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COMPARISON BETWEEN WHEAT AND TRITICALE UNDER UNFEVORABEL SOIL CONDITIONS

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ABSTRACT

Four experiments were carried out. Two experiments were grown in each of Ismailia and Tag El-Ezz Agricultural Research Station in 1997/1998 and 1998/1999 growing seasons. Ismailia and Tag El-Ezz experimental soils representing a sandy soil with drought stress conditions and salt affected clay soil.

Two triticale varieties (Juan and the new line T. line 1) and the commercial bread wheat cultivar Sids 1 were used. The varieties were grown in split-split plot in RCB design under three nitrogen levels (60, 90 and 120 kg N/faddan) with three seeding rates (200, 300 and 400 seeds/m^2). Data of grain yield and yield components were recorded from all the experiments.

Analysis of variance indicated that the mean grain yield in sandy soil (10.20 ardab/ faddan) was higher than that in saline soil (7.24 ardab/faddan). That was true with number of spikes/m^2 and 1000-kernel weight. The new triticale "T. line 1" significantly outyielded the other varieties and produced 11.17 ardab/faddan in sandy soil. No significant differences were observed between varieties in saline soil.

In sandy soil, grain yield responded up to 90 kg N/faddan and recorded 10.74 ardab/ faddan, while in saline soil the nitrogen level of 60 kg/faddan seems to be adequate, since it gave the higher grain yield of 7.86 ardab/faddan. Nitrogen level had the same significant effect on number of grains/spike and with insignificant effect on either number of spikes/m^2 or 1000-kernel weight, in both soils.

Seeding rate had a significant effect on grain yield and yield components in sandy soil only. The higher seeding rate (400 seeds/m^2) produced higher grain yield (11.03 ardab/faddan). The same trend was observed in the three yield components.

Under sandy soil conditions, in Ismailia, the nitrogen level of 60kg N/faddan was enough for Juan to produce its highest grain yield, while T. Line 1 gave the highest grain yield with 90 kg N/faddan. Sids 1 responded up to 120 kg N/faddan.

Generally, the highest grain yield produced when T. Line 1 was grown under 90 kg N/faddan using 400 grains/m^2.

INTRODUCTION

Triticale has been grown in Europe, North and South America and Asia (Wolski, 1991). Interest in Triticale mainly concerns its potential as a small grain cereal. It is known for its stress tolerance and thus lends itself to be most useful as a field crop for arid and semi arid regions, as well as for poor quality soils.

Nutritionally, it is with much as 18-20% of protein, superior to contemporary wheat. The protein is composed of high percentage of an amino acid lysine, which is an essential ingredient of human and animal nutrition. It is true that the grain is rather coarse and lacks in sufficient gluten content (Kempanna and Seetharam, 1972). So, it cannot make good bread flour. However, Triticale could be used in babies food and cereals and/or

animal nutrition. In Egypt, Triticale could be grown for these reasons, especially under stress conditions.

Many investigators, indicated that the grain yield of wheat, barley, triticale and other cereals could be increased by improving the agronomic practices and optimizing inputs, i.e. nitrogen fertilizer, seeding rate, irrigation water, …etc.

Increasing levels of nitrogen fertilizer usually improves cereal grain yields (Nielsen and Havorson, 1991, Nuttal and Malhi, 1991, Ayoub *et al*., 1994 and Koziara, *et al*., 1995). However, the response to nitrogen inputs is influenced by the interactions between nitrogen fertility and other factors (Ayoub *et al*., 1994). Also, seeding density provides an alternative method of influencing production (Turner *et al*., 1994). Soman *et al*., 1987) showed that increased variation in plant spacing (with extremely high or low seeding rate) usually decreased cereal grain yield, sometimes by as much as a third.

Accordingly, grain yield of triticale is strongly influenced by seeding rate (Podolska, 1994, Koziara, 1995 and Garcia del Moral *et al*., 1995), and could accounted remarkable percentage increase.

The objectives of this work are to compare the grain yield of bread wheat with that of triticale and to identify if triticale could yield better than bread wheat when grown under unfavorable soil conditions. Also, to find out the optimum agronomic agricultural practices, which could help higher grain yield.

