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Effect of tillage and crop residue management on the growth and yield of mustard in Dehradun

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Abstract

The present investigation "Effect of the tillage and crop residues management on the growth and yield of mustard in Dehradun district of Uttarakhand" was carried out. The field experiment was conducted during summer season, 2022 at the DBUU University, Dehradun, Uttarakhand. In this experiment the RBD method was used in which 10 treatments and 3 replications were performed and data interpretation was done to check out the effect of different treatments. As a result it was found out that T7 Neem manure is overall best to get the best output.

Based on the experiment and its result it can be concluded that for the Dehradun area and its climatic conditions application of neem manure can be suggested to get the best result.

Keywords: Neem manure, tillage, mulch, mustard

Introduction

Mustard (2 n=36) is also called as rai or Raya or Laha in different region of country. In a majority significant member of the collection is mustard, which has a majority of more than 70% of the area under species mustard, which is followed by tori, yellow coloured sarson, and brown coloured sarson. Mustard and sarson plants, on the other hand, are cultivated in both type first is sandy and second one heavy Botanical soils and grow under both well irrigated as well as rainfed situations. This type of crop is, mostly grown in quite marginal and sub-marginal productivity regions, it can be either combined or its intercropping can be done along wheat, barley, gramme, pea, sugarcane, lentil, and other crops. In other areas with advanced agriculture, it is mostly cultivated as a purely useful plant. Despite recent increases in planted area and the production and outcome as in yield of rapeseed and mustard, in the country's average productive yield (800 kg/ha) is considerably lower than in wealthier western countries. India, Canada, China, Pakistan, Japan, Poland, Bangladesh and Sweden are one of the world's leading producers of rapeseed and mustard. In terms of planted area, India ranks first with a 31.8% share of the world's total, and in case of production it ranks second only to Canada with about 16% share of the world total. The area of canola and mustard was 35.4 million hectares and produced 16.18 million tons per year. Most of the cultivation mainly done in the bigger Indian states such Uttar Pradesh, Rajasthan, Madhya Pradesh, Haryana, Punjab, Orissa, Assam, Bihar, Gujarat and West Bengal. Of all mustard and canola growing regions, Uttar Pradesh alone accounts for over 60% of India's total canola and mustard production. It is grown on about 340,000 hectares in Gujarat with annually yielding of up to 3.5 million tons. This is grown in Mehsana, Banakantha, Ahmedabad, Jamnagar, Sabarkantha, Rajkot, Kutch, Kedah.

Material and Method

The study was titled "Effect of tillage and crop residue management on the growth and yield of mustard (T-59 RK GOLD) in Foothills of Himalayan Zone," and it was completed during the winter (Rabi) season of 2022-2023 at Agricultural Department experimental field at the Dev Bhoomi Uttarakhand University Dehradun, Uttarakhand. This chapter includes description of the location, the soil, the history of the field, the weather throughout the cropping season, the materials utilized, and the methods used. In the Tarai area of Dehradun, Uttarakhand, the experiment was carried out on the mustard (T-59 RK GOLD) grown as a cereal crop during the Rabi season of 2022-2023 on the experimental field Dev Bhoomi Uttarakhand University, Naugaon, Dehradun.

It was located at a latitude of 29.51'43"N, a longitude of 78.39'56"E, and an elevation of 987 meters above mean sea level. Mustard (T-59 RK GOLD Varuna) was used in the experiment; it is recommended for both rain-fed and irrigated areas of Haryana, Punjab, Madhya Pradesh, Bihar, Rajasthan, Gujarat, Maharashtra, Uttarakhand, and Uttar Pradesh, with an average yield of 50 to 60 q/ha and an average plant height of 80 to 105 cm.

Take time to mature roughly in 125 days. Dehradun's climate, like that of other north Indian cities, was moderate with chilly winters, pleasant summers, wet monsoons, and a balmy spring due to its location at the foothills of the Himalayas (warm and temperate). Dehradun's climate is also influenced by height, becoming cooler as altitude rises. The majority of Uttarakhand is hilly; hence the district saw significant temperature changes as a result of the height differences. The following description of metrological data from the experimental period. Both the winter and summer seasons provide rain to Dehradun; however, the winter season brings less rain than the summer season. More than 1500 millimeters of rain fall on average each year in Dehradun. Rainfall was recorded during the trial period in the first few weeks with 7.1 mm and the last week with 57.4 mm, and minor amounts were also recorded in the intervening weeks with 0.0 mm and 0.1 mm minimum fall. In the summer, North India experiences scorching winds from the Loo that may reach temperatures of up to 23 °C for a few days. In the winter, upper elevations in Dehradun experience temperatures below freezing. The experiment's average max climate was 22 °C in the third week of November, while the experiment's average lowest temperature was 2 °C in the first week of January. Over the course of the experimental time, the temperature varies from 22 to 2 °C. The quantity of water vapor in the air in a specific location is referred to as humidity. Always exceeding 90% on average, the greatest maximum humidity was recorded during March 9–15 at 98.7%. December 16–22 saw an average

