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Influence of varieties, sheep manure and nitrogen on yield of cumin (*Cuminum cyminum* L.)

M Patidar, Balak Ram, M P Singh & Gopal Singh

Central Arid Zone Research Institute
Jodhpur – 342 003, Rajasthan, India
E-mail: mpatidar@cazri.raj.nic.in

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Abstract

The performance of three varieties (Local, RZ-19 and RZ-209) of cumin (*Cuminum cyminum*) and the effect of sheep manure (0 and 5 t ha^{-1}) and nitrogen levels (20 and 40 kg N ha^{-1}) on the yield of the crop was evaluated at Jodhpur (Rajasthan). Growth and yield attributes, seed yield and net returns were significantly higher in improved varieties compared to local variety. Maximum seed yield (580 kg ha^{-1}) and net returns (Rs 32,400 ha^{-1}) were obtained with RZ-19. Application of sheep manure increased seed yield by 5.2% over no manure; however, net returns were not increased. Nitrogen @ 40 kg ha^{-1} significantly increased seed yield by 26 kg ha^{-1} and net returns by Rs 1850 ha^{-1} with benefit-cost ratio of 2.19 over 15 kg N ha^{-1}.

Key words: cumin, *Cuminum cyminum*, nitrogen, sheep manure, yield.

Cultivation of high yielding varieties along with judicious use of organic manures and fertilizers especially, nitrogen, can play a major role in realization of higher yield of cumin (*Cuminum cyminum* L.). The information available on these aspects on cumin in the arid zone of Rajasthan is meagre. Hence, a study was undertaken to assess the relative performance of cumin varieties, and to evaluate the effect of sheep manure and nitrogen fertilization on cumin production in the agro-climatic conditions of western Rajasthan.

The study was conducted during *rabi* season of 2001 and 2002 at Salodi watershed area (26° 24′ 35"-26° 26′ 03" N, 72° 49′ 28"-72° 52′ 15" E) of Jodhpur (Rajasthan). The treatments comprised of three varieties (Local, RZ-19, RZ-209), two levels of sheep manure (0, and 5 t ha^{-1}) and two nitrogen levels (20 and 40 kg N ha^{-1}), and laid out in a strip plot design with three replications. The plants of var. RZ-19 are erect, with bell shaped, dark brown seeds, which mature in 120-125 days with yield potential of 10.5 q ha^{-1}. Var. RZ-209 was selected from local cultivar of cumin of Jalore District. The seeds are bell shaped and dark brown in colour. It is comparatively less susceptible to blight and powdery mildew with yield potential of 10-12 q ha^{-1}. The soil of the experimental field was loamy sand having 0.11% organic carbon, 14 kg ha^{-1} available phosphorus and 129 kg ha^{-1} available potassium with pH 8.71 and $CaCO_3$ 1.44%. The crop was sown on 20 November 2001 and 23 November 2002 with a seed rate of 12 kg ha^{-1}. A uniform dose of 20 kg ha^{-1} P_2O_5 was applied at the time of sowing. The first irrigation was given just after sowing and the second, third, fourth

and fifth irrigations were applied at 7, 25, 45 and 65 days after sowing (DAS), respectively. Nitrogen was applied as per treatments in two splits, 50% at sowing and 50% at the time of third irrigation. Data on growth and yield attributes and yield were recorded and analysed statistically.

Plant growth, yield attributes and yield of cumin were significantly influenced by varieties (Table1). The improved varieties, RZ-19 and RZ-209 performed better and produced significantly higher seed yield than the local check. Maximum seed yield (580 kg ha^{-1}) was recorded in var. RZ-19 which was on par with var. RZ-209 (569 kg ha^{-1}). The increase in seed yield was 15.5% and 13.3% by var. RZ-19 and RZ-209, respectively, over local check (502 kg ha^{-1}). Straw yield was significantly higher in improved varieties over local check. The performance of RZ-19 and RZ-209 was on par in respect of growth, yield and yield attributes. The improvement in yield was attributed to better plant growth and yield components as a result of varietal characteristics. Net return and benefit : cost ratio also increased under improved varieties as compared to local variety. Maximum net return (Rs 32,400 ha^{-1}) with benefit : cost ratio of 2.31 was obtained with RZ-19, which was followed by RZ-209 (Table 2).

Application of sheep manure @ 5 t ha^{-1} significantly increased plant height, number of branches plant^{-1}, number of umbels plant^{-1} and seeds umbel^{-1} resulting in higher seed yield of cumin over no manure application (Tables 1 and 2). The increase in seed yield was 5.2% over no manure application. However, the difference in straw yield was non-significant. The benefit : cost ratio was not improved with application of sheep manure because of high cost of manure. However, application of sheep manure is advantageous because of its residual effect and is locally available. The improvement in growth and yield of cumin due to application of sheep manure was ascribed to its favourable effect on physical and chemical properties of the soil. Building up of organic matter in sandy soil of hot arid zone is difficult but use of easily decomposable organic waste and organic manure increases organic matter content of soil, improves physico-chemical properties and water holding capacity of sandy soils (Gupta *et al.* 1983).

