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Effect on nutrient management on storage study in papaya (*Carica papaya* L.)

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Abstract
The experiment was conducted during 2016-2017 and 2017-2018 at Department of Horticulture, college of Agriculture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani. The experiment was laid out in Randomized Block Design (RBD) with ten treatments and three replications. Farm yard manure (10 kg/pit) was applied as basal dose as per recommendation. In all, ten treatment combinations involving different level of recommended dose and time of application, T_1: 100% RDF through straight Fertilizer at once, T_2: 80% RDF through water soluble fertilizers at monthly interval, T_3: 70% RDF through water soluble fertilizers at monthly interval, T_4: 60% RDF through water soluble fertilizers at monthly interval, T_5: 80% RDF through water soluble fertilizers at bimonthly interval, T_6: 70% RDF through water soluble fertilizers at bimonthly interval, T_7: 60% RDF through water soluble fertilizers at bimonthly interval, T_8: 80% RDF through water soluble fertilizers at trimonthly interval, T_9: 70% RDF through water soluble fertilizers at trimonthly interval, T_{10}: 60% RDF through water soluble fertilizers at trimonthly interval.
The storage parameters like physiological loss in weight (%) was minimum and fruit firmness (kg/cm^2), total sugar (%), TSS (%) and shelf life were maximum in plant treated with 80% RDF through water soluble fertilizer at monthly interval (T_2).

Keywords: RDF, papaya, storage

Introduction

Papaya (*Carica papaya* L.) is one of the important delicious fruit crop grown in the tropical and subtropical parts of the world. It is believed to be originated in Mexico and spread to almost all the corners of the tropical world. Papaya (*Carica papaya* L.*)* belonging to the family *caricaceae* was introduced in India in 16th century by Portuguese. It is one of the few plants which produce fruits throughout the year. It owes its popularity to various simple reasons like, it requires less area per tree, comes to fruiting within a year, easy to cultivate, provides per hectare income next to banana and has a high nutritive and medicinal value. Papaya belongs to the family of the 48 species known in *Caricaceae*, *Carica papaya* is only species grown for edible fruits (Chadha, 1992) [2]. There is wide diversity of biological types of cultivated papaya, which may be dioecious, monoecious and hermaphrodite (Arrilia *et al*., 1980) [1]. These are herbaceous, evergreen plants, grows with single and straight trunk which can reach upto 2-10 m having large deeply lobed hollow petiole leaves which gives palm like structure. Fruits are produced from leaf axils, and are generally spherical to oblong in shape, having central cavity. Papaya is one among the fruits which has attained a great popularity in recent years because of gynodioecious nature, itseasy cultivation, quick returns, adoptability to diverse soil and climatic conditions and above all its attractive delicious wholesome fruits having multifarious uses.

Papaya is known as poor man's fruit due to its nutritional value and price. Papaya's sweet fruits are mainly used for table purpose. It contents 89.6% moisture, 0.5% protein, 0.1% fat, 9.5% carbohydrates, 0.01% calcium, 0.01% phosphorus, 0.4% iron, 2020 IU/100 g vitamin A, 0.04 mg/100 g nicotinic acid, 250 mg/100 g riboflavin and calorific value 40/100 g. Papaya is rich source of several natural compounds like, alkaloids, pectins, volatile compounds, proteolytic enzymes and growth inhibitors besides papain (Ram, 2005) [4].

2. Material and Methods

The present investigation was carried out in year 2016-2017 and 2017-2018 at Department of Horticulture, college of Agriculture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani. The investigation was carried out with of different level of fertilizer and time of application on yield and quality of Papaya.

The present experiment was laid out in Randomized Block Design (RBD) with ten treatments and three replications. Farm yard manure (10 kg/pit) was applied as basal dose as per recommendation. In all, ten treatment combinations involving different level of recommended dose and time of application, T_1: 100% RDF through straight Fertilizer at once, T_2: 80% RDF through water soluble fertilizers at monthly interval, T_3: 70% RDF through water soluble fertilizers at monthly interval, T_4: 60% RDF through water soluble fertilizers at monthly interval, T_5: 80% RDF through water soluble fertilizers at bimonthly interval, T_6: 70% RDF through water soluble fertilizers at bimonthly interval, T_7: 60% RDF through water soluble fertilizers at bimonthly interval, T_8: 80% RDF through water soluble fertilizers at trimonthly interval, T_9: 70% RDF through water soluble fertilizers at trimonthly interval, T_{10}: 60% RDF through water soluble fertilizers at trimonthly interval.

