Growth and yield of Maize (*Zea mays* L.) hybrids under agro-climatic conditions of Prayagraj, U.P., India

Abstract:

At the Crop Research Farm (CRF), Department of Agronomy, SHUATS, Prayagraj (UP), a field experiment was carried out in the Kharif season of 2022 to examine the "Evaluation of Maize (Zea mays L.) hybrids under agro-climatic conditions of Prayagraj, U.P." Ten hybids make up the course of treatment. Ten treatments were reproduced three times, and the experiment was set up using a randomised block design. Compared to other hybrids, hybrid M-400 had the largest plant height (196.65 cm), dry weight (157.25 g/plant), number of cobs / plant (2.65), cob length (19.87 cm), number of grains / row (31.73/row), seed yield (8.64 t/ha), stover output (19.45 t/ha), and biological yield (28.09 t/ha).

Key words : hybrid maize, yield, and varietal response kharif Zea mays L.

INTRODUCTION

One of the most adaptable crops, maize (Zea mays L.), is produced in both tropical and temperate climates around the globe. Every month of the year, maize is planted and harvested somewhere in the world. It is also known as the "Queen of Cereals" since no other cereal on the planet has as enormous potential. It is the most significant cereal crop in the world, ranking third after rice and wheat. up terms of acreage and maize production, India comes up at number five globally.

The poaceae (or, Graminae) family includes maize. Colombia, today's Colombia, must have been the original home of maize. Because of historical allusions to pod corn in that region. Maize originated in the lowlands of South America. One of the most significant cereal crops in the world, maize is produced over an area of 132 mha and produces 57 mt. Maize can use sun energy more effectively than other grains since it is a C4 plant. It needs more nutrients throughout the crop's growing season, but this is because artificial fertilisers are used so frequently to preserve the crop's health. We must use organic fertiliser if we want to maintain the health of the soil.

About 9% protein, 4% oil, 70% starch, and 2.7% crude fibre are found in maize grains. corn protein. Tryptophan and lysine, two important amino acids, are abundant in zein. Since the beginning of time, cereals have been a mainstay of the human diet due to their widespread cultivation, excellent preservation qualities, blend of flavours, and enormous variety. In many regions of the world, maize is a significant staple food. Maize is used as a basic raw material in the production of thousands of industrial products, including starch, oil, protein, alcoholic beverages, food sweeteners, pharmaceuticals, cosmetics, film, textile, gum, package, and paper industries, among others.

Since maize is primarily grown as a rainfed crop, water stress has an impact on the crop's productivity and yield stability. The management of maize's nutrients has a major impact on the crop's productivity. To provide the required moisture for good germination and inoculation, maize should be sown on moist soils. Maize is extremely susceptible to conditions of water logging and drought.

In the years 2020–21, India produced 30 million tonnes on an area of 9.9 million hectares. Maize is a largely cultivated crop in north India. Andhra Pradesh produces 20.9% of the nation's maize, followed by 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 0.736 million hectares, producing 1.53 million tonnes with a productivity of 2082 kg/ha. The yield advantage over the two years varied from 12 to 25%, indicating significant genetic advancements in QPM breeding. The QPM hybrids CZH132044Q, CZH142238Q, and CZH142236Q were stable and high yielding. The

promotion of such QPM hybrids may aid in reducing protein and energy deficiency.

In India, after rice (Oryza sativa L.) and wheat (Triticum aestivum L.), maize is the third-most significant food crop. It has a 22 t/ha production potential, which is extremely high (Anonymous, 2013). In order to prevent the strains caused by climatic conditions throughout the critical growth stages, it is necessary to examine and find solutions that work for maize-specific varieties, either hybrids or varieties with acceptable planting dates. The most crucial aspects of cropping are timing the sowing and choosing a desirable variety. Its grain is very nutrient-dense, comprising 1.5% minerals, 11.1% protein, 66.2% carbohydrate, and 7.12% oil. Additionally, per 100 g of grains, it has 90 mg of carotene, 1.8 mg of niacin, 0.8 mg of thiamin, and 0.1 mg of riboflavin (Hasan et al. 2018). In

In comparison to conventional varieties of maize, the adoption of high yielding appropriate hybrids increases income per hectare while also improving grain production and quality (Abbas, 2001). In comparison to older hybrids, modern maize varieties offer more promise (Russel, 1986). The selection of good varieties with high potential and broad range of adoptability is vitally essential because the yield potential of our current varieties is declining day by day. The likely source of high yield in recent hybrids has been more ear bearing plants per unit land area without a decrease in kernels per year, in addition to tolerance to biotic and abiotic challenges.

The current study, "Evaluation of Maize (Zea mays L.) hybrids under agro-climatic conditions of Prayagraj, U.P.," was conducted at the Crop Research Farm, Department of Agronomy, Sam Higginbottom University of Agriculture, Technology, and Sciences while keeping an eye on the aforementioned factors. Prayagraj in the Kharif Season of 2022.