MATERIALS AND METHODS

Four field trials were carried out, two in each of 1997/1998 and 1998/1999 growing season. The trials were grown in the experimental farms of Ismailia and Tag El-Ezz Agricultural Research Stations. The two respective farms representing sandy soil conditions, suffering from drought stress and low soil fertility, and a salt affected clay soil, with EC of 8.8 and 8.1 mmohs/cm 20 ^{o}C in the two respective seasons.

The tested varieties were the imported triticale variety “Juan”, which imported from CIMMYT and the local one “Triticale line # 1 (T. line 1)”, which produced from the local breeding program, and the commercial bread wheat cultivar Sids 1, as a check cultivar. The three nitrogen levels were 60, 90 and 120 kg N/faddan, in a form of ammonium nitrate (33.5% N), while the three seeding rates were 200, 300 and 400 seeds/m^2. Treatments were arranged in a split-split plot of four Randomized Complete Blocks Design. The three tested varieties were allocated in the main plots and the three nitrogen levels were distributed in the sub plots. The sub-sub plots were occupied by the three seeding rates. Trials were drilled in plots of 12 rows, 3.5 m long and 20 cm apart. The other cultural practices of growing wheat were followed as recommended for the conditions.

At crop maturity, the internal 10 rows (7 m^2 area) were manually harvested at ground level from each plot and mechanically threshed to estimate the grain yield. Grain yield was adjusted to ardab per faddan. The yield components were determined from each plot as follows:

- Number of spikes per m^2 (NS), estimated as a number of spikes of the three central rows, and adjusted to number of spikes per m^2,
- Number of grains per spike (NG), estimated on the basis of 20 spikes, randomly collected from the plot.
- 1000-kernel weight in grams (KW), estimated as an average of three samples.

The data were subjected to statistical analysis for each season and to combined analysis, according to Steel and Torrie (1984).

RESULTS AND DISCUSSION

Differences between varieties

In Ismailia "sandy soil" the new triticale variety "T. line1" surpassed the other triticale variety and also, the bread wheat Sids 1 by an averaged of 1.4 and 1.5 ardab/ faddan or 14.3 and 15.8%, respectively. It yielded an averaged of 11.17 ardab/faddan, by 10.98 and 11.35 ardab/faddan in the two respective seasons (Table 1).

Table 1: Effects of variety on grain yield and yield components in the two seasons (S1 and S2).

Variety	Ismailia			Tag El-Ezz		
	S1	S2	Mean	S1	S2	Mean
	Grain yield, ardab/faddan					
Juan	10.18	9.35	9.77	7.45	7.21	7.33
T. Line 1	10.98	11.35	11.17	7.32	7.03	7.18
Sids 1	9.48	9.82	9.65	7.09	4.35	7.22
Mean	10.21	10.17	10.20	7.29	7.20	7.24
LSD 0.05	0.09	0.06	0.05	N.S.	N.S.	N.S.
	No. spikes/m^2					
Juan	367	321	344	208	203	206
T. Line 1	376	333	354	205	204	205
Sids 1	369	307	338	208	206	207
Mean	371	320	345	207	204	206
LSD 0.05	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
	No. grains/spike					
Juan	39.5	38.8	39.1	49.9	49.4	49.7
T. Line 1	44.4	40.9	42.7	50.8	50.1	50.5
Sids 1	49.0	36.5	41.8	48.3	51.1	49.7
Mean	44.3	38.7	41.2	49.7	50.2	49.9
LSD 0.05	2.1	0.6	1.0	N.S.	N.S.	N.S.
	1000-kernel weight, gm					
Juan	48.1	32.3	40.2	39.0	37.3	38.1
T. Line 1	48.3	34.9	41.6	38.7	37.9	38.3
Sids 1	46.1	28.8	37.5	38.1	38.6	38.4
Mean	47.5	32.0	39.8	38.6	37.9	38.3
LSD 0.05	1.1	0.8	0.6	N.S.	N.S.	N.S.

These results could be attributed to the significant differences between number of grains/spike and 1000-kernel weight, which were in favor of the new line "T. line 1". Moreover, this line had insignificant higher number of spikes/m^2. Koczowsha and Korona, 1995 and Podolska, 1994, reported that grain yield of triticale is positively correlated to the number of grains/spike and productive tillering.

