E-ISSN: 2618-0618
P-ISSN: 2618-060X

www.agronomyjournals.com
2024; SP-7(6): 154-156
Received: 15-03-2024
Accepted: 29-04-2024

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Evaluation of private sector maize genotypes (*Zea mays* L.) under agro-climatic condition of Prayagraj, U.P

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DOI: https://doi.org/10.33545/2618060X.2024.v7.i6Sc.832

Abstract
Maize (*Zea mays* L.) stands out as a highly adaptable crop, in diverse Agro-climatic conditions. It is known as "Queen of cereals" on a global scale due to its exceptional genetic yield potential compared to other cereals. Determining the optimal genotype among maize hybrids is crucial for enhancing productivity and meeting agricultural demands. A field experiment was conducted during *Kharif* season of 2023 at Crop Research Farm (CRF), Department of Agronomy, SHUATS, Prayagraj (UP) to investigate the "Evaluation of Private Sector Maize Genotypes (*Zea mays* L.) under Agro-climatic condition of Prayagraj, U.P." The treatments consist of 07 hybrids. The 7 hybrids are UM-10, UM-20, UM-30, UM-40, UM-50, UM-60, UM-70. The experiment was laid out in Randomized Block Design with seven hybrids and replicated thrice. The significantly highest plant height (172.07 cm), no. of leaves/plant (12.30) plant dry weight (183.30 g/plant), crop growth rate (7.35 g/m^2/day), seed index (30.45g), seed yield (8.76 t/ha) and harvest index (38.09%) were significantly higher in UM -20. In other hand UM -60 taking minimum time for Days to tasselling (46 DAS) and Days to silking (50 DAS), in UM -70 Days to maturity was recorded earliest (86.66 DAS).

Keywords: Maize, hybrids, *kharif*, growth, yield, economics

Introduction
Maize (*Zea mays* L.) is one of the most versatile crops grown throughout the tropical as well as temperate regions of the world. a crop of maize is sown and harvested somewhere in the world in every month of the year. There is no cereal on the earth which has so immense potentiality and that is also called "Queen of cereals". It is most important cereal crop which ranks third after wheat and rice in the world. Globally, India stands 5th rank in acreage and 8th rank in production of maize.

Maize belongs to poaceae (or), Graminae family. Maize is one of the most important cereal crops in the world grown over an area of 132 Mha. with a production of 57mt. Being a C4 plant, Maize is capable of utilizing solar radiation more efficiently compared to other cereals. It requires higher amount of nutrient thought the crop grown period, but due to heavy utilization of chemical fertilizer as to maintain the crop health. To maintain the soil health, we have to go for organic fertilizer management. In Uttar Pradesh it is considered third most important crop. The nutrient content of maize is crude protein 7.6%, crude fibre 2.3%, crude fat 3.6%, starch 63.8%, Total sugar 1.7%, Gross energy 3840 kcal/kg. (Afzal *et al.* 2017) [1].

Maize protein "Zein" is rich in tryptophan and lysine, the two essential amino acids. Most of cereals have been the staple human diet from prehistoric times because of their wide cultivation, good keeping quality, blend flavour and great variety. Maize is an important staple food in many parts of the world. In addition to staple food for human being and quality feed for animals, maize serves as basic raw material as an ingredient to thousands of industrial products that includes starch, oil, protein, alcoholic beverages, food sweeteners, pharmaceutical, cosmetics, film, textile, gum, package and paper industries etc. In Uttar Pradesh maize accounts for 7.36 lakh hectare area with the production of 12.86 lakh ton and productivity of 18.47 kg/ha. (Department of Agricultural Government of UP 2013) [5].

India has produced 30 million tons in an area of 9.9 million hectares in 2020-21. Maize is a largely cultivated crop in northern 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%). Madya Pradesh ranks first in maize production. In Uttar Pradesh maize accounts for a 0.736 Mha. area with the production of 1.53 million tons and productivity of 2082 kg/ha (Agricultural Statistics at a Glance 2020).

Materials and Methods

The experiment was conducted during *Kharif* season of 2023 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P), which is located at 25.24°N latitude, 81.51° E longitude and 86 m altitude above the mean sea level. The soil of the field constituting a part of central Gangetic alluvium is neutral and deep. The soil of the experimental field was sandy loam in texture, nearly neutral in soil reaction (pH 7.8), low level of organic carbon (0.35%), available N (225 Kg/ha), K (105.0 kg/ha), P (20.10 kg/ha) and zinc (2.32 mg/kg). The treatments consist of 7 hybrids. The experiment was laid out in RBD with 7 hybrids each replicated thrice. The 7 hybrids are UM-10, UM-20, UM-30, UM-40, UM-50, UM-60, UM-70. The growth parameters and yield, production was recorded at harvest from randomly selected plants in each plot. The data was computed and analysed by the statistical method of Gomez and Gomez (1984) [6].

