

Effect of Mulching and Supplementary Irrigation on Fruit Quality Characteristics of Karonda

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ABSTRACT

The present investigation was carried out to study the efficacy of different mulching materials with irrigation and without irrigation in karonda cultivation in respect to improve the growth, yield and quality parameters. The TSS and total sugars were significantly highest in T₄ (Black polythene mulching and irrigation) viz., 7.85⁰ Brix and 5.98% respectively followed by T₅ (White polythene mulching+ irrigation) and T₆ (Leaf mulching + irrigation at 15 days intervals). While the lowest TSS (6.05⁰ Brix) and lowest total sugar (4.57%) was recorded in control (no mulching and no irrigation). Similarly, maximum reducing sugar (3.47%) and ascorbic acid (16.05 mg) was recorded under the treatment of Black polythene mulching+ irrigation (T₄). Whereas it was minimum in control (no mulching and no irrigation). On the contrary, maximum acidity (2.80%) was recorded in control i.e. no mulching and no irrigation whereas minimum acidity (1.89%) observed in Black polythene mulching + irrigation (T₄). The maximum (4.26) TSS/Acid ratio was found in T₄ while minimum TSS/Acid ratio (2.16) was recorded in control. The highest (63.65%) juice percentage was recorded under Leaf mulching + irrigation (T₆) while lowest juice (49.65%) was recorded in control i.e. no mulching and no irrigation (T₇). From the results it can be concluded that considering all treatments, Black polythene mulching + irrigation at 15 days interval (T₄) may be recommended for used in karonda cultivation in new alluvial zone of West Bengal.

Key words: Mulching Material, Irrigation, Karonda, Black Polythene, White Polythene, Leaf Mulching.

INTRODUCTION

Karonda, (*Carissa carandas*) is an indigenous fruit crop belongs to family Apocynaceae. It occurs throughout India, Myanmar, Sri Lanka, South Africa and Malaya, mostly on sandy or rocky soil in a wild state. Karonda is a large,

evergreen, erect shrub with dense dark green foliage and it grows to a height of about 3-6 meters. Being a thorny it is used as live fencing around the field besides providing sweet fruits.

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Fruits are oblong, broad ovoid or round, 1.25-2.5 cm long; has thin but tough purplish -red smooth glossy skin turning dark purple or nearly black when ripe. The fruits are sub acidic and sweet when ripe and rich in carbohydrates, pectins, minerals, especially iron and vitamin C. Dried fruit contain about 67.1 per cent carbohydrates, 9.6 per cent fat, 2.3 per cent pectin and 39.1 per cent iron. The ripe fruits of karonda are sweet and particularly suitable for tarts, puddings and jellies. The unripe fruit is sour and astringent and which is used for making pickles, chutneys. The fruits are traditionally used in the treatments of malaria, epilepsy, nerve disorder, relieve of pain and headache, fever, blood purifier, myopic spasms, dog bite, cough, colds, itches and leprosy^{14,18}. Tree growth is greatly influence by mulching and supplementary irrigation. Supplemented irrigation along with organic mulch has reported to enhance the yield and quality of fruits¹¹. Mulching is known to play an important role in the conservation of soil moisture⁶ during dry periods besides offering the advantages water runoff and soil erosion, improve water and fertilizer use efficiency¹⁵. Studies also indicate that the addition of organic mulches decreased the fertilizer

requirements⁴, decreased soil bulk density, and increased soil carbon and cation exchange capacity¹⁷, as well as improved soil structure¹³. Therefore, the present study aimed to investigate the effect of mulching and supplementary irrigation on fruit quality of karonda.

