

Effect of different varieties on growth and yield of maize (*Zea mays* L.) under gird region of Madhya Pradesh, India

Abstract

The present investigation was conducted at field of School of Agriculture science, Vikrant University, Gwalior, (M.P.). Maize (*Zea mays* L.) is one of the important cereal crops belong to the *Poaceae* family, which ranked third after wheat and rice crops in of the productivity and cultivated area in the world. It is a short duration, quick growing and widely grown crop with high potential, there are no cereal crops with such an immense potentiality, so it is called as “queen of cereals”. Different varieties of maize e.g., JM 218, JM 215, PRMH-306, JM-8, JM-13 are grown. The medium or late maturing varieties suffer due to water stress at maturity stage and lack of suitable varieties with stress tolerance at various stages of growth is one of the limiting factors. The experiment was laid out in Randomized Block Design (RBD) with three replications. Each replication was comprised of six treatments involving different varieties i.e. JM218, JM215, PRMH – 306, JM – 8 and JM – 13 of maize. Result concluded that the varieties PRMH – 306 (T₃) may be more beneficial in terms of growth, productivity, and profitability over rest of the treatments, which suggests that the varieties PRMH – 306 is more scientific management for under field condition as well as sandy loam soil for maize in region of Madhya Pradesh.

Keywords: cereal crops, agronomic practices, maize variety, stress tolerance

Introduction

“Maize (*Zea mays* L.) is one of the important cereal crops belong to the *Poaceae* family, which ranked third after wheat and rice crops in of the productivity and cultivated area in the world” (Kumar *et al.*, 2017). It is a short duration, quick growing and widely grown crop with high potential, there are no cereal crops with such an immense potentiality, so it is called as “queen of cereals” (Gangaiah, 2008). “The production of maize depends on the correct agronomic practices and right application of inputs like fertilizer and improved seed varieties to sustain the

environment and increase the production” (Essilfie et al., 2023; Ngairangbam et al., 2024). “The correct efficient -spacing and the suitable variety of the region are the best agronomic cultural practices which had important consideration during optimizing grain and above ground bio-mass yield” (Enujeke, 2013). “Maize seed contains 10% protein, 4% oil and 2-3% crude fiber. Maize kernel is an edible and nutritive part of the plant” (Nwogboduhu, 2016). “Different varieties of maize e.g., JM 218, JM 215, PRMH-306, JM-8, JM-13 are grown. The medium or late maturing varieties suffer due to water stress at maturity stage. The reasons of low productivity of rice in rain fed lowland ecosystem are many and varied. Lack of suitable varieties with stress tolerance at various stages of growth is one of the limiting factors” (Ghimire et al., 2016).

Material and Methods

The experiment was conducted at field of School of Agriculture science, Vikrant University, Gwalior, M.P. The experiment was laid out in Randomized Block Design (RBD) with three replications. Each replication was comprised of six treatments involving different varieties i.e. JM218, JM215, PRMH – 306, JM – 8 and JM – 13 of maize. The observations on different aspects such as growth parameters (viz., plant height (cm), days to silking stage, number of leaves plant⁻¹, dry matter accumulation plant⁻¹ and number of effective tillers metre⁻¹ row length) and yield parameters (viz., number of cobs per plant, girth of cob (cm), length of cob (cm), number of grains per cob, grain weight plant⁻¹, test weight (g), grain yield (q ha⁻¹), stover yield (q ha⁻¹) and harvest index) and economical parameters were calculated.

Result and Discussion

Effect on growth parameters:

Plant population (m²)

In the present investigation, results revealed that the initial and final population of plants was not influenced significantly due to different nutrient management applications.

Plant height (cm)

In general, the plant height was minimum during early period of crop growth. However, the rate of increase in plant height was higher between 30 and 45 DAS. At all growth stages, the plant height was affected significantly under all treatments. Among the varieties PRMH – 306 recorded maximum plant height which was significantly more than that of JM218, JM215, JM - 8 and JM - 13. Control recorded significantly minimum plant height. These results of present study agree with the findings of several other investigators (Reddy and Reddy 1997) and (Das et al. 2012).

Dry matter accumulation (g plant⁻¹)

The dry matter accumulation by different varieties differed significantly as observed at all growth stages. Among the varieties PRMH–306 recorded maximum dry matter which was significantly more than that of JM218, JM215, JM-8 and JM-13. However, control recorded significantly minimum dry matter at different stages. It is evident from the data that dry matter accumulation (g plant⁻¹) gradually increased with the advancement in the growth being maximum at harvest under all the treatments. The results also confirm the findings of several other investigators by Kudachikar and Janagoudar (1999).

No. of leaves/plant

The number of leaves/plants of different maize varieties differed significantly at all growth stages. Among the varieties PRMH – 306 recorded number of leaves/plant which was significantly more than that of JM218, JM215, JM-8 and JM-13 whereas control recorded significantly minimum number of leaves/plant at different stages. (Kumar *et al.* 2016, Sharma *et al.* 2021 and Layek *et al.* 2017).

