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DETERMINING PERFORMANCE ASPECTS OF MAIZE PRODUCTION IN PRESENT TIMES

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ABSTRACT

Maize is the third most important crop after rice and wheat in India in terms of its area coverage and contribution to total food grains production. It is grown in almost all agro-ecological regions, contributing about 22 million tonnes of grain production from about 9 million hectares of land. The production pattern as well as its consumption pattern has dramatically changed in India in the recent past. However, the average crop yield of 2.5 t/ha is still very low as compared to the other Asian countries like Bangladesh (6.8 t/ha), China (5.7 t/ha), Indonesia (4.6 t/ha) and Pakistan (3.8 t/ha) in 2012 (FAOSTAT). This paper has examined the growth and instability in maize production in the major districts of major maize growing States in the country. An attempt has also been made to forecast its production in near and mid-term under different scenarios. The results showed that more than 60 percent of maize area is observed to be having maize yield less than 2 t/ha. At the same time, huge variability in maize yield between and within the maize growing States was also found. However, the maize yield is estimated to increase little more than 3 t/ha by the year 2020, if the current policy and macro-economic environment continues.

Keywords: -Maize, Wheat, Population, Production, Yield

I. INTRODUCTION

Maize (Zea mays L) is a cereal grain, also known as Queen of Cereals due to its diverse usages. In India, it is cultivated in most of the States throughout all the seasons. Depending on the regions and socio-economic conditions of the population, the maize-grain is used for various purposes including food, feed, fodder, green cobs, sweet corn, baby corn, popcorn, starch and several industrial products. According to the fourth advance estimates of the Ministry of Agriculture, Government of India, maize in India occupied about 8.7 million hectares (M ha) of the area and produced about 22.2 million tonnes (Mt) of maize grain during 2012-13. It is about 15 per cent and 5 per cent to total maize-area, while 8 per cent and 2.4 per cent to total production in Asia and the world, respectively.

n the past two decades, production performance in India has been significant as compared to the previous periods. The total maize production in the country has doubled within 15 years from about 10 Mt in 1992-93 to 20 Mt in 2008-09. However, this growth can be equally attributed to area expansion under the crop as well as improvement in the yield, as both has increased by around 40 per cent in the same period.

During this period, the country has witnessed a tectonic shift in maize growing regions. Till 1990s, Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh were the major maize-producing States, but the southern States especially Andhra Pradesh and Karnataka became the predominant maize-growing states from the last two decades.

More recently, Maharashtra and Tamil Nadu are also emerging as very important maize growing States. The new territory of the crop has also pushed the crop yield up significantly due to the clement weather condition in the region. Although, the improvement in average crop yield (2.55 t/ha in 2012-13) has not been very encouraging, which is far lower than that realized in many other Asian countries like Bangladesh (6.8 t/ha), China (5.7 t/ha), Indonesia (4.6 t/ha) and Pakistan (3.8 t/ha) in 2012.

II. MAIZE TRENDS IN INDIA

In this section, the results of past performances of the area, production and yield of maize for different States are presented. From perusal of the findings, it was observed that four States namely Karnataka, Rajasthan, Andhra Pradesh and Madhya Pradesh together constituted about 48% of the total maize area in the country. As compared to TE 2000-01, the percentage share of Karnataka, Andhra Pradesh, Maharashtra and Tamil Nadu to the total maize area in the country has increased significantly in TE 2010-11, while it has declined in Rajasthan, Madhya Pradesh, Uttar Pradesh, Bihar, Himachal Pradesh and Punjab (Fig. 1). The area under the crop in Tamil Nadu, Maharashtra and Karnataka has escalated by 3.47, 2.54 and 2.07 times, respectively during this period. Contrary to it, the traditional maize growing States like Bihar, Himachal Pradesh, Madhya Pradesh and Uttar Pradesh have witnessed a decline in the crop area during the same period.It is important to note that the states where maize area started contracting are traditional maize belt. The maize-growers in these States prefer to grow open pollinated varieties (OPVs) or composites, mainly for domestic consumption. Besides, it is mainly grown in Kharif season as rainfed crops with low inputs. The yield in Odisha, Himachal Pradesh, Rajasthan, Uttar Pradesh, Chhattisgarh, Gujarat and Madhya Pradesh was below the national average yield.

