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Studies on the Effect of Micronutrients, Urea and Growth Substance on Guava (*Psidium gujava.*) c.v. Banarasi Round.

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A field experiment on guave trees of about 15 year old was conducted to study the effect of micronutrients, urea and growth substance on the growth, flowering and yield. These chemicals sprayed before the flowering at 0.4% zinc, 0.2% boron, 0.4% copperand urea at 2.0% had significant effect in increasing the growth, fruitset and yield of guava as compared to the control. The effect of planofix was not effective.

The guave (*Psidium guajava*.L) is one of the important tropical fruit crops. The nutritional management of guava is very important for maintenance of healthy tree and production. The low nutritional levels of both macro and micronutirents caused die back and other ailments putting the orchardist to a tremendous loss. Therefore an expriment was undertaken to study their effects on the growth, fruit set and production of guava fruits.

MATERIALS AND METHODS

Forty guava trees of 15 year old at the Horticultural research Station O.U.A.T., Bhubaneswar growing on sandy loam having 0.67% organic carbon, 0.07% total nitrogen, 11.3 kg/ha of available potash and pH 5.5 (soil) were selected. The experimental trees were equally applied with 20 kg farm yard manure + 2 kg of calcium ammonium nitrate + 4 kg single superphosphate + 2 kg of muriate of potash per tree as a basal dressing. Irrigations were given uniformly to all the trees during the course of investigation. The experimental trees were regularly irrigated once a week during March to May being the hot summer season. There were ten treatments (T_1 to T_{10}), as detailed in the tables and the chemicals were sprayed equally with the solutions pertaining to each treatment by a power sprayer. The treatments were replicated four times and the randomised design was followed.

RESULTS DISCUSSION

The data collected on the effect of various treatments on the growth, fruit set and yield of guava presented in Table I and II revealed significant effect.

Growth studies: The data presented in the Table I on the growth characters indicated that there is significant increase in the number of new shoots with urea and copper as compared to

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other treatments. Urea at 2% produced the maximum number of new shoots followed by 0.4% copper, 1.0% urea and 0.2% copper. The other treatments (zinc, boron, planofix) though gave higher number of shoots were not significant. The rate of growth of guava plants c. v. Banarasi Round showed that the maximum linear growth was recorded with 0.4% zinc followed by 0.4% copper, 0.2% copper, 0.2 boron and 2% urea. However, all of them were significantly superior to the control and planofix. Zinc and copper have influenced the growth of plant cell and also their multiplication as zinc specially has its influence on the auxin synthesis (Tsui, 1948). Copper is also associated with cell division and elongation due to the increasing enzyme activities and other plant physiological processes (Arora and singh, 1971). These microelements can also influence the utilization of the absorbed minerals which ultimately help increased growth.

The data recorded on the effect of the various treatments on the leaf number have significantly influenced this aspect of the plant growth. Zinc at 0.4% produced the maximum number of leaves per shoot followed by zinc 0.2%, 0.4% copper, 2.0% urea and 0.2 % boron and were significantly higher than the control. The application of urea produced more leaves, while boron has helped the calcium motabolism in the absorption of nitrogen and translocation of sugar.

TABLE I. Growth and fruit set in guava as affected by the micronutrients urea and planofix.

Treatments (1)	Number of new shoots per twig (2)	Length of new shoots (cm) (3)	Number of leaves per shoot (4)	Leaf area (sq cm) (5)	Thickness of leaf (cm) (6)	Average No. of flower bud per twig (7)	% of fruit set/twig (8)	No. of fruits per twig (9)
T_1 Control	5.25	4.40	4.55	22.35	0.034	5.25	52.03	3.25
T_2 Zinc 0.2%	5.74	6.80	7.42	25.00	0.036	5.75	60.46	4.25
T_3 Zinc 0.4%	6.50	7.27	7.87	25.97	0.045	4.75	53.44	2.50
T_4 Boron 0.1%	4.75	5.25	5.32	29.97	0.041	9.25	76.02	8.50
T_5 Boron 0.2%	5.75	5.60	6.05	30.45	0.038	12.25	81.96	11.75
T_6 Copper 0.2%	7.00	6.55	6.85	30.77	0.044	3.00	58.67	1.75
T_7 Copper 0.4%	7.75	7.22	7.73	32.40	0.040	2.22	38.60	1.25
T_8 Urea 1.0%	7.50	5.27	6.57	27.70	0.039	4.25	56.36	3.25
T_9 Urea 2.0%	8.25	5.77	7.07	26.07	0.341	6.75	60.99	5.25
T_{10} Planofix. 0.04%	6.75	4.85	5.57	22.02	0.034	6.50	81.17	5.75
S.E. (m) ±	0.972	0.538	0.489	3.274	N.S.	1.592	1.228	11.228
C.D. 0.05%	1.994	1.103	1.003	6.718		3.266	23.039	23.039

