www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(2): 2954-2959

www.thepharmajournal.com
Received: 11-11-2021
Accepted: 31-01-2022

Effect of fertigation and mulching on growth and yield of pineapple cv. Simhachalam

K Patnaik, S Dash, C Patra, DK Dash, S Swain, PC Pradhan, A Mishra and R Bhol

K Patnaik
Department of Fruit Science and Horticulture Technology, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha, India

S Dash
Department of Fruit Science and Horticulture Technology, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha, India

C Patra
Department of Agricultural Statistics, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha, India

DK Dash
Department of Fruit Science and Horticulture Technology, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha, India

S Swain
Department of Fruit Science and Horticulture Technology, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha, India

PC Pradhan
Precision Farming Development Centre, O.U.A.T, Bhubaneswar, Odisha, India

A Mishra
Department of Soil Science and Agricultural Chemistry, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha, India

R Bhol
Department of Plant Physiology, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha, India

Corresponding Author:
K Patnaik
Department of Fruit Science and Horticulture Technology, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha, India

Abstract
The effect of fertigation levels with and without plastic mulching; on the vegetative growth of pineapple variety 'Simhachalam' was studied in both plant and ratoon crops at experimental research farm of Odisha University of Agriculture and Technology, Bhubaneswar during 2016-19. Different levels of the recommended fertilizers and mulching were tried along with a control. In both the plant and ratoon crops, fertigation with full fertilizers and mulch resulted in maximum values in plant height (99.4 cm), number of leaves (53.09), plant spread of N-S orientation (89.90cm), plant spread E-W orientation (83.50 cm), D leaf length (60.95 cm, 84.50cm), width (3.74cm, 4.53cm) and area (206.43 cm^2, 448.16 cm^2) both at crop establishment and flower induction stages respectively. Chlorophyll contents were not affected by the treatments. However, chlorophyll a, chlorophyll b and total chlorophyll content were observed highest under mulch and full fertilizer doses in form of fertigation with 1.29 mg/g, 1.43 mg/g and 2.44 mg/g, respectively. At flower induction stage the same treatment also recorded highest nitrogen content (1.95%) and potassium content (2.53%) in leaves. The yield per plot (34.84 kg) was also recorded highest in the treatment applied with 100% RDF fertigation with mulch.

Keywords: Fertigation, plastic mulch, vegetative parameters, D leaf, Simhachalam

Introduction

Pineapple is an important commercial fruit crop of the tropical and sub-tropical regions of the world with an annual world production of 25.8 million tons (FAOSTAT, 2018). India grows the crop in diverse agro-ecological zones with a production of 1706 thousand ton and productivity of 16.6 t/ha, respectively (NHB data, 2017-18). In India it is grown abundantly in the North-east region and east and west-Indian states. Fertilizer is one of the major inputs accounting for nearly one third of the cost of cultivation. Hence efficient and judicious use of fertilizers is imperative for obtaining more yields per unit area. Yield reduction may reach even hundred per cent caused by severe weed incidence (Chadha *et al.*, 1997) [1]. Fertilization has a direct influence on pineapple productivity and fruit quality (Mendes *et al.*, 2011) [10]. Pineapple crop is commonly cultivated as rain-fed crop without emphasizing much on its nutrition and irrigation and is mostly maintained perennially. The nutritional status of the pineapple plant has a large influence on plant growth and consequently, on yield and fruit quality. Drip irrigation, micro-jets or over-head sprinklers can be used under restricted water supply to reduce the high cost of labour (Carr, 2012) [8].

The eastern part of India receives heavy rains during monsoon from June to September coupled with cyclones followed by water shortage up to the month of May. Heavy rainfall causes leaching of the nutrients thereby reducing the nutrient use efficiency. Fertigation can reduce nutrient loss and increase the nutrient use efficiency through reduced surface evaporation, surface runoff and deep percolation of applied water (Jiusheng *et al.*, 2003) [7].