MATERIAL AND METHODS

The experiment was conducted at Horticultural Research Station, 'Mandouri, Faculty of Horticulture, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal. The experimental was laid out in Randomized block design with total seven treatments and replicated four times. The local variety of karoda is planted at spacing of 2x2 m. There were total seven treatment of mulching and supplementary irrigation viz., T₁- Black polythene mulching, T₂- White polythene mulching, T₃- Leaf mulching, T₄- Black polythene mulching and irrigation (15 litre per plant) at 15 days interval, T₅- White polythene mulching and irrigation (15 litre per plant) at 15 days interval, T₆- Leaf mulching and irrigation (15 litre per plant) at 15 days interval, T₇ (control)- No mulching and no irrigation.

Table 1: Physico-chemical properties of soil of the experimental field

S.N.	Parameters	Values observed	Method used
1.	Soil texture	Sandy loam	
2.	pH	6.8	pH meter ⁷ (Jackson, 1973)
3.	Organic carbon (%)	0.36	Walkley and Black's method ⁷ (Jackson, 1973)
4.	Available nitrogen (kg/ha)	238.37	Modified micro Kjeldal ⁷ (Jackson, 1973)
5.	Available phosphorus (kg/ha)	24.67	Bray and Kutzon calorimetric ⁷ (Jackson, 1973)
6.	Available potassium (kg/ha)	282.15	Flame Photo meter ⁷ (Jackson 1973)

The observations were recorded and analysed the quality parameters in the laboratory. The total soluble solids of the fruit juice was determined by using hand refractometer (Erma.Tokyo – A^o 32) and the results were expressed in (°Brix). The total sugars content was estimated by using the method suggested by Hedge and Hofreiter⁵ and was expressed in

per cent. The reducing sugars content was estimated by following the method suggested by Somogyi and was expressed in per cent. The acidity will be estimated as per the AOAC method¹ and expressed in per cent of citric acid equivalents. The ascorbic acid content of fruit or pulp was estimated as per the method of AOAC¹ and expressed in (mg 100g⁻¹). The

sugar-acid ratio determines by ratio of percentage of total sugar and titrable acidity.

RESULTS AND DISCUSSION

Significant difference was observed and varied from 6.05 to 8.05⁰ Brix in total soluble solids content of fruits due to different mulching materials, irrigation and their interaction effects (**Table 2**). The maximum total soluble solids 8.05⁰ Brix was found in Black polythene mulch + irrigation (T4) followed by TSS 7.85⁰ Brix and TSS 7.67⁰ Brix under the treatments of White polythene mulch + irrigation (T5) and Leaf mulching + irrigation at 15 days interval (T6) respectively. The minimum TSS 6.05⁰ Brix was recorded in control (no mulching and no irrigation). The higher TSS recorded under black polythene mulching may be attributed due to better availability of nutrients, optimum soil moisture and temperature that might have been maintained due to mulching treatments. The present findings are in conformity with observation of Joshi *et.al*⁸., in Litchi, Bakshi *et al*²., in

Strawberry; Singh *et.al*¹⁶., in Guava. The highest total sugar (5.98%) was noticed when applied with Black polythene mulch + irrigation (T4) followed by White polythene mulch + irrigation (5.77%) (T5) and 5.39% under the treatment of Leaf mulching + irrigation at 15 days' interval (T6) (**Table 2**). The lowest total sugar (4.57%) was in control plant (no mulching and no irrigation). The present investigation is similar with the findings of Pande *et al*¹²., in apple cv. Red Delicious recorded highest total sugars (9.50%) and reducing sugar (6.90%) under black polyethylene mulch followed by dry leaves mulch and clean cultivation. The data pertaining in Reducing sugar content showed significant variation (**Table 2**).The maximum Reducing sugar (3.47%) was recorded under the treatment of Black polythene mulching+ irrigation (T4) which was statistically at par with White polythene mulching + irrigation (3.38%) and of Leaf mulching + irrigation (3.30%).Where as it was minimum (2.28%) in control (no mulching and no irrigation).

