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Response of turmeric varieties to conventional versus organic production practices under Bundelkhand Region of Uttar Pradesh

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ABSTRACT

The five improved turmeric varieties *viz.,*IISR Pratibha (V_1), Rajendra Sonia (V_2), IISR Pragathi (V_3), MotiHaldi (V_4) and Megha Turmeric (V_5) were examined to study the comparative effect between conventional production practices (P1: NPK @ 150:80:60 kg ha^{-1}+ FYM @ 5 t ha^{-1}) and organic production practices (P2: FYM @ 15.625 t ha^{-1} + vermicompost @ 6.2 t ha^{-1}) for the growth and yield characters. The highest plant height (149.95 cm and 141.92 cm), leaf length (91.70 cm and 88.24 cm) and maximum number of leaves (13.96 and 13.82) was recorded with variety Rajendra Sonia (T_2) under conventional and organic production practice, respectively followed by variety IISR Pratibha (T_1) however, both the varieties were statistically at par with each other for plant height and leaf length under both the production practices. All the turmeric varieties under both the production practices had non-significant effect on number of tillers per plant. The highest rhizome yield (312.00 and 321.90 q ha^{-1}) and straw yield (21.85 and 20.60 q ha^{-1}) was recorded with variety Rajendra Sonia (T_2) under both conventional and organic production practices however, it was statistically at par with variety MotiHaldi (T_4) for straw yield under organic production practice.

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KEY WORDS : Conventional, Organic, Production practices, Turmeric

Introduction

Turmeric (*Curcuma longa* L.) is an ancient, most valuable and sacred spice of India. Turmeric is a rhizomatous crop, requires heavy application of nutrients for boosting the yield. Being a long duration crop, it extracts a lot of nutrients from the soil. After the enforcement of the green revolution in India, the use of chemical fertilizers for agriculture uses is increasing day by day. But in the present era, there is a need for judicious and balanced use of chemical fertilizers. The injudicious use of these fertilizers creates the problem of the ecological balance of the environment as well as soil health.The continuous use of an imbalanced dose of chemical fertilizers affects soil health as well as responsible for soil and environmental pollution. The majority of turmeric growers were attracted towards organic farming as it will help to improve soil structure and fertility. The use of organic manures helps to improve soil structure and fertility. The judicious use of organic manures helps to increase the porosity of the soil, improves water holding capacity and drainage which will be helpful for the better rhizome development in the turmeric[4]. Organic manure plays an important role in maintaining the physical and chemical properties of the soil. It also helps in improving soil microflora and accelerates their activities in the soil. The different biological process in the soil plays a vital role in the mineralization of organic carbon and recycling of nutrients[5]. Chemical fertilizers contain higher amounts of nutrients and are sources of readily available form of nutrients, but, the fertilizers use efficiency is often low due to the inherent soil characters, losses and low uptake.Generally conventional practice implies integrated use of inorganic fertilizers and organic manures with normal agronomic practices, which is dominating the farmer's field traditionally. As we know, organic cultivation is eco-friendly and less harmful for our health, the consumer demand for organically grown turmeric is markedly increasing all over the world for export market[8]. Very scanty information is available on this aspect for turmeric crop under Bundelkhand condition. Hence, the present study was carried out with a view to have a comparative study of the effect of organic nutrients management practice and conventional nutrient management practices on crop performance with respect to crop growth, yield and quality.

TABLE -1: Response of turmeric varieties to organic versus conventional production practices for growth of turmeric

Treatments		Plant Height (cm)		Number of tillers per plant		Number of leaves per plant	
		P1	P2	P1	P2	P1	P2
V_1	IISR Pratibha	148.64	140.32	4.93	4.42	12.63	12.10
V_2	Rajendra Sonia	149.95	141.92	5.76	4.99	13.96	13.82
V_3	IISR Pragathi	127.86	111.84	4.52	4.47	11.99	11.17
V_4	MotiHaldi	113.29	109.27	4.26	4.14	9.46	8.37
V_5	Megha Turmeric	112.57	108.38	4.64	4.62	8.41	7.51
SEm±		**1.22**	**1.04**	**0.36**	**0.27**	**0.35**	**0.39**
C.D. at 5% level		**4.03**	**3.44**	**NS**	**NS**	**1.16**	**1.28**

