



ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(7): 2531-2534
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www.thepharmajournal.com

Received: 02-03-2022

Accepted: 03-06-2022

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Effect of varying levels of nutrients on growth and yield of pineapple cv. Amritha

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Abstract

A study on the effect of varying levels of nutrients on the growth and yield of pineapple cv. Amritha was conducted at Fruits Crop Research Station, Vellanikkara during 2018-2019. Six treatments comprising of varying levels of NPK based on soil test results were carried in RBD with four replications. Adhoc organic POP recorded the maximum length of 'D' leaf and 'D' leaf area. Application of 75 percent higher than the modified POP based on soil test results (16.5:20:19.2 N, P₂O₅, K₂O g plant⁻¹) was observed to produce maximum fruit weight, length, girth and breadth of the fruit, pulp weight and the highest yield per hectare (51.99 t/ha).

Keywords: Pineapple, Amritha, Nutrients, Adhoc organic POP, 'D' leaf area, Fruit weight, Length of the fruit, Yield per hectare

Introduction

Amritha, is the pineapple hybrid released from the Pineapple Research Centre, Vellanikkara, under Kerala Agricultural University (KAU), as the cross between Kew and Ripley Queen. The fruit yield and shape are comparable with that of female parent, Kew. Fruit quality attributes like flesh colour, flavour and sweetness are comparable with male parent Ripley Queen. Amritha fruits are harvested 13-15 months after planting. Crop is less susceptible to pest and disease incidence. The cylindrical fruits are tapering slightly from the base, weighing 1.5-2 kg and crown weighing 80-100 g. They are green when unripe and changes to yellow during ripening. It tastes good with high TSS (18.3%) and low acidity (0.2%). When grown under the existing POP recommendation of KAU the fruit weight was varying from 0.5 - 1 kg per plant. Therefore, there is a need to develop optimum nutrient doses for ensuring higher productivity of pineapple cv. Amritha.

Materials and Methods

The study was conducted at Fruits Crop Research Station, Vellanikkara during 2018-2019. The experiment was laid out in RBD with six treatments and four replications. (T₁-POP recommendation of KAU (8:4:8 N, P₂O₅, K₂O g plant⁻¹), T₂-Modified based on soil test results (9.39:11.45:11.36 N, P₂O₅, K₂O g plant⁻¹), T₃-25 percent higher than the modified POP based on soil test results (11.7:14.31:14.31 N, P₂O₅, K₂O g plant⁻¹), T₄-50 percent higher than the modified POP based on soil test results (14.08: 17.17: 17.03 N, P₂O₅, K₂O g plant⁻¹), T₅-75 percent higher than the modified POP based on soil test results (16.4:20.03:19.13 N, P₂O₅, K₂O g plant⁻¹) and T₆-ad hoc organic POP. Healthy suckers weighing 500 g were planted at a spacing of 45 cm x 30 cm during the month of April. Organic manure (FYM) was incorporated into the soil prior to planting @ 50 tonnes ha⁻¹. Full dose of P₂O₅ was applied at the time of planting. Nitrogen and K₂O were applied in 3 split doses, at the time of planting, during August - September and in March of the second year. In case of ad hoc organic POP (T₆), FYM @ 500 g plant⁻¹, rock phosphate @ 20 g plant⁻¹, bone meal @ 50 g plant⁻¹ were applied at the time of planting and 250 g cow dung, 50 g neem cake, 50g groundnut cake, 1g Azospirillum and PGPR mix 1 were applied six weeks after planting. 1.5 g of SOP in liquid form was applied along with cow dung solution at an interval of 6, 10, 14, 18, 22 and 30 weeks after planting for each plant (KAU, 2013).

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Observations were recorded monthly for vegetative parameters viz., plant height (cm), number of leaves per plant, length and breadth of 'D' leaf (cm), 'D' leaf area (cm²) and leaf area index. Yield parameters recorded were fruit weight (kg), length of the fruit (cm), girth of the fruit (cm), breadth of the fruit (cm), yield per hectare (t/ha), pulp weight (kg), pulp percentage (%), harvest index and crown weight (kg).

Results and Discussion

The plant height was not significantly influenced by different levels of nutrients. This was a deviation from the finding of Tay (1975)^[10], Vilela-Morales *et al.* (1977)^[12] where there was a positive effect on plant height with the application N, P and K. Application of different treatments on number of leaves per plant had no significant effect. Razzaque and Hanafi (2001)^[7] reported negative influence on growth parameters upon application of higher rates of potassium.

The length of 'D' leaf was not influenced by different treatments up to seven months after planting. However, at eight months after planting, T₆, T₅ and T₁ were on par and T₆ was superior to T₄ which was on par with T₂ and T₃. Similar trend was reported where, increased application of N doses increased the D-leaf length of pineapple cv. Victoria (Pereira da Silva *et al.*, 2012). However, the width of 'D' leaf was not influenced significantly by application of different levels of nutrients. In case of 'D' leaf area, there was no significant effect up to nine months after planting. But from ten months after planting had a significant effect on 'D' leaf area. Application of different levels of nutrients did not have any significant effect on leaf area index.

