***Original Research Article***

# Cultivation of Hybrids Mustard (*Brassica juncea* L.) in the pedo- climatic conditions of paryagrajsangam region(U.P), India


## Abstract

The field experiment was carried outat the Crop Research Farm, Department of Agronomy, Sam HigginbottomUniversityofAgriculture,TechnologyandSciences,Prayagraj during *Rabi*season 2021-22 on Mustard crop. The experiment was performed in randomized block design with ten treatments and three replication. The soil of experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 7.1), low in organic carbon (0.36%), available N (171.48 kg/ha), available P (15.2 kg/ha) and available K (232.5 kg/ha). The maximum plant height (171.76 cm), primary branches (6.5/plant), secondary branches (16.20/plant), plant dry weight (43.43 g/plant) at 100 DAS in hybrid ADV 4029 was recorded. Maximum Crop growth rate (CGR) recorded at 40-60DAS (20.32 g/$m^2$ /day), number of siliqua/plant (457.27), number of seeds/siliqua (13.55), test weight (4.73 g) and seed yield (2.51 t/ha) were observed in hybrid ADV 4029. In terms of economics, highest gross returns (Rs 136660.90/ha), net returns (Rs 87347.93/ha) and B:C ratio (1.77) were observed in hybrid ADV 4029.



*Keywords: Economics, Growth, Mustard hybrids, Yield.*


## INTRODUCTION

Indian mustard (*Brassica juncea* L.) belonging to the family cruciferae is one of the important oilseed crops and currently ranked as the world's third important oil seed crop in terms of production and area. Rapeseed and mustard have oil contents that range from 33% to 46%, while the average oil recovery is between 32% and 38%. The leftover portion of the seed is used to make rapeseed/mustard meal, an essential component of bovine and poultry feed, after the oil has been extracted. With a total productivity of 0.94 tons $ha^{-1}$, India produced 58.03 lakh tons of rapeseed-mustard per year on an area of roughly 61.90 lakh hectares **(Anonymous, 2015)**. Rapeseed-mustard output in India totals 79.77 lakh tons, ranking second

in the country's oilseed industry to soybeans (137.94 lakh tons), which produce 320.83 lakh tons in total. Rajasthan, Uttar Pradesh, Haryana, Madhya Pradesh, Gujarat, West Bengal, Assam, Bihar, and Punjab are the states where Indian mustard (*Brassica juncea* L.) is primarily grown **(DES, 2017)**. Mustard seeds have an oil content that varies from 35 to 48%. These crops are grown in 28 states across the nation under various agro-ecological conditions on 6.51 million hectares of land, yielding 8.18 million tons of vegetable oil, demonstrating their significance in the nation's vegetable oil production scenario. While Haryana alone produced 10.2% of the nation's total rapeseed-mustard production, rapeseed-mustard accounted for 20–22% of all oilseed production. It is grown on 6.70 million hectares in India, where it produced 7.96 mt and had a productivity of 1188 kg/ha in 2013–14. A significant rapeseed and mustard-growing state, Haryana produced 8.8 lakh tons of crop on 5.4 lakh ha of land in 2013–14, with an average yield of 1639 kg/ha (**Pattam*et al.*, 2017**).

Mustard needs a clear sky and no frost because it cannot survive frost. It may be cultivated in many different types of soil, including light and thick loamy soils. The optimum soils for growing mustard are medium to deep and well-drained. The pH range in the optimal soil for mustard is 6.0 to 7.5. The mustard-growing regions of India are subject to a wide range of agro climatic conditions. The productivity and output of rapeseed-mustard will be further increased and stabilized through effective management of natural resources, an integrated approach to plant water, nutrient, and pest management, and expansion of rapeseed-mustard cultivation to newer areas under different cropping systems.