minimum humidity of 20.1%. The pH of the soil at the testing site was 6.34. The nature of the factors under research, as well as the practicality and efficacy of agricultural operation, were taken into consideration while designing the experiment was based on randomized block design (RBD) where three replications and a total of ten treatment combinations made up the randomized block design (RBD). Treatments are T₁ - Control, T₂ - Soil mulch 45%, T₃ - Wheat straw mulch 30%, T₄ - Secondary tillage/ planking, T₅ - Conservation tillage, T₆ -Neem manure, T₇ - FYM 60%, T₈ - FYM 60% + Secondary tillage, T₉ - Organic fertilizer + FYM, T₁₀ - Vermicompost 45%.

Result and Discussion

Plants height

At final harvest stage, maximum height was recorded under T₈ (68.4 cm) FYM + CONSERVATION TILLAGE followed by FYM T₇ (66.3 cm).

Number of siliqua per plants

At Harvest, T₁₀ had the maximum amount of siliqua/ plant (44), which was followed by T₆, T₄, T₉ and T₃. T₂ recorded the least.

Seed amount in every Siliqua

Different treatments influenced the no. of seed/siliqua as represented in the Table 1. Conservation tillage recorded the least number of seeds in a siliqua T₅, T₇ recorded the highest number of seeds per siliqua, which was followed by T₁₀, T₉, and T₆, T₈.

Branches number examined per plant

At the time of harvest, the maximum branches per plant was examined under T₁₀ (8.06) which was followed by T₆ T₉, T₈, T₇. T₁ recorded minimum number of branches per plant.

Table 1: Plant height (cm) at different stages of plant under the influence of different treatments

| S. No. | Treatments | Height | Branches | No. of siliqua/plant | No. of Seeds/siliqua |
|-----------------|----------------------------|--------|----------|----------------------|----------------------|
| T ₁ | Control | 51.5 | 4.3 | 29.3 | 6 |
| T ₂ | Soil mulch | 57.4 | 4 | 26.3 | 5.4 |
| T ₃ | Wheat straw mulch | 65.7 | 5.17 | 33 | 7.2 |
| T ₄ | Secondary tillage | 53.3 | 4.93 | 32.67 | 6 |
| T ₅ | Conservation Tillage | 58.0 | 6.67 | 30.67 | 5 |
| T ₆ | Neem manure | 59.6 | 8 | 39.3 | 8 |
| T ₇ | FYM | 66.3 | 6.4 | 33.3 | 8.2 |
| T ₈ | FYM + Conservation tillage | 68.4 | 6.3 | 39.6 | 7.6 |
| T ₉ | FYM + Mulch | 62.3 | 6.73 | 36.67 | 7.6 |
| T ₁₀ | Compost | 59.0 | 8.06 | 44 | 8 |
| S.Em± | | 5.489 | 0.93 | 2.29 | 1.16 |
| | CD(P=0.05) | 15.80 | 2.82 | 6.87 | 3.34 |

