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Effects of Growth Retardants on Yield and Fruit Quality Attributes of Hybrid Tomato, Karnataka-1*

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The influence of SADH and Cycocel, on growth, yield and certain fruit quality attributes of hybrid tomato, 'Karnataka' was determined. SADH or Cycocel at 2000 - 3000 ppm not only increased yield of fruits but also considerably improved its quality, praticularly total soluble solids, ascorbic acid and dry matter content. The effects were marked when the plants were treated at nursery stage, with or without follow up sprays at later stages.

Improving the nutritional values of the popularly consumed vegetables will go a long way in contributing the essen-tial nutrients to the diet of our people. Tomato is high in its nutritive value, being a good source of vitamin C, containing moderate quantities of vitamins A and B, besides other useful constituents.

Increased yields of tomato fruits were recorded due to Alar or Cycocel treatments (Read, 1967; Bhujbal and Patil, 1973). According to earlier workers, plants treated exogenously with Alar or Cycocel either at the first two true leaf stage or at the fourth true leaf stage improved some of the constituents of tomato fruit (Irulappan and Muthukrishnan, 1973a, b: Sinnadurai and Amuti, 1973). Read and Fieldhouse (1970) reported that floral abscission and consequently yield suppression when the growth retardants were sprayed at flowering stage.

The results of an investigation undertaken with a view to determine the beneficial effects of treatments with varying concentrations of two growth retardants, SADH(Succinic acid 2,2-dimethyl trimehydrazide) and CCC (2-Chloroethyl thylammonium chloride), on yield and quality attributes of a tomato hybrid, 'Karnataka' are presented in this paper.

MATERIALS AND METHODS

The studies were carried out at the Horticultural Research Station, Gandhi Krishi Vignana Kendra of the University of Agricultural Sciences, Bangalore dur-ing summer (January-June) 1974. The soil type of the experimental plot was red sandy loam with pH ranging from 5.5to 5.8.

A split plot design was adopted maintaining SADH and CCC as main plots and the three concentrations viz.,

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TABLE I Effect of SADH and Cycocel on the number of fruits per plant and average fruit weight

Concentration (ppm)	Mean number of fruits per plant			Average fruit weight(g)		
	SADH	Cycocel	Mean	SADH	Cycocel	Mean
1000	18.14	17.88	18.01 a*	222.88	226.25	224.56 c
2000	19.23	19.52	19.37 c	216.48	215.66	216.07b
3000	20.45	17.73	19.09 b	213.04	213.36	213.19 a
Mean	19.27 b	18.38 a	18.82	217.47	218.42	217.94
Stage of growth						
S_1	21.33	20.11	20.72 e	212.38	214.12	213.25 b
S_2	17.83	17.05	17.44 b	225.94	225.14	225.54 cd
S_3	16.94	16.55	16.75 a	226.78	226.34	226.56 d
S_4	20.44	19.44	19.94 d	211.41	212.61	212.01 a
S_5	20.44	19.38	19.91 d	213.36	215.65	214.51 b
S_6	17.77	17.22	17.49 b	225.03	222.06	223.55 c
S_7	20.16	18.88	19.52 c	207.38	213.03	210.20 a
Control	—	—	16.41	—	—	230.79

C.D. at :	P=0.05	P=0.05
Retardants	0.31	NS
Concentrations	0.16	1.90
Stages	0.35	2.35
Control Vs. retardants	0.29	2.12
Control Vs. concentrations	0.28	3.03
Control Vs. stages	0.35	2.32

* Means followed by a common letter do not differ significantly at P = 0.05.

1000 ppm, 2000 ppm 3000 ppm of both, as the sub plots. The chemicals were sprayed at three stages of plant growth with the following combinations:

S_1 : At nursery stage - two weeks before transplanting,
S_2 : Four weeks after transplanting,
S_3 : Eight weeks after transplanting.
S_4 : $(S_1 + S_2)$,
S_5 : $S_1 + S_3$),
S_6 : $(S_2 + S_3)$, and
S_7 : $(S_1 + S_2 + S_3)$.

A separate plot of untreated plants was included under each sub-plot of treatments as control. The treatment units with a net plot size of 3.0x1.8 m²

were replicated twice with ten plants in in each treatmeet. The gross experimental area of 48.40 x 17.20 m² was divided into two blocks (replications), which in turn were divided into main plots with a net area of 12.10 x 17.20 m² each. The recommended spacing 90cm x 60 cm) and the package of practices were followed (Attavar and Bhat, 1972) The plants were sprayed with the growth retardant solutions to run off in the forenoon as per schedule at different stages of plant growth, and three randomly selected plants were considered for recording observations. Data on mean number of fruits per plant, ascorbic acid, total soluble solids and dry matter content of fruits were recorded (Anon., 1970).

