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Research Journal of Agricultural Sciences  
An International Journal

P- ISSN: 0976-1675

E- ISSN: 2249-4538

Volume: 12

Issue: 03

Res Jr of Agril Sci (2021) 12: 745–748

# Effect of Different Levels of Solid Organic Manure with Combination of Liquid Organic Manures on Growth and Yield of Mustard at Dehradun

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Received: 18 Feb 2021 | Revised accepted: 30 Apr 2021 | Published online: 07 May 2021  
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## ABSTRACT

A field experiment was conducted during Rabi season of 2020-21 at research farm, Department of Agriculture Dev Bhoomi Group of Institutions, Dehradun, Uttarakhand. In order to investigate the effect of solid organic manures with combination of liquid organic manure on growth and yield of mustard crop. The layout of experimental field was laid randomized block design (RBD) with 8 treatments and 3 replications. Consisting of T<sub>1</sub> (Control), T<sub>2</sub> (Vermiwash @50%), T<sub>3</sub> (Cow urine @50%), T<sub>4</sub> (Vermicompost @100%), T<sub>5</sub> (FYM @100%), T<sub>6</sub> (Poultry Manure @ 100%), T<sub>7</sub> (FYM@50% + Cow urine @50%), T<sub>8</sub> (Vermicompost @50% + Vermiwash @50%). The results indicated that among all the treatments, T<sub>8</sub> (Vermicompost @50% + Vermiwash @50%), overall was found best for farmer point of view with respect to plant height (116.03), number of leaves per plant (52.96), Seed yield (1533.36 kg/ha), stover yield (1876.08 kg/ha), biological yield (3420.33 kg/ha). Based on present investigation, it can be concluded that the combination of both solid organic manure with liquid organic manure are applied that improved growth of mustard crop under present agro-climatic conditions.

**Key words:** Organic manures, Indian mustard, Vermiwash, Poultry manure, Cow urine

Mustard and rapeseed (*Brassica juncea* L Czern & Coss, rapa) is an important oilseed crop belonging to family cruciferous (Syn. brassicaceae). Rapeseed-mustard is the third most important edible oilseed crop in India after soybean and groundnut. Mustard is a cool season crop, which requires temperature range of 10-25 degree centigrade. Mustard is generally grown as rainfed condition and moderately tolerant to soil acidity, it required well drained soil having pH near to neutral [1]. It has low water requirement (240-400mm) which fits well under rain fed cropping system. India is the third largest producer of rapeseed-mustard [2] occupying 6.23 million hectares area with 9.34 million tonnes production, but the average yield of rapeseed-mustard in India is only 1499 kg/ha (Directorate of Economic and Statistics, Govt., of India 2018-19) due to the lack of optimum use of nutrients and improper management. Rapeseed-mustard are the major Rabi oilseed crops of India and stand next to groundnut in the oilseed economy. The contribution of rapeseed-mustard to the total oilseed production in India is 26.0 percent. Indian mustard (*Brassica juncea*) is predominantly cultivated in the states of Rajasthan (38.07%), Uttar Pradesh (12.08%),

Haryana (9.78%), Madhya Pradesh (12.49%), and West Bengal (9.87%). Domestic production of edible oils meets only 50% of the total requirements, while rest is imported [3]. Huge gap between the consumption and domestic production of edible oils can be filled up by increasing the area under oilseed crops like rapeseed and mustard, sunflower and soybean or increasing production per unit area.

## MATERIALS AND METHODS

The present investigation entitled “Effect of Different Levels of Solid Organic Manure with Combination of Liquid Organic Manures on Growth and Yield of Mustard at Dehradun” Valley was carried out during Rabi season of 2020 – 2021 in the research farm, Department of Agriculture Dev Bhoomi Group of Institutions, Dehradun, Uttarakhand. It is located in the north western region of Uttarakhand at an altitude of 450 m above mean sea level (MSL) and 3088 square kilometer in size. Geographically, the location of Dehradun is in between 29 58’ and 31 2’30” North latitude and 77 34’45” and 78 18’30” east longitudes.

