The Pharma Innovation Journal 2021; 10(12): 1588-1590

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; 10(12): 1588-1590

www.thepharmajournal.com
Received: 02-10-2021
Accepted: 09-11-2021

**Niranjan R Chavan**
M.Sc. Scholar, Department of Agronomy, College of Agriculture, Latur, VNMKV, Parbhani, Maharashtra, India

**Pratiksha J Karpe**
M.Sc. Scholar, Department of Agronomy, College of Agriculture, Latur, VNMKV, Parbhani, Maharashtra, India

**Sharad S Jadhav**
M.Sc. Scholar, Department of Agronomy, College of Agriculture, VNMKV, Parbhani, Maharashtra, India

**Corresponding Author:**
**Niranjan R Chavan**
M.Sc. Scholar, Department of Agronomy, College of Agriculture, Latur, VNMKV, Parbhani, Maharashtra, India

# Influence of different nutrient sources on seed and oil yield and economics of mustard (*Brassica juncea* L.)

**Niranjan R Chavan, Pratiksha J Karpe and Sharad S Jadhav**

**Abstract**
A field experiment was conducted during *rabi* 2020-2021 at Experimental Farm, Agronomy, Oilseeds Research Station, Latur, to study the influence of different nutrient sources on seed and oil yield and economics of mustard (*Brassica juncea* L.). The soil was clayey in texture, low in available nitrogen, very low in available phosphorus, very high in available potassium and alkaline in reaction. The experiment was laid out in Randomized Block Design with 8 treatments each with three replications. The treatments were $T_1$ – Control, $T_2$ - RDF + FYM @ 5 t ha$^{-1}$, $T_3$ - RDF + Vermicompost @ 2.5 t ha$^{-1}$, $T_4$ - RDF + Poultry manure @ 5 t ha$^{-1}$, $T_5$- RDF + Elemental sulphur @ 20 kg ha$^{-1}$, $T_6$ - RDF + $ZnSO_4$ @ 20 kg ha$^{-1}$, $T_7$- RDF + $FeSO_4$ @ 20 kg ha$^{-1}$ and $T_8$ - RDF + Gypsum @ 500 kg ha$^{-1}$. The gross and net plot size was 5.4 m x 4.5 m and 4.5 m x 3.9 m, respectively. Sowing was done on 12$^{th}$ November, 2020. The recommended dose of fertilizer was applied as per treatments through Urea, DAP and MOP. The crop was harvested on 23$^{rd}$ February, 2021. The results of the experiment indicated that combined application of RDF + Vermicompost @ 2.5 t ha$^{-1}$ ($T_3$) observed significantly maximum seed yield (kg ha$^{-1}$), but statistically remained at par with RDF + FYM @ 5 t ha$^{-1}$ ($T_2$) and RDF + Gypsum @ 500 kg ha$^{-1}$ ($T_8$). The application of RDF + Vermicompost @ 2.5 t ha$^{-1}$ ($T_3$) recorded the significantly highest oil content. The application of RDF + Vermicompost @ 2.5 t ha$^{-1}$ ($T_3$) obtained maximum net returns. Highest B:C ratio was obtained with the application of RDF + Vermicompost @ 2.5 t ha$^{-1}$ ($T_3$).

