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# ECONOMICS AND QUALITY PARAMETERS OF TORIA VARIETIES AS INFLUENCED BY SOWING DATES AND SULPHUR LEVELS

**Ashutosh Pratap Singh, Puspendra Kumar*, Mayank Kumar[1], Mamta and S. Elamathi**

Department of Agronomy, Allahabad Agricultural Institute-Deemed University, Allahabad - 211 007 (U.P.), India.
[1]Department of Plant Pathology, Allahabad Agricultural Institute-Deemed University, Allahabad-211 007 (U.P.), India.

## Abstract

A field experiment was conducted during the *rabi*, 2008-09 to study the effect of three sowing dates (8th September, 15th September and 22nd September) and three levels of sulphur (30, 45, and 60 kg S $ha^{-1}$) on growth and yield of toria varieties at the Crop Research Farm, Department of Agronomy At Allahabad Agricultural Institute-Deemed University, Allahabad (U.P.), India. Growth and yield parameters of toria are significantly influenced by sowing dates and sulphur levels. Variety PT-303 with application of 60 kg S/ha on 22nd September sown crop recorded higher dry weight, number of siliqua per plant number of seeds per siliqua and benefit : cost ratio.

***Key words :*** Sowing dates, sulphur levels, varieties, sulphur levels, sowing dates, toria.

## Introdution

Rapeseed and mustard group of oilseed is the second most important oilseed crop after groundnut, contributing nearly 25-30% of the total oilseed production in the country. In India, rapeseed and mustard is grown in about 7.06 m ha with a total production of 4.71 m t and a productivity of 6.67 q $ha^{-1}$ (Hegde, 2007). In oilseed, the role of sulphur is well known. Sulphur is a component of amino acids like cystein, cystine, methionine and essential for chlorophyll formation. It is also required for protein synthesis. Oilseeds crop, therefore, needs more sulphure for their oil and protein synthesis. The crops sown in optimum time produces taller plants and more number of branches, siliqua per plant, higher number of seed per siliqua and higher test weight than though sown in late. The late sown crop shows the lowest value of these variables. The south-west monsoon ceases normally in September. Therefore, it is more important to make use of the available soil moisture by adjusting the time of toria. The performance of any crop depends upon the available soil moisture during sowing time. Hence, an experiment was conducted to find out weather there is an advantages of early sowing of toria in north-eastern U.P. region or not.

***Author for correspondence:** E-mail: puspendrak39@gmail.com

## Materials and Methods

The field experiment was carried out during *rabi*, 2008-09 at Crop Research Farm, Department of Agronomy, Allahabad Agricultural Institute-Deemed University, Allahabad (U.P.), India. The soil was sandy loam, low in organic carbon (0.40%), available nitrogen (182.50 kg $ha^{-1}$), medium in available P (12.66 $kg^{-1}$) and K (160 $kg^{-1}$).

The experiment was laid out in factorial RBD with three replications. The treatments consisted of two varieties (T-9 & PT-303), three sowing dates (8th September, 15th September and 22nd September) and three levels of sulphur (30, 45, and 60 kg S $ha^{-1}$). Half dose N and full P & K were applied uniformly to all plots. The remaining half dose of N was applied at flowering stage. As per treatment full dose of sulphur was applied before sowing. The sowing of toria was done as per sowing dates. Using seed rate of 5 kg/ha. All other cultural practices were followed as per recommendation. Five randomly selected plants were tagged too study the growth and yield attributes and yield. Oil content was estimated by using Soxhlet apparatus.

## Results and Discussion

### Varietal comparison

Among the varieties tried, there was significant difference in siliqua per plant, seeds per siliqua, test weight,

**Table 1 :** Losses in production of toria due to sowing dates.

| Sowing dates | Seed yield | | | Oil yield | | |
|---|---|---|---|---|---|---|
| | Production (kg/ha) | Per cent (%) | Decrease (kg/ha/day) | Production (kg/ha) | Per cent (%) | Decrease (kg/ha/day) |
| September 8th | 863 | 54.20 | 45.40 | 357 | 58 | 14.20 |
| September 15th | 1181 | 12.70 | 21.40 | 457 | 27 | 15.40 |
| September 22nd | 1331 | - | - | 565 | - | - |

seed yield and oil content was observed variety PT-303 higher seed yield than T-9. The per cent increase in siliqua per plant, seeds per siliqua and test weight in PT-303 over T-9 were 13.40, 7.40 and 4.00, respectively. Higher seed yield and stalk yield was recorded in PT-303, which was significantly superior T-9. The per cent increase in seed yield and stalk yield in PT-303 over T-9 were 14.30 and 11.30, respectively. The higher seed yield PT-303 was obtained owing to increase in yield attributing characters, *viz*., siliquae per plant, seeds per siliqua and 1000 seed weight.

