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INFLUENCE OF NITROGEN FERTILIZER AND WEED CONTROL TREATMENTS ON WEEDS AND PRODACTIVITY OF SOME GRAIN SORGHUM GENOTYPES

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ABSTRACT

Weed control in grain sorghum is a big challenge because of the limited number of herbicides registered for use in grain sorghum in the world and non of them in Egypt. For this reason a two- year field experiments was conducted at Shandaweel Research Station, Sohag Governorate, during 2013 and 2014 summer seasons to study the effect of the combination of 45 treatments, three rates of nitrogen which were 70, 100 and 130 kg N faddan^{-1} and five weed control treatments i.e., Gesagard (prometryne) 50 % FW at 500 g a.i., Stellar star (pyrazolone) 21 % SL at 60 g a.i., Stomp extra (pendimethalin) 45.5% CS at 455 g a.i. faddan^{-1}} , hand hoeing twice and un-weeded check on weeds, yield and yield components of grain sorghum genotypes namely hybrid 305 and 306 and Dorado. The experimental design used was a split-split plot with three replications.

Results showed that hybrid 306 gave the highest reduction in dry weight of broad leaved, grassy and total annual weeds accompanied with the highest sorghum grain yield faddan^{-1} and its components as compared to other two genotypes in both seasons.

Application of nitrogen rate at 70 kg N faddan^{-1} reduced the dry weight of broad leaved, grassy and total annual weeds and gave the lowest sorghum grain yield compared to nitrogen rate at 130 kg N fed^{-1}.

Weed control treatments had significant effect on dry weight of broad- leaved, grassy and total weedy (g m^{-2}) in both seasons. Hand hoeing twice and pyrazolone herbicide reduced the dry weight of total weeds by 86.6 and 80.9 % in the first season and by 87.3 and 81.5 % in the second season and increased sorghum grain yield faddan^{-1} by 46.0 and 38.6 % in the first season and 40.9 and 32.0 % in the second season compared with untreated, respectively.

Integration between hybrid 306 and hand hoeing twice and pyrazolone herbicide under nitrogen rate at 130 kg N fed^{-1}. increased sorghum grain yield, N- uptake and protein % as compared to Dorado genotype with untreated under nitrogen rate at 70 kg N fed^{-1} in both season.

Under the conditions of this experiment sowing hybrid 306 using hand hoeing twice and pyrazolone herbicide and under nitrogen rate at 130 kg N fed^{-1} can be recommended to improve sorghum yield productivity.

INTRODUCTION

Sorghum (*Sorghum bicolor* (L.) Moench) is considered as one of the most important crops grown in Upper Egypt. The cultivated area is about 335182 faddans* producing about 7.6 million ardab of grain yield. Many promising sorghum hybrids have been evolved for traditional sorghum growing areas, making it essential to investigate the differential response of promising hybrids. Ragheb and El-nagar (1997) indicated that Giza-15 significantly surpassed Dorado in yield and yield components. Moshtohry *et al*. (2007) indicated that under untreated check treatments, the tallest variety Giza 15 seemed to have less weed infestation than Shandaweel 6 and Dorado varieties by (7.2 &13.5) and (3.5 &16.9 %), respectively in 2004 and 2005 seasons. Fakkar *et al*. (2009) showed that sowing Shandaweel 6 and Shandaweel 1 hybrids gave the lowest values of broad-leaved, grassy and total weeds and the highest values of 1000-grain weight, number of leaves plant^{-1} and grain yield in both seasons compared to Dorado.

It is an accepted fact that nitrogen fertilizer is the main source of increasing crop production. Fertilizer application can have a marked influnce on the competitive ability of crops and the degree of interference from weeds Di Tomaso (1995). Saba *et al.* (1990) reported that the highest grain yield was recorded by applying 100 kg N fed^{-1}compared to 80 kg N fed^{-1}. Bashir *et al*. (1994) found that the average of grains yield faddan^{-1} was significantly increased by 1.8 ardab fed^{-1} when raising nitrogen rate from 80 to 100 kg N fed-1 and highest grain yield was obtained by using 120 kg N fed^{-1}. Mourad *et al*. (2000) found that panicle weight, grain weight panicle^{-1}, 1000- karnel weight, green yield, total biomass and grain yield characters were increased by increasing nitrogen fertilizer from 80 to 100 kg N fed^{-1}. El-Aref and Ibrahim (2004) reported that increasing nitrogen fertilizer level up to 100 kg N/fed significantly increased head length, diameter and weight, grain yield per plant, 1000- grain weight and grain yield fed^{-1} of sorghum as compared with the crops of the other two nitrogen levels (60 and 80 kg N/fed). Mourad and Manshawi (2005) found that each of leaf area plant^{-1}, LAI, number of grains plant^{-1},fodder and grain yield significantly increased by raising nitrogen levels from 75 to 100 kg N fed^{-1}. Whereas grain yield plant^{-1} significantly increased by raising nitrogen levels from 75 to 125 kg N fed^{-1}. Mourad (2006) reported that increasing nitrogen fertilization from 80 to 120 kg N fed^{-1} significantly increased plant height, head weight, grain weight head $^{-1}$, number of kernels panicales^{-1} and grain yield fed^{-1}. Abd El-Mawgoud (2012) found that decreasing nitrogen fertilizer from 120 to 80 kg N fed^{-1} decreased plant height, panicle length, panicle width, 1000 grain weight and grain yield plant^{-1}, while, increasing days to 50% flowering.

Weeds are the most serious pests reducing the growth and yield of crop in Egypt. Yield losses due to weed competition ranged between 15- 55 % (Everaarts, 1993), reached 85% (Raghuvanshi *et al*. (1990) and 50 % Mishra *et al*. (2012). Competition from broadleaved weeds reduced grain sorghum yield more than grass species competition or mixtures of broadleaved and grass weeds (Feltner *et al*., 1969). Weed competition

after the first 2 weeks after crop emergence has not reduced grain sorghum yields (Smith *et al*., 1990). Weed control treatments i.e. hand hoeing or herbicides significantly increased the yield of sorghum (Kasole *et al*., 1994). Mishra *et al*. (2012) revealed that pre-emergence application of atrazine, pendimethalin and oxyfluorfen significantly reduced the nutrient depletion by weeds as compared to weedy check, mainly due to reduction in weed dry matter accumulation of weeds. Pendimethalin at 0.5 kg ha^{-1} was safa to crop and resulted in good weed control and higher sorghum grain yield. Ishaku and Shittu (2014) concluded that 3.0 kg a.i. ha^{-1} of Pendimethalin can be tolerated by sorghum with relatively low weed fresh and dry weights as well as higher grain yield and 1000 grain weight. Khaffagy *et al*. (2015), found that application of herbicides (acetochlor at 900 g a.i.fed^{-1} (Vern), acetochlor at 840 g a.i.fed^{-1} (Harness) and pendimethalin at 773.5 g a.i.fed^{-1} (Stomp Extra) gave satisfactory effect on controlling weed species (annual broadleaf and grassy weeds) more than 80 % and reflected that on increasing plant weight, LAI, forage and grain sorghum yield. These herbicides can be advised to control weeds in sorghum field.

Al-Nagar *et al*. (2006) found that mean square of N levels and genotypes x N levels interactions were highly significant for all studied traits such as 50 % flowering.