**Keywords:** Mustard, nutrient sources, RDF, Vermicompost, FYM, Gypsum

## 1. Introduction
Indian mustard (*Brassica juncea* L.) is one of the major oilseed crop and has been cultivated in India since ancient times. India is the third largest Rapeseed-Mustard seed producer in the world (Chauhan *et al*., 2002) [3]. Mustard is an important *rabi* oilseed crop of India. Indian mustard, locally known as "Khardal" belongs to *Cruciferae* family and genus *Brassica*. Mustard has two center of origin i.e. (1) Middle - East and India, where oldest forms are found and (2) China. Rapa is believed to be the oldest species with the widest distribution. The term "Rapeseed-Mustard" is used for oilseed of genus *Brassica*, *Eruca* and *Sinapsis*. Of these, *Brassica* is most the important and has 5 species i.e. *Brassica juncea*, *B. rapa*, *B. napus*, *B. carinata* and *B. nigra*. Indian mustard is known as Rai, Raya or laha.
Mustard is cool season crop and follows $C_3$ pathway. It requires temperature between $06^0$ – $26^0$C. It is generally grown in rainfed condition. It requires well drained soil and is moderately tolerant to acidic soil. Water requirement of mustard is low (240-400 mm) which is sufficient for rainfed cropping system. Seed colour of the Indian mustard is dark brown and has rough seed coat. It has tapering root system. Height of plant is about 90-200 cm. It is self-pollinated but cross pollination also takes place to some extent. Flower has 4 sepals and 4 petals having dark yellow - pale yellow colour**.**
Oil content in mustard varies from 37% to 49% with 14-15% carbohydrate, 25-30% protein, 10-12% fibre, 1-1.5% minerals and vitamins, 2-3% glucosinolate. Mustard oil contains about 40-60% of ericic acid, 4.5 to 13% linolenic acid and 25-30% of oleic acid. Linoleic acid has a higher nutritive value. Mustard oil should be nutritious and palatable by reducing the linolinic and erucic acid. The seeds of mustard are used as condiments in the preparation of pickles and for flavoring curries and vegetables. The oil is used for human consumption and also for preparation of hair oils, medicines, greases and tanning industry. Oilcake is used as manure. Oil cake contains 'sinirgin', that causes palatability problem due to its bitter taste and glucosinolate which limits its use as a protein supplement. Young leaves are used as green vegetables as they contain sulphur and minerals. Addition of FYM directly adds organic carbon and helps stimulate the growth and activity of microorganisms.to

Higher production of biomass also increases the organic carbon content of soil (Babulkar *et al.*, 2000) [1]. The application of vermicompost adds plant nutrient and growth regulators. It increases soil water retention, microbial population, soil aeration, porosity, mineralization and consequently more release of available nutrients. Vermicompost application improves physical, chemical and biological properties of soil (Nagavallemma *et al.*, 2004) [9]. The application of poultry manure stimulates the soil microbial growth and activity, subsequent mineralization of plant nutrients and increases soil fertility and quality. Poultry manure is a good source of organic matter and plays a vital role in soil fertility. Sulphur is essential for synthesis of amino acids, protein and oil and activates enzymes system in plant. Application of sulphur in combination with balanced amounts of other nutrients significantly increases oil content and protein content of *Brassica* spp. (Pasricha and Aulakh, 1991) [10]. Zinc has vital role in growth, development and quality of crop. Zinc plays important role in biosynthesis of protein and amino acids in plants. Iron has an important role in synthesis of chlorophyll and proteins. It regulates respiration, photosynthesis, reduction of nitrates and sulphates. Gypsum is available in India and is a cheaper source of S which is used for oilseed crop.

Since adequate information is lacking on the choice of different sources of sulphur and micronutrient fertilizers for mustard, this investigation was undertaken to find out the suitability of various levels and sources of micronutrient for mustard. Keeping these points in view, the present investigation was carried out.