3. Results and Discussion

3.1 Effect on Storage

The present investigation of different levels of recommended dose of fertilizers and their time of application in split *i.e.* monthly, bimonthly and trimonthly significantly effect on storage parameter viz., physiological loss in weight (Table 1), fruit firmness (Table 2), total sugar (Table 3), total soluble solid (Table 4) and shelf life (Table 5) of papaya fruit were recorded at significantly maximum in treatment $T_{2.}$ However, the fruit firmness was at par with T_3, T_4, T_1 and $T_{5.}$The total soluble solid was at par with T_5,T_1, $T_{3,}$$T_4$, $T_{6,}$ However, shelf life was at par with T_3, T_1, $T_{8,}$ T_6 and $T_{5.}$

Shelf life of the fruits was affected significantly with different treatments. This might be due to the fact that, shelf life is not control by nutritional factors. It depends on various factors only such as stage of maturity, temperature, humidity ethylene content and chemical composition of the fruits etc. Shelf life of fruit longer might be due to reduced rate of respiration and transpiration from fruit surfaces. The decreased in the respiration could be further attributed to lowering of succinate and malate dehydrogenase activities associated with TCA cycle. Presence of epicuticular wax on the fruit skin also reduces respiration and transpiration during postharvest period by partially blocking the lenticels, cuticle and consequently retards the moisture loss caused by transpiration. (Singh *et al.* 2010) [5] these results are in conformity with finding reported by Parmar *et al.*, (2017) [3].

Table 1: Effect of nutrient management on physiological loss in weight

Treatment No.	Treatment Details	Physiological loss in weight (%)		
		2016-17	2017-18	Pooled
T_1	100% RDF through Straight Fertilizer at once	14.74* (22.58)	15.71 (23.35)	15.22 (22.96)
T_2	80% RDF through water soluble fertilizer at monthly interval	13.21 (21.31)	13.29 (21.38)	13.24 (21.34)
T_3	70% RDF through water soluble fertilizer at monthly interval	15.29 (23.02)	15.29 (23.02)	15.29 (23.02)
T_4	60% RDF through water soluble fertilizer at monthly interval	19.14 (25.94)	19.73 (26.37)	19.43 (26.15)
T_5	80% RDF through water soluble fertilizer at bimonthly interval	15.86 (23.47)	15.93 (23.52)	15.89 (23.49)
T_6	70% RDF through water soluble fertilizer at bimonthly interval	16.61 (24.05)	16.37 (23.87)	16.49 (23.96)
T_7	60% RDF through water soluble fertilizer at bimonthly interval	16.30 (23.81)	16.83 (24.22)	16.56 (24.01)
T_8	80% RDF through water soluble fertilizer at trimonthly interval	15.27 (23.00)	14.47 (22.36)	14.87(22.68)
T_9	70% RDF through water soluble fertilizer at trimonthly interval	20.28 (26.77)	20.35 (26.81)	20.31 (26.79)
T_{10}	60% RDF through water soluble fertilizer at trimonthly interval	22.21 (28.12)	21.74 (27.79)	21.97 (27.95)
	S.Em. ±	0.79	0.87	0.54
	C.D. at 5%	2.36	2.59	1.50

* figures in parenthesis indicate the arc sine value.

Table 2: Effect of nutrient management on fruit firmness

Treatment No.	Treatment Details	Fruit firmness (Kg/cm^2)		
		2016-17	2017-18	Pooled
T_1	100% RDF through Straight Fertilizer at once	6.90	6.74	6.82
T_2	80% RDF through water soluble fertilizer at monthly interval	7.24	7.07	7.15
T_3	70% RDF through water soluble fertilizer at monthly interval	7.02	6.88	6.95
T_4	60% RDF through water soluble fertilizer at monthly interval	6.82	6.88	6.85
T_5	80% RDF through water soluble fertilizer at bimonthly interval	6.40	6.50	6.44
T_6	70% RDF through water soluble fertilizer at bimonthly interval	6.32	6.12	6.22
T_7	60% RDF through water soluble fertilizer at bimonthly interval	5.98	6.05	6.01
T_8	80% RDF through water soluble fertilizer at trimonthly interval	6.00	6.21	6.10
T_9	70% RDF through water soluble fertilizer at trimonthly interval	5.84	5.96	5.90
T_{10}	60% RDF through water soluble fertilizer at trimonthly interval	5.66	5.476	5.56
	S.Em. ±	0.42	0.45	0.28
	C.D. at 5%	NS	NS	0.78