Mean fruit weight was significantly influenced by the application of different levels of nutrients. Treatment T₅ (16.4:20.03:19.13 N, P₂O₅, K₂O g plant⁻¹) recorded the maximum fruit weight (0.98 kg) which was significantly

superior. It indicates that increased application of N, P₂O and K₂O increased the average fruit weight as observed by Abutiante and Eyeson, 1973^[11]. Similar trend was also reported in pineapple cv. Kew (Singh *et al.*, 1977)^[8] and cv. Pernambuco (Vilela-Morales *et al.*, 1977)^[12]. The fruit length and breadth increased with increased application of different levels of nutrients. The maximum length (14.15 cm), girth (30.79 cm) and breadth (30.33 cm) of the fruit was recorded by treatment T₅. The probable reason for this may be due to increased level of nitrogen application (Omotoso and Akinrinde, 2013)^[5]. It was also reported that application of phosphorus influenced fruit weight and length (Buzzetti *et al.*, 1986)^[2].

The yield per hectare was significantly influenced by the application of different levels of nutrients. Results revealed that T₅ recorded the highest yield (51.99 t/ha) and was significantly superior compared to the other treatments. This may be due to application of higher doses of N, P and K. Teixeira *et al.* (2011)^[10] reported that application of potassium fertilizers increased the fruit yield. Singh *et al.* (1977)^[8] observed increased fruit yield with the increased application of nitrogen in pineapple cv. Kew. Because nitrogen was the primary single limiting nutrient in pineapple production (Spironello *et al.*, 2004)^[9].

Pulp weight was significantly affected by the application of different levels of nutrients. T₅ recorded highest value for pulp weight (0.402 kg). This may be due to high fruit weight acquired by the application of increased levels of N, P₂O₅ and K₂O (Caetano *et al.*, 2013)^[3]. There was no significant difference observed among the different treatments for pulp percentage and harvest index. Hence application of 16.5:20:19.2 N, P₂O₅, K₂O g plant⁻¹ had a significant effect on growth and yield parameters of pineapple cv. Amritha.

Table 1: Effect of treatments on plant height of pineapple cv. Amritha

Treatments	Plant height (cm)											
	Months after planting (MAP)											
	1	2	3	4	5	6	7	8	9	10	11	12
T1	35.8	36.2	39.4	49.7	54.3	56.0	57.4	59.3	59.2	59.9	61.3	63.5
T2	38.8	41.3	45.1	49.5	53.1	56.0	58.2	60.3	61.4	62.6	64.5	66.8
T3	37.5	39.0	43.8	49.2	53.1	56.3	57.9	59.7	60.5	62.1	64.0	66.7
T4	37.1	39.2	44.2	50.2	54.7	57.4	59.9	62.3	62.8	64.5	66.1	68.4
T5	39.1	41.8	44.7	51.5	55.1	58.9	62.0	63.9	64.4	66.1	67.7	70.0
T6	39.2	41.2	48.1	50.9	52.9	54.6	56.1	57.4	58.8	60.8	63.0	65.3
CD (0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

NS – Non significant

Table 2: Effect of treatments on number of leaves per plant of pineapple cv. Amritha

Treatments	No of leaves per plant											
	Months after planting (MAP)											
	1	2	3	4	5	6	7	8	9	10	11	12
T1	18.5	22.8	25.6	25.7	25.9	29.6	29.6	31.1	32.0	32.2	32.7	33.7
T2	20.0	24.1	26.6	26.5	27.0	30.1	30.1	32.9	33.2	34.4	35.3	35.6
T3	22.0	22.1	25.1	26.4	27.3	30.5	30.5	32.2	33.9	33.9	34.3	34.6
T4	19.7	24.1	27.0	27.8	28.6	32.6	32.6	34.7	36.0	36.5	37.1	37.3
T5	19.2	23.2	26.8	27.3	27.9	31.0	31.0	33.2	35.0	35.5	36.1	36.2
T6	18.4	21.8	25.4	25.9	24.7	29.2	29.2	32.4	33.0	34.7	35.2	36.4
CD (0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

