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# Effect of dates of sowing and levels of nitrogen on growth, yield and oil content of Indian mustard (*Brassica juncea* L.)

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## ABSTRACT

*A field experiment was conducted at Research Farm, Department of Agronomy, AKS University, Sherganj, Satna (M.P.) during the year 2024-2025 The treatments were fitted in a Factorial Randomized Block design replicated three times with, making twelve treatment combinations A field experiment was conducted to evaluate the effect of different nitrogen levels and sowing dates on growth, yield, and oil content of mustard. The treatments included four nitrogen levels (0, 40, 60, and 80 kg N ha$^{-1}$) and three sowing dates (15th October, 25th October, and 4th November). The results revealed that increasing nitrogen levels significantly enhanced all growth parameters, including plant population, plant height, number of leaves and branches, root length, and biomass production. The application of 80 kg N ha$^{-1}$ ($N_3$) recorded the highest seed yield (1186.11 kg ha$^{-1}$), siliquae per plant (198.51), and oil content (40.50%), followed by 60 kg N/ha ($N_2$). The untreated control ($N_0$) showed the lowest performance across all parameters. Sowing date also had a significant influence on mustard performance. Sowing on 4th November ($D_3$) consistently resulted in superior growth and yield attributes, including the highest plant height (143.11 cm), seed yield (1069.25 kg ha$^{-1}$), and oil content (36.94%). Application of 80 kg N ha$^{-1}$ and 4th November sowing date recorded the highest net return (₹50,230.45 and ₹44,306.670/ha respectively) and B:C ratio (2.83 and 2.57), indicating maximum profitability among all treatments. The 15th October sowing ($D_1$) recorded the lowest values in all parameters. The study concludes that the application of 80 kg N ha$^{-1}$ combined with sowing on 4th November is the most effective strategy to improve mustard productivity and oil content in the region.*

**Key words:** Mustard, Nitrogen levels, Productivity, Sowing dates, yield attributes

## INTRODUCTION

Mustard (*Brassica juncea* L.) is ranked as the third most significant oilseed crop worldwide, following soybean and palm oil. It belongs to the *Cruciferae* family. Different regions have different names for it, including Sarson, Rai, Raya, Toria, and Lahi. Rai or Laha is frequently called mustard, and Sarson and Toria are commonly called rapeseed. Oil produced from mustard seeds has a concentration between 37 and 49%. According to Kumar *et al.* (2025), India is ranked fourth globally, second in terms of area after China, and third in terms of output after China and Canada. The temperate and subtropical regions of Europe, Asia, and North America are the primary growing regions for brassica species. The main producers of oilseeds are Russia, China, India, Pakistan, Europe, and Canada. In non-traditional states like Tamil Nadu, Karnataka, Maharashtra, and Andhra Pradesh, its cultivation is expanding. In 2018–19, India produced 7.20 million tons of mustard and rapeseed on 6.30 million hectares of land (Kumar *et al.,* 2025). According to Verma *et al.* (2023), Rajasthan is the state with the most area and output, followed by Madhya Pradesh, Uttar Pradesh, Punjab, Haryana, Assam, Bihar, West Bengal. The most important nutrient is nitrogen (N). It is a part of protoplasm and protein and has a role in several metabolic processes that affect crop growth, productivity, and quality. Oil content is also decreased by increasing N application. Because it creates favorable conditions for growth and development, sowing time is crucial to maximizing a variety's genetic potential. One of the most important and least expensive production decisions that influence the yield and quality of mustard seeds is the planting date. The crop's production is increased by robust plant stands and healthy growth, both of which depend on the timing of the sowing.

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## MATERIAL AND METHODS

The present experiment was conducted during the *Rabi* season of 2024-25 at the Research plot, Department of Agronomy, Faculty of Agriculture Science and Technology, AKS University, Sherganj, Satna (M.P.). The experimental site is situated in the semi-arid region of Satna District. The experiment was laid out in Factorial Randomized Block design replicated three times with four Nitrogen levels and three levels of date of sowing to thereby making twelve treatment combinations. The details of treatments are as follows: N @ 00, 40, 60, 80 kg N $ha^{-1}$ and sowing on 15$^{th}$, 25$^{th}$ October and 4$^{th}$ November. The observations were recorded for the growth, yield attributes and yield characters along with the oil content of the crop. Fertilizers such as SSP, and MOP were applied accordingly on the treatments. Recommended agricultural practices and plant protection measures were adhered to until the crop was harvested. Biometric observations were obtained from the selection of five random plants within each plot. Analysis of Variance approach was employed to analysed the gathered data at 5% level of significance.

## RESULTS AND DISCUSSION

A statistical analysis was performed on the experimental observation data that was periodically captured. Appropriate tables are used to display the results, which are based on mean values. This chapter presents the findings and discussions.