The present investigation was, therefore, undertaken to study the influence of nitrogen fertilizer and weed control treatments on weeds, yield and yield components of some sorghum genotypes.

* Bulletin of the Agriculture Statistics, Economic Affairs Sector. Part.2 Summer and Nile crops. October 2012/ 2013 .

MATERIALS AND METHODS

Two year field experiments were conducted at Shandaweel Research Station in Sohag Governorate during 2013 and 2014 summer seasons to study the effect of the combinations of 45 treatments which were three nitrogen fertilizer rates at 70, 100 and 130 kg N $faddan^{-1}$ and five weed control treatments on three genotypes of sorghum (hybrid 305 , 306 and Dorado). The experiment was laid out in a split- split-plot design with three replicates. Before planting soil samples was taken from the experimental site and analyses according to the procedures of Jackson (1973). Some physical and chemical properties of the soil are presented in Table 1.

Table 1: Properties of the soil analysis (Mechanical and chemical properties) during 2013 and 2014 seasons.

	Soil property	2013 season	2014 season
Physical analysis	sand %	53.16	50.62
	Silt%	29.72	25.21
	Clay%	17.12	24.17
	Soil texture	Sand loam	Sandy clay loam
Chemical analysis	Organic mater %		
	Total N (%)	0.196	0.168
	Ca Co_3%	1.26	1.41
	Soluble ions (meq/100g soil (1:5)		
	CO_3^-	-----	----
	H CO_3^-	0.30	0.26
	Cl^-	0.88	0.79
	$So_4^=$	1.02	1.00
	Ca^{++}	0.52	0.50
	Mg^{++}	0.26	0.24
	Na^+	1.26	1.17
	K^+	0.16	0.14
	EC(ds/m) (1:5)	0.263	0.246
	pH(1:1)	7.3	7.8

Sorghum genotypes were grown on June 23rd and 19th for the first and second seasons and harvested on October 20th and 15th for the first and second season, respectively. The plot area was 10.5 m^2 and each plot consisted of five ridges 3.5 m long and 60 cm apart. Each experiment contained the following treatments.

A- Main plots (Three sorghum hybrids): 1-Hybrid 305 2-Hybrid 306 3-Dorado variety.

B- Sub-plot (Three N-Fertilizer rates): 1- 70 kg N $faddan^{-1}$ 2-100 kg N $faddan^{-1}$ 3-130 kg N $faddan^{-1}$.

C- Sub sub-plots: five weed control treatments:

1- Prometryn [*N*2,*N*4-di-isopropyl-6-methylthio-1,3,5-triazine-2,4-diamine)], known commercially as Gesagard 50 % FW was applied at 375 g a.i. fed^{-1}applied pre-emergence.

2-Pyrazolone [methanone, [3-(4,5-dihydro-3-isoxazolyl)-2-methyl-4- ethylsulfonyl) phenyl](5-hydroxy-1-methyl-1H-pyrazol-4-yl)], known commercially as Stellar star 21 % SL was applied at 60 g a.i. fed^{-1}applied 30 days after sowing.

3-Pendimethalin [N-(1-ethylpropyl) -3, 4- dimethyl- 2, 6-dinitrobenzene - amine], known commercially as Stomp Extra 45.5% CS, was applied at 341.3 g a.i. fed^{-1}, applied pre-emergence.

4- Hand hoeing twice at 20 and 45 days after sowing.

5-Unweeded check.

The herbicides were sprayed by knapsack sprayer CP3 with water volume of 200 liters per feddan. The preceding winter crop in the two seasons was wheat.

The cultural practices for sorghum production were managed in accordance with local recommendations.

Data recorded:

The following data were recorded in three categories:

A- On weeds:

Weeds were hand pulled randomly from one square meter from each plot at 60 days after sowing and classified to broad leaved and grassy weeds and were air dried for seven days and then oven dried at 70°C until reaching a constant weight and weight to record :-

Dry weight of broad leaved, grassy and total weeds in g m^{-2} were recorded.

B- On growth characteristics of sorghum:

Number of days to 50 % flowering was recorded at flowering stage. While, plant height (cm), number of green leaves $plant^{-1}$ and leaf area index (LAI) was recorded after 80 days from sowing.

Sorghum leaf area index was calculated using the formula developed by Krishnamurthy et al. (1974):

Leaf area (cm^2) = Maximum leaf width (cm) x Maximum leaf length (cm) x 0.75

Leaf Area Index (LAI) = was calculated by using the following equation:

$$\text{Leaf Area Index (LAI)} = \frac{\text{Leaf area (cm}^2\text{)}}{\text{Ground area (cm}^2\text{)}}$$

C- Sorghum yield and yield components:

At harvest, ten plants were randomly taken from each plot to study the following characteristics:
1-1000- kernel weight (g). 2- Grain yield (ardab fed^{-1})

D- Protein and N-uptake in grain sorghum:

At harvest, grain samples were dried in a forced oven at 70°C, and then ground and wet digested using concentrated sulfuric acid and mixture of H_2SO_4 and perchloric (1:1) for oxidation (A. O.A. C., 1990) to determine N concentration. Total nitrogen was determined using the standard procedure of micro-Kjeldahl as described by Black (1965) and crude protein percent in sorghum grains was calculated by multiplying N % by 6.25 according Tkachck (1966). N-uptake was calculated by multiplying the nitrogen concentration by dry grain sorghum yield per feddan.

$$\text{N uptake} = \frac{\text{Grain yield (Kg faddan}^{-1}\text{)} \times (\%)\ \text{Total N}}{100}$$

Statistical analysis:

The obtained data were subjected to analysis of variance according to Gomez and Gomez (1984). Means were compared using the L.S.D. at 5% level was calculated.

RESULTS AND DISCUSSION

Resisted flora:

The dominant weed species in this experimental fields were *Portulaca oleracea*, L.; *Corchorus olitorius*, L.; *Amaranthus hybridus*, L.; *Xanthium strumarium*, L.; *Tribulus longipetabus*,L. and *Euphorbia geniculata* ortega as broadleaved weeds and *Echinochloa colonum*, L. as grassy weed.

A- Dry weight of weeds (g m^{-2}):

1- Effect of genotypes :

Data in Table 2 indicated that the effect of sorghum genotypes on the dry weight of weeds (g m^{-2}) were statistically significant in both seasons. Hybrid 306 suppressed broad-leaved by 43.9 and 33.3 %, grassy weeds by 49.6 and 47.4 % and total weeds by 45.7 and 38.7 % as compared with Dorado variety in 2013 and 2014 seasons, respectively.

Table (2) : Effect of grain sorghum genotypes, Nitrogen rates and weed control treatments on dry weight of weeds (g m^{-2}) during 2013 and 2014 seasons.