Table 3: Effect of nutrient management on total sugars (%) in storage

Treatment No.	Treatment Details	Total sugars (%)		
		2016-17	2017-18	Pooled
T_1	100% RDF through Straight Fertilizer at once	10.39	9.7	10.05
T_2	80% RDF through water soluble fertilizer at monthly interval	11.50	10.6	11.05
T_3	70% RDF through water soluble fertilizer at monthly interval	11.35	10.2	10.78
T_4	60% RDF through water soluble fertilizer at monthly interval	10.22	9.8	10.01
T_5	80% RDF through water soluble fertilizer at bimonthly interval	11.03	10.2	10.62
T_6	70% RDF through water soluble fertilizer at bimonthly interval	10.38	9.5	9.94
T_7	60% RDF through water soluble fertilizer at bimonthly interval	9.95	9.3	9.63
T_8	80% RDF through water soluble fertilizer at trimonthly interval	10.06	9.3	9.68
T_9	70% RDF through water soluble fertilizer at trimonthly interval	9.70	9.2	9.45
T_{10}	60% RDF through water soluble fertilizer at trimonthly interval	9.07	8.3	8.69
	S.Em. ±	0.31	0.31	0.32
	C.D. at 5%	0.93	0.92	0.95

Table 4: Effect of nutrient management on total soluble solids (%) in storage

Treatment No.	Treatment Details	Total soluble solids (%)		
		2016-17	2017-18	Pooled
T_1	100% RDF through Straight Fertilizer at once	13.58	12.9	13.24
T_2	80% RDF through water soluble fertilizer at monthly interval	13.83	13.0	13.42
T_3	70% RDF through water soluble fertilizer at monthly interval	13.74	12.6	13.17
T_4	60% RDF through water soluble fertilizer at monthly interval	12.56	12.3	12.43
T_5	80% RDF through water soluble fertilizer at bimonthly interval	13.77	12.9	13.34
T_6	70% RDF through water soluble fertilizer at bimonthly interval	13.35	12.5	12.93
T_7	60% RDF through water soluble fertilizer at bimonthly interval	11.95	11.2	11.58
T_8	80% RDF through water soluble fertilizer at trimonthly interval	12.86	12.1	12.48
T_9	70% RDF through water soluble fertilizer at trimonthly interval	11.49	11.1	11.30
T_{10}	60% RDF through water soluble fertilizer at trimonthly interval	10.71	9.4	10.06
	S.Em. ±	0.52	0.38	0.40
	C.D. at 5%	1.56	1.13	1.17

Table 5: Effect of nutrient management on shelf life of fruit

Treatment No.	Treatment Details	Shelf life of fruit (Days)		
		2016-17	2017-18	Pooled
T_1	100% RDF through Straight Fertilizer at once	7.13	6.89	7.01
T_2	80% RDF through water soluble fertilizer at monthly interval	7.60	7.11	7.35
T_3	70% RDF through water soluble fertilizer at monthly interval	7.47	6.89	7.17
T_4	60% RDF through water soluble fertilizer at monthly interval	6.33	6.22	6.27
T_5	80% RDF through water soluble fertilizer at bimonthly interval	7.33	5.89	6.61
T_6	70% RDF through water soluble fertilizer at bimonthly interval	7.07	6.22	6.64
T_7	60% RDF through water soluble fertilizer at bimonthly interval	6.20	5.11	5,65
T_8	80% RDF through water soluble fertilizer at trimonthly interval	6.93	6.78	6,85
T_9	70% RDF through water soluble fertilizer at trimonthly interval	5.73	5.78	5.75
T_{10}	60% RDF through water soluble fertilizer at trimonthly interval	5.47	5.11	5.28
	S.Em. ±	0.47	0.44	0.30
	C.D. at 5%	1.41	1.31	0.85

Conclusion

The data regrading storage parameters viz., fruit firmness, total sugars, total soluble solid, shelf life where as maximum and minimum in physiological loss in weight recorded in T2 i.e. application of 80% RDF through water soluble fertilizer at monthly interval.

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