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Effect of Different Form of Phosphorous Nutrition on Growth and Yield of Cauliflower (*Brassica Olaracea* Var. *Botrytis* L.)

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Abstract

A field experiment was conducted at Naggar Farm of I.A.R.I., Regional Station Katrain, (Kullu Valley) H.P. during 2005-06 and 2006-07 with cauliflower var. Pusa Snowball K^{-1}. The experiment was laid out laid out in a randomized block design with 3 replications. There were ten treatments comprising of different sources of phosphorous. These were T^{-1} 100% phosphorous (Single Super Phosphate), T-2 100% Phosphorous (Rock Phosphate), T-3 50% phosphorous (Rock Phosphate) + Psolubiliser + Vascular Arbuscular Mycorrhizal (VAM), T-4 VAM, T-5 P solubiliser, T-6 100% Phosphorous (Rock Phosphate) + 15 t/ha Farm Yard Mannure, T-7 Liming + 50% phosphorous(Single Super Phosphate), T-8 15 t/ha Pine needle compost, T-9 15 t/ha Rice straw compost and T-10 control. The maximum curd yield were recorded with 50% P (R.P.) + P solubiliser + VAM (415.30 q/ha) followed by liming + 50% P (SSP 387.22 q/ha) and maximum growth were recorded with 50% P (R.P.) + P solubiliser + VAM 1339.73 cm^2) followed by 100% P (R.P.) + 15t/ha FYM (1097.57 cm^2).

Highlights

The highiest yield as curd weight was obtained in treatment ,50% P(R.P.) + P Solubiliser + VAM which gave 40.10% higher yield than control.

Keywords: cauliflower, FYM, rock phosphate, single super phosphate, VAM

Cauliflower (*Brassica oleracea* var. *botryis* L.) is one of the most important vegetable crop of India. It is a heavy feeder nad responds to the nutrient application for good growth and quality produce.Food is the most basic and primary need of life. It is natural therefore, that the greatest emphasis has to be laid on increasing its production both from the point of view of quantity and quality. To produce sufficient food not only for the maintenance of our increasing population but also for improving the quality of life is challenge to agricultural scientists.

Assured phosphorous supply is the pre-requisite for its proper growth and development. Beneficial effect of phosphorous on cauliflower has been reported by many research workers (Nurtika, 1979; Jamwal *et al*., 1995 and Roosre, 1997). The different group in relation to growth period in cauliflower under Indian condition has been classified by Swarup and Chatterjee (1971). This study has been undertaken on the Group IV, a very important

group of cauliflower. Since very little information is available on phosphorous application for this group particularly in the hill soils, therefore, the investigation was carried out to study the effect of phosphorous on cauliflower. Cauliflower is the most popular vegetable among Cole crops. It is fifth most important vegetable crops of the country primarily grown in winter season. It is cultivated for its shortened flower parts, which are used as a vegetable in curries and soups, and for pickling. Cauliflower contains a good amount of vitamin B and a fair amount of protein in comparison to leafy vegetables. It is grown over an area of 2.55 lakh ha with a production of 46.91 lakh tones, contributing 4.35 and 5.36 % of the total area and production (Anonymous, 1999). It has small, thick stem, bearing whorl of leaves and branched tap root system.

The edible part, i.e. curd is generally white in colour and may be enclosed by inner leaves its exposure. India is next to China in area and production, contributing 13.38 % to the total world production. India occupies first position in cauliflower in the world. In hills, cauliflower is grown for both table and seed purpose. There is a great potential for increasing the productivity of cauliflower per unit area by judicious and balanced use of nutrients together with better management practices.

Materials and materials

A field experiment was conducted at Naggar Farm of I.A.R.I., Regional Station Katrain, (Kullu Valley) H.P. during 2005-06 and 2006-07 with cauliflower var. Pusa Snowball K-1. the experiment was laid out laid out in a randomised block design with 3 replications. The transplanting of seedling was done at a spacing 45x 45 cm keeping plot size of 3x3 m per treatment. There were ten treatments comprising of different sources of phosphorous. These were T-1 100% phosphorous (Single Super Phosphate), T-2 100% Phosphorous (Rock Phosphate), T-3 50% phosphorous (Rock Phosphate) + Psolubiliser + Vascular Arbuscular Mycorrhizal (VAM), T-4 VAM, T-5 P solubiliser, T-6 100% Phosphorous (Rock Phosphate) + 15 t/ha Farm Yard Mannure, T-7 Liming + 50% phosphorous(Single Super Phosphate), T-8 15 t/ha Pine needle compost, T-9 15 t/ha Rice straw compost and T-10 control. Every plot received on equal amount of N, K and Agromin as basal dose which were added at the rate of 250 Kg N /ha as CAN (Calcium Ammonium Nitrate), 80 Kg K /ha as Muriate of potash and 25 Kg/ha Agromin. All the fertilizer except CAN were added to the soil during land preparation before transplanting. CAN was added in three doses, the first (50%) during land preparation and remaining (50%) in two doses of 30 and 60 days after transplanting. All inter cultural operations and plant protection measures were taken as and when required by the crop. The observation was recorded for days to 50% curd formation after transplanting. The other observations on number of outer leaves/plant, leaf size index, frame size, curd size index, gross weight and net weight recorded at the time of crop harvest. The data were analysed statistically as suggested by Panse and Sukhatme (1967).

