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Study the Effect of Integrated Nutrient Management on Yield and Nutrient Uptake in Pumpkin

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Abstract

An experiment entitled "Integrated nutrient management studies in pumpkin" was carried out during summer season of 2011 at Horticulture Farm, Department of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. The experiment conducted in Randomized Block Design with three replications using cv. Arka chandan, with ten treatments, two kinds of organic manures (FYM and Vermicompost) alone and in combination with two kinds of bio-fertilizers (Azotobacter and PSB) and reduced doses of chemical fertilizers were tested in comparison with RDF.

On the basis of results, the application of 50:25:25 Kg NPK ha^{-1} + FYM 25 t ha^{-1} + seed treatment with PSB to the crop found to be sound integrated practice. The integrated use of inorganic fertilizers, organic manures and bio-fertilizers had a significant effect on nutrient uptake. The highest uptake of Nitrogen, Phosphorus, and Potash by pumpkin vine was recorded maximum in the treatment 50 kg N, 25 kg P_2O_5, 25 kg K_2O ha^{-1} dose of fertilizers in combination with FYM 25 t ha^{-1} and seed treatment with PSB 25 g kg^{-1} of seed. i.e. T_4. Available Nitrogen, Phosphorus and Potash in the soil after harvest of pumpkin crop were highest in the treatment with application of inorganic fertilizers 50 kg N, 25 kg P_2O_5, 25 kg K_2O ha^{-1} in combination with FYM 25 t ha^{-1} and seed treatment with PSB 25 g kg^{-1} of seed. i.e. T_4 recorded maximum Nitrogen, Phosphorus, Potash (190.23, 27.97, 386.91 kg ha^{-1} respectively).

Keywords: Pumpkin; INM; Arka chandan; Vermicompost; FYM

Introduction

Cucurbitaceae is one of the largest family in vegetable kingdom consisting of largest number of edible type species. Pumpkin (*Cucurbita moschata* Poir.) is one such important vegetable belongs to family Cucurbitaceae. Pumpkin fruits are extensively used as vegetables both in immature and mature stage. The yellow and orange fleshed fruits are very rich in carotene (3,332 IU), which is precursor of Vitamin-A with fair quantities of vitamins B and C. In modern agriculture, chemical fertilizers constitute the major portion of total cost of seed production. As the cultivation of pumpkin is fast expanding, the growers often come across one or the other problems that limit its fullest expressions of growth and productivity. Hence, these problems could be overcome partially or completely by using different agrochemicals like mineral nutrients and growth regulators. The optimum doses of nitrogen, phosphorus and potassium vary greatly with the length of growing season, fertility status of soil, soil type, cultivar, geographical location and the environmental factors. These factors will have marked effect on the growth and yield parameters of pumpkin [1,2].

Material and Methods

The experiment entitled "Integrated Nutrient Management studies in Pumpkin" was conducted at Horticulture farm, Department of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during the year 2011. Sowing of pumpkin seed on medium black soil, it was free from weeds and disease infection. In order to know the chemical properties of soil a representative soil sample was collected from experimental site by using appropriate soil sampling technique. The treatments detail are as follow as, T_1-50:25:0 kg NPK (RDF) + FYM @25t/ha, T_2-50:25:25 kg NPK + FYM@25t/ha, T_3-25:25:25 kg NPK + Seed treatment with Azotobacter @ 25 g/kg seed + FYM@25t/ha, T_4-50:25:25 kg NPK + Seed treatment with PSB @ 25 g/kg seed + FYM@25t/ha, T_5-25:25:25 kg NPK +Seed treatment with Azotobacter and PSB @ 25 g/kg seed + FYM@25t/ha, T_6-Seed treatment with Azotobacter and PSB @ 25 g/kg seed + FYM@25t/ha, T_7-Seed treatment with Azotobacter and PSB @ 25 g/kg seed + Vermicompost 2 t/ha + FYM@25t/ha, T_8-50:25:0 kg NPK + Seed treatment with PSB@ 25 g/kg seed +FYM@25t/ha, T_9-50:25:0 kg NPK + Seed treatment with Azotobacter and PSB @ 25 g/kg seed + FYM@25t/ha, T_{10}-25:25:25 kg NPK + Seed treatment with Azotobacter and PSB @ 25 g/kg seed + vermicompost 2 t/ha + FYM @25t/ha. The experiment was laid out in Randomized Block Design with Three replications and Ten treatments. Variety used was Arka Chandan for Pumpkin. Five plants were selected at random in each plot to record the observations on Flesh colour of fruit, Thickness of flesh (cm), Number of seeds per fruit, Total Soluble Solids (%), Yield per hectare (q), Nutrient uptake (%) by vine, Final nutrient status after harvest (kg ha^{-1}).

