

Agronomic evaluation of maize (*Zea mays* L.) genotypes under agro-climatic conditions of prayagraj, uttarpradesh in Kharif-2022

ABSTRACT

Maize (*Zea mays* L.) is one of the most versatile emerging crops having wider adaptability under varied agro-climatic conditions. Globally maize is known as "Queen of cereals" because it has highest genetic yield potential among the cereals. To find out the best Genotype among the maize hybrids, a field experiment was conducted during the *kharif* season of 2022 at the experimental field of the Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India. The study was conducted to evaluate some agronomic characters of maize genotypes under "Agronomic Evaluation of Maize (*Zea mays* L.) Genotypes under agro-climatic conditions of Prayagraj, Uttar Pradesh in Kharif-2022". The experiment was laid out in a randomized complete block design which consisted of ten maize genotypes as treatments. The treatments were replicated three times. The result of the study indicates that among different maize Genotypes, M-410 produced significantly higher plant height (218.35 cm), number of leaves per plant (15.60), dry weight per plant (152.24g), cob length (19.26 cm), number of rows per cob (14.85), number of grains per row (37.03), seed yield (9.54 t/ha) and stover yield (21.62 t/ha). Based on the result obtained M-410 is most suitable, productive economical to be grown in the study area and therefore recommended as planting material in the agro-ecological zone.

Keywords: Hybrid maize, yield attributes, growth attributes Kharif, varietal response.

1. Introduction

Maize (*Zea mays* L.), is the world's leading crop and is widely cultivated as cereal grain that was first domesticated in Central America. The crop is one of the most versatile emerging crops having wider adaptability. Globally, maize is known as queen of cereals because of its highest genetic yield potential. In India, maize is predominantly cultivated as rainfed crop but due to focused research on single cross hybrids. Moreover, local varieties of Uttar Pradesh failed to give higher yields in comparison with hybrids of maize. Consequently, there was a great need for replacing local varieties with different hybrids groups [3]. It is cultivated on nearly 197 Mha with a production of 1148 MT and productivity of 5823.8 kg/ha all over the globe, contributing 37 per cent of the global grain production [4]. India has produced 21.24 MT in an area of 8.15 Mha in 2021-22. India is the world's seventh largest maize producer, with the fourth greatest production area. In 2021-22, India produced 21.24 million tonnes over an area of 8.15 million hectares [5]. Maize is a largely cultivated crop in north India. Major maize producing states are Andhra Pradesh (20.9%), Karnataka (16.5%), Rajasthan (9.9%), Maharashtra (9.1%), Bihar (8.9%), Uttar Pradesh (6.1%), Madhya Pradesh (5.7%) and Himachal Pradesh (4.4%). Madhya Pradesh ranks first in maize production. In Uttar Pradesh maize accounts for a 0.74 Mha area with the production of 1.53 MT and productivity of 2082 kg/ha. The problem of maize production is high cost of inputs [6].

The progress achieved on hybrid maize in the United States led to the initiation of hybrid research all over the maize world. The adoption of high yielding variety seed helped to accelerate the growth rate of production and yield of maize [7]. In recent years, farmers started and continue to replace traditional cultivars with the newer higher-yielding maize hybrids, because they are having 3 times more productivity than traditional varieties. However, changing environmental conditions have an impact on maize hybrids growth and production, thus it's crucial to test them in specific agro-climatic conditions. The objective of this study was to identify the superior maize hybrid that is suitable for cultivation in the Prayagraj, Uttar Pradesh conditions based on the performance of maize hybrids in the field condition.

2. MATERIALS AND METHODS

The experiment was conducted during the *kharif* season of 2022 at the Crop Research Farm, Sam Higginbottom Institute of Agriculture, Technology & Sciences Prayagraj, Uttar Pradesh, which is located at 25.24°N latitude, 81.51°E longitude and 86 m altitude above the mean sea level. It was laid out in Randomized Block Design (RBD) with three replications, and it consisted of 10 maize Genotypes viz., T1: M-400, T2: M-410, T3: M-502, T4: M-512, T5: M-600, T6: M-608, T7: M-612, T8: M-618, T9: M-702 and T10: M-710.

The maize hybrid seeds were provided by the Uttar Pradesh Council of Agricultural Research (UPCAR). They were sown at rate 20 kg/ha by maintaining the spacing of 60 cm x 20 cm in net plot area of 3 m x 3.2 m sandy loam soil on 9th of July in 2022.

