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Effect of plant growth regulators and micronutrients on certain quality attributes of kagzi lime (*Citrus aurantifolia* Swingle)

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ABSTRACT

An experiment was carried out during the years 2002 and 2003 on kagzi lime on Pramalini at Department of Horticulture, Marathwada Agricultural University, Parbhani. Fifteen-year-old kagzi lime orchard was treated with two growth regulator, NAA (100 ppm and 200 ppm) and GA (50 ppm) singly and in combination with micronutrient (0.5 % and 1% spray) at flowering and pea size fruit stage. Results reveled that NAA 200 ppm + micronutrients mixture 1 % spray is the best treatment for increasing total soluble solids, acidity, ascorbic acid, reducing sugar of fruit and chlorophyll-b content of leaves.

Key words : Plant growth regulators, micronutrients, Kagzi lime, quality attributes

INTRODUCTION

Acid lime is an important fruit crop under citrus group and the edible portion is juicy fruits. In recent year a great deal of research work has been reported on the uses of plant growth regulators in citrus crops. However most of the studies have been carried out in the field of growth and yield of citrus crops and very little information is available on use of plant growth regulator and micronutrients in quality improvement of fruits especially in acid lime. A trial therefore was conducted at Department of Horticulture, College of Agriculture, Marathwada Agricultural University, Parbhani in year 2002 and was repeated in 2003 to evaluate the response of GA, NAA and micronutrient mixture in quality improvement of acid lime.

MATERIALS AND METHODS

The trial was conducted at the Department of Horticulture, College of Agriculture, Marathwada Agricultural University, Parbhani in year 2002 and was repeated in 2003 and pooled data was analysed. The soil of experimental site was fairly uniform deep black cotton soil with good drainage. The trial was laid out in Randomized Block Design with twelve treatments and three replications. The treatments consisted of GA (50 ppm), NAA (100 and 200 ppm) and micronutrient mixture spray (0.5 and 1%) singly and in combinations. The micronutrient mixture contains Fe-2.5 %, Mn-1%, Zn-3 %, Cu-1 %, Mo-0.1 % and B-0.5 %. The aqueous solution of different treatments was sprayed on sunny days during first week of January at flower emergence stage and first week of March at pea size fruit stage in both years. The total soluble solid of juice was determined by hand refractometer, acidity was determined by treating juice against sodium hydroxide solution, ascorbic acid by using 2,6 chichloro phenol indophenols visual turation method (AOAC.1965), total sugar by Lane and Eynon (1923), non reducing sugar by subtracting reducing from total sugar and chlorophyll a and b by Hiscox and Israelstan (1979).

RESULTS AND DISCUSSION

Total soluble solid of juice:

The data presented in Table 1 revealed that different treatments significantly influenced the total soluble solid and acidity of fruit juice content. The TSS was increased due to treatment of NAA 200 ppm (10.23 %) spray where as minimum was recorded in control (8.15%). As regard the acidity, the NAA 200 ppm + micronutrient 1 % recorded maximum acidity of juice and minimum acidity was found in control (6.2%) Haribabu (1980) noted considerable improvement in the chemical composition of kagzi lime fruits as the results of zinc and 2,4-D. Similarly Singh and Rethy (1985) observed that application of different micronutrients and NAA improved the TSS and titratable acidity of fruit juice. Josan *et al.* (1998) found that NAA 10,20,40 ppm increased TSS and acid content of fruit juice in lemon cv. BARAMASI. The failure of micronutrients to significantly affect fruit juice composition in the present investigation may be due to its low concentration tried or inadequate number of sprays of micronutrients.

Ascorbic acid content of juice:

The results presented in Table 1 revealed that there was significant increase in ascorbic acid content of fruit juice due to application of different chemical treatments. The maximum ascorbic acid content was recorded in treatment NAA 200 ppm + micronutrient 1 per cent spray

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Table 1 : Effect of growth regulators and micronutrients on certain quality attributes of *Kagzi* Lime fruits

