CHAPTER ONE

INTRODUCTION

Maize (*Zea Mays* L.)belongs to the tribe tripsaraceae (Maydeae) of the Family Gramineae, this tribe consists of eight genera, vise ‹Zea‹ coir, Euchlaena and tripsacum, polytonal, sclerachne chinches and trilobachne.

The genus Zea is monotypic and is represented by the single species (*Zea mays*‹which is great of economics importance maize crop science(Panda; 2009), Maize ranks as one of the world three most important cereal crops. It is cultivated a wide range of environment more than wheat and rice because of it is greater adaptability. Currently‹ it is global production is 140 million hectaresof which approximately 96 are in the developing countries although, 68% of the world. Maize production of 602 million tons is production in other area, low average yield in the tropic are responsible for the wide gap between the global shortage of areas and of production (Mohammed et al, 2014). Today maize is one of the world's most important food productions for human beings and for livestock, Maize also yields more industrial products than any other grain. In the united states alone‹ hybrid acreage increased 143.000 acres in1933nearly 72 million acres in 1956.Mean while hybrid maize is rapidly replacing open_ pollinated maize in the European and Mediterranean countries. More than 23% of Italy's large maize is acreage is now hybrid (Dr. Robert). According to FAO data, the area planted to maize in west and central Africa alone increased from 3.2 million in 1961 to 8.9 million in 2005.

This phenomenal expansion of the land area devoted to maize resulted in increased production from 2.4 million metric tones in 1961 to 10.6 million metric tons in 2005.

While the average yield of maize in developed countries can reach up to 8.6 tons per hectares، production per hectares is still very low(1.3tons per hectares).(2005،I.I.T.A).

In Sudan maize is consider as a minor crop and it is normally grown in KordofanDarFur and Southern states or in small irrigated areas in the Northern state with average production of about 0.675 ton per hectares in the traditional farm of Sudan. The low productivity of maize was attributed to the local open pollinated cultivars that are normally grown and the greater sensitivity of the crop to water stress recently there have been an increasing interest in developing maize production in Sudan. However; work on maize improvement in Sudan is limited and only three cultivars have been released.(Idris, 2011). Therefore, the main objectives of this study were:

1. Study variability in eleven genotypes of maize (*Zea mays* L.)for some growth and yield characters.
2. Select the most productive genotype among the studied maize genotypes.

CHAPTER TWO

LETIRETURE REVIEW

2.1 Botanical description:

Maize (*Zea mays* L.) belongs to tribe tripsaraceae (Maydeae) of familygramineae. The botanical description of it is statedby (Ishag,2004)as the following:-

2.1.1 Root system

The root system of maize is deep and fibrous .it consists of Seminal or temporary roots: consist of radical and number lateral roots which arise at the base of the stem under soil surface just above the scutellar node, Crown or coronal roots: they arise from the basal portion of the stem, Brace crop or aerial roots: they arise from second third and sometimes for the nodes above the soil surface .all may or may not enter the soil.

2.1.2 Shoot system

2.1.2.1 Stem

The stem is made up of nodes and inter nodes and is filled with pith the inter nodes part are flattened on the sides next to the leaf sheath. The plants grow to the height of 1.5m to 3m depending upon variety. They also bear tillers if the main shoot is damaged or even otherwise، however it is greatly influenced by soil and climatic conditions. The stem is mode up to approximately 12_18 alternating nodes and inter nodes and is completely filled with pith the number of inter nodes may be very but on the average there 14 inter nodes a lead is attached to each node، and often a Buber

branch a rises at a node‹ inter nodes are somewhat flattened or grooved on the side next to the leaf sheath (fig 3.2).

2.1.2.2 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 to20.the width varies greatly with varieties fertility status of the soil‹ climatic and management practices etc.Each leaf consists of a thin‹flat and expanded blade with a definite‹midrib and smaller veins and thicker‹more rigid sheath .each sheath surrounds the inter node above to which it is attached .stomata are present on both the surface of the leaf .

2.1.2.3 INFLORESENCE:

The maize plant bears two types of inflorescences the staminate or tassel containing male flowers which is always terminal and there fore‹ only on tassel is found per stalk: and the pistil late inflorescence or female inflorescence which develops into an ear and they are born at the plant into the axis of the leaves of a short branch known as‹ shank.‹they may be more than one per stalk depending upon variety and management practices. The shank consists of modified leaves enclosing ear and is collectively known as, husk.