The same trend was observed in Tag El-Ezz "saline soil", but with insignificant differences. The insignificant differences between grain yields and yield components, of the three tested varieties, in saline soil may be because of the salinity levels (8.8 and 8.1 mmohs/cm 20 ^oC), which could be higher enough to affect normal growth and cause the absence of significance.

Effect of nitrogen level

Nitrogen level had a significant effect, only on grain yield and number of grains/ spike, in both locations (Table 2). In either sandy or saline soil type, increasing nitrogen application over the rate of 60 kg N/faddan, significantly increased grain yield to the average of 10.74 and 7.87, respectively.

Table 2. Effects of nitrogen level (NL) on grain yield and yield components during the two seasons (S1 and S2).

NL	Ismailia			Tag El-Ezz		
Kg/faddan	S1	S2	Mean	S1	S2	Mean
	Grain yield, ardab/faddan					
60	9.62	9.81	9.72	6.70	7.20	6.95
90	10.94	10.53	10.74	8.38	7.37	7.87
120	10.53	10.19	10.36	6.77	7.33	7.05
Mean	10.36	10.18	10.27	7.28	7.30	7.29
LSD 0.05	0.07	0.11	0.06	0.38	N.S.	0.28
	No. spikes/m^2					
60	346	308	327	207	200	204
90	369	331	350	209	207	208
120	367	330	348	205	205	205
Mean	360	320	341	207	204	206
LSD 0.05	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
	No. grains/spike					
60	50.6	32.4	41.5	46.1	49.6	47.9
90	51.0	38.8	44.9	52.8	51.4	52.1
120	49.3	30.9	40.1	50.1	49.5	49.8
Mean	50.3	34.0	42.2	49.7	51.2	49.9
LSD 0.05	1.2	0.4	0.6	3.3	N.S.	2.7
	1000-kernel weight, gm					
60	47.7	32.0	39.9	40.1	39.1	39.6
90	47.4	33.3	40.4	38.0	37.0	37.5
120	47.5	31.7	39.6	37.1	37.6	37.4
Mean	47.5	32.3	39.6	38.4	37.9	38.2
LSD 0.05	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

Grain yield responded up to the level of 90 kg N/faddan. The additional increase in nitrogen level up to 120 kg N/ faddan had a positive effect and slightly decreased grain yield. It is true either in individual season or when data were combined. Higher nitrogen fertilizer level of 120 kg N/faddan, gave an average grain yield of 10.36 and 7.05 ardab/faddan in the two respective soil types.

These results may be due to the significant increase in number of grains/spike when the level of 90 kg N/faddan was applied.

On the other hand, nitrogen application did not affect number of spikes/m^2 and 1000-kernel weight (Table 2).

However, insignificantly higher number of spikes/m^2 and higher 1000-kernel weight was obtained under nitrogen level of 90 kg N/faddan. That is true in individual seasons and when data were combined under both soil types.

The same results were obtained by Fatyga and Chrzanowska, 1994, Koziara *el al*., 1995 and Wrobel and Budzynski, 1995. They had a high triticale grain yield by applying a mediator nitrogen level (200 kg N/ha). Also, they stated that the dose of nitrogen fertilizer caused a reduction in 1000-kernel weight.

Effect of seeding rate

Results in Table 3 indicated that seeding rat had a significant effect on grain yield and yield components under the sandy soil only. Each increase in seeding rate dramatically increased grain yield. Increasing seeding rate from 200 to 300 seeds/m^2 increased grain yield/faddan by an average of 1.00 ardab or 10.8%. Additional 100 seeds/m^2 caused an average increase of 0.75 ardab or 7.3%. The three tested seeding rate, i.e. 200, 300 and 400 seeds/m^2, increased grain yield from 9.41 to 10.72 and 10.31 ardab/faddan, and from 9.15 to 10.24 and 11.13 ardab/faddan in the two respective seasons.

The increase in grain yield is mainly due to the significant increase in number of spikes/m^2 by increasing seeding rate up to 400 seeds/m^2 (Table 3). The highest number of spikes/m^2 was 378 and 376 in the two respective seasons, by an average of 377.

Adary *et al*. (1992) and Koziara *et al*. (1995) also, obtained the highest grain yield with the highest seeding rate they used, by increasing number of spikes/m^2.