### Effect of Nitrogen

### Growth Parameters

The experimental findings clearly show that raising nitrogen levels significantly improved all of the crop measured growth characters. The application of 80 kg N/ha ($N_3$) resulted in the largest plant population (6.22/m²), followed by (5.00/m²) under 60 kg N/ha ($N_2$), and the lowest (1.68/m²) under control. The height of the plants likewise showed a similar pattern, with the control having the lowest height (101.84 cm), $N_3$ having the highest height (171.26cm), and $N_2$ having the following highest (145.97cm). The number of leaves per plant varied between 14.58 (control) and 22.48 ($N_3$), with $N_2$ yielding 21.11 leaves per plant. Similarly, there were 27.53 branches per plant ($N_3$) compared to 21.49 ($N_0$), with $N_2$ displaying 25.60 branches per plant. $N_3$ had the longest roots (23.47 cm), followed by $N_2$ (20.90 cm) and $N_0$ (12.50 cm). 80kg N was statistically equivalent to all other treatments and consistently yielded the best results for plant population, height, number of branches, and other metrics. These results highlight how important nitrogen is for improving plant development characteristics. The findings agreed with Dutta *et al.* (2016), Kumar *et al.* (2017), Tripathi *et al.* (2021), Kaur *et al.* (2018).

Table 1: Effect of growth parameters as influenced by Nitrogen and Date of sowing

| | Nitrogen levels | | | |
|---|---|---|---|---|
| | Plant population /$m^2$ | Plant height (cm) | Number of leaves/ plants | Number of branches/ plants |
| $N_0$ | 1.68 | 101.84 | 14.58 | 21.49 |
| $N_1$ | 4.09 | 121.30 | 18.27 | 23.73 |
| $N_2$ | 5.00 | 145.97 | 21.11 | 25.60 |
| $N_3$ | 6.62 | 171.26 | 22.48 | 27.53 |
| S.Em± | 0.36 | 1.05 | 0.24 | 0.06 |
| C.D. (*p*=0.05) | NS | 3.08 | 0.70 | 0.18 |
| | | Date of sowing | | |
| $D_1$ | 5.19 | 150.42 | 19.94 | 25.47 |
| $D_2$ | 4.20 | 132.27 | 18.99 | 24.60 |
| $D_3$ | 3.66 | 122.59 | 18.40 | 23.70 |
| S.Em± | 0.35 | 0.91 | 0.21 | 0.05 |
| C.D. (*p*=0.05) | 1.03 | 2.67 | 0.62 | 0.15 |

*$N_0$- 00 kg N $ha^{-1}$, $N_1$- 40 kg N $ha^{-1}$, $N_2$- 60 kg N $ha^{-1}$, $N_3$-80 kg N $ha^{-1}$, $_0$- 15$^{th}$ October, $D_1$- 25$^{th}$ October, $D_3$- 4$^{th}$ November*

**Yield and yield attributes**

The mustard crop's yield and yield-attributing characteristics were all greatly impacted by the administration of higher nitrogen levels. Nitrogen significantly increased the number of siliquae per plant; the greatest value was 208.00 under 80 kg N $ha^{-1}$ ($N_3$), followed by 181.31 under 60 kg N $ha^{-1}$ ($N_2$), and the lowest was 112.20 in the control ($N_0$). In a similar, $N_3$ recorded 7.10cm of length siliquae, while $N_0$ recorded 3.57cm and $N_2$ recorded 6.11cm. With $N_3$ yielding 11.53 seeds per siliquae, the number of seeds per siliquae rose from 5.40 ($N_0$) to 11.53 ($N_3$). Similarly, $N_3$ produced the highest yield (1173.11kg $ha^{-1}$), somewhat more than $N_2$ (1045.56 kg $ha^{-1}$), and significantly more than $N_0$ (775.33 kg $ha^{-1}$) in terms of seed yield per hectare. Additionally, the stover production rose with nitrogen, rising from 2409.67kg $ha^{-1}$ ($N_0$) to 2783.56 kg $ha^{-1}$ ($N_3$), with $N_2$ accounting for 2669.89 kg $ha^{-1}$. With the greatest results in every parameter, treatment 80 kg N was statistically comparable to all other treatments except 60 kg N and 40 kg N, indicating the significant beneficial effects of nitrogen, especially at 80 kg $ha^{-1}$, on mustard yield and its constituent parts. Several workers in the past also studied and came to a conclusion are Raghuvanshi *et al.* (2018), Patel *et al.* (2004), Dutta *et al.* (2016), Jat *et al.* (2017).

**Oil content**

According to the data, oil content gradually incremented as nitrogen treatment increased. With the application of 80 kg N $ha^{-1}$ ($N_3$), the highest oil content of 41.20% was observed, closely followed by 39.38% under 60 kg N/ha ($N_2$). Conversely, the control treatment (0 kg N/ha, $N_0$) had the lowest oil concentration, at 28.27%. These results unequivocally show that nitrogen is essential for increasing mustard's oil content, with the best efficacy noted at the 80 kg N/ha application level.

