

## Production Potential and Influence of Different sowing Dates on Various Variety of Indian Mustard (*Brassica juncea* L.)

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### ABSTRACT

A field experiments was conducted during winter seasons of 2017-18 at Agricultural Research Farm of Rama University Kanpur to study effects of sowing dates on growth and yields of Indian mustard (*Brassica juncea* L.). Experiment was conducted in Split Plot Design (SPD) with three replications having two factors. First factor comprised of three dates of sowing (15 Oct, 10 Nov and 05 Dec) whereas, second

factor consist of three Indian mustard varieties viz; Varuna, Narendra rai-1 and Kranti. Results showed that both dates and varieties (10 Nov and Varuna) were superior when compare to rest of treatment. However, highest growth attributes (plant height, dry matter accumulation, Days taken to 50% flowering, number of tillers, LAI (Leaf Area Index) and other yield attributes (No. of siliqua (cm) per plant, length of siliqua (cm) test weight, seed yield (q/ha) grain yield, stover yield, biological yield and harvest index) was recorded on 10 Nov. under Varuna variety, and oil character. Lowest yield recorded under dates and varieties at 15 Oct followed by 05 Dec. and Narendra rai-1 and Kranti. Among treatment, dates and varieties (10 Nov and Varuna) showed effectively increasing growth, yield and enhanced the nitrogen content efficiency, oil content and oil yield.

**Keywords** Indian mustard, Sowing dates, Varieties, Nitrogen content, Economics.

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### INTRODUCTION

Mustard is the second most important oil seed in India after soya been. In the world, it is grown over an area of 703.119 million ha, Production of 68000 tones and consumption of 71000 tonnes during 2016-17 (Use recent data). It accounts for nearly 25% of the total oilseed production in India. India is the third largest mustard producing country in the world after China

and Canada. India accounts for nearly 12% of world production. As per COOTI's (central organization for Oil Industry and Trade) estimates, in Uttar Pradesh about 8.40 lakh tones of is estimate to be produce in the year 2015-16 while in previous year the state had produced only 6.75 lakh tones of Mustard. Uttar Pradesh is the second largest mustard producing state in India after Rajasthan and Madhya Pradesh (Anonymous 2017). The important mustard growing countries of the world are India, Canada, China, Pakistan, Poland, Bangladesh and Sweden. In India, its cultivation is mainly confined in the states viz., Rajasthan, Uttar Pradesh, Madhya Pradesh, Haryana, Punjab, Assam, Bihar, Gujarat and West Bengal. Among states, Uttar Pradesh alone produces about 20% of total mustard production in India.

Rapeseed-Mustard (*Brassica juncea* L.) is the third important oilseed crop in the world after soybean and palm oil. Among the seven edible oilseed cultivation in India, rapeseed-mustard (*Brassica* spp.) contributes 28.6% in the production of oilseeds. The global production of rapeseed-mustard and its oil is around 38-42 and 12-14 million tonnes respectively. India contributes 8.3% and 19.8% of world acreage and production respectively. India is one of the important among the leading oilseed producing countries of the world. Oilseed ranks the second largest agriculture commodity after cereals. Mustard is the second most important edible oil seed crop after groundnut. It plays an important role in the oil seed economy of the country. India occupies the third position in rapeseed and mustard production in world after Canada and China. In India, during 2013-14, the area of rapeseed-mustard was 6.5 million ha with the production of 7.8 million tonnes and productivity of 1208 kg/ha. However, in Uttar Pradesh during the year 2013-14 the area of rapeseed-mustard was 10.26 lakh ha with the production of 11.29 lakh tonnes and productivity of 1110 kg/ha (Anonymous 2013-14) (Use recent data). However, oilseeds area and production in the India in 2016-17 at 262.06 lakh hectare and 32.10 million tonnes respectively (DACFWM A&FW, 2017-18).

