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EFFECT OF VARYING LEVELS OF NITROGEN AND PHOSPHORUS ON GROWTH AND SEED YIELD OF CORIANDER (*CORIANDRUM SATIVUM*)

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Abstract

A field experiment was conducted during *rabi* season at Panjabrao Krishi Vidyapeeth, Akola (Maharashtra), India. The experiment comprising sixteen treatments of different nitrogen and phosphorus levels was laid in factorial randomized block design (FRBD) with three replications. The maximum plant height, number of branches per plant, days for first flowering, days for 50% flowering, flesh and dry biomass weight, days required for harvesting, number of umbels per plant, seed yield, germination percent of primary and secondary umbels were recorded with 60 kg nitrogen and 30 kg phosphorus followed by 30 kg nitrogen and 45 kg phosphorus as compared to control without application of fertilizers. Higher dose 30 kg nitrogen and 45 kg P_2O_5 per hectare of both the fertilizers had no effect in increasing the seed yield.

Key words : Coriander, nitrogen, phosphorus, growth parameters, plant height, fresh and dry biomass.

Introduction

Coriander (*Coriandrum sativum* L.) belonging to family Apiaceae. The seeds has a fragrant odour and the taste is due to essential oil made up of hydrocarbons and oxygenated compounds. The major oxygenated compounds is corianderol (45-70%), which possess carminative, digestive, stimulant, stomachic properties (Rahman *et al*., 1990). It is widely cultivated in USSR, Hungary, Poland, Rumania, guatemala, Mexico and USA. In India, it is grown as commercial crop in Madhya Pradesh, Maharashtra, Andhra Pradesh, Tamil Nadu and Rajasthan both for seed and green foliage. The growth and seed yield are largely influenced by the nutrient fertilely status of the soil apart from genetic potential of the variety. Altering the soil nutrients and fertility status by providing balanced and adequate dose of major nutrients like nitrogen, phosphorus and potassium as per the crop requirement is one of the easiest way to boost up the productivity of coriander. The interception in the supply of major nutrients in early stages of crop growth and development result into lower yield. By applying heavier doses of nutrients and due to unfavourable environmental conditions results in adverse growth and productivity of medicinal and aromatic plants. Therefore, the study on effect of nitrogen and phosphorus levels on growth and yield of coriander was conducted with a view to find out optimum level of nitrogen and phosphorus for coriander.

Materials and Methods

The experiment was conducted on sandy loam soil having pH 7-7.5 at Research Farm of Panjabrao Deshmukh Krishi Vidyapeeth, Akola (Maharashtra), India. Coriander seeds variety RCR-41 was sown with spacing of 30 × 30 cm in a plot of 2.70 × 2.20 m size. The soil of the experimental field was sandy loam having low organic matter (0.68%) available nitrogen (135.60 kg ha^{-1}) and phosphorus (38.85 kg/ha). The experiment with sixteen treatments comprising four levels of nitrogen *viz* 30 kg ha^{-1} (N_1) (P_3) including control treatments without both nitrogen and phosphorus keeping nitrogen as optimum dose. Nitrogen was given in form of urea, phosphorus was given in form of single superphosphate and potash in the form of MOP was applied in all the treatments including control. Other crop husbandry was followed as per recommendations. Growth and yield parameters were recorded on ten randomly selected plants, which were tagged from each plot and the observations were recorded the different growth parameters. The average of different growth parameters such as plant height, number of branches, fresh and dry bio mass and seed yield and yield plot wise was subjected to statistical analysis prescribed by Panse and Sukhatme (1985).

Results and Discussion

Effect of nitrogen levels on growth parameters

Data presented in table 1 clearly indicates that application of varying levels of nitrogen significantly influenced plant growth parameters at different growth stages. The highest plant height (103.98 cm), number of branches per plant (18.66), fresh and dry biomass per plant (44.11 g and 20.68 g, respectively) at all growth stages were recorded in the treatment receiving application of 60 kg nitrogen/ha (N_2) and was statically at par with that of 30 kg nitrogen/ha (N_1). There was no response of high dose of nitrogen towards growth parameters and yield characters. This might be due to properly of nitrogen to enhance the vegetative growth

Table 1 : Effect of varying levels of nitrogen and phosphorus on growth parameters of coriander.

Treatment	Plant height (cm.)	Number of branches per plant	Fresh biomass (g)	Dry biomass (g)
Nitrogen levels				
N_0 = Control	96.9	17.81	39.17	18.01
N_1 = 30 kg/ha	103.07	18.41	41.59	19.53
N_2 = 60 kg/ha	103.98	18.66	44.11	20.86
N_3 = 90 kg/ha	99.56	18.50	42.32	19.27
S.Em±	0.58	0.12	0.28	0.36
CD (P = 0.05)	1.69	0.35	0.24	1.06
Phosphorus levels				
P_0 = Control	97.91	17.65	39.67	16.39
P_1 = 15 kg./ha	100.86	18.28	41.22	18.93
P_2 = 30 kg./ha	102.86	18.76	43.62	20.70
P_3 = 45 kg./ha	101.87	18.42	42.68	19.64
S.Em±	0.58	0.12	0.28	0.36
CD (P=0.05)	1.69	0.35	0.84	1.06

Table 2 : Effect of varying levels of nitrogen and phosphorus on yield attributes and yield of coriander.

