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EFFECT OF GIBBERELIC ACID (GA₃) ON YIELD AND FRUIT LENGTH OF EGGPLANT (Solanum melongena L.)

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RESUMEN

Se estudio el efecto de la aplicacion de Acido Giberelico (GA₃) a la berenjena (Solanum melongena L.) "Jira" sobre su productividad y la longitud del fruto en tres experimentos de campo. En el primer ensayo, frutos significativamente mas largos fueron obtenidos con dosis de 5 a 20 ppm, alcanzandose maxima productividad de cosecha a 5 ppm, al aplicarse en plena floracion. En el segundo experimento no se detecto diferencia significativa en rendimiento al aplicarse en plena floracion, pero los frutos tuvieron longitud significativamente mayor al aplicarse 25 ppm de GA₃. En el tercer experimento, la aplicacion antes de la floracion plena no afecto significativamente la productividad o la longitud del fruto, mientras que la aplicacion despues de la floracion plena aumento el rendimiento en dosis de 5 y 10 ppm, y la longitud de 5 a 30 ppm.

ABSTRACT

The effect of Gibberellic Acid (GA₃) application to eggplant (Solanum melongena L.) "Jira" on its yield and fruit length was studied in three field experiment. In the first trial, significantly longer fruits were obtained at 5 to 20 ppm, with the highest yield at 5 ppm, when applied at flowering. In the second experiment, no significant difference in yield was found with applications at flowering up to 25 ppm, finding

significantly longer fruits at 25 ppm. In the third experiment, spraying at early flowering did not significantly affect either yield or fruit length, while spraying after flowering significantly increased yield at 5 and 10 ppm, and fruit length at 5 to 30 ppm.

INTRODUCTION

In the Dominican Republic, eggplant (*Solanum melongena* L.) is an important horticultural crop. During 1991 about 850 ha. were dedicated to this crop, with a national production of 4250 Tons. Cultivar, fruit weight, size and maturity stage are decisive factors in its commercialization. Local cultivar 'Jira' is preferred; the fruit must be physiologically immature, and longer and heavier fruits are the consumer first choice. The productivity of this cultivar is, however, considered low. The improvement of yield has been attempted primarily via fertilisation and plant protection.

The possibility of improving productivity and fruit quality on eggplant using plant growth regulators has been reported (KINET and LEONARD, 1983; NICKELL, 1982; ADDICOTT, 1982; NOTHMANN 1973, 1985), but no reports about similar work were available in the Dominican Republic. In 1990, a research program was started to study the effects of plant growth regulators on several horticultural crop species, including eggplant, in local conditions. Several experiments have been carried out, in crops like eggplant, okra and potato (MOSCAT, 1992; DENO, 1992; MORALES, 1990; MORALES, CASTILLO and VITTINI, 1990a, 1990b). The present work shows the results of three experiments within this program, about the effects of GA₃ on eggplant 'Jira'.

MATERIALS AND METHODS

Three field experiments were performed. Experiment 1 was done at the Central Station of Centro Sur de Desarrollo Agropecuario (CESDA) in San Cristobal, Dominican Republic, from June to October of 1990. Experiments 2 and 3 were performed almost simultaneously from February to June, 1992, at the Experimental Station of the

Universidad Nacional Pedro Henriquez Urena (UNPHU) in Nigua, San Cristobal, Dominican Republic. All the experiments had a complete randomized block design with three repetitions (Experiments 1 and 3) or four (Experiment 2).

Cultivar 'Jira' was used in every experiment; gibberellic acid aqueous solutions were applied only once, and the spraying was directed to the reproductive organs of the plants. The treatments evaluated were as follows:

- Experiment 1: 0, 1, 5, 10 and 20 ppm of GA₃ 10 days after full flowering (AFF).

- Experiment 2: 0, 5, 15 and 25 ppm of GA₃ 10 days AFF.

- Experiment 3: 0, 1, 5, 10, 20 and 30 ppm of GA₃ 10 days AFF and the same rates applied at the beginning of flowering. For each experimental unit 10 plants on perfect competency were evaluated, measuring length and weight of all harvested fruits; harvesting started 15 days after GA₃ application. Two harvests were performed on experiments 1 and 3, while four harvests were performed on experiment 2.

RESULTS

In Experiment 1, GA₃ application significantly increased the productivity of 'Jira' eggplant at the 5 ppm rate. Higher rates (10 and 20 ppm) reduced the productivity to levels statistically equivalent to those of the control (figure 1). Fruit length was significantly affected by GA₃ application; plants receiving 1 ppm of GA₃ produced longer fruits than control plants. At rates 5, 10 and 20 ppm fruits were not significantly different in terms of length, but they were statistically longer than those produced at 1 ppm rate, according to Tukey's Test (figure 2).

In Experiment 2, no significant difference was detected for productivity at the rates evaluated (figure 3). Significantly longer fruits were produced with 25 ppm in the first harvest, 15 days after GA₃ application (figure 4), but when the average fruit length of the four harvests was analysed no statistical difference was found among the rates evaluated. This results suggest that GA₃ might be affecting the first fruits formed by the plant, but the effect of the gibberellin is not

detectable in the fruits produced later, possibly due to an important amount of GA_3 having been metabolised already.

