EVALUATION OF CERTAIN EGYPTIAN MAIZE HYBRIDS UNDER SUB-TROPICAL CONDITIONS IN NIGER

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ABSTRACT

Thirteen Egyptian maize hybrids were evaluated under two Nitrogen levels (90 kg N/fed and 120 kg N/fad) under sub-tropical conditions at the Republic of Niger in the farm of Agricultural Cooperation project between Niger and Egypt (Ferme Agricole Commune Niger-Egypte) during the growing seasons (1998/1999) and (1999/2000).

The obtained results revealed that differences under sub-tropical climatic conditions between the two seasons were significant in most of the studied traits. Differences between low (90 kg N /fad) and high (120 kg N/fad) nitrogen levels were not significant for all studied traits except for grain yield, silking date and number of kernels /ear. Also variances due to the interactions nitrogen levels x seasons were not significant for traits except silking date, ear diameter and number of kernels/ ear. The high nitrogen level (120 kg N/fad) increased grain yield by 3.5 ard /fad and caused 1.4 days earliness as compared to the low nitrogen level (90 kg N /fad).

Hybrids could be significantly distinguished from each others for all the studied traits. While, the variances due to interactions between hybrids x seasons, hybrids x nitrogen levels and hybrids x seasons x nitrogen levels were not significant for all traits except hybrids x seasons for grain yield and number of rows /ear, hybrids x nitrogen levels and hybrids x seasons x nitrogen levels for grain yield.

The best hybrids for grain yield in descending order were white SC 10,SC122, SC124 and TWC310 and the yellow SC161, SC160 and TWC 352.These hybrids were the most adaptable under sub-tropical conditions. Generally, Grain yield for the tested hybrids ranged from 31.6 ard/fed (SC10) to 26.1 ard/fed (SC158) with an average of 28.95 ard/fed. The productivity of such hybrids

tended to be the same as it was under the Egyptian conditions. Consequently, these results would pave the road for the Egyptian maize hybrids to be sown under sub-tropical conditions

INTRODUCTION

Maize is one of the most important cereal crops in Egypt and in the world. Also, maize is the most important food crop after millet and rice in Niger. The farm of Agricultural Cooperation project between Niger and Egypt (Ferme Agricole Commune Niger –Egypte) had started in 1996 at Tiagurire in zone Say where maize before this time maize was planted in few places (in gardens to be used fried only (green maize)). The means of humidity in growth stages were ranged from 50% to 31% from November to March; also temperatures ranged from 36 to 39^0 C at the same period.

Also, Nitrogen fertilization is among the most important cultural practices .that influence maize production. Many investigators reported grain yield per Faddan of maize increased by increasing nitrogen fertilizer level; 90 kg N/fad (Galal *et al.*1979) and 120 kg N/fad, (Katta *et al.*1976 and Abou-Khadrah 1984). Mohamed (1999) studied the response of 8 crosses to nitrogen levels (100,130 and 160 kg N /fad) and found that genotypes were significantly different for grain yield, ear length and number of kernels per ear. Also, Esmail and EL-Sheikh (1994) used different nitrogen fertilizer levels (60, 90, 120 and 150 kg N/fad) for fourteen maize varieties and found that maize received 150 or 120 kg N/fad should higher grain yield /fad than that received lower nitrogen levels Abu-Grab *et al.* (1997) stated that 100 or 125 kg N /fad gave the best yield. Shant *et al.* (1997) used 5 levels of nitrogen applications (0, 40,80,120 and 160 kg/ha) and report that 160 kg N/ha gave the highest yield. Sallah *et al.* (1998) evaluated the maize population 43 under 3 nitrogen levels, i.e 0,80 and 160 kg N/ha at 6 locations in Gana and West Africa and found that grain yields across locations under the three nitrogen levels were 3.0, 4.7 and 5.2 t/ha, respectively Mosa (2001) found also that increasing the nitrogen level from 90to 130 kg N/fad significantly increased grain yield .The main objective of this study was to evaluate some Egyptian maize hybrids under sub-tropical conditions of Niger