In contrary, each increase in seeding rate significantly decreased number of grains/spike and 1000-kernel weight. The highest average number of grains/spike was 45.5 and the highest 1000-kernel weight was 41.8 when only 200 seeds/m^2 were grown. Increasing seeding rate from 200 to 300 and/or 400 seeds/m^2 decreased number of grains/spike to 41.4 and to 36.6 or by 9.9 and 13.1%, and 1000-kernel weight to 39.3 and 38.3 or by 6.4 and 2.6%, respectively.

Table 3: Effects of seeding rate on grain yield and yield components during the two seasons (S1 and S2).

Seeding rate Grains/m^2	Ismailia			Tag El-Ezz		
	S1	S2	Mean	S1	S2	Mean
	Grain yield, ardab/faddan					
200	9.4 1	9.15	9.28	7.37	7.31	7.34
300	10.31	10.24	10.28	7.28	7.31	7.30
400	10.92	11.13	11.03	7.20	7.28	7.24
Mean	10.21	10.17	10.20	7.28	7.30	7.29
LSD 0.05	0.08	0.11	0.07	N.S.	N.S.	N.S.
	No. spikes/m^2					
200	363	333	348	207	203	205
300	371	352	361	207	204	206
400	378	376	377	207	205	206
Mean	371	354	362	207	204	206
LSD 0.05	9.6	14.9	12.1	N.S.	N.S.	N.S.
	No. grains/spike					
200	45.3	28.0	36.6	50.1	50.0	50.1
300	50.3	32.4	41.4	49.3	49.8	49.6
400	55.3	35.8	45.5	49.6	50.7	50.1
Mean	50.3	32.1	41.2	49.7	50.2	49.9
LSD 0.05	1.6	0.4	0.8	N.S.	N.S.	N.S.
	1000-kernel weight					
200	46.3	30.2	38.3	38.3	37.6	37.9
300	47.4	31.1	39.3	38.9	37.8	38.4
400	48.8	34.7	41.8	38.6	38.4	38.5
Mean	47.5	32.0	39.5	38.6	38.3	38.3
LSD 0.05	0.8	1.0	0.6	N.S.	N.S.	N.S.

In respect of that, Koziara *et al*. (1995) had a decrease in number of grains/spike due to increasing seeding rate, but 1000-kernel weight did not significantly affected.

However, in Tag El-Ezz, under saline soil conditions, seeding rates did not differentiate either grain yield or yield components and no significant differences were observed (Table 3). The effect of seeding rate under such conditions was not clear.

Effect of interactions

Results in Table 4 indicated that the new triticale variety “T. line 1” gave the highest grain yield with the nitrogen level of 90 kg N/faddan. It produced 12.09 and 11.80 ardab/ faddan, in the two respective seasons, with an average of 11.95 ardab/faddan. The bread wheat variety Sids 1 responded up to the nitrogen level of 120 kg N/faddan and produced its highest grain yield of 10.13 and 9.92 ardab/faddan, in the two respective seasons, with an average of 10.03 ardab/faddan.

These results mainly attributed to the insignificant higher number of spikes/m^2 and the significant higher number of grains/spike of both “T. line 1” and Sids1 when they were grown under 90 and 120 kg N/faddan, respectively (Table 4).

Table 4: Effects of variety x nitrogen level interaction (VxNL) on grain yield and yield components during the two seasons (S1 and S2).