There was significant jump in the crop yield due to better hybrid adoption, as well as relatively high input use. Andhra Pradesh and Madhya Pradesh have almost the same area, but these two States differed significantly in the yield level. Similarly, Uttar Pradesh and Maharashtra has the same area, but the yield is 1.48 t/ha and 2.50 t/ha, respectively, while the maize area in Himachal Pradesh and Tamil Nadu are equal, but these two States differedsignificantlyintheyield at 2.13 t/ha and 4.44 t/ha, respectively in TE 2010-11.In terms of production, four States Karnataka, Andhra Pradesh, Maharashtra and Tamil Nadu together contributed about 55 per cent of total maize production in India. During the past ten years, the highest change was observed in Andhra Pradesh, Maharashtra and Tamil Nadu.

A significant increase in the maize area and production during this period has happened mainly due to the introduction of single crossed hybrids and implementation of Government of India sponsored ‘Integrated Scheme of Oilseeds, Pulses, Oilpalm and Maize’ (ISOPOM), as well as shift in growing season from Kharif to Rabi in many States. For the popularization of hybrid maize in the country, several State governments also started promotional programmes in public-private-partnership mode to launch the

projects like 'Project Sunshine' in Gujarat, the 'Golden Rays Project' in Rajasthan, 'Project Golden Days' in Odisha, 'MakkaVikasPariyojana' in Madhya Pradesh and the 'Project Rainbow' in Jammu & Kashmir.

III. MATERIALS AND METHODS

Study Area:

The present study was conducted to evaluate maize populations for genetic variability in yield and yield component, at the teaching and research farm of the federal university of technology, Akure (Latitude 7°16' N, Longitude 5°12'E), tropical rainforest of southern Nigeria.

The location is characterized by bimodal pattern of rainfall with an annual mean of 1300 mm with a mean temperature of 27°C and climate of sub-humid type.

The Experiment Layout:

Ten early maturing maize populations which were obtained from the International Institute for Tropical Agriculture (IITA) Ibadan, Nigeria was used for the experiment. The experiment was laid out in randomized complete block design with three replications. The seeds were grown in two row plots, with row length of 5 m, having row to row and plant to plant distance of 0.75 and 0.25 m, respectively. Two seeds per hill were planted, which were thinned to one plant per hill at 4-5 leaf stage. NPK (15:15:15) fertilizer applied at the same rate at third week after planting while urea was applied week before flowering. Standard cultural practices were followed from sowing till harvesting during the entire crop season.

IV. RESULT

Means and Ranges of Fourteen Characters in the Maize Varieties:

Days to tasseling varied from 46 days to 66 days with the overall mean of 54.7. Days to silking varied from 50 days to 77 days with the overall mean of 58.53. Plant height varied from 114 cm to 173 cm with the overall mean of 145.3 cm. Ear height varied from 42 cm to 79 cm with the overall mean of 56.97 cm. Number of cobs varied from 5 to 24 with the overall mean of 11.4. Length of cobs varied from 12 cm to 19 cm with the overall mean of 15.13 cm. Girth of cobs varied from 14 to 17 with the overall mean of 14.7. Field weight varied from 151g to 2160 g with the overall mean of 1206.07 G. Five hundred grain weight varied from 88 g to 127g with the overall mean of 103.73 g. Kernel row varied from 20 to 30 with the overall mean of 23.83. Plant girth varied from 6 cm to 8 cm while average cob weight varied from 20c m to 30 cm (Table 1).

Mean Performance of the Varieties:

Table 2 shows that the mean number of days to 50% tasseling ranged from 49.667 to 64.33. IWDC SYNF had the highest mean$_{32}$ (64.33) which was not significantly different from TZE.