Treatments	2013 season			2014 season		
	Broad leaved weeds	Grassy weeds	Total weeds	Broad leaved weeds	Grassy weeds	Total weeds
A- sorghum genotypes						
Hybrid 305	259.0	109.6	368.6	293.0	162.6	455.6
Hybrid 306	163.3	69.0	232.3	245.6	109.9	355.4
Dorado	290.9	137.0	427.9	370.9	208.9	579.8
LSD at $_{0.05}$	37.4	5.0	15.4	16.4	16.4	32.1
B- Nitrogen rate kg N $faddan^{-1}$						
70	192.2	67.2	259.5	247.0	96.0	343.0
100	236.2	104.0	340.3	299.0	164.6	464.0
130	284.8	144.3	429.1	363.1	220.8	583.9
LSD at $_{0.05}$	37.3	7.5	17.6	19.8	12.1	22.8
C- Weed control treatments						
Prometryn	180.0	85.7	265.7	280.2	150.1	430.3
Pyrazolone	112.5	59.6	172.1	160.4	83.1	243.5
Pendimthalin	165.8	92.2	258.1	237.3	117.2	354.5
H.h. twice	88.3	31.8	120.1	116.4	51.1	167.4
Untreated	642.2	256.6	898.8	721.5	400.7	1122.2
LSD at $_{0.05}$	43.2	7.8	22.9	22.9	15.4	26.8
Interaction						
A x B	NS	12.9	NS	NS	21.0	NS
A x C	74.0	13.6	39.6	39.5	26.7	46.5
B x C	36.0	13.6	39.6	39.0	26.5	53.7
A x B x C	62.3	NS	NS	NS	NS	93.1

These results may be attributed to big hybrid vigor of 306 which gave the highest number of leaves and plant height than other sorghum genotypes which considered as more competitor to weeds. These results are in agreement with those obtained by Moshtohry *et al*. (2007) and Fakkar *et al.* (2009).

2-Effect of nitrogen rate:-

Data in Table 2 showed that N- fertilizer rates had a significant effect on dry weight of broad- leaved, grassy weed and total weeds during 2013 and 2014 seasons. N- fertilizer rates at 100 and 130 kg fed^{-1} increased dry weight of broad- leaved by (18.6 and 32.5%) and (17.4 and 32. 0%), grassy weeds by (35.4 and 53.4 %) and (41.7 and 56.5 %), and total weeds by (23.7 and 39. 5 %) and (26.1 and 41. 3 %) in 2013 and 2014 seasons as compared with N- fertilizer rate at 70 Kg fed^{-1}, respectively. These results may be due to that the addition of nitrogen fertilizer cause enhancing weed growth.

3-Effect of weed control treatment :-

Statistical analysis of the data shown in Table 2 revealed that weed control treatments had significant effect on dry weights of broad- leaved, grassy and total weeds (g m^{-2})in both seasons. Hand hoeing twice, pyrazolone and pendimthalin reduced dry weight of broadleaf weeds by 86.3, 82.5 and 74.2 %, respectively, in 1st season and by 83.9, 77.8 and 67.1 %, respectively, in 2nd season. Meanwhile; the reduction in dry weight of grassy weeds by hand hoeing twice, pyrazolone and prometryn reached 87.6, 76.8 and 66.6 %, respectively, in the first season, and by hand hoeing twice, pyrazolone and pendimthalin was 87.3, 79.3 and 70.8%, respectively, in the second season. Hand hoeing twice, pyrazolone and pendimthalin reduced dry weight of total weeds by (86.6 and 87.3%) , (80.9 and 81.5 %) and (71.3 and 73.1 %) in 2013 and 2014 seasons as compared with untreated, respectively. These results are in conformity with the inferences of Smith et al. (1990), Ishaku and Shittu (2014) and Khaffagy et al. (2015).

B-Sorghum growth, yield and yield components:

1- Effect of genotypes :

Results in Tables 3 and 4 show that sorghum genotypes significantly increased plant height, leaf area index (LAI), days to 50 % flowering, 1000- grain weight (g), grain yield (ard fed^{-1}) and protein %, except number of green leaves^{-1} in both seasons. Hybrid 306 gave the tallest plants (185.4 and 188.1cm) and maximum LAI (6.18 and 6.21) as compared to Dorado variety which gave the shortest plants (139.8 and 147.5 cm) and minimum LAI (4.84 and 5.74) in 2013 and 2014 seasons, respectively.

Hybrid 306 gave lowest days to 50 % flowering (72.7 and 73.5 days) respectively, as compared with Dorado (76.4 and 76.6 days) in 2013 and 2014 seasons. Dorado genotype gave highest 1000-grain weight (32.0 and 34.6 g) as compared to hybrid 305 (27.7 and 28.4 g) in both seasons, respectively. Hybrid 306 increased grain yield ard fed^{-1} by 20.4 and 21.3 %, as compared to Dorado in both seasons, respectively. These results may be due to that the hybrid 306 suppression effects grassy and broad-leaved weeds by increase in plant shedding and due to increases in growth characteristic than Dorado variety. Hybrid 306 gave the highest protein % (10.83 and 10.93 %) in 2013 and 2014 seasons, respectively as compared to Dorado (10.65 and 10.62 %).

Table 3: Effect of grain sorghum genotypes, nitrogen rates and weed control treatments on grain sorghum growth during 2013 and 2014 seasons.

Treatment	2013 season				2014 season			
	Plant height (cm)	Green leaves (No plant^{-1})	LAI	Days to 50 % flowering	Plant height (cm)	Green leaves (No plant^{-1})	LAI	Days to 50 % flowering
A- Grain sorghum genotypes								
Hybrid 305	181.7	8.24	5.80	73.8	185.8	8.22	5.91	74.4
Hybrid 306	185.4	8.67	6.18	72.7	188.1	8.38	6.31	73.5
Dorado	139.8	8.22	4.84	76.4	147.5	7.91	5.74	76.6
LSD at $_{0.05}$	8.3	NS	0.23	2. 5	9.2	NS	0.43	2.8
B- Nitrogen rate kg N faddan^{-1}								
70	159.4	7.02	4.95	73.3	163.4	6.71	5.32	74.0
100	172.7	8.73	5.65	74.7	176.6	8.58	6.11	74.9
130	174.8	9.38	6.22	74.9	181.4	9.22	6.49	75.7
LSD at $_{0.05}$	5.4	0.40	0.32	NS	5.2	0.62	0.41	1.2
C- Weed control treatments								
Prometryn	177.4	8.78	5.48	74.8	176.9	8.70	5.85	74.6
Pyrazolone	172.0	8.41	5.45	74.4	172.3	8.11	5.87	73.4
Pendimthalin	169.6	8.11	5.48	74.7	174.6	8.22	6.02	74.3
H.h. twice	165.9	9.37	7.16	65.2	181.6	9.11	7.32	69.2
Untreated	160.0	7.22	4.45	82.4	163.6	6.70	4.81	82.8
LSD at $_{0.05}$	6.0	0.70	0.84	5.9	6.4	0.68	0.77	6.0
Interaction								
A x B	NS	NS	NS	1.4	NS	NS	NS	2.0
A x C	NS	NS	NS	1.61	NS	NS	NS	1.68
B x C	NS	NS	NS	1.58	NS	NS	NS	1.60
A x B x C	NS	NS	NS	NS	NS	NS	NS	NS

These results are in conformity with the inferences of Moshtohry *et al.* (2007) and Fakkar *et al.* (2009). Mishra *et al.* (2013) found that higher protein content in sorghum grains was recorded by CSH 15R and CSH 16 due to higher nitrogen concentration .

