



Determination of Maize (*Zea mays* L.) Hybrids under Agro-climatic Conditions of Prayagraj, Uttar Pradesh, India

Prince Jose^{a*#}, Vikram Singh^{b†}, Shruti Grace George^{a‡} and A. C. Singh^{c†}

^a Department of Agronomy, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, India.

^b Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, India.

^c Department of Agronomy, Kulbhaskar Ashram P. G. College, Prayagraj, Uttar Pradesh, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJECC/2022/v12i1030852

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/87584>

Original Research Article

Received 12 March 2022

Accepted 24 May 2022

Published 27 May 2022

ABSTRACT

Worldwide Maize (*Zea mays* L.) is referred to as the "Miracle Crop" due to its high genetic yield potential compared to other Gramineae family members. Hybridization plays a vital role in boosting the production and productivity of maize, which is crucial for mitigating food insecurity in developing countries. To find out the best hybrid among the maize hybrids, a field experiment was conducted during the *kharif* season of 2021 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 for "Evaluation of Maize (*Zea mays* L.) hybrids under agro-climatic conditions of Prayagraj, Uttar Pradesh". The experiment was done on 10 maize Hybrids. It was carried out in Randomized Block Design (RBD) with three replications. The report of the study indicates that among different maize Hybrids, UM-12 produced significantly higher plant height (217.05 cm), number of leaves per plant (12.80), dry weight per plant (151.25 g), cob length (16.62 cm), number of rows per cob (14.80), number of grains per row

M.Sc Scholar;

† Associate Professor;

‡ Ph.D Scholar;

*Corresponding author: E-mail: princejose97@gmail.com;

(31.73), seed yield (8.27 t/ha) and stover yield (20.50 t/ha). Hence, it can be concluded that the Maize hybrid UM-12 was found to be the most suitable, productive and economical for the agroclimatic conditions of Prayagraj, Uttar Pradesh.

Keywords: Hybrid maize; yield attributes; growth attributes; kharif ; varietal response.

1. INTRODUCTION

Maize (*Zea mays* L.), the “Queen of Cereals” is one of the important cereal crops in the world. It can be grown over a range of agro-climatic zones and this quality makes it a versatile crop. It is used as a key raw material across various sectors such as feed for livestock, starch, food processing and bio-ethanol. Derivatives of corn starch are extensively used in different industries including pharmaceuticals, cosmetics, food processing, textiles and the paper industry. Along with rice and wheat, maize provides at least 30% of the food calories to more than 4.5 billion people in 94 developing countries [1]. 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 [2]. India has produced 30 MT in an area of 9.9 Mha in 2020-21. India is the world's seventh largest maize producer, with the fourth greatest production area. In 2020-21, India produced 30 million tonnes over an area of 9.9 million hectares. 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 [3].

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 [4]. 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 the Prayagraj, Uttar Pradesh conditions based on the performance of maize hybrids in the field condition. Keeping an eye on the above aspects the present study entitled “Evaluation of Maize (*Zea mays* L.) hybrids under agro-climatic conditions of Prayagraj, Uttar Pradesh.” was carried out at Crop Research Farm, Department of Agronomy, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh during 2021 *Kharif* Season.

2. MATERIALS AND METHODS

The experiment was conducted during the *kharif* season of 2021 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 hybrids viz., T₁: UM-11, T₂: UM-12, T₃: UM-13, T₄: UM-14, T₅: UM-15, T₆: UM-16, T₇: UM-17, T₈: UM-18, T₉: UM-19 and T₁₀: UM-20. 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 on 9th of July 2021.

The observations on growth parameters and yield attributes of maize hybrids was recorded during the experiment, and was subjected to statistical analysis by adopting the tactics of study of variance (ANOVA) as described by Gomez and Gomes [5]. 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.

Table 1. Chemical analysis of soil at pre-experimental stage

Parameter	Value (unit)	Method	References
Organic carbon (%)	0.35%	Walkley and Black Method	Jackson [6]
Available Nitrogen	243 kg/ha	Alkaline Permanganate Method	Subbaiah and Asija [7]
Available Phosphorus	20.10 kg/ha	Olsen's Colorimetric Method	Olsen et al., [8]
Available Potassium	105.00 kg/ha	Flame Photometer method	Jackson [6]
Soil pH	7.8	Glass electrode pH meter	Jackson [6]

Table 2. Evaluation of growth parameters of maize hybrids under agro-climatic conditions of Prayagraj, Uttar Pradesh

Hybrids	Plant height (cm)	At harvest Number of leaves (No.)	Plant dry weight(g)
UM-11	187.68	12.20	142.71
UM-12	217.05	12.80	151.25
UM-13	199.49	12.53	127.93
UM-14	202.12	11.60	136.57
UM-15	199.89	12.33	140.20
UM-16	208.85	11.80	132.24
UM-17	196.48	11.40	142.65
UM-18	203.07	11.67	138.42
UM-19	204.13	11.87	145.86
UM-20	182.19	11.93	142.11
SEm(±)	3.89	0.26	1.08
CD (p=0.05)	11.25	0.76	3.20

