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Influence of sheep manure, vermicompost and *Azotobactor* sp. on growth and yield of ajowan (*Trachyspermum ammi* Sprague)

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Abstract

A field experiment was conducted at Ajmer (Rajasthan) to study the influence of sheep manure, vermicompost and bio-fertilizer on growth and yield of ajowan (*Trachyspermum ammi*). The experiment consisted of 16 treatments comprising of three levels of sheep manure (5.0, 7.5, and 10.0 t ha^{-1}), three levels of vermicompost (2, 3, and 4 t ha^{-1}) and recommended fertilizer dose (90 kg N, 40 kg P_2O_5 and 30 kg K_2O ha^{-1}) with and without *Azotobactor* sp. and control. The results revealed that application of *Azotobactor* sp. alone and with sheep manure, vermicompost and recommended fertilizer dose resulted in higher growth parameters, yield attributes and yield of ajowan over control. Increasing levels of sheep manure (5.0, 7.5 and 10.0 t ha^{-1}) and vermicompost (2, 3, and 4 t ha^{-1}) exhibited higher yield over their respective lower doses. The highest seed (16.35 q ha^{-1}), stover (33.14 q ha^{-1}) and biological yield (49.49 q ha^{-1}) of ajowan was obtained with application of sheep manure @ t 10 ha^{-1} with *Azotobactor* sp.

Keywords: ajowan, bio-fertilizer, *Trachyspermum ammi*, yield.

The nutrient requirement of ajowan (*Trachyspermum ammi* Sprague) is generally met by the application of chemical fertilizers. Information on use of organic sources of nutrition are lacking in ajowan. The production of ajowan can be increased considerably through integrated nutrient management. Singh (1998) stressed the need to enhance the contribution of biofertilizers to meet about one third of plant nutrient needs. Hence, studies were conducted to identify suitable and feasible sources of organic nutrition for increasing the productivity of ajowan.

The experiment was carried out at National Research Centre on Seed Spices, Ajmer (Rajasthan) (74° 35' 39" E to 74° 36' 01" longitude and 26° 22' 12" to 26° 22' 31" N latitude, 460.17 m above MSL) during *rabi* 2005-06 and 2006-07. The experiment consisted of 16 treatments comprising of three levels of sheep manure (5.0, 7.5, and 10.0 t ha^{-1}), three levels of vermicompost (2, 3, and 4 t ha^{-1}), recommended fertilizer dose (90 kg N, 40 kg P_2O_5 and 30 kg K_2O ha^{-1}) with and without bio-fertilizer (*Azotobactor* sp.) and absolute control. The experiment was laid in a randomized block design with three

replications. The organic sources of nutrients namely, sheep manure (1.25% N and 0.5% P_2O_5) and vermicompost (2.5% N and 1.1% P_2O_5) were applied before sowing. The seeds were treated with biofertilizer (*Azotobactor* sp.) and dried in shade and sown. The soil of the experimental site was sandy loam with pH 8.9 and 0.21% organic carbon and 76.0, 33.4, and 234.1 kg ha^{-1} available N, P_2O_5 and K_2O, respectively. Observations were recorded on plant height, branches $plant^{-1}$, yield attributing characters namely, umbels $plant^{-1}$, umbellets $umbel^{-1}$, seeds $umbellet^{-1}$ and seed yield.

Application of sheep manure and vermicompost at all levels and recommended fertilizers with and without bio-fertilizer resulted in significantly higher plant height, yield attributing characters namely, umbels $plant^{-1}$, umbellets $umbel^{-1}$, seeds $umbellet^{-1}$ and yield over absolute control.

Application of increasing levels of sheep manure and vermicompost increased plant height, yield attributing characters and yield over their lower levels (Table 1). Moreover, application of sheep manure at all three levels showed better performance on yield attributing characters as compared to three levels of vermicompost with and without biofertilizer. The amount of nutrients supplied by sheep manure to the crop is comparatively higher as compared to vermicompost, which resulted in higher yield attributes and yield of ajowan. The application of biofertilizer responded positively with all the sources of organic nutrition as well as with recommended fertilizer in respect of growth, yield attributing characters and seed yield of ajowan.