In spite of huge potential pineapple coverage is meager in Odisha. Simhachalam, a local variety in the Spanish group of pineapple is mostly grown in Andhra Pradesh and southern parts of Odisha characterised by spiny leaves, high slip and sucker bearing habit. Irrigation and nutrient management are often neglected since it is very hardy and the crop is mostly cultivated rain-fed with fewer amounts of nutrients. In the era of declining resources there is an urgent need to standardize precision farming technologies for farmers with the aim to enhance productivity and reduce water foot print per unit of crop produce. There is a need to study the effective use of fertilizer with a goal to match nutrient supply with crop requirements and minimize nutrient losses. Therefore, the present investigation was carried out to see the effects of varying nutrient doses under fertigation and mulching on the growth of pineapple plants.

Materials and Methods

The effects of different levels of fertigation with or without mulching on vegetative growth of pineapple var. Simhachalam were studied at the Odisha University of Agriculture and Technology, Bhubaneswar during 2016-19 in both plant and ratoon crops. The experimental site is located on a flat land at 20° 16' N latitude and 85° 47' E longitude and at an altitude of 52 m above mean sea level. The site belongs to the East and South-Eastern Coastal Plain Zone. The annual rainfall ranges from 125 to 150 cm per year. Most of the rainfall is received through South-West monsoon from June to September. Scanty and occasional rain is also received during winter season. The soil of the experimental area was lateritic and slight acidic with sandy loam texture and an EC of 0.014 dSm^{-1}. The soil organic carbon content was 2.26% with available nitrogen, phosphorus and potassium of 93, 4.9 and 67 kg/ ha, respectively, at the time of planting. Uniform, disease free suckers weighing 400-500 g were used for planting in trenches with 30 x 60 x 90 cm spacing accommodating around 44000 plants/ ha. The experiment was laid out in randomized block design with seven treatments and three replications. The land was divided into seven individual raised beds of 2.1 m^2 (3.0m x 0.7 m) size replicated thrice and separated by drainage channels. The beds were covered with 50 micron black plastic mulch. The source of water for irrigation was the well existing in the field. The fertigation system had a 2Hp motor, 50 L sand filter, venturi system, 60 mm PVC main line, 50 mm PVC sub main line and 16 mm LDPE lateral lines. The water requirement of pineapple plant at different growth stages of pineapple for the experimental region was calculated from the consolidated evapotranspiration and rainfall data of from 2016-2019 obtained from the meteorological observatory of Department of Agro-meteorology, Odisha University of Agriculture and Technology. Crop evapotranspiration (Kc) of pineapple was taken as 0.5 up to six months after planting and 0.3 beyond that (Allen *et al*., 1994). Irrigation was done through drippers at 2lph discharge rate, one hour daily during March to May and one hour on alternate days during November to February. From June to October plots were irrigated at an interval of 3 days depending upon the available soil moisture due to rains.

Water soluble fertilizers *viz.* urea, suIphate of potash and monoammonium phosphate were used in the experiment which were applied through a venturi. The 100%, 80% and 60% RDF of water soluble fertilizer were regulated by operating the tap connected at the starting end of each lateral. Drip laterals were laid along the length of each raised bed with the spacing of 60 cm between two adjacent laterals. Fertigation to individual plot in each replication was controlled by a manual regulating valve fixed to each lateral line. Fertigation was scheduled at fortnightly intervals starting from second month of planting till flower induction in the plant crop.

The details of the treatments are furnished below

T1: Fertigation with 100% recommended dose of fertilizer without mulch
T2: Fertigation with 80% recommended dose of fertilizer without mulch
T3: Fertigation with 60% recommended dose of fertilizer without mulch
T4: Fertigation with 100% recommended dose of fertilizer with mulch
T5: Fertigation with 80% recommended dose of fertilizer with mulch
T6: Fertigation with 60% recommended dose of fertilizer with mulch
T7: Drip irrigation with 100% recommended dose of fertilizer as soil application without mulch

After fruit harvesting of the plant crop, one healthy sucker was kept on the mother plant by de-suckering the other emerging suckers. In the ratoon crop, fertigation was followed in a similar manner after fruit harvest of the plant crop till the flower induction. In treatment T7, the conventional method of fertilizer application (100% RDF @12:4:12 g NPK per plant) was followed by applying 1/4th quantity of N and K as basal and remaining quantity were given in three equal splits at three month interval till flower induction. Full dose of phosphorus was applied as basal at the time of planting. Table-1 shows the amount of nutrients applied under the various treatments.

