

Comparative efficacy of different farmyard manure sources on growth and yield of castor (*Ricinus communis* L.)

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ABSTRACT

A field experiment was conducted at Castor-Mustard Research Station, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar in the North-Gujarat Agro-climatic region during *kharif* season of 2015-16. Results revealed that the plant height, 100 seed weight and oil content was recorded marginally higher with application of heap method FYM before one month of sowing and remains as pile for 15 days than incorporation into soil while length of main spike and seed yield of castor was registered higher under application of pit method FYM before one month of sowing and remains as pile for 15 days than incorporation into soil. Nutrient composition in FYM at the time of incorporation and soil fertility status after harvest of crop was also unaffected due to various treatments.

Key words: Farmyard manure, efficacy, castor, growth

Castor is an important non-edible oilseed crop of the arid and semi arid regions. It is the most useful and economically important oilseed crop having vast and varied industrial importance. Castor cake is considered to be excellent organic manure. At present, India is the World leader in castor production and export of castor oil, seed and some of its derivatives. Currently, the total castor production is 11.96 lakh tonnes obtained from 7.51 lakh ha with a productivity of 1593 kg/ha during 2018-19 in India. Gujarat is the largest castor growing state of India. Where, it's grown over an area of 5.21 lakh ha with the annual production of 9.44 lakh tonne with average productivity of about 1809 kg/ha and its shares

about 69.5% of the total area and 78.9% of the total castor production of the country (Anonymous, 2018-19). Integrated nutrient management holds a great promise in maintaining yield stability and soil fertility with providing favourable soil physical condition. Farmyard manure (FYM) incorporation into soil as a source of nutrients and organic matter is an integral part of conventional crop production. Farmers produce the FYM by putting materials such as cattle dung, cattle shed wastes, kitchen wastes, ash, and house sweepings into the pit and heap on a daily basis. Hence, not much information was available on the heap and pit methods of FYM with its proper time of incorporation into the field and their influence on crop productivity. Therefore, present field experiment was planned to study the efficacy of heap and pit methods FYM on performance of castor under North Gujarat Agro-climatic region.

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MATERIALS AND METHODS

A field experiment was carried out during 2015-16 at Castor-Mustard Research Station, S. D. Agricultural University, Sardarkrushinagar, Gujarat to study the effect of heap and pit method FYM on performance of castor (*Ricinus communis* L.) in loamy sand soil of North Gujarat. The ten treatments consisted i.e. T₁: Application of heap method FYM before one month of sowing and remains as pile for 15 days than incorporation into soil, T₂: Application of pit method FYM before one month of sowing and remains as pile for 15 days than incorporation into soil, T₃: Application of heap method FYM before one month of sowing and incorporation into soil, T₄: Application of pit method FYM before one month of sowing and incorporation into soil, T₅: Application of heap method FYM before 15 days of sowing and remains as pile for 15 days than incorporation into soil, T₆: Application of pit method FYM before 15 days of sowing and remains as pile for 15 days than incorporation into soil, T₇: Application of heap method FYM before 15 days of sowing and incorporation into soil, T₈: Application of pit method FYM before 15 days of sowing and incorporation into soil, T₉: Application and incorporation of heap method FYM at the time of sowing and T₁₀: Application and incorporation of pit method FYM at the time of sowing. The experiment was laid out in randomized block design with three replications. Castor hybrid 'GCH 7' was sown in row of 150 cm apart with keeping plant to plant distance 120 cm. From the recommended dose of fertilizer (RDF) (180-37.5-20 kg N-P-S/ha), the full dose of phosphorus and sulphur with 1/4th part of nitrogen were supplied through urea, diammonium phosphate and elemental sulphur to all the plots as basal and remaining 3/4th dose of nitrogen applied in 3 equal splits at 30-35, 60-65 and 90-95 DAS. Weed management was done manually as well as

interculturing by tractor operated cultivator. Other crop management practices were followed as per recommendations under irrigation situation. All the data were statistically analysed to draw a valid conclusion and logical interference.

RESULTS AND DISCUSSIONS

Growth and yield attributes:

An examination of the data presented in Table 1 indicated that the different sources of FYM & time of application and incorporation in the soil were failed to showed significant variation on growth (plant height and number of nodes/plant), yield attributing characters (effective branches/plant, primary spike length, number of capsules on primary spike, 100 seed weight) of castor. Similar results were also reported by Saha *et al.*, 2008 and Basak *et al.*, 2012.

