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Variability Study in Ten Maize (*Zea mays* L.) hybrids for some Growth Characters

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قال تعالى:

وَتِلْكَ الْجَنَّةُ الَّتِي أُورِثْتُمُوهَا بِمَا كُنتُمْ تَعْمَلُونَ ﴿٧٢﴾

لَكُمْ فِيهَا فَاكِهَةٌ كَثِيرَةٌ مِّنْهَا تَأْكُلُونَ ﴿٧٣﴾

صدق الله العظيم

الآيتان 72،73 من سورة الزخرف

Dedication

To my beloved fatherwho gave me hope and care,,,

To my great mother who gave me love,,,

To my dear brothers who were there when I'm in need,,,

To my teachers, friends and colleagues,,,

With love

Acknowledgements

Thanks and gratefulness firstly and lastly to “Allah” who gave me mind, determination and patience to carry out this study successfully.

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Abstract

The experiment was carried out to study variability in ten maize genotypes for some growth parameters. The experiment was laid out in randomized complete block design with three replicates. Six growth characters were measured included, days to tasselling, days to siliking, plant height, cob height, stem diameter and number of leaves. The results showed that there were significant differences between maize genotype for days to tasselling, days to siliking, plant height, cob height, number of leaves and no significant difference for plant height and stem diameter. The genotype (No. 4 and 10) of maize scored the lowest days to siliking and tasselling.

الخلاصة

تم إجراء التجربة في المزرعة التجريبية بكلية الدراسات الزراعية - جامعة السودان للعلوم والتكنولوجيا شمبات في الموسم الصيفي 2018/2017 لدراسة التباين بين عشرة أصناف من الذرة الشامية لبعض صفات النمو والتي تضمنت صفات الأعضاء الذكرية، الأعضاء الأنثوية، طول النبات، طول القندول، عدد الأوراق وسمك الساق. تم استخدام القطاعات العشوائية الكاملة بثلاث مكررات. أظهرت النتائج وجود فروق معنوية لصفات الذكرية، الأعضاء الأنثوية، طول القندول و عدد الأوراق وعدم وجود فروق معنوية لصفات طول النبات وسمك الساق. الأصناف رقم (4 و10) أظهرت أقل أيام للأزهار الأنثوية والذكرية.

CHAPTER ONE

INTRODUCTION

Maize(*Zea mays* L.) is animportant cereal crop in many developing countries. It grows over a wide capital ranges and various environments than any other cereal crop. It is considered as the third most important cereal crop on a global basis (CIMMYT and EARO, 1999). To the fact that, it is cultivated and adapted to a wide range of environment more than wheat and rice the world's top ranking food crop (Kputsika- Sotiriou, 1999). Maize originated in Mexico about 6,000 to 7,000 years ago (Smith, 1995). Maize was introduced into Africa in the 1500s and has since become one of Africa's dominant food crops.

Maize is the most important cereal crop in Sub- Saharan Africa (SSA) and is the most staple food for more than 1.2 billion people in SSA and Latin America. All parts of the crop can be used for food and non- food products. Nowadays, there is an increasing interest in maize production in Sudan to be cultivated in the agricultural irrigated schemes, especially in the Gezira State. In addition, maize can occupy an important position in the economy of the country due to the possibility of blending it with wheat for making bread (Noure*t al*., 1997; Meseka, 200).

Most of grain maize cultivars in the Sudan characterized with low yield.

Therefore, the main objectives of this study are:

1- To study variability among ten genotypes of grain maize (*Zea mays* L.) for some growth characters.

2- To select the most early hybrid in flowering.

CHAPTER TWO

LITERATURE REVIEW

2.1 Botanical Description of the Maize Plant:

2.1.1Stem:

The stem is made up of nodes and internodes and is filled with pith. The intermodal parts are flattened on the side next to the leaf sheath. The plant grows to the height of 1.5m to 3 meters depending upon variety.

2.1.2 Leaf:

The leaves grow alternately on the opposite sides of the stem. They bear small hairs on them and number of leaves varies from 10-20. The width varies greatly with the varieties, fertility, status of the climate conditions and management…etc. Each leaf consists of a thin, flat and expanded blade with a definite mid smaller veins and thicker more rigid sheath.Each sheath surrounds the inter node above the node to which it is attached (Panda, 2009).

2.1.3 Inflorescence:

The maize plant bears two types of inflorescence:

1- The staminate or tassel containing male flowers which is always terminal and therefore.

2- The pistllate inflorescence which develops into an ear and they are borne at side of the plant into the axis of the leaves on a short branch

known as shank. They may be more than open stalk depending upon variety and management.