**Effect of Date of Sowing**

**Growth Parameters**

It is evident from the data analysis that the growth parameters of mustard were significantly impacted by the dates of sowing. Although it was statistically comparable to the 25$^{th}$ October ($D_2$) sowing (4.20/m²), the crop seeded on 15$^{th}$ October ($D_1$) had the greatest plant population/m² (5.19), outperforming all other sowing dates. A similar pattern was seen in plant height, with $D_1$ recording the tallest plants (150.42cm), followed closely by $D_2$ (132.27cm), and $D_3$ recording the shortest plants (122.59cm). The sowing date also had a substantial impact on the number of leaves per plant, $D_1$ produced the greatest value (19.94), followed closely by $D_2$ (18.99), and $D_3$ produced the lowest value (18.40). Likewise, $D_1$ had the most branches per plant (25.47), statistically comparable to $D_2$ (24.60), while $D_3$ had the fewest (23.70). Additionally, the 15$^{th}$ October sowing produced the longest root length at harvest (20.29cm), followed by the 25$^{th}$ October sowing (18.48cm), while the 4$^{th}$ November sowing produced the shortest root length (16.99cm). All things considered, it is clear that planting mustard on October 15$^{th}$ ($D_1$) continuously produced better growth performance across all metrics examined. Finding agreed with Tripathi *et al.* (2021), Kumar *et al.* (2017), Patel *et al.* (2017), Dutta *et al.* (2016), Kaur *et al.* (2018).

**Yield and yield attributes**

Data analysis showed that mustard production and yield parameters were significantly impacted by the dates of sowing. Superior performance in every parameter was regularly obtained by sowing on October 15$^{th}$ ($D_1$). Even though it was frequently statistically comparable to October 25$^{th}$ ($D_2$), $D_1$ produced the maximum number of siliquae per plant (174.18), siliqua length (5.88cm), seeds per siliqua (9.52), seed yield (kg $ha^{-1}$) (1032.83 kg $ha^{-1}$), $D_1$ also yielded the most seeds, with $D_2$ coming in second (965.75 kg $ha^{-1}$). Under 4$^{th}$ November ($D_3$) sowing, the lowest values for each of these metrics were consistently observed. Furthermore, $D_1$ had the highest stover production (2664.84 kg $ha^{-1}$), followed by $D_2$ (2605.34 kg $ha^{-1}$), and $D_1$ had the lowest (2534.25 kg $ha^{-1}$). These results unequivocally show that, in comparison to earlier sowing dates, planting mustard on 15$^{th}$ October results in noticeably higher productivity and superior yield components. Results are in corporation with Patel *et al.* (2004), Patel *et al.* (2017), Tripathi *et al.* (2021), Raghuvanshi *et al.* (2018).

Table 2: Effects of yield attribute and yield as influenced by nitrogen and date of sowing

| | Nitrogen levels | | | | | |
|---|---|---|---|---|---|---|
| | Number of siliquae per plant | Length of siliquae (cm) | Number of seeds per siliquae | Seed yield (kg/ha) | Stover yield (kg / ha) | Oil content (%) |
| $N_0$ | 112.20 | 3.57 | 5.40 | 775.33 | 2409.67 | 28.27 |
| $N_1$ | 144.38 | 4.83 | 8.20 | 879.33 | 2542.78 | 35.47 |
| $N_2$ | 181.31 | 6.11 | 9.87 | 1045.56 | 2669.89 | 39.38 |
| $N_3$ | 208.00 | 7.10 | 11.53 | 1173.11 | 2783.56 | 41.20 |
| S.Em± | 0.14 | 0.06 | 0.06 | 2.33 | 9.48 | 0.37 |
| C.D. (*p*=0.05) | 0.41 | 0.18 | 0.18 | 6.83 | 27.80 | 1.09 |
| | | | Date of sowing | | | |
| $D_1$ | 174.18 | 5.88 | 9.52 | 1032.83 | 2664.84 | 37.08 |
| $D_2$ | 161.48 | 5.45 | 8.78 | 965.75 | 2605.34 | 36.07 |
| $D_3$ | 148.75 | 4.89 | 7.95 | 906.42 | 2534.25 | 35.09 |
| S.Em± | 0.12 | 0.05 | 0.05 | 2.02 | 8.21 | 0.32 |
| C.D. (*p*=0.05) | 0.35 | 0.15 | 0.15 | 5.92 | 24.08 | 0.94 |

*$N_0$- 00 kg N ha$^{-1}$, $N_1$- 40 kg N ha$^{-1}$, $N_2$- 60 kg N ha$^{-1}$, $N_3$-80 kg N ha$^{-}$1, D0- 15$^{th}$ October, $D_1$- 25$^{th}$ October, $D_3$- 4$^{th}$ November*

**Oil content**

The data showed that the oil content (%) of mustard was significantly impacted by the dates of sowing. Sowing on October 15$^{th}$ ($D_1$) had the highest oil content (37.08%), followed by October 25$^{th}$ ($D_2$) with (36.07%), and November 4$^{th}$ ($D_3$) with the lowest (35.09%). Therefore, the best time to increase the oil content was to sown on October 15$^{th}$.

