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Performance of yellow coated mustard (*Brassica juncea* L.) mutants under West Bengal condition

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ABSTRACT

An experiment on the performance of various mustard mutants developed at Bhaba Atomic Research Centre, Mumbai was carried out at Bidhan Chandra Krishi Viswavidyalaya, West Bengal during the winter season of 2013-14, 2014-15 and 2015-16 at 13 locations across four agro climatic zones. Among the test entries, two yellow coated mustard TM-204 and TM-143 were included in the trial. The experiment was laid out in Randomized Complete Block Design having four replications, with 5 rows of 5 m length. Statistical analysis of the data showed significant differences for all the parameters except days to 50 per cent flowering, days to maturity and 1000 seed weight. Based on three years trial TM 204 showed 10-15 per cent yield advantage and TM 143 showed 7-12 per cent yield advantage over two check varieties Kranti (National Check) and Pusa Bold (Zonal Check).

Keywords : Mustard, mutant, seed yield, West Bengal

India accounts for 12-15 per cent of World's oilseed area, 7-8 per cent of oilseeds output, 6-7 per cent of vegetable oil production, 9-12 per cent of vegetable oil import and 9-10 per cent of vegetable oil consumption Hegde, 2009). Among the oilseed crops, mustard (*Brassica juncea* L.) occupies second position next to soybean. During winter season it is the most important crop in terms of acreage and production. Among the mustard growing states West Bengal occupies 5.57 per cent of total area and 5.10 per cent of production with average productivity of 911 kg ha^{-1} (Chauhan *et al.,* 2013). The state has a great potential of increasing productivity by adoption of new varieties with improved package of practices. Since yellow sarson is grown in most of the areas there is a preference of growing yellow seeded variety due to its early maturity and high oil content. Considering the farmers acceptance of yellow coated variety breeding efforts were initiated at Bhaba Atomic Research Centre, Mumbai through mutation breeding. This paper captures the productivity potential of Trombay Mustard (TM) under different agro climatic zones of West Bengal.

MATERIALS AND METHODS

Two yellow coated mustard entries (TM 204 and TM 143) along with other promising entries and check varieties were evaluated at Bidhan Chandra Krishi Viswavidyalaya, West Bengal during the winter season of 2013-14, 2014-15 and 2015-16 at 13 locations across four agro climatic zones. The four agro climatic zones comprised of New Alluvial, Old Alluvial, Red and Laterite and Coastal Saline Zone covering six districts of West Bengal. The experimental design was Randomized Complete Block Design having four replications, with each sub plot size of 5 x 1.2 m. The rows $plot^{-1}$ was five in number with row spacing of 30 cm. The crop was thinned at 15-20 days after sowing keeping plant to plant distance of 10 cm. Uniform dose of fertilizer @ 100 kg N, 50 kg P_2O_5 and 50 kg K_2O $hectare^{-1}$ was applied. All agronomic practices were followed for raising a good crop. Observations were recorded on ten randomly selected plants from each plot of all replications to record data on the following characters *viz*. plant height, 50 per cent flowering, maturity, no. of primary branches, no. of siliqua, length of siliqua, no. of seeds $siliqua^{-1}$, and 1000 seed weight. Seed yield was estimated on plot basis. The mean values were subjected to statistical analysis.

RESULTS AND DISCUSSION

Growth and development

The statistical analysis revealed that Plant height differed significantly by various mustard mutants and check varieties. Pool analysis of data over 13 locations and three years showed that the yellow coated mustard TM 204 and TM 143 recorded 153.7 cm and 148.3 cm plant height respectively (Table 2). National check Kranti and zonal check Pusa Bold showed 156.2 and 157 cm plant height respectively. In terms of 50 per cent flowering and maturity statistical analysis of the data showed that both the characters were non-significantly affected by the various varieties, although TM 143 is 7-10 days earlier in maturity than TM 204. Table 2 also shows comparison of various characters of mustard mutants with check varieties.

Seed Yield

Table 1 presented comparative performance of seed yield of Mutant mustard along with check varieties. During 2013-14 the trial was conducted at three locations

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Table 1: Seed yield of Trombay Mustard in different agro climatic conditions of West Bengal.

Year		Seed yield (kg ha $^{-1}$)	increase of seed yield over %	
			Kranti(NC)	Pusa Bold(ZC)
2013-14	TM 204	1097	19.6	35.9
(Mean of 3 locations)	TM 143	1083	18.1	34.2
	Kranti	917		
	Pusa Bold	807		
2014-15	TM 204	1390	13.1	16.7
(Mean of 4 locations)	TM 143	1195	-0.28	10.34
	Kranti	1229		
	Pusa Bold	1191		
2015-16	TM 204	1519.8	2.46	3.74
(Mean of 6 locations)	TM 143	1598.0	7.74	9.08
	Kranti	1483.2		
	Pusa Bold	1464.9		
Mean over 3 years	TM 204	1335.6	10.41	15.71
	TM 143	1292.0	6.80	11.93
	Kranti	1209.7		
	Pusa Bold	1154.3		

Table 2: Mean plant height, 50% flowering and maturity and other ancillary characters of TM 204 and TM 143 in comparison to check varieties under WB condition.