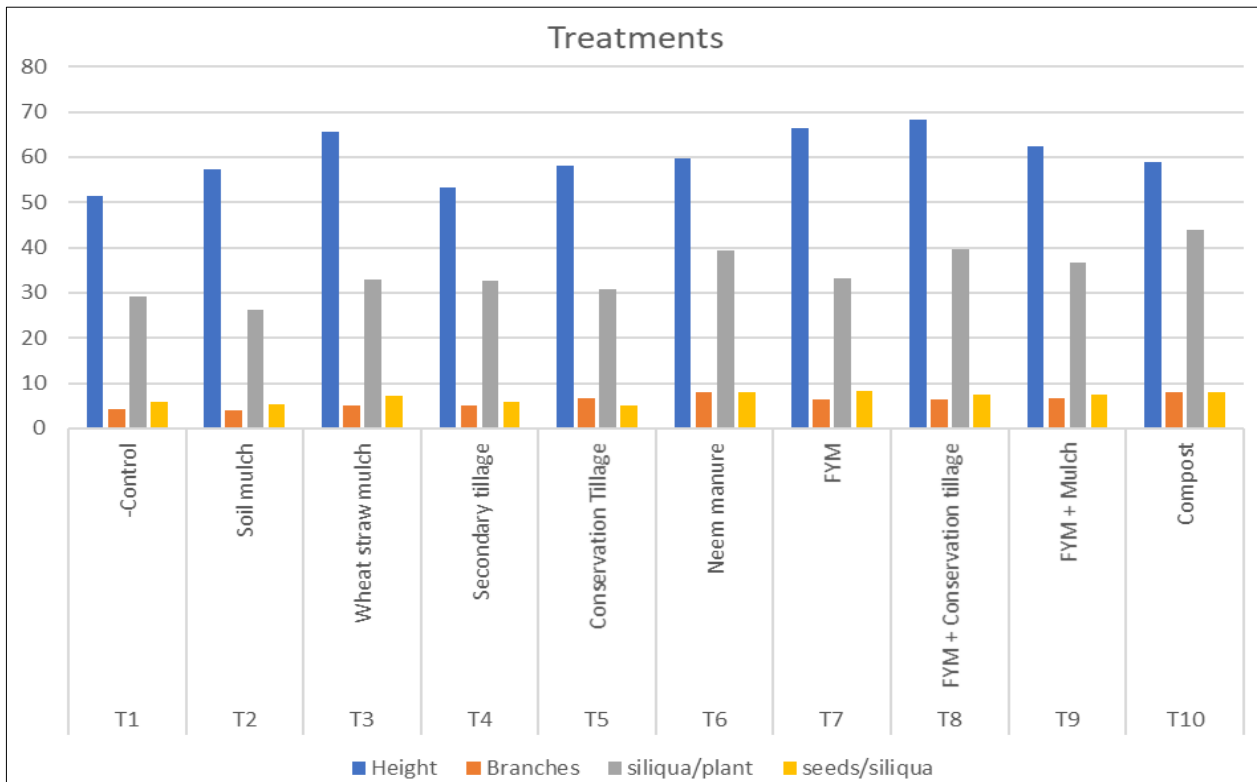


Fig 1: Plant height (cm) at different stages of plant under the influence of different treatments

Seed yield

Significant difference was noticed by the application of different treatment. Treatment T₆ neem manure though recorded significantly highest grain yield (543 kg/ha.), followed by T₇ FYM (468 kg/ha. Minimum yield recorded under T₁ (243 kg/ha).

Stover yield

From the different treatment application it is examined that, T₇ produced the higher straw yield (1827.33kg/ha) than other applied treatments while Control (T₁) recorded lowest straw yield (772 kg/ha).

Biological yield

This data was calculated on the basis of grains and straw mean data from which treatment, T₇ produced the highest biological yield (2067.3 kg/ha. Control T₁ was recorded with the lowest biological yield (1015.7 kg/ha).

Harvest index

On the basis of grain yield and total biological yield the harvesting index was calculated. Very minute differences were observed among various treatments from which treatment T₇ is found with the highest harvest index (29.9) while the lowest harvest index was registered under T₁ (22.6%).

Table 2: Effect of different treatments on the seed yield, harvesting index and stover yield of the crop

| Treatment | Seed yield (Kg/hac.) | Stover yield (Kg/hac.) | Biological yield (Kg/hac.) | Harvesting index (%) |
|---------------------------------------|----------------------|------------------------|----------------------------|----------------------|
| T ₁ - Control | 243 | 772.733 | 1015.7 | 23.94 |
| T ₂ - Soil mulch | 266.673 | 909.767 | 1,176.43 | 22.667 |
| T ₃ - Wheat straw mulch | 295 | 1,039.10 | 1,334.10 | 26 |
| T ₄ - Secondary tillage | 314.133 | 1,157.27 | 1,471.27 | 27.1 |
| T ₅ - Conservation tillage | 304.43 | 1,096.53 | 1,400.9 | 27.7 |
| T ₆ - Neem manure | 548.3 | 1,827.33 | 2,375.63 | 29.9 |
| T ₇ - FYM | 468.333 | 1,599.03 | 2067.3 | 29.2 |
| T ₈ - FYM + Tillage | 340.767 | 951.333 | 1,292 | 26.3 |
| T ₉ - FYM + Mulch | 327.28 | 1014.3 | 1,341.5 | 24.3 |
| T ₁₀ - Compost | 357.9 | 1,136.33 | 1,494.2 | 23.9 |
| S.Em± | 66.3 | 293.4 | 343.4 | 3.5 |
| C.D (P=0.05) | 190.9 | 844.9 | 988.9 | 10 |