The climate of Dehradun is humid subtropical. Summer temperatures can reach up to 44°C for a few days and a hot wind called Loo blows over North India. Winter temperatures are usually between 1 and 20°C and fog is quite common in winters like plains. Although the temperature in Dehradun can reach below freezing during severe cold snaps, this is not

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common. During the monsoon season, there is often heavy and protracted rainfall.

The soil of experimental site is classified as 'sandy loam' with characteristics as deep, well drained, coarse loamy cover over fragmental soils and of medium fertility. Total five soil samples were taken from upper (0-15 cm) layer of the soil and mixed properly from different sites of the field. After proper mixing of the soil, a representative sample was taken for its physiochemical process. A composite soil sample was prepared and analyzed separately for different physiochemical characteristics of the soil. The analysis revealed that the soil of the experimental site was Sandy loam in texture poor in organic matter, low in available nitrogen, medium in available phosphorus and Potassium contents with neutral in reaction and normal in electrical conductivity.

The experimental site having neutral pH and experiment was laid out in completely Randomized block design (RBD). The experiment was replicated thrice with 8 treatments viz., T<sub>1</sub> (Control), T<sub>2</sub> (Vermiwash @50%), T<sub>3</sub> (Cow urine @50%), T<sub>4</sub> (Vermicompost @100%), T<sub>5</sub> (FYM @100%), T<sub>6</sub> (Poultry Manure @ 100%), T<sub>7</sub> (FYM@50% +

Cow urine @50%), T<sub>8</sub> (Vermicompost @50% + Vermiwash @50%). All the solid organic manure were applied at the time of sowing (i.e., FYM-8t/ha, PM-4t/ha, vermicompost 5t/ha) and liquid organic manures were applied as foliar spray at 40 DAS. The spacing of mustard crop was 45×15 cm. Gross plot size was 9.2m (4 m×2.3m) and net plot size was 6 m (3 m×2 m). Total number of plots were 24.

## RESULTS AND DISCUSSION

### Growth attribute

*Plant height:* Observations on the plant height were recorded at 30, 45 and 60 days after sowing (DAS) and at harvest and the data were statistically analyzed. The mean values have been presented in (Table 1). At harvest stage, maximum height recorded under T<sub>8</sub> (116.03 cm) i.e. (Vermicompost @50% + Vermiwash @50%) followed by T<sub>7</sub> (109.16), T<sub>6</sub> (103.33cm), T<sub>2</sub> (94.23 cm), T<sub>5</sub> (94.56cm), T<sub>3</sub> (91.53cm), T<sub>4</sub> (85.06cm), and least height recorded on control plots i.e., T<sub>1</sub> (74.26cm) [4-5].

Table 1 Plant height (cm) at various stages of crop growth as influenced by different treatments

Treatments	Days After Sowing			At harvest
	30	45	60	
T <sub>1</sub> : Control	25.66	55.03	66.76	74.26
T <sub>2</sub> : FYM @ (100%)	27.53	61.01	85.13	94.23
T <sub>3</sub> : Vermiwash @ (100%)	27.16	56.04	84.03	91.63
T <sub>4</sub> : Cow urine @ (50%)	28.00	64.73	77.05	85.06
T <sub>5</sub> : Poultry manure @ (100%)	35.01	75.43	84.33	94.56
T <sub>6</sub> : Vermicompost @ (100%)	32.06	78.04	94.09	103.33
T <sub>7</sub> : FYM@ (50%) + Cow urine (50%)	36.43	85.08	104.16	109.16
T <sub>8</sub> : Vermicompost @ (50%) + Vermiwash @ (50%)	29.46	87.00	109.96	116.03
SEm±	2.63	1.54	2.48	2.93
CD (P = 0.05)	7.83	4.58	7.39	8.73

### Number of leaves per plant

The data on the number of leaves per plant at different stages of growth have been summarized and presented in (Table 2). Number of leaves per plant increased with advancement in crop age up to 60 days of sowing. Differences in number of leaves due to different treatments were

significant at all the stages of crop growth [6]. At 60 DAS, the maximum number of leaves per plant was obtained under T<sub>8</sub> (52.96) i.e. (Vermicompost @50% + Vermiwash @50%) followed by T<sub>5</sub> (51.04), T<sub>7</sub> (46.06), T<sub>6</sub> (43.26), T<sub>2</sub> (34.04), T<sub>3</sub> (33.66), T<sub>4</sub> (33.63), and least height recorded on control plots i.e., T<sub>1</sub> (25.43) [7].

