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Effect of cultural and chemical treatments on fruit set and fruit yield of custard apple (*annona sqamosa* Lin.) cv. Sindhan

N. M. Patel *, D. K. Patel, L. R. Verma and M. M. Masu
Department of Horticulture, C.P.College of Agriculture, S.D.A.U., Sardar krushinagar- 385 506, District: Banaskantha, Gujarat

Abstract

A trial was conducted to study the influence of wheat straw mulch and different plant growth regulators on fruit set, yield and quality of custard apple. Maximum flowering duration and fruit retention was observed with wheat straw mulch + GA_3 (5 t/ha + 50 ppm) treatments. Highest number of fruits, fruit yield , fruit diameter and fruit pulp were also recorded under same treatments. Wheat straw mulch gave 21% higher fruit yield of custard apple. However application of 20 ppm NAA was at par with GA_3 (50 ppm). On economic basis , 50 ppm GA_3 + wheat straw mulch followed by 20 ppm NAA + wheat straw mulch gave highest net income.

Key wards: *Custard apple ,fruit retention, fruit yield, GA, mulch, NAA*

Introduction

Custard apple (*Anona squamosa* L.) is an arid fruit crop and hardy in nature requires dry climate with mild winter . It can grow successfully from sea level up to 100 m above the mean sea level elevation and also drought (Singh, 1992). Custard apple flowered during the period of April to August. Due to high temperature , low atmospheric humidity , lack of irrigation water and natural stress resulted less number of flower , poor fruit setting and low yield and degraded quality of fruit too. To control these problems only one solution is that , with mulch to procure the moisture within the periphery of the plant of custard apple . Several scientists have also reviewed this type of the cultural practices in Maharashtra and also in Gujarat. Studies have shown that mulching of even an evergreen tree like mango could ensure regular bearing. The techniques have been successfully tried in many orchards in Maharashtra. Among the various uses of growth regulators which have received wide spread acceptance and application in the field of Horticulture in recent years, the use of plant growth regulating chemicals in grape,mango,mandrin have become a standard practice for increasing flowering , fruit setting , fruit size and control of post harvest losses. This paper describes the interference of mulch and plant growth regulators on yield attributing characters and fruit yield of custard apple.

* Corresponding author's E-mail : patel.narottambhai @ yahoo.com

Materials and methods

Present investigation on the Effect of mulch and plant growth regulators on custard apple cv. Sindhan were carried out on the nine year old trees having uniform growth with spaced at 6 m x 5 m at Fruit Research Station, Dehgam, Di: Gandhinagar (Gujarat) during the year 2002 and 2003. The experiment was conducted in Randomized Block Design with four replications with total sixteen treatment combinations. Mulch with wheat straw and no mulch were tested. Custard apple trees were sprayed with different plant growth regulators viz., GA3 at 50 and 100 ppm , NAA at 20 and 30 ppm , 2,4-D at 15 and 30 ppm and water spray. The plant growth regulators were sprayed four times at twenty-one days interval. The first spray was done on 1st week of May in both the years. Irrigation was given one day before spray. All the cultural operations like weeding, interculturing and irrigation were adapted uniformly to all experimental plants. Observations of various yields attributing characters and fruit yield were recorded. Results thus obtained were subjected to statistical analysis.

Results and discussion

Wheat straw mulch and spraying of plant growth regulators like GA_3 50 ppm and NAA 20 ppm had

significant effect on flowering duration , fruit retention , number of fruits , fruit yield , fruit pulp and fruit diameter during both the years of study as well as in pooled results also (Table 1,2,3). Only flowering duaration and fruit retention were not affected significantly in pooled years. Mandal and Chattopadhyay (1994) observed the effect of mulches like black plastic , saw dust, straw or coarse sand increase the flowering duration , fruit set and yield of *Annona squamosa* at Mondouri during 1990-91. Among the various treatments, flowering duration was longest with the spraying of 50 ppm GA_3 and it was followed by 20 ppm NAA and 100 ppm GA_3. In this study, it was observed that four spraying of plant growth regulators increased flowering duration over control and other sprays. The more day of flowering duration increased the more number of fruit set due to the application of 50 ppm GA_3 and mulch with wheat straw . Khan et al (1974) also found same results with 75 ppm GA_3 in litchi fruits. Chaudhary *et al* (1992) proved that application of GA_3 was the best for fruit retention percentage in Loquat. The results obtained by Raghuramulu *et. al* (1990) in Robusta coffee , Oasthuyse (1995) in Tommy Atkins and Heldi mango, Sandhu and Thind (7) in Umran ber are collaborated with these results. This might be due to well known effect of NAA for its flower and fruit retention property.