MATERIALS AND METHODS

Thirteen Egyptian maize hybrids (H), that include the single crosses: the hybrids, white SC10, SC122, SC123, SC124 and the yellow SC155, SC158, SC159, SC160 and SC 161and the three-way crosses: the white TWC310, TWC320, TWC321 and the yellow TWC352 were evaluated under two nitrogen levels (N) (90 kg N/fad and 120 kg N/fed) at the farm of Agricultural Cooperation project between Niger and Egypt (Ferme Agricole Commune Niger–Egypte) at the Republic of Niger. Date of sowing was at the first of November for 1998/1999 and 1999/2000 seasons (S). A split-plot design with four replicates was used in both seasons. Nitrogen levels were arranged in the main plots, while hybrids in the sub plots. Each sub plot contained three rows with 6m long, 80cm width and25cm between hills. The nitrogen doses were applied before the first and second irrigation. Data were recorded for grain yield ard/fad (all plants in the middle row/plot are harvested and adjusted with 15.5% grain moisture content), number of days from planting to 50% silking, plant and ear height, ear length, ear diameter, No. of rows/ear, No.of kernels/row and No.of kernels/ear. The analysis of variance was carried out as a combined analysis for the two seasons according to Snedecor and Cochran (1967). Treatment means were compared by Duncan's Multiple Range test (Duncan, 1955).

RESULTS AND DISCUSSION

Data in Table (1 and 2) show means of 50% silking date, plant height, ear height,ear length, ear diameter, rows number/ear, kernels number/row, kernels number/ ear and grain yield of 13 maize hybrids under two nitrogen levels in combining analysis for 1998/1999 and 1999/2000 seasons. The two growing seasons varied significantly in grain yield,ear length, number of kernels/row and number of kernels/ear only. This may attributed to differences in environmental conditions. EL-Shenawy (1995) and Mosa (1996) found that most growth and ear characters were affected by years. The two nitrogen levels significantly affected silking date and number of kernels/ears. Maize hybred plants received 120 Kg

N/fad were significantly earlier in appearance of 50% silking and greater in number of kernels/ear than those received 90 kg N/fad. These results confirm the findings of EL-Habbak (1996), Mohamed (1999), Samia *et al.* (1995), Hassan (2000) and Mosa (2001), However, plant height, ear diameter, number of rows/ear and number of kernels/row were not significantly affected by increasing nitrogen level from 90 to 120 Kg N/fad.

Grain yield per faddan was significantly increased with increasing nitrogen level from 90 to 120 kgN/fad (Table 2). This may be attributed to considerable increase in number of kernels/ear and earliness of silking appearance at 120 kg N/fad. This results agreed with those obtained by Abu-Khadra (1984), Nawar *et al.* (1992), Mosa (1996) and Mosa (2001).

The combined analysis showed highly significant differences in all studied traits among maize hybrids (Table1 and 2),The best hybrids for earliness were obtained from white SC124, yellow SC161 and TWC352 .The desirable (short) hybrids for plant height were from white SC122, yellow SC155 and SC160and yellow TWC352 Also, hybrids showing the lowest ear height were white SC123, yellow SC158 and yellow TWC352.The best white hybrids for grain yield and most yield components were obtained from SC10 (31.9 ard /fad), SC122 (31.5 ard /fad)and S.C124(30.4 ard/fad). Also the best yellow crosses for grain yield and most yield components were SC161 (30.9 ard /fad) followed by SC 160 and TWC352.

The interactions (S x N) for silking date, ear diameter ,number of kernels/ear and grain yield, (H x S) for grain yield and number of rows / ear, (H x N and H x N x S) for grain yield were significant (Tables 1& 2). These results indicated that the nitrogen levels were affected by seasons for silking date, ear diameter and number of kernels /ear; also, the hybrids were affected by years, nitrogen levels and (S x N) interaction for grain yield. These results agreed with those obtained by Mosa (1996) who found significant variance due to (H x S) and (H x N) for grain yield.

Mean grain yield of 13 hybrids as affected by seasons is presented in Table (3). The highest means were obtained (1998/1999) season from the white SC122, yellow SC161 and

white TWC310. While SC10, SC160 and TWC321 had the highest means in 1999/2000 seasons.