P1: Conventional practice (NPK @ 150:80:60 kg ha^{-1}+ FYM @ 5 t ha^{-1}

P2: Organic practice (FYM @ 15.625 t ha^{-1} + vermicompost @ 6.2 t ha^{-1}

Materials and Methods

The field experiment was conducted at the Institute of Agricultural Sciences, Bundelkhand University, Jhansi (U.P.). The soil was of sandy loam type having pH of 5.74, organic carbon content 0.85% and available Nitrogen, Phosphorus and Potassium, were 170.85 kg/ha, 18.29 kg/ha and 120.45 kg/ha respectively. The experiment was carried out in randomized block design with three replications, where organic and inorganic plots had similar soil properties. The experiment constituted five varieties *viz.,* IISR Pratibha (V_1), Rajendra Sonia (V_2), IISR Pragathi (V_3), MotiHaldi (V_4) and Megha Turmeric (V_5)under conventional (P1: NPK @ 150:80:60 kg ha^{-1}+ FYM @ 5 t ha^{-1}) and organic (P2: Organic practice (FYM @ 15.625 t ha^{-1} + vermicompost @ 6.2 t ha^{-1}). The treatments under organic cultivation received well decomposed FYM and vermicompost as source of nutrient two weeks before sowing. Quantity of 50% nutrients from FYM and 50% nutrients from vermicompost was calculated on equivalent nitrogen content basis, which was 0.48% in FYM and 1.21% in vermicompost. In P1, the recommended dosage of N: P: K @ 150:80:60 $kgha^{-1}$ was given in form of inorganic fertilizers. Entire quantity of P, K and half quantity of N was applied as basal dose while, rest half quantity of N was applied in two equal splits doses at 30 and 60 days after germination. The crop was harvested as per maturity commenced. The observation on crop growth parameters and yield were recorded and STATISTICALLY analyzed.

Results and Discussion

Application of organic manure and inorganic fertilizers is indispensable as their conjunctive use stimulates the mineralization of nitrogen and diminishes the fixation of phosphorus and potassium in the acidic soils and thus might have enhanced vegetative growth[1]. The highest plant height (149.95 cm and 141.92 cm), leaf length (91.70 cm and 88.24 cm) and maximum number of leaves (13.96 and 13.82) were recorded with variety Rajendra Sonia (V_2) under conventional and organic production practice, respectively followed by variety IISR Pratibha (V_1) however, both the varieties were statistically at par with each other for plant height and leaf length under both the production practices. All the turmeric varieties under both the production practices had non-significant effect on number of tillers per plant. The lowest values of plant height, number of leaf and leaf length were observed with variety Megha Turmeric

TABLE -2: Response of turmeric varieties to organic versus conventional production practices for growth and yield of turmeric

Treatments		Length of leaf (cm)		Rhizome yield (q ha^{-1})		Straw yield (q ha^{-1})	
		P1	P2	P1	P2	P1	P2
V_1	IISR Pratibha	90.23	87.33	264.21	275.60	17.17	16.81
V_2	Rajendra Sonia	91.70	88.24	312.10	321.90	21.85	20.60
V_3	IISR Pragathi	82.28	75.55	191.42	198.10	12.06	11.89
V_4	MotiHaldi	80.96	71.08	278.02	290.40	18.63	18.30
V_5	Megha Turmeric	75.55	68.53	201.03	211.40	12.26	12.05
SEm±	0.85	1.28	6.01	7.11	0.84	0.81	
C.D. at 5% level		**2.82**	**4.24**	**19.90**	**23.53**	**2.77**	**2.69**

P1: Conventional practice (NPK @ 150:80:60 kg ha^{-1}+ FYM @ 5 t ha^{-1}

P2: Organic practice (FYM @ 15.625 t ha^{-1} + vermicompost @ 6.2 t ha^{-1}

(V_5) however it was statistically at par with variety MotiHaldi (V_4) for all these growth parameters under both the production practices. The variation in growth parameters of different varieties in same production practice may be due to its genetic characteristics as well as suitability of climatic situation of growing area reported earlier[1]. The values of growth parameters for all the turmeric verities were higher under conventional production practice as compared to organic production practice. This might be due to the fact that inorganic fertilizers kept the nutrients in readily available form for uptake and translocation by the turmeric plants compared to organic manures that required relatively more time for making the nutrients in readily available form for absorption by the plants[12]. The higher nutrient content due to mineral fertilization in soil accelerated the vegetative growth of turmeric plants in terms of plant height, leaf number, leaf length and tiller number. Similar findings were reported earlier[1,2,13-15] in turmeric crop. On the other hand, lower values for growth parameters were recorded under organic production practice as compared to conventional production practice may be due to lower content of major nutrients in FYM and vermicompost and its slow release to plant in initial stage reported[12].

