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Effect of plant growth regulators and fungicides on chemical composition on Nagpur Mandarin

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SUMMARY

Two trees of Nagpur mandarin were taken as a treatment unit and replicated four times. Randomly ten fruits were selected from dropped and retained fruits on tree in September, October and November and comparative quality analysis was carried out. Regarding average weight, volume of fruit, juice and TSS, treatment T_5 (2,4-D 10 ppm + Carbendazim 0.1%) was found to be significantly superior and produced fruits with maximum 157.56 g, 170.99 cc, 55.28 % and 10.28%, respectively. Significantly minimum acidity percentage of fruit juice (0.82%) was obtained with the application of T_5 (2, 4-D 10 ppm + Carbendazim 0.1%) and ascorbic acid content in fruit juice was not significantly influenced by the application of plant growth regulators and fungicides.

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Key words : Nagpur Mandarian, Chemical composition, Fruit drop

Maharashtra stands first in area under citrus cultivation *i.e.* 1.54 lakh ha followed by Andhra Pradesh, Punjab, Karnataka, Uttar Pradesh and Bihar. Maharashtra stands first in area, its productivity is low *i.e.* 7.5 tonnes/ha. Citrus fruits are highly regarded for their nutritive as well as medicinal values. Different citrus species have different chemical composition, sugar (glucose and sucrose) and acids are main parts of sweet group while in acid group, citric acid and little malic acid are the main.

Nagpur mandarin blooms twice in a year *i.e.* in the month of February and June, the blooms in each are called as "Ambia bahar" and "Mrig bahar", respectively. If left to nature, the mandarin trees may bloom and fruit irregularly in any one or in both seasons and give irregular and spare fruiting. Fruit drop, particularly at pre-harvest stage is a very complex problem and is known to be the net result of lack of adequate production of hormones within the tissue of plant, nutrient deficiency and pathological causes resulting in heavy monitory loss.

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In India, the problem of pre-harvest fruit drop in citrus has not been tackled extensively, although some work using plant growth regulators only has been done, but hardly any attempt has so far been made to evaluate the relative efficacy of plant growth regulators when mix with other material. Very little attention has been paid to Nagpur mandarin and thus little information is available on the effect of plant growth regulators and fungicides on pre-harvest fruit drop in Nagpur mandarin.

The investigation of many research workers such as Sharma and Randhawa (1967), Jawanda *et al*. (1972) were observed that several plant growth regulators minimizes fruit drop to a considerable extent.

Keeping in view the past research work by using growth regulators and fungicides effect on quality, a very limited research work have been carried out on above aspect under this region particularly in Nagpur mandarin. Present investigation entitled "Effect of plant growth regulators and fungicides on chemical composition on Nagpur mandarin", was undertaken.

MATERIALS AND METHODS

The present study entitled "Effect of plant growth regulators and fungicides on chemical composition on Nagpur Mandarin was carried out on 18 year old Nagpur mandarin trees.

Climate and weather conditions:

Akola has got dry summer and moderately cold

winter. During summer, maximum temperature range is 41.3 to 45.05^{0}C and 7 to 10^{0}C in winter as minimum temperature. While maximum relative humidity is 60.94 per cent and 31.23 per cent is minimum. In winter, December is the coolest month with 10^{0}C temperature.

Experimental details:

From 18-year-old mandarin orchard, 72 trees of uniform growth were selected for investigations.

Crop	: Mandarin (*Citrus reticulata* Blanco)
Variety	: Nagpur mandarin
Year of planting	: 1987
Age of tree	: 18 year
Spacing	: 6 x 6
Number of trees /treatment	: 2
Total number of experimental trees	: 72
Experimental design	: RBD
Replication	: 4
Number of treatments	: 9
Location	: Private orchard of Nagpur mandarin, Kamargaon, Tahasil Murtizapur, District Akola (M.S.).

Treatment details:

T_1 - 2,4-D 10 ppm
T_2 - NAA 10 ppm
T_3 - Carbendazim 0.1%
T_4 - Copper oxychloride 0.3%
T_5 - 2,4-D 10 ppm + Carbendazim 0.1%
T_6 - NAA 10 ppm + Carbendazim 0.1%
T_7 - 2,4-D 10 ppm + Copper oxychloride 0.3%
T_8 - NAA 10 ppm + Copper oxychloride 0.3%
T_9 – Control (no spray)

Methodology:

Two trees of Nagpur mandarin were taken as a treatment unit and replicated four times. The experiment was started from August, two spray of plant growth regulators and fungicides were given in the first week of August and September (before commencement of pre-harvest fruit drop).

