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Studies on Growth and Yield Parameters of Parental Lines of Promising Maize Hybrids for their Seed Production Potentiality

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ABSTRACT

The field experiments were conducted at ZARS, V. C. Farm, Mandya, during *kharif* 2020 to study the growth and yield traits of parental lines of promising maize hybrids for their seed production potentiality. The results revealed that mean sum of squares due to parental lines indicated significant differences for growth and yield parameters viz., plant height, cob weight, number of rows per cob, seed yield per cob and seed yield per hectare. Among the parental lines MAI-729 has significantly showed higher cob weight (114.33 g), hundred seed weight (29.11 g), seed yield per cob (94.61 g), seed yield (45.71 q ha^{-1}). Whereas lowest cob weight (54.27 g), hundred seed weight (19.18 g), seed yield per cob (43.00 g) and seed yield (17.89 q ha^{-1}) were recorded in DH-376. Therefore, MAI-729 parental line could be recommended for breeding and seed production programs.

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Keywords Parental lines, Days to 50% flowering, Cob weight, Seed yield.

INTRODUCTION

Maize (*Zea mays* L.) is one of the important versatile and staple cereal crops of the world and ranks next to wheat and rice. Maize has been an important cereal because of its great production potential and adaptability under wide range of environments. Maize occupies an important place in Indian economy, like rice, wheat and millets. Besides being a potential source of food for human being, it is also used for feeding cattle, poultry and industries for the production of starch, syrup, alcohol, acetic acid, lactic acid .

Globally, maize is cultivated on an area of 193.7 million hectares with production of 1147.7 million tonnes with productivity of 5750 kg ha^{-1} (FAO 2020). In India, maize is grown over an area of 9.89 million hectares with a production of 31.65 million tonnes and productivity of 3199 kg ha^{-1}. In Karnataka, it is cultivated in an area of 1.34 million hectares with production of 3.98 million tonnes accounting the productivity of 3305 kg ha^{-1} (Anonymous 2021)

Maize is the only cereal crop which will be grown in various seasons and requires moderate climate for their growth. Being a C_4 plant, it is physiologically more efficient and has higher yield potential and wider adaptability over environmental conditions. The production and utilization potential of maize in

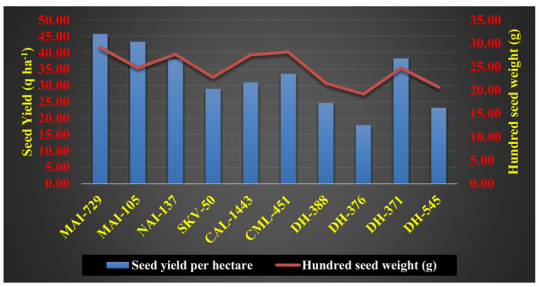

Fig. 1. Mean performance of parental lines on seed yield per hectare and hundred seed weight.

the recent times is not only attracting the attention of Research Scientists, but also evolving major National and International Research thrusts, with a view to providing solutions to various problems of maize particularly in terms of poor genetic potential, low seed yield, poor adaptation to various agro ecologies and overall poor performance of some varieties. For achieving the successes of crop improvement program not only depend on amount of genetic variability present in the population but also, it can be achieved through selection of genotypes based on growth and yield parameters viz., days to 50% tasseling and silking, days to maturity, plant height, number of rows per cob, grain number per cob and seed yield traits.

The study of agronomic characters is one of the most important functions that determines the crop growth and development of any crop and is essential to acquire knowledge on the physiological response of the crop under different field conditions. Therefore, evaluating the parental lines of promising maize hybrids to study genetic variability for agronomic characters (growth and yield traits) is a key component of breeding programmes for broadening the gene pool of crops (Chakravarthy and Jagannathan 2014). Hence, the present study was conducted to evaluate the maize parental lines for growth and grain yield traits and also to identify appropriate parental line for seed production and hybrid development program.

METHODOLOGY

The experiment was laid out in Randomized Complete Block Design during *kharif* 2020 to study the crop growth, days to flowering and seed yield in parental lines of promising maize hybrids with three replications at ZARS, V.C. Farm, Mandya. Seeds of each parental lines were sown on a 3 m long row with an inter-plant spacing of 30 cm and an inter- row spacing of 60 cm. Normal agronomic practices were followed to raise the crop. The experiment consisted of ten treatments (parental lines) viz. P_1: MAI 729, P_2: MAI 105, P_3: NAI 137, P_4: SKV 50, P_5: CAL 1443, P_6 : CML 451, P_7: DH 388, P_8: DH 371, P_9: DH 376, P_{10}: DH 545. Observations on growth and yield attributes were recorded on five randomly selected plants from each plot during *kharif* 2020 season.

RESULTS AND DISCUSSION

Significant difference was observed among the parental lines for plant height at harvest. The plant height ranged from 161.67 cm (DH-371) to 127.67 cm (CML-451) with a mean of 144.80 cm (Table 1). Significantly higher plant height was noticed in DH-371 followed by MAI-729, NAI-137, MAI-105, DH-388 and DH-376. The lowest plant height was found in CML-451. This variation may be attributed to their genetic background. Higher plant height may be attributable to earlier field emergence, which boosted the plant's resistance to heat and drought, resulting in higher plant height at harvest. The similar findings were also reported by several researchers (Hidayat *et al.* 2008 and Manjunath *et al*. 2018) in maize.