Table 1: Means, standard deviation and ranges of fourteen characters of the maize varieties

Variable	Mean	STD	MINI	MAX
Days to 50%tasselling	54.7	6.2	46	66
Days to 50%silking	58.53	7.09	50	77
Plant height(cm)	145.3	17.074	114	173
Ear height (cm)	56.97	8.27	42	79
Plant girth	6.6	0.563	6	8
Number of cobs	11.4	4.74	5	24
Cob length (cm)	15.13	2.29	12	19
Girth of cobs (cm)	14.7	0.837	14	17
Field weight (g)	1206.07	620.13	151	2160
Cob weight (g)	118.67	28.88	20	30
Grain weight (g)	103.73	10.808	88	127
Kernel row	23.83	2.653	20	30

Table 2: Means of vegetative and reproductive traits I selected varieties of maize

Varieties	Days to Tasselling	Days to Silking	Plant Girth (cm)	Kernel Row	500 Grain weight (g)	Cob girth (cm)	Cob Length (cm)	Cob Weight (g)	Ear Height (cm)	Plant Height (cm)	Fresh Weight (g)
TZE.COMP 5 WCT	50.33c	53.33c	7.37a	24.00a	95.33cde	14.67ab	14.80cd	105.40c	45.73c	148.87bc	939.67d
POOL18 SR/ARC94 DMR ESR	49.67c	52.33c	7.16ab	25.67a	109.33ab	14.26b	12.03e	95.06cd	61.00b	168.37a	1037.67cd
ARC91.SUWAN1 SRC1	51.33c	60.00abc	6.84abc	24.00a	104.67bc	14.40b	14.80cd	146.23ab	57.10b	135.94cd	167.33e
SUWAN1 SR-Y	50.00c	53.33c	6.99ab	24.33a	90.67e	15.06ab	13.80d	130.69b	58.70b	164.10ab	140.00bc
TZE COMP.3C DT2	62.33ab	60.00abc	6.83abc	22.33a	92.33de	14.23b	18.36a	158.26a	55.533b	147.30c	208.33e
SUWAN1 SR QPM	52.00c	52.00c	6.73bc	22.00a	120.67a	14.17b	14.03d	78.23d	54.83b	145.50c	2042.00a
DMR ESR-Y	50.00c	55.00bc	6.05de	24.33a	120.33a	14.87ab	18.70a	108.84c	58.22b	136.12cd	1514.00b
DT-Y-SYN15	62.33ab	66.67ab	5.99de	26.67a	101.33bcde	16.30a	16.80b	163.47a	71.89a	120.97d	1629.67ab
IWDC SYNF3 2	64.33a	71.00a	6.40cd	22.00a	100.00bcde	14.10b	12.36e	109.36c	62.40b	163.73ab	1736.00ab
ARC.94.TZE.COMP5Y	54.33bc	61.67abc	5.84e	23.00a	102.67bcd	14.93ab	15.33c	90.96cd	43.77c	122.18d	1386.00bc

DISCUSSION

The result from this experiment revealed the significant ($p<0.01$) variation among the varieties in reproductive and field weight traits investigated in this study. This variation may be attributed to different genetic makeup of the genotypes. The possible reason for the observed differences could be variation in their genetic akeup. Moreover, different researchers have reported significant amount of variability in different maize populations including top-crosses and open pollinated varieties. This result is in line with that of, who also observed considerable genotypic variability among various maize genotypes. Similarly, recommended to be considered in association with genetic advance to predict the effect of selecting superior crops varieties.

V. CONCLUSION

The result shows that variation existed among the varieties for field weight and reproductive traits studied. Ear height had positive and significant correlation with field weight and number of cobs. Varieties that had high earliness trait are not high yielding; tall varieties with moderate earliness had high field weight and had the highest yield (SUWAN1 SR QPM) while POOL18 SR1 ARC94 DMR ESR are the earliest in maturity. Therefore any of SWUWAN 1 SR QPM and POOL 18 SR1 ARC94 DMR ESR can be crossed to develop hybrid with combined traits (high yielding and early maturity). The phenomenal growth in the production and its spread across the regions proved maize a golden grain in India. Its diversified usage as food, feed and other multifarious industrial derivatives make the crop special and apart from any other cereals. Hitherto, the increase in production has been due to expansion in area under the crop as well as slow and steady improvement in its yield. Maize in India has explored new regions and seasons, where it is performing relatively faster, while in traditional belt, it started shrinking.

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