Table 1: Nutrient applied under the treatments (g/ plant/ cycle)

Treatments	Fertilizer requirement (g)		
	Urea (46% N)	Monoammonium sulphate (12:52:0)	Sulphate of potash (50% K_2O)
T1: Fertigation with 100% RDF without mulch (12:4:12 g/plant)	24.4	6.6	24
T2: Fertigation with 80% RDF without mulch (9.6:3.2:9.6 g/plant)	19.5	5.3	19.2
T3: Fertigation with 60% RDF without mulch (7.2:2.4:7.2 g/plant)	14.6	3.9	14.4
T4: Fertigation with 100% RDF with mulch (12:4:12 g/plant)	24.4	6.6	24
T5: Fertigation with 80% RDF with mulch (9.6:3.2:9.6 g/plant)	19.5	5.3	19.2
T6: Fertigation with 60% RDF with mulch (7.2:2.4:7.2 g/plant)	14.6	3.9	14.4
T7: Drip irrigation with 100% RDF as soil application without mulch (12:4:12 g/plant)	24.4	6.6	24

All the biometric parameters were taken from 6 months after planting onwards in the plant crop and 2 months after harvesting of the plant crop in the ratoon crop. The observations were recorded at every 3 month interval up to flower induction in both the plant and ratoon crops.

The plant height was measured from the base to the tip of the tallest leaf and expressed in cm. Plant spread was taken in East-West and North- South direction and recorded in cm. All the functional and fully developed leaves were counted and recorded as the number of leaves. The D leaf, the tallest among all the leaves, was measured for length and width. The length was taken from the base to the tip of the leaf while the width from the middle, widest region of the leaf lamina. D-leaf chlorophyll content was estimated at flower induction stage following the standard procedure using 80% Acetone as the extraction agent. For leaf nutrient analysis, D leaves were collected, placed in a drier and kept at 65°C for 96 hours (Maeda *et al.*, 2011) [10] to fine powder form and stored in airtight plastic bottles at room temperature before digestion for nutrient analysis. Total nitrogen was estimated by the "Micro-kjeldahl Distillation" method. Phosphorus content of the leaf was determined by "Vanadomolybdophosphoric yellow colour method" as described by Jackson (1973). Total potassium content in the leaf sample was determined with the help of Flame Photometer. The yield per plot was determined by weighing the fruits with crown (average mass of the fruits) multiplying by the planting density per plot. The data were statistically analyzed with 0.05 probabilities using R software.

Results and Discussion

The height of the pineapple plant is an important growth character directly linked with its productive potential in terms of fruit yield. A perusal of data presented in Table- 2 on plant height showed that significant variations were noticed among different treatments at recorded stages of growth both in plant and ratoon crop. From the pooled mean data of both the seasons, it was found that at each recorded stage of plant growth, T4 i.e., 100% RDF through fertigation with mulch recorded the maximum plant height (99.44 cm) followed by T5 i.e., 80% RDF through fertigation with mulch (90.49 cm) which was at par with T1 i.e., 100% RDF through fertigation without mulch (85.79 cm). T7 i.e., 100% RDF through conventional fertilization without mulch (73.48 cm) recorded comparatively lower value for plant height. T3 i.e., 60% RDF through fertigation without mulch (60.53 cm) recorded the lowest plant height for both the seasons.

From Table-3 and Table-4 it was evident that the pooled mean data of two seasons showed significant variations among the treatments for canopy spread in both North-South and East-West directions at recorded crop growth stages. From crop establishment phase to floral induction phase T4 recorded the maximum plant spread (89.90 cm in N-S and 83.50 cm in E-W) in both the orientations which was followed by T5 (83.46 cm in N-S and 71.47 cm in E-W) and T1 (80.62 cm in N-S and 67.07 cm in E-W). T3 attained the lowest plant spread (64.18 cm in N-S and 48.60cm in E-W) at all the recorded growth stages in both plant and ratoon crop.