2.2 CLASSIFICATION OF MAIZE:

The genus Zea belonging to tribe maydeae of family gramineae which has 10 pairs of chromosomes which has only one species‹Zea maize.The maize was classified by Sturtevant in 1899 into seven groups or types based

on the endosperm of kernels. They are pod corn flit corn aunt corn flour corn‹ sweet of corn and waxy corn.

Tremendous diversity of maize is a result of countries of selection mutation and hybridization different kind of grains recognized so far described as under pod corn (Zea maize turnicate start):the kernel is enclosed in a pod or husk‹the ear formed is also known as caw corn‹ forage corn and husk corn _it is not grown commercially. The pod corns characterized by having each kernel enclosed within a pod or husk pod corn (Zea maize evater start).It is cultivation is mainly confined to the new world which has small kernels with hard corneous endosperm.

The grains are used for human consumption and are basis of pop corn confections. The kernels are small and posses a higher percentage of hard endosperm starch. The ability to pop is due to rapid expansion of moisture in each individual starch grain upon the application of heat.It is a popular snach food in many parts of the world it is kernels are small and it is an extreme farm of flint maize.Flint corn (Zea maize indurate start) this is the type first discovered by Europeans which has an early maturity. The kernels of this type are rounded on the top. The kernel consists of endosperm with soft starch in the center and completely enclosed by a very hard outer layer.The kernels shrink uniformly as they mature.It is grown European. Asia. Central America and South America as well as it is a principal type of grain corn in India.

1.Dent corn (Zea maize in dentate start) it is popularly known as dent corn because of dent formation on top of the kernel having yellow or white color, the kernels are characterized by a depression or dent in crown due to

shrinkage during ripening in a deposit of soft starch at crown this depression or dent in the crown of the seed is the result of rapid drying and shrinkage of the soft starch this group is the most widely cultivated corn in U.S.A. in united state it a accounts for 95% of all maize.

2.Flour corn

(Zea Mays amylaceae start).The sugar and starch and have little or notdent.Flour corn is one of the oldest types of maize grown widely in U.S.A. and South Africa. The kernels consist almost entirely of soft starch with everything layer of hard starch on the sides. They are also known as soft corn. It is grown in the Andean high lands of South Africa in the drier area of as south - west the kernels of flour corn are composed largely of soft starch little or on hard starch.

3.Sweet corn (*Zea mays*saccharata start): The sugar starches make major component of the endosperm that result in sweetish taste of the kernels

2.3 Phenotypic Variability:

Maize (*Zea mays* L.) is saponaceous plan to the family poaceae (Gramineae). The crop originated Mexico and central America, it is commonly cultivated in tropical areas and grown in summer crop in temperature regions (skerman and River 1990), the name of maize was given by Columbus in his first voyage to the new world. His introduced the crop to Europe an the taken from the West Africa by protuguese and subsequently to India (Dowswell*et al*, 1996).

Maize ranks number there after wheat and rice in the world as again crop (Frova*et a*, 1999). The summarized used of maize in there ways, firstly

in the human food especially in the tropical areas as cobs, soup of fermenting the grain as alcohol or as flour in from of porridge, secondly in the livestock feeding pticularly cattle by cutting the whole plant before maturely thirdly. In industries for making corn flacks, high quality oil.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Experimental site

The experiments was conducted in season 2016, at locations, Shambat, College of Agricultural Studies, Sudan University of Science and Technology at latitude $15^{0}32'$ N, longitude $32^{0}35'$ E and 380 meter above sea level. It is characterized by high heavy cracking clays .

3.2 Plant material

The plant material usedin the study consisted 11 lines (F1) of grain maize, prepared at Shambat, College of Agricultural Studies, Sudan University of Science and Technology.

3.3 Design and Experiment layout:

A randomized complete block design (RCBD), with three replicates was used in this study. The plot size was maintained as 2 rows x 3 m 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 Data to be collection:

For data collection,the followinggrowth and yield characters were measured from five harvested plant at each plot as the following:

3.4.1 Cob diameter (CD)

Cob 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.

3.4.2 Cob Length (CL)

Cob Length was measured in cm using 5 plant and the average was then taken.

3.4.3 Number of Leaves (NL)

Number of leaves in five plant was measured

3.4.4 Number of kernels per row (NKR)

An average of three kernel rows taken at random from each ear was used to determine the number of kernels row of each ear.

3.4.5 100-kernel weight (KW) gm

The weight of 100 kernels in (g) taken at random from the bulk kernels of the ear after threshing.