## MATERIALS AND METHODS

The experiment was conducted at Agronomy Re-

search Farm, Rama University Mandhana Kanpur (UP). The research farm is located in the main campus of the University. Experiment was laid out in split-plot design (SPD). Twelve treatment combinations comprised of four sowing dates and 3 varieties of mustard were tested in split plot design with 4 replications. The dates of sowing were kept in main plots and varieties were kept in sub plots. Details of the experiments are given as under; Soil of that particular field was Silt loam, with pH 8.2, lower in organic carbon content (0.37) and low in available nitrogen (194.25 kg ha<sup>-1</sup>) and medium in phosphorus (18.3 kg ha<sup>-1</sup>) and potash (250.25 kg ha<sup>-1</sup>). Three varieties viz., Varuna (V<sub>1</sub>), Narendra Rai-1 (V<sub>2</sub>) and Kranti (V<sub>3</sub>) were used to assess their performance fewer than four dates of sowing viz., 15<sup>th</sup> October (D<sub>1</sub>), 10 November (D<sub>2</sub>) and 5 December (D<sub>3</sub>). The experiment was conducted under Split plot design with four replications in which date of sowing was taken as main plot treatments and varieties were allocated in sub plots. The crop was fertilized with a uniform dose of nitrogen, phosphorus and potassium @ 120 kg, 60 kg and 50 kg ha<sup>-1</sup>, respectively. Urea, DAP and Murate of potash were used as the source of nitrogen, phosphorus and potassium. Half dose of nitrogen along with full dose of phosphorus, potassium and sulfur were applied as basal and remaining dose of nitrogen was top dressed into two equal splits. 1<sup>st</sup> split was top dressed at 30 DAS and 2<sup>nd</sup> splits at pre flowering stage of the crop. Thinning was done in two phases. In first phase emerging seedlings were thinned out at 25 days after sowing and second phase of thinning was completed at three leaves stage at 45 days after sowing of the crop to maintain the plant to plant distance of 15 cm. Two irrigations were given to the mustard crop. First irrigation was given at 30 days after sowing and second, irrigation was given at flowering stage of the crop. Harvesting of individual plots was done at physiological maturity when siliquae turned brownish. Mainly mustard crop was harvested as soon as 75% pods turned yellowish brown. The border rows were harvested first thereafter, net plots were harvested. For minimizing the shattering losses, the crop was harvested especially in the morning hours when siliquae are slightly damage with night dew. The bundles of harvested plants were sun dried for few days at threshing floor after proper tagging. The bundle weight of net plot was recorded individually. Threshing was done by wooden sticks

**Table 1.** Nitrogen content and protein content as influenced by different date of sowing and varieties.

Treatment	Nitrogen content (%)	Protein content (%)
15 Oct 2018	3.3	22.3
10 Nov 2018	3.6	22.8
05 Dec 2018	2.9	19.2
SEm±	0.07	0.68
CD (p=0.05)	2.17	2.24
Varities		
Varuna	3.6	21.6
Narendra Rai-1	3.5	22.7
Kranti	3.3	19.3
SEm±	0.48	0.57
CD (p=0.05)	1.57	1.69

and the seed weights from the net plots were recorded. Seed was subtracted from the total produce as to know the stover yield of its each net plot.

## RESULTS AND DISCUSSION

### Nitrogen content (%)

Data pertaining to nitrogen content of mustard as affected by dates of sowing and varieties have been presented in Table 1 Nitrogen content of mustard was not influenced significantly due to dates of sowing and varieties.

### Protein content (%)

Data pertaining to protein content of mustard as affected by dates of sowing and varieties have been presented in Table 1 Protein content of mustard was not influenced significantly due to dates of sowing and varieties.

Interaction effect between dates of sowing x varieties was found non-significant on protein content of mustard.

A critical examination over data obviously reveal that the crop sown on 10<sup>th</sup> November produced significantly higher oil yield as compared to 15<sup>th</sup> October sowing and at par with 05 December sowing.

Interaction effect between dates of sowing and varieties was found non-significant on nitrogen content of mustard.

**Table 2.** Economics of various treatment combinations.

Treatments combinations	Cost of cultivation (Rs ha <sup>-1</sup> )	B-C ratio
D <sub>1</sub> V <sub>1</sub>	26427.0	1.82
D <sub>1</sub> V <sub>2</sub>	26427.0	1.68
D <sub>1</sub> V <sub>3</sub>	26427.0	1.24
D <sub>2</sub> V <sub>1</sub>	26427.0	2.05
D <sub>2</sub> V <sub>2</sub>	26427.0	1.87
D <sub>2</sub> V <sub>3</sub>	26427.0	1.38
D <sub>3</sub> V <sub>1</sub>	26427.0	2.32
D <sub>3</sub> V <sub>2</sub>	26427.0	2.17
D <sub>3</sub> V <sub>3</sub>	26427.0	1.45
D <sub>4</sub> V <sub>1</sub>	26427.0	1.75
D <sub>4</sub> V <sub>2</sub>	26427.0	1.48
D <sub>4</sub> V <sub>3</sub>	25527.0	1.06

## Economics

The main objective of any experiment with its background is to find out highest profit with minimum cost of cultivation. With the aim, the treatment combination which recorded higher profit are worth adopting. As such to work out the economics of each treatment combination separately, average prevailing market rates of different commodities were used. The data on economic aspects of different treatments have been given in Table 2.

### Cost of cultivation (Rs ha<sup>-1</sup>)

The data presented in Table 4.8 quite revealed that the cost of cultivation of Rs 26427.0 ha<sup>-1</sup> was recorded in all treatment combinations.

### Gross income (Rs ha<sup>-1</sup>)

Data pertaining gross income of different treatments combinations have been presented in Table 3. It revealed that the gross income increased with increase in seed and stover yield of Indian mustard.