Table 2 Number of leaves at various stages of crop growth as influenced by different treatments

Treatments	Days After Sowing		
	30	45	60
T <sub>1</sub> : Control	7.76	13.09	25.43
T <sub>2</sub> : FYM @ (100%)	9.08	14.63	34.02
T <sub>3</sub> : Vermiwash @ (100%)	8.01	17.26	33.66
T <sub>4</sub> : Cow urine @ (50%)	10.23	15.01	33.63
T <sub>5</sub> : Poultry manure @ (100%)	14.53	22.01	51.04
T <sub>6</sub> : Vermicompost @ (100%)	11.33	19.00	43.26
T <sub>7</sub> : FYM@ (50%) + Cow urine (50%)	14.76	22.36	46.06
T <sub>8</sub> : Vermicompost @ (50%) + Vermiwash @ (50%)	15.09	26.03	52.96
SEm±	0.71	0.84	1.83
CD (P = 0.05)	2.11	2.50	5.45

### Yield attribute

*Seed yield:* The grain yield differed significantly due to addition of different combinations of solid and liquid organic manures treatments [8]. The maximum seed yield were

recorded under Treatment T<sub>8</sub> (1533.36 kg/ha) i.e. (Vermicompost @50% + Vermiwash @50%) followed by T<sub>7</sub> (1433.15kg/ha), T<sub>5</sub> (1119.99kg/ha), T<sub>6</sub> (1048.13kg/ha), T<sub>2</sub> (906.39kg/ha), T<sub>3</sub> (829.54kg/ha), T<sub>4</sub> (804.54kg/ha), and least height recorded on control plots i.e., T<sub>1</sub> (650.62kg/ha) [9].

**Stover yield**

A close examination of data on straw yield from the (Table 3). Among all the treatments, the maximum stover yield were recorded under treatment T<sub>8</sub> (1876.08 kg/ha) i.e.

(Vermicompost @50% + Vermiwash @50%) followed by T<sub>7</sub> (1836.85kg/ha), T<sub>5</sub> (1430.68kg/ha), T<sub>6</sub> (1359.29kg/ha), T<sub>3</sub> (1165.45kg/ha), T<sub>2</sub> (1110.39kg/ha), T<sub>4</sub> (1091.49kg/ha), and least height recorded on control plots i.e., T<sub>1</sub> (935.74kg/ha).

