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Effect of Miraculan (aTRIA) on some biochemical properties of tomato (*Lycopersicon esculantum* Mill.)

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Abstract

A field experiment was conducted to study the effect of miraculan on biochemical parameters in tomato (Lycopersicon esculentum Mill.). The different concentration of miraculan (0.5, 1.0, 2.0, 4.0, 6.0, 8.0 and 10 ppm) was applied at preflowering, flowering and post flowering stages i.e. 20, 40 and 60 DAS. The lower concentration showed increasing effect on chlorophyll content (in fresh leaves), total soluble sugar and Ascorbic acid content in fruit, while 8.0 and 10.0 ppm show non-significant increase in the above parameters.

Key words- Tomato, miraculan, chlorophyll, total soluble sugar, ascorbic acid

Introduction

Bioregulators currently account for only a small share (5 to 10%) of total world wide agrochemical in market and they form only a small portion of total sales of agrochemicals world wide (Raghava and Raghava, 1990; 1991). In which, one of the recenntly used plant growth regulators is long chain aliphatic alcohol. TRIA) is a C-30 primary alcohol was first identified in thr early 1933 asa natural constituent of plant waxes (Kolkar, 1978) in alfa-alfa meal (Ries, *et al.* 1977) were first isolated in form of crystalline colourless substance. TRIA is available in market in various trade names, viz. Vipul, Miraculan, Mixtalol, Golden vipul, Paras, Tween 20, Jeevan and Nutron, etc. Out of these long chains aliphatic alcohols Mixtalol (a mixture of long chain aliphatic alcohols) are very common in use due to their growth regulating properties contents; leaf area, crop yield, biomass, contolling stomatal opening and fecreasing photorespiration in many horticultural and other crops (Zelitch, 1975; Ries, *et al.* 1977; Ries and Wert, 1982; Nickell, 1982; Menon and Srivastava, 1984; Ries, *et al.* 1990; Raghava and Raghava, 1991; Malik et al., 1993; Zhou and Zhao, 1995; Jiang and Sun, 2011). Since various investigations revealed that TRIA affect several metabolic processes in different plants as mentioned above i.e. altimatly influenced the various biochemical parameters which are reported by different workers on different plants (Debta and Murty, 1981; Houtz *et al*., 1985b; Minzan and Xiuhua, 2009; Mishra ans Raghav, 2010). The present study was carried out to analyses the influence of TRIA (Miraculan) on biochemical parameter in tomato.

Materials and Methods

The certified seed of tomato (*Lycopersicon esculantum* Mill.) were obtained from Agriculture Extension Division of IARI, Pusa campus, New Delhi. The seed were surface sterilized with mercuric chloride, washed thoroughly with distilled water and soaked in water for the duration of 24 hr. before sowing. There after, 5 kg well processed and sieved black soil and manure mixture were filled in pots and moist it

for sowing. Five healthy seeds were sown in each pot and after germination maintained one plant at 15th days after sowing. The pots were irrigated and germinated plants with pots were kept in light till the end of experimental trial, after 15 days of sowing leaves were well developed on the plant. The eight treatment combination as concentration (Control, 0.5, 1.0, 2.0, 3.0,4.0, 6.0, 8.0 and 10.0 ppm) of Miraculan was applied as foliar application at 20, 40 and 60 days after sowing (DAS) (i.e. preflowering, flowering and post flowering stage) of tomato crop. The effect of Miraculan was observed at 25, 45, and 65 days after sowing for for chlorophyll (ppm) content in leaves and total soluble sugar, ascoebic acid content in fruit at maturity stage. Chlorophyll was analyses in collected fresh leaf samples at each stage of method discribed by Arnon (1949) and Jensen & Jensen (1972) in fresh leaves. Total soluble sugar (mg/l) content was estimated in fresh fruit of tomato by the method of Morris (1948) and High Kin and Frenkel (1962), ascorbic acid (mg/l) content was analyses in fresf fruit by the method proposed by Dhopte and Manuel (1989). The collected data from biochemical analysis were subjected to statistical analyses of variance using completely randamised block design as described by Pense and Sukhatme (1995).