Number of functional leaves retained at flower induction is crucial for determining the yield potential. From Table-5 it can be observed that a similar pattern of growth was recorded in terms of number of functional leaves in both plant and ratoon crops. The pooled mean data of both the crops showed that the number of leaves ranged from 20.19 to 31.60 at crop establishment and 34.80 to 53.09 at flower induction. T4 observed the maximum number of functional leaves at flower induction i.e., 53.09, followed by T5 (46.75) and T1 (46.32). The lowest value for this parameter was recorded in T3 (34.80).

The D leaf of the pineapple plant is the youngest and physiologically mature leaf which reflects the current nutrient status of the plant with acceptable accuracy. Table-6 and 7 shows the recorded data of D leaf length and width at crop establishment and flower induction stages of plant and ratoon crops. The data of pooled mean of both the seasons revealed that D leaf length was observed the highest in T4 (60.95 cm and 84.50 cm). At both these stages D leaf width (3.74 cm and 4.53 cm) and leaf area (206.43 cm^2 and 448.16 cm^2) were also the highest in T4. D leaf width was highest in T4 at crop establishment (3.74 cm) and flower induction (4.53 cm). The lowest values (114.54 cm^2 and 221.33 cm^2) of this parameter were recorded in T3 at these stages.

Table-8 indicates that the maximum nitrogen content of leaves was observed in T4 (1.95%) followed by T5 (1.60%) and the minimum was found in T3 (0.75%). With regard to phosphorus content, no significant variation was found among the treatments but the maximum value was recorded in T4 (0.42%). Similarly, potassium content was found the maximum in T4 (2.53%) followed by T5 (1.92%).

The pooled mean of the D-leaf chlorophyll content indicated that chlorophyll a, chlorophyll b and total chlorophyll contents did not vary between the treatments either at crop establishment or flower induction stages. However, the values were higher in T4 (1.29 mg/g chlorophyll a, 1.43 mg/g chlorophyll b and 2.44 mg/g total chlorophyll) (Table-9).

The pooled mean pertaining to fruit yield per plot indicated that the maximum fruit yield was obtained in T4 (34.84 kg) followed by T5 (29.93 kg). The lowest yield was recorded in T3 (20.59 kg). (Table-10)

In pineapple, the initial vigour of the plant at the moment of flower induction is positively associated with quality attributes of the fruit at harvest. Plant height, plant girth, initiation of D-leaf and overall vegetative growth of pineapple is considered to be important factors to judge the vigour of pineapple crop (Bareily and Deb, 2018) [2]. In the present investigation, the application of 100% RDF through fertigation with plastic mulch (T4) significantly enhanced the plant height at all the recorded stages of growth both in plant and ratoon crops which indicated that the application of NPK at optimum rate and time promoted faster rate of plant growth. The absorbed nitrogen through judicious and frequent amount of fertigation might have been utilized by the plants in the formation of complex substances like protein and amino acids which in turn helped to build up new tissues. The number of functional leaves indicates the development status of the plant at flower induction stage. A pineapple crop should produce sufficient number of leaves to harness the light energy and synthesize adequate photosynthates for biomass production. The photosynthetic surface increases with the development of leaf area resulting in greater accumulation of water. Melo *et al.* (2006) [9] also observed that there is a significant and positive correlation between leaf area and shoot dry matter, stem dry matter and fruit mass of 'Perola' pineapple plants. T4 showed better results than T1 and T7, which were 100% RDF applied through fertigation and conventional methods respectively without mulch, which might be due to the combination of fertigation and mulching. Increased number of leaves might have increased the photosynthetic activity resulting in higher accumulation of carbohydrates. Relative higher amount of carbohydrates could have prompted the growth rate. The improvement in biometric parameters due to fertigation with 100% RDF and mulching could be ascribed to proper supply and translocation of nutrients with sufficient moisture availability in the root zone of the plants and minimized leaching of nutrients due to mulching. Followed by T4, the performance of T5 (80% RDF fertigation with mulch) was better than all other treatments which showed that effective use of fertilizers in combination with mulch can result in better growth and development of the plant. These results are in accordance with the findings of Bonomo *et al.* (2020) [4], Maneesha *et al.* (2019) [5] and Paoli *et al.* (2010) [6] on the effects of fertigation on pineapple and Tiwari (2017) [3] on the effects of fertigation and black plastic mulch on banana. In the control treatment (soil application of fertilizers without mulch) the same 100% RDF were applied to the soil and the performance could not match with the fertigated treatments with mulching which might be due to leaching loss of the nutrients and presence of weeds in the former. Nutrient levels in leaf tissue provide information about the quantity of nutrients absorbed by the plant. The higher total content and uptake of plant macronutrients (N, P and K) by pineapple plant might have resulted due to higher accumulation of all these nutrients in soil by frequent application through fertigation. These results are in consistent with those of Baraily and Deb (2018) [2].