Treatments	TSS (%)	Acidity (%)	Ascorbic acid mg/ 100 g of juice	Reducing sugar (%)	Non reducing sugar (%)	Total sugar	Chlorophyll-a mg/g	Chlorophyll-b mg/g
T_1- NAA spray-100 ppm	9.85	8.18	45.02	0.61	0.40	1.00	0.99	1.08
T_2- NAA spray-200 ppm	10.23	8.35	46.08	0.62	0.42	1.05	1.04	1.19
T_3- GA spray 50 ppm	8.43	7.65	43.18	0.62	0.40	1.01	0.82	0.89
T_4 -Micronutrients 0.5 % spray	8.70	7.04	43.55	0.56	0.37	0.94	1.41	1.30
T_5- Micronutrients 1% spray	8.93	7.27	44.32	0.58	0.39	0.97	1.49	1.34
T_6-NAA 100 ppm+ 1% Micronutrients 0.5 %	8.35	7.71	44.08	0.60	0.40	1.00	1.04	1.34
T_7-NAA 200 ppm+ 1% Micronutrients 0.5 %	9.38	8.63	46.51	0.61	0.41	1.03	1.04	1.08
T_8-NAA 200 ppm+ 1% Micronutrients 0.5 %	8.86	7.76	44.71	0.62	0.40	1.02	1.20	1.28
T_9-NAA 200 ppm+ Micronutrients 1.0%	10.06	8.98	48.65	0.62	0.41	1.03	1.19	1.15
T_{10}-GA ppm + Micronutrients 0.5 %	8.94	8.01	42.95	0.60	0.40	1.06	1.30	1.42
T_{11}-GA 50 ppm + Micronutrients 1 %	9.69	8.64	46.56	0.62	0.41	1.40	1.14	1.21
T_{12}- Control	8.15	6.20	40.06	0.54	0.36	0.90	1.18	1.36
S.E. ±	0.50	0.47	0.903	0.025	0.015	0.022	0.96	0.98
C.D. (P=0.05)	1.386	1.30	2.503	0.071	0.043	0.061	0.10	0.131

(48.65 mg/100g) which was followed bt treatment GA 50 pm + micronutrient mg/100 g 1% spray (46.56 mg/100g). Many workers *viz.* Haribabu (1980), Singh and Rethy (1996), Josan *et al.* (19998) found that treatment of *kazgi* lime was affected due to application of NAA and micronutrients. The results obtained in the present investigation are on similar line. This is because there was a positive correlation between the acidity of juice and ascorbic acid content and hence the increase in the ascorbic acid content due to different treatment cab be attributed to the increase in the acidity of fruit juice by these treatments.

Reducing, non-reducing and total sugar content of juice:

The results presented in Table 1 indicated that different growth regulators and micronutrients significantly increased the reducing, non reducing and total sugar content of juice. The maximum amount of this sugar were found in NAA 200 ppm. However different treatments were found to be at par with each other. The minimum reducing, non reducing and total sugar were found in control. Haribabu (1980) reported that the 2, 4-D treatments significantly increased the total sugar in the kagzi lime juice. Similarly Singh and Singh (1981) observed improvement in quality in respect of TSS, reducing and non reducing sugars in Karna mandarin sprayed with 300 ppm planofix. The results of present experiment are in confirmatory with the earlier reported result. The application of NAA might have affected the physiological process particularly the photosynthesis, which ultimately lead to the accumulation of dry matter and carbohydrates. The improved quality of fruits in the present investigation could be attributed to the fact that foliar feeding of NAA, GA and micronutrients might have caused cell elongation accompanied by considerable increase in the carbohydrate content of the cell through the increased rate photosynthesis. The increased amount of TSS and sugar might be due to high conversion of starch into sugars.

Chlorophyll-a and b content of leaves:

The chlorophyll- a and b content of the kagzi lime leaf was significantly affected by different treatments. All the treatments except GA_3 50 ppm (0.82 mg/g) and control (0.96 mg/g) significantly increased the chlorophyll content. Where as the chlorophyll- b content was not significantly influenced by GA_3 50 ppm. The maximum chlorophyll content was recorded in micronutrient 1% (1.49 mg/g) and chlorophyll-b in NAA 200 ppm+ micronutrient 1% spray. Johan *et.al.* (1998) found that NAA at 10,20,40 ppm increased the peel chlorophyll content of lemon fruits cv. BARAMASI. Several investigators have reported that the leaves of GA_3 treated plants become pale and chlorotic after GA treatment. Ahmed and Khan (1962) in Rough lemon, Randhawa and Iwata (1965) in *Citrus natsudaidai* recorded pale and chlorotic leaves after GA_3 treatment. The decrease in chlorophyll might be due to the dilution over a large area of leaves as GA_3 is reported to increase the leaf area (Monsehise and Halevey 1962). In the present investigation the GA treatment did not significantly decrease the chlorophyll content of leaves probably

because of its lower concentration.

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