NS – Non significant

Table 3: Effect of treatments on length of 'D' leaf of pineapple cv. Amritha

Treatments	Length of 'D' leaf(cm)											
	Months after planting (MAP)											
	1	2	3	4	5	6	7	8	9	10	11	12
T1	27.8	29.6	34.5	39.8	43.5	45.7	44.2	41.1	41.1	41.6	42.9	43.7
T2	27.9	30.7	32.7	40.3	45.7	46.3	42.6	39.3	40.2	40.9	42.1	42.9
T3	28.2	29.9	30.6	39.3	44.2	43.6	41.8	38.9	40.5	40.5	41.8	42.8
T4	29.1	30.0	32.3	40.0	43.9	45.9	38.2	38.5	39.5	40.2	41.3	42.2
T5	28.8	30.2	30.3	39.5	46.0	46.5	41.0	40.9	41.9	43.1	44.0	45.1
T6	30.2	32.6	32.7	39.1	42.6	42.9	43.1	44.3	46.0	47.6	49.8	51.4
CD (0.05)	NS	NS	NS	NS	NS	NS	NS	3.54	3.13	3.38	3.01	3.18

NS – Non significant

Table 4: Effect of treatments on breadth of 'D' leaf of pineapple cv. Amritha

Treatments	Breadth of 'D' leaf(cm)											
	Months after planting (MAP)											
	1	2	3	4	5	6	7	8	9	10	11	12
T1	1.82	2.02	2.05	2.35	2.77	2.75	2.80	2.82	3.05	3.30	3.66	3.66
T2	1.80	2.03	1.85	2.21	2.57	2.70	2.70	2.65	3.09	3.34	3.58	3.58
T3	1.77	1.69	1.73	2.20	2.75	2.82	2.62	2.60	2.97	3.36	3.60	3.60
T4	1.94	2.14	1.94	2.27	2.65	2.85	2.77	2.80	3.08	3.33	3.60	3.60
T5	1.94	2.14	1.95	2.22	2.65	2.77	2.75	2.77	2.98	3.27	3.54	3.54
T6	1.78	1.99	2.04	2.55	2.82	2.82	2.65	2.67	2.98	3.27	3.55	3.55
CD (0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

NS – Non significant

Table 5: Effect of treatments on leaf area index of pineapple cv. Amritha

Treatments	Leaf area index											
	Months after planting (MAP)											
	1	2	3	4	5	6	7	8	9	10	11	12
T1	0.53	0.63	0.73	0.83	0.93	1.03	1.23	1.33	1.43	1.73	2.03	2.33
T2	0.55	0.65	0.75	0.85	0.95	1.05	1.25	1.35	1.45	1.75	2.05	2.35
T3	0.55	0.65	0.75	0.85	0.95	1.05	1.25	1.35	1.45	1.75	2.05	2.35
T4	0.52	0.62	0.72	0.82	0.92	1.02	1.22	1.32	1.42	1.72	2.02	2.32
T5	0.61	0.71	0.81	0.91	1.01	1.11	1.31	1.41	1.51	1.81	2.11	2.41
T6	0.64	0.74	0.84	0.94	1.04	1.14	1.34	1.44	1.54	1.84	2.14	2.44
CD (0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

NS – Non significant

Table 6: Effect of treatments on 'D' leaf area of pineapple cv. Amritha

Treatments	'D' leaf area(cm ²)											
	Months after planting (MAP)											
	1	2	3	4	5	6	7	8	9	10	11	12
T1	36.85	43.38	52.04	52.04	88.26	91.95	90.42	84.65	91.24	99.51	114.1	125.6
T2	36.48	45.41	44.65	44.65	85.40	90.94	83.57	75.56	90.23	99.35	109.4	125.0
T3	36.19	36.78	39.00	39.00	88.81	89.42	79.13	73.41	87.28	98.63	108.9	123.0
T4	41.12	46.78	45.66	45.66	84.91	94.80	76.95	78.26	88.33	97.51	107.8	124.3
T5	40.69	47.15	42.75	42.75	89.48	94.34	81.82	82.30	90.69	102.76	113.1	135.6
T6	38.99	47.00	48.34	48.34	87.63	88.09	83.31	86.43	99.78	113.77	128.7	155.2
CD (0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	10.56	10.56	10.93

NS – Non significant

Table 7: Effect of treatments on fruit characters of pineapple cv. Amritha

Treatments	Fruit weight (kg)	Length of the fruit (cm)	Girth of the fruit (cm)	Breadth of the fruit (cm)	Pulp weight (g)	Pulp percentage (%)	Crown weight (kg)	Yield (t/ha)	Harvest index
T1	0.55	12.10	27.04	26.41	259	46.83	99.49	32.33	28.7
T2	0.66	11.92	27.49	26.72	255	38.26	102.47	38.58	29.7
T3	0.71	12.32	27.89	27.32	283	39.99	106.72	34.24	29.6
T4	0.85	12.85	29.26	28.77	315	37.31	106.50	39.58	29.1
T5	0.98	14.15	30.79	30.33	402	41.05	118.54	51.99	30.4
T6	0.74	13.74	28.29	27.83	332	44.38	102.75	42.57	29.3
CD (0.05)	0.101	0.693	1.307	1.333	0.037	NS	9.577	4.144	NS

NS – Non significant

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