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 60cm × 20cm in net plot area of 5m × 5m on 13th of July 2023. Observations on growth parameters, yield attributes of maize hybrids, was recorded during the experiment.

Results and Discussion

Growth Parameters

At Harvest, significantly highest plant height (172.07 cm) was recorded in UM- 20. However, UM-30 (163.28 cm), and UM-70 (160.34 cm) were found to be statistically at par with UM-20. The variation in plant height in several hybrids was reported by (Ali *et al*., 2008) [2] This is because plant height is a genetically controlled factor, and as a result, the height of various types does not remain equal. It is impossible to ignore how environmental conditions affect plant height, however by choosing the right crop cultivar, environmental influence can be controlled.

At 80 DAS, significantly highest number of leaves/plant (12.20) was recorded in UM-20. However, UM-30 (11.93), UM-50 (12.07) and UM-60 (12.00) were statistically at par with UM-20. The differences observed in the number of leaves of maize may be attributed to differences in growth characteristics which are being influenced by the genetic makeup of the plants as reported by Gollar *et al*. (1996) [7].

At Harvest, significantly higher plant dry weight (183.30 g/plant) was recorded in UM 20. The hybrids UM-10 (166.50 g/plant) and UM-70 (173.19 g/plant) recorded statistical parity with UM-20. the differential growth concerning plant dry weight among the hybrids may be attributed to differences in genetic characterization of the individual varieties, including rapid growth rates, tallness, or shortness of species. The result confirmed with Pal and Bhatnagar (2012) [10]. The variation in dry matter of different hybrids at different growth stages was attributed to variation in plant height and speed of growth at that time which was in conformity with Sangai and Salvador (1998) [11].

At 80-at harvest significantly highest crop growth rate (7.35 g/m^2/day) was recorded in UM-20. However, the hybrid UM-60 (7.18 g/m^2/day) and UM-70 (7.02 g/m^2/day) were found statistically at par with UM-20. Sabir *et al.,* (2017) [12] reported the similar results in maize that increase in CGR values in early stages due to the less vegetation and low percent of light absorption, but rapid increase in the rate of plant growth that occurs because the level of developed leaves and thus absorption of solar radiation increases. The distribution and remobilization of assimilate partitioning and also duration of the crop influences the biomass accumulation and CGR of the crop.

At 20-40 DAS, highest relative growth rate (0.149 g/g/day) was recorded in UM-50. Lowest was recorded in UM-60 having 0.139 g/g/day as compared to rest of the treatments and there is no significance difference between the treatments.

Days taken to 50 percent tasselling as influenced in hybrids and presented in Table 1. The days to 50% tasselling was recorded minimum in the hybrid UM-60 (46.00 DAS). The maximum (55.00 DAS) days to 50% tasselling was taken in UM 40.

Days took to 50 percent silking as influenced in hybrids and presented in Table 1. The days taken to 50% silking was found minimum in UM-60 (50.00 DAS). The maximum days to 50% silking was recorded in UM-40 (58.33 DAS).

Days to Maturity Observed data has recorded and presented in Table 1. The days to maturity was found significant. The hybrid UM-70 had recorded days to maturity (86.66 DAS) which was considered as significant and better performing as it took less days to mature. However, hybrids UM-10 (86.67 DAS), UM-20 (87.00 DAS), and UM-60 (87.67 DAS) were statistically at par with UM-70. The maximum days to maturity was recorded in UM-40 (93.00 DAS).

Yield parameters

At harvest, the number of cobs/plant (2.36) was recorded highest in the hybrid UM-50. However, UM-10 (1.84), UM-30 (2.24), UM-40 (1.90), and UM-70 (2.12) were statistically at par with UM-50. Number of cobs /plants depend against genetic character of the hybrids and is a vital yield contributing parameter, which is affected by environmental conditions. Similar results have also been reported by Asghar and Mehdi (2010) [3].

The cob length was affected by the selection of hybrids and different Agro-climatic conditions, the recorded data was presented in table 2. At harvest, significantly highest cob length (16.30 cm) was recorded in UM-60. However, UM-20 (15.65 cm), UM-30 (15.33 cm) and UM-50 (15.80 cm) were found statistically at par with UM-60. The probable reason for longer cob length could be due to optimum utilization of solar light, higher assimilated production and its conversion to starches resulted in higher ear length as reported by Derbay *et al.* (2004) [4].

