Research and Reviews: Journal of Ecology and Environmental Sciences

e-ISSN: 2347-7830
p-ISSN: 2347-7822

# Response of Different Nutrients on Growth and Yield of Rapeseed Crop (PR20061) Pant Rai 19 in Dehradun Valley (*Brassica napus L.*)

Reshma Rana*

Department of Agronomy, Shri Guru Ram Rai University, Dehradun, Uttarakhand, India

Research Article

**Received:** 08/12/2021

**Accepted:** 22/12/2021

**Published:** 29/12/2021

***For correspondence:**

Reshma Rana, Department of Agronomy, Shri Guru Ram Rai University, Dehradun, Uttarakhand, India.

**E-mail: reshmirana10@gmail.com**

**Keywords:** Plant height; Number of siliquae per plant; Seed yield; Stalk yield; Harvesting index

## ABSTRACT

The present investigation entitled "Integrated Nutrient Management of Mustard and Rapeseed (PR20061) pant Rai 19'' was carried out to examine the response of Different Nutrients Treatments on growth, yield and economics of Rapeseed. The field experiment was conducted during winter season, 2019 at research block of S.G.R.R. University, Pathribagh, Dehradun, Uttarakhand. The experiment was carried out in completely randomize block design with 9 treatments and 3 replications. The investigation revealed that the performance of rapeseed crop was significantly influenced by application of nutrients. Among all the treatments, Treatment t6 overall was found best for farmer point of view with respect to plant height (120 cm), dry matter accumulation per plant (80 g), number of siliquae per plant (118.7), weight of siliquae per plant (16.57 g), length of siliquae (4.9cm), number of seeds per siliquae (11.1) seed weight per plants (6.12), seed yield (12.96 q/ha), stalk yield (32.68 q/ha) , harvest index (28.41%), and net return (7799 Rs per ha).

## INTRODUCTION

Integrated Nutrient Management (INM) aims at maintenance of plant nutrient supply to achieve a given level of crop production by optimizing the benefits from all possible sources of plant nutrients in an integrated manner, appropriate to cropping system and farming situation. Crop productivity is increased due to combined application of chemical fertilizer and organic manures. Such combination contributed to the improvement of physical, chemical and biological properties of soil [1]. Rapeseed-mustard occupies the second position in oilseeds next to the groundnut. Among the Brassica family, Indian rapeseed (*Brassica campestrisL*. var. yellow sarson) is the 2nd most important oil-yielding crop after Indian mustard [*Brassica juncea (L.)* Czern. and Coss.] followed by toria (*Brassica* campestris var. toria). Mustard and sarson group of plants are cultivated in 26 states in the northern and eastern plains of the country, occupying 6.9 mha areas with 7.96 million tons of production at 11.02 q $ha^{-1}$ productivity.

India holds a premier position in rapeseed- mustard economy of the world with 3rd rank in both area and production [2]. The productivity of Indian rapeseed is quite low due to sub-optimal application of fertilizers and cultivation on marginal lands under rain fed conditions. Intensive cultivation and use of unbalanced and inadequate fertilizers accompanied by restricted use of organic manures have made the soils not only deficient in the nutrients, but also deteriorated the soil health.

All these things resulted in poor crop yield of rapeseed in terms of quantity and quality. In order to supply all the nutrients in adequate amount and to maintain its good health, it is necessary to use organic sources like FYM in combination with fertilizers [3]. They not only supply macro- nutrients but also meet the demand of micronutrients, besides improving soil health. It was reported that long term combined application of zinc, sulfur and along with FYM significantly increased crop yield, uptake and availability of micronutrients in soil over chemical fertilizer alone. Researchers also reported that integrated nutrient management increased the economic yield of mustard-based cropping system by 35% than that without FYM treatment [4]. The present experiment was, therefore, conducted to study the influence of integrated nutrient management (especially FYM, S and Zn) on soil fertility build up as well as yield and quality improvement of rapeseed. The investigation was conducted with rapeseed at SGRRU Dehardun Uttrakhand India (23.08°N, 88.53°E, 11 m above MSL) during October, 2019 to February, 2020.