Table 3. Evaluation of yield attributes and yield of maize hybrids under agroclimatic conditions of Prayagraj, Uttar Pradesh

Hybrids	Number of cobs per 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)
UM-11	1.47	13.47	27.73	15.47	26.33	5.55	18.44	23.99
UM-12	1.80	14.80	31.73	16.62	32.33	8.27	20.50	28.76
UM-13	1.47	14.20	28.40	15.46	28.67	7.61	19.02	26.37
UM-14	1.67	13.37	30.00	14.57	27.67	5.97	18.67	24.64
UM-15	1.67	13.42	24.80	13.81	27.67	6.80	15.67	22.47
UM-16	1.47	13.00	28.27	15.29	29.67	6.67	13.47	20.14
UM-17	1.27	12.20	30.33	16.51	26.00	5.49	12.78	18.27
UM-18	1.47	14.47	28.00	15.32	25.67	5.54	15.68	21.22
UM-19	1.53	12.87	28.27	15.37	30.33	7.71	19.05	26.76
UM-20	1.60	13.30	28.33	16.43	27.67	5.77	18.40	24.18
SEm(±)	0.16	0.41	0.99	0.38	1.44	0.42	0.60	0.83
CD (p=0.05)	-	1.17	2.88	1.09	-	1.20	1.75	1.17

3. RESULTS AND DISCUSSION

3.1 Growth Parameters

The recorded and analysed data pertaining to growth parameters indicates that significantly higher plant height (217.05 cm), number of

leaves per plant (12.80) and plant dry weight (151.25 g) was recorded in maize hybrid UM-12.

The difference in the plant height, number of leaves per plant, plant dry weight was probably due to the diverse background of parental lines, from where the hybrids were developed. Similar

findings were reported by Muchie and Fentie [9], Pal and Bhatnagar [10].

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 Hybrid UM-12 was recorded with higher yield attributes viz. Cobs per plant (No.) (1.80), Cob length (16.62 cm), Grain row per cob (No.) (14.80), Number of grains per row (No.) (31.73), Seed index (32.33 g). The maize hybrid UM-12 was also recorded significantly higher Seed yield (8.27 t/ha), Stover yield (20.50 t/ha) and Biological yield (28.76 t/ha).

The significant difference in grain yield and other agronomic traits among various hybrids was 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 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 [11] and Manjunatha et al. [12].

4. CONCLUSION

Based on the findings of this field experiment it is concluded that among 10 tested maize hybrids, UM-12 was found the most suitable maize hybrid 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 results are based on a single season of research, they can be repeated for conformation.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Shiferaw B, Prasanna BM, Hellin J, Banziger M. Crops that feed the world 6.

Past successes and future challenges to the role played by maize in global food security. Food Security. 2011;3:307–327.

2. FAO. Food and Agriculture organization. Online Interactive Database on Agriculture. FAOSTAT; 2019. Available: www.fao.org . [Visited on 5 January 2021].

3. Farmer Portal. About maize. <https://farmer.gov.in/>. [Visited on 22 January 2021]

4. DMR. DMR Vision 2050. Directorate of Maize Research, Indian Council of Agricultural Research, New Delhi; 2014.

5. Gomez KA, Gomez AA. Statistical Procedures for Agricultural Research. 2nd Edition; 1984.

6. Jackson ML. Soil chemical analysis. Prentice Hall of India Pvt. Ltd. New Delhi; 1973.

7. Subbiah B, Asija GL. A rapid procedure for estimation of available nitrogen in soils. Current Science. 1956;25:259-260.

8. Olsen SR, Cole CV, Watanabe FS, Dean LA. Estimation of available phosphorus in soils by extraction with sodium bicarbonate. Washington, D.C.: U.S. Government Printing Office; 1954.

9. Muchie A, Fentie D. Performance evaluation of maize hybrids (*Zea Mays* L.) in Bahir Dar Zuria District, North Western Ethiopia. Int. Invent. J. Agric. Soil Sci. 2016;4(3):2408–7254.

10. Pal MS, Bhatnagar A, Singh V, Bisht AS. Growth dynamics, productivity and economics of quality protein maize (*Zea mays* L.) under varying plant density and nutrient management practices. Madras Agriculture Journal. 2012;99 (3):73-76.

11. Kumar S, Kandel BP. Performance evaluation of maize (*Zea mays* L.) hybrids in inner-plains of Nepal. Heliyon. 2020;1:1-6

12. Manjunatha B, Kumara BN, Jagadeesh GB. Performance Evaluation of Maize Hybrids (*Zea mays* L.) .Int. J. Curr. Microbiol. App. Sci. 2018;7(11):1198-1203.

Peer-review history:
The peer review history for this paper can be accessed here:
<https://www.sdiarticle5.com/review-history/87584>