Significantly higher number of grains per row (32.87) was recorded in UM 60. However, the hybrid U M-10 (31.67), and UM-40 (32.33) were found statistically at par with UM-40. The number of grains per row was found significant. The data recorded was presented in table 2.

At harvest, significantly highest number of rows per cob was recorded in UM-60 (14.33). However, the hybrids UM-10 (14.07), UM-50 (13.87) and UM-70 (14.00) were found statistically at par with UM-60.

The seed index refers to 100 seeds weight (g) was found non-significant. The data recorded was presented in table 2. The maximum test weight (30.45 g) was recorded in UM-20. The minimum test weight (23.33g) was recorded in UM-10. There was no significant difference among hybrids.

At harvest, significantly the highest seed yield (8.76 t/ha) was

recorded in UM-20. However, the hybrid UM-10 (7.42 t/ha) and UM-60 (8.16 t/ha) exhibited statistical at par with UM-20. The significant difference in grain yield and other agronomic traits among various hybrids were probably 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 grains per row and cob weight. Similar results have also been reported by Manjunatha *et al.*, (2018) [9].

At harvest, significantly higher stover yield (20.90 t/ha) was recorded in UM-70. However, UM-60 (17.43 t/ha), were found statistically at par with UM-70. The increase in biological growth reflects the better growth and development of the plants due to steady and more availability of nutrients throughout the growing period. These results are in consonance with of Ibeawuchi *et al.*, (2007) [8].

The harvest index was non-significant. The data recorded was presented in the table 2. At harvest, highest harvest index (38.09%) was recorded in UM-20.

Table 1: Evaluation of Pre-Harvest Observations of hybrids Maize under Agro-climatic condition of Prayagraj, U.P

Sl. No.	Hybrids	Plant Height(cm) At Harvest	No. of Leaves /Plant At 80 DAS	Dry weight (g/plant) at Harvest	Crop growth rate (g/m^2/day) 80-At Harvest	Relative growth rate (g/g/day) 20-40 DAS	Days to 50% Tasseling	Days to 50% Silking	Days to Maturity
1.	UM 10	154.83	11.20	166.50	29.10	0.146	48.00	51.00	86.67
2.	UM 20	172.07	12.20	183.30	32.67	0.139	51.33	54.67	87.00
3.	UM30	163.28	11.93	152.37	29.47	0.146	51.67	55.33	91.33
4.	UM 40	141.61	11.33	152.93	29.84	0.145	55.00	58.33	93.00
5.	UM 50	152.47	12.07	157.57	29.23	0.149	49.33	53.00	90.67
6.	UM 60	155.61	12.00	181.77	31.80	0.139	46.00	50.00	87.67
7	UM 70	160.34	11.47	173.19	31.12	0.145	47.67	52.00	86.67
	F-test	S	S	S	NS	NS	NS	NS	S
	S.Em(+)	5.01	0.18	6.49	1.40	0.004	2.16	2.14	0.90
	CD (p= 0.05)	15.44	0.58	19.99	-	-	-	-	2.79

Table 2: Evaluation of Post-Harvest Observations of hybrids Maize under Agro-climatic condition of Prayagraj, U.P.

Sl. No.	Hybrids	Cobs /Plant	Cob Length (cm)	No. of Grains /row	No. of grain row/cob	Seed Index (g)	Seed Yield (t/ha)	Stover yield (t/ha)	Harvest Index (%)
1.	UM 10	1.84	14.35	31.67	14.07	23.33	7.43	15.87	31.16
2.	UM 20	1.50	15.65	30.47	12.80	30.45	8.76	14.30	38.09
3.	UM30	2.24	15.33	29.30	12.67	26.65	6.43	15.67	30.57
4.	UM 40	1.90	13.97	32.33	12.80	25.23	6.93	16.37	28.82
5.	UM 50	2.36	15.80	29.60	13.87	25.83	6.36	15.30	29.89
6.	UM 60	1.74	16.30	32.87	14.33	27.56	8.16	17.43	31.04
7.	UM 70	2.12	13.96	29.73	14.00	25.64	6.70	20.90	24.17
	F-test	S	S	S	S	NS	S	S	NS
	S.Em(+)	0.2	0.53	0.7	0.31	1.54	0.47	1.22	3.15
	CD (p= 0.05)	0.61	1.64	2.18	0.95	-	1.45	3.76	-

Conclusion

The study concluded that significantly higher growth and yield parameters were found in UM-20. Since the findings were based on the only one season, further trials are to be done to confirm the above obtained results from this experimental research trials.

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