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EFFECT OF KINETIN ON GROWTH, FLOWERING, YIELD AND CHEMICAL COMPOSITION OF FRUIT OF TOMATO (*Lycopersicon esculentum Mill.*)

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Plants of tomato (*Lycopersicon esculentum Mill.*) cv. 'Pusa Ruby' were sprayed with an aqueous solution of kinetin at 0, 10, 50, 100 and 200 ppm. This bioregulant increased the linear growth at all the used concentrations and stimulated the growth of lateral branches up to a concentration of 100 ppm and had no significant influence at 200 ppm. Kinetin increased the number of leaves per plant and their area at 10-200 ppm. Quantitative promotion in flowering was observed in plants treated with kinetin. Application of kinetin enhanced the yield of fruits. Kinetin also increased juice, total soluble solids, sugars, protein and ascorbic acid contents of fruits but did not affect the acidity in tomato.

Cytokinins ccnstitute one of the potent groups of bioregulants. The bioregulants are known to modify the growth, development, structure and function of flowering plants. Kinetin, one of the cytokinins is a well known growth promoter. Kinetin has been found to initiate and stimulate the cell division in plants (Moore, 1981). Kinetin has also been reported to affect vegetative characters of plant (Moore, 1981).

The exogenous application of kinetin has been found to promote flower formation in many plants (Tse *et al.*, 1974). Kinetin has been reported to enhance the fruitset and yield in *Pyrus malus* (Goldacre and Battamly, 1959), *Vitis vinifera* (Weaver, 1972) and *L. esculentum* (Kaushik *et al.*, 1975). Recently the influence kinetin on chemical composition of plant has been reported in some plants (Singh and Jain, 1982; Singh and Sexena, 1983).

A perusal of the present literatur indicates that a limited information available pertaining to the influenc of kinetin on tomato. The preser studies were, therefore undertaken t elucidate the effect of foliar spra of kinetin on growth, flowering, fruit set, yield and chemical compositio of fruit of tomato, as it is an im portant fruit - vegetable crop and i cultivated throughout the Indi Union.

MATERIALS AND METHODS

The present investigations we carried out during January to Apr in 1981 and 1982. Seeds of tomat cv. 'Pusa Ruby' were sown on see bed on 5th January. Out - doo experimental plots (8m x 6m) wer prepared by incorporating farm - yar manure. The seedlings were transplan ted on 30th January. The distanc between plants and rows was 50 c

and 60 cm respectively. One month old plants were sprayed with an aqueous solution of kinetin (6-furfuryl amino purine) at 0, 10, 50, 100 and 200 ppm twice at weekly intervals by a manual automizer (high valume sprayer). Tween - 20 at 0.05% was used as a surfactant. A randomised block of four replicates, each consisted of ten plants for each treatment was taken into consideration in the present study. Plants were grown under natural day - length of 11-13 h and temperature ranging between 21.5°c and 37.0°c. They were weeded and irrigated at weekly intervals. Pollen viability was tested with 0.5% (w/v) TTC (Triphenyl tetrazolium chloride) and their germination was determined on an artificial medium consisted c sucrose 10% (w/v), agar 2% (w/v and boric acid 0.02% (w/v) on cavit slides. The observations were mad on growth attributes, flowering, poll : viability and germination, fruit mor phology and yield. Sugar, ascorbi acid, protein and acidity were deter mined according to A. O. A. C. (1975 methods and total soluble solids (TSS was determined by hand refractometc (Erma, Japan).

RESULTS AND DISCUSSION

The values for growth attributes flowering and pollen germination ar presented in Table 1 and for frui

Table 1. Effect of kinetin on growth, flowering and pollen germination in tomato values f each parameter differs significantly at P = 0.05 except those marked with NS. (NS = Non Significant).

Attribute	Control	Kinetin concentration in ppm			
		10	50	100	200
Height of plant (cm)	115.05	132.14	140.3	127.20	122.39
Thickness of stem (mm)	40.0	42.8 NS	43.5	44.9	44.1
No. of lateral branches	31.50	34.10	37.63	38.94	40.27
Length of lateral branch (cm	21.33	23.65	28.31	33.10	25.74
No. of leaves per plant	69.1	72.3	77.9	82.4	74.3
Area of leaf (sq cm)	50.37	53.98	55.19	61.29	54.11
Flower initiation (days)	66.25	64.23 NS	61.90	58.35	55.27
Flowering phase (days)	63.17	66.74	70.34	72.08	75.10
Area of sepal (Sq mm)	38.1	39.5 NS	38.7 NS	36.9 NS	37.4 N
Area of petal (Sq mm)	25.80	26.47 NS	28.10 NS	28.63 NS	27.15 N
No. of flowers per plant	106.2	115.5	121.7	129.4	110.1 N
		88.7 NS	88.4 NS	89.2 NS	88.1 N

characters, yield and chemical composition of fruit of tomato in Table 2. The results based on the experimental observations are discussed below.