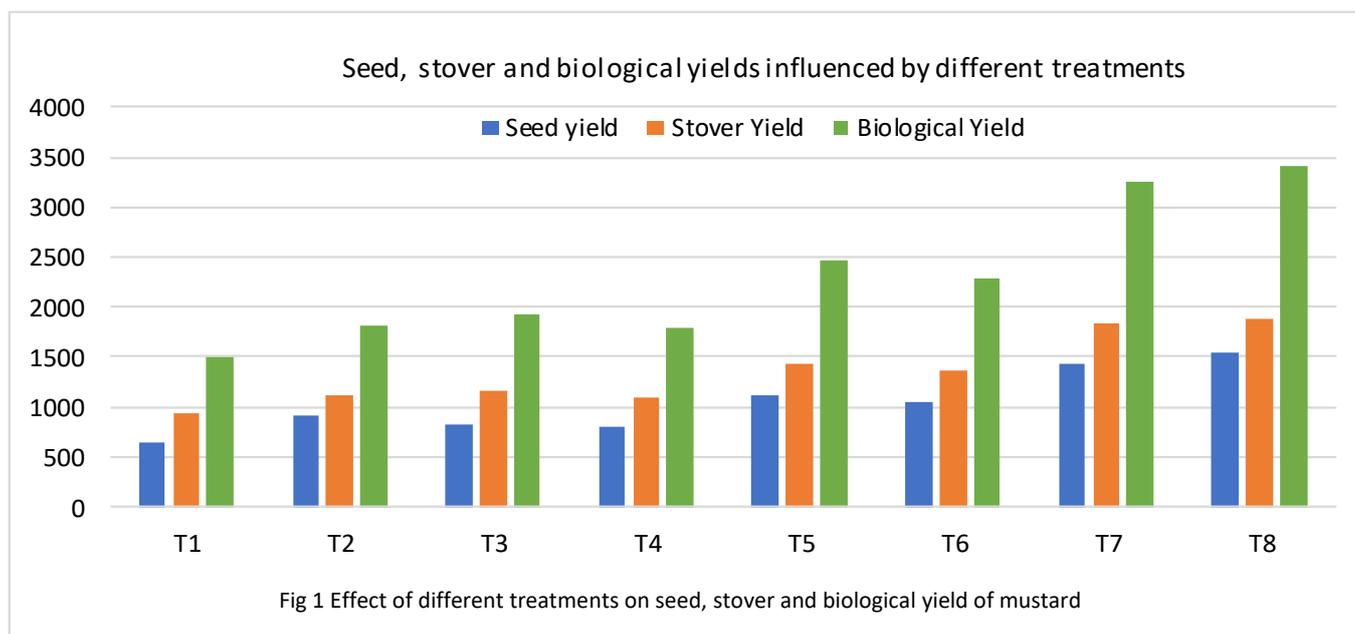


Fig 1 Effect of different treatments on seed, stover and biological yield of mustard

**Biological yield:** Data on Biological yield was calculated on the basis of grain and straw yield and the Mean data have been presented in (Table 3). Among all the treatments, the maximum biological yield were recorded under treatment T<sub>8</sub> (3420.33 kg/ha) i.e. (Vermicompost @50% + Vermiwash @50%) followed by T<sub>7</sub> (3252.86kg/ha), T<sub>5</sub> (2465.87kg/ha), T<sub>6</sub> (2280.69kg/ha), T<sub>3</sub> (1916.32kg/ha), T<sub>2</sub> (1809.45kg/ha), T<sub>4</sub> (1791.35kg/ha), and least height recorded on control plots i.e., T<sub>1</sub> (1496.87kg/ha) [10].

**Harvest index:** Data on the harvest index were gathered on the basis of grain yield and total biological yield and the mean data have been presented in (Table 3). The non-significant differences were observed among the various treatments for harvest index. However, treatment T<sub>2</sub> had the highest harvest index value (50.04%) followed by T<sub>6</sub> (46.18%), T<sub>5</sub> (45.21%), T<sub>4</sub> (45.06%), T<sub>8</sub> (44.69%), T<sub>7</sub> (43.91%), T<sub>1</sub>(43.79%). while the lowest harvest index was registered under T<sub>3</sub> (43.05%) [11].

Table 3 Seed yield (kg/ha), stover yield (kg/ha), biological yield (kg/ha) and HI (%) effected by different treatments

Treatments	Seed yield	Stover yield	Biological yield	H.I (%)
T <sub>1</sub> : Control	650.62	935.74	1496.87	43.79
T <sub>2</sub> : FYM @ (100%)	906.39	1110.39	1809.45	50.04
T <sub>3</sub> : Vermiwash @ (100%)	829.75	1165.45	1916.32	43.05
T <sub>4</sub> : Cow urine @ (50%)	804.54	1091.49	1791.35	45.06
T <sub>5</sub> : Poultry manure @ (100%)	1119.99	1430.68	2465.87	45.21
T <sub>6</sub> : Vermicompost @ (100%)	1048.13	1359.29	2280.69	46.18
T <sub>7</sub> : FYM@ (50%) + Cow urine (50%)	1433.15	1836.85	3252.86	43.91
T <sub>8</sub> : Vermicompost @ (50%) + Vermiwash @ (50%)	1533.36	1876.08	3420.33	44.69
SEm±	133.78	143.81	139.64	4.95
CD (P = 0.05)	398.66	428.55	416.12	14.75

## CONCLUSION

On the basis of field experiment conducted on Effect of Different Levels of Solid Organic Manure with Combination of Liquid Organic Manure on growth and yield of mustard concluded that treatment T<sub>8</sub> (Vermicompost @50% +

Vermiwash @50%) was found superior among the other treatments on growth and yield of mustard. Treatment T<sub>8</sub> the combination of both solid and liquid organic manures were obtaining higher seed yield 1533.36 kg/ha and stover yield 1876.08 kg/ha. As per the economics feasibility performance is concerned treatment T<sub>8</sub>.

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