more light interception by winter wheat reduced weed growth. Manipulation of crop fertilization is a promising agronomic practice in reducing weed interference in crops (DiTomaso, 1995).

Nitrogen fertilizer, as well as fresh and composted manure, can affect weed germination and establishment (Menalled *et al.*, 2002).Research has shown that crop-weed competitive interactions can be altered by N dose (Cathcart and Swanton, 2003).

3. Effect of Seeding rates on weed species and % weeds reduction:

The increasing of seeding rates (70.0, 80.0 and 90.0 kg/fed.) caused decreasing of weeds population and weed yields. Fresh weight of annual grassy weeds at 90.0 kg/fed. (table 5) caused reduction of 23.01, 20.39, 20.03 and 21.97% with *Zygophyllum album, Phragmites australis, Setaria viridis* and *Echinochloa colonum*, respectively. While fresh weight of broad leaf weeds at the same rate caused reduction of 19.94, 19.96, 19.80, 21.05, 15.16, 21.12 and 20.51% with *Chenopodium album, Malva parviflora, Cichorium pumpilum, Beta vulgaris, Convolvulus arvensis, Melilotus indicus* and *Medicago polymorpha*, respectively. The best wheat biological, grain and straw yield (ton/fed.) were observed at seed rate of 90.0 kg/fed. compared to other rates (table 8).

Table (6): Effect of phosphorus fertilization levels on Broad leaf weed, Grasses weed, Total annual weed and its associated wheat growth characters.

Phosphorus rate (kg f-1)	Studied Characters (2003-2004 growing seasons)					
	Broad leaf weed (g./m2)	Grasses weed (g./m2)	Total annual weed (g./m2)	Biological yield (ton./fed)	Grain yield (ton./fed)	Straw yield (ton./fed)
0.0	503.09 a	254.82 a	757.91 a	3.21 d	1.20 d	2.01 d
15.5	441.66 b	228.27 b	669.93 b	4.67 a	1.63 b	2.44 b
31.0	391.79 d	215.88 c	607.67 d	4.44 b	1.77 a	2.66 a
46.0	420.88 c	213.33 c	634.21 c	3.89 c	1.36 c	2.33 c

Table (7): Effect of nitrogen fertilization levels on Broad leaf weed, Grasses weed, Total annual weed and its associated wheat growth characters.

Nitrogen rate (kg f-1)	Studied Characters (2003-2004 growing seasons)					
	Broad leaf weed (g./m2)	Grasses weed (g./m2)	Total annual weed (g./m2)	Biological yield (ton./fed)	Grain yield (ton./fed)	Straw yield (ton./fed)
0.0	555.03 a	264.68 a	819.71 a	1.93 d	0.77 d	1.15 d
80.0	490.20 b	237.93 b	728.13 b	4.75 b	1.86 b	2.89 b
100.0	406.63 c	214.88 c	621.51 c	5.04 a	1.98 a	3.07 a
120.0	305.56 d	194.80 d	500.36 d	3.55 c	1.39 c	2.15 c

Table (8): Effect of grain rates on Broad leaf weed, Grasses weed, Total annual weed and its associated wheat growth characters.

Wheat grain rates (kg f-1)	Studied Characters (2003-2004 growing seasons)					
	Broad leaf weed (g./m2)	Grasses weed (g./m2)	Total annual weed (g./m2)	Biological yield (ton./fed)	Grain yield (ton./fed)	Straw yield (ton./fed)
0.0	490.31 a	240.45 a	730.76 a	3.67 c	1.44 c	2.23 c
70.0	490.31 a	240.45 a	730.76 a	3.67 c	1.44 c	2.23 c
80.0	435.35 b	226.36 b	661.71 b	3.89 b	1.51 b	2.36 b
90.0	392.41 c	217.42 c	609.83 c	4.16 a	1.64 a	2.53 a

These results suggest that increasing seedling rate can regulate partially weed/wheat competition in favor to wheat plant. Yehia et al. (1993) found that increasing seedling rate from 119kg/ha to 214kg/ha decreased the fresh weight of wild oat by 54.1%.

Managing for increased competitive ability of crops with weeds is an important means of achieving improved weed management programs (Liebman et al., 2001).

Π- Effect of first order interactions:

Results in tables (9, 10 and 11) indicated that, all the first order interactions i.e. (phosphorus X nitrogen fertilization levels), (phosphorus fertilization levels X grain rates) and (nitrogen fertilization levels X grain rates), respectively, were been able to reduce significantly broad leaf weeds, grassy weeds and total annual weeds (g / m2), while it increased significantly biological, grain and straw yield.

Table (9): Effect of phosphorus and nitrogen fertilization levels on Broad leaf weed, Grasses weed, Total annual weed and its associated wheat growth characters.