Treatments	Number of seeds/ fruit	Thickness of flesh (cm)	TSS (%)	Flesh colour of fruit	Yield/ha (q)	Nutrient uptake (%) by vine			Final nutrient status after harvest (kg ha^{-1})		
						N	P	K	N	P	K
T_1	223.33	1.90	11.30	Yellow	80.28	3.88	0.37	0.23	186.76	21.15	335.32
T_2	318.58	2.03	7.76	Pale yellow	106.66	3.93	0.36	0.27	188.84	24.30	367.43
T_3	302.47	2.00	9.90	Yellow	137.14	4.03	0.35	0.24	178.13	24.24	364.08
T_4	380.12	2.67	11.76	Yellow	210.95	4.23	0.42	0.39	190.23	27.97	386.81
T_5	361.67	2.37	9.26	Pale yellow	161.90	3.40	0.38	0.35	189.75	27.09	359.49
T_6	354.25	2.20	11.50	Pale yellow	159.52	3.32	0.41	0.29	162.75	27.68	362.08
T_7	365.82	2.07	9.06	Yellow	94.28	3.60	0.28	0.28	174.91	26.67	360.14
T_8	342.08	2.17	8.36	Yellow	117.61	3.89	0.38	0.32	182.03	26.91	358.96
T_9	309.33	2.07	8.80	Yellow	90.95	3.97	0.33	0.28	190.21	27.94	364.08
T_{10}	291.67	2.03	8.93	Yellow	144.76	3.62	0.39	0.28	180.08	25.67	368.31
'F' Test	Sig.	Sig.	Sig.	-	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
SE(m)±	9.208	0.10	0.54	-	14.69	0.049	0.02	0.01	2.14	1.20	1.54
C.D. at 5%	27.36	0.31	1.61	-	43.66	0.14	0.06	0.04	6.37	3.58	4.59

Table 1: Effect of integrated nutrient management on total nitrogen, total phosphorus and total potassium content of the vine and Available soil Nitrogen, Phosphorus and potassium after harvest (kg ha^{-1}) as influenced by integrated nutrient management

Result and Discussion

The number of seeds per fruit was recorded maximum in treatment T_4 (380.12) followed by T_7, T_5 and T_6 were found at par with each other. Minimum (223.33) number of seeds was recorded in treatment T_1. In respect of thickness of flesh showed significant influence over INM. The treatment T_4 recorded maximum (2.67 cm) thickness of flesh, which was at par with the treatment T_5. Whereas, minimum (1.90 cm) thickness of flesh was recorded in the treatment T_1. The maximum (11.76%) TSS percentage was recorded significantly in the treatment T_8. The minimum (7.56%) TSS percentage was recorded in the treatment T_2. The results of present investigation are in agreement with the finding of [3]. The observation on the effect of INM on flesh colour of pumpkin fruit was recorded. Basically, pumpkin produces fruit with yellowish flesh colour. Observation were recorded by eye estimation, most of the fruit did not show variation regarding flesh colour. In respect to the yield of fruit per hectare treatment T_4 produced maximum (210.95 q/ha), which is significantly superior over all other remaining treatments followed by T_5, T_6, T_3, T_{10}, T_8 and T_2. The minimum (80.28 q/ha) yield per hectare was recorded in T_1 [4].