V	NL Kg/faddan	Ismailia S1	Ismailia S2	Ismailia Mean	Tag El-Ezz S1	Tag El-Ezz S2	Tag El-Ezz Mean
		Grain yield, ardab/faddan					
Juan	60	10.35	9.68	10.02	8.68	7.20	7.94
	90	9.86	10.03	9.45	6.80	7.03	6.92
	120	10.33	8.35	9.34	6.86	7.39	7.13
T.Line1	60	9.71	9.97	9.84	8.42	7.35	7.28
	90	12.09	11.80	11.95	9.78	7.28	7.03
	120	11.14	12.29	11.72	6.76	7.41	7.09
Sids 1	60	8.80	8.78	9.29	8.04	7.45	7.75
	90	9.52	9.77	9.65	6.53	7.29	6.91
	120	10.13	9.92	10.03	6.69	7.32	7.01
LSD 0.05		0.12	0.20	0.11	N.S.	N.S.	N.S.
		No. spikes/m^2					
Juan	60	363	301	332	208	199	203
	90	364	326	345	209	207	208
	120	373	335	354	206	202	204
T.Line1	60	395	328	362	205	201	203
	90	370	336	353	207	205	206
	120	362	333	348	204	205	205
Sids 1	60	368	296	332	207	201	204
	90	368	304	336	210	209	209
	120	371	321	346	206	207	206
LSD 0.05		N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
		No. grains/spike					
Juan	60	50.9	30.6	40.8	47.0	49.2	48.1
	90	52.2	36.8	39.5	53.0	50.4	51.7
	120	45.3	28.8	37.1	51.8	48.6	51.2
T.Line1	60	54.7	30.2	41.4	46.4	49.7	40.1
	90	55.3	32.6	44.0	53.3	51.4	52.4
	120	53.3	29.9	41.6	50.8	49.1	50.0
Sids 1	60	46.2	36.4	41.3	44.9	50.0	47.5
	90	47.6	34.1	41.3	51.4	52.3	51.9
	120	47.3	38.9	43.7	48.5	50.8	49.7
LSD 0.05		2.1	0.8	3.9	N.S.	N.S.	N.S.
		1000-kernel weight, gm					
Juan	60	48.1	35.3	41.7	41.2	39.3	40.3
	90	48.8	35.5	42.2	37.8	35.7	36.8
	120	48.1	33.8	40.9	37.9	36.8	37.3
T.Line1	60	48.2	33.3	40.7	39.9	38.0	39.0
	90	47.7	31.5	39.6	37.9	38.0	38.0
	120	48.4	32.3	40.3	38.2	37.8	38.0
Sids 1	60	43.8	30.5	37.2	38.2	40.1	39.6
	90	45.6	29.8	37.7	38.3	37.3	37.8
	120	49.0	26.1	37.5	36.9	38.4	37.7
LSD 0.05		1.7	2.0	N.S.	N.S.	N.S.	N.S.

Table 5. Effects of variety x seeding rate interaction (VxSR) on grain yield and yield components during the two seasons (S1 and S2).

V	SR	Ismailia			Tag El-Ezz		
	Seeds/m²	S1	S2	Mean	S1	S2	Mean
		Grain yield, ardab/faddan					
Juan	200	9.21	8.54	8.88	7.61	7.16	7.39
	300	10.63	9.03	9.83	7.43	7.27	7.34
	400	10.71	10.49	10.60	7.30	7.20	7.25
T.Line1	200	10.01	9.77	9.89	7.41	7.39	7.40
	300	11.00	11.73	11.37	7.33	7.36	7.35
	400	11.94	12.56	12.25	7.21	7.29	7.25
Sids 1	200	9.02	9.16	9.09	7.09	7.39	7.24
	300	9.32	9.96	9.64	7.08	7.31	7.20
	400	10.11	10.35	10.23	7.09	7.36	7.23
LSD 0.05		0.14	0.19	0.11	N.S.	N.S.	N.S.
		No. spikes/m²					
Juan	200	363	326	344	208	202	205
	300	368	329	348	207	203	205
	400	370	347	353	210	203	206
T.Line1	200	367	354	330	206	203	204
	300	376	331	353	207	204	205
	400	385	344	365	204	205	204
Sids 1	200	359	320	339	207	204	206
	300	369	305	337	208	205	207
	400	379	317	348	207	207	207
LSD 0.05		N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
		No. grains/spike					
Juan	200	52.8	32.4	42.6	51.0	49.0	50.0
	300	50.2	29.7	40.0	50.9	49.2	50.1
	400	45.4	24.2	34.8	50.3	50.0	50.2
T.Line1	200	60.5	34.3	47.4	50.4	50.1	50.3
	300	54.6	31.0	42.8	49.3	50.2	49.8
	400	48.2	27.4	37.8	50.1	49.9	50.0
Sids 1	200	52.6	40.6	46.6	48.9	51.0	50.0
	300	46.2	36.5	41.3	47.7	50.1	48.9
	400	42.3	32.3	37.3	48.3	52.1	50.2
LSD 0.05		N.S.	0.7	N.S.	N.S.	N.S.	N.S.
		1000-kernel weight, gm					
Juan	200	50.2	35.8	43.0	38.9	37.4	38.2
	300	47.8	34.8	41.3	38.6	36.9	37.8
	400	47.0	34.1	40.5	39.4	37.4	38.4
T.Line1	200	49.3	34.7	42.0	38.5	37.1	37.8
	300	47.9	31.6	39.8	38.8	38.3	38.5
	400	47.1	30.8	38.9	38.8	38.3	38.5
Sids 1	200	47.1	33.7	40.4	37.4	38.3	37.8
	300	46.4	27.1	36.8	39.3	38.3	38.8
	400	44.9	25.6	35.3	37.7	39.3	38.5
LSD 0.05		N.S.	1.7	N.S.	N.S.	N.S.	N.S.