Randomly ten fruits were selected from dropped and retained fruits on tree in September, October and November and comparative chemical composition analysis was carried out.

Cultural operations:

The plot were kept free from weeds by attending timely spraying of weedicide and followed another cultural operations such as manuring and fertilization. Plant protection measures and irrigation were undertaken uniformly at appropriate time.

Nutritional supply:

The recommended dose of 1200g N, 400g P_2O_5 and 400g K_2O per tree was given along with 50 kg. FYM. Half dose of nitrogen and full dose of P_2O_5 and K_2O were applied in the second week of January and remaining half dose of nitrogen (600g) was applied in first week of March.

Observation recorded:

Quality:

Physico-chemical analysis of fruits was carried out on the following parameters to ascertain the effect of different treatments on fruit quality.

Average weight of fruit (g):

Ten fruits were selected randomly and average weight of fruits was recorded by gravimetric balance in gram.

Average volume of fruits (cm^3):

With the help of measuring cylinder the volume of selected ten fruits were measured in cubic centimeter.

Juice percentage:

The juice was extracted by hand operated extractor. The juice per cent was calculated from juice weight and total weight of the fruits.

Total soluble solids (%):

The TSS in fruit juice was determined by using hand refractometer in per cent.

Titrable acidity (%):

The percentage of acidity (titrable) was determined by an anhydrous citric acid by titrating the diluted juice against 0.1 N sodium hydroxide by using phenolphthalein indicator (AOAC, 1985). The percentage acidity was calculated by using following formula

1 ml of NaOH (1N) = 0.00640 g of citric acid

Ascorbic acid:

The vitamin 'C' determined in the form of ascorbic acid. It was estimated by conducting titration against

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standard solution of 0.1 N. Iodine solution in the presence of starch indicator method as indicated by Ranganna (1973).

The following was formula used for determination of ascorbic acid

1 ml of 0.1 N KI = 0.88 mg of ascorbic acid

The data recorded in respect to above parameters were subjected to statistical analysis and for interpretation of results. The Randomized Block Design (RBD) was used for statistical analysis (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been presented under following heads :

Quality:

Effect of plant growth regulators and fungicides on quality parameters in respect of average fruit weight, average volume, juice percentage, TSS in fruit juice, acidity percentage, ascorbic acid content in fruit juice and number of seeds per fruit were recorded.

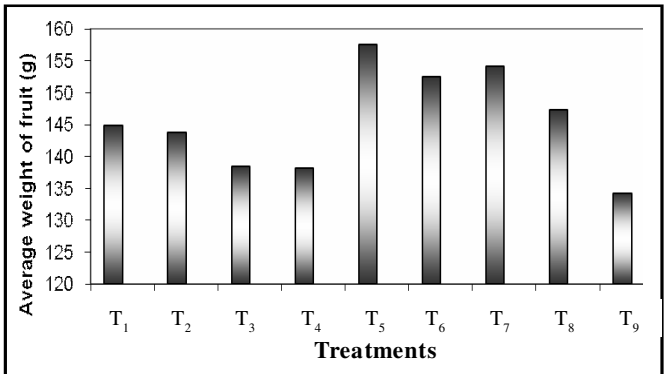

Fig. 1 : Effect of plant regulators and fungicides on average weight fruit of Ambia bahar in Nagpur mandarin (g)

Average weight of fruit:

Effect of plant growth regulators and fungicides on average weight of fruit is given in Fig.1.

It reveals that the average weight of fruit was significantly influenced by foliar application of plant growth regulator and fungicides. Maximum average weight per fruits (157.56 g) was observed with treatment T_5 (2,4-D 10 ppm + Carbendazim 0.1 %) and was at par with treatment T_7 (2,4-D 10 ppm + Copper oxychloride 0.3 %) and T_6 (NAA 10 ppm + Carbendazim 0.1 %). The findings are in agreement with Narula *et al.* (1999) who reported that the application of 2,4-D (15 ppm) increased the size and weight of fruit in Kinnow mandarin. Kaur *et al.* (1990) observed that the average weight of fruit was maximum when Jaffa orange trees were sprayed with 2,4-D 20 ppm.