Variations in growth, yield attributes and yield of cumin were significant with nitrogen levels (Tables 1 and 2). Plant height, number of branches plant^{-1}, number of umbels plant^{-1} and seeds umbel^{-1} increased with 40 kg N ha^{-1} over 20 kg N ha^{-1}. However, test

Table 1. Effect of varieties, sheep manure and nitrogen levels on growth and yield attributes of cumin

Treatment	Plant height (cm)			Branches plant^{-1}			Umbels plant^{-1}			Seeds umbel^{-1}			1000 seed weight (g)		
	2001	2002	Mean	2001	2002	Mean	2001	2002	Mean	2001	2002	Mean	2001	2002	Mean
Variety															
Local	29.2	30.2	29.7	3.9	3.9	3.9	11.7	11.7	11.7	25.5	25.6	25.2	4.2	4.3	4.3
RZ-19	32.5	34.0	33.2	4.2	4.2	4.2	15.2	15.0	15.1	28.2	27.7	28.0	4.3	4.3	4.3
RZ-209	33.3	32.4	32.9	4.0	4.1	4.0	14.0	15.6	14.8	28.4	27.8	27.6	4.3	4.2	4.3
CD (P=0.05)	2.1	2.0	1.5	0.3	0.3	0.2	1.5	1.4	1.1	2.7	2.1	1.5	NS	NS	NS
Sheep manure															
0 t ha^{-1}	30.8	29.2	30.0	3.3	3.9	3.9	12.6	13.0	12.8	25.8	26.5	26.2	4.3	4.2	4.3
5 t ha^{-1}	32.5	35.1	33.8	4.1	4.2	4.2	14.7	15.1	14.9	27.9	27.4	27.7	4.3	4.4	4.4
CD (P=0.05)	1.7	1.6	1.2	0.2	0.2	0.2	1.2	1.6	0.9	1.7	NS	1.2	NS	NS	NS
Nitrogen															
20 kg ha^{-1}	30.6	30.6	30.6	3.9	4.0	4.0	12.9	13.3	13.1	26.1	25.8	26.5	4.3	4.2	4.3
40 kg ha^{-1}	32.7	33.8	33.2	4.1	4.1	4.1	14.4	14.9	14.7	27.6	27.4	27.3	4.3	4.3	4.3
CD (P=0.05)	1.7	1.6	1.2	0.2	NS	0.2	1.2	1.6	0.9	NS	1.6	1.2	NS	NS	NS

Table 2. Effect of varieties, sheep manure and nitrogen levels on yield and economics of cumin

Treatment	Grain yield (kg ha^{-1})			Straw yield (kg ha^{-1})			Gross returns (Rs ha^{-1})			Net returns (Rs ha^{-1})			B:C ratio
	2001	2002	Mean	2001	2002	Mean	2001	2002	Mean	2001	2002	Mean	Mean
Variety													
Local	528	475	502	652	615	634	42,240	38,080	40,160	28,990	24,830	26,910	2.03
RZ-19	590	569	580	708	682	695	47,200	45,600	46,400	33,200	31,600	32,400	2.31
RZ-209	580	558	569	706	662	687	46,400	44,600	45,500	32,400	30,640	31,520	2.25
CD (P=0.05)	39	24	23	52	46	37	-	-	-	-	-	-	-
Sheep manure													
0 t ha^{-1}	549	523	536	676	644	660	43,920	41,840	42,880	31,170	29,090	30,130	2.36
5 t ha^{-1}	583	545	564	701	667	684	46,640	43,600	45,120	31,390	28,350	29,870	1.96
CD (P=0.05)	32	20	19	NS	NS	NS	-	-	-	-	-	-	-
Nitrogen													
20 kg ha^{-1}	548	525	537	670	642	656	43,840	42,080	42,960	29,965	28,205	29,085	2.10
40 kg ha^{-1}	584	543	563	714	662	688	46,720	43,360	45,040	32,595	29,235	30,915	2.19
CD (P=0.05)	32	NS	19	42	NS	30	-	-	-	-	-	-	-

B:C=benefit : cost

weight was unaffected by nitrogen levels. Seed yield was significantly higher with 40 kg N ha^{-1} accounting an increase of 4.8% over 20 kg N ha^{-1}. Straw yield also significantly increased with the application of 40 kg N ha^{-1} over 20 kg N ha^{-1}. The economic benefit increased by Rs.1830 ha^{-1} with B:C ratio of 2.19 over 20 kg N ha^{-1} with B:C ratio of 2.10. The higher seed and straw yield of cumin were due to better plant growth and improvement in yield attributes as a result of nitrogen application. The results are in close conformity with the findings of Bhati (1990) and Gora *et al.* (1996).

The study affirms the potential role of improved genotypes, use of sheep manure and nitrogen fertilizer in increasing productivity of cumin in the arid zone of Rajasthan. Use of improved varieties of cumin, RZ-19 or RZ-209 with application of 5 t ha^{-1} sheep manure and 40 kg N ha^{-1} maximized production of cumin and economic returns (Rs 33,025 ha^{-1}).

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