These results are emphasized the previous results of the effect of nitrogen fertilizer levels on varieties (Table 2), since the variety "T. line 1" had the highest grain yield when the nitrogen level 90 kg N/faddan was applied.

However, the triticale variety "Juan" Did not responded clearly to nitrogen fertilizer level. In the first season, it produced the highest grain yield (10.35 and/or 10.33 ardab/faddan) with the two nitrogen levels 60 and/or 90 kg N/faadan. In the second season, its highest grain yield was 10.02 ardab/faddan with the level of 60 kg N/faddan (Table 4).

It is clearly that, from the results in Table 5, the three tested varieties were significantly responded up to the highest seeding rate of 400 seeds/m^2. The respective three varieties, when they grow with 400 seeds/m^2, produced 10.71, 11.94 and 10.11 ardab/faddan, in the first season and 10.49, 12.56 and 10.35 ardab/faddan, in the second one. The averaged 10.6, 12.25 and 10.23 ardab/faddan.

Increasing seeding rate to 300 and/or 400 seeds/m^2 increased the average grain yield by 10.7 and/or 7.8% with "Juan", 9.9 and/or 8.5 with "T. line 1" and 2.2 and/or 8.5% with "Sids 1".

The increase in grain yield of the three varieties by increasing seeding rate to 400 seeds /m^2 is mainly due to the enhancing effect of this rate to increase number of spikes/m^2. However, the differences between number of spikes/m^2 did not reach the level of significance.

In contrary, increasing seeding rate dramatically decreased number of grains/spike and 1000-kernel weight of the three varieties. The difference between 200 and 400 seeds/m^2 as seeding rates, in some times, is significant (Table 5).

Data in Table 6 showed the effect of the interaction between nitrogen levels and seeding rates. Under all nitrogen levels, increasing seeding rate tended to increase grain yield up to seeding rate of 400 seeds/m^2. On the other hand, and over all seeding rates, nitrogen level had an effect to increase grain yield up to the mediate level of 90 kg N/ faddan. The 120 kg N/faddan level seems to be not economic.

However, the highest grain yields, in the two respective seasons and when data were combined, were resulted when 90 kg N/faddan were applied on the seeding rate of 400 seeds/m^2. The highest grain yields were 11.45, 11.21 ardab/faadan in the two respective seasons and 11.33 ardab/faddan when data were combined.

These results are attributed to the effect of 60 kg N/faddan level (Table 2) and to the effect of 400 seed/m^2 seeding rate (Table 3). Moreover, the enhancing effects of the highest seeding rate to increase number of spikes/m^2 and consequently increased grain yield per unit area (Koziara *et al.,* 1995).

Concerning the second order interaction, between varieties, nitrogen levels and seeding rates, data in Table 7 presented the highest five grain yield values and their yield components, in both locations.

Under sandy soil conditions, the significantly highest grain yields, either from individual seasons or combined data, were produced when the new triticale variety "T. line 1" was grown under 90 kg N/faddan using 400 seeds/m^2. The grain yields were 13.4, 12.9 and 13.1 ardab/faddan,

Table 6. Effects of nitrogen level x seeding rate interaction (NLxSR) on grain yield and yield components during the two seasons (S1 and S2).

