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Effect of cultural practices and chemicals on stress induction in sweet orange cv. sathgudi for off season crop production

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Abstract

The experiment "Effect of cultural practices and chemicals on stress induction in sweet orange cv. Sathgudi for off season crop production" was conducted at Horticultural Research Station, Konda Mallepally in an existing sweet orange orchard on five year old trees. The experiment was laid out in randomized block design with six treatments consisted of T1 – withholding of irrigation for 25 days, T2 - 15 day's withholding of irrigation + Thiourea (0.5%), T3 - 15 days withholding of irrigation + Ethrel (50 ppm), T4 - 15 day's withholding of irrigation + Urea (5%), T5 - 15 days withholding of irrigation + Salicylic acid (100 ppm), T6 - 15 days withholding of irrigation + KNO₃ (3%). Data on vegetative growth, yield and quality differed significantly among the treatments. Plant height (4.94 m) canopy spread, East – West (4.77 m), number of fruits per tree (348.67), average fruit weight (191.67 g), yield (62.33 kg per plant) and TSS (9.06 °Brix) were found significantly highest with treatment T1 when irrigation is withheld for 25 days during the months of August and September.

Keywords: Cultural practices, irrigation, retardants, nutrients, sweet orange

Introduction

Sweet orange is one of the most popular citrus fruit grown in tropical and sub tropical regions of India which belongs to the family Rutaceae. Sweet orange popularly called as tight skinned oranges in India, mainly cultivated in Telangana, Andhra Pradesh and Maharashtra. In Telangana, sweet orange occupies an area of 62,904 acres with annual production of 503028 metric tonnes (Commissioner of Horticulture, Telangana State, 2018-19) ^[1]. Fruits crops like sweet orange (citrus group), guava and pomegranate bloom throughout the year and produces two or three crops in a year with inferior quality fruits. To get good yields with quality is at most important to the growers to get a remunerative price. To avoid continuous flowering plants need a rest period to avoid several harvests. This requires a bahar treatment in which tree is forced to take rest and after wards by various methods, trees are forced to produce profuse flowering in a particular month or season. Among the various bahar treatments i.e., withholding the irrigation, root exposure, shoot pruning, shoot bending, spaying of nutrients and chemicals are the few methods followed by the farmers to get a quality crop in a particular season. In Telangana, sweet orange plants flowers profusely in the months of June, July and September to January. Keeping in view of market demand for produce in summer season due to its refreshing juice, farmers in Telangana state go for bahar (Hasth) treatment by withholding the irrigation during August and September months to get the flowering in the month of October and fruiting in months of April and May to get a remunerative price in the summer. However, in Telangana state where monsoon continues up to the month of August, it is rather difficult for induction of stress in the plants only through withdrawal of irrigation. Hence, present study was undertaken to study the effect of various cultural practices and chemicals for induction of stress in the plants for off season production of fruits.

Materials & Methods

The present studies on "Effect of cultural practices and chemicals on stress induction in sweet orange cv. Sathgudi for off season crop production" was carried out at existing sweet orange orchard on 5 years old trees in Horticultural Research Station, Konda Mallepally with 6 treatments i.e., T1- withholding of irrigation for 25 days, T2 - 15 day's withholding of irrigation + Thiourea (0.5%), T3 - 15 days withholding of irrigation + Ethrel (50 ppm), T4 - 15 day's withholding of irrigation + Urea (5%), T5 - 15 days withholding of irrigation + Salicylic acid (100 ppm), T6 - 15 days withholding of irrigation + KNO₃ (3%) and 4 replications in

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randomized block design. All the treatments were imposed in the months of August and September. Various biometric observations on growth attributes i.e., plant height, girth, canopy spread, yield and quality attributes like are number of fruits per tree, average fruit weight, yield, juice percent, TSS, acidity percent and ascorbic acid content in fruits were recorded. The data was analyzed as per standard procedures.