2.1.4 Tassel:

The tassel is a branched inflorescence. It consists of a central spike (rachis) and about 10- 50 lateral branches. The paired spikelet (pendicellate and sessile) occur in many ranks around the central spike. Each spikelet contains 2 florets.

The development of upper floret is about 2-3 days ahead of the flower. Florets measured at anthesis. Each floret is enclosed with a pair of thin scales, a lemma (located adjacent to the glume) and a palea (located opposite to the lemma, between the two florets). Two of the three anthers present in each floret are located adjacent to the palea, the third is located adjacent to the lemma and is flanked by two lodigules which grows from the lowest stalk joint, develops.

At this stage, most of the food utilized is from the endosperm.

2.2 Classification of maize:

The genus zea belonging to the tribe Mayadea of family gramine with 10 pairs of chromosomes which has only one species zeamys. The maize was classified by Sturvant in1899 into seven groups or types on the base of the endosperm milk kernel.

Pod corn (Zea mays iurnicatesturt):

The kernel is enclosed in a pod or husk, the ear formed is also enclosed in husk. Pod corn is also known as cow corn forage corn and husk corn.

Podcorn (Zea mays eurtasturt):

Its cultivation is mainly confined to the new world which has small kernels with hard corneous endosperm.

Filn corn (Zea mays indurate sturt):

This is the type first discovered by Europeans which has an early maturity. The kernels of this type are rounded on the top.

Flour corn (Zea mays amylaceasturt):

It resembles to the flint corn in appearance and ear characteristics. The grains are composed of soft starch and have little or no dent.

Sweet corn (Zea mays saccharatastrut):

The sugar and starch make the major component of the endosperm that result in sweetish taste of the kernels before attain the maturity and after maturity the kernels become wrinkled.

Baby corn (Zea mays):

Brown for young babies (cobs) to be used for vegetable soup and salad. This is rich in minerals and vitamins and can be harvested within 45- 50 days for marketing.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Experimental site

The experiments were conducted in season 2016, at locations, Shambat, College of Agricultural Studies, Sudan University of Science and Technology at latitude 15.32° N, longitude 32.35° E and 407 meter above sea level. It is characterized by high heavy cracking clays.

3.2 Plant material

The plant material used consisted 10 line (F1) hybrids prepared atShambat, College of Agricultural Studies, Sudan University of Science and Technology

3.3 Design, layout of Experiment

The design used in this was a randomized complete block design (RCBD) with three replicates. The plot size was maintained as 2 rows ×3m long for each entry in each replication, with inter and intra row spacing of 80 and 25 cm, respectively. Land was prepared using disk plowing, harrowing and then ridging. Sowing date was the second week of July. Seeds were sown at the rate of 3- 4 seeds per hill. Resowing was carried out before the second irrigation. The plants were later thinned to one plant per hill three weeks after sowing. A

dose of 86 -kg N/ha was applied in split equal doses after thinning and before flowering. The crop was irrigated at intervals of 7-12 days, and plots were kept free of weeds by hand weeding.

3.4 Parameters measured

3.4.1 Days to 50% tasseling (DT)

Days to tasseling was taken as the number of days from sowing until 50% of the plants in the plot shed pollen.

3.4.2 Days to silking (DS)

Days to silking was taken as the number of days from sowing until 50% of the plants in the plot started to undergo silking, i.e silk emerged to 2cm length.

3.4.3 Plant height (PH)

Plant height was measured in cm from the soil surface to the collar of the last leaf on the plant.

3.4.4 Cob height (CH)

Ear height was measurePd in cm from the soil surface to the node bearing the upper most ears.

3.4.5 Stem diameter (SD)

Ear diameter was measured in cm using Vernier Caliper from dehusked ears. Measurements were taken on different positions on the ear, i.e., the top, middle and bottom, and the average was then taken.

3.4.6 Number of leaves (NL)

It was counted from five tagged plants and the average was determined.

3.5 Statistical analysis

The analysis of variance (ANOVA) was carried out for the collected data using the Statistical Analysis System (SAS) computer package. The analysis was done .for all characters and then combined. Coefficient of variation (C.V.) for each character and correlation of the characters was computed. Mean performance was compared according to Duncan's Multiple Range Test (DMRT).