**Date of sowing**

Date of sowing had significant effect on toria yield and yield attributing characters. The maximum yield was obtained, when toria was sown on 22nd September as compared to early sowing. However, September 22nd sowing was significantly superior to early sowing the yield attributes siliquae per plant, seeds per siliqua and test weight significantly increased in September 22nd sowing as compared to 8th and 15th September sowing. The September sowing the reproductive phase was comparatively longer, which resulted into higher in yield attributes. On the other hand, in 8th and 15th September crop subjected to higher temperature during initial stages resulted in lesser yield attributes and seed yield. Oil content and oil yield was recorded higher in PT-303 with 60 kg S/ha on September 22nd sown crop. The percentage increase in seed yield due to 22nd September over 15th and 8th September are 23.10 and 54.20, respectively. The increase in seed yield on sowing 22nd September toria crop may be due to prevailing conductive soil/air temperature during initial stage, which would have determine all the yield contributing character recorded highly.

**Effect of sulphur**

There was significant difference in numbers of siliqua per plant, seeds per siliqua, test weight, seed yield and oil content. Increasing level of sulphur up to 60 kg/ha significantly increased the seed yield as compared to 45 and 30 kg S/ha. Improvement in growth and yield parameters due to sulphur are well known. Each increment in sulphur application has recorded increase in yield and yield contributing characters. The increase in siliquae per plant, seeds per siliqua and test weight were recorded in 60 kg S/ha. This was significantly higher than 30 and 45 kg/ha. The rate of increase in seed yield was very low in increasing sulphur level beyond 45 kg S/ha. The per cent increase in seed yield with 60 kg S/ha over 30 and 45 kg S/ha were 5.40 and 10.20 and stalk yield 3.30 and 7.20, respectively. There was no significant difference in harvest index was observed by application of 60 kg S/ha and 45 kg S/ha. Oil content and oil yield was increased in increased application of sulphur. Higher yield was obtained when 60 kg of S application. This may be due to higher seed yield. The improvement in the parameter with increase the supply of sulphur may be due to more synthesis of chlorophyll as well as enhanced photosynthesis, translocation, cell division and cell elongation. It is corroborated with the finding of Singh and Meena (2004).

**Losses in production due to sowing dates**

Studies on impact of sowing dates on total production of seed yield and oil yield indicated sowing of toria September 8th reduced production of seed and oil yield by 21 and 15 kg/ha/day till September 15th reduction further increased considerately September 8th recording seed yield and oil yield losses by 45 and 15 kg/ha/day. The loss in production found to be two times higher in seed yield due to earlier sowing of September 15th.

**Economics**

There was increased in grass income, net return and benefit cost ratio were observed in $\mathbf{T_{18}}$ (PT-303 + 22nd September + 60 kg S/ha) followed by $\mathbf{T_{17}}$ (PT-303 + 22nd September + 45 kg S/ha), $\mathbf{T_{16}}$ (PT-303 + 22nd September + 30 kg S/ha) and $\mathbf{T_{9}}$ (T-9 + 22nd September + 60 kg S/ha). Grass income and net return of $\mathbf{T_{18}}$ are Rs. 39139.33 and Rs. 24713.33, B : C ratio is 2.71.

## Summary

Growth and productivity of toria was significantly increased in 22nd September. The percent increased in seed yield of 22nd September over 8th and 15th September

**Table 2 :** Effect of sowing dates and levels of sulphur on the growth and yield attributing character of two varieties of toria.

| Factors | No. of siliqua /plant | Seeds/ siliqua | Test weight (g) | Seed yield (q/ha) | Stalk yield (q/ha) | Harvest index |
|---|---|---|---|---|---|---|
| **Varieties** | | | | | | |
| T-9 | 149.41 | 12.95 | 3.55 | 10.19 | 28.28 | 26.44 |
| PT-303 | 169.41 | 13.92 | 3.69 | 11.65 | 31.47 | 26.88 |
| S. Ed. (±) | 5.37 | 0.486 | 0.023 | 0.403 | 0.65 | 0.85 |
| CD (p = 0.05) | 10.92 | 0.99 | 0.05 | 0.82 | 1.32 | 0.17 |
| **Date of sowing** | | | | | | |
| 8th Sep. | 129.17 | 11.94 | 3.39 | 8.63 | 24.59 | 26.00 |
| 15th Sep. | 155.33 | 13.11 | 3.60 | 10.81 | 29.92 | 26.53 |
| 22nd Sep. | 193.72 | 15.26 | 3.86 | 13.31 | 35.11 | 27.44 |
| S. Ed. (±) | 6.58 | 0.595 | 0.028 | 0.493 | 0.80 | 1.04 |
| CD (p = 0.05) | 13.38 | 1.21 | 0.06 | 1.00 | 1.63 | 0.21 |
| **Sulphur** | | | | | | |
| 30 kg/ha | 150.33 | 13.05 | 3.56 | 10.41 | 28.86 | 26.44 |
| 45 kg/ha | 160.33 | 13.37 | 3.62 | 10.88 | 29.83 | 26.66 |
| 60 kg/ha | 167.56 | 13.89 | 3.67 | 11.47 | 30.93 | 26.87 |
| S. Ed. (±) | 6.58 | 0.595 | 0.028 | 0.493 | 0.80 | 1.04 |
| CD (p = 0.05) | 6.58 | 0.60 | 0.03 | 0.49 | 0.80 | 0.21 |