## CONCLUSION

The study found that nitrogen application levels and sowing dates significantly impact mustard growth, yield, and quality. The application of 80 kg N ha$^{-1}$ ($N_3$) resulted in higher plant population, height, and leaf number, as well as improved yield-attributing traits. The highest oil content was recorded under 80kg N ha$^{-1}$, highlighting nitrogen critical role in boosting mustard yield and quality. The optimal nitrogen fertilization at 80 kg N/ha combined with sowing on October 15$^{th}$ significantly enhances mustard growth, yield, and quality, providing valuable guidance for farmers and agronomists.

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## REFERENCES

Dutta, R., and Joshila Enghipi (2016) Effect of dates of sowing and nitrogen levels on nutrient uptake (kg/ha), nutrient use efficiency, and quality of Yellow Sarson (*Brassica rapa* var. trilocularis) grown in rice fallow. *Journal of Oil seed Brassica*, **7**(2):174-179

Jat A.L., Prajapati K.P., Patel B.K., Patel P.J., Patel J.R., Shah S.K. and Desai, A.G. (2017) Influence of NPK Levels on Performance of Indian Mustard (*Brassica juncea* L.). *International Journal of Current Microbiology and Applied Sciences* **6**(9): 1986-1990.

Jat, N.K., Shamim, M. And Sudhir Kumar (2021) Physiological evaluation of growth and yield variation of mustard (*Brassica juncea*) varieties under organic products in North-Western Indo-Gangetic Plains. Annals of Plant and Soil Research; **23**(4):509-514.

Kaur L., Sardana V. and Sharma P. (2018) Effect of sowing dates and nitrogen application on growth and productivity of canola oilseed rape (*Brassica napus*). *Journal of Oilseed Brassica* **9**(2): 114-121.

Kumar M., Singh P. K., Yadav K.G., Chaurasiya A. and Yadav A. (2017) Effect of nitrogen and sulphur nutrition on growth and yield

of Indian mustard (*Brassica juncea* L.) in western UP. *Journal of Pharmacognosy and Phytochemistry* 445-448.

Kumar, P., Nand, V., Kumar, D., Deepu, Mishra, A., Suryabhan, Kumar, S. and Janardan Prasad Bagri. (2025) Effect of integrated nutrient management on growth, yield and quality of Indian mustard (Brassica juncea L.). Plant Archives Vol. 25, Supplement 1, pp. 1286 1292.

Kumar, V. and Singh, S. (2019) Effect of fertilizer biofertilizer and farmyard manure on sustainable production of Indian mustard (*Brassica juncea*). *Annals of Plant and Soil Research;* **21**(1): 25-29.

Patel, A., Singh, A. K., Singh, V. S., Sharma, A., Raghuvanshi, N. and Avanish Kumar Singh. (2017) Effect of Different Sowing Dates on Growth, Yield and Quality of Various Indian Mustard (*Brassica juncea* L.) Varieties. *Int.J.Curr.Microbiol.App.Sci*. ISSN: 2319-7706

Patel, R.H; Sharma, V. and Usadadia, V.P. (2004) Influence of irrigation schedule, spacing and nitrogen on growth, yield and quality of mustard. Dept. of Agron., Gujarat Agri. U. India. **5**(2/3): 290-293.

Raghuvanshi N., Kumar V. and Dev J. (2018). Effect of Nitrogen Levels on Mustard (*Brassica juncea* (L.) Cuzern and Coss.) Varieties under Late Sown Condition. *Current Journal of Applied Science and Technology* **30**(2): 1-8.

Tripathi, M. B. K., Gaur, T., Pandey, L., Singh, A., Tiwari, A., Prakash, V., Rathore, S. U. and Rohit Kumar Singh.(2021) Effect of Sowing Dates on Growth and Yield of Indian Mustard (*Brassica juncea* L.). *Int.J.Curr.Microbiol.App.Sci*. **10**(01): 3046-305.

Verma, A., Singh P.K, Singh A.K, Singh M, Kumar A, Sachan R, Soni A and Ashish R (2023) Phenological and metabolic study of mustard [*Brassica juncea* (L.)]as affected by sulphur and zinc levels, *International Journal Of Environment And Climate Change,* **13**(11): 560-567.