## MATERIALS AND METHODS

The characteristics of the initial soil samples were: pH 6.4, EC 0.160 $dSm^{-1}$, Org. C 0.91%, Clay 19.5%, Textural class clay loam, CEC 0.01 c mol (p+) $kg^{-1}$, Available N 283.1 kg $ha^{-1}$, Available P2O5 24.5 kg $ha^{-1}$, Available K2O 275.5 kg ha-1, Available SO4-2 23.75 kg $ha^{-1}$, DTPA-extractable Zn 0.45 mg $kg^{-1}$, Altogether 9 treatments were employed in the present investigation, each with 3 replications. The treatments were: The experimental site having neutral pH and experiment was laid out in completely Randomized block design (RBD). The experiment was replicated thrice with 9 treatments *viz*., T1 (NPK@60:40:40 kg/ha), T2 (ZINC@25 kg/ha), T3 (SULPHER@40 kg/ha+NPK @60:4:040 kg/ha), T4 (FYM@10t/ha), T5 (VERMICOMPOST@5t/ha), T6 (Ca@20 kg/ha+Mg@40 kg/ha+S@ 40kg/ha+ NPK), T7 (BIOFERTILIZERRhizobium@5 kg/ha), T8 (NEEMCAKE @150 kg /ha+ NPK @ 60:40: 40kg /ha) Under Control (T9).

## RESULTS AND DISCUSSION

### Plant height (cm)

The pattern of plant height showed progressive increase up to harvest stage under all the treatments. However, the rate of increase was rapid from 45 to 75 day stage and thereafter, it slowed down. There was rapid increase in plant height from 75 to 105 day stage as compared to period from 105 days to harvest.

The plant height did not differ significantly due to different treatments at 45 days stage. However, its significant influence was recorded at 75 and 105 day stages and also at harvest. Maximum plant height (126.2 cm) was recorded with the treatment receiving of Ca@20 kg/ha+ mg@40 kg/ha+ S@40 kg/ha+NPK. 75-day stage which was statistically at per with the treatments receiving recommended dose of fertilizers (T3) S@40kg per ha+NPK@ 60:40:40 kg per ha, NPK@60;40;40kg per ha but were significantly superior over all the remaining treatments. The lowest plant height (101.0 cm) was observed in the treatment receiving under control (T9) which was at per with (T4) FYM@10t/ha or (T8) Neemcake@150kg/ha+NPK@60:40:40kg/ha. But differences in height between (T6) Ca@20kg/ha+Mg@40kg/ha+S@40kg/ha+NPK, (T3) Sulphur@40kg/ha+NPK@60:40:40kg/ha, (T1)NPK@60:40:40kg/ha and (T9) control treatments were not significant. Similar trend in plant height was noticed at 105 day stage and at harvest.

### Number of primary branches per plant

The perusal of data revealed that number of primary branches per plant increased up to 105 day stage, which remained more or less the same at harvest.

There was a significant difference in number of primary branches per plant due to different treatments except at 45 day stage [5]. Treatment receiving Ca@20kg/ha+Mg @40kg /ha+S@40kg/ha+NPK (T6) resulted in maximum number of primary branches per plant (4.9) at 75 day stage with no significant difference among the treatments

receiving recommended dose of fertilizers (T3) S@40kg/ha+ NPK@ 60:40:40kg/ha but was significantly superior over rest of the treatments [6]. The lowest number of primary branches per plant was observed in the treatment receiving only under control (T9) with non-significant difference amongst (T8) Neemcake @150kg/ha+NPK@60:40:40kg/ha, (T5) Vermicompost@5t/ha, (T4)FYM@10t/ha treatments. Similar trend was also noticed at 105 day stage and at harvest.