Growth attributes

Foliar application of kinetin increased the height of plant and thickness of stem at all the used concentrations (Table 1). This bioregulant stimulated lateral branching and also increased the length of lateral branches (Table 1). Kinetin boosted the formations of leaves and increased their area gradually with increasing concentration up to 100 ppm (Table1). However, the values obtained for these attributes were lesser an higher over 100 ppm and control respectively. A well marked reduction i vegetative phase was recorded in plant sprayed with kinetin. Such growth promotions due to kinetin have been reported earlier (Singh and Saxena, 1983).

Flowering

Plants sprayed with kinetin at 50 100 and 200 ppm registered earl flowering but did not affect thi attribute at 10ppm in tomato (Table 1) The reduction in vegetative ph and prolongation of flowering pha

Table 2. Effect of kinetin on fruit-set, yield and chemical composition of fruit in tomato Values fo each parmeter differs significantly at P = 0.05 except those marked with NS (NS = Non Significant).

Attribute	Control	Kinetin concentration in ppm			
		10	50	100	200
No. of normal fruits	50.97	59.41	66.25	71.18	62.02
No. of fruits abscised	14.80	10.06	9.15	6.29	4.10
Total no. of fruits per plant	65.77	69.47	75.40	77.47	66.12
Circumference of fruit (cm)	14.90	15.10 NS	17.33	17.84	15.03 NS
Weight of fruit (g)	39.27	39.76 NS	44.62	49.31	40.00 NS
No. of seeds per fruit	284.3	267.9	245.2	224.7	198.2
Weight of seeds per fruit(g)	1.23	1.16 NS	0.98	0.93	0.84
Yield of fruits (Kg) per plant	2.073	2.627	3.119	3.481	2.293
Juice (%)	58.6	59.1 NS	61.8	64.3	60.9
Total soluble solids (%)	5.03	5.29 NS	5.88	5.96	6.27
Total sugars (g/ 100 g pulp)	3.18	3.29 NS	3.87	3.96	3.61
Protein (g/100g pulp)	1.89	1.98 NS	2.29	2.47	2.41
Ascorbic acid (mg/100g pulp)	23.02	23.54 NS	25.11	26.73	26.19

was observed at all the used concentrations (Table 1). Kinetin enhanced the number of flowers gradually with increasing concentration but did not affect the size of either sepals or petals (Table 1). Though, the viability of pollen grains remained unaffected but iprovement in their germination *in vitro* was observed (Table 1). According to Table 1, foliar application of kinetin increased the number of flowers per plant and reduced the flower abscission. This promotion in flower population and inhibition of flower abscission was found proportional to the concentration of the bioregulant.

The present observations pertaining to the early flowering and accelerated quantitative flowering are in agreement with those reported for *Cucumis melo* (Bisaria, 1974) and *Lycopersicon esculentum* (Kaushilk *et al.*, 1975; Kinet, 1977). Our findings on pollen germination are in accordance with those made in *Cucumis melo* (Bisaria, 1974), *Pinus roxburghii* (Chhabra and Parmar, 1976) and *Corchorus capsularis* (Bisaria, 1983).

Fruit-set and yield

According to Table 2, the exogenous application of kinetin enhanced fruit-set in tomato. Kinetin increased the average circumference of fruit as well as their weight at 50 and 100 ppm (Table 2), and did not affect them significantly, at 10 and 200 ppm in fruit yield was recorded in the treatments of kinetin over contr (Table 2).. The maximum yield w registered at 100 ppm (Table 2). observations that kinetin applicatic induced better fruit-set and improvc quantitative characters of fruit a in accordance with those made i *Pyrus malus* (Goldacre and Bottaml 1959), *L. esculentum* (Kaushik *et a* 1975) and *Solonum melongena* (Sha an Malik, 1981).

Chemical composition of fruit

The data presented in Table indicated significant difference i total soluble solids due to applic tion of kinetin. The maximum T. S. (6 03%) in fruits was determined 200 ppm. Juice percentage, sug protein (g/100 g pulp) and ascorbi acid (mg/100 g pulp) of fruit wer increased by kinetin at 50, 100 ar 200 ppm but these metabolites r mained unaffected at 10 ppm (Tabl 2). The acidity of fruit was not aff ected significantly at any of th concentrations of kinetin (Table 2 The present observations regardi the influence of kinetin on sugars, pr tein and ascorbic acid contents of fru are in accordance with those report for *Cicer arietinum* (Singh and Jai 1982), *Lamna gibba* (Tabin and Turkal 1982) and *L. esculentum* (Singh an Saxena, 1983).