Mean grain yield of thirteen hybrids as affected by nitrogen levels is clarified in Table (4). The best hybrids for grain yield under low nitrogen level conditions were SC122, SC161 and TWC310, while SC10, SC160 and TWC352 exhibited the highest mean grain yield under the high nitrogen levels this indicates that the responses of hybrids for grain yield were not the same at different nitrogen levels conditions.

Mean grain yield of hybrids under the two seasons and the two nitrogen levels is presented in Table (5). The highest grain yields in season 1998/1999 under the low and high nitrogen levels were obtained from SC122, SC161and TWC310 and SC122, SC161and TWC352, respectively in a descending order. This trend differed in the 1999/2000 season, where SC10,SC160 and TWC321 under low nitrogen level and SC10, SC161 and TWC320 under high nitrogen level were the best yielder, indicating that the ranks of hybrids were different between seasons and nitrogen levels.

Table (6) showed the average productivity of SC10, SC122, SC123, SC124, SC155, TWC310, TWC320, TWC 321 and TWC 352 from the observation fields grown at new land regions of Egypt during 2001 season. The productivity means were 31.3, 29.7, 29.1, 27.7, 30.5, 30.0, 28.9, 28.6 and 29.8 ard/fed respectively as compared with average productivity for the same hybrids grow under Nigerian conditions i.e 31.6, 31.5, 27.0, 30.9, 27.8, 29.0, 26.4, 28.5 and 28.1 ard/fed under Nigerian conditions, From these data it is clear that SC10,SC122and SC124 showed higher yields under Nigerian than Egypt conditions.

Generally SC10, SC122, SC124, SC161, TWC310 and TWC352 were superior hybrids under sub-tropical condition. These results would pave the road for the commercial use of the Egypt maize hybrids in Niger and other countries having similar climatic subtropical conditions.

Table 1: Silking date, plant height,ear height, ear length and diameter of maize as affected by hybrids, nitrogen levels and seasons and their interaction.

Factor	50% Silking date (day)	Plant height (cm)	Ear height (cm)	Ear length (cm)	Ear Diameter (cm)
Season (s):	NS	**	NS	**	NS
1998/1999	62.3	251a	122	21.3a	5.18
1999/2000	62.7	238b	122	20.3b	5.20
N level (N):	**	NS	NS	NS	NS
90 kg/fad.	63.2a	243	120	20.9	5.2
120 kg/fad.	61.8b	246	124	20.7	5.2
Hybrid (H):	**	**	**	**	**
SC10	63.8 ab	260 a	132 a	21.6 ab	5.04 de
SC122	62.1 b-e	230 f	130 a	20.9 b	4.93 e
SC123	64.1 a	235 ef	121 bc	19.7 c	5.23 abc
SC124	61.9 cde	231 f	122 bc	20.9 b	5.14 bcd
SC155	62.1 b-e	240 de	120 c	18.0 e	5.25 ab
SC158	63.4 abc	243 cde	109 d	22.0 a	5.26 ab
SC159	60.9 e	257 ab	117 c	21.9 a	5.38 a
SC160	61.2 de	240 de	116 bc	21.7 ab	5.26 ab
SC161	60.9 e	248 cd	121 bc	21.6 ab	5.20 bc
TWC310	63.6 abc	251 bc	128 ab	21.0 b	5.13 bcd
TWC320	62.3 b-e	257 ab	131 a	21..2 ab	5.08 cd
TWC321	62.8a-d	243 cde	119 c	21.0 b	5.20 bc
TWC352	61.1 de	240 de	117 c	18.8 d	5.23 abc
Interaction					
S X N	**	NS	NS	NS	*
S X H	NS	NS	NS	NS	NS
N X H	NS	NS	NS	NS	NS
S X N X H	NS	NS	NS	NS	NS

*,** and NS indicate $p<0.05$, $p<0.01$ and not significant, respectively. Means of each factor designated by the same latter are not significantly different at 5% level using duncan ·s Multiple Range Test.