Phosphorus & Nitrogen rate (kg f-1)		Studied Characters (2003-2004 growing seasons)					
		Broad leaf weed (g./m2)	Grasses weed (g./m2)	Total annual weed (g./m2)	Biological yield (ton./fed)	Grain yield (ton./fed)	Straw yield (ton./fed)
0	0	615.86 a	292.71 a	908.57 a	2.90 m	1.10 f	1.80 j
	80	567.56 b	269.07 b	836.63 b	3.20 k	1.20 e	2.00 h
	100	460.98 g	238.98 f	699.96 g	3.50 h	1.30 d	2.20 f
	120	367.97m	218.51 i	586.48 l	3.10 l	1.15 f	1.90 i
15.5	0	540.54 d	256.17 d	796.71 d	3.90 f	1.50 c	2.30 e
	80	457.18 h	235.30 g	692.48 h	4.10 e	1.60 c	2.40 d
	100	454.15 i	226.39 h	680.54 i	4.30 c	1.70 b	2.60 b
	120	314.79 n	195.21 l	510.00m	4.00 f	1.55 c	2.35 d
31	0	515.36 e	250.18 e	765.34 e	4.20 c	1.70 b	2.50 c
	80	483.66 f	234.66 g	718.32 f	4.40 b	1.80 b	2.60 b
	100	313.05 n	191.27 m	504.32 n	4.70 a	1.90 a	2.80 a
	120	255.09 p	187.41 n	442.50 p	4.30 d	1.75 b	2.55 c
46	0	548.35 c	259.66 c	808.01 c	3.10 l	1.15 f	1.90 i
	80	452.41 j	212.69 j	665.10 j	3.40 i	1.25 e	2.10 g
	100	398.36 k	202.87 k	601.23 k	3.70 g	1.35 d	2.30 e
	120	284.40 o	178.09 o	462.49 o	3.30 j	1.20 e	2.0 h

Table (10): Effect of phosphorus fertilization level and grain rates on Broad leaf weed, Grasses weed, Total annual weed and its associated wheat growth characters.

Phosphorus & grain rate (kg f-1)		Studied Characters (2003-2004 growing seasons)					
		Broad leaf weed (g./m2)	Grasses weed (g./m2)	Total annual weed (g./m2)	Biological yield (ton./fed)	Grain yield (ton./fed)	Straw yield (ton./fed)
0	70	541.03 a	260.99 a	802.02 a	1.36 l	0.53 k	0.79 l
	80	490.64 c	255.93 b	746.57 c	3.94 h	1.46 h	2.50 g
	90	477.62 d	247.53 c	725.15 d	4.34 f	1.60 g	2.73 e
15.5	70	507.98 b	242.39 d	750.37 b	2.12 j	0.84 j	1.28 j
	80	440.41 g	227.68 f	668.09 f	4.91 d	1.97 d	2.94 c
	90	207.82 l	214.72 g	422.55 k	5.17 c	2.07 c	3.10 b
31	70	464.67 e	238.68 e	703.35 e	2.31 i	0.92 i	1.39 i
	80	387.83 j	210.83 i	598.66 j	5.39 b	2.14 b	2.23 h
	90	322.87 k	66.12 j	388.99 l	5.61 a	2.27 a	3.37 a
46.5	70	447.58 f	219.72 h	667.30 g	1.55 k	0.62 k	0.92 k
	80	422.51 h	210.98 i	633.49 h	4.10 g	1.80 f	2.60 f
	90	392.55 i	209.28 i	601.83 i	4.65 e	1.91 e	2.85 d

Table (11): Effect of nitrogen fertilization levels and grain rates on Broad leaf weed, Grasses weed, Total annual weed and its associated wheat growth characters.

Nitrogen & grain rate (kg f-1)		Studied Characters (2003-2004 growing seasons)					
		Broad leaf weed (g./m2)	Grasses weed (g./m2)	Total annual weed (g./m2)	Biological yield (ton./fed)	Grain yield (ton./fed)	Straw yield (ton./fed)
0	70	590.03 a	280.06 a	870.09 a	1.70 k	0.67 g	1.01 h
	80	557.31 b	264.04 b	821.35 b	4.50 g	1.76 d	2.73 e
	90	517.75 d	216.79 h	734.54 d	4.82 e	1.90 b	2.93 d
80	70	534.35 c	252.81 c	787.16 c	1.93 i	0.75 f	1.16 g
	80	480.77 e	234.91 d	715.68 e	4.72 d	1.84 c	2.86 e
	90	443.59 g	226.07 f	669.66 g	5.01 b	1.94 b	3.04 c
100	70	479.00 f	229.46 e	708.46 f	2.15 h	0.86 e	1.27 f
	80	416.24 h	221.25 g	637.49 h	5.02 b	1.96 b	3.07 b
	90	324.66 j	193.93 i	518.59 j	5.28 a	2.08 a	3.23 a
120	70	357.87 i	199.46 i	557.33 i	1.80 j	0.70 f	1.17 g
	80	275.17 l	185.23 j	460.40 l	4.65 f	1.81 c	2.78 e
	90	283.64 k	199.73 i	483.37 k	4.95 c	1.93 b	2.96 d