Results & Discussion

The results of the present study given in Table 1 & 2 revealed that different sprays with chemicals along with withholding the irrigation revealed that in treatment T1 when irrigation is withheld for 25 days in the month of August and September (month depends upon the rainfall in that particular year) plants profusely flowered in the month of October and fruits are harvested in the month of April and May. The maximum plant height (4.94 m) canopy spread, East – West (4.77 m), number of fruits per tree (348.67), average fruit weight (191.67 g), yield (62.33 kg per plant) and TSS (9.06 °Brix) recorded in treatment T1 when irrigation was withheld for 25 days in the month of August and September. In this treatment, irrigation was withheld for 25 days or more prior to the flowering till the leaves show symptoms of temporary wilting. During this period, weeds were removed in the tree basins by light to medium earthing up facilitated the plant to go under stress condition. By noticing the symptoms of wilting, recommended dose of fertilizers are applied and light irrigation was given. After a week or ten days, new vegetative growth along with profuse flowering is noticed in the stress induced plants. In Telangana, rains will be ceased by the month of September and fruit development takes place during

the winter and summer months. The favorable temperatures during winter months and dry spells allow the fruits to attain good size, colour with quality. The availability of fruits in the market during the peak summer months i.e., April and May is limited and they fetch premium price in the market.

Increase in vegetative growth, yield and quality parameters may be due to rest period in which plants accumulates the carbohydrates and other food materials in their tissues and thereafter by application of fertilizers and irrigation to the treated plants produce profuse vegetative growth in terms of shoot growth. Conservation of large amount of food materials in branches helps the plants in profuse flowering. Similar findings were observed in guava by Singh *et al.*, (2018) [7] who reported that with holding of water and exposing feeder and pruning of fibrous roots to force flowering in desired season is practiced in Maharashtra. The above results of the present investigation are in close agreement with the report of Singh (1963) [5] who recommended with holding of water in the light soils of western India. Kumar (2010) [3] also reported that in certain parts of Maharashtra, roots are exposed and irrigation is withheld so as to allow the leaves to shed for regulation of flowering. Singh and Chadha (1988) [6] also reported that in acid lime plants, imposition of stress caused uniformity in flushing and intensity depended on amount of stress as measured by relative water content. Similar findings were also reported by Goell *et al.*, (1981) [2] in citrus plants that moisture stress flowered by alleviation was effective in promoting vegetative growth. Nir *et al.*, (1972) [4] also reported in lemon trees, that flower differentiation occurred during moisture stress period and increased intensity of flowering noticed after water application.

Table 1: Effect of cultural practices and chemicals on vegetative growth in sweet orange cv. Sathgudi

Treatments	Plant height (m)	Plant girth (cm)	Canopy spread	
			NS (m)	EW (m)
T1- Withholding of irrigation for 25 days	4.94	47.63	4.70	4.77
T2-15 day's withholding of irrigation + Thiourea (0.5%)	4.78	47.07	4.27	4.12
T3-15 day's withholding of irrigation + Ethrel (50 ppm)	4.67	44.64	4.29	4.41
T4-15 day's withholding of irrigation + Urea (5%)	4.65	43.09	4.30	3.86
T5- 15 day's withholding of irrigation + Salicylic acid (100 ppm)	4.45	43.87	4.23	3.96
T6- 15 day's withholding of irrigation + KNO ₃ (3%)	4.69	44.89	4.48	3.70
CD (0.05)	0.22	N.S.	N.S.	0.44
SE (m)	0.07	0.99	0.11	0.13

Table 2: Effect of cultural practices and chemicals on yield and quality characters in sweet orange cv. Sathgudi

Treatments	No. of fruits / tree	Average fruit weight (g)	Yield (kg/ tree)	Juice (%)	TSS (°B)	Acidity (%)	Ascorbic acid (mg per 100 ml)
T1 - Withholding of irrigation for 25 days	348.67	191.67	62.33	43.91	9.06	0.91	72.13
T2 - 15 day's withholding of irrigation + Thiourea (0.5%)	304.67	150.00	51.00	42.37	8.55	0.89	71.52
T3 - 15 day's withholding of irrigation + Ethrel (50 ppm)	330.33	152.33	54.00	42.97	8.94	0.86	71.01
T4 - 15 day's withholding of irrigation + Urea (5%)	324.67	164.67	47.00	42.05	8.57	0.88	70.93
T5 - 15 day's withholding of irrigation + Salicylic acid (100 ppm)	339.33	142.00	48.67	40.95	8.87	0.89	68.19
T6 - 15 day's withholding of irrigation + KNO ₃ (3%)	307.67	148.67	45.33	40.77	8.70	0.87	70.95
CD (0.05)	30.20	20.52	9.28	N.S.	0.34	N.S.	N.S.
SE (m)	9.46	6.43	2.90	0.73	0.10	0.01	1.13

Conclusion

Based on the above results, it can be concluded that, to increase vegetative growth, yield and quality of sweet orange cv. sathgudi, irrigation is withheld for 25 days during the months of August and September to get the flowering in the month of October and off season fruiting in months of April and May to get a remunerative price in the summer.

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