Days to 50 % silking

It was recorded that there was non-significance difference had been observed due to all treatments and it was practically similar in all the treatments including control where no fertilizer was applied. These were supported by Kumar *et al.* (2020).

Effect on yield parameters:

Data on yield attributing character as influenced by different treatments are depicted. It was recorded that the yield attributing character varied significantly due to different characters of particular variety. Among all the treatments, the minimum yield attributing characters were recorded under control (T₆). The variety PRMH-306 registered more yield attributing character. Among the varieties PRMH – 306 registered maximum number of cobs plant^{-1} , number of grains cob^{-1} , cob girth, cob length no. of row cob^{-1} and grain row⁻¹ whereas the minimum was recorded under control T₆. These results are concomitant with the findings of Paulpandi *et al.* 1998), Layek (2017) *et al.* and Kumar *et al.* (2019)

Yield character is the function of various growth and yield parameters like crop dry matter accumulation, number of grains/cob and test weight. It is clear from the results. These treatments caused significant variation in yield of maize. The minimum seed and stover yield were obtained under control (T₆), while it was increased when different varieties of maize were sown in different plots. Among the varieties PRMH – 306 produced significantly maximum grain and stover yield over rest of other varieties. These results confirm the findings of Maddonni *et al.* (1996), Bandyopadhyay (1984), and Shao chang *et al.* (2003).

Conclusion

Based on this study, it can be concluded as follows

- Result concluded that the maize variety PRMH – 306 was found significantly superior variety for enhancing the growth and yield of maize as compared to rest of varieties.
- It was recorded that the maximum growth and yield parameters were observed under variety PRMH – 306, whereas the minimum were recorded under control.
- The variety PRMH – 306 may be more beneficial in terms of growth, productivity and profitability over rest of the treatments, which suggests that the varieties PRMH – 306 is more scientific management for under field condition as well as sandy loam soil for maize in region of Madhya Pradesh.
- The maximum net monetary returns (Rs 42397 /ha) and maximum benefit cost ratio (2.19) was recorded under cultivar PRMH-306.

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References

- Bandyopadhyay S K. (1984). 'Nitrogen and water relations in grain sorghum legume intercropping systems'. Ph D. Dissertation, *Indian Agricultural Research Institute (IARI)*, New Delhi, India.
- Das B, Mannan M A and Das P K. (2012). Performance study of three high yielding varieties of Bangladesh and one exotic rice variety. Thesis, Khulna University, Khulna.
- Enujeke, E.C. (2013). Effects of variety and spacing on yield indices of open-pollinated Maize in Asaba area of Delta State. *Sustainable Agriculture Research*, 2526-37848.
- Gangaiah, B. (2008). Agronomy-kharif crops. *World*, 7(3.28):441.
- Ghimire, S. Sherchan, D.P. Andersen, P., Pokhrel, C. Ghimire, S. and Khanal, D. (2016). Effect of variety and practice of cultivation on yield of spring Maize in Terai of Nepal. *Agrotechnol*, 5(144):2.

- Kudachikar V B and Janagoudar B S. 1999. Physiological analysis of hirsutum cotton for higher productivity under rainfed conditions. *Madras Agricultural Journal* 86(1-3): 10–13
- Kumar D, Patel R A and Ramani V P. (2019). Assessment of precision nitrogen management strategies in terms of growth, yield and monetary efficiency of maize grown in Western India. *Journal of Plant Nutrition* 42(2): 2844–60.
- Kumar N, Sharma S K, Yadav S K, Choudhary Roshan and Choudhary R S. 2016. Nutrient content, uptake and economics of sweet corn (*Zea mays* L.) grown under organic management practices. *Crop Research* 51(1,2 & 3): 38–44
- Kumar, S. Soukup, M. and Elbaum, R. (2017). Silicification in grasses: variation between different cell types. *Frontiers in Plant Science*, 8:438.
- Layek J. Ramkrushna G I. Suting D. Ngangom B. Krishnappa R. Utpal D and Das A. 2017. Evaluation of maize cultivars for their suitability under organic production system in North Eastern Hill Region of India. *Indian Journal of Hill Farming* 29(2): 19–24.
- Li Shao Chang; Bai Ping; Lu Xin; Liu ShuYun; Dong ShuTing (2003). Ecological and sowing date effects on maize grain filling *Acta Agronomica Sinica* 29(5): 775-778
- Maddni G. A. Otegui M. E. (1996) Leaf area, light interception, and crop development in maize *Field Crops Res* 48 (1): 81-87.
- Paulpandi, V.K. Palaniappan, S.P. and Solaiappan, V. 1998, Effect of cycocel on different crop geometry and nutrient levels in sorghum (*Sorghum bicolor*). *Indian Journal of Agronomy*. 43: 524-527.
- Pradeep Kumar, J. P. Singh and Manraj Yadav. 2020. Days to 50% Tasselling, Silking and Yield as affected by Planting Pattern and Weed Management in Field Pea and Baby Corn Intercropping System. *Int.J.Curr.Microbiol.App.Sci*. 9(01): 231-236.
- Reddy T. Y. and Reddy G. H. 1997. Principles and Practices Of Agronomy. Kalyani Publication, New Delhi, 515