Fruit diameter and fruit pulp were also affected significantly due to wheat straw mulch, 50 ppm GA_3 and 20 ppm NAA. The research work done by Chaudhary *et al* (1992) and reported that GA3 at 40 ppm proved to be the most effective for the retention of fruits, increased diameter and weight of fruits. The increase in total yield of fruits by GA treatments can be attributed to better vegetative growth and more leaf area for photosynthetic activity. With the spraying of GA , number of seeds and seed weight are reduced and higher pulp produced. Chaudhary *et al* (1992) noticed reduction in seed size in ber by spraying of 40 ppm NAA. Wheat straw mulch also significant affect on fruit diameter and fruit pulp . This might be due to mulching reduced the need for weed control and substituted control the soil temperature and accumulation of more moisture resulted more absorption of water and plant nutrients from the soil and ultimately attain big size of fruit, higher fruit pulp and resulted more yield per tree. Aulakh and Sir (1999) also observed the effect of different mulches on soil temperature, soil moisture, weed population, growth and yield in pomegranate.

The combined effect of GA_3 50 ppm and wheat straw mulch was significantly influenced in pooled results in respect of fruit yield , number of fruits and fruit pulp (Table 2.1, 2.2, 3.1). Application of GA_3 identically prolonged the maturity of fruit and increased the number of fruits as well as fruit yield (Fig. 1 and Fig. 2). By using different cultural practices and spraying of GA_3 (50 ppm) and NAA (20 ppm), the benefits to farmers can be increased.(Table 4)

Table 1. Effect of various plant growth regulators and mulching treatments on flowering duration and fruit retention of custard apple

	Flowering duration (Days)			Fruit retention (%)		
	2002	2003	pooled	2002	2003	pooled
Cultural (Mulching) :						
With mulch	93	97	96	81.74	85.60	83.67
Without mulch	91	93	92	75.33	82.51	78.92
S.Em.±	0.16	0.53	0.72	0.87	0.46	1.17
C.D. at 5%	0.47	1.51	N.S.	2.50	1.33	N.S.
Chemicals (PGRs) :						
GA_3 50 ppm	94	97	96	89.31	91.56	90.44
GA_3 100 ppm	93	96	94	85.10	87.51	86.31
NAA 20 ppm	93	97	95	85.78	89.70	87.74
NAA 30 ppm	93	96	95	80.61	86.70	83.65
2,4 -D 15 ppm	93	95	94	77.35	82.90	80.13
2,4-D 30 ppm	93	93	93	75.20	81.20	78.20
Water spray	92	93	93	72.32	78.06	75.19
Control	90	93	92	62.61	74.84	68.73
S.Em.±	0.32	1.06	0.55	1.75	0.93	1.56
C.D. at 5%	0.92	N.S.	1.56	5.01	2.67	5.23
C.V.%	0.99	3.17	2.37	6.33	3.15	4.90
Interaction :						
C.D. at 5%	NS	NS	NS	NS	NS	NS

Table 2. Effect of various plant growth regulators and mulching treatments on number of fruits and fruit yield of custard apple

	Number of fruits			Fruit yield (kg ha^{-1})		
	2002	2003	pooled	2002	2003	pooled
Cultural (Mulching) :						
With mulch	65.50	126.71	96.10	2640	4640	3640
Without mulch	53.71	108.37	81.04	2197	3840	3020
S.Em.±	1.30	2.38	1.35	73.33	113.3	66.67
C.D. at 5%	3.71	6.80	3.82	206.7	323.3	190
Chemicals (PGRs) :						
GA_3 50 ppm	84.12	166.37	125.25	3363	5790	4577
GA_3 100 ppm	63.75	122.25	93.00	2600	4437	3517
NAA 20 ppm	66.37	139.50	102.93	2963	5280	4120
NAA 30 ppm	60.50	123.12	91.81	2337	3667	3003
2,4 -D 15 ppm	52.50	105.12	78.81	2583	4453	3520
2,4-D 30 ppm	56.62	104.87	80.75	2083	3543	2813
Water spray	53.37	95.37	74.37	1720	3777	2750
Control	39.62	83.75	61.68	1703	2977	2340
S.Em.±	2.60	4.77	7.09	143.3	226.7	220
C.D. at 5%	7.43	13.60	23.74	410	650	733.3
C.V.%	12.38	11.48	12.28	16.83	15.17	16.16
Interaction :						
C.D. at 5%	N.S.	N.S.	CUCH	N.S.	N.S.	CUCH