Results and Discussion

The leaves collected at three different growth stages i.e. 25, 45 and 65 DAS. Increased chlorophyll content (ppm fresh wt.) was found in all the concentrations significantly over thr control at all stages but increasing levels of Miraculan from 0.5 ppm up to 2.0 ppm were enchanced the chlorophyll content of leaves in all the observation. The application of Miraculan at higher concentration from 4.0 ppm up to 10.0 ppm was showed significant decreasing the chlorophyll content in the leaves at all the growth stage of crop. The maximum chlorophyll content 13.26 ppm, 14.69 ppm and 14.99 ppm were significantly recorded with application of 2 ppm miraculan on fresh leaves at 25, 45 and 65 DAS respectively (Table - 1). Similarly the total soluble suger and ascorbic acid content in fruits showed the increasing effect with same concentrations (table-2). At level of miraculan 2 ppm foliar application was significantly increased 4.78 mg/l of total solulble suger content and 92.83 ppm of ascorbic acid content in fruit among all other miraculan doses at maturity stage of fruit (Table -2).

Table- 1 Effect of Miraculan on the chlorophyll (ppm) content in the leaves of Tomato at different stages of growth (all the datas are average of three replicate)

Conc./DAS	25	45	65
Control	10.45 ±0.68	11.05 ±0.99	11.65 ±0.98
0.5	11.48 ±0.77	11.94 ±0.76	12.16 ±0.96
1	11.98 ±0.76	12.56 ±0.75	12.85 ±0.83
2	13.26 ±0.65	14.69 ±0.76	14.99 ±0.54
4	11.95 ±0.68	12.42 ±0.45	12.55 ±0.96
6	10.96 ±0.77	11.25 ±0.73	11.96 ±0.78
8	10.25 ±0.69 *	10.95 ±0.85 *	11.01 ±0.76 *
10	9.85 ±1.43 *	10.62 ±1.06 *	10.50 ±1.21 *
C.D. at 5% Level	**0.64**	**0.48**	**1.15**

Table- 2 Effect of miraculan on the total soluble sugar (mg/l) and Ascorbic Acid (mg/l) Content in fruits of Tomatol at maturity (all the datas are average of three replicate)

Conc. (ppm)	Total Soluble Sugar	Ascorbic Acid
Control	2.98 ± 0.06	88.82 ± 0.63
0.5	3.32 ± 0.03	89.94 ± 0.34
1	3.99 ± 0.04	90.25 ± 0.74
2	4.78 ± 0.02	92.83 ± 0.38
4	3.36 ± 0.24	90.42 ± 0.34
6	3.30 ± 0.32	89.01 ± 0.82
8	2.86 ± 0.04*	88.60 ± 0.84*
10	2.84 ± 0.03*	87.80 ± 0.19*
C.D. at 5% level	**0.35**	**1.47**

- * Non-significant, DAS =Days After Sowing, Conc. = Concentration

The increase in chlorophyll content by the application of 2.0 ppm miraculan was due to inhibition of senescence or iron uptake which regulated chlorophyll biosynthesis (Menon and Shrivastava, 1984) and appeared dence green coloured leaf. TRIA universally improves the photosynthetic efficiency of plant (Chaudhary et al. 2006), increase leaf area and its contents of chlorophyll and protein in seeds as well as control stomatal opening (Yadava and Sreenath, 1975; Zelitch, 1975; 1979; Eriksen, 1981, Menon 1987; Setia *et al*., 1989; Gupta *et al.,* 2000 and Xingping Chen *et al.*, 2002)). However, the general effect of TRIA appears to increase the dry weight of the plants (Satler and Thiman, 1980, Raghava and Raghava, 1991; Ries, 1991; Raghava *et al*. 2007). So, the results showed correlations with the work of different above workers the increases due to acceliration of metabolic biochemical complex mechanism involve which in promoted by TRIA in the plant.

Conclusion

The application of miraculan as a plant growth regulator to express the tomato growth was found significant increased chlorophyll content in leaves and total soluble sugar and ascorbic acid content in fruit but the 2.0 ppm concentration as foliar application was found suitable for vigerous and blooming growth of tomato. The other doses of miraculan i.e. 4.0, 6.0, 8.0 and 10.0 ppm could be needed for new scope of further research.

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