Journal of Spices and Aromatic Crops
Vol. 13 (1) : 52–54 (2004)

Indian Society for Spices

Effect of NPK fertilizers on growth, oil yield and quality of French basil (*Ocimum basilicum* L.)

K Singh, P P Singh, S U Beg, D Kumar & D D Patra

Division of Soil Science and Water Technology
Central Institute of Medicinal and Aromatic Plants
P. O. CIMAP, Lucknow – 226 015, India
E-mail: kambods@yahoo.co.in

Received 27 May 2003; Revised 03 June 2004; Accepted 07 June 2004

Abstract

A field trial was conducted at Lucknow (Uttar Pradesh), to study the effect of different levels of NPK on growth, oil yield and quality of methyl chavicol rich cultivar of French basil (*Ocimum basilicum*). Five levels of N, P_2O_5 and K_2O namely, control (no fertilizer), 37.5, 20.0 and 20.0 kg ha^{-1}, 56.25, 30.00 and 30.00 kg ha^{-1}, 75.0, 40.0 and 40.0 kg ha^{-1} and 93.5, 50.0 and 50.0 kg ha^{-1} were evaluated. The results indicated that application of N, P_2O_5 and K_2O @ 75.0, 40.0 and 40.0 kg ha^{-1} increased plant height, fresh herbage, dry matter and oil yield significantly over control. The oil content in fresh herbage and its quality were not influenced by fertilizer application.

Key words: fertilizer, French basil, methyl chavicol, *Ocimum basilicum*, quality, yield.

Several cultivars of different chemotypes of basil (*Ocimum basilicum* L.) like methyl chavicol / methyl cinnamate / eugenol / geraniol and linalool types have been reported (Sobati & Pushpangadan 1982). Basil being a foliage rich crop, responds well to application of NPK. In spite of high domestic and international demand, the crop has not received its due importance in evolving appropriate agro-technologies for its cultivation to enhance productivity. Though the nutritional requirement of many chemotypes have been evaluated (Gulati *et al.* 1978; Dey & Choudhuri 1984; Balyan *et al.* 1987; Balyan & Sobati 1990), no work has been done so far on methyl chavicol rich clone, which is one of the most important chemotypes of basil. The present trial was conducted to work out the effect of graded levels of NPK on yield and quality of methyl chavicol rich cultivar of basil in the sub-tropical climate of Central Uttar Pradesh.

The trial was conducted during *kharif* season of 1999 and 2000 at Lucknow (Uttar Pradesh) (26° 5′N, 80° 5′E and 120 m MSL). The soil of experimental field was sandy loam in texture (*Ustifluvent*) with pH 7.7, organic carbon 0.3%, available N 135 kg ha^{-1}, P_2O_5 12.8 kg ha^{-1} and K_2O 156 kg ha^{-1}. The treatments consisted of five combinations of N, P_2O_5 and K_2O namely, T_1 : control (no fertilizer), T_2: 37.5, 20.0 and 20.0 kg ha^{-1}, T_3: 56.25, 30.00 and 30.00 kg ha^{-1}, T_4: 75.0, 40.0 and 40.0 kg ha^{-1} and T_5 : 93.5, 50.0 and 50.0 kg ha^{-1}, in a randomized block design with four replications. Thirty five day-old healthy seedlings were planted

at a spacing of 45 cm x 30 cm in a net plot size of 4.5 m x 3.6m. Half dose of N (urea) and full dose of P_2O_5 (single super phosphate) and K_2O (muriate of potash) were applied at the time of planting and the remaining dose of N was applied 25 days after planting. Other agronomic practices were done as and when required. Growth parameters like plant height and fresh herb yield were recorded at the time of harvest. Oil was extracted by hydrodistillation of fresh herb and the quality of oil like methyl chavicol, linalool and eugenol were analysed by gas liquid chromatography using 1 m x 3 mm stainless steel column packed with 10% FFAP on 80/100 chromosorb WAW. Nitrogen was used as a carrier gas @ 30 ml minute^{-1}. Oven temperature was programmed from 110^0 C to 220^0 C @ 5^0 C min^{-1}. Injector and detector temperatures were maintained at 240^0 C and 250^0 C, respectively.

Application of N:P_2O_5:K_2O @ 75, 40 and 40 kgha^{-1} increased plant height significantly over control (no fertilizer) (Table 1). Similar results were also reported in *O. sanctum* (Dey & Choudhuri 1984). Application of different levels of fertilizers increased the fresh herb yield during both the years. The fresh herb yield increased by 15% to 91% and 11% to 96% with application of different combinations of N:P_2O_5:K_2O during the first and second year, respectively. Application of N:P_2O_5:K_2O @ 75, 40 and 40 kg ha^{-1} increased the herb yield significantly over control and other treatments (Table 2). A positive role of fertilizer application in other chemotypes of basil have been reported by Gulati *et al.* (1978), Balyan *et al.* (1987) and Balyan & Sobti (1990).

A similar trend was also observed on dry matter yield by application of different levels of N:P_2O_5:K_2O. Application of N:P_2O_5:K_2O @ 75, 40 and 40 kg ha^{-1} increased dry matter yield significantly over control and other treatments (Table 1).