Results and discussion

The data on number of outer leaves/plant, 50% maturity period, leaf size index (cm^2), frame size (cm), curd size index (cm^2), gross weight (Kg/plot) and net curd weight (Kg/plot) are presented in Table 1. the data indicated that the phosphorous application had significant effect for all characters. The highest yield as curd weight was obtained in treatment, 50% P (R.P.) + P solubiliser + VAM which gave 40.10% higher yield than control. The highest vegetative growth (leaf size index) was recorded in the same treatment which was highly, significant to control, followed by treatment with 100% P (R.P.) + 15 t/ha FYM. Rooster (1997) reported that the effect of different forms of phosphorous fertilizers application were significant for better growth on the application of phosphorous before transplanting. Significant in gross weight and net curd yield with the application phosphorous was noticed by Thakur *et al.* (1991). The results obtained due to phosphorous application in the present investigation are in conformity with the finding of Nutrika (1979) who got the higher yield of cauliflower with phosphorous application. The poor growth and the lowest yield (both gross and net) were obtained in treatment, which had 15 t/ha RSC.The results indicate that cauliflower responded favourably for phosphorous application. This might be due to rapid cell division cell elongation and better root development of plants of cauliflower by phosphorous.

Conclusion

A study was undertaken at Naggar farm of IARI, Regional Station Katrian, (Kullu Valley) H.P. during 2005-06 and 2006-07 to find out the optimum and economical doses of phosphorous for better growth and yield of cauliflower. The leaf size index, frame size, curd size index, gross weight and net weight increased on application of phosphorous. The maximum curd yield were recorded with 50% P (R.P.)

Table 1: Mean performance of different characters var. PSBK-1 under variable phosphorous application.

Treatment	No.of outer leaves	Maturity (days) period	Leaf size index(cm2)	Frame size index (cm2)	Curd size index(cm2)	Gross weight (Kg/plot)	Net weight (Kg/plot	Net weight (Kg/ha)
100% P(SSP)	15.0	159.33**	725.97	62.47*	235.13	51.24	27.14*	301.55
100%P(RP)	15.9**	155.0	793.88	59.83	252.56	62.35*	32.82*	364.66
50%P(RP)+P solubiliser + VAM	14.9	161.0**	1339.73**	67.73	287.06	74.55**	37.38**	415.32
VAM only	14.3	148.83	795.28	59.97	230.61	51.52	26.13	290.33
Psolubiliser only	16.1**	153.67	713.61	61.17	230.84	52.08	28.20	313.33
100% P(RP)+15t/ha FYM	15.4	160.17**	1097.57**	61.43	238.29	61.97*	31.45**	349.44
Liming+ 50% P(SSP)	15.3	169.67**	864.59*	63.27**	248.20	68.21**	34.85**	387.22
15t/ha PNC	15.1	148.0	751.77	60.30	235.28	46.70	19.45	216.11
15 t/ha RSC	15.2	145.83	670.17	57.10	234.76	43.50	17.31	192.33
Control	14.5	148.0	693.56	57.33	229.61	50.67	22.39	248.77
SE	0.4	4.066	78.17	1.89	9.49	4.70	1.94	21.55
C.D. at 5%	0.92	8.54	167.24	3.96	19.93	9.88	4.07	45.22
C.D. at 1%	1.27	11.702	224.94	5.43	27.31	13.52	5.58	61.99

***= Significant at 5% and 1% level respectively.

Table 2: Analysis report of plant sample (Cauliflower var. PSB K-1)

Samples	N (%)	P(%)	K (%)	S(%)	Ca(%)	Mg (%)	Fe (ppm)	Mn(ppm)	Zn(ppm)
Control	3.74	0.78	1.59	0.2	0.25	0.21	290	85	120
100%P (SSP)	3.37	0.84	1.54	0.8	0.16	0.28	300	60	130
100%P (RP)	3.34	0.82	1.54	0.17	0.10	0.11	220	60	160
50%P(RP)+P solubiliser + VAM	3.43	0.93	1.54	0.81	0.16	0.23	290	75	131
VAM only	3.39	0.77	1.22	0.3	0.17	0.2	300	70	129
Psolubiliser only	3.65	0.78	1.36	0.13	0.24	0.18	300	76	130
100% P(RP)+15t/ha FYM	4.31	0.78	1.54	0.2	0.12	0.15	290	70	131
Liming+ 50% P(SSP)	3.45	0.83	1.24	0.55	0.13	0.28	240	60	129
15t/ha PNC	3.39	0.75	1.25	0.26	0.29	0.27	220	60	131
15 t/ha RSC	3.36	0.71	1.45	0.28	0.29	0.31	160	35	161
100% N	3.22	0.79	1.65	0.57	0.17	0.26	220	70	145
30t/haFYM	3.48	0.96	1.73	0.38	0.14	0.26	180	85	145
15t/haFYM	3.29	0.97	1.62	0.68	0.13	0.27	210	36	145
150% N	3.91	0.87	1.75	0.32	0.13	0.27	290	60	145

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+ P solubiliser + VAM (415.30 q/ha) followed by liming + 50% P (SSP 387.22 q/ha) and maximum growth were recorded with 50% P (R.P.) + P solubiliser + VAM 1339.73 cm^2) followed by 100% P (R.P.) + 15t/ha FYM (1097.57 cm^2).

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