Table 2: Number of rows, number of kernels per row as well as per ear and grain yield of maize as affected by hybrids, nitrogen levels and seasons and their interaction.

Factor	Rows (no/ear)	Kernels (no/ row)	Kernels (no/ear)	Grain yield (ardab/fad)
Season (s):	NS	**	**	**
1998/1999	14.1	42	588	31.5
1999/2000	13.9	44	608	26.4
N level (N):	NS	NS	**	**
90 kg/fad.	13.9	43	591	27.2
120 kg/fad.	14.1	43	605	30.7
Hybrid (H):	**	**	**	**
SC10	12.5f	44b	549ef	31.6a
SC122	13.3de	44b	579cde	31.5ab
SC123	13.8d	42c	571c-f	27.0ef
SC124	13.1e	46a	601bc	30.4a-d
SC155	15.3b	35e	541f	27.8def
SC158	15.1b	42c	630ab	26.1f
SC159	15.1b	42c	630ab	28.4c-f
SC160	14.5c	46a	659a	30.4a-d
SC161	14.3c	44b	630ab	30.9abc
TWC310	13.4de	45ab	601bc	29.0b-e
TWC320	12.5f	45ab	561def	26.4ef
TWC321	13.1e	45ab	587cd	28.5c-f
TWC352	16.3a	39d	635ab	28.1def
Interaction			*	
S X N	NS	NS	**	*
S X H	*	NS	NS	**
N X H	NS	NS	NS	*
S X N X H	NS	NS	NS	*

*,** and NS indicate $p<0.05$, $p<0.01$ and not significant, respectively. Means of each factor designated by the same latter are not significantly different at 5% level using duncan ·s Multiple Range Test.

Table 3: Mean grain yield (ard / fad).of 13 hybrids as affected by seasons .

	1998/1999	1999/2000
SC10	32.90abc	30.40b-f
SC122	35.50a	27.40e-i
SC123	30.00b-g	23.90ij
SC124	32.70a-d	28.00e-h
SC155	30.70b-e	24.90hij
SC158	29.10c-g	23.10j
SC159	30.10b-g	26.80f-j
SC160	32.00a-d	29.00d-g
SC161	33.70ab	28.10e-h
TWC310	33.00ab	25.00hij
TWC320	26.40g-j	23.50j
TWC321	30.40b-f	26.70j
TWC352	32.50a-d	23.80ij

Table 4: Mean grain yield (ard/fad) for 13 hybrids as affected by nitrogen levels.

	N1	N2
SC10	30.1a-d	33.30a
SC122	30.40a-d	32.50ab
SC123	26.60def	27.30c-f
SC124	27.8c-f	32.90ab
SC155	27.10c-f	28.50c-f
SC158	21.80g	30.80abc
SC159	26.10ef	30.30a-d
SC160	27.60c-f	33.30a
SC161	29.40b-e	32.40ab
TWC310	28.60c-f	29.30b-e
TWC320	25.00fg	27.90c-f
TWC321	27.70c-f	29.40b-e
TWC352	25.30f	31.00abc

Table 5: Mean grain yield (ard/fad) for 13 hybrids of maize under two seasons and two nitrogen levels.

H	S1		S2		X̄
	N1	N2	N1	N2	
SC10	31.1a-k	34.8abc	29.0d-q	31.8a-l	31.6
SC122	35.7a	35.3ab	25.0m-t	29.8b-n	31.6
SC123	30.9a-l	29.1d-p	22.3stu	25.5k-t	27.0
SC124	30.9a-l	34.6a-d	24.7n-t	31.2a-j	30.4
SC155	30.8a-l	30.6a-m	23.4q-u	26.4i-t	27.8
SC158	25.0m-t	33.3a-f	18.7u	27.4g-s	26.1
SC159	28.2f-r	32.1a-h	24.1o-t	29.5c-o	28.4
SC160	29.7b-o	34.3a-e	25.6j-t	32.4a-g	30.5
SC161	33.4a-f	34.0a-e	25.4l-t	30.8a-l	30.9
TWC310	33.9a-f	32.0a-i	23.3r-u	26.6h-t	29.0
TWC320	29.0d-q	23.8p-u	21.1tu	31.9a-l	26.4
TWC321	31.1a-k	29.6c-o	24.3n-t	29.1d-p	28.5
TWC352	28.8e-r	36.1a	21.8tu	25.8j-t	28.1
X̄	30.7	32.3	23.7	29.1	28.95

H= hybrid,

S= season,

N= nitrogen,

N1= 90 Kg/fad,

N2= 120 kg/fad.