Table 2: Effect of mulching and supplementary irrigation on TSS, total Sugar, reducing Sugar in karonda

Treatments	Characters		
	TSS (⁰ B)	Total sugar (%)	Reducing sugar (%)
T1	7.15	5.34	3.21
T2	6.82	5.23	3.13
T3	6.47	5.14	2.98
T4	8.05	5.98	3.47
T5	7.85	5.77	3.38
T6	7.67	5.53	3.30
T7	6.05	4.57	2.28
SEm	0.08	0.05	0.06
CD (0.5%)	0.24	0.15	0.19

T₁- Black polythene mulching, T₂- White polythene mulching, T₃- Leaf mulching, T₄- Black polythene mulching + irrigation (15 litre per plant) at 15 days' interval, T₅- White polythene mulching+ irrigation (15 litre per plant) oat 15 days' interval, T₆- Leaf mulching + irrigation (15 litre per plant) at 15 days' interval, T₇-No mulching and no irrigation

Significant difference was recorded on Ascorbic acid content of fruits due to different mulching and irrigation effects (**Table 3**). The

highest (16.05 mg) ascorbic acid content was observed in Black polythene mulch + irrigation (T4) followed by White polythene mulching + irrigation (T5) (14.57 mg) at 15 days' interval and it was 13.25 mg under the Leaf mulching + irrigation (T6) and minimum 8.97 mg in control (no mulching and no irrigation). The result is in close agreement with the findings of Maji and Das¹⁰ in guava under different organic and inorganic mulching materials. Bal and Singh³ also

reported similar trend in Ber. The acidity percentage in different treatments vary from 1.89 to 2.80 percent (**Table 3**). The maximum acidity (2.80%) was recorded in control *i.e.* no mulching and no irrigation whereas minimum acidity (1.89%) observed in Black polythene mulching + irrigation (T4) followed by White polythene mulching + irrigation at 15 days' interval (T5) (2.10%). Bal and Singh³ in Ber & Bakshi *et al*², in Strawberry also reported similar results for this character. Significant difference was observed and varied from 2.16 to 4.26 in TSS/Acid ratio content of fruits due to different mulching materials, irrigation and their interaction effects (**Table 3**). The maximum (4.26) TSS/Acid ratio was found in Black polythene mulching + irrigation followed by 3.74 and 3.57 under the treatments of White polythene mulching

+irrigation and Leaf mulching + irrigation at 15 days' interval (T6) respectively. The minimum TSS/Acid ratio (2.16) was recorded in control (no mulching and no irrigation). The highest (63.65%) juice percentage was recorded under Leaf mulching + irrigation (T6) followed by Black polythene mulching+ irrigation (T4) having 61.67 percent and White polythene mulching + irrigation at (T5), it was 58.22 percent. The Lowest juice (49.65%) was recorded in control *i.e.* no mulching and no irrigation (T7). Similar findings in terms of juice percentage was reported by Kumar *et al*⁹. From the results it can be concluded that considering all treatments, Black polythene mulching + irrigation at 15 days interval (T₄) may be recommended for used in karonda cultivation in new alluvial zone of West Bengal.

Table 3: Effect of mulching and supplementary irrigation on Ascorbic acid content, Acidity and Juice Percentage in karonda

Treatments	Characters			
	Ascorbic acid (mg/ 100 g edible portion)	Acidity (%)	TSS/Acid ratio	Juice (%)
T1	11.72	2.34	3.05	54.75
T2	11.00	2.41	2.83	53.05
T3	10.37	2.52	2.57	55.90
T4	16.05	1.89	4.26	61.67
T5	14.57	2.10	3.74	58.22
T6	13.25	2.15	3.57	63.65
T7	8.97	2.80	2.16	49.65
SEm	0.25	0.03	0.09	0.47
CD (0.5%)	0.75	0.10	0.27	1.41

T₁- Black polythene mulching, T₂- White polythene mulching, T₃- Leaf mulching, T₄- Black polythene mulching + irrigation (15 litre per plant) at 15 days' interval, T₅- White polythene mulching+ irrigation (15 litre per plant) at 15 days' interval, T₆- Leaf mulching + irrigation (15 litre per plant) at 15 days' interval, T₇-No mulching and no irrigation.

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