## Dry matter accumulation per plant (g)

Data with regard to dry matter accumulation revealed that rate of dry matter accumulation was very slow up to 45 days which increased rapidly from 45 to 75 days and it reached the maximum from 75 to 105 days. The rate of dry matter production was slightly lower from 105 days to harvest [7]. The dry matter accumulation per plant was affected significantly due to different treatments at all the crop growth stages. Application of Ca@20kg/ha+ Mg@ 40kg/ha +S@40kg/ha+NPK (T6) recorded highest.

## Yield and harvest index

Various treatments caused significant variation in seed yield. Highest seed yield (12.96 q/ha) was recorded with Ca@20kg/ha+ Mg@40kg/ha+S@40kg/ha+NPK (T6) which was statistically at par with the treatments receiving recommended dose of S@40kg/ha+ NPK@60:40:40kg/ha (T3) but all these treatments were significantly superior to the remaining treatments. Lowest seed yield (7.20 q/ ha) was observed in the under treatments receiving (T9). It was however, at par with sulphur@40kg/ha+NPK@60:40:40kg/ha T3, Neemcake@ 150kg/ha+ NPK@ 60:40:40kg /ha (T8) and under control (T9) treatments. But the differences in seed yield between NPK@60:40:40Kg/ha (T1) Ca@20kg/ha+mg@40kg/ha+S@ 40kg/ha+NPK T6, and Biofertilizer@Rhizobium (T7), treatments were not significant.

## Dry matter accumulation per plant (g)

Data with regard to dry matter accumulation revealed that rate of dry matter accumulation was very slow up to 45 days which increased rapidly from 45 to 75 days and it reached the maximum from 75 to 105 days. The rate of dry matter production was slightly lower from 105 days to harvest [8]. The dry matter accumulation per plant was affected significantly due to different treatments at all the crop growth stages. Application of Ca@20kg/ha+Mg@ 40kg/ ha+S@40kg/ha+NPK (T6) recorded highest.

**Table 1.** Effect of integrated nutrient management on various yield and yield attributes of rapeseed.

| Treatments | Plant height (cm)at harvest | No. of silliquae/plants | Seed yield (q/ha) | Stalk yield (q/ha) | Harvet Index (%) |
|---|---|---|---|---|---|
| NPK@60:40:40Kg/ha | 156.8 | 116.8 | 11.82 | 31.9 | 27.3 |
| Zinc@25kg/ha | 124.3 | 67.3 | 9.62 | 26.88 | 27.3 |
| sulphur@40kg/ha+NPK @60:40:40kg/ha | 157.5 | 118.2 | 12.87 | 32.54 | 28.34 |
| FYM@10t/ha | 140.5 | 84.2 | 7.79 | 21.75 | 26.4 |
| Vermicompost@5t/ha | 141.4 | 83.5 | 8.14 | 21.26 | 27.68 |
| Ca@20kg/ha+mg@40kg/ha+S@40kg/ha+ NPK | 158.3 | 118.7 | 12.96 | 32.68 | 28.41 |
| Biofertilizer@Rhizobium | 141.4 | 96 | 9.72 | 26.52 | 26.61 |
| Neemcake@150 kg/ha+NPK @60:40:40 kg/ha | 139.2 | 67.3 | 7.66 | 21.6 | 26.18 |
| Control | 123.7 | 64.6 | 7.2 | 20.41 | 26.07 |
| SEm ± | 4.9 | 6.92 | 0.67 | 1.6 | 0.38 |
| CD (P=0.05) | 14.3 | 20 | 1.92 | 4.67 | 1.16 |

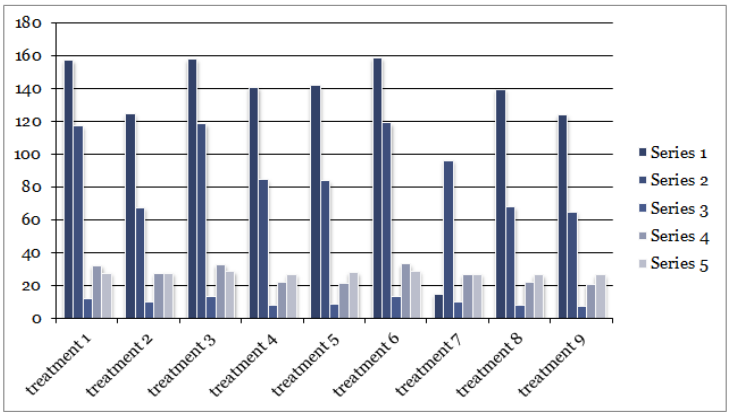
### Stalk yield (q/ ha)