The effect of different levels of N:P_2O_5:K_2O on oil yield was also similar to that of fresh herb yield (Table 3). The oil yield increased significantly up to application of N:P_2O_5:K_2O @ 75, 40 and 40 kg ha^{-1}. Similar results were

Table 1. Effect of NPK fertilizers on plant height and dry matter accumulation in methyl chavicol rich cultivar of *Ocimum basilicum*

Treatment	Plant height (cm)		Dry matter yield (q ha^{-1})		
(N, P_2O_5 and K_2O level) (kg ha^{-1})	1999	2000	1999	2000	Mean
T_1 (no fertilizer)	67.33	70.00	17.05	16.79	16.92
T_2 37.5:20.0:20.0	71.00	73.20	23.06	23.42	23.24
T_3 56.25:30.00:30.00	75.00	74.00	27.65	26.98	27.32
T_4 75.0:40.0:40.0	76.78	75.00	32.50	32.71	32.61
T_5 93.5:50.0:50.0	76.66	75.00	28.27	29.57	28.92
SEm±	1.50	1.52	0.74	0.89	0.82
CD (P=0.05)	4.41	4.47	2.40	2.63	2.52

Table 2. Effect of NPK fertilizers on herb and oil yield of methyl chavicol rich cultivar of *Ocimum basilicum*

Treatment	Herb yield (q ha^{-1})			Oil yield (kg ha^{-1})		
(N, P_2O_5 and K_2O level) (kg ha^{-1})	1999	2000	Mean	1999	2000	Mean
T_1 (no fertilizer)	77.50	76.30	76.90	62.01	61.59	61.80
T_2 37.5:20.0:20.0	105.04	106.95	106.00	78.78	79.35	79.07
T_3 56.25:30.00:30.00	126.25	123.20	124.73	90.89	88.93	89.91
T_4 75.0:40.0:40.0	148.41	149.35	148.88	103.89	104.35	104.12
T_5 93.5:50.0:50.0	129.10	135.00	132.05	90.39	93.03	91.71
SEm±	3.36	4.09	3.73	2.86	3.30	3.08
CD (P=0.05)	11.11	12.03	11.57	8.75	11.21	9.98

Table 3. Effect of NPK fertilizers on essential oil quality of *Ocimum basilicum*

Treatment	Linalool (%)		Methyl chavicol (%)		Eugenol (%)	
(N, P_2O_5 and K_2O level) (kg ha^{-1})	1999	2000	1999	2000	1999	2000
T_1 (no fertilizer)	19.82	19.41	74.03	74.20	2.60	2.35
T_2 37.5:20.0:20.0	19.58	19.58	74.44	73.25	3.52	3.95
T_3 56.25:30.00:30.00	19.58	19.80	75.05	75.29	2.49	3.43
T_4 75.0:40.0:40.0	20.33	20.35	74.33	74.29	2.23	2.79
T_5 93.5:50.0:50.0	20.02	19.87	74.84	74.79	2.30	2.33

also reported by Dey & Choudhuri (1984) and Balyan & Sobti (1990) in *O. sanctum* and *O. gratissimum*, respectively. A positive role of NPK fertilizers on oil yield of other cultivars of basil have been reported by Balyan *et al.* (1987) and Balyan & Sobti (1990). In other essential oil crops, increase in dry herbage produces higher oil yield (Patra *et al.* 1987).

Oil quality was not influenced due to application of different levels of N:P_2O_5:K_2O (Table 3). Similar results were also reported by Gulati *et al.* (1978), Pareek *et al.* (1982) and Maheshwari (1995).

Thus it may be concluded that application of N:P_2O_5:K_2O @ 75:40:40 kg ha^{-1} is optimum for getting maximum oil yield of methyl chavicol rich cultivar of basil under sub tropical climate of Central Uttar Pradesh.

Acknowledgement

The authors are thankful to the Director, Central Institute of Medicinal and Aromatic Plants, Lucknow, for providing necessary facilities and encouragement.

References

Balyan S S, Pal S, Sharma S N, Singh S N & Sobti S N 1987 Effect of spacing, nitrogen and phosphorus on growth and yield of two *Ocimum* species. Indian Perfumer 31 : 89–96.

Balyan S S & Sobti S N 1990 Effect of nitrogen, phosphorus and potassium on dry matter accumulation and nutrient uptake pattern in *Ocimum gratissimum* L. var. *clocimum*. Indian Perfumer 34 : 225–231.

Dey B B & Choudhari M A 1984 Effect of application of N, P and K on growth and yield of essential oil and eugenol in *Ocimum sanctum*. Pafai J. 6 : 20–24.

Gulati B C, Duhan S P S & Garg S N 1978 Effect of nitrogen on the yield of herb, oil and quality of essential oil of *Ocimum basilicum* L. (methyl cinnamate type). Indian Perfumer 22 : 53–54.

Maheshwari M L 1995 Quality and chemistry of essential oil. In: Chadha K L & Gupta R (Eds.) Advances in Horticulture Vol. 11 Medicinal and Aromatic Plants (pp. 145–197). Malhotra Publishing House, New Delhi.

Pareek S K, Maheshwari M L & Gupta R 1982 Oil content and its composition at different stages of growth in *Ocimum sanctum* L. Indian Perfumer 26 : 86–89.

Patra N K, Srivastava H K, Srivastava R K& Naqvi A A 1987 Association of oil content with floral characteristics of *Rosa damascene*. Indian J. Agric. Sci. 57 : 938–940.

Sobti S N & Pushpangadan P 1982 Studies in the genus *Ocimum*: Cytogenetics, breeding and production of new strains of economic importance. In: Atal C K and Kapur B M (Eds.) Cultivation and Utilization of Aromatic Plants (pp. 457–572). Council of Scientific and Industrial Research, New Delhi.