**MATERIALSANDMETHODS**

During the *Rabi* season of 2021-22, a field experiment was conducted in alluvial soil at the Crop Research Farm of the Department of Agronomy, SHUATS, Prayagraj, U.P. The soil of experimental plot was sandy loam, having a nearly neutral soil reaction (pH 7.1), electrical conductivity (0.365 ds/m), medium in available Nitrogen (173.4 kg/ha) and available potassium (213.9 kg/ha), and low in available phosphorous (11.63 kg/ha). The crop was sown on November 5$^{th}$2022 using hybrids. TheexperimentwasconductedinaRandomizedBlock Design consisting of 10 treatment combinations and 3 replications *viz.*T1 (Bullet), T2 (HB 19101), T3 (ADV 4019),T4 ( ADV 427), T5 (TM 936), T6 (Indam 1702), T7 (TMMD 9988), T8 (ADV 4029), T9 (DHM 45), T10 (Siri 19).The nutrient sources were Urea, Single Super Phosphate (SSP) and Muriateof Potash (MOP), applied as per the recommended dose of 60-30-30 kg NPK/ha. Plant growth parameters, such asplant height (cm), dry weight (g/plant) were measured at a regular intervals from germination till harvest and yield and yield

attributes, such as Days to 50% flowering, Number of primary branches/plant, No. of secondary branches/plant,Siliqua/plant, Seeds/Siliqua, seed index (g), seed yield (t/ha), stoveryield (t/ha),harvest index(%) and oil content(%) were measured at harvest. The observed data were statistically analysed using analysis of variance (ANOVA) as applicable to randomized block design **(Gomez and Gomez, 1984)**.

**Resultsand Discussions**

**Growthparameter**

At 100 DAS, maximum plant height was recorded in hybrid ADV 4029 (171.76 cm).hybridsSiri 19 (168.76 cm) were statistically at par with hybrid ADV 4029. The hybrid reached its maximum plant height at every stage of crop development, and its tallest plant was mostly a result of varietal features. The above findings are supported by **Kumari*et al*., 2009**. Whereas, the highest number of secondary branches (16.20/plant) in hybrid ADV 4029. Hybrid Indam 1702 (15.60/plant) was found to be statistically at par with hybrid ADV 4029. A larger LAI increases the total energy available for branch development by increasing the amount of dry matter accumulated, which is the main reason for the higher number of primary and secondary branches throughout maturity. These findings are supported by**Singh**1989 and **Raquiballah***et al*.,2006. The significantly lower fifty percent of flowering was achieved (32.78 DAS) by the hybrid Indam 1702. However, DHM 45 (40.64 DAS) and Siri 19 (39.72 DAS) were statistically at par with Indam 1702. It may be because diverse crop growth maturity patterns during the entire life cycle of the plant differ in how mustard varieties affect flowering traits at productive portion blooming development stages. These findings are supported by **Kumar *et al*., 2017**. At 100 DAS, significantly maximum dry matter was recorded in hybrid ADV 4029 (43.43 g/plant). Hybrid Siri 19 (42.76 g/plant) was found to be statistically at par with ADV 4029. At 40-60 DAS, significantly maximum crop growth rate was recorded in hybridTMMD 9988(20.32g/$m^2$/day). However, ADV 427(19.58g/$m^2$/day) and ADV 4019 (19.49 g/$m^2$/day) werefoundtobestatisticallyatparwith TMMD 9988. Might be due to different rates of dry matter accumulation at various phases of crop growth, hybrids UMR-5 and UMR-4 had higher dry matter output at maturity than the other hybrids. CGR and RGR, two physiological growth parameters, differ greatly. These findings are supported by **Singh 1989** and **Raquibullah*et al.*2006**

**Yieldattributes**

The number of siliqua/plant of mustard was recordedsignificantly higher inhybrid ADV 4029

(457.27/plant). However, ADV 427 and Siri 19 recorded 423.17 and 440.80 siliqua/plant respectively which was statistically at par with ADV 4029. Thenumberofsiliqua/plantswerehighestduetohigherdrymatterproduction. The length of the siliqua of was recorded significantly higher in hybrid Indam 1702 (5.65 cm). However, Bullet (5.12 cm) and Siri 19 (5.08 cm) were statistically at par with Indam 1702. The number of seeds/siliquas of mustard was significantly maximum in hybrid ADV 4029 (13.55). However, hybrid HB19101 (12.84), TM 936 (13.14),Indam 1702 (12.78)and Siri 19 (13.31) were found to be statistically at par with ADV 4029. Largerthesiliquamorethegrainspersiliquaandhighertestweightwererecordedinmainshootfollowed by primary and secondary branches. The maximum seed yield of mustard was recorded in hybrid ADV 4029 (2.51 t/ha). However,statistical parity was observed in HB19101 (2.25t/ha) andSiri 19 (2.48t/ha). The hybrid recorded significantly highest seed yield this might be due to highernumber of branches, siliqua and highest seed weight per plant according to **Dehghani***et al*., 2008. The significantly maximum stover yield of mustard was recorded in hybrid ADV 427(5.52 t/ha). However, TM 936 (4.98 t/ha) and ADV 4029 (4.69t/ha) were statistically at par with ADV 427. Thestoveryieldwashighestduetohigherdrymatteraccumulationinthathybrid. The maximum harvest index of mustard was recorded in hybrid TMMD 9988 (36.42 %)which was statistically at par with Indam 1702 (35.33 %), ADV 4019 (36.05 %) and Siri 19 (36.15 %) were statistically at par with TMMD 9988.