2-Effect of nitrogen rates:-

Data in Tables 3 and 4 show that increasing N-fertilizer rates significantly increased plant height (cm), number of green leaves plant^{-1}, LAI, days to 50 % flowering, 1000-grain weight, grain yield (ard fed^{-1}) and protein % in both seasons except days to 50 % flowering in the first season. Application N- fertilizer rate at 130 kg N fed^{-1} gave the tallest plant (174.8 and 181.4 cm), highest number of green leaves plant^{-1} by (9.38 and 9. 22) and LAI (6.22 and 6.49) , respectively in both seasons. While, the least days to 50 % flowering (73.3 and 74.0 days) obtained from using 70 kg N fed^{-1}, respectively, in both seasons. These results may be attributed to nitrogen levels which have promoted the effects of the growth regulators and enzymes, enzymatic actives, photosynthetic processes as well as synthesis of protein, carbohydrates and lipids. The highest 1000-grain weight (31.0 and 32.6 g) obtained from N-fertilizer rate at 130 kg N fed^{-1}, respectively, in both seasons. The highest sorghum grain yield (ard fed^{-1}) was obtained at 130 kg N fed^{-1} by 17.1 and 17.3 % and protein % by 6.0 and 4.3 as compared to N- fertilizer rate at 70 kg N fed^{-1}, respectively in both seasons.

Table 4: Effect of grain sorghum genotypes, nitrogen rates and weed control treatments on yield and its components during 2013 and 2014 seasons.

Treatment	2013 season			2014 season		
	1000-grain weigh	Grain yield (ard fed^{-1})	Protein (%)	1000-grain weigh	Grain yield (ard fed^{-1})	Protein (%)
A- Grain sorghum genotypes						
Hybrid 305	27.7	24.00	10.74	28.4	25.36	10.76
Hybrid 306	28.7	26.01	10.83	29.5	26.64	10.94
Dorado	32.0	21.60	10.65	34.6	20.96	10.62
LSD at $_{0.05}$	3.4	2.5	0.06	3.5	3.7	0.08
B- Nitrogen rate kg N faddan^{-1}						
70	28.0	21.21	10.51	28.7	21.57	10.59
100	30.0	24.78	10.75	31.2	25.31	10.81
130	31.0	25.59	10.96	32.6	26.08	10.92
LSD at $_{0.05}$	1.7	2.4	0.09	1.6	2.4	0.08
C- Weed control treatments						
Prometryn	30.5	24.74	10.64	31.3	25.18	10.69
Pyrazolone	30.6	25.19	11.14	31.6	25.27	11.25
Pendimthalin	30.5	24.64	10.62	31.5	25.04	10.63
H.h. twice	32.2	26.54	11.46	33.3	26.97	11.50
Untreated	24.7	18.18	9.83	26.4	19.14	9.81
LSD at $_{0.05}$	4.4	4.5	0.08	2.5	4.5	0.09
Interaction						
A x B	NS	0.74	NS	NS	0.76	NS
A x C	0.76	0.80	NS	0.87	0.88	NS
B x C	NS	0.82	NS	NS	0.90	NS
A x B x C	NS	1.52	NS	NS	1.55	NS

These results are in agreement with those obtained by Saba *et al*. (1990), Bashir *et al*. (1994), Mourad *et al*. (2000), El-Aref and Ibrahim (2004), Mourad (2005), Mourad *et al*. (2006) and Abd El-Mawgoud (2012). Ogunlela and Okoh (1989) found that grain crude protein (CP) content and protein yield were increased 8 and 52 %, respectively by 60 kg N ha^{-1}.

3-Effect of weed control treatment :-

Data in Table 3 and 4 demonstrated that weed control treatments had a significant effect on plant height, number of green leaves plant^{-1}and LAI, flowering date %, 1000- grain weight, grain yield (ard fed^{-1}) and protein % in both seasons. The tallest plant of sorghum (177.4, 172.0 and 169.6 cm) resulted from Prometryn, pyrazolone and pendimthalin, respectively in the first season, while hand hoeing twice, prometryn and pendimthalin gave the tallest plants (181.6, 176.9 and 174.6 cm), respectively in the second season. Hand hoeing twice, prometryn and pyrazolone gave the highest number of green leaves plant^{-1} (9.37, 8.78, 8.41, 9.11, 8.70 and 8.22), respectively in the both seasons. Using hand hoeing twice, prometryn and pendimthalin gave the highest values of LAI (7.16, 5.48 and 5.48), respectively, in the first season. While, hand hoeing twice, pendimthalin and pyrazolone gave the best values of LAI (7.32, 6.02 and 5.87), respectively, in the second season. The earliest flowered of sorghum (65.2, 74.4, 74.7, 69.2, 73.4 and 74.3) were recorder from hand hoeing twice, pyrazolone and pendimthalin, respectively, in both seasons. The heaviest 1000- grain weight of sorghum was achieved from hand hoeing twice pyrazolone and pendimthalin (32.2, 30.6, 30.5, 33.3, 31.6 and 31.5 g), respectively, in both seasons. For grain yield (ard. fed.$^{-1}$), using hand hoeing twice, pyrazolone and prometryn gave the best values by 46.0, 38.6, 36.1 and 40.9, 32.0 and 31.6%, respectively, in

2013 and 2014 seasons as compared with untreated. The increase in grain yield of sorghum was attributed to the increase in plant height and leaf area index (LAI) and1000- grain weight. This was attributed to the decrease of weed /sorghum competition which was owing to weed elimination by herbicides or hand hoeing.

Hand hoeing twice and pyrazolone resulted in the maximum amount of grain protein content % (11.46, 11.14 and 10.64 %), respectively, in the first season and (11.50, 11.25 and 10.69 %), respectively, in the second season. These results are in agreement with those obtained by Everaats (1993), Kasole *et al.* (1994), Ishaku and Shittu (2014) and Khaffagy et al. (2015).

C- N- grain sorghum uptake:

1- Effect of genotypes :

Data in Table 5 indicated that the three sorghum genotypes varied in N % and N- uptake kg N fed^{-1} were significantly affected in both seasons. Hybrid 306 surpassed that other hybrids on N % (1.73 and 1.75 %) and N- uptake (63.59 and 65.75 %) in 2013 and 2014 seasons, respectively.

2-Effect of nitrogen rate:-

Data presented in Table 5 show that N % and N- uptake (kg N fed^{-1}) in grain sorghum significantly increased by increasing nitrogen rates from 70 up to 130 kg N fed^{-1}. The addition of the higher N- rate at 130 kg N fed^{-1} gave maximum of N % (1.75 and 1.75 %) and N- uptake (63.19 and 64.24 Kg N fed $^{-1}$), respectively, in both seasons. While, the minimum of N % (1.69 and 1.70 %) and N- uptake (50.23 and 51.40 Kg N fed $^{-1}$) resulted from N- rate at 70 kg N fed^{-1} , respectively, in both seasons. Similar results were obtained by Mishra *et al.* (2013) the nutrients (NPK) content in sorghum grain increased with increasing levels of nitrogen from 25 to 225 kg ha^{-1} but the effect was more pronounced on N content.

Table 5: Effect of grain sorghum genotypes, nitrogen rates and weed control treatments on grain sorghum content in 2013 and 2014 seasons.

