International Journal of Agricultural Sciences
Volume 14 | Issue 1 | January, 2018 | 254-257 ■ e ISSN-0976-5670
☞DOI:10.15740/HAS/IJAS/14.1/254-257
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*RESEARCH PAPER*

# Performance of promising varieties of mustard under Tarai and Bhabar area of Uttarakhand

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**Abstract :** The experiment was conducted at Krishi Vigyan Kendra, Dhanauri, Haridwar to study the performance of promising Indian mustard varieties. The experiments comprises of nine combinations of 3 varieties (Pusa Tarak, Pusa Agrani, Pusa Vijay) and 3 spacing (30, 45 and 60 cm). Growth, yield attributes and grain and straw yield were significantly higher in 45 cm row spacing. The decrease in grain yield in 30 cm confored to spacing 60 cm spacing and 45 cm spacing was to the tune of 21.7 and 6.0 per cent. Mustard variety Pusa Vijay recorded maximum grain and straw yield during both the years. Net returns and BC ratio followed the same trend as grain yield.

**Key Words :** Indian mustard, Seed yield, Variety, Spacing

**View Point Article :** Kumar, Vinod, Pal, Yogendra and Kumar, Purushottam (2018). Performance of promising varieties of mustard under Tarai and Bhabar area of Uttarakhand. *Internat. J. agric. Sci.*, **14** (1) : 254-257, **DOI:10.15740/HAS/IJAS/14.1/254-257.**

**Article History : Received :** 24.10.2017**; Revised :** 13.12.2017**; Accepted :** 25.12.2017

## INTRODUCTION

Success of crop production mainly depends on temperature. As germination, growth, growth rate, crop duration etc are controlled by temperature. Mustard is usually planted late in Tarai and Bhabar area of Uttarakhand during the month of November. Owing to which the grain yield of mustard is poor. Under late sown condition, productivity declines primarily due to shortening of vegetative and reproductive phase. Process of grain formation is highly variable and depends on genetic, environmental and agronomic factors (Sidlauskas and Barnotas, 2003). Spacing of crop plant and their different genotypes mainly depend on their growth habit. Plant density has been observed to have a huge influence on growth, development and seed yield of mustard (Kumar *et al.,* 2004). Different cultivars may respond variably to different spacing. New varieties of mustard are capable of yielding higher when grown under optimum conditions. Spacing is a non-monetary input and information particularly in relation to newly developed varieties of mustard is scantily available. Therefore, the present experiment was conducted to study the performance of row spacing of promising mustard varieties in Tarai and Bhabar area of Uttarakhand.

## MATERIAL AND METHODS

The experiment was conducted at the Research Farm of Gobind Ballabh Pant University of Agriculture

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and Technology, Krishi Vighyan Kendra, Dhanauri, Haridwar, Uttarakhand during the *Rabi* season of 2015-16 and 2016-17 to study the performance of promising mustard varieties in Tarai and Bhabar area of Uttarakhand. The treatments comprises of nine combinations of 3 varieties (Pusa Tarak, Pusa Agrani, Pusa Vijay) and 3 spacing (30, 45 and 60 cm). The soil was sandy loam in texture with pH 7.5, low in available nitrogen (260 kg N/ha) and phosphorous (10.5 kg $P_2O_5$/ ha) and medium in potash (265 kg $K_2O$/ha). The experiment was carried out in Randomized Block Design with four replications. The crop was sown as per treatment with recommended package of practices on 3-11-15 and 4-11-16 and harvested on 14-3-2016 and 17-3-2017 (Pusa Vijay), 3-3-2016 and 4-3-17 (Pusa Tarak) and 26-2-2016 and 28-2-2017 (Pusa Agrani). The dose of fertilizers applied was 90 kg N + 40 kg $P_2O_5$ + 20 kg $K_2O$ + 30 kg S/ha. Full dose of phosphorus, potassium and sulphur and half dose of nitrogen were applied at the time of sowing and remaining half dose of nitrogen was top dressed after first irrigation. The cost of cultivation was calculated by taking into account the prevailing market price of produce and inputs. All the data on growth and growth attributes, yield and yield attributes and economics were statistically analyzed.

## RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

### Growth and growth attributes :

Mustard varieties and spacing influenced plant height and branches significantly (Table 1). Variety Pusa Vijay recorded significantly highest number of branches and plant height compared to Pusa Tarak and Pusa Agrani during both the years. However, the difference in plant height between Pusa Vijay and Pusa Tarak was not found significant. Mustard var. Pusa Tarak resulted in significantly more number of branches compared to Pusa Agrani during both the years. Variety Pusa Agrani recorded lowest number of branches and plant height during both the years. In general Pusa Vijay recorded

**Table 1: Effect of various treatments on the performance of mustard (2015-16 and 2016-17)**

| Treatments | Branches (number) | | | Height (cm) | | | 1000 grain weight (g) | | | Grain yield (q/ha) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Variety/Year | 2015-16 | 2016-17 | Av. | 2015-16 | 2016-17 | Av. | 2015-16 | 2016-17 | Av. | 2015-16 | 2016-17 | Av. |
| Pusa Tarak | 15.2 | 16.5 | 15.8 | 76.2 | 75.1 | 75.7 | 5.8 | 5.7 | 5.7 | 19.3 | 20.1 | 19.7 |
| Pusa Agrani | 12.3 | 12.2 | 12.3 | 75.2 | 74.8 | 75.0 | 4.4 | 4.3 | 4.4 | 17.1 | 16.9 | 17.0 |
| Pusa vijay | 16.2 | 17.4 | 16.8 | 97.7 | 96.1 | 96.8 | 5.9 | 6.0 | 5.9 | 21.7 | 22.4 | 22.1 |
| C.D. (P=0.05) | 1.8 | 1.9 | - | 7.1 | 7.8 | - | 0.4 | 0.5 | - | 2.1 | 2.2 | - |
| **Spacing (cm)** | | | | | | | | | | | | |
| 30 | 12.2 | 12.3 | 12.2 | 82.4 | 83.1 | 82.7 | 5.5 | 4.2 | 4.9 | 16.5 | 17.2 | 16.9 |
| 45 | 16.3 | 17.3 | 16.8 | 84.4 | 87.5 | 85.9 | 5.3 | 5.8 | 5.6 | 21.1 | 22.1 | 21.1 |
| 60 | 15.2 | 16.5 | 15.9 | 75.9 | 75.4 | 75.7 | 5.5 | 6.0 | 5.8 | 20.5 | 20.1 | 20.3 |
| C.D. (P=0.05) | 1.8 | 1.9 | - | 7.1 | 7.8 | - | 0.4 | 0.5 | - | 2.1 | 2.2 | - |

**Table 2: Effect of various treatments on the performance of mustard (2015-16 and 2016-17)**

| Treatments | Straw yield (q/ha) | | | Economics (Rs./ha) | | | |
|---|---|---|---|---|---|---|---|
| Variety/year | 2015-16 | 2016-17 | Av. | Gross return | Cost of cultivation | Net return | BC ratio |
| Pusa Tarak | 52.4 | 55.2 | 53.8 | 69100.00 | 28000.00 | 41100.00 | 2.46 |
| Pusa Agrani | 51.1 | 52.1 | 51.6 | 61000.00 | 28000.00 | 33000.00 | 2.17 |
| Pusa vijay | 62.0 | 65.9 | 64.0 | 79300.00 | 28000.00 | 51300.00 | 2.83 |
| C.D. (P=0.05) | 4.2 | 5.4 | - | - | - | - | - |
| **Spacing (cm)** | | | | | | | |
| 30 | 49.3 | 53.8 | 51.5 | 60700.00 | 28000.00 | 32700.00 | 2.16 |
| 45 | 59.2 | 61.7 | 60.5 | 77700.00 | 28000.00 | 49700.00 | 2.77 |
| 60 | 57.3 | 57.7 | 57.5 | 71000.00 | 28000.00 | 43000.00 | 2.53 |
| C.D. (P=0.05) | 4.2 | 5.4 | - | - | - | - | - |