The exogenous application of kin

area are mainly brought about by the induction of new leaf buds and their expansion, resulting in production of more and bigger leaves.

The foliar spray of kinetin enhanced the fruit-set and therefore, the yield (Table 2). Higher fruit-set and yield in tomato is probably due to stimulated branching, quantitative promotion in flowering and better fruit characteristics.

Our evidence indicates that the sprays of kinetin increased sugar contents of fruit as has been reported earlier (Singh and Saxena. 1983), possibly due to its accelerated photosynthetic efficency and translocation of photosynthates from leaves to fruits. Increme in protein and ascorbic acid may be due to some regulatory influence o kinetin in their synthesis. These observations are of agricultural importance and could perhaps lead to improved yields and quality fruits of tomato.

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REFERENCES

BISARIA, A. K. 1974. *Physiology of sex expression in plants*. Ph. D. Thesis, Meerut University, Meerut, India.

BISARIA, A. K. 1983. Influence of some growth regulators on pollen germination in jute *in vitro*. Intl. Symp. on Plant Physiology in Coming Years. pp 84. I. A. R. I., New Delh (Abstract).

CHHABRA, N. and U. PARMAR, 1976. Effec of some growth regulators, amino acids and a proline analogue on pollen germination and tube growth Intl. Symp. on Physiology of sexual reproduction in Flowering Plants. pp 17, Punjab Agrl. University, Ludhiana (Abstract).

GOLDACRE, P. L. and W. BOTTAMLY, 1959. A kinin in apple fruit-set. *Nature* (London) *184* : 555-556.

ctin on yield of tomato. *Plant Sci. 6* : 51-54.

KINET, J. M. 1977. Effect of defoliation and growth substances on the development of inflorescence in tomato. *Hort. Sci. 6* :27-35

MOORE, T. C. 1981. *Biochemistry and Physiology of Plant Hormones*. pp. 147-176. Narosa Pub., New Delhi, India

SHA, J. and A. M. MALIK, 1981. Influence of kinetin on quality of brinjal. *Bangladesh J. Bot. 11* : 25-29.

SINGH, G. and S. JAIN, 1982. Effect of some growth regulators on certain biochemical parameters during seed development in chickpea under salinity. *Indian J. Plant Physiol. 25* : 167-170.

SINGH, G. and O. P. SAXENA, 1983. Effect of some growth regulators on yield of tomato

LABIN, E. M. and E. YURKALY, 1982. Kinetin affects rates of degradation of mRNA of two major chloroplast protein in *Lemna gibba* L. *J. Plant Growth Regulators* 1:3-13.

TSE. A. T. Y., A. RAMINA, W. P. HACKETT and R. M. SACHS, 1974. Enhanced inflorescence development in Bougainvillae 'San Di Red' by removal of young leaves and cytc inin treatment. *Plant Physiol. 54* : 404-4(

WEAVER, R. J. 1972 *Plant growth substances agriculture*. F. H. Freemann & Co., Sa Fransisco. U. S. A.

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STUDIES ON NITROGEN MANAGEMENT IN RELATION TO QUALITY GRAIN AND YIELD IN LOWLAND IRRIGATED RICE

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Studies conducted in rice with Ratna (early), Prakash (medium) and Phalguna (late) varieties during 1984 kharif season at different nitrogen levels (0, 50, 100, 150 and 200 kg N/ha) indicated that increased level of nitrogen contributed to higher yields but reduced the production of quality (high density) grain. The 1000 grain wt was unaffected at all nitrogen levels. Wider differences observed between average and potential test weight of Ratna and Prakash and meagre difference in Phalguna indicate the extent of possible variation in grain filling pattern among varieties of different duration in relation to nitrogen levels. Higher yield recorded at higher 'N' was attributed to increased production of varied yield componcnts such as panicle number, spikelet and grain number, as influenced by dry matter, leaf area index reflecting in higher photosynthetic efficiency. The study indicated that varieties possessing higher amount of high density grain (quality grain) are suitable for low 'N' management.

Paddy being an important crop and consumed as a whole kernel, the nature of grain filling is considered to be an important character to be investigated. Grain filling is a complex process involving photosynthesis, translocation and conversion of soluble photosynthates to solid form contributing to size and grain in the present study refers to 'filled grain' or high density grain (Padmaja Rao and Venkateswarlu, 1985). Since yield potential in a variety is dependent on grain size (1000 grain weight) number and the quantum of filling (percent of ripening), efforts were i e current st d to