**Table 3 :** Economics and quality parameters of toria varieties as influenced by sowing dates and sulphur levels.

| S. no. | Treatment combinations | Description of treatment combination | Oil per cent | Oil yield (kg/ha) | Cost of cultivation (Rs./ha) | Grass return (Rs./ha) | Net return (Rs./ha) | B : C ratio |
|---|---|---|---|---|---|---|---|---|
| $T_1$ | $V_1D_1S_1$ | T-9 + 8 September + 30 kg sulphur /ha | 39.97 | 303.47 | 14077.50 | 18,927.00 | 4,849.50 | 1.34 |
| $T_2$ | $V_1D_1S_2$ | T-9 + 8 September + 45 kg sulphur /ha | 41.56 | 333.73 | 14265.00 | 19,991.00 | 5,726.00 | 1.40 |
| $T_3$ | $V_1D_1S_3$ | T-9 + 8 September + 60 kg sulphur /ha | 42.32 | 361.00 | 14452.50 | 21,268.33 | 6,815.83 | 1.47 |
| $T_4$ | $V_1D_2S_1$ | T-9 + 15 September + 30 kg sulphur /ha | 41.06 | 413.47 | 14077.50 | 25,084.67 | 11,007.67 | 1.78 |
| $T_5$ | $V_1D_2S_2$ | T-9 + 15 September + 45 kg sulphur /ha | 42.23 | 430.75 | 14265.00 | 25,411.33 | 11,146.33 | 1.78 |
| $T_6$ | $V_1D_2S_3$ | T-9 + 15 September + 60 kg sulphur /ha | 42.96 | 443.78 | 14452.50 | 25,749.83 | 11,297.33 | 1.78 |
| $T_7$ | $V_1D_3S_1$ | T-9 + 22 September + 30 kg sulphur /ha | 41.32 | 483.44 | 14077.50 | 29,108.17 | 15,030.67 | 2.07 |
| $T_8$ | $V_1D_3S_2$ | T-9 + 22 September + 45 kg sulphur /ha | 42.12 | 521.02 | 14265.00 | 30,714.83 | 14,449.83 | 2.15 |
| $T_9$ | $V_1D_3S_3$ | T-9 + 22 September + 60 kg sulphur /ha | 43.21 | 554.38 | 14452.50 | 31,886.83 | 17,434.33 | 2.21 |
| $T_{10}$ | $V_2D_1S_1$ | PT-303 + 8 September + 30 kg sulphur /ha | 40.24 | 350.09 | 14077.50 | 21,705.50 | 7,628.00 | 1.54 |
| $T_{11}$ | $V_2D_1S_2$ | PT-303 + 8 September + 45 kg sulphur /ha | 41.84 | 392.04 | 14265.00 | 23,360.50 | 9,095.50 | 1.64 |
| $T_{12}$ | $V_2D_1S_3$ | PT-303 + 8 September + 60 kg sulphur /ha | 42.61 | 407.78 | 14452.50 | 23,855.83 | 9,403.33 | 1.65 |
| $T_{13}$ | $V_2D_2S_1$ | PT-303 +15 September + 30 kg sulphur /ha | 41.84 | 468.35 | 14077.50 | 27,765.83 | 13,688.33 | 1.97 |
| $T_{14}$ | $V_2D_2S_2$ | PT-303 +15 September + 45 kg sulphur /ha | 42.42 | 483.59 | 14265.50 | 28,340.17 | 14,075.17 | 1.99 |
| $T_{15}$ | $V_2D_2S_3$ | PT-303 +15 September + 60 kg sulphur /ha | 43.31 | 506.73 | 14452.50 | 29,060.00 | 14,667.50 | 2.01 |
| $T_{16}$ | $V_2D_3S_1$ | PT-303 + 22 September + 30 kg sulphur /ha | 41.72 | 551.96 | 14077.50 | 32,863.67 | 18,786.17 | 2.33 |
| $T_{17}$ | $V_2D_3S_2$ | PT-303 + 22 September + 45 kg sulphur /ha | 42.64 | 592.70 | 14265.50 | 34,506.33 | 20,241.33 | 2.42 |
| $T_{18}$ | $V_2D_3S_3$ | PT-303 + 22 September + 60 kg sulphur /ha | 43.63 | 690.66 | 14452.50 | 39,139.33 | 24,713.53 | 2.71 |

sowing was 36 and 54, respectively. The variety PT-303 with 60 kg S/ha on September 22nd sown recorded higher net income and seed yield and benefit cost ratio.

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