Table 2: Effect of fertigation with and without mulch on plant height (cm)

Treatments	6MAP/2MAH			9MAP/5 MAH			12MAP/8 MAH			15MAP/8 MAH		
	Plant crop	Ratoon crop	Pooled mean	Plant crop	Ratoon crop	Pooled mean	Plant crop	Ratoon crop	Pooled mean	Plant crop	Ratoon crop	Pooled mean
T1	58.94	57.26	58.10	67.74	65.54	66.64	82.19	74.04	78.12	92.07	79.50	85.79
T2	53.43	48.60	51.02	65.89	56.57	61.23	73.05	64.17	68.61	81.84	68.87	75.36
T3	40.63	38.50	39.57	46.61	44.57	45.59	56.60	51.53	54.07	65.92	55.13	60.53
T4	68.72	67.34	68.03	79.64	77.15	78.40	93.09	85.43	89.26	104.35	94.53	99.44
T5	65.23	58.43	61.83	77.43	66.40	71.92	88.43	72.98	80.71	100.08	80.90	90.49
T6	46.23	39.98	43.11	53.98	47.13	50.56	60.33	55.00	57.67	69.17	61.6	65.39
T7	53.03	45.63	49.33	65.06	53.94	59.50	71.39	59.65	65.52	78.10	68.86	73.48
S.Em±	3.99	1.87	2.09	3.56	2.22	2.13	1.76	2.23	1.63	2.49	2.21	1.950
CD (0.05)	12.30	5.761	6.12	10.96	6.84	6.25	5.42	6.89	4.78	7.68	6.820	5.718

*MAP-months after planting
*MAH-months after harvesting

Table 3: Effect of fertigation with and without mulch on canopy spread N-S (cm)

Treatments	6MAP/2MAH			9MAP/5 MAH			12MAP/8 MAH			15MAP/8 MAH		
	Plant crop	Ratoon crop	Pooled mean	Plant crop	Ratoon crop	Pooled mean	Plant crop	Ratoon crop	Pooled mean	Plant crop	Ratoon crop	Pooled mean
T1	48.56	46.39	47.47	65.18	60.87	63.03	78.24	70.81	74.53	85.24	76.00	80.62
T2	45.17	42.35	43.76	56.52	52.39	54.46	70.33	65.28	67.81	78.67	71.89	75.28
T3	41.83	39.15	40.49	47.63	43.57	45.60	67.40	56.30	59.35	68.73	59.63	64.18
T4	54.83	49.42	52.13	74.51	67.75	71.13	83.74	79.72	81.73	93.08	86.72	89.90
T5	49.75	44.73	47.24	63.01	59.69	61.35	77.40	73.78	75.59	86.22	80.7	83.46
T6	43.27	41.96	42.62	50.44	48.75	49.57	69.92	63.46	66.69	71.25	66.13	68.69
T7	45.8	45.33	45.57	59.76	55.67	57.72	75.7	70.95	73.33	80.18	73.90	77.04
S.Em±	0.72	0.77	0.62	2.86	2.15	1.706	1.17	2.29	1.35	3.10	2.28	1.876
CD (0.05)	2.21	2.37	1.82	8.80	6.64	5.004	3.60	7.06	5.96	9.55	7.02	5.501