Table (6): Average of grain yield production (ard/fad) of some maize hybrids under the conditions of Egypt and Niger conditions.

Country	SC 10	SC 122	SC 123	SC 124	SC 155	TWC 310	TWC 320	TWC 321	TWC 352
Egypt 2001*	31.3	29.7	29.1	27.7	30.5	30.0	28.9	28.6	29.8
Niger**	31.6	31.5	27.0	30.9	27.8	29.0	26.4	28.5	28.1

* Source : Maize Work-Shop Giza ,February,5,2002, Egypt

** Average (experimental) yield over two seasons.

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الملخص العربى

تقييم بعض هجن الذرة الشامية المصرية تحت ظروف المناطق شبة الاستوائية (بدولة النيجر)

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تـــم تقييم ١٣ هجين من الذرة المصرية البيضاء و الصفراء تحت معدلين من التسميد النيتروجيني (٩٠و ١٢٠ وحدة ازوت للفدان) في المزرعة

المشتركة بين جمهورية مصر العربية وجمهورية النيجر خلال موسمى النمو (١٩٩٨/١٩٩٩) و (١٩٩٩/٢٠٠٠).

ويمكن تلخيص النتائج فيما يلى:

-اختلاف الظروف البيئية فى المناطق شبه الاستوائية بين موسم الدراسة ادى الى اختلافات معنوية فى معظم الصفات المدروسة .

-كانت الاختلافات بين مستوى التسميد المنخفض والمرتفع معنوية على صفات محصول الحبوب و٥٠% حريرة وعدد الحبوب بالكوز . وكان التفاعل بين مستويات التسميد والسنوات غير معنوي فى كل الصفات المدروسة ما عدا التزهير وقطر الكوز وعدد الحبوب للكوز.

- ادى استخدام مستوى التسميد الأزوتى ١٢٠ وحدة ازوت للفدان أدى إلى زيادة محصول الحبوب بمقدار ٣,٤ اردب للفدان والى التبكير فى التزهير بـ ١,٤ يوم مقارنة بمعدل التسميد المنخفض (٩٠ وحدة ازوت للفدان).

-كانت الاختلافات بين الهجن معنوية في جميع الصّفات المدروسة بينما التفاعلات بين الهجن xالمواسم ، الهجن xالنتروجين ، الهجن x النتروجين xالسنوات غير معنوية لمعظم الصفات ما عدا تفاعل الهجن x السنوات لصفة المحصول وعدد سطور الكوز والهجن xالنتروجين و الهجنx النتروجين xالسنوات لصفة محصول الحبوب.

-كانت افضل الهجن البيضاء تحت الدراسة هجين فردى ١٠و هجين فردى ١٢٢و هجين فردى ١٢٤و هجين ثلاثي ٣١٠ ومن الهجن الصفراء هجين فردى١٦١ وهجين فردى ١٦٠ و هجين ثلاثي ٣٥٢ وعلى وجه العموم فان اكثر الهجن إنتاجا كان هجين فردى ١٠(٣١,٦ اردب للفدان) واقلها هجين فردى ١٥٨ (٢٦,١ أردب للفدان) وذلك بمتوسط عام (٢٨،٩٥اردب للفدان) لجميع الهجن المستخدمة وهذه الإنتاجية مماثلة لإنتاجية هذه الهجن بجمهورية مصر العربية.

وهذه النتائج تفتح الطريق أمام هجن الذرة الشامية المصرية للتوسع والانتشار بجمهورية النيجر وكذلك الدول المجاورة والمشابهة لها فى الظروف البيئية.