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. Coefficient of variation (C.V.) for each character was computed. Mean performance was compared according to Duncan's Multiple Range Test (DMRT).

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Cob diameter:

The statistical analysis of variance revealed that there were significant differences (P>0.05) between the eleven maize genotypes for the character, (Table.4.1). The highest value (4.30) and the lowest value (3.86) were obtund by the genotype 5 and 4,respectively , the coefficient of variation for this character was (3.79).(Table.4.2).

4.2 Number of Leaves:

The statistical analysis of variance revealed that there werehiegh significant differences (P>0.05) between the eleven maize genotype for the characters,(Table.4.1). The highest value (13.33) and the lowest value (10.33) were obtund by the genotype 1 and 5 respectively , the coefficient of variation for this character was (5.43).(Table.4.2).

4.3 Cob lengths:

The statistical analysis of variance revealed that there were significant differences (P>0.05) between the eleven maize genotype for the characters, (Table.4.1). The height value (17.06) and the lowest value (15.06) were obtund by the genotype 7 and (1and 4) respectively , the coefficient of variation for this character was (5.42).(Table.4.2).

4.4 100 Seeds Weight:

The statistical analysis of variance revealed that there were significant differences (P>0.05) between the eleven maize genotype for the characters,(Table.4.1). The height value (20.90) and the lowest value

(14.46) were obtund by the genotype 5 and 1 respectively , the coefficient of variation for this character was (7.23).(Table.4.2).

4.5 Numbers of Kernels:

The statistical analysis of variance revealed that there were significant differences (P>0.05) between the eleven maize genotype for the characters, (Table.4.1). The height value (37.33) and the lowest value (30.33) were obtund by the genotype 7 and 8 respectively , the coefficient of variation for this character was (7.04).(Table.4.2).

Table (٤.١): Mean squares for some growth and yield characters in eleven maize of (*Zeamays*L.)genotypes used in the study

Characters	Rep.	Genotypes	Error
CD	0.009	0.044*	0.023
CL	3.385	1.522*	0.738
NL	0.030	1.987**	0.396
100 Seed	7.282	10.256*	1.849
NK	19.757	9.890*	5.890

4-2 Means of some growth and yield characters of eleven maize (*Zea mays* L.) genotypes used in the study.

GENOTYPS	CD	NL	CL	100 S.W	NK
L.1	3.86c	13.33a	15.06b	14.46d	33.66ab
L.2	4.03bc	12.00b	16.16ab	17.20c	36.00a
L.3	4.13ab	12.00b	17.00a	19.63ab	34.66a
L.4	4.13ab	11.66bc	15.06b	20.33ab	33.33ab
L.5	4.30a	10.33d	16.13ab	20.90a	35.33a
L.6	4.16ab	12.00b	15.80ab	18.03bc	35.00a
L.7	4.03bc	11.00bcd	17.06a	19.83ab	37.33a
L.8	4.00bc	12.00b	15.23b	18.26bc	30.33b
L.9	4.13ab	10.66cd	15.73ab	18.10bc	35.33a
L.10	3.93bc	11.33bcd	15.86ab	19.96ab	35.00a
L.11	4.00bc	11.33bcd	15.16b	20.06ab	33.33ab
CV	3.79	5.43	5.42	7.23	7.04

Means followed by similar letter(s) are not significantly different at 0.05 level of probability according to L S D.

CHAPTETR FIVE

DISCUSSION

In this study significant difference were revealed among cob diameter,cob length , number of leaves , number of kernels per row ,100- kernelweight this variation could be attributed to genetic factors ,environmental factors Their interaction similar finding were observed by (Ishag,2004) (Ahmad at al 2000) (Idris and Abu Ali 2012) (Bello at al 2009).

The L5 scored the highest means of cob diameter and 100 seed weight and theL7scored the highest means cob length and number of kernels, these results indicate that these lines are promising lines for obtaining high yield if they used in any maize breeding program. Similar findings were obtained by (Idris and Abu Ali 2012).

CHAPTETR SIX

CONCLUSION

Based on the results obtained in this research, it could be concluded that:

1. Wide range of variability among the 11 lines of maize for the all characters could be of a great benefit in any grain maize breeding program.

2. The lines L5 and L7 scored highest means of cob length, 100 seed weight, cob diameter and number of kernels, therefore they could be used as a parental line in hybridization in any grain maize breeding program.

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