Table (3.1): Listof 10 maize for Hybrids used is the study

Hybrids	**Origin**
1	Shmbat1 X Hudeba1 (Sh1 x H1)
2	Shmbat1 X Hudeba2(Sh1 x H1)
3	Shmbat1 X Hudeba3(Sh3 x H3)
4	Brkat1 X Hudeba1 (Br1XH1)
5	Brkat2 X Hudeba2 (Br1XH1)
6	Brkat3 X Hudeba3 (Br3XH3)
7	Brkat1 X Hudeba1 (Br1XH1)
8	Brkat2 X Hudeba2 (Br2XH2)
9	Brkat3 X Hudeba3 (Br3XH3)
10	Hudeba1 X Hudeba1 (Sh1 x H1)

CHAPTER FOUR

RESULTS

4.1 Phenotype variability:

4.1.1 Days to tasselling (DT):

The statistical analysis of variance revealed that there were no significant differences ($p \leq 0.05$) between the eleven maize genotypes for this character. The highest value (64.67) and the lowest value (56.67) were obtained by the genotypes 1 and 4 respectively.

The coefficient of variation for this character was 3.68.

4.1.2. Days to siliking (DS):

The statistical analysis of variance revealed that there were no significant differences ($p \leq 0.05$) between the eleven maize genotypes for this character. The highest value (71.07) and the lowest value (62.00) were obtained by the genotypes 1 and 4 respectively.

The coefficient of variation for this character was 4.36.

4.1.3 Plant Height (PH):

The statistical analysis of variance revealed that there were no significant differences ($p \leq 0.05$) between the eleven maize genotypes for this character. The highest value (205.40) and the lowest value (177.07) were obtained by the genotypes 6 and 1 respectively.

The coefficient of variation for this character was 6.27.

4.1.4 Cob Heights (CH):

The statistical analysis of variance revealed that there were significant differences ($p \leq 0.05$) between the eleven maize genotypes for this character. The highest value (95.26) and the lowest value (67.53) were obtained by the genotypes 6 and 5 respectively.

The coefficient of variation for this character was 12.13.

4.1.5 Stem Diameter (SD):

The statistical analysis of variance revealed that there were significant differences ($p \leq 0.05$) between the eleven maize genotypes for this character. The highest value (2.20) and the lowest value (2.00) were obtained by the genotypes 1 and 8 respectively.

The coefficient of variation for this character was 6.75.

4.1.6 Number of Leaves (NL):

The statistical analysis of variance revealed that there were significant differences ($p \leq 0.01$) between the eleven maize genotypes for this character. The highest value (12.00) and the lowest value (10.00) were obtained by the genotypes 2 and 5 respectively.

The coefficient of variation for this character was 5.43.

Table (4.1): Means square for some growth characters in eleven maize (*ZeaMays*L .) hybrids

Character	Rep	Cenlyrxs	Eror
Daysto Tasselling (DT)	0.12	15.67*	4.65
Days to Siliking (DS)	0.0303	22.4848*	7.8303
Plant Height (PH)	119.142	73.802 N,s	148.011
Cob Height (CH)	47.046	222.735*	100.735
Stem Diameter (SD)	0.09364	0.01255 N,s	0.02064
Number of Leaves (NL)	0.03030	1.98788**	0.39697

**, *, Ns =Significant at 0.01,0.05 and non significant

Table (4.2.): Means of some growth characters of elevenmaize (*ZeaMays* L.) hybrids

C	DT	DS	PH	CH	SD	NL
1	64.67	71.00	177.07	85.800	2.2000	13.333
2	60.33	65.67	192.60	79.933	2.1000	12.000
3	57.000	62.667	204.93	94.933	2.1667	12.000
4	56.671	62.000	201.07	87.333	2.1000	11.667
5	57.000	62.667	194.57	67.533	2.1667	10.333
6	59.000	65.333	205.40	95.267	2.1333	12.000
7	57.667	62.000	198.73	82.667	2.233	11.000
8	58.667	63.333	199.87	84.600	2.000	12.000
9	58.333	63.333	192.87	75.667	2.1000	10.667
10	57.667	62.00	190.47	72.200	2.0667	11.333
106	57.333	66.333	178.07	24.367	2.1333	11.333
C.V	3.68	4.36	6.27	12.13	6.75	5.43

CHAPTER FIVE

DISCUSSION

Phenotypic variability:

The amount of variation present is any plant material under study is of a great importance for a successful application of selection, this is because selection based on great variability will be of a great benefit in any breeding program.(Panda, 2009).

Considerably amount of variation was observed in this study, this variation could be attributed to genetic and environmental effects and to their interactions. These results were agreed with the findings of (Mohamed, 2014)

CHAPTER SIX

CONCLUSIONS

Based on the resultsobtainedin this study, it could be concluded that:

1. Wide range of genetic variability among the tenmaize for growth characters could be of a great benefit in any maize breeding program.

2.Thehybrid scored highest plant height and stem diameter could be used as a forage cultivar.

3. The hybrid scored the early days to flowering could be used as a parental line in any grain maize breeding program.

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