Treatments	2013 season		2014 season	
	N (%)	N- uptake (kg fed^{-1})	N (%)	N- uptake (kg fed^{-1})
A- Grain sorghum genotypes				
Hybrid 305	1.70	58.11	1.72	60.61
Hybrid 306	1.73	63.59	1.75	65.75
Dorado	1.68	51.73	1.70	50.02
LSD at $_{0.05}$	0.04	4.14	0.02	3.95
B- Nitrogen rate kg N $faddan^{-1}$				
70	1.69	50.23	1.70	51.40
100	1.72	60.00	1.72	61.69
130	1.75	63.19	1.75	64.24
LSD at $_{0.05}$	0.02	2.28	0.01	3.20
C- Weed control treatments				
Prometryn	1.70	59.13	1.71	60.63
Pyrazolone	1.78	61.56	1.80	63.18
Pendimthalin	1.70	60.05	1.70	60.07
H.h. twice	1.80	68.25	1.84	69.63
Untreated	1.55	40.06	1.57	42.12
LSD at $_{0.05}$	0.06	4.25	0.09	3.00
Interaction				
A x B	NS	2.21	NS	2.07
A x C	NS	2.15	NS	2.30
B x C	NS	2.17	NS	2.32
A x B x C	NS	3.76	NS	4.01

3-Effect of weed control treatment :-

From the results in (Table 5) it could be concluded that weed control treatment significantly affected N % and N- uptake in grain sorghum in both seasons. Hand hoeing twice, pyrazolone and pendimthalin gave the highest values of N % (1.80, 1.78 and 1.70 %) and N- uptake in grain sorghum (68.25, 61.56 and 60.05 kg N fed^{-1}), respectively, in the first season. While, the highest N % (1.84, 1.80 and 1.71 %) and N- uptake in grain sorghum (69.63, 63.18 and 60.63 kg N fed^{-1}) were obtained from hand hoeing twice, pyrazolone and prometryn, respectively, in the second season. These results are in agreement with those obtained by Satao and Nalamwar (1993) they reported that uncontrolled weeds in sorghum depleted 29.94-51.05, 5.03-11.58 and 48.74-74.34 kg/ha NPK, respectively from soil.

D-Effect of the interactions on:

1-Effect of the interaction between genotypes and N-fertilizer rates.

The interaction between sorghum genotypes and N- fertilizer rates significantly affected the dry weight of grassy weeds, days of 50 % flowering, grain yield (ard fed^{-1}) and N- uptake (kg N fed^{-1}) in both seasons (Table 6). The integration between hybrid 306 with N-fertilizer rates at 70 kg $faddan^{-1}$ gave highest reduction of grassy weed by 83.6 and 78.9 %, respectively, in the first and second seasons as compared to Dorado variety with high N- fertilizer rate at 130 kg $faddan^{-1}$. The earliest flowered of sorghum (71.1 and 73.3 days) was

obtained from hybrid 306 with high N- fertilizer rate at 130 kg fed^{-1} than the latest flowered of sorghum (77.9 and 78.2 days) which obtained from Dorado variety with high N- fertilizer rate at 130 kg feddan^{-1}.

Table 6: Effect of interactions between genotypes and nitrogen rates on some traits of sorghum in 2013 and 2014 seasons.

Sorghum genotype	Nitrogen rates (Kg N fed^{-1})	2013 season				2014 season			
		Grassy weeds	Days to 50 % flowering	Grain yield (ard fed^{-1})	N- uptake (kg fed^{-1})	Grassy weeds	Days to 50 % flowering	Grain yield (ard fed^{-1})	N- uptake (kg fed^{-1})
Hybrid 305	70	76.0	72.2	20.31	48.01	101.7	74.3	21.67	51.67
	100	102.4	73.5	25.23	61.17	173.6	73.4	27.06	65.92
	130	150.3	75.6	26.36	65.14	212.6	75.5	27.33	67.22
Hybrid 306	70	42.1	72.9	23.07	55.28	61.1	73.5	23.77	57.51
	100	67.1	74.2	27.07	66.05	107.9	73.8	27.55	68.14
	130	98.0	71.1	27.89	69.45	160.6	73.3	28.59	71.61
Dorado	70	83.6	74.8	20.25	47.40	125.1	74.1	19.26	45.20
	100	142.7	76.4	22.04	52.79	212.4	77.6	21.32	51.00
	130	256.6	77.9	22.51	54.99	289.1	78.2	22.31	53.88
LSD at $_{0.05}$		12.9	1.4	0.74	2.21	21.0	2.0	0.76	2.07

The highest rate of N- fertilizer at 130 kg fed^{-1} with hybrid 306 increasing grain yield (ard fed^{-1}) by 37.7 and 48.4 % , respectively, in the first season and second seasons as compared to Dorado genotype with low N- fertilizer rate at 70 kg faddan^{-1}. The maximum N- uptake (69.45 and 71.61 kg N fed^{-1}) was obtained from integration between hybrid 306 and N- fertilizer rate at 130 kg faddan^{-1}, respectively, in the first and second seasons. While, The minimum N- uptake (45.20 and 47.40 kg N fed^{-1}) was obtained from integration between Dorado genotype and N- fertilizer rate at 70 kg faddan^{-1}. These results are in agreement with those obtained by Al-Nagar et al. (2006).

2. Effect of the interaction between sorghum genotypes and weed control treatments:

The effect of interaction between sorghum genotypes and weed control treatments on dry weights of broad leaved, grassy, total weeds, 1000-grain weight, days to 50 % flowering, grain yield (ard fad.$^{-1}$) and N-uptake were statistically significant at (0.05) level, in 2013 and 2014 seasons (Tables 7 and 8).

On weeds

The data in Table 7 revealed that hybrid 306 with hand hoeing twice and pyrazolone herbicide gave the highest reduction of dry weight of broad-leaved (92.6 and 91.6 %), grassy weeds (94.2 and 89.4 %) and total weeds (93.1 and 90.9 %), respectively, in the first season.

Table 7: Effect of the interaction between sorghum genotypes and weed control treatments on dry weight of weeds (g m^{-2}) in 2013 and 2014 seasons.

Sorghum genotypes	Weed control treatments	Rate (g a.i fed^{-1})	2013 season Dry weight of weeds (g m^{-2})			2014 season Dry weight of weeds (g m^{-2})		
			Broad-leaved weeds	Grassy weeds	Total weeds	Broad-leaved weeds	Grassy weeds	Total weeds
Hybrid 305	Prometryn	500	242.7	97.1	339.8	260.5	178.6	439.1
	Pyrazolone	60	115.5	66.6	182.1	127.4	83.3	210.7
	Pendimthalin	455	154.5	80.7	235.2	173.4	131.7	305.1
	H.h. twice	-	90.5	38.2	128.7	98.4	56.1	154.5
	Untreated	-	691.9	265.4	957.3	805.2	363.3	1168.5
Hybrid 306	Prometryn	500	93.4	52.7	146.2	244.1	99.7	343.8
	Pyrazolone	60	63.3	34.8	98.1	158.7	61.6	220.3
	Pendimthalin	455	124.1	62.8	186.9	227.3	82.5	309.8
	H.h. twice	-	55.8	19.4	75.2	114.0	29.1	143.1
	Untreated	-	480.0	175. 4	655.4	483.8	276.4	760.2
Dorado	Prometryn	500	204.0	107.2	311.1	335.9	172.1	508.0
	Pyrazolone	60	158.7	77.3	236.0	195.0	104.5	299.5
	Pendimthalin	455	218.9	133.2	352.1	311.2	137.4	448.6
	H.h. twice	-	118.6	37.9	156.5	136.7	68.0	204.6
	Untreated	-	754.7	329.1	1083.8	875.6	562.5	1438.1
LSD at $_{0.05}$			74.7	13.6	39.6	39.5	26.7	46.5

While, hybrid 306 and 305 with hand hoeing reduced dry weight of broad-leaved (87.0 and 88.8 %) grassy weeds (94.8 and 90.0 %) and total weeds (90.0 and 89.3 %), respectively, in the second season as compared to Dorado variety with untreated. This may be owing to the role of genotypes on suppressing weed growth. The differences between the three sorghum genotypes under this study could be due to their genetic variation and their response to the environmental conditions.