Maximum gross income of mustard (Rs 85425.00 ha<sup>-1</sup>) was recorded under 10<sup>th</sup> November sowing with Varuna variety followed by Narendra Rai-1 (Rs 81305.00 ha<sup>-1</sup>) sown on 05 December. Minimum gross income (Rs 51753.00 ha<sup>-1</sup>) was found under 15 October sowing with Kranti variety.

**Table 3.** Maximum gross income and net return.

Treatments combinations	Gross income (Rs ha <sup>-1</sup> )	Net return (Rs ha <sup>-1</sup> )
D <sub>1</sub> V <sub>1</sub>	71914.0	46178.0
D <sub>1</sub> V <sub>2</sub>	69685.0	42343.0
D <sub>1</sub> V <sub>3</sub>	56677.0	31150.0
D <sub>2</sub> V <sub>1</sub>	77834.0	52116.0
D <sub>2</sub> V <sub>2</sub>	73510.0	47082.0
D <sub>2</sub> V <sub>3</sub>	61023.0	34506.0
D <sub>3</sub> V <sub>1</sub>	85425.0	60018.0
D <sub>3</sub> V <sub>2</sub>	81204.0	55668.0
D <sub>3</sub> V <sub>3</sub>	61573.0	36223.0
D <sub>4</sub> V <sub>1</sub>	68715.0	44189.0
D <sub>4</sub> V <sub>2</sub>	67966.0	40494.0
D <sub>4</sub> V <sub>3</sub>	51753.0	27236.0

### Net return (Rs ha<sup>-1</sup>)

A perusal of the data given in Table 3 indicated that maximum net return (Rs 60018.00 ha<sup>-1</sup>) was recorded under 10<sup>th</sup> November sowing with Varuna variety followed by 05<sup>th</sup> December sowing with Narendra Rai -1 (Rs 55668.00 ha<sup>-1</sup>) sown on same date. Minimum net return (Rs 27236.00 ha<sup>-1</sup>) was found under 15 October sowing with Kranti variety.

### Benefit - cost ratio

The data pertaining to benefit - cost ratio as influenced by different treatments have been presented in Table 2. The data reveal that highest benefit - cost ratio (2.32) was recorded under 10<sup>th</sup> November sowing with Varuna variety followed by Narendra Rai -1 (2.17) sown on 15 October.

### Quality

The quality of mustard seeds was measured in the term of oil and protein contents. The variety Varuna produces much oil content which was significantly higher to Narendra Rai -1 and Kranti whereas, protein contents were not significantly influenced due to varieties.

The quality of mustard seeds was measured in the term of oil and protein contents which were markedly influenced by dates of sowing. Oil content was significantly higher under 15<sup>th</sup> October sown crop as compared to 10<sup>th</sup> November and 05 December sown

crop. Whereas, variety Varuna produce higher oil content which was significantly higher to Narendra Rai-1 and Kranti whereas, protein contents were not significantly influenced by varieties. Patel *et al.* (2017). Similar finding reviewed found by Ghanbahadur *et al.* (2006) and Singh *et al.* (2017).

### Interaction effect of dates of sowing and varieties

The interaction effect between date of sowing and varieties was found non-significant in all the growth parameters, yield attributes, yield and quality characters.

### Economics

The cost of cultivation of Rs 25527.00 ha<sup>-1</sup> was computed in all the treatments. The highest net return of Rs 60018.00 ha<sup>-1</sup> was recorded with crop sown on 14<sup>th</sup> November with Varuna variety followed by the same sowing date with Narendra Rai-1. The highest net income per rupee invested i.e. (2.32) was recorded sowing on 14<sup>th</sup> November with Varuna variety followed by the same sowing date with Narendra Rai -1 (2.17). The results are in close accordance with Jadhav and Singh (1992) and Iraddi and Mansur (2008).

The above finding shows that the data pertaining to protein content of mustard as affected by dates of sowing and varieties. Protein content of mustard was not influenced significantly due to dates of sowing and varieties. Interaction effect between dates of sowing x varieties was found non-significant on protein content of mustard. A critical examination over data obviously reveals that the crop sown on 10<sup>th</sup> November produced significantly higher oil yield as compared to 15<sup>th</sup> October sowing and at par with 05 December sowing. Interaction effect between dates of sowing x varieties was found non-significant on nitrogen content of mustard. Oil content was significantly higher under 15<sup>th</sup> October sown crop as compared to 10<sup>th</sup> November and 05 December sown crop. Whereas, variety Varuna produce higher oil content which was significantly higher to Narendra Rai-1 and Kranti Whereas, protein contents were not significantly influenced by varieties. On the basis of above summarized results it may be concluded that, 10<sup>th</sup> November sowing of mustard was found suitable for realizing higher yields.

Varuna was found most suitable variety of mustard for higher yield. The interaction effect between date of sowing and varieties was found non-significant. The highest net return Rs 60018.00 and B-C ratio 2.32 was observed with 10<sup>th</sup> November sowing dates along with Varuna followed by Narendra Rai -1 sown with 10<sup>th</sup> November.

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