Sharma S. K. Jain D, Choudhary R, Jat G, Jain P, Bhojiya A A, Jain R and Yadav S K. 2021 . Microbiological and enzymatic properties of diverse Jaivik Krishi inputs used in organic farming. Indian

Nwogboduhu, N.G. (2016). Response of maize (*Zea mays* L.) varieties to planting densities. *J. Agric. and Vet. Sci.*, **9** (10):1-6.

Essilfie ME, Appiah E, Asiedu EK, Owusu SE. Growth and Yield Response of Maize (*Zea mays* L.) to Integrated Nutrient Management of Biochar, Organic and Inorganic Fertilizers. *Asian J. Adv. Agric. Res.* [Internet]. 2023 Dec. 30 [cited 2024 Dec. 14];23(4):69-91. Available from: <https://journalajaar.com/index.php/AJAAR/article/view/481>

Ngairangbam, Haripriya, Anmol Preet Kaur, Gurpreet Singh, and Sandeep Menon. 2024. "Effect of Different Spacing and Nutrient Management on Growth and Yield of Maize: A Review". *Journal of Advances in Biology & Biotechnology* 27 (6):682-92. <https://doi.org/10.9734/jabb/2024/v27i6928> .

Bhakne, A. E., Gawali, K., Thaokar, A., Lanjewar, J., & Chakole, J. (2023). Performance of different cultivar of maize (*Zea mays* L.) for optimum growth, yield attributes and yield under field condition. *International Journal of Statistics and Applied Mathematics* 2023; SP-8(5): 665-667

Table no. 1: Effect of different varieties on growth parameters of maize (Bhakne, A. E et al. 2023)

T. No.	Treatments	Plant population (m ²)		Plant height (cm)			Dry matter accumulation (g/plant)			No. of leaves/plant			Days to 50 % silking
		15 DAS	At harvest	30 DAS	45 DAS	60 DAS	30 DAS	45 DAS	60 DAS	30 DAS	45 DAS	60 DAS	
T ₁	JM218	11.33	11.00	27.16	46.84	54.03	5.51	20.99	40.33	5.67	9.33	11.33	55.33
T ₂	JM215	11.33	11.33	26.47	45.24	53.66	5.00	19.92	38.68	4.67	8.67	11.00	56.67
T ₃	PRMH – 306	11.00	11.00	28.68	48.00	57.14	6.36	22.50	41.61	7.33	10.67	13.00	52.67
T ₄	JM – 8	11.33	11.00	25.93	40.47	51.66	4.53	18.90	37.89	4.33	8.33	9.67	55.33
T ₅	JM – 13	11.33	11.33	25.98	40.61	50.58	4.26	18.20	36.14	4.33	7.67	9.00	57.00
T ₆	Control	11.67	11.33	24.76	39.58	50.02	2.89	9.76	27.28	4.00	6.67	8.33	58.33
SEm±		0.52	0.35	0.34	0.86	0.58	0.21	0.37	0.81	0.33	0.44	0.40	1.28
CD (P=0.05)		NS	NS	1.08	2.74	1.86	0.66	1.20	2.57	1.05	1.41	1.29	NS

Table no. 2: Effect of different varieties on yield parameters of maize (Bhakne, A. E et al. 2023)

T. No.	Treatments	Cob/ plant	Seeds/ cob	100 grain weight	Length of cob (cm)	Girth of cob (cm)	No. of row/ cob	Grain/r ow	Grain yield (kg/ha)	Stover yield (kg/ha)	HI (%)
T ₁	JM218	1.67	363.33	22.00	35.66	12.56	12.33	26.67	5451	8093	40.25
T ₂	JM215	1.00	337.00	21.38	34.05	12.04	11.67	25.33	5315	7526	41.39
T ₃	PRMH-306	2.00	387.00	24.78	36.96	13.97	13.67	28.00	5781	8190	41.38
T ₄	JM-8	1.33	331.33	20.49	34.43	11.65	11.33	24.67	5221	7302	41.69
T ₅	JM-13	1.67	324.00	20.14	33.05	11.33	11.33	24.00	5164	7258	41.57
T ₆	Control	1.00	111.00	13.65	19.78	8.27	8.00	11.00	1985	6220	24.19
SEm±		0.20	7.84	0.36	0.66	0.31	0.36	0.50	45	546	0.72
CD (P=0.05)		0.64	25.03	1.15	2.10	0.99	1.15	1.60	145	1743	2.26