NL	SR	Ismailia			Tag El-Ezz		
KgN/faddan	Seeds/m^2	S1	S2	Mean	S1	S2	Mean
		Grain yield, ardab/faddan					
60	200	8.80	9.32	9.06	8.46	7.24	7.85
	300	9.77	9.91	9.84	8.46	7.33	7.90
	400	10.28	10.20	0.24	8.23	7.43	7.83
90	200	9.76	9.53	9.65	6.80	7.24	7.02
	300	10.27	10.86	10.57	6.61	7.23	6.92
	400	11.45	11.21	11.33	6.70	7.13	9.92
120	200	9.68	8.62	9.15	6.85	7.46	7.16
	300	10.89	9.95	10.42	6.78	7.37	7.08
	400	11.03	11.99	11.51	6.68	7.29	6.99
LSD 0.05		0.14	0.19	0.11	N.S.	N.S.	N.S.
		No. spikes/m^2					
60	200	367	315	341	200	200	203
	300	374	318	346	206	200	203
	400	385	393	339	208	204	205
90	200	356	320	338	209	207	208
	300	368	338	353	209	207	208
	400	377	348	363	209	208	208
120	200	363	346	355	205	204	204
	300	371	327	349	206	206	206
	400	372	347	360	205	205	205
LSD 0.05		N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
		No. grains/spike					
60	200	56.6	38.0	47.3	46.6	50.1	48.3
	300	51.7	31.3	41.5	45.8	48.9	47.3
	400	43.5	27.8	35.7	46.0	49.8	47.9
90	200	66.9	35.9	46.9	53.3	51.0	52.2
	300	49.7	34.3	42.0	52.3	50.8	51.6
	400	46.4	28.2	37.3	52.8	52.3	52.6
120	200	52.4	33.3	42.9	50.4	49.0	49.7
	300	49.6	31.6	40.6	49.8	49.7	49.8
	400	46.0	27.9	37.0	50.1	49.8	50.0
LSD 0.05		2.8	0.7	1.4	N.S.	N.S.	N.S.
		1000-kernel weight, gm					
60	200	47.8	35.3	41.5	40.3	38.3	39.3
	300	46.5	32.3	39.4	39.8	39.3	39.5
	400	45.8	31.5	38.7	40.2	39.8	40.0
90	200	48.5	35.7	42.1	37.3	36.8	37.0
	300	47.3	30.8	39.1	38.9	37.3	38.1
	400	46.3	30.3	38.3	37.9	36.9	37.4
120	200	50.3	33.1	41.7	37.3	37.7	37.5
	300	48.3	20.3	39.3	38.0	36.9	37.5
	400	46.9	28.7	37.8	37.8	38.3	38.0
LSD 0.05		N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

Table 7. The highest 5 values of grain yield, ardab/faddan, and their yield components as produced from the interaction between variety, nitrogen level and seeding rate, at Ismailia "sandy soil" and Tag El-Ezz "saline soil" during the two seasons (S1 and S2).

Treatment			Grain yield			No. spikes/m^2			No. grains/spike			1000-kernel weight		
V	NL	SR	S1	S2	Mean	S1	S2	Mean	S1	S2	Mean	S1	S2	Mean
Ismailia														
1	2	3	10.8	10.6	10.7	367	316	342	48.0	33.5	40.8	48.0	35.3	41.6
2	2	2	11.7	12.7	12.2	375	336	355	50.3	43.8	47.1	47.5	31.0	39.3
		3	13.4	12.9	13.1	381	318	349	48.5	37.8	43.2	46.3	39.5	43.0
2	3	2	11.4	12.5	11.9	362	323	342	56.0	35.3	45.7	48.3	37.0	42.7
		3	11.5	14.7	13.1	377	310	344	52.0	37.0	44.6	47.5	38.5	43.1
LSD 0.05			0.2	0.3	0.2	N.S.	N.S.	N.S.	N.S.	1.3	2.5	N.S.	2.9	2.2
Tag El-Ezz														
1	1	1	8.8	7.0	7.9	209	197	203	47.3	4.85	47.9	40.8	38.8	39.8
		2	8.9	7.2	8.0	205	198	202	47.8	49.8	48.8	40.8	39.0	39.9
		3	8.4	7.4	7.9	209	207	208	45.0	49.3	47.1	42.0	40.3	41.1
2	1	1	8.5	7.3	7.9	206	201	203	46.5	50.8	48.6	40.8	36.3	38.5
		2	8.5	7.4	8.0	205	200	203	45.8	49.0	47.4	39.0	38.3	38.6
LSD 0.05			N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

respectively. Increasing nitrogen level to 120 kg N/faddan gave almost the same average grain yield of 13.1 ardab/faddan (Table 7).