The data relating to stalk yield of rapeseed revealed a significant effect of different treatments on stalk yield of Rapeseed [9]. Though treatment Ca@20kg/ha+ Mg@ 40kg/ ha+S@40kg/ha+NPK (T6) recorded the highest yield which did not differ significantly from recommended dose of S@40kg/ha+ NPK@60:40:40kg/ha (T3) such remained superior over rest of the treatments. No significant difference with regard to stalk yield of rapeseed was noticed among Zinc@25kg/ha (T2) and Neemcake@150kg/ha+NPK@60:40:40kg/ha (T8) treatments.

### Harvest index (%)

There was a marked influence of different treatments on the harvest index. Highest value (28.40%) of harvest index was obtained in the treatment receiving Ca@20kg/ha+ Mg@40kg/ha+S@40kg/ha+NPK (T6) which was statistically also at par with S@40kg/ha+ NPK@60:40:40kg/ha (T3) though remained significantly superior over rest of the treatments [10]. No significant difference in harvest index was noticed among FYM@10t/ha (T4), Biofertilizer@Rhizobium (T7) treatments. The lowest harvest index (26.07%) was recorded with under control treatment (T9) (Table 1 and Figure 1).

**Figure 1.** Effect of integrated nutrient management on various yield and yield attributes of rapeseed.




## CONCLUSION

The spacing of rapeseed crop was 30 × 10 cm. Gross plot size was (4.6 m × 3.2 m) and net plot size was (4m × 3 m). Total number of plots was 27 Seed yield was recorded after harvest. Data of soil, plant and grain samples were analyzed statistically at different growth stages of rapeseed crop using Microsoft Excel. Parameters like Critical Difference (CD) at 5 % level (for test of significance), SEM i.e. Standard Error Mean were calculated.

## REFERENCES

1. Abmad A, et al. Intractive effect of nitrogen and sulphur on growth and yield of rapeseed-mustard [*Brassica campestris (L.) and Brassica juncea (L.) Czern. and Coss*] genotypes. J Agron Crop Sci. 1998;181:193-199.
2. Ainslev A. Fertilizer requirements of spring oilsecd rape. J Sci Food Agr. 1977;28:301-11.
3. Allen El, et al. A quantitative analysis of the effects of nitrogen on the growth, development and yield of oilseed rape. J Agri Sci Cambridge. 1972;78:315-324.
4. Allen EJ, et al. A physiological analysis of the growth of oil seed rape. J Agri Sci. 1971;77:339-341.
5. Arora AS, et al. Yield and quality of mustard as affected by rates of N and S in Inceptisols. J Oilseeds Res. 1994;11:273-276.
6. Elf S, et al. Low temperature treatment of (*Brassica juncea*) grown in field. 7th Int Rapeseed Congress. 1987;11-14.
7. Poland F, et al. Yield and quality of mustard as influenced by different levels of phosphorus and sulphur. Asian J Soil Sci. 2008;3:207-208.

8. Fenwick GR, et al. Glucosinolates and their break down products in food and food plains. Crit Rev Food Sci Nutr. 1983;18:123-201.
9. Finlayson AJ, et al. Changes in the nitrogenous components of rape seed (*Brassica napus*) grown on a nitrogen and sulphur deficient soil. Canadian J Plant Sci. 1970;50:705-9.
10. Ghosh PK, et al. Filed of integrated management of Farmyard manure, phospho compost. Poultry manure and in organic fertilizers for rainfed sorghum (Sorghum bicolor) in Vertisols of central India. Indian J Agron. 2003;48:48-52.