## 2. Materials and Methods

An agronomic investigation was conducted at Experimental farm, Oilseeds Research Station, Latur to study the influence of different nutrient sources on seed and oil yield and economics of mustard (*Brassica juncea* L.). The soil of experimental plot was clayey in texture, low in available nitrogen (231.00 kg ha$^{-1}$), very low in available phosphorous (8.55 kg ha$^{-1}$) and very high in available potassium (580.89 kg ha$^{-1}$). The soil was moderately alkaline in reaction having pH 7.02. This soil was favourable for normal growth of the crop. The environmental conditions were moderately suited for growth and development of mustard. The experiment comprised of eight treatments and laid out in Randomized Block Design (RBD). The treatments consisted of effect of different nutrient sources on growth and yield of mustard. The treatments were $T_1$ – Control, $T_2$ - RDF + FYM @ 5 t ha$^{-1}$, $T_3$ - RDF + Vermicompost @ 2.5 t ha$^{-1}$, $T_4$ - RDF + Poultry manure @ 5t ha$^{-1}$, $T_5$- RDF + Elemental sulphur @ 20kg ha$^{-1}$, $T_6$ - RDF + $ZnSO_4$ @ 20kg ha$^{-1}$, $T_7$- RDF + $FeSO_4$ @ 20kg ha$^{-1}$ and $T_8$ - RDF + Gypsum @ 500kg ha$^{-1}$. Each experimental unit was replicated thrice. Experimental unit had the plot size of 5.4 m x 4.5 m and 4.5 m x 3.9 m as the gross and net plot, respectively. Sowing was done by dibbling method at spacing of 45 cm x 15 cm. Sowing was done on 12$^{th}$ November, 2020. As per treatments, half dose of nitrogenous fertilizers and full dose of phosphatic were applied. The next half dose of nitrogen fertilizer was applied in bands as top dressing one month after sowing. The sources of nitrogen and phosphorus were urea and DAP, respectively. Elemental sulphur through bensulf, $ZnSO_4$, $FeSO_4$ and gypsum were also applied as per treatments. The recommended cultural practices and plant protection measures were undertaken as per recommendation. The crop was harvested on 23$^{rd}$ February, 2021.

## 3. Results and Discussion

**3.1. Seed yield (kg ha$^{-1}$):** Data regarding seed yield (kg ha$^{-1}$) of mustard at harvest is presented in Table 1.

Application of RDF + Vermicompost @ 2.5 t ha$^{-1}$ ($T_3$) produced highest seed yield (2051 kg ha$^{-1}$) and it was statistically at par with RDF + FYM @ 5 t ha$^{-1}$ ($T_2$) and RDF + Gypsum @ 500 kg ha$^{-1}$ ($T_8$). The treatment control ($T_1$) recorded the lowest seed yield (1174 kg ha$^{-1}$). The treatments gave immediate supply of nutrients to crop from inorganic sources at early stage and slow, continuous supply of nutrients from organic sources throughout crop growth period. This resulted into sufficient biomass production and improvement in yield parameters resulting in maximum seed yield. Positive response of crop in terms of RDF and vermicompost were also reported by Kansotia *et al.*, (2013) [5], Singh *et al.*, (2014) [11], Kumar *et al.*, (2016) [6], Gour *et al.*, (2017) [4] and Singh *et al.*, (2018) [12].

### 3.2. Quality attributes

#### 3.2.1. Oil content (%)

The effect of different fertilizers and manures on oil content is presented in Table 2. Mean oil content was 39.94%. Different treatments did not influence significantly on mean oil content. Highest oil content was recorded with RDF + Elemental sulphur @ 20 kg/ha which was followed by $T_3$- RDF + Vermicompost @ 2.5 t/ha. Sulphur is a essential key nutrient for oilseed production and directly involved in the formation of oil compounds. Increase in oil content might be due to increase in glucoside formation. According to Mani *et al*., (2006) [7] and Mishra (2003) [8], Sulphur enhances oil formation in mustard.

#### 3.2.2. Oil yield (kg ha$^{-1}$)

The data regarding mean oil yield (kg ha$^{-1}$) of mustard as influenced by different treatments in Table 2. Different treatments influenced significantly on mean oil yield (kg ha$^{-1}$) and which was 646 kg ha$^{-1}$. The highest oil yield (kg ha$^{-1}$) (840 kg ha$^{-1}$) was recorded with the application of RDF + Vermicompost @ 2.5 t/ha. The lowest oil yield (kg ha$^{-1}$) (449 kg ha$^{-1}$) was recorded with the treatment $T_1$ (control).

### 3.3. Economics

Data in Table 1 revealed that the gross monetary returns (GMR), cost of cultivation, net monetary returns (NMR) and B:C ratio as influenced by different treatments.

The application of RDF + Vermicompost @ 2.5 t ha$^{-1}$ ($T_3$) recorded significantly highest gross monetary returns (Rs. 84089 ha$^{-1}$). The lowest gross monetary returns of Rs. 48135 ha$^{-1}$ was recorded by the treatment $T_1$ (control). Similar trends were also observed by Singh *et al.*, (2014) [11].