Nutrient uptake by vine for nitrogen reveals that, maximum (4.23 kg) nitrogen uptake by vine was found in treatment T_4, which was at par with treatment T_3. Minimum (3.32 kg) uptake of nitrogen was recorded in T_6. Phosphorous uptake by vine was recorded Maximum (0.42%) in treatment T_4 and the treatment T_7 recorded minimum (0.28%) uptake of total phosphorus. Potassium uptake by vine indicated that, the treatment T_4 recorded maximum (0.39%) amount of total potash content and it was found to be at par with the treatment T_5 (0.35%). The treatment T_1 recorded minimum (0.23%) uptake amount of total potash. In general, overall trend of the data revealed that integrated use of inorganic fertilizers along with application of organic manures and biofertilizers resulted in increased N uptake compared to sole application of organic manures or inorganic fertilizers. The results are in conformity with the findings of [5,6]. The maximum total uptake of P by plant was recorded in T_4-50:25:25 NPK kg ha^{-1} + 25 t FYM ha^{-1} and seed treatment of PSB which was significantly superior over other treatments. These findings are in conformity with the results obtained which revealed that application of biofertilizers increased P uptake along with increasing uptake of N in pumpkin. The phosphate activity and phosphorus content [7] was more in vermicompost than FYM, resulted in higher uptake and availability of phosphorus after harvest. The same trend in increasing K_2O uptake by pumpkin plants. This may be due to fact that favorable effect of higher uptake of N influenced the faster growth of plant that increases the demand for K_2O in soil [8,9].

Available Soil Nitrogen after Harvest (kg ha^{-1}) as Influenced by Integrated Nutrient Management

The data presented in Table 1 revealed that, various combinations of inorganic fertilizers, organic manures and biofertilizers significantly influenced the nutrient status of Nitrogen, Phosphorus and Potash in the soil after harvest in integrated nutrient management system.

The significantly maximum (190.23 kg ha^{-1}) nitrogen was observed in the soil with the treatment T_4 receiving application of 50:25:25(NPK kg ha^{-1}) recommended dose of fertilizers in combination with FYM 25 t ha^{-1} and seed treatment of PSB with 25 gm kg^{-1} of seed, which was at par with T_9, T_5, T_2, followed by treatment T_1, T_8, T_{10} at par with each other. Minimum (162.75 kg ha^{-1}) nitrogen was recorded in the soil after harvest in the treatment T_6 where no use of chemical fertilizer was done. In respect of Phosphorus status in the soil after harvest, various combinations of inorganic fertilizers, organic manures and biofertilizers significantly influenced it. Significantly maximum (27.97 kg ha^{-1}) phosphorus was recorded in the treatment T_4 which was at par with T_9, T_6, T_5 and T_3. Whereas, minimum phosphorus was recorded in the treatment T_1 (21.15 kg ha^{-1}). Potash status in the soil after harvest was significantly influenced by various treatments of integrated nutrient management. Significantly maximum (386.81 kg ha^{-1}) potash was recorded in the treatment T_4 with the 50:25:25 (NPK kg ha^{-1}) dose of fertilizers in combination with FYM 25 t ha^{-1} and seed treatment of PSB, which was significantly superior over other treatments. The minimum (335.35 kg ha^{-1}) Potash was recorded in treatment T_1.

There was an overall increase in the available NPK in soil with the combined application of inorganic fertilizers, organic manures and Biofertilizers. Improvement in the status of available nutrients in the soil after harvest of the crop was due to addition of these nutrients through application of organic manures, inorganic fertilizers and biofertilizers. This may be attributed to direct application of inorganic fertilizers and slow release of N through Vermicompost or FYM and biological fixation of N by bacteria. Vermicompost is a better source of N and a good carrier material for Azotobacter and PSB [10] over the FYM [7]. Vermicompost may brought up the population of Azotobacter and PSB which resulted in higher available in the soils.

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