**Economics**

The data pertaining to the economics of different treatments presented in Table 3 showed that themaximum gross return (136660.90 INR/ha), net return (87347.93 INR/ha), and benefit-cost ratio (1.77) were recorded in ADV 4029, and the minimum gross return (103041.50 INR/ha), net return (53728.52 INR/ha), and lowest benefit-cost ratio (1.09) were recorded in TMMD9988.

**Conclusion**

The concluded experiment showed that hybrid ADV 4029 was found to be best for obtaining more productivity in both growth and yield parameters.

**References**

1. Anonymous. Agricultural Statistics at a Glance.Directorate of Economics and Statistics, Ministry of Agriculture, GOI, New Delhi, 2015.

2. Anonymous, 2013–14. Directorate of Economics and Statistics, Department of Agriculture and Cooperation (DAC).Chapter 8 Table 8.2, 138 and Mustard Crop Survey Report 2014– 15. 2. 2.

3. Vasudha KS, Singh V, Tiwari D. Agronomic evaluation of mustard (Brassica juncea L.) hybrids under agro-climatic conditions of Prayagraj (UP). The Pharma Innovation Journal. 2021;10(10):852-855.

4. Pattam K, Pannu RK, Dhaka AK, Sharma KD. Effect of dates of sowing and nitrogen levels on growth and yield of Indian mustard. Intl J Current MicrobiolAppl Sci. 2017;6:1029-1036.

5. Singh RK. Effect of different levels of nitrogen on promising varieties of mustard (Brassica juncea L.)M. Sc. Ag., Thesis G.B. Pant Univ. of Agric. & Tech., Pantnagar; 1989.

6. Gomez KA, Gomez AA. Three or more factor expects. In statistical Procedure for Agricultural Research. 1984;2:139-141.

7. Kumari A. Evaluation of hybrid varieties of mustard (Brassica juncea L.) under different sowing time and spacing (Doctoral dissertation, GB Pant University of Agriculture and Technology, Pantnagar. (Uttarakhand). 2009;263:145.

8. Singh RK, Singh Y, Singh AK, Kumar R, Rakesh VK.Productivity and economics of mustard (Brassica juncea) varieties as influenced by different fertility levels under late sown condition.Indian Journal of Soil Conservation. 2010;38(2):121- 124.

9. Singh S, Singh V. Effect of sources and levels of sulphur on yield, quality and nutrient uptake by linseed (Linumusitatissimum). Indian Journal of Agronomy. 2007;52(2):158-159.

10. Kumar A, Mahapatra BS, Singh VP, Shukla A, Negi MS, Yadav AS, Singh P, Gaurendra G, Singh M. Effect of nutrient levels on yield, nutrient uptakeand economics of Indianmustard (Brassica juncea) in tarai region of Uttarakhand. Indian Journal of Agronomy. 2017;62(3):378-381. 11. Razzaque M, Karim M. Effect of varing concentrations of certain salts on germination and seedling vigor of two rape (Bassicanapus L.) varoties.). Mesopotamia Journal of Agriculture. 2007;14(2):25-40.

12. Dehghani H, Omidi H, Sabaghania N. Graphic analysis of trait relations of rapeseed using the biplot method.Agron. J. 2008;100(5):1443-144.