highest plant height and number of branches compared to Pusa Tarak and Pusa Agrani. Higher Plant height and number of branches in Pusa Vijay may be due to the better utilization of carbohydrates resulting in more cell division and increased plant vigour. Crop sown with 45 cm spacing recorded significantly higher number of branches compared to 30 cm row spacing during both the years. However, the difference in number of branches between 45 and 60 cm row spacing was not found significant during both the years. Sixty cm row spacing gave significantly higher number of branches compared to 30 cm row spacing during both the years. Significantly lowest number of branches was recorded with 30 cm row spacing during both the years. In general crop sown with 45 cm row spacing resulted in maximum number of branches over to 30 and 60 cm spacing. 45 cm row spacing resulted in significantly higher plant height compared to 60 cm row spacing during both the years. The difference in plant height between 45 and 30 cm spacing was not observed statistically significant during both the years. 60 cm row spacing resulted in significantly lowest plant height during both the years. The similar findings were observed by Bhuiyan *et al.* (2008) and Kumari *et al.* (2012).

**Yield and yield attributes :**

Variety and spacing influenced the 1000 grain weight and grain and straw yield significantly (Table 1 and 2). Variety Pusa Vijay and Pusa Tarak recorded statistically at par but significantly higher 1000 grain weight compared to Pusa Agrani during both the years. Pusa Agrani recorded significantly lowest 1000 grain height and grain yield during both the years. In general variety Pusa Vijay recorded 3.50 and 34.09 per cent more 1000 grain weight compared to Pusa Tarak and Pusa Agrani, respectively. The significantly highest grain (22.10 q/ha) and straw (64.0 q/ha) yields were recorded with variety Pusa Vijay followed by variety Pusa Tarak which produced 19.7 and 53.8 q/ha grain and straw yields, respectively. Variety Pusa Tarak produced significantly more grain yield compared to mustard variety Pusa Agrani. However, the difference in straw yield between variety Pusa Tarak and Pusa Agrani was not found significant. Lowest grain and straw yields were recorded with variety Pusa Agrani (17.0 and 51.6 q/ha, respectively). Highest grain and straw yields in mustard variety Pusa Vijay were associated with higher plant height, more number of branches and more 1000 grain weight. The varietal differences in seed yield has also been reported by Kumar (2003) and Dehghani *et al.* (2008).

Spacing influenced the grain and straw yield significantly (Table 1 and 2). Spacing (45 cm) recorded significantly highest plant height, number of branches, grain and straw yields during both the years. However, the difference in yields recorded with 45 and 60 cm spacing was not found significant during both the years. On an average, crop sown with 45 cm row spacing recorded 21.1 and 60.5 q/ha grain and straw yield, respectively. Spacing 60 cm resulted in significantly higher grain and straw yields compared to 30 cm row spacing during both the years. Based on two years data 60 cm row spacing gave 20.3 and 57.5 q/ha grain and straw yield, respectively. Lowest grain and straw yields were recorded with spacing 30 cm. Highest grain and straw yields in spacing 45 cm were associated with higher plant height and more number of branches. These results are in conformity with findings obtained by Kumar *et al*. (2004) and Tyagi and Upadhya (2016).

**Economics:**

The data on economic parameters (Table 2) revealed that the highest gross returns, net returns and B:C ratio were observed with Variety Pusa Vijay (Rs 79300.00/ ha, Rs. 51300/ ha and 2.83, respectively) followed by variety Pusa Tarak which gave Rs 69100/ha, 41100/ ha and 2.46 gross returns, net returns and B:C ratio, respectively. Lowest gross returns, net returns and BC ratio were recorded with variety Pusa Agrani. Higher returns in Pusa Vijay are due to its inherent capacity to produce more yields. Highest gross returns, net returns and BC ratio were observed with the crop sown with 45 cm row spacing (Rs.77700.00/ ha, Rs.49700/ ha and 2.77, respectively) followed by 60 cm spacing which gave Rs. 71000/ha, 43000/ ha and 2.53 gross returns, net returns and B:C ratio, respectively. Lowest gross returns, net returns and B:C ratio were recorded with the crop sown at 30 cm row to distance.

It was concluded that mustard variety Pusa Vijay sown at 45 cm row spacing gave maximum yield in the Tarai and Bhabar area of Uttarakhand.

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