*MAP-months after planting
*MAH-months after harvesting

Table 4: Effect of fertigation with and without mulch on effect of canopy spread E-W (cm)

Treatments	6MAP/2MAH			9MAP/5 MAH			12MAP/8 MAH			15MAP/8 MAH		
	Plant crop	Ratoon crop	Pooled mean	Plant crop	Ratoon crop	Pooled mean	Plant crop	Ratoon crop	Pooled mean	Plant crop	Ratoon crop	Pooled mean
T1	44.03	43.88	43.95	53.13	51.93	52.53	61.43	59.27	60.85	68.73	65.40	67.07
T2	43.28	41.93	42.61	50.77	49.20	49.98	58.57	54.40	56.49	64.2	59.97	62.09
T3	37.24	36.20	36.72	42.20	39.10	40.65	47.37	43.40	45.38	51.03	46.17	48.60
T4	54.03	53.83	53.93	66.73	64.30	65.52	76.93	73.17	75.05	84.27	82.73	83.50
T5	51.49	50.13	50.81	58.83	57.08	57.96	67.47	62.80	65.14	72.8	70.13	71.47
T6	41.41	38.53	39.97	47.80	43.57	46.19	55.23	48.53	51.88	59.57	55.2	57.39
T7	44.58	40.50	42.54	53.37	53.23	53.30	62.55	57.37	59.96	68.7	64.5	66.60
S.Em±	1.68	2.60	1.429	1.79	2.69	1.541	2.54	3.36	1.946	2.74	2.93	1.878
CD (0.05)	5.19	8.02	4.190	5.50	8.29	4.518	7.82	10.35	5.707	8.44	9.03	5.507

*MAP-months after planting
*MAH-months after harvesting

Table 5: Effect of fertigation with and without mulch on number of leaves

Treatments	6MAP/2MAH			9MAP/5 MAH			12MAP/8 MAH			15MAP/8 MAH		
	Plant crop	Ratoon crop	Pooled mean	Plant crop	Ratoon crop	Pooled mean	Plant crop	Ratoon crop	Pooled mean	Plant crop	Ratoon crop	Pooled mean
T1	28.13	27.08	27.61	36.33	32.83	34.58	42.53	37.27	39.90	49.53	43.10	46.32
T2	25.27	24.42	24.85	30.20	28.33	29.27	36.87	33.50	35.18	42.53	38.40	40.47
T3	20.87	19.51	20.19	22.77	21.83	22.30	30.40	28.10	29.25	35.73	33.87	34.80
T4	32.93	30.27	31.60	39.80	34.93	37.37	48.07	43.73	45.90	56.40	49.77	53.09
T5	27.27	26.88	27.08	35.67	30.83	33.25	43.60	39.33	41.47	48.63	44.87	46.75
T6	21.60	19.95	20.78	27.17	24.45	25.81	32.17	31.03	31.60	39.07	36.33	37.70
T7	23.93	20.89	22.41	28.07	26.53	27.30	38.80	35.97	37.39	46.07	41.83	43.95
S.Em±	1.40	1.84	1.077	1.97	1.56	1.249	2.11	1.49	1.313	1.76	1.43	1.104
CD (0.05)	4.30	5.67	3.158	6.06	4.80	3.662	6.50	4.58	3.849	5.43	4.42	3.237

*MAP-months after planting
*MAH-months after harvesting

Table 6: Effect of fertigation with and without mulch on D-leaf length and width (cm)