However, application of sheep manure @ 10 t ha^{-1} with biofertilizer exhibited highest growth, yield attributing characters, seed yield (16.35 q ha^{-1}) stover yield (33.14 q ha^{-1}) and biological yield (49.49 q ha^{-1}) which was followed by application of vermicompost @ 4 t ha^{-1} with biofertilizer. This shows the additive effect of organic sources of nutrition and biofertilizer on yield and yield attributing characters of ajowan.

Application of sheep manure, vermicompost and biofertilizer is responsible for the improvement of physical, chemical and biological properties of the soil which in turn enhance availability and uptake of macro and micronutrients which affect various physical and biochemical processes in plants resulting better yield attributing characters and yield of the crop. Hence, the overall effect of organic source of nutrient in improving yield attributes leads to better seed, stover and biological yield of ajowan at higher vermicompost and sheep manure levels with biofertilizer.

Prabhu *et al*. (2000) reported significantly higher yield of coriander with 25% recommended dose of fertilizer + FYM @ 10 t ha^{-1} + *Azospirillum* sp. with VAM over other combination of nutrient sources. Similar results were obtained by Mehta *et al*. (2007) in case of fennel and dill. The results obtained are in close conformity with the findings of Kumar *et al*. (2004) and Kothari *et al*. (1998) in case of coriander. It is concluded that application of sheep manure @ 10 t ha^{-1} along with *Azotobactor* sp. significantly enhanced the growth attributes and seed yield of ajowan.

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Table 1. Influence of sheep manure, vermicompost and biofertilizer on growth and yield of ajowan (pooled data of two years)

Treatment	Plant height (cm)		Umbels plant^{-1}	Umbellets umbel^{-1}	No.of seeds umbellet^{-1}	Seed yield (q ha^{-1})	Stover yield (q ha^{-1})	Biological yield (q ha^{-1})
	120 DAS	Maturity						
Absolute control	71.93	76.85	165.00	9.50	11.80	10.45	21.15	31.60
Recommended fertilizer (RF)	87.53	90.92	176.00	11.25	12.75	14.16	27.40	41.56
Biofertilizer (*Azotobactor* sp.)	80.10	85.81	170.00	10.50	12.30	12.25	23.60	35.85
RF with Biofertilizer	90.40	93.69	179.00	12.48	13.10	14.85	29.00	43.85
Sheep manure @ 5 t ha^{-1}	85.41	89.98	173.00	10.75	12.15	12.60	25.15	37.75
Sheep manure @ 7.5 t ha^{-1}	87.55	91.33	176.00	11.00	12.20	13.40	27.15	40.55
Sheep manure @ 10 t ha^{-1}	91.52	96.26	180.00	12.50	13.40	15.25	31.18	46.43
Sheep manure @ 5 t ha^{-1} + Biofertilizer	89.90	95.33	174.00	11.80	12.50	13.40	27.00	40.40
Sheep manure @ 7.5 t ha^{-1} + Biofertilizer	96.22	101.33	182.00	12.25	12.65	14.25	29.15	43.40
Sheep manure @ 10 t ha^{-1} + Biofertilizer	97.58	103.37	195.00	13.50	14.15	16.35	33.14	49.49
Vermicompost @ 2 t ha^{-1}	85.28	84.72	172.00	10.55	12.10	11.90	23.25	35.15
Vermicompost @ 3 t ha^{-1}	87.38	88.90	175.00	11.25	12.25	13.15	26.50	39.55
Vermicompost @ 4 t ha^{-1}	89.42	94.33	177.00	12.45	13.30	14.95	29.40	44.35
Vermicompost @ 2 t ha^{-1} + Biofertilizer	85.28	93.42	180.00	11.70	12.40	12.80	26.90	39.70
Vermicompost @ 3 t ha^{-1} + Biofertilizer	87.38	97.75	183.00	12.00	12.60	14.25	28.15	42.20
Vermicompost @ 4 t ha^{-1} + Biofertilizer	89.42	99.87	193.00	13.25	14.00	15.20	30.40	45.60
SEm±	0.64	1.00	1.18	0.21	0.22	0.22	0.51	1.53
CD (P= 0.05)	1.31	2.04	2.41	0.42	0.46	0.45	1.05	3.13

Recommended fertilizer=80 kg N, 20 kg P_2O_5 and 20 kg K_2O ha^{-1}

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