The application of RDF + Vermicompost @ 2.5 t ha$^{-1}$ ($T_3$) recorded significantly highest net monetary returns of Rs. 39139 ha$^{-1}$ of mustard and which was followed by RDF + FYM @ 5 t ha$^{-1}$ ($T_2$) and RDF + Gypsum @ 500 kg ha$^{-1}$ ($T_8$) and the lowest net monetary returns Rs. 14935 ha$^{-1}$ was recorded by the treatment $T_1$ (control). Present findings result was in line with the results obtained by Singh *et al.*, (2014) [11], Gour *et al.*, (2017) [4] and Beenish *et al.*, (2018) [2].

The application of RDF + Vermicompost @ 2.5 t ha$^{-1}$ ($T_3$) recorded higher B:C ratio (1.87). The lowest B:C ratio (1.45) was recorded by the treatment $T_1$ (control). Beenish *et al.*, (2018) [2] also reported similar results.

**Table 1:** Economics of mustard as influenced by various treatments

| Treatments | Seed yield (kg ha$^{-1}$) | GMR (Rs ha$^{-1}$) | COC (Rs ha$^{-1}$) | NMR (Rs ha$^{-1}$) | B:C ratio |
|---|---|---|---|---|---|
| $T_1$ – Control | 1174 | 48135 | 33200 | 14935 | 1.45 |
| $T_2$ - RDF + FYM @ 5 t/ha | 1846 | 75688 | 41450 | 34238 | 1.83 |
| $T_3$ - RDF +Vermicompost @ 2.5 t/ha | 2051 | 84089 | 44950 | 39139 | 1.87 |
| $T_4$ - RDF + Poultry manure @ 5 t/ha | 1493 | 61208 | 42950 | 18258 | 1.43 |
| $T_5$ - RDF + Elemental Sulphur @ 20 kg/ha | 1464 | 60022 | 36150 | 23872 | 1.66 |
| $T_6$ - RDF + $ZnSO_4$ @ 20 kg/ha | 1590 | 65179 | 36750 | 28429 | 1.77 |
| $T_7$ - RDF + $FeSO_4$ @ 20 kg/ha | 1481 | 60741 | 35450 | 25291 | 1.71 |
| $T_8$ - RDF + Gypsum @500 kg/ha | 1812 | 74286 | 40950 | 33336 | 1.81 |
| SE ± | 92 | 3789 | - | 3789 | - |
| CD at 5% | 280 | 11493 | - | 11493 | - |
| General mean | 1614 | 66169 | 38981 | 27188 | 1.7 |

**Table 2:** Oil content (%) and Oil yield (kg ha$^{-1}$) of mustard as influenced by various treatments

| Treatments | Oil content (%) | Oil yield (kg ha$^{-1}$) |
|---|---|---|
| $T_1$ – Control | 38.22 | 449 |
| $T_2$ - RDF + FYM @ 5 t/ha | 40.18 | 742 |
| $T_3$ - RDF + Vermicompost @ 2.5 t/ha | 40.96 | 840 |
| $T_4$ - RDF + Poultry manure @ 5 t/ha | 39.88 | 595 |
| $T_5$ - RDF + Elemental sulphur @ 20 kg/ha | 41.44 | 607 |
| $T_6$ - RDF + $ZnSO_4$ @ 20 kg/ha | 39.90 | 634 |
| $T_7$ - RDF + $FeSO_4$ @ 20 kg/ha | 38.76 | 574 |
| $T_8$ - RDF + Gypsum @ 500 kg/ha | 40.16 | 728 |
| SE ± | 1.77 | 27.72 |
| CD at 5% | NS | 84.08 |
| General mean | 39.94 | 646 |