TABLE II. N.P.K. & B. content of guava leaf as affected by micronutrients, urea and planofix

Treatments (1)	Nitrogen % (2)	Phosphorus % (3)	Potash% (4)	Boron % (5)	Yield/Tree(kg) (summer crop) (6)
T_1 Control (H_2O)	1.21	0.742	3.29	28.0	12.28
T_2 Zinc 0.2%	1.64	0.572	4.67	23.5	17.92
T_3 Zinc 0.4%	1.81	0.705	5.98	19.0	12.92
T_4 Boron 0.1%	1.31	0.672	3.64	36.0	24.17
T_5 Boron 0.2%	1.38	0.648	3.84	41.0	17.25
T_6 Copper 02.%	1.56	0.596	4.56	24.5	12.75
T_7 Copper 0.4%	1.76	0.524	4.82	22.0	14.49
T_8 Urea 1.0%	1.46	0.632	4.12	26.0	12.82
T_9 Urea 2.0%	1.50	0.611	4.37	25.0	19.34
T_{10} Planofix 0.04%	1.22	0.705	3.47	26.5	13.64
S.E. (m)	± 0.21	±0.008	±0.084	—	1.33
C.D. 0.05%	0.044	0.017	0.171	—	3.85

The data presented on the leaf area had significant effect as compared to the control. Copper 0.4% produced the maximum effect followed by 0.2% copper, 0.2% boron and 0.1% boron. This indicates that copper and boron are essential for plant growth. Lefebyre (1970), Arora and Singh (1971) have reported increased leaf numbers in cashew and guava plants respectively. These two micro elements also enhance the carbohydrate metabolism and physiological and biochemical processes of the plants (Kevalenka, 1971; Ashour and Reda, 1972).

The effect of zinc, boron, copper, urea and planofix on the leaf thickness of guava. c.v. Banarasi Round was not significant. However, zinc, copper, boron and urea have stimulated the thickness of the leaves compared to the control.

Floral Studies: The number of flower buds produced per twig as influenced by the various treatments showed significant effects. Boron at 0.2% gave the maximum number followed by its lower concentration. Urea, planofix and zinc eventhough produced higher number of buds per shoot but the difference is not significant. Copper, however, gave the minimum number of flower buds compared to the control but not significantly. The effect of boron on the floral mechanism specially on the floral primodia, enhanced synthesis of sugar in leaves and quicker translocation in the fruit plants due to boron have also been reported (Ljubkin 1966 and Sanko, 1968).

In view of the above facts, it is evident that the increase in flower bud number may be due to the effect of boron which has profound effect on the carbohydrate and protein metabolism of the plant. The effect of urea and planofix are also indicating positive response. While copper indicated the supressive effects.

The data on the effect of various treatments on the fruit set revealed that 0.2% and 0.2% boron with strawberry (Lasaruishrili 1971 and grapes, (Khanduja *et al*. 1974) have increased fruit set through foliar application of boron. The increase in fruit set by boron may be due to its role on hormonal mechanism, sugar translocation and pollen mechanism (Nasen & McElory 1963 and Gauch and Dugger 1954). It is also further revealed that the application of planofix had significantly improved the fruit set in guava as compared to the control- Durate *et. al* (1975) with *Anona cherimoya*, Das and Mohapatra (1973) with sapota have reported increase fruit set with NAA and planofix. Urea, zinc, and copper though caused higher frui tset compared to the control the differences were not significant.

The data on the number of fruits produced per twig revealed that 0.1 to0.2% urea increased the fruit but fruit drop was less. This fact is also true in the case of planofix.

Yield of fruits per tree : It is evident from Table II that 0.1% boron (T_4) recorded the maximum yield followed by 2% urea (T_0), zinc 0.2% (T_2) and boron 0.2% (T_5). However, all the remaining treatments showed higher values compared to the control.

Leaf analysis : Maximum nitrogen content was observed in treatment having 0.4% zinc followed by 0.4% copper, 0.2% and 0.1% boron, urea 1.0 and 2% and all were significantly higher than planofix and control.

Phosphorus content of the guava leaves indicated that the values of all the treatments were significantly less than the control. The maximum phosphate content is recorded with the control followed by zinc, planofix, boron, urea and copper. This condition of the leaf tissues may be due to more utilization of the element in the treated plants as per essentiality of micro elements in connection with the utilization of the macro elements in the plants (Joshi and Joshi, 1957).

The potassium content in the guava leaf as effected by the treatments, reveals that, like nitrogen, potassium contents were significantly increased in the case of all treatments excepting in the control. The highest value is noticed (Table II) with the treatment having 0.4% zinc closely followed by 0.4% copper. Similarily the treatments having urea, boron and planofix were significantly higher than control.

The boron content of the leaf as influenced by the various treatments indicates that (Table II) treatments having boron helped maintenance of maximum boron content as compared to all other treatments. However, all other treatments (Zinc, Copper, Urea) including planofix had lower values than the control.

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