Ш- Effect of second order interactions:

Results of table (12) indicated that the second order interaction between the three factors i.e. (phosphorus X nitrogen fertilization levels X grain rates) led to decrease significantly of green weeds population and weed yields while it increased significantly wheat biological, grain and straw yield (ton/fed.).
Higher observations of Broad leaf and Grasses weed % and biological, grain and straw yield (ton./fed.) were obtained from the interaction between (31.0 p kg./fed. & 100.0 N kg./fed. and 90.0 kg. wheat grains /fed.), which led to decreasing by 88.23, 57.36% and increasing to 6.0, 2.4 and 3.6 ton. /fed., respectively compared to other treatments (table, 12).

Table (12): Effect of interaction between phosphorus, nitrogen fertilization levels and grain rates on weed and wheat characters (combined of 2003 and 2004 growing seasons).

Treatments			Studied characters					
P levels (kg/f^1)	N levels (kg/f^1)	Grain rate (kg/f^1)	Broad leaf weed (g/m^2)	Grasses weed (g/m^2)	Total annual weed (g/m^2)	Biological yield (ton./fed)	Grain yield (ton./fed)	Straw yield (ton./fed)
0.0	0.0	70.0	631.06 a	300.15 a	931.21 a	1.00 t	0.40 p	0.60 q
		80.0	618.04 b	293.77 ab	911.81 b	1.30 s	0.50 o	0.80 p
		90.0	598.50 c	284.21 bc	882.71 c	1.60 r	0.70 n	1.10 o
	80.0	70.0	588.72 d	279.43 cd	868.15 d	3.63 n	1.33 j	2.30 k
		80.0	569.19 e	269.87 de	839.06 e	3.96 m	1.56 h	2.50 j
		90.0	531.57 h	257.90 fg	789.47 g	4.26 k	1.53 h	2.70 h
	100.0	70.0	519.70 j	245.64 hi	765.34 l	4.13 l	1.56 h	2.60 i
		80.0	404.75 uv	217.66 hi	622.41 o	4.26 j	1.70 g	2.70 h
		90.0	458.48 no	225.67 jklm	684.15 lm	4.60 i	0.75 p	2.90 g
	120.0	70.0	424.62 s	218.76 lmn	643.38 o	1.08 t	0.88 o	0.82 p
		80.0	370.58 w	214.43 no	585.01 r	1.86 r	0.99 n	0.84 p
		90.0	308.71 a	222.35 klmn	531.06 t	1.10 t	0.73 p	1.18 o
15.5	0.0	70.0	597.19 c	286.57 bc	880.76 c	1.83 q	0.86 o	1.10 n
		80.0	543.14 h	254.12 fg	800.26 g	2.16 p	0.93 n	1.30 m
		90.0	481.28 i	227.82 jkl	709.10 k	2.33 op	1.90 f	1.40 m
	80.0	70.0	534.68 h	252.97 gh	787.65 h	4.70 h	1.93 f	2.80 g
		80.0	460.44 n	226.62 jklm	687.06 l	4.83 g	2.06 d	2.90 g
		90.0	376.44 w	226.30 jklm	602.74 q	5.16 e	2.00 e	3.10 e
	100.0	70.0	498.20 j	235.11 ij	733.31 j	5.00 f	2.03 de	3.00 f
		80.0	455.89 pq	228.16 jkl	684.05 lm	5.13 e	2.16 c	3.10 e
		90.0	408.35 u	215.91 mno	624.26 p	5.36 o	2.08 d	3.20 d
	120.0	70.0	401.83 v	197.93 pqrs	599.76 q	1.92 q	1.80 f	1.15 n
		80.0	302.19 b	198.84 pqr	501.03 v	2.25 p	1.89 d	1.39 m
		90.0	240.34 f	188.86 rs	429.20 y	2.41 op	1.99 e	1.51 m
31.0	0.0	70.0	570.49 e	270.50 de	840.99 e	2.20 p	0.90 lm	1.40 m
		80.0	519.05 j	245.31 hi	764.36 i	2.30 op	0.90 lm	1.40 m
		90.0	456.53 op	234.71 ij	691.24 i	2.40 o	1.00 k	1.40 m
	80.0	70.0	518.39 j	245.00 hi	763.39 i	5.13 e	2.03 de	3.10 ef
		80.0	537.80 k	229.70 jkl	767.50 k	5.33 d	2.13 c	3.20 d
		90.0	445.46 q	229.30 jkl	674.76 mn	6.66 b	2.26 b	4.40 b
	100.0	70.0	462.40 a	232.59 op	694.99 u	5.36 d	2.16 c	3.20 d
		80.0	402.48 g	213.26 u	615.74 z	5.53 c	2.23 b	3.30 c
		90.0	74.27 h	127.98 v	202.25 vu	6.00 a	2.40 a	3.60 a
	120.0	70.0	307.41 m	206.65 jk	514.06 l	2.28 p	0.98 lm	1.22 n
		80.0	142.66 v	155.04 no	297.70 p	2.35 op	0.99 lm	1.35 m
		90.0	315.22 z	200.54 pq	515.76 u	2.49 o	1.10 k	1.52 m
46.0	0.0	70.0	561.37 f	266.04 ef	827.41 f	1.10 t	0.42 p	0.89 p
		80.0	549.00 g	259.98 efg	808.98 g	1.35 s	0.55 o	0.99 p
		90.0	534.68 i	252.97 gh	787.65 h	1.89 r	0.78 n	1.18 n
	80.0	70.0	495.61 k	233.84 jk	729.45 j	3.72 n	1.39 j	2.67 g
		80.0	453.93 pq	213.43 no	667.36 n	3.99 m	1.63 h	2.80 g
		90.0	407.69 u	190.80 qrs	598.49 q	4.35 k	1.64 h	3.00 f
	100.0	70.0	435.70 r	204.51 op	640.21 o	4.18 l	1.58 h	3.00 f
		80.0	401.83 v	197.93 pqrs	599.76 q	4.32 k	1.81 g	3.10 e
		90.0	357.56 y	206.16 op	563.72 s	4.68 i	0.80 p	3.20 d
	120.0	70.0	297.64 c	174.49 t	472.13 w	1.12 t	0.91 o	1.10 n
		80.0	285.27 d	172.60 t	457.87 x	1.91 r	1.02 n	1.22 n
		90.0	270.28 e	187.18 s	457.46 x	1.17 t	0.89 p	1.42 m