## 4. Conclusion

Seed yield (kg ha$^{-1}$) was significantly higher with the application of RDF + Vermicompost @ 2.5 t ha$^{-1}$ ($T_3$) which was found to be at par with RDF + FYM @ 5 t ha$^{-1}$ ($T_2$) and RDF + Gypsum @ 500 kg ha$^{-1}$ ($T_8$). Highest oil content was recorded with RDF + Elemental sulphur @ 20 kg/ha which was followed by $T_3$- RDF + Vermicompost @ 2.5 t ha$^{-1}$. The highest oil yield (kg ha$^{-1}$) (840 kg ha$^{-1}$) was recorded with the application of RDF + Vermicompost @ 2.5 t ha$^{-1}$. The lowest oil yield (kg ha$^{-1}$) (449 kg ha$^{-1}$) was recorded with the treatment $T_1$ (control). Highest gross monetary returns (Rs. 66169 ha-$^{1}$) and net monetary returns (Rs. 27188 ha$^{-1}$) was recorded with the application of RDF + Vermicompost @ 2.5 t/ha ($T_3$) which was statistically at par with the application of RDF + FYM @ 5 t ha$^{-1}$ ($T_2$) and RDF + Gypsum @ 500 kg ha$^{-1}$ ($T_8$). Highest benefit: cost ratio (1.87) was recorded with the application of RDF + Vermicompost @ 2.5 t/ha ($T_3$).

## 5. References


1. Babhulkar PS, Wandile RM, Badole WP, Balpande SS. Residual effect of long term application of FYM and fertilization on soil properties (Vertisols) and yield of soybean. Journal of the Indian Society of Soil Science. 2000;48:89-92.
2. Beenish O, Ahmad L, Hussain A, Lal EP. Organic manure and Biofertlizers: effect on the growth and yield of Indian mustard (*Brassica juncea* L.) varieties. Current Journal of Applied Science & Technology. 2018;30(04):1-7.
3. Chauhan JS, Tyagi MK, Kumar PR, Tyagi P, Singh M, Kumar S. Breeding for oil and seed meal quality in rapeseed-mustard in India-A Review. Agricultural Review. 2002;23(02):71-92.
4. Gour MK, Choudhary R, Jat BL. Influence of vermicompost and different nutrients on performance of Indian mustard [*Brassica juncea* (L.) Czern and Coss] in Typic Haplustepts. Journal of Biological Sciences. 2017;12(02):165-184.
5. Kansotia B, Meenaand RS, Meena VS. Effect of vermicompost and inorganic fertilizers on Indian mustard (*Brassica juncea* L.). Asian Journal of Soil Science. 2013;8(01):136-139.
6. Kumar V, Kandpal BK, Dwivedi A, Kumar SV, Kumar V, Sharma DK. Effect of nitrogen and zinc fertilizer rates on growth, yield and quality of Indian Mustard (*Brassica juncea* L.). International Journal of Agricultural Sciences. 2016;8(06):1031-1035.
7. Mani D, Kumar A, Kumar C, Kumar R. Effect of ammonium sulphate and DAP on yield and sulphur and phosphorus uptake by mustard. New Agriculturist. 2006;17(1&2):163-166.
8. Mishra SK. Effect of sulphur and potassium on yield, nutrient uptake and quality characteristics of mustard (B*rassica juncea* L.) udic Haplustepts of Kanpur. Journal of Indian Society of Soil Sciences. 2003;51:544-548.
9. Nagavallemma KP, Wani SP, Lacroix S, Padmaja VV. Vineela C, Baburao M, *et al*. Vermicomposting recycling wastes into valuable organic fertilizer. Global Theme on Agroecosystems Report no. 8. Patancheru 502 324, Andhra Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics, 2004, pp. 20.
10. Pasricha NS, Aulakh MS. Twenty years of sulphur research and oilseed production in Punjab. Sulphur Agric 1991;15:13-23.
11. Singh V, Chaudhary S, Verma VK, Srivastava AK, Aslam M, Thaneshwar. Studies on integrated nutrient management in mustard [*Brassica juncea* (L.) Czern & Coss]. International Journal of Agricultural Sciences. 2014;10(02):667-670.
12. Singh S, Singh M. Influence of nitrogen and sulphur application on growth, yield attributes, yield and quality of mustard (*Brassica juncea* L.) in Bundelkhand region. International Journal of Fauna & Biological Studies. 2018b;5(02):83-85.