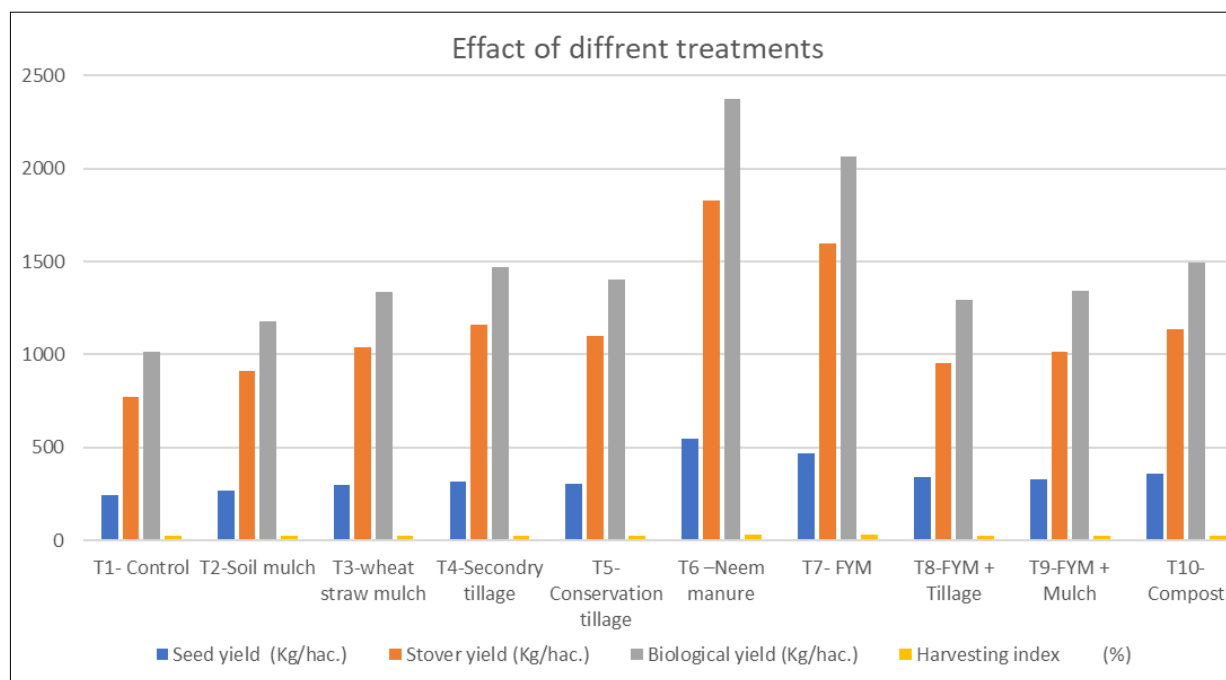


Fig 2: Effect of different treatments on the seed yield, harvesting index and stover yield of the crop

Conclusion

The findings of present investigation revealed that – The use of different treatment have diverse effect on plant growth, yield attributes and economic returns in rapeseed and mustard. Among different treatment, T₆ neem manure applied at 30 days intervals 2 times registered the maximum in most of the studied parameters like plant height (cm), seeds/siliqua, test weight (gm), seed yield (kg/ha), stover yield (kg/ha), B:C ratio. The treatment T₇ FYM observed good response in most of parameters to rest of the treatments, like number of leaves per-plant, number of siliqua per-plant. The treatment T₆ also recorded highest gross return 31,100 rs/ha due the higher yield of mustard seed obtained at applied combination of neem manure. The highest net return of 21650 rs/ha also recorded under T₆. T₁ (control) recorded least in every parameters of crop growth and yield.

Based on the overall performance of all the treatments throughout the investigation it was concluded that in all the treatments T₆ (neem manure) gives the best response under different climatic conditions of Dehradun region.

So application Neem manure can be recommended to get maximum yield and net return and should be recommended to the farmer for better results and returns.

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