Under saline soil conditions of Tag El-Ezz, the interaction effect on grain yield and its components was insignificant. However, it observed that, when the two triticale varieties were grown under the nitrogen lowest level of 60 kg N/faddan with 200 and/or 300 seeds/m^2, they produced higher grain yield. The highest average grain yield of 8.0 ardab/faddan was obtained when either "Juan" or "T. line 1" was grown under 60 kg N/faddan with 300 seeds/m^2 (Table 7).

Again, the insignificant differences between treatments and the interactions, in saline soil, may be because of the salinity levels (8.8 and 8.1 mmohs/cm 20 ^{o}C), which could be higher enough to affect normal growth and cause the absence of significance.

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مقارنة القمح و التريتيكال تحت ظروف التربة الغير ملائمة

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يهدف البحث إلى مقارنة محصول التريتيكال و قمح الخبز و إيضاح مدى تحمل التريتيكال للزراعة فى الأراضى ذات الظروف الغير ملائمة، و كذلك تحديد أنسب معدلات التقاوى و السماد النيتروجينى و التى تساعد على إعطاء أعلى محصول من الحبوب تحت تلك الظروف.

و لذلك زرعت أربعة تجارب حقلية، اثنان فى كل من محطة البحوث الزراعية بالإسماعيلية و تاج العز، فى موسمى الزراعة 1998/1997 و 1999/1998. و تمثل الإسماعيلية التربة الرملية قليلة الاحتفاظ بمياه الرى و تمثل تاج العز التربة التى ترتفع بها نسبة الملوحة و كانت درجة التوصيل الكهربى بها 8.8 و 8.1 مليموز فى موسمى الزراعة على التوالى.

استعمل صنفى التريتيكال Juan (صنف مستورد) و تريتيكال سلالة رقم 1 (صنف منتج محليا) بالمقارنة مع صنف قمح الخبز سدس 1. و زرعت الأصناف تحت ثلاثة مستويات من السماد النيتروجينى هى 60، 90 و 120 كجم نيتروجين للفدان باستعمال ثلاثة معدلات من التقاوى هى 200، 300 و 400 حبة/م^2، و زرعت التجربة فى تصميم قطع منشقة مرتين فى أربعة مكررات. و سجلت بيانات المحصول من الحبوب و مكوناته فى كل التجارب.

أظهرت النتائج تفوق المحصول من الحبوب فى الأرض الرملية عنه فى الأرض الملحية حيث كان 10.20 و 7.24 أردب للفدان فى كلا نوعى التربة على التوالى. و تفوق صنف التريتيكال المحلى "سلالة 1"، فى الأرض الرملية، و أعطى 11.17 أردب للفدان.

فى الأرض الرملية أعطى معدل السماد النيتروجينى 90 كجم نيتروجين للفدان أعلى محصول من الحبوب و قدرة 10.74 أردب للفدان، فى حين أنه فى الأرض الملحية كان المعدل 60 كجم نيتروجين للفدان يبدو أنه كافيا و أعطى أعلى محصول و قدرة 7.56 أردب للفدان. و كان لمعدل السماد النيتروجينى نفس التأثير، بفروق معنوية، على عدد الحبوب بالسنبلة و بدون فروق معنوية على عدد السنابل/م^2 و وزن 1000 حبة، فى كلا نوعى التربة.

كما أثر معدل التقاوى معنويا على المحصول و مكوناته، فى الأرض الرملية فقط، حيث أعطى المعدل 400 حبة/م^2 أعلى محصول و قدرة 11.03 أردب للفدان، كنتيجة لتأثيره على مكونات المحصول.

و فى الأرض الرملية، و بصفة عامة فقد تحقق محصول عند زراعة صنف التريتيكال المحلى تحت مستوى التسميد النيتروجينى 90 كجم نيتروجين للفدان (11.95 أردب للفدان)، أو بزراعة 400 حبة/م^2 (11.37 أردب للفدان)، و ارتفع محصوله إلى 13.10 أردب للفدان عند زراعته تحت المعاملتان السابقتان معا.

هذا ولم تكن هناك فروق معنوية واضحة بين الأصناف أو معدل التقاوى أو التفاعلات بين معاملات التجربة فى الأرض الملحية.