Days to 50% tasseling and silking did not differ significantly among parental lines (Table 1). However, SKV-50 took lesser days for flowering (54.00 and 54.00, respectively) and CML-451 took longer days to flowering (63.00 and 65.00 days, respectively). Furthermore, all the parental lines come under medium and late flowering groups as per the DUS guidelines. Variability may be attributed to their differential genetic constitution and also due to speed of emergence, improved field stand and vigorus growth of plant. The above results are in line with previous findings of Hidayat *et al.* (2008), Kiran and Channakeshava (2017) and Arjun *et al.* (2021) in maize.

Non-significant difference was noticed for number of days taken to maturity among parental lines. CML-451 matured in 114 days while, CAL-1443 and DH-545 took 113 and 108 days for maturation, respectively. The earliest maturation was noticed in

Table 1. Mean performance of maize parental lines for their growth parameters.

Parental lines	Plant height (cm)	Days to 50% tasse-ling	Days to 50% silking	Days to matu-rity	Cob weight (g)
MAI-729	152.33	55.00	57.00	102.00	114.33
MAI-105	149.33	57.00	58.00	104.00	113.44
NAI-137	151.00	56.00	58.00	106.00	93.40
SKV-50	142.67	54.00	54.00	97.00	71.33
CAL-1443	133.00	58.00	59.00	113.00	80.67
CML-451	127.67	63.00	65.00	114.00	86.67
DH-388	147.00	57.00	57.00	95.00	63.60
DH-376	146.33	62.00	64.00	97.00	54.27
DH-371	161.67	57.00	57.00	97.00	106.82
DH-545	137.00	57.00	57.00	108.00	73.33
Mean	144.80	57.60	58.60	103.30	85.79
SEm±	5.19	2.55	2.61	4.58	3.96
CD (P = 0.05)	15.57	NS	NS	NS	11.87

Table 2. Mean performance of maize parental lines for yield parameters.

Parental lines	No rows per cob	Seed yield per cob (g)	Seed yield per plot (kg)	Seed yield per ha (q ha^{-1})	100 seed weight (g)
MAI-729	15.45	94.61	4.03	45.71	29.11
MAI-105	16.58	90.08	3.75	43.37	24.75
NAI-137	14.73	72.60	3.29	37.96	27.63
SKV-50	12.72	58.72	2.43	28.94	22.71
CAL-1443	16.67	66.33	2.65	30.96	27.54
CML-451	14.67	69.67	2.90	33.54	28.12
DH-388	11.33	53.33	2.11	24.63	21.46
DH-376	11.33	43.00	1.51	17.89	19.18
DH-371	12.67	90.00	3.38	38.25	24.72
DH-545	11.67	63.67	1.99	23.21	20.60
Mean	13.78	70.20	2.80	32.45	24.58
SEm±	0.62	3.39	0.14	1.66	0.67
CD (P = 0.05)	1.85	10.15	0.43	4.97	1.97

DH-388 (Table 1). Flowering and maturity period are essential qualities that are typically taken into account before a variety is released for commercial use. This might be due to better utilization of nutrients and moisture among the parental lines populations. Similar results were also reported by Ahmed *et al.* (2012), Ibrahim and Mukhtar (2016) and Anil kumar (2018).

The trait cob weight also differed significantly among the parental lines (Table 1). It was ranged from 114.33 (MAI-729) to 54.27(DH-376) with a mean of 85.79 grams. Similarly, significant differences were observed among the parental lines of promising maize hybrids for number of rows per cob (Table 2). The number of rows per cob ranged from 16.67 (CAL-1443) to 11.33 (DH-388 and DH-376) with a mean of 13.78.

The seed yield per cob showed significant differences among the parental lines studied (Table 2). It was found that significantly higher seed yield per cob was recorded in MAI-729 (94.61 g) followed by MAI-105 and DH-371. Whereas, lower seed yield per cob was recorded in DH-376 (43.00 g).

Seed yield per plot and seed yield per hectare showed significant differences among the parental lines of promising maize hybrids (Table 2, Fig. 1). Among the parental lines, MAI-729 showed highest seed yield per plot and seed yield per hectare (4.03 kg and 45.71 q, respectively) which was followed by MAI-105. Whereas, lower seed yield per plot and seed yield per hectare was recorded in DH-376 (1.51 kg and 17.89 q, respectively).The variation in the yield potential is probably due to the diverse background of parental lines. Positive and significant association of cob weight and hundred seed weight contribute to more seed yield (Prasad and Shrestha 2020). The above findings were in accordance with Daniel (2014) and Dhakal *et al.* (2017) in maize genotypes.

Significantly higher hundred seed weight was observed in MAI-729 (29.11 g) followed by CML-451 (28.12 g), NAI-137 (27.63 g) and CAL -1443 (27.54 g). Whereas, lower hundred seed weight was observed in DH-376 (19.18 g) (Table 2, Fig. 1). The variation among the parental lines might be due to inherent genotypic differences that existed during the crop growth, seed development and maturation stage. Similar pattern of classification was reported earlier by Pinnisch *et al.* (2012) in maize and Bhusal *et al.* (2017) in sorghum.

CONCLUSION

Growth and yield parameters differed significantly for different parental lines. The parental line MAI-729 was considered as a better performer among the parental lines in terms of growth, higher seed yield and yield traits aspects. Therefore, study of agronomic

characters would be most suporter for selection of parental lines in breeding and seed production programs.

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