Means having the same letters in he same row are not significantly different at ≥ 0.05

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المكافحة غير الكيماوية للحشائش المصاحبة لمحصول القمح تحت ظروف الأراضي الملحية

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أجريت تجربتان حقليتان بمحطة بحوث تجزرتي التابعة لمركز بحوث الصحراء – بواحة سيوة خلال الموسمين الشتويين لعامي ٢٠٠٣ ، ٢٠٠٤ وذلك لدراسة تأثير مستويات التسميد الفوسفاتي (صفر ، ١٥,٠ ، ٣١,٠ ، ٤٦,٥ كيلوجرام فوسفور/فدان) ، والتسميد النتروجيني (صفر ، ٨٠,٠ ، ١٠٠,٠ ، ١٢٠,٠ كيلوجرام نتروجين/فدان) ، ومعدلات تقاوي القمح (٧٠,٠ ، ٨٠,٠ ، ٩٠,٠ كيلوجرام بذور/فدان) علي مقاومة الحشائش وعلاقة ذلك بإنتاجية القمح. كان التصميم التجريبي علي هيئة قطاعات منشقة مرتين مع أربع مكررات لكلا الموسمين ، حيث أحتلت معاملات التسميد الفوسفاتي الأحواض الرئيسية ، ورتبت معاملات التسميد النتروجيني في الأحواض التحت رئيسية ، وأخذت معدلات التقاوي الأحواض التحت تحت رئيسية علي الترتيب. كانت معاملات الحشائش المتداخلة هي الحشائش العريضة الأوراق (زربيح ، خبيزة ، سريس ، سلق ، عليق ، حندقوق ، نفل) والحشائش النجيلية (رطريط ، حجنة ، صيفية ، أبو ركبة) والحشائش الحولية الإجمالية.

أظهرت النتائج أن زيادة معدلات التسميد الفوسفاتي ، والنتروجيني ، ونسب تقاوي القمح – قد أدي إلي انخفاض معنوي للحشائش العريضة الأوراق ، والحشائش الضيقة الأوراق (النجيلية) ، بينما أدت نفس المعاملات إلي زيادة معنوية للمحصول البيولوجي ومحصول الحبوب والقش.

أخذت أعلي ملاحظة للمحصول البيولوجي ومحصول الحبوب والقش كنتيجة للتفاعل بين العوامل الرئيسية الثلاثة وبالأخص مع (٣١,٠ كيلوجرام فوسفور/فدان ، ١٠٠,٠ كيلوجرام نتروجين/فدان ، و ٩٠,٠ كيلوجرام تقاوي قمح/فدان) الأمر الذي أدي إلي ٦,٠ ، ٢,٤ ، ٣,٦ طن/فدان علي الترتيب بالمقارنة مع المعاملات الأخرى.