MATERIALS AND METHODS:

During Kharif 2022, a field experiment was carried out at the Crop Research Farm of the Department of Agronomy, SHUATS, Prayagraj (U.P). The soil in the experimental plot had a sandy loam texture, a pH of 7.1 that was almost neutral, 0.75 percent organic carbon, and the following available nutrients: 269.96 kg/ha of available N, 33.10 kg/ha of available P, and 336 kg/ha of available K. Ten hybrids(M207, M210, M305, M312 M400, M410, M502, M512, M600, M608) were duplicated three times in each of the 10 blocks of the Randomised Block Design experiment. Plant height (in cm), plant dry weight(g/plant), test weight(g), seed yield(t/ha), stover yield(t/ha), and harvest index(%) were the growth characteristics that were observed at harvest. were tested for significance using statistical analysis, and the experiment's results have been condensed in the context of scientific reasoning and explained below under the following headings: -

RESULTS AND DISCUSSION

A. Growth Attributes:

At harvest, significantly highest plant height (196.65 cm) was recorded in M-400. However,

M-410 (190.43 cm) and M-600 (193.43 cm) were found to be statistically at par with M-400. **Afzal *et al.* (2017)** revealed the difference in plant height in various hybrids. This occurred because plant height is a genetically controlled component, and different types' heights do not remain constant. The influence of environmental conditions on plant height cannot be disregarded, but it can be controlled by choosing the right crop cultivar. At harvest, significantly higher plant dry weight (157.25 g) was recorded in M-400. The hybrids M-305 (151.93 g), M-312 (149.65 g) and M-600 (146.20) recorded statistical parity with M-400. The varied genetic traits of the separate varieties, such as quick growth rates, tallness or shortness of species, may be to blame for the hybrids' varied growth in terms of plant dry weight. The outcome was corroborated by **Pal et al. (2012).**

B. Yield Attributes

At harvest, the number of cobs/plant (2.65) was recorded highest in the hybrid M-400. However, M-600 (2.04), M-502 (2.12), and M-305 (2.23) were statistically at par with M-400. One key factor influencing production is the number of cobs/plant, which is determined by the hybrid's genetic makeup and is influenced by the environment. At harvest, significantly highest cob length (19.87 cm) was recorded in M-400. However, M-207 (17.65 cm), M-210 (18.94 cm), M-305 (18.62 cm) and M-512 (17.67 cm) were found statistically at par with M-400. According to **Belay and Patil (2018)**, the likely cause of the larger cob length could be owing to the best possible use of solar energy, faster assimilation production, and its conversion to starches, which led to a longer ear length. Significantly highest number of rows/ cob was recorded in M-400 (13.74). However, the hybrids M-305 (12.73), M-512 (13.62) and M-600 (13.54) were found statistically at par with M-400. Significantly higher number of grains/row (24.65) was recorded in M-400. However, the hybrid M-207 (24.54), M-305 (22.78), M-502 (23.54) and M-512 (24.02) were found statistically at par with M-400. At harvest, significantly the highest seed yield (8.64 t/ha) was recorded in M-400. However, the hybrid M-502 (7.70 t/ha) and M-600 (8.20 t/ha) exhibited statistical parity with M-400. The heterogeneous backgrounds from which the hybrids were generated are likely to blame for the notable differences in grain yield and other agronomic features among different hybrids. The higher grain yield of the above genotypes could be correlated to the higher number of grains/row and cob weight. **Manjunatha *et al.* (2018)** reported similar outcomes as well. It was reported that plant height was positively correlated with grain yield. Significantly higher stover yield (19.45 t/ha) was recorded in M-400. However, M-210 (19.09 t/ha), M-312 (18.48 t/ha), M-410 (17.76 t/ha) and M-512 (18.34 t/ha) were found statistically at par with M-400.

CONCLUSION:

M-400 was found to be more productive, in terms of growth, yield and economics under agroclimatic conditions of Prayagraj. UP.

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Table.1 Field evaluation of hybrid on growth parameters of maize hybrids

Hybrids	Plant height (cm)	Dry weight (g/plant)
M-207	172.08	142.71
M-210	183.98	145.86
M-305	176.56	151.93
M-312	186.38	149.65
M-400	196.65	157.25
M-410	190.43	132.24
M-502	182.56	136.57
M-512	180.34	141.42
M-600	193.43	146.20
M-608	185.87	142.11
F-test	S	S
SEm±	1.89	3.30
CD (P=0.05)	4.25	11.05

Table.2 Field evaluation of maize hybrids on yield attributes

Hybrids	Number of cobs/plant (No.)	Cob length(cm)	Number of Rows/cob (No.)	Number of grains/row (No.)	Seed yield (t/ha)	Stover yield (t/ha)
M-207	1.85	17.65	12.26	24.54	6.45	15.67
M-210	1.50	18.94	11.59	22.28	6.53	19.09
M-305	2.23	18.62	12.73	22.78	5.86	13.23
M-312	1.90	15.43	12.55	20.87	5.54	18.48
M-400	2.65	19.87	11.26	24.65	8.64	19.45
M-410	1.74	16.65	13.74	22.93	5.04	17.76
M-502	2.12	15.12	12.54	23.54	7.90	12.90
M-512	1.46	17.67	13.62	24.02	5.32	18.34
M-600	2.04	16.43	13.54	22.24	8.20	15.21
M-608	1.75	15.20	11.04	22.55	5.65	17.34
F-test	S	S	S	S	S	S
SEm±	0.20	0.62	0.41	0.36	0.33	0.56
CD (P=0.05)	0.61	2.70	1.17	1.08	1.80	1.69