Average volume of fruit:

Effect of plant growth regulators and fungicides on average volume of fruit of Ambia bahar in Nagpur mandarin is given in Fig. 2. It reveals that the volume of fruit was significantly influenced by foliar application of plant growth regulators and fungicides. Significantly maximum (170.93 cc) volume of fruit was observed in

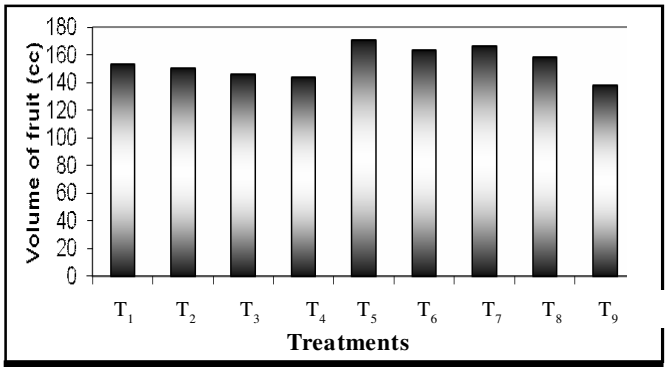

Fig. 2 : Effect of plant growth regulators and fungicides on volume of fruit of Ambia bahar in Nagpur mandarin (cc)

treatment T_5 (2,4-D 10 ppm + Carbendazim 0.1 %) and was found at par with treatment T_7 (2, 4-D 10 ppm + Copper oxychloride 0.3 %) and T_6 (NAA 10 ppm + Carbendazim 0.1 %). These findings are in agreement with Kumar *et al.* (1992) who observed the increased volume with the application of 2,4-D 25 ppm. Kadam and Warke (1980) noticed that the application of 2,4-D increased the volume of the fruits of Mudkhed seedless mandarin.

Juice percentage:

Effect of plant growth regulators and fungicides on juice percentage of fruits is recorded in Fig. 3. It reveals that the juice percentage in fruit was significantly influenced by foliar application of plant growth regulators and fungicides. Significantly maximum juice percentage in fruits (55.28 %) was observed in treatment T_5 (2,4-D 10 ppm + Carbendazim 0.1 %) and was found at par with T_7 (2,4-D 10 ppm + Copper oxychloride 0.3 %) and T_6 (NAA 10 ppm + Carbendazim 0.1 %). Similar results were obtained by Singh and Misra (1986) in Kinnow mandarin, Sinha *et al.* (1977) in Nagpur mandarin and

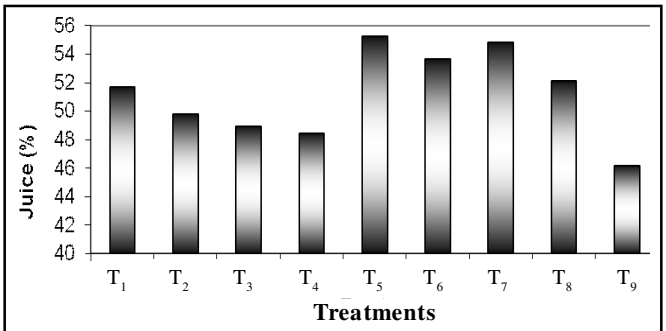

Fig. 3 : Effect of plant growth regulators and fungicides on juice of Ambia bhar in Nagpur madarin (%)

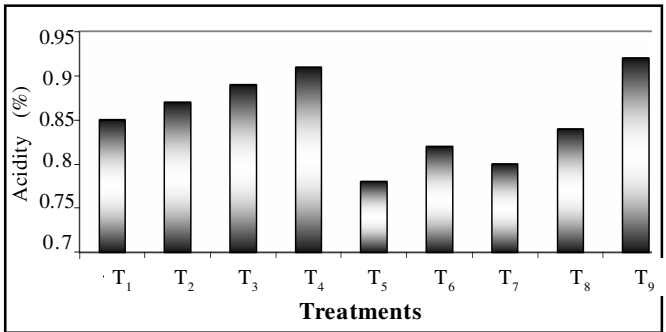

Fig. 5 : Effect of plant growth regulators and fungicides on acidity of Ambia bhar in Nagpur madarin (%)

Das and Narayan (1974) in Mosambi

Total soluble solids (TSS):

Effect of plant growth regulators and fungicides on total soluble solids (TSS) is presented in Fig. 4. It reveals that the TSS of fruit juice in Nagpur mandarin was significantly influenced by foliar application of plant growth regulators and fungicides. Significantly maximum TSS