The data on growth parameters and yield attributes of maize hybrids were recorded and subjected to analysis of variance as described by Gomez and Gomes [1]. The significance of comparison was tested. The significant difference (SD) values were calculated for a 5% probability of error. Critical difference (CD) values were calculated for comparisons between treatment means whenever the variance ratio (F value) was found to be significant.

3. RESULTS AND DISCUSSION

3.1 Growth Parameters

The recorded and analysed data on growth parameters indicates that significantly ($p=0.05$) higher plant height (218.35 cm), number of leaves per plant (14.40) and plant dry weight (152.24) was recorded in the maize genotype M-410. The difference in the plant height, number of leaves per plant, plant dry weight. These traits shown by m-410 is attributable due to the diverse background of parental lines, from where the hybrids were developed. Similar findings were reported by Muchie and Fentie [13], Pal and Bhatnagar [10].

Table 1. Evaluation of growth parameters of maize Genotypes under agro-climatic conditions of Prayagraj, Uttar Pradesh

Hybrids	Plant height (cm)	Number of leaves (No.)	Plant dry weight(g)
M-400	188.72	15.40	143.70
M-410	218.35	15.60	152.24
M-502	197.41	15.52	137.92
M-512	198.60	14.77	136.57
M-600	198.60	15.65	141.19
M-608	211.13	14.82	130.23
M-612	195.36	14.40	143.64
M-618	198.52	14.66	133.41
M-702	184.40	14.85	144.85
M-710	180.03	14.91	140.10
SEm(±)	3.88	0.25	1.09
CD (p=0.05)	11.24	0.75	3.21

3.2 Yield and Yield Attributes

Yield attributes such as Cobs per plant (No.), Cob length (cm), Grain row per cob (No.), Number of grains per row (No.), Seed index (g) varied among different maize hybrids. The Genotype M-410 was recorded with higher yield attributes viz. Cobs per plant (No.) (1.82), Cob length (19.96 cm), Grain row per cob (No.) (14.85), Number of grains per row (No.) (37.03), Seed index (38.40 g). The maize Genotype M-410 was also recorded significantly higher Seed yield (9.54 t/ha), Stover yield (21.62 t/ha) and Biological yield (30.61t/ha).

The significant difference in grain yield and other agronomic traits among various hybrids was due to the diverse background from which the hybrids were developed. The higher grain yield of the above genotypes could be correlated to the higher number of Cobs per plant, Cob length, Grain row per cob, Number of grains per row and Seed index. Similar results have also been reported by Kumar and Kandel [8] and Manjunatha et al. [15].

Table 2. Evaluation of yield attributes and yield of maize Genotypes under agroclimatic conditions of Prayagraj, Uttar Pradesh

Hybrids	Number of cobs/plant (No.)	Number of grain rows/cob (No.)	Number of grains /row (No.)	Cob length (cm)	Seed index (g)	Seed Yield (t/ha)	Stover yield (t/ha)	Biological yield (t/ha)
M-400	1.46	13.80	34.50	12.60	33.22	7.70	19.32	27.02
M-410	1.82	14.85	37.03	19.96	38.40	9.54	21.62	30.61
M-502	1.53	12.60	32.66	17.45	32.67	8.69	20.74	29.52
M-512	1.23	12.20	31.64	16.98	30.67	9.35	21.41	30.39
M-600	1.70	12.42	27.02	15.08	28.24	8.47	20.45	29.28
M-608	1.42	14.40	30.50	18.68	25.00	9.31	21.23	30.48
M-612	1.57	12.84	34.34	17.52	30.32	8.45	20.57	29.11
M-618	1.34	13.40	35.78	15.28	35.70	9.23	21.60	29.93
M-702	1.65	14.60	31.35	16.95	30.60	7.64	19.43	28.22
M-710	1.44	13.20	34.68	16.53	33.40	8.51	20.20	29.64
SEm(±)	0.15	0.41	2.30	0.37	1.45	0.40	0.18	1.41
CD (p=0.05)	-	1.17	6.64	1.08	-	1.18	0.72	4.11

CONCLUSION

Based on the findings of this field experiment it is concluded that among 10 tested maize Genotypes, M-410 was found to be most suitable maize genotype to be recommended as it recorded highest growth parameters, yield attributes and yield. It was found more productive, when compared to others under agroclimatic conditions of Prayagraj, Uttar Pradesh. Since the future research is recommended to be conducted before recommending M-410 genotype to farmer.

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COMPETING INTERESTS

"Authors have declared that no competing interests exist".

AUTHORS' CONTRIBUTIONS

Murugudu Manoj designed the study, Performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Vikram Singh and Shruthi Grace George managed the analyses of the study. Shruthi Grace George managed the literature searches and All authors read and approved the final manuscript.

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