	D leaf length						D leaf breadth					
	Crop establishment			Flower induction			Crop establishment			Flower induction		
Treatments	Plant crop	Ratoon crop	Pooled mean	Plant crop	Ratoon crop	Pooled mean	Plant crop	Ratoon crop	Pooled mean	Plant crop	Ratoon crop	Pooled mean
T1	56.33	48.23	52.28	80.60	72.56	76.58	3.30	3.23	3.27	4.26	4.06	4.16
T2	53.72	45	49.36	75.68	66.43	71.06	3.21	3.13	3.17	4.05	3.97	4.01
T3	43.97	38.47	41.22	64.02	59.13	61.58	2.53	2.44	2.48	3.19	2.78	3.13
T4	65.63	56.27	60.95	87.83	81.17	84.50	3.81	3.67	3.74	4.71	4.68	4.53
T5	56.03	50.10	53.07	81.89	73.00	77.45	3.31	3.19	3.25	4.55	4.54	4.40
T6	47.27	41.87	44.57	68.86	64.2	66.53	2.67	2.56	2.61	3.53	3.38	3.45
T7	52.18	48.40	50.29	74.8	68.96	71.88	3.21	3.14	3.18	3.92	3.88	3.78
S.Em±	2.69	2.58	1.79	1.85	1.36	1.216	0.16	0.21	0.12	0.11	0.18	0.10
CD (0.05)	8.29	7.93	5.24	5.71	4.18	3.565	0.50	0.64	0.36	0.34	0.56	0.29

Table 7: Effect of fertigation with and without mulch on D leaf area

	D leaf area(cm^2)					
Treatments	Crop establishment			Flower induction		
	Plant crop	Ratoon crop	Pooled mean	Plant crop	Ratoon crop	Pooled mean
T1	192.20	174.59	183.40	357.02	314.03	335.53
T2	171.98	160.45	166.22	312.93	270.41	291.92
T3	117.41	111.66	114.54	256.04	186.63	221.33
T4	222.75	190.10	206.43	477.26	419.06	448.16
T5	194.72	169.61	182.16	382.37	325.14	353.75
T6	133.97	122.30	128.13	220.83	216.93	218.88
T7	185.40	166.89	176.15	310.44	292.95	301.70
S.Em±	12.16	6.83	6.67	21.12	17.77	13.64
CD (0.05)	37.45	21.04	19.56	65.07	54.74	39.99

Table 8: Effect of fertigation with and without mulch on D-leaf nutrient content

	D leaf N% content			D leaf P% content			D leaf K% content		
Treatments	Plant crop	Ratoon crop	Pooled mean	Plant crop	Ratoon crop	Pooled mean	Plant crop	Ratoon crop	Pooled mean
T1	1.26	1.24	1.25	0.16	0.27	0.22	1.43	1.54	1.48
T2	0.97	1.14	1.05	0.15	0.23	0.19	1.06	1.27	1.16
T3	0.67	0.84	0.75	0.11	0.21	0.16	0.83	0.99	0.91
T4	1.68	2.22	1.95	0.25	0.59	0.42	2.22	2.83	2.53
T5	1.35	1.85	1.60	0.20	0.40	0.30	1.73	2.10	1.92
T6	0.81	0.92	0.86	0.19	0.33	0.26	1.02	1.08	1.05
T7	0.88	1.02	0.95	0.14	0.35	0.24	0.74	0.93	0.83
S.Em	0.119	0.146	0.094	NS	NS	NS	0.213	0.157	0.132
CD (0.05)	0.367	0.451	0.275				0.656	0.482	0.385

Table 9: Effect of fertigation with and without mulch on D leaf chlorophyll content

	Chlorophyll a			Chlorophyll b			Total Chlorophyll		
Treatments	Plant crop	Ratoon crop	Pooled mean	Plant crop	Ratoon crop	Pooled mean	Plant crop	Ratoon crop	Pooled mean
T1	1.07	0.91	0.99	1.18	1.10	1.14	2.35	2.26	2.31
T2	1.02	0.92	0.97	1.02	0.89	0.96	1.94	1.78	1.86
T3	0.76	0.67	0.72	0.41	0.38	0.39	1.42	1.23	1.32
T4	1.40	1.20	1.30	1.76	1.57	1.67	2.61	2.41	2.51
T5	1.14	0.94	1.04	1.23	1.12	1.18	2.34	2.11	2.23
T6	0.88	0.75	0.82	0.64	0.56	0.60	1.53	1.28	1.41
T7	0.94	0.87	0.90	1.06	0.99	1.03	2.23	1.96	2.10
SEM	NS	NS	NS	NS	NS	NS	NS	NS	NS
CD(0.05)									