Seed yield and oil content:

Seed yield of castor was produced numerically higher under the application of pit method FYM before one month of sowing and remains as pile for 15 days than incorporation into soil (T₂), which was closely followed by application of heap method FYM before one month of sowing and remains as pile for 15 days than incorporation into soil (T₁) but it could not at the level of significance to make a significant variation among the treatments (Table 1). However, the minimum seed yield (2781 kg/ha) was obtained with the application of heap method FYM before 15 days of sowing and incorporation into soil (T₇). Oil content (51.45%) and oil yield (1742 kg/ha) of castor were observed marginally higher with the application of heap method FYM before one month of sowing and remains as pile for 15 days than incorporation into soil (T₁), respectively. These results are in agreement with the findings of Reddy *et al.*, (2010) and Basak *et al.*, (2012).

Nutrient content in FYM and Soil fertility status:

Nutrient content in FYM at the time of incorporation had unaffected due to different sources (heap and pit methods) of FYM. Soil analysis viz. bulk density, organic carbon, available phosphorus, potassium and sulphur after harvest of the crop indicated that no significant variation was observed due to different sources of FYM as well as their time of application and incorporation in the field (Table 2). These results are in close conformity with the findings of Pandit *et al.*, (2020).

Thus, it can be concluded that the yield of castor and soil nutrient status after harvest of crop did not influenced significantly due to various sources of farmyard manure and its time of incorporation into the soil in North Gujarat Agro-climatic region.

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Table 1 Effect of heap and pit methods FYM application on growth and yield of castor

Treatments	Plant height (cm)	Nodes/plant (no.)	Effective branches/plant	Length of main Spike (cm)	No. of capsules on main Spike	100-seed weight (g)	Seed yield (kg/ha)	Oil content (%)	Oil yield (kg/ha)
T ₁	84.27	19.47	32.00	75.20	100.87	35.10	3387	51.45	1742
T ₂	81.40	18.20	33.33	79.00	100.27	33.55	3415	48.96	1675
T ₃	79.67	18.93	29.67	78.60	107.73	34.11	3342	48.55	1624
T ₄	75.87	19.47	29.40	76.27	99.07	31.95	3074	47.18	1449
T ₅	77.80	18.60	28.33	75.53	91.47	34.36	3349	47.99	1606
T ₆	73.40	18.27	31.67	72.47	95.20	33.38	2946	47.96	1410
T ₇	78.27	19.00	34.33	76.67	96.93	33.55	2781	50.27	1395
T ₈	76.13	18.13	34.87	74.33	95.87	34.14	2975	50.85	1512
T ₉	81.67	19.40	33.67	72.53	104.00	32.81	3266	49.30	1609
T ₁₀	80.33	19.73	34.33	75.80	104.13	32.89	2955	50.65	1497
SEm±	3.62	0.39	1.80	2.49	4.94	0.68	216.32	1.28	107.60
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS
CV (%)	7.97	3.58	9.70	5.72	8.61	3.53	11.90	4.50	12.01

Table 1 Effect of heap and pit methods FYM application on growth and yield of castor

Treatments	Bulk density (g/cc)	Nutrient content in FYM at incorporation			Nutrient content in soil after harvest of castor			
		N (%)	P (%)	K (%)	Organic carbon (%)	Available P ₂ O ₅ (kg/ha)	Available K ₂ O (kg/ha)	Available S (ppm)
T ₁	1.59	0.48	0.21	0.46	0.32	50.00	262.00	12.33
T ₂	1.65	0.45	0.21	0.47	0.33	49.00	266.00	12.67
T ₃	1.63	0.50	0.21	0.46	0.33	50.00	264.67	11.67
T ₄	1.63	0.48	0.22	0.48	0.33	48.67	262.33	13.00
T ₅	1.62	0.47	0.21	0.46	0.33	48.67	262.67	11.67
T ₆	1.58	0.46	0.21	0.47	0.32	50.67	263.33	12.67
T ₇	1.64	0.51	0.21	0.46	0.33	49.67	264.00	12.33
T ₈	1.60	0.48	0.22	0.48	0.33	49.67	267.33	11.33
T ₉	1.59	0.50	0.21	0.46	0.33	49.67	263.00	12.67
T ₁₀	1.62	0.48	0.22	0.48	0.33	50.33	260.00	11.67
SEm±	0.03	0.02	0.01	0.01	0.01	1.14	6.34	0.38
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS
CV (%)	3.09	5.65	4.94	5.28	4.05	3.39	4.17	5.40