Treatments	Days to first flowering	Days to 50% flowering	Number of umbels per plant	Test wt. 100 seeds	Germination of primary umbels	Germination of secondary umbels	Seed yield (kg/ha)
Nitrogen levels							
N_0	21.41	49.27	6.57	1.06	80.66	82.08	305.19
N_1	22.35	49.70	7.05	1.21	85.83	84.33	309.16
N_2	23.74	52.26	7.71	1.33	92.58	86.26	336.21
N_3	21.94	50.07	7.54	1.32	86.66	84.62	335.89
S.Em. ±	0.17	0.33	0.06	0.01	0.02	0.03	4.60
CD (P = 0.05)	0.49	0.99	0.19	0.05	0.06	0.09	13.28
Phosphorus level							
P_0	21.49	49.16	6.93	1.11	84.66	82.08	309.60
P_1	22.24	49.98	7.18	1.19	85.83	83.91	316.83
P_2	23.13	51.63	7.46	1.36	87.08	85.10	333.01
P_3	22.57	50.53	7.29	1.27	88.16	86.20	326.40
S.Em±	0.17	0.33	0.06	0.01	0.02	0.03	4.60
CD (P=0.05)	0.49	0.99	0.19	0.05	0.0	0.09	13.28

and capacity of plant to utilize more amount of nitrogen. These findings are supported by Singh *et al.* (1996). The lowest values of these parameters were recorded infer control without nitrogen and phosphorus. This may be due to sever nutrient deficiency for the resources, which made the crop in efficient to makeup moisture and nutrients. Consequently, plant height, number of branches per plant, fresh and dry biomass accumulation were adversely affected. These results were confirmed with those reported by Bhaskar (1996) and Rao *et al*. (1983).

Effect of phosphorus levels on growth parameters

Application of varying levels of phosphorus significantly influenced plant growth parameters at different stages (table 1). The higher plant height (102.86 cm), number of branches per plant (18.76), fresh and dry biomass weight (43.62 and 20.70) were recorded with application of 45 kg phosphorus/ha (P_3), which was found to be at par with 30 kg phosphorus/ha (P_2). The lowest values of these parameters were recorded under control treatment as 45 kg. P_2O_5/ha recorded lower height, less branches and biomass. The maximum parameters of growth may be due to favorable agro climate conditions during the crop growth period, which might have resulted due to better availability of moisture and nutrients which resulted in luxurious growth due to better availability of phosphorus. These results were supported by Das *et al*. (1991) in coriander.

Effect of nitrogen levels on yield attributes and yield

The highest yield attributes like days required for first flowering (21.94 days), 50% flowering (43.27%), number of umbels/plant (7.710, per cent germination of primary and secondary umbels (92.58 and 88.16), test seed weight (1.33 g) and seed yield (336.21g) were recorded with the application of 60 kg nitrogen (N_2), which was found to be at per with 30 kg nitrogen/ha (N_1) and lower values were recorded under control treatments (No). All the yield and yield attributes were comparatively low even though the nitrogen dose (N_3) was inn eased. Application of nitrogen affect physiological and bio-chemical process in plant, which thoroughly enhanced 50% flowering in plants. Thus, on one hand profuse branching might have led to formation of maximum number of flowers, while on the other inversed availability on nitrogen to these developing characters seems to have resulted in greater retention of flowers leading to development of beetle fruits (umbels per plant) maintaining high soil fertility, which ultimately exhibited higher yield attributes and yield. Similar findings were also reported by Kaswan *et al*. (1995) in fenugreek.

Effect of phosphorus levels on yield attributes and yield

As evident from table 2, yield and yield attributes as well as seed yield were significantly influenced by the application of different phosphorus level, such as the minimum days for first flowering (21.41 days) and 50% flowering (51.63%), highest umbels/plant (7.71), highest test seed weight (1.33) and maximum seed yield (336.21 gm) was obtained due to application of 30 kg P_2O_5/ha(P_2). Thus, treatment was at par with that of the treatment receiving 45 kg P/ha (P_3). In higher dose of P and control plants yield and yield attributing factors were at lower level.

Profuse branching might have lead to formation of maximum number of flowers due to increased availability of nutrients and photosynthetic. These developing structures seem to have resulted in greater retention of flowers and which developed in to fertile umbels. Similar findings were also reported by Kumar *et al*. (2002) in coriander and Azizi (2000) in anse.

Thus, it can be conducted that 60 kg nitrogen per hectare and 45 kg phosphorus per hectare is optimum for greater foliage and maximum seed yield.

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