On sorghum

Data in table (8) revealed that the interactions between hybrid 306 with hand hoeing twice gave the lowest days to 50 % flowering (66.0 and 68.4 days) than hybrid 306 with untreated (79.8 and 80.4 days) which gave the highest days to 50 % flowering, respectively, in both seasons. The heaviest 1000- grain weight (35.6 and 37.1 g) was obtained from Dorado variety with hand hoeing twice, respectively, in both seasons.

Table 8: Effect of the interaction between sorghum genotypes and weed control treatments on growth characters in 2013 and 2014 seasons.

Genotype	Weed control treatment	Rate (g a.i fed-1)	Days to 50 % Flowering	1000-grain weight	Grain yield (ard fed^{-1})	N-uptake (kg fed^{-1})	Days to 50 % Flowering	1000-grain weight	Grain yield (ard fed^{-1})	N-uptake (kg fed^{-1})
			2013 season				2014 season			
Hybrid 305	Prometryn	500	72.8	28.71	25.81	61.71	73.4	29.36	27.44	65.78
	Pyrazolone	60	72.9	28.46	25.39	61.77	72.3	29.10	26.47	66.69
	Pendimthalin	455	74.2	28.41	25.41	60.59	73.1	29.12	25.63	61.13
	H.h. twice	-	67.7	30.38	27.03	69.43	70.0	31.34	28.37	73.11
	Untreated	-	77.1	22.59	17.31	37.02	78.00	22.97	18.87	41.31
Hybrid 306	Prometryn	500	77.8	29.93	28.03	66.75	76.8	30.82	27.59	68.36
	Pyrazolone	60	76.4	29.56	28.13	69.71	75.0	30.42	28.17	70.32
	Pendimthalin	455	77.6	28.91	27.57	66.25	74.4	29.54	27.93	67.57
	H.h. twice	-	66.0	30.54	28.88	74.89	68.4	31.62	29.82	78.31
	Untreated	-	79.8	24.51	18.47	40.38	80.4	25.23	19.67	44.21
Dorado	Prometryn	500	73.5	32.92	20.59	48.93	73.4	34.59	20.31	47.77
	Pyrazolone	60	71.0	33.44	21.59	53.19	71.8	34.47	21.32	52.53
	Pendimthalin	455	70.7	34.33	22.61	53.30	71.6	35.96	21.98	51.51
	H.h. twice	-	66.9	35.56	23.72	60.44	70.6	37.02	22.71	57.49
	Untreated	-	76.3	26.14	19.60	42.79	77.3	26.3	18.97	40.83
LSD at $_{0.05}$			1.61	0.76	0.80	2.15	1.68	0.87	0.88	2.30

While, the lowest 1000- grain weight (22.6 and 23.0 g) was obtained from hybrid 305 with untreated, respectively, in both seasons. The interactions between hybrid 306 with hand hoeing twice increased sorghum grain yield by 66.8 and 58.0 %, respectively, in both seasons compared to hybrid 305 with untreated. The maximum N- uptake (74.9 and 78.3 kg N fed^{-1}) was obtained from integration between hybrid 306 and hand hoeing twice, respectively, in the first and second seasons. While, The minimum N- uptake (37.0 and 40.8 kg N fed^{-1}) was obtained from integration between hybrid 306 and Dorado variety and untreated, respectively, in both seasons.

3. Effect of interaction between nitrogen levels and weed control treatments.

The interaction between nitrogen rates and weed control treatments significantly effect on dry weight of grassy, broad-leaved, total weeds, days to 50 % flowering, grain yield (ard fed^{-1}) and N- uptake were statistically significant at (0.05) level, in 2013 and 2014 seasons (Tables 9 and 10).

On weeds

Results in Table 9 indicated that hand hoeing twice and pyrazolone herbicide under nitrogen rate at 70 reduce dry weights of broad-leaved (91.7 and 88.6 %) , grassy (94.4 and 91.1 %) and total weed (92.5 and 88.9 %), respectively, in 2013 season as compared with untreated under nitrogen rate at 130 kg fed^{-1}.

Also, interaction between hand hoeing twice with 70 and 100 kg N fed^{-1} reduce dry weight broad-leaved (89.9 and 86.3 %), grassy (94.6 and 91.0 %) and total weed (91.7 and 88.2 %), respectively, in 2014 season as compared with untreated under nitrogen rate at 130 kg Nfaddan^{-1}.

On sorghum

Data in Table 10 show that nitrogen rate at 70 kg fed^{-1} with hand hoeing twice gave the earliest plant (61.3 and 68.4 days), respectively, in both seasons as compared to nitrogen rate at 70 kg fed-1 with untreated (81.8 and 82.4 days).

Table 9: Effect of interactions between nitrogen levels and weed control treatments on dry weight of weeds (g m^{-2}) in 2013 and 2014 seasons.

Nitrogen rate (kg N fed^{-1})	Weed control treatment	Rate (g a.i fed^{-1})	Broad-leaved weeds	Grassy weeds	Total weeds	Broad-leaved weeds	Grassy weeds	Total weeds
			2013 season			2014 season		
	Prometryn	500	142.1	53.2	195.3	233.3	94.5	327.9
	Pyrazolone	60	84.9	34.4	119.3	147.2	55.5	202.7
70	Pendimthalin	455	120.3	57.6	177.7	185.4	71.7	257.1
	H.h. twice	-	61.8	18.6	80.3	89.9	30.5	120.3
	Untreated	-	552.1	172.4	724.5	579.4	227.6	807.0
	Prometryn	500	180.3	79.8	260.1	282.1	157.2	439.3
	Pyrazolone	60	115.8	57.0	172.8	162.5	83.4	246.0
100	Pendimthalin	455	161.7	90.1	151.8	234.4	125.6	360.0
	H.h. twice	-	91.2	29.6	120.8	121.6	51.1	172.7
	Untreated	-	632.0	263.6	895.6	696.0	405.8	1101.8
	Prometryn	500	217.7	124.0	341.7	325.1	198.7	523.8
	Pyrazolone	60	136.8	87.2	224.0	171.4	110.5	281.8
130	Pendimthalin	455	215.5	128.9	344.5	292.0	154.4	446.4
	H.h. twice	-	111.8	47.4	159.2	137.6	71.7	209.3
	Untreated	-	742.4	333.9	1076.3	889.2	568.7	1458.0
	LSD at $_{0.05}$		36.0	13.6	39.6	39.0	26.5	53.7

Table 10 : Effect of the interaction between nitrogen rates and weed control treatments on growth characters in 2013 and 2014 seasons.