1. Yield attributes

a. Number of fruits per plant:

Significant difference was observed between the effects of SADH and Cyco -cel. SADH significantly increased the number of fruits per plant compared to that of Cycocel (Table I). Among the concentrations, 2000 ppm significantly increased the number of fruits over 1000 and 3000 ppm. Application of growth retardants at nursery stage was markedly beneficial in increasing the number of fruits per plant. The results was in conformity with the findings of earlier workers on tomato (Knavel, 1969; Bhujbal and Patil, 1973). The increase in the number of fruits could be attributed to increased flower production and and higher percentage of fruit set due to growth retardant treatments employed at early stage of growth (Read and Field house, 1970; Irulappan and Muthukrishnan, 1973a).

b. Average fruit weight:

The mean fruit weight generally reduced by both the chemicals. As the concentration increased, the average fruit weight significantly reduced. Spraying the chemicals at later stages of plant growth affected average fruit weight compared to treatments given at earlier stages (Table I).

TABLE IIa Effects of SADH and Cycocel on ascorbic acid content of fruits.

oncenta-on (ppm)	Ascorbic acid (mg/100g)		
	SADH	Cycocel	Mean
1000	28.45	28.33	28.39
2000	28.79	28.68	28.74
3000	29.02	28.33	28.68
Mean	28.76	28.45	28.60
Stage of growth			
S_1	29.29	29.03	29.16 b*
S_2	28.22	28.08	28.15 a
S_3	28.18	27.88	28.03 a
S_4	29.43	29.02	29.22 b
S_5	29.03	28.49	28.75 b
S_6	28.35	27.95	28.15 a
S_7	29.16	28.89	29.03 b
Control	—	—	28.02
		C.D. at P —	0.05
Stages			0.59
Control vs. retardants			0.44
Control vs. concentrations			0.47
Control vs. stages			0.58

* Means followed by a common letter do not differ significantly at P—0.05.

2. Fruit quality

a. Ascorbic acid: The ascorbic acid content of fruits was not significantly altered due to SADH and Cycocel Higher concentrations of the growth retardants (2000 and 3000 ppm) sprayed particularly at the nursery stage, with or without repeated treatments, significantly increased the ascorbic acid content of fruits compared to control (Table IIa). Similar increases in ascorbic acid were reported earlier (Anon., 1968; Irulappan and Muthukrishnan, 1973b).

b. Total soluble solids (T.S.S.): T.S.S. in fruits significantly increased increased due to higher concentrations of SADH and Cycocel over the lower concentration and control (Table IIb). Spraying the chemicals at nursery stage was found considerably beneficial compared to spraying at later stages of growth in respect of T.S.S. content. The trend of results was in conformity with those obtained by Irulappan and Muthu krishnan (1973) and Sinnadurai and Amuti (1973).

TABLE IIb Effects of SADH and Cycocel on total soluble solids of fruits

Concentration (ppm)	T.S.S. (%)		
	SADH	Cycocel	Mean
1000	5.98	6.04	6.01 a*
2000	6.12	6.15	6.14 b
3000	6.22	6.00	6.12 b
Mean	6.11	6.07	6.09
Stage of growth			
S_1	6.25	6.20	6.22 b
S_2	5.96	6.00	5.98 a
S_3	5.99	5.88	5.94 a
S_4	6.23	6.20	6.21 b
S_5	6.18	6.06	6.12 b
S_6	6.00	5.95	5.97 a
S_7	6.22	6.18	6.20 b
Control	—	—	5.94
	C.D. at P —		0.05
Concentrations			0.08
Stages			0.10
Control vs. retardants			0.08
Control vs. concentrations			0.077
Control vs. stages			0.074

* Means followed by a common letter do not differ significantly at P — 0.05.

TABLE IIc Effects of SADH and Cycocel on per cent dry matter of fruits

Concentration (ppm)	per cent dry matter		
	SADH	Cycocel	Mean
1000	6.13	6.13	6.13 a
2000	6.16	6.16	6.16 b
3000	6.19	6.11	6.16 ab
Mean	6.16	6.13	6.14
Stage of growth			
S_1	6.25	6.20	6.22 b
S_2	6.08	6.06	6.07 a
S_3	6.08	6.03	6.05 a
S_4	6.25	6.20	6.22 b
S_5	6.20	6.18	6.19 b
S_6	6.08	6.06	6.07 a
S_7	6.23	6.18	6.21 b
Control	—	—	6.04
	C.D. at P —		0.05
Concentrations			0.03
Stages			0.05
Control vs. retardants			0.044
Control vs. concentrations			0.036
Control vs. stages			0.040

* Means followed by a common letter do not differ significantly at P — 0.05.

c. Per cent dry matter of fruits: The difference between the growth retardants was not significant. Higher concentrations (2000 and 3000 ppm) did not significantly differ between them, but were superior to 1000 ppm and control (Table IIc). Significant increases in per cent dry matter of fruits were recorded when the growth retardants were sprayed at nursery stage, with or without repeated sprays, over those treated at later stages of growth or untreated plants. Increased dry mat-ter was reported in other vegetable crops also due to treatments with LADH (Humphries and Dyson, 1967; Gowda, 1972).

It is evident, thus, that certain simple treatments such as spraying the young nersery stock with SADH or Cycocel at 2000-3000 ppm not only increa-sed yield of tomato fruits, but also considerably improved the fruit quality in respect of T.S.S., ascorbic acid and dry matter content.

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