Characters	TM 204	TM 143	Kranti (NC)	Pusa Bold (ZC)
Plant height (cm)	153.7	148.3	156.4	157.2
50% flowering (days)	53.3	49.3	50.7	52.3
Maturity (days)	110.0	100.7	109.3	109.3
No. of primary branches (plant $^{-1}$)	5.0	4.6	4.8	4.9
No. of siliqua (plant $^{-1}$)	238.4	229.1	231.0	252.2
Length of siliqua (cm)	6.3	6.0	5.8	5.7
No. of seeds siliqua $^{-1}$	13.9	12.5	12.1	13.0
1000 seed weight (g)	5.5	5.5	5.6	5.1

viz. Kalyani, Kakdwip and Shekhampur under 3 agro climatic zones of West Bengal. Statistical analysis of data on seed yield revealed that mustard mutant TM 204 recorded highest mean seed yield (1097 kg ha^{-1}) followed by TM 143 (1083 kg ha^{-1}). TM 204 recorded 19.6 per cent and 35.9 per cent more seed yield than the check varieties Kranti and Pusa Bold. Whereas TM 143 recorded 18.1 and 34.2 per cent more seed yield than the check varieties Kranti (NC) and Pusa Bold (ZC). During 2014-15 the trial was conducted at four locations *viz*. Raghunathpur, Kakdwip, Jhargram and Shekhampur under 3 agro climatic zones of West Bengal. Statistical analysis of data on seed yield revealed that TM 204 recorded highest mean seed yield (1390 kg ha^{-1}) followed by national check variety Kranti (1229 kg ha^{-1}). TM 204 recorded 13.1 and 16.71 per cent more seed yield than the check varieties Kranti and Pusa Bold. During 2015-16 the trial was conducted at six locations *viz*. Kalyani, Burdwan, Raghunathpur, Kakdwip, Jhargram and Shekhampur under 4 agro climatic zones of West Bengal. Statistical analysis of data on seed yield showed that TM 204 recorded highest mean seed yield (1519.8 kg ha^{-1}) followed by national check variety TM 143 (1598 kg ha^{-1}). TM 204 recorded 2.46 and 3.74 per cent more seed yield than the check varieties Kranti and Pusa Bold. Whereas TM 143 recorded 7.74 and 9.08 per cent more seed yield than the check varieties Kranti (NC) and Pusa Bold (ZC).

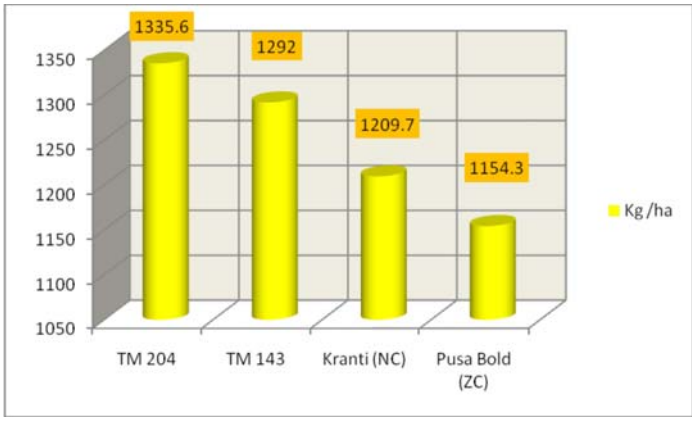

Fig. 1: Seed yield of TM 204 and TM 143 in comparison to Kranti (NC) and Pusa Bold (ZC) (Average of 3 years)

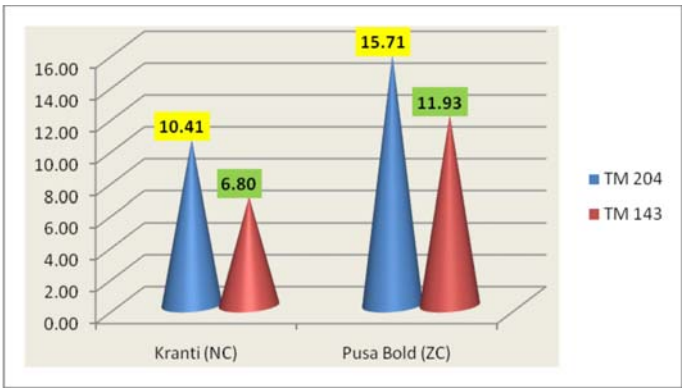

Fig. 2: Percentage increase of seed yield of TM 204 and TM 143 in comparison to Kranti (NC) and Pusa Bold (ZC) (Average of 3 years)

Pooled analysis of data over three years at 13 locations across four agro climatic zones revealed that both TM 204 and TM 143 surpassed the yield of two check varieties. TM 204 recorded 1335.6 kg ha $^{-1}$and TM 143 recorded 1292 kg ha $^{-1}$ seed yield whereas two check varieties Kranti (National Check) and Pusa Bold (Zonal Check) recorded 1209.7 and 1154.3 kg ha $^{-1}$ seed yield respectively. TM 204 showed 10.41 and 15.71 per cent yield advantage and TM 143 showed 6.80 per cent and 11.93 per cent yield advantage (Fig.1) over two check varieties Kranti (National Check) and Pusa Bold (Zonal Check).

The per capita consumption of vegetable oil is rising with the increase of purchasing capacity. The country needs to produce at least 60 m t of oilseeds by 2020 (Dutta, 2014). In West Bengal rapeseed mustard is mostly grown after harvest of kharif (winter) paddy when normal time of rapeseed mustard is over. Moreover due to short winter spell, rise of temperature during maturity time with high incidence of pest and diseases reduce the seed yield as well as oil yield. Since TM 204 and TM 143 matures early (within 110 days) and there is a preference of growing yellow coated mustard among the farmers the yellow coated Trombay Mustard can replace the existing yellow sarson variety Benoy (B-9) and can boost up the production and productivity of West Bengal.

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