Nitrogen rates (kg N fed^{-1})	Weed control treatments	Rate g a.i/ fed^{-1}	2013 season			2014 season		
			Days to 50 % flowering	Grain yield (ard fed^{-1})	N-uptake (kg fed^{-1})	Days to 50 % flowering	Grain yield (ard fed^{-1})	N-uptake (kg fed^{-1})
	Prometryn	500	76.6	20.83	48.64	76.0	20.26	48.24
	Pyrazolone	60	76.3	22.58	55.44	75.0	22.73	56.39
70	Pendimthalin	455	75.5	21.81	50.99	74.4	21.87	51.48
	H.h. twice	-	61.3	23.44	59.48	68.4	23.76	60.48
	Untreated	-	81.8	17.37	36.69	82.4	18.23	38.79
	Prometryn	500	74.9	23.92	56.60	73.9	23.42	56.34
	Pyrazolone	60	73.4	25.99	65.27	72.6	26.27	66.33
100	Pendimthalin	455	75.8	23.29	54.80	74.8	23.47	55.93
	H.h. twice	-	67.6	27.47	70.56	70.1	27.09	72.89
	Untreated	-	78.9	18.24	40.70	79.3	19.30	42.85
	Prometryn	500	72.6	24.47	60.57	73.7	24.13	58.82
	Pyrazolone	60	73.5	26.36	66.09	72.6	27.12	68.83
130	Pendimthalin	455	73.3	24.48	60.14	73.8	25.20	60.80
	H.h. twice	-	66.7	28.72	74.72	69.1	29.06	75.53
	Untreated	-	76.4	18.92	42.79	77.6	19.88	44.70
	LSD at $_{0.05}$		1.58	0.82	2.17	1.60	0.90	2.32

The highest grain yield obtained from integration between nitrogen rate at 130 kg fed^{-1} with hand hoeing twice by 65.3 and 59.4 %, respectively, in the first and second seasons as compared with the lowest nitrogen rate at 70 kg fed^{-1} and untreated. The maximum N- uptake (74.7and 75.5 kg N fed^{-1}) was obtained from hand hoeing twice under nitrogen rate at 130 kg fed^{-1}, respectively, in the first and second seasons. While, The minimum N- uptake (36.7 and 38.8 kg N fed^{-1}) was obtained from integration between the lowest nitrogen rate at 70 kg fed^{-1} with untreated, respectively, in both seasons.

4- Interaction among genotypes, nitrogen levels and weed control treatments

The effect of interaction among sorghum genotypes, nitrogen rates and weed control treatments were statistically significant on dry weight of grassy and total weeds, grain yield (ard fed^{-1}) and N- uptake in both seasons at 0.05 levels (Table 11). The integration between hybrid 306 with hand hoeing twice and pyrazolone herbicide under nitrogen rate at 70 and 100 kg $faddan^{-1}$ reduce dry weight of grassy by 96.1, 96.0 and 93.2 %, respectively, in the first season. The highest reduction dry weight of total weeds obtained from interaction among hybrid 306 and 305 with hand hoeing

twice under nitrogen rates at 70 and 100 kg faddan^{-1} by 95.3, 94.5 and 91.8 %, respectively, in the second season. The highest sorghum grain yield (ard fed^{-1}) achieved from integration among hybrid 306 and 305 with hand hoeing twice and pyrazolone herbicide and nitrogen rate at 130 kg fed^{-1} by 89.3, 82.9 and 82.8 %, respectively, in the first season and from hybrid 306 and 305 with hand hoeing twice under nitrogen rate at 130 and 100 kg N faddan^{-1} by 77.2, 72.6 and 72.2%, respectively, in the second. Also, The highest N- uptake achieved from integration among hybrid 306 with hand hoeing twice under nitrogen rate at 130 kg N fed^{-1} (81.8 and 84.7 kg N fed^{-1}), respectively, in the first and second seasons.

This may be attributed to the major role of either herbicides or mechanical methods and the role of cultural practices mainly in genotypes.

Table 11: Effect of interaction between sorghum genotypes, nitrogen rates and weed control treatments on dry weight of weeds (g), yield (ard fed^{-1}) and N- uptake in 2013 and 2014 seasons.

Sorghum genotypes	Nitrogen rates (kg N fed^{-1})	Weed control treatments	2013 season Broad-leaved weeds	2013 season Grain yield (ard fed^{-1})	2013 season N-uptake (kg fed^{-1})	2014 season Total weeds	2014 season Grain Yield (ard fed^{-1})	2014 season N-uptake (kg fed^{-1})
Hybrid 305	70	Prometryn	164.2	21.57	49.90	325.6	23.63	55.56
		Pyrazolone	95.6	20.80	51.30	171.0	22.03	55.21
		Pendimthalin	112.3	20.07	46.76	207.7	20.63	48.67
		H.h. twice	59.5	22.50	56.91	104.8	24.07	61.06
		Untreated	588.3	16.60	35.17	875.6	18.00	37.85
	100	Prometryn	232.9	27.80	65.88	431.0	29.20	69.81
		Pyrazolone	114.7	26.53	66.47	207.9	28.23	71.19
		Pendimthalin	154.6	26.87	63.44	306.4	28.63	68.13
		H.h. twice	94.2	28.50	73.26	154.7	30.03	77.87
		Untreated	659.2	16.47	36.77	1200.6	19.20	42.59
	130	Prometryn	312.6	28.07	69.34	560.8	29.50	71.96
		Pyrazolone	136.3	27.03	67.54	253.2	29.13	73.66
		Pendimthalin	196.7	29.30	71.56	401.4	27.63	66.59
		H.h. twice	117.7	30.10	78.13	204.2	31.00	80.41
		Untreated	784.6	17.30	39.12	1429.2	19.40	43.50
Hybrid 306	70	Prometryn	79.4	24.57	57.75	258.0	24.40	57.79
		Pyrazolone	33.1	24.03	60.00	169.6	23.90	60.23
		Pendimthalin	94.3	23.87	56.21	217.8	24.83	58.95
		H.h. twice	32.5	25.47	65.46	89.9	26.50	68.38
		Untreated	314.7	17.40	36.98	495.4	19.23	68.38
	100	Prometryn	94.1	28.40	67.95	352.5	29.57	42.17
		Pyrazolone	59.1	29.43	74.42	226.0	29.07	71.66
		Pendimthalin	110.4	29.20	69.44	323.1	28.47	74.31
		H.h. twice	56.5	30.00	77.38	160.8	31.07	81.71
		Untreated	510.8	18.33	41.04	732.2	19.57	44.26
	130	Prometryn	106.7	29.60	74.53	421.0	29.80	75.62
		Pyrazolone	97.8	30.13	74.71	265.4	30.53	76.43
		Pendimthalin	167.7	29.67	73.08	388.6	30.50	74.99
		H.h. twice	78.2	31.17	81.82	178.7	31.90	84.82
		Untreated	614.2	18.90	43.11	1052.9	20.20	46.20
Dorado	70	Prometryn	182.6	19.37	44.26	400.0	18.73	43.35
		Pyrazolone	126.1	19.93	49.01	267.7	19.27	47.70
		Pendimthalin	154.2	21.50	49.75	345.8	20.13	46.60
		H.h. twice	93.3	22.37	56.07	166.4	20.70	52.00
		Untreated	753.3	18.10	37.93	1049.8	17.47	36.36
	100	Prometryn	213.9	21.57	50.61	534.4	20.50	48.56
		Pyrazolone	173.6	22.00	54.93	304.0	21.50	53.49
		Pendimthalin	220.1	22.80	53.10	450.7	22.30	52.11
		H.h. twice	122.8	23.90	61.03	202.5	23.17	59.09
		Untreated	726.1	19.93	44.29	1372.5	19.13	41.71
	130	Prometryn	233.8	21.20	51.93	589.6	21.37	51.39
		Pyrazolone	176.3	22.43	55.62	326.9	22.43	56.40
		Pendimthalin	282.3	23.47	57.06	549.2	23.47	55.81
		H.h. twice	139.6	24.90	64.22	245.1	24.27	61.37
		Untreated	828.2	20.57	46.13	1891.6	20.03	44.41
LSD at $_{0.05}$			62.3	1.52	3.76	93.1	1.55	4.01