Yield is the ultimate and most important objective for which crops are grown. The data recorded on yield parameters as affected by different turmeric varieties and production practices. The highest rhizome yield (312.00 and 321.90 q ha^{-1}) and straw yield (21.85 and 20.60 q ha^{-1}) were recorded with variety Rajendra Sonia (V_2) under both conventional and organic production practices however, it was statistically at par with variety MotiHaldi (V_4) for straw yield under organic production practice.

The highest value for yield was recorded with organic production practice as compared to conventional production practice. This might be due to the positive effect of incorporated FYM and vermicompost which have positive influence on soil structure, better water holding capacity which in turn helps better nutrient availability to become favorable condition for good rhizome growth which increased the number, size and weight of turmeric rhizome[12]. Vermicompost is formed from the bio-oxidation and stabilization process of organic material which involves the joint action of earthworms and microorganisms and does not involve a thermophilic stage. It is a peat like material with excellent structure, porosity, aeration, drainage, moisture holding capacity and considerably superior than compost

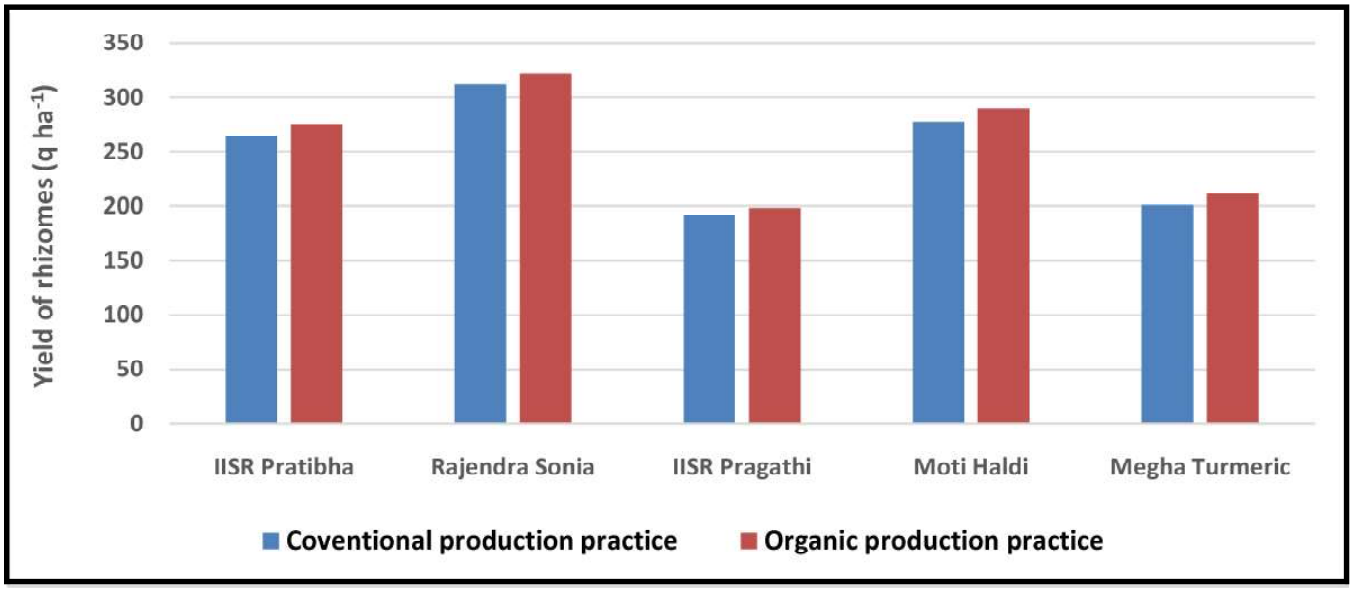

Fig. 1: Response of turmeric varieties of organic versus conventional production practices for yield of turmeric

with regard to physical and chemical characteristics. Vermicompost have a vast surface area, providing strong absorbability and retention of nutrients reported[10]. The organic manure applied in the form of vermicompost in combination with FYM might have improved the soil's physical and chemical properties and leading to the adequate supply of macro and micro nutrients to the plants which might have promoted the maximum reproductive growth while comparatively lower values for yield parameters under conventional production practice due to limited availability of micro nutrients to the crop. Similar findings were reported[1,9,11] in turmeric and in tomato[3,7].

Conclusions

It is concluded that the turmeric variety Rajendra Sonia is most suitable for growing in red soils of Bundelkhand region under both conventional and organic production practice. The second suitable variety is MotiHaldi for both the production practices. The organic production practice has better results in respect of yield as compared to conventional production practice. There is no doubt that organic nutrient management has undeniable effect on soil, plant and ecology however it was more expensive as compared to conventional production practice.

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