**Table 1. Growth parameter ofdifferentmustardhybrids**

| Hybrids | Plant height (cm) 100 DAS | Dry weight (g/plant) 100DAS | Crop Growth Rate ($g/cm^2/day$) During 40-60 DAS | Primary Branches | Secondary Branches | 50% Flowering |
|---|---|---|---|---|---|---|
| Bullet | 128.16 | 36.73 | 15.46 | 5 | 14.4 | 36.56 |
| HB 19101 | 143.76 | 40.95 | 17.5 | 5.4 | 15.2 | 32.78 |
| ADV 4019 | 140.52 | 37.79 | 18.98 | 4.9 | 15.6 | 35.34 |
| ADV 427 | 126.02 | 41.23 | 19.58 | 5 | 14.4 | 34.98 |
| TM 936 | 133.12 | 38.79 | 18.99 | 6.5 | 12.4 | 39.64 |
| Indam 1702 | 155.02 | 35.29 | 15.05 | 4.9 | 15.6 | 42.72 |
| TMMD 9988 | 147.08 | 32.83 | 20.32 | 5.4 | 13.2 | 35.54 |
| ADV 4029 | 171.76 | 43.43 | 14.08 | 4.2 | 16.2 | 38.98 |
| DHM 45 | 152.16 | 36.43 | 19.49 | 3.8 | 10.4 | 40.64 |
| Siri 19 | 168.76 | 42.76 | 16.5 | 3.6 | 11.6 | 39.72 |
| F-test | S | S | S | S | S | S |
| SEm(±) | 2.29 | 0.65 | 0.36 | 0.40 | 1.44 | 0.95 |
| CD (P=0.05) | 6.89 | 2.02 | 1.20 | 1.20 | 4.39 | 2.89 |

**Table 2.Yield and yield attributes parameter ofdifferentmustardhybrids**

| | Yield and Yield attributes | | | | | | |
|---|---|---|---|---|---|---|---|
| **Hybrids** | **Numberofsiliqua/plant** | **Length of siliqua/plant (cm)** | **Numberofseeds/siliqua** | **Testweight(g)** | **Seed yield (t/ha)** | **StoverYield(t/ha)** | **HarvestIndex(%)** |
| Bullet | 352.27 | 5.12 | 11.51 | 3.18 | 1.96 | 4.52 | 29.91 |
| HB 19101 | 351.53 | 4.36 | 12.84 | 4.19 | 2.25 | 4.48 | 33.42 |
| ADV 4019 | 284.47 | 4.68 | 11.44 | 4.01 | 2.12 | 4.33 | 32.89 |
| ADV 427 | 423.17 | 4.14 | 9.91 | 3.63 | 2.11 | 5.52 | 27.70 |
| TM 936 | 346.13 | 4.58 | 13.14 | 4.54 | 2.08 | 4.98 | 29.47 |
| Indam 1702 | 296.34 | 5.56 | 12.78 | 4.23 | 1.81 | 3.50 | 35.33 |
| TMMD 9988 | 205.76 | 4.06 | 11.71 | 4.01 | 1.89 | 3.30 | 36.42 |
| ADV 4029 | 457.27 | 4.56 | 13.55 | 4.73 | 2.51 | 4.69 | 34.86 |
| DHM 45 | 346.13 | 4.58 | 11.14 | 3.91 | 1.95 | 4.40 | 36.05 |
| Siri 19 | 440.8 | 5.08 | 13.31 | 4.01 | 2.48 | 3.45 | 36.15 |
| F-test | S | S | S | NS | S | S | S |
| SEm± | 28.10 | 0.18 | 0.30 | 0.28 | 0.10 | 0.30 | 0.94 |
| CD(P=0.05) | 84.30 | 0.56 | 0.95 | - | 0.31 | 0.92 | 2.84 |

**Table 3. Economics of mustard hybrid**

| Hybrids | Economic | | |
|---|---|---|---|
| | Grossreturns (INR/ha) | Net returns (INR/ha) | B:C |
| Bullet | 128438.50 | 79125.52 | 1.16 |
| HB 19101 | 122625.00 | 73312.00 | 1.49 |
| ADV 4019 | 115740.00 | 66427.02 | 1.35 |
| ADV 427 | 115176.50 | 65863.49 | 1.34 |
| TM 936 | 113396.50 | 64083.52 | 1.30 |
| Indam 1702 | 104095.00 | 54782.00 | 1.00 |
| TMMD 9988 | 103041.50 | 53728.52 | 1.09 |
| ADV 4029 | 136660.90 | 87347.93 | 1.77 |
| DHM 45 | 135196.50 | 85883.52 | 1.74 |
| Siri 19 | 106456.50 | 57143.49 | 1.16 |