5- Correlation analysis

Data presented in Table 12 indicated that broad leaved, grassy and total annual weeds were negatively and significantly correlated with plant height, LAI, 1000- grain weight, grain yield, protein % and N-uptake in both seasons. While, broad leaved, grassy and total weeds were positively and significantly correlated with days to 50 % flowering in both seasons. Also, the results revealed that LAI and grain yield were positively and significantly correlated with plant height, LAI, 1000- grain weight, grain yield, protein % and N-uptake in both seasons. Moreover, it was negatively and significantly correlated with days to 50 % flowering in both seasons.

Table 12. Correlation analysis between some studied traits in 2013 and 2014 seasons.

Traits	Plant height (cm)	LAI	Days to 50 % flowering	1000-grain weight (g)	Grain Yield (ard fed^{-1})	Protein %	N-uptake (kg N fed^{-1})
2013 season							
Broad-leaved weeds	-0.28**	-0.47**	0.63**	-0.51**	-0.60**	-0.71**	-0.65**
Grassy weeds	-0.27**	-0.43**	0.68**	-0.37**	-0.51**	-0.62**	-0.56**
Total weeds	-0.28**	-0.63**	0.66**	-0.48**	-0.58**	-0.69**	-0.63**
LAI	0.52**	-	-0.60**	0.27**	0.63**	0.73**	0.69**
Grain Yield (ard fed^{-1})	0.57**	0.63**	-0.48**	0.44**	-	0.69**	0.99**
2014 season							
Broad-leaved weeds	-0.32**	-0.50**	0.63**	-0.51**	-0.60**	-0.71**	-0.65**
Grassy weeds	-0.26**	-0.35**	0.68**	-0.37**	-0.51**	-0.62**	-0.56**
Total weeds	-0.30**	-0.45**	0.83**	-0.26**	-0.50**	-0.73**	-0.58**
LAI	0.50**	-	-0.51**	0.45**	0.64**	0.72**	0.70**
Grain Yield (ard fed^{-1})	0.80**	0.64**	-0.58**	0.22*	-	0.69**	0.99**

CONCLUSION

From the previous results we can concluded that the best integration from view point of weed control is to grow sorghum hybrid 306 with applying pyrazolone herbicide under high nitrogen fertilizer rate (130 Kg N fed^{-1}) to control weeds and produce high grain yield production faddan^{-1}.

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تأثير إضافة التسميد النتروجيني و معاملات مكافحة الحشائش علي الحشائش و إنتاجية بعض التراكيب الوراثية للذرة الرفيعة.

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تعتبر مكافحة الحشائش فى الذرة الرفيعة أكبر تحد نظرا لقلة عدد مبيدات الحشائش المسجلة على هذا المحصول فى مصر. لذلك أجريت هذه الدراسة في محطة البحوث الزراعية بشندويل في الموسم الصيفي ٢٠١٣ و ٢٠١٤ علي التوالي. لدراسة تأثيرتوليفة من ٤٥ معاملة هى عبارة ثلاثة مستويات التسميد النتروجيني (٧٠، ١٠٠ و١٣٠ كجم/ف) وخمس معاملات من مكافحة الحشائش مبيد جيساجارد (بروميترين) ٥٠.٠% بمعدل ٥٠٠ جم مادة فعالة /ف بعد الزراعة وقبل الري ، مبيد ستلرستار (بيرازولون) بمعدل ٦٠جم مادة فعالة /ف بعد الزراعة وقبل الري ، ومبيد ستومب اكسترا (بنديمثالين) ٤٥.٥% بمعدل ٤٥٥ جم مادة فعالة /ف بعد الزراعة وقبل الري ،عزيق مرتين بعد ١٨ و٤٥ يوم من الزراعة بدون معاملة) علي إنتاجية ثلاثة تراكيب وراثية من الذرة الرفيعة للحبوب (هجين ٣٠٥، هجين ٣٠٦ و الصنف دورادو). وقد استخدم في هذه الدراسة نظام القطع المنشقة مرتين مع ثلاث مكررات حيث وضعت هجن الذرة الرفيعة في القطع الرئيسة ووضعت مستويات التسميد النتروجيني بالقطع الشقية الأولي ووزعت معاملات مكافحة الحشائش عشوائيا في القطع الشقية الثانية.

أشارت النتائج إلى أن زراعة الهجين ٣٠٦ أعطى أعلى انخفاض فى الوزن الجاف للحشائش عريضة وضيقة الأوراق و الكلية وأعلى محصول من الذرة الرفيعة ومكوناته مقارنة بالتراكيب الوراثية الأخرى.

أعطى استخدام التسميد النيتروجينى بمعدل٧٠ كجم نيتروجين/ ف أعلى انخفاض فى الوزن الجاف للحشائش عريضة وضيقة الأوراق و الكلية وأقل محصول من الذرة الرفيعة ومكوناته مقارنة بالتسميد النيتروجينى بمعدل١٣٠ كجم نيتروجين/ ف.

أثرت معاملات الحشائش تأثيرا معنويا على الوزن الجاف للحشائش العريضة والضيقة والكلية (جم م^{2}) فى الموسمين

أعطت معاملة العزيق مرتين بعد ٢٠ و٤٥ يوم من الزراعة و مبيد الحشائش بيرازولون أعلي انخفاض في الوزن الجاف للحشائش الكلية بمقدار ٨٦,٦ و٨٠,٩ % فى الموسم الأول و٨٧,٣ و٨١,٥ % فى الموسم الثانى وأعلى محصول للذرة الرفيعة بمقدار ٤٦,٠ و٣٨,٦ % فى الموسم الأول و٤٠,٩ و٣٢,٠% فى الموسم الثانى على التوالى بالمقارنة بمعاملة الكنترول.

أدى التكامل ما بين هجين ٣٠٦ و معاملة العزيق مرتين بعد ٢٠ و٤٥ يوم من الزراعة و مبيد الحشائش بيرازولون تحت التسميد النيتروجينى بمعدل١٣٠ كجم نيتروجين/ ف إلى الحصول على أعلى محصول، أفضل كفاءة لامتصاص النيتروجين وأعلى بروتين للذرة الرفيعة.

يمكن تحت ظروف هذه الدراسة التوصية بزراعة هجين ٣٠٦ واستخدام معاملة العز يق مرتين

و مبيد الحشائش بيرازولون تحت التسميد النيتروجينى بمعدل١٣٠ كجم نيتروجين/ ف لتحسين إنتاجية الذرة الرفيعة.