Table 2.1. Interaction for number of fruits/tree (pooled) Mulching x Plant growth regulators

Mulching / Plant growth regulators	CH_1	CH_2	CH_3	CH_4	CH_5	CH_6	CH_7	CH_8
With mulch (CU_1)	142.87	100.00	109.87	100.87	80.37	88.50	81.87	64.50
Without mulch (CU_2)	107.62	86.00	96.00	82.75	77.25	73.00	66.87	58.87
S.Em.±	3.84							
C.D. at 5%	10.82							

Table 2.2. Interaction for total fruit yield (kg ha^{-1}) (pooled) Mulching x Plant growth regulators

Mulching / Plant growth regulators	CH_1	CH_2	CH_3	CH_4	CH_5	CH_6	CH_7	CH_8
With mulch (CU_1)	5187	4093	4420	3320	3900	2897	2920	2373
Without mulch (CU_2)	3960	2940	3820	2683	3137	2727	2573	2303
S.Em.±	190							
C.D. at 5%	533							

From the foregoing discussion, it can be concluded that application of either GA_3 (50 ppm) or NAA (20 ppm) with wheat straw mulch enhanced fruit set, fruit retention and fruit yield of custard apple as well as higher economic return in North Gujarat conditions.

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Table 3. Effect of various plant growth regulators and mulching treatments on fruit diameter and fruit pulp weight of custard apple

	Fruit diameter (cm)			Fruit pulp (g)		
	2002	2003	pooled	2002	2003	pooled
Cultural (Mulching) :						
With mulch	6.89	7.00	6.95	71.09	81.96	76.53
Without mulch	6.60	6.66	6.63	65.00	70.87	67.93
S.Em.±	0.07	0.05	0.04	1.19	1.41	0.92
C.D. at 5 %	0.21	0.15	0.13	3.40	4.03	2.59
Chemicals (PGRs) :						
GA_3 50 ppm	7.22	7.40	7.31	88.50	97.12	92.81
GA_3 100 ppm	6.71	6.95	6.83	75.00	84.75	79.87
NAA 20 ppm	6.95	7.10	7.02	84.00	92.37	88.18
NAA 30 ppm	6.75	6.82	6.78	67.75	76.50	72.12
2,4 -D 15 ppm	6.76	6.81	6.78	61.12	71.50	66.31
2,4-D 30 ppm	6.53	6.68	6.61	59.50	65.50	62.50
Water spray	6.62	6.53	6.58	54.37	60.50	57.43
Control	6.42	6.36	6.39	54.13	63.12	58.62
S.Em.±	0.15	0.10	0.09	1.19	2.82	1.85
C.D. at 5 %	0.43	0.31	0.26	3.40	8.06	5.19
C.V.%	6.38	4.50	5.51	9.94	10.46	10.26
Interaction :						
C.D. at 5 %	N.S.	N.S.	N.S.	N.S.	N.S.	CUCH

Table 3.1. Interaction for fruit pulp weight of fruit (g) (pooled) Mulching x Plant growth regulators

Mulching / Plant growth regulators	CH_1	CH_2	CH_3	CH_4	CH_5	CH_6	CH_7	CH_8
With mulch (CU_1)	95.75	82.62	89.00	82.12	73.75	67.87	61.25	59.87
Without mulch (CU_2)	89.00	77.12	87.00	62.12	58.87	51.12	53.62	56.12
S.Em.±	2.61							
C.D. at 5 %	7.35							

Table 4. Economics of custard apple as influenced by various plant growth substances and mulching treatments

Treatments	Net income (Rs./ha)	B:C Ratio
With mulch + GA3 50 ppm	42087	5.38
With mulch + GA3 100 ppm	29137	3.50
With mulch + NAA 10 ppm	36315	5.60
With mulch + NAA 20 ppm	25287	4.20
With mulch + 2,4-D 15 ppm	31147	5.00
With mulch + 2,4-D 30 ppm	21097	3.70
With mulch + Water spray	21397	3.70
With mulch + Control	16437	3.20
Without mulch + GA3 50 ppm	31150	4.70
Without mulch + GA3 100 ppm	18970	2.80
Without mulch + NAA 10 ppm	31648	5.80
Without mulch + NAA 20 ppm	20250	4.10
Without mulch + 2,4-D 15 ppm	24850	4.80
Without mulch + 2,4-D 30 ppm	20730	4.20
Without mulch + Water spray	19270	3.90
Without mulch + Control	17030	3.80

Selling price of custard apple fruit Rs. 10/- / kg

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