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Preliminary Evaluation of Maize (*Zea mays* L.) Hybrids for Grain Yield under Temperate Conditions

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Authors' contributions

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

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ABSTRACT

Maize (*Zea mays* L.) is the third most important cereal crop after wheat and rice. Improving maize production is considered to be one of the most important strategies for food security in the developing countries. The farmers in Kandi areas usually grow their own saved seed which comprises of composites and landraces due to which maize production in the area suffers due to low productivity. Considering this scenario, a number of hybrids were developed in order to improve yield and productivity in order to enhance their income. Hence evaluating the performance of hybrid maize genotypes in terms of yield in specific agro ecology is very crucial for horizontal expansion. The study was aimed to conduct the preliminary evaluation of 12 maize hybrids to determine their grain yields. The hybrids were ranked according to their superiority in yield over check.

Keywords: Maize; yield; superiority; performance.

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1. INTRODUCTION

Maize (*Zea mays* L.) is the third most important cereal crop after wheat and rice. It is the world's leading crop and is widely cultivated as cereal grain. It 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 addition to staple food for human being and quality feed for animals, maize serves as a basic raw material as an ingredient to thousands of industrial products that includes starch, oil, protein, alcoholic beverages, food sweeteners, pharmaceutical, cosmetic, film, textile, gum, package and paper industries, etc. Improving maize production is considered to be one of the most important strategies for food security in the developing countries. Maize grain today is recognized worldwide as a strategic food and feed crop that provides good amount of protein and energy for humans and livestock [1]. It is used as food, feed, fodder and raw materials for industries.

Evaluating the performance of hybrid maize genotypes in specific agro ecology on different traits is very crucial [2]. Maize improvement in India started an century ago and several promising hybrids and composite varieties were introduced and evaluated at different locations. The replacement of open pollinated varieties by hybrids is an effective way to increase the maize production [3]. In order to identify high yielding maize hybrids, they tested eighteen maize hybrids under coordinated varietal trial using randomized complete block design in two replicates in 2007/08 to 2008/09 during winter seasons at National Maize Research Program, Rampur, Chitwan. However, the changing environmental conditions affect the performance of maize genotypes which requires a breeding program that needs to take into account the consequences of environment and genotype interaction in the selection and release of improved varieties [4]. Hybridization plays a vital role in increasing the production and productivity of maize [5]. In this regard twelve maize hybrids were evaluated in a randomized complete block design (RCBD) with three replications alongwith two checks. Currently, DARS Rangreth is accelerating on the development of the hybrid maize, and additionally, it is evaluating and registering the hybrid seeds from multinational companies. But given the diverse agro-ecological regime of our country, not all hybrids are suitable for cultivation in all areas. So, there is a need for a region-specific performance trials before recommending hybrid maize for that region [6]. Therefore, our objective is to conduct a performance evaluation to identify the superior maize hybrids for the plains and hilly areas of Kashmir region.

2. MATERIALS AND METHODS

The experiment was carried out in randomized complete block designs (RCBD) with three replications in two main cropping seasons of 2018 and 2019. Each genotype was grown in the plots of 3 m × 3 m area with the net plot area of 90m^2 per block. Seed sowing was performed at the rate of two seeds per hill with a crop geometry of 75 × 25cm^2 (RR × PP). Each genotype was sown in four rows of a 3m long plot. Farmyard manure was applied at the time of land preparation. Fertilizer was applied at the rate of 150:60:40 NPK kg ha^{-1} (urea, DAP and MOP). A half dose of N and a full dose of P_2O_5 and K_2O were applied as a basal dose. The remaining half of the N was applied in two splits at knee-high and pre-tasselling/silking stages.

2.1 Data Collection and Statistical Analysis

The hybrids were evaluated over two years for yield and the ranking was done on the basis of yield for inclusion in the breeding programme and commercial cultivation.

3. RESULTS AND DISCUSSION

This study was carried out at in the Research field of Dryland Agriculture Research Station Rangreth. The research site lies at an altitude of 1640 m above mean sea level on the south-facing slopes at 34 .05o N latitude and 74.50 °E longitude coordinates.

Geographically, the experimental location falls in the eastern inner plains of Kashmir. The area has humid weather with cold winters and very hot summers. The soil composition of the study area was found to be sandy loam to clay loam with pH range around 5.5. The hybrids were evaluated for the grain yield and the maturity groups. All the hybrids were ranked for their yield performance. The highest and lowest grain yield were recorded for KDMH-118 (83.47 q/ ha) and VH-3815 (81.49 q/ha) respectively. All the hybrids were early maturing hybrids. These results are in line with those of Tripathi and Shrestha [7] and Prasai et al. (2015) who reported significant differences among maize cultivars for grain yield. Bishal and

Shrestha [3] also studied the variation in agro-morphological traits and grain yield in a set of 14 early maize genotypes in summer seasons of 2018 and 2019. The variation among genotypes was observed for grain yield and flowering. Their combined analysis over the years showed that KDMH-118 (Fig. 1) produced the highest grain yield (83.47q/ha), followed by VH-3815 (81.49q/ha) (Fig. 2), KDMH-104 (77.48q/ha), KDMH-114 (76.15q/ha) and VH-3819 (73.03 q/ha), respectively (Fig. 3).

Fig. 1. KDMH-118

Fig. 2. VH-3815

Fig. 3. Field view of hybrids

Table 1. Yield performance data of hybrids

S.No	HYBRID	Yield (q/ ha) 2018	2019	Ranking	Pooled Yield q/ha
1.	KDMH-102	68.94	68.97	10	68.98
2.	KDMH-108	69.35	70.13	9	69.66
3.	KDMH-104	77.08	78.15	3	77.48
4.	KDMH-114	76.04	76.24	4	76.15
5.	KDMH-118	83.04	84.14	1	83.47
6.	VH-3815	81.62	82.03	2	81.49
7.	VH-3819	72.62	73.42	5	73.03
8.	VH-3820	70.44	70.44	8	70.49
9	VH-3821	68.72	69.74	11	69.26
10	VH-3827	67.92	68.45	12	68.17
11	VH-3848	71.60	72.34	6	71.94
12	VH-3850	70.66	71.21	7	70.89
13	VH-39(C)	64.56	64.56	13	64.48
14	PMH-5(C)	64.22	64.22	14	64.19
	CD	3.4	4.1	4.5	

4. CONCLUSION

Maize improvement in India started an century ago and several promising hybrids and composite varieties were introduced and evaluated at different locations. Hence evaluating the performance of hybrid maize genotypes in specific agro ecology on different traits becomes very crucial. In this study twelve hybrids were evaluated for their yield over two years alongwith two checks. Accordingly these were ranked based on the decreasing order of their yields. As such the hybrids can be used for distribution to farmers to improve their livelihood security.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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