Table 10: Effect of fertigation with and without mulch on fruit yield per plot

	Fruit yield /plot (kg/plot)		
Treatments	**Plant crop**	**Ratoon crop**	**Pooled mean**
T1	29.44	28.91	29.18
T2	28.42	24.90	26.66
T3	21.22	19.96	20.59
T4	35.43	34.26	34.84
T5	31.41	28.44	29.93
T6	22.05	20.62	21.34
T7	27.44	24.89	26.16
S.Em	1.84	1.48	1.104
CD(0.05)	5.67	4.57	3.237

Conclusion

Growth response of pineapple to NPK fertigation with and without mulching indicated that all the treatments were significantly affected by different levels of fertigation. Complete RDF through fertigation and mulch followed by 80% RDF through fertigation and mulch responded better in terms of growth and other biometric parameters in main and ratoon crops. It is concluded that fertigation applied at 80% RDF with mulching can produce equivalent results to the 100% RDF application through drip fertigation or soil without mulch with regard to growth and other vegetative parameters in pineapple crop.

References

1. Chadha KL, Leela D, Challa P. Weed management in horticultural and plantation crops. Malhotra Publishing House, New Delhi. 1997, 218.
2. Baraily P, Deb P. Effect of integrated nutrient management on growth and yield of pineapple (cv. Kew). International Journal of Chemical Studies. 2018;6(5):1691-1695
3. Santosh-Tiwari. Response of tissue cultured banana cv. Grand Naine to different levels of nutrients under drip fertigation and black plastic mulch. Applied Ecology and Environmental Research. 2017;15(4):1473-1488.
4. Robson Bonomo, MoisesZucoloto, Joabe Martins de Souza, Augusto Moreira de Paula Magalhães, Pedro Henrique de Souza Baldotto, Alex Campanharo. Production and quality of 'Pérola' pineapple under fertigation. Emirates Journal of Food and Agriculture. 2020;32(2):109-116.
5. Maneesha SR, Priya Devi S, Vijayakumar RM, Soorianathasundaram K. Effect of fertigation on vegetative growth of pineapple (*Ananas comosus* (L.) Merr.) Variety ‘Giant Kew’. International Journal of Chemical Studies. 2019;7(3):28-32.
6. Acevedo M, Román-Paoli E, Román-Pérez FM, Valencia E, Tirado-Corbalá R. Pineapple growth and yield response to fertilizer and drip irrigation management. The Journal of Agriculture of the University of Puerto Rico. 2017;101(2):203-223.
7. Jiusheng L, Jianjun Z, Ren L. Water and nitrogen distribution as affected by fertigation of ammonium nitrate from a point source. Irrigation Science. 2003;22:19-30.
8. Carr Mike. The water relations and irrigation requirements of pineapple (*Ananas comosus* var. comosus): A review. Experimental Agriculture. 2012, 48(04).
9. Melo AS, Netto AOA, Neto JD, Brito MEB, Viégas PRA, Magalhães LTS, *et al*. Vegetative development, fruit yield and optimization of pineapple variety ‘Pérola’ at different levels of irrigation. Rural Science Journal. 2006;36:93-98.
10. Mendes RM, Krause W, Rocha LA, Souza FL, Souza CB. Nitrogen Sources and Potassium Chloride Doses in Pineapple crop. Conference of Scientific Initiation. Cáceres, Brazil: University of Mato Grosso. 2011, 2178-74924.
11. Allen RG, Pareira LS, Dirk R, Smith M.Crop-Evapotranspiration-Guidelines for Computing Crop Water Requirements, FAO Irrigation & Drainage, Paper. 1994, 56.