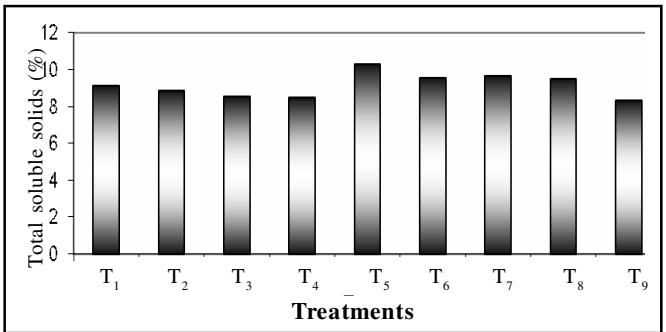

Fig. 4 : Effect of plant growth regulators and fungicides on total soluble solid of Ambia bhar in Nagpur madarin (%)

(10.28 %) was observed with treatment T_5 (2,4-D 10 ppm + Carbendazim 0.1 %) and was found at par with T_7 (2,4-D 10 ppm + Copper oxychloride 0.3 %), T_6 (NAA 10 ppm + Carbendazim 0.1 %) and T_8 (NAA 10 ppm + Copper oxychloride 0.3 %). Similar results were observed by Kaur *et al.* (1990) and Gill *et al.* (1983) in sweet orange.

Acidity percentage:

Effect of growth regulators and fungicides on acidity percentage of fruit juice is presented in Fig. 5.

Data presented in Fig.5 reveal that quality in terms of acidity percentage of fruit juice in Nagpur mandarin was significantly influenced by foliar application of growth regulators and fungicides. The acidity in fruit juice was significantly maximum (0.92 %) in treatment T_9 (control) followed by T_4 (Copper oxychloride 0.3%) and T_3 (Carbendazim 0.1%) and were at par with each other. The results are in agreement with the results obtained by Mohan *et al.* (1986) who observed the minimum acidity in fruit juice with the application of Bavistin (0.1 %) followed by 2,4-D 10 ppm in sweet orange cv. JAFFA.

Ascorbic acid content in fruit juice:

The data presented in Fig.6 reveal that quality in terms of ascorbic acid content in fruit juice of Nagpur mandarin was not significantly influenced by foliar application of plant growth regulators and fungicides.

The results presented in Fig. 6 reveal that the ascorbic acid content in fruit juice was not significantly influenced by growth regulators and fungicides. However, maximum ascorbic acid content in fruit juice (53.21mg/100 ml juice) was observed with treatment T_2 (NAA 10 ppm). While minimum ascorbic acid content in fruit juice was observed in treatment T_4 (Copper oxychloride 0.3%). Similar findings were reported by Das and Narayan (1974) in Mosambi, Babu *et al.* (1984) in Pant lemon-1, Kumar *et al.* (1992) in Lemon tree and Kaur *et al.* (1990) in Jaffa orange.

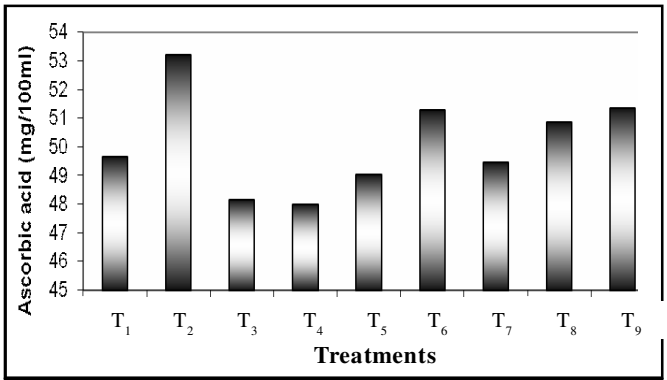

Fig. 6 : Effect of plant growth regulators and fungicides ascorbic acid of Ambia bhar in Nagpur madarin (mg/100ml)

Conclusion:

Regarding average weight, volume of fruit, juice and TSS, treatment T_5 (2,4-D 10 ppm + Carbendazim 0.1%) was found to be significantly superior and produced fruits with maximum 157.56 g, 170.99 cc, 55.28 % and 10.28%, respectively.

Significantly minimum acidity percentage of fruit juice (0.82%) was obtained with the application of T_5 (2,4-D 10 ppm + Carbendazim 0.1%) and ascorbic acid content in fruit juice was not significantly influenced by the application of plant growth regulators and fungicides.

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