In Experiment 3, the possible effect of GA_3 application at the beginning of flowering compared to later applications (10 days AFF) were studied. Treatment at the beginning of flowering did not affect either yield nor fruit length at rates up to 30 ppm (figure 5). On the other hand, spraying 10 days AFF produced effects similar to those obtained in experiments 1 and 2; yield was significantly higher at rates 5 and 10, while at 1, 20 and 30 ppm it was statistically equivalent to that of the control (figure 6). Fruit length was significantly lesser in plants receiving 0 or 1 ppm than in plants receiving 5 to 30 ppm (figure 6).

DISCUSSION

The results of these experiments show that GA_3 application affects the 'Jira' eggplant productivity and fruit length. The treatments at the beginning of flowering did not produce significant changes in either productivity or fruit length, while the same treatments applied 10 days AFF resulted in significant responses in both variables, suggesting that 'Jira' eggplant is physiologically more sensitive to GA_3 when fruits start to develop.

There was response only in the first harvest (Experiment 2) or in the first two harvests (Experiments 1 and 3). This suggests that GA_3 might be metabolised during the growth of the first fruits produced after the application of the gibberellin, and thus the length or yield of later production is not affected. If such assumption is correct, multiple applications of GA_3 might result in a sustained stimulation of fruit elongation throughout the commercial life of the plant. This hypothesis will be tested in future experiments.

Productivity (measured as weight of fruits produced per area of soil) was higher at rates of 5 and 10 ppm, whereas maximum fruit length was obtained from 5 to 30 ppm. Since fruit radial growth (thickness) is not affected by GA_3 application (data not shown), it has been speculated that at rates up to 10 ppm GA_3 increases fruit elongation without affecting fruit density, but over 10 ppm it affects elongation as well as density, making the fruits longer and lighter. This hypothesis is also under study.

Yield (Kg.ha⁻¹)

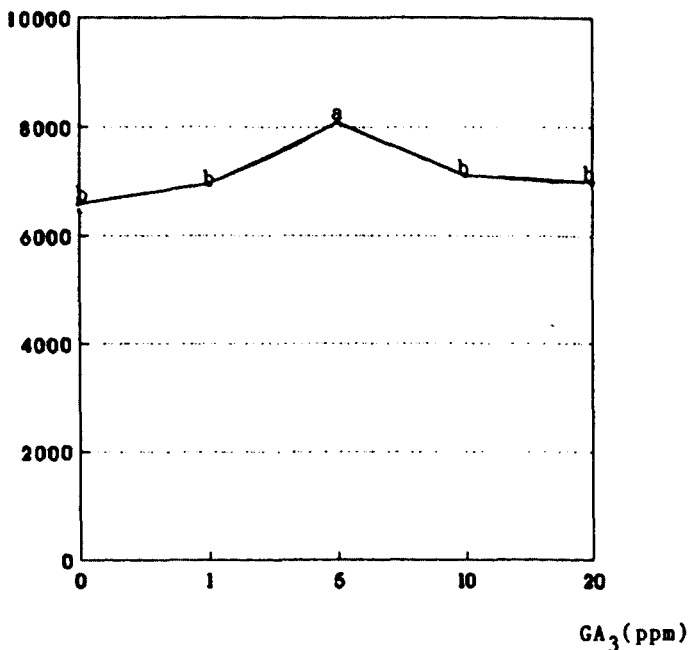


Figure 1. Effect of GA₃ on Eggplant (*Solanum melongena* L.) 'Jira' yield. Experiment 1.

Fruit Length (cm)

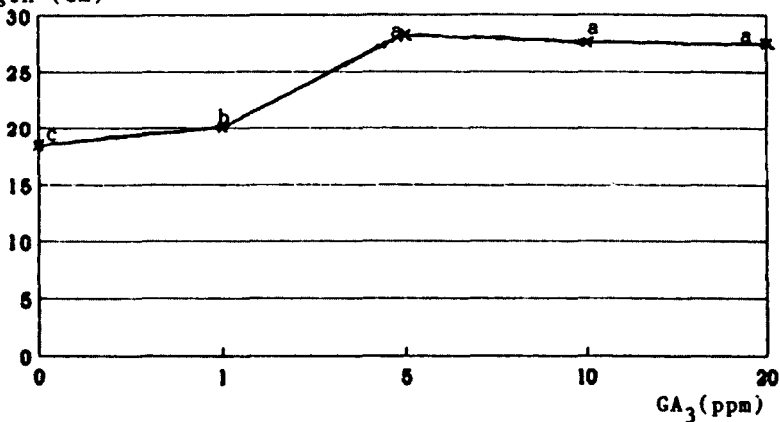


Figure 2. Effect of GA₃ on Eggplant (*Solanum melongena* L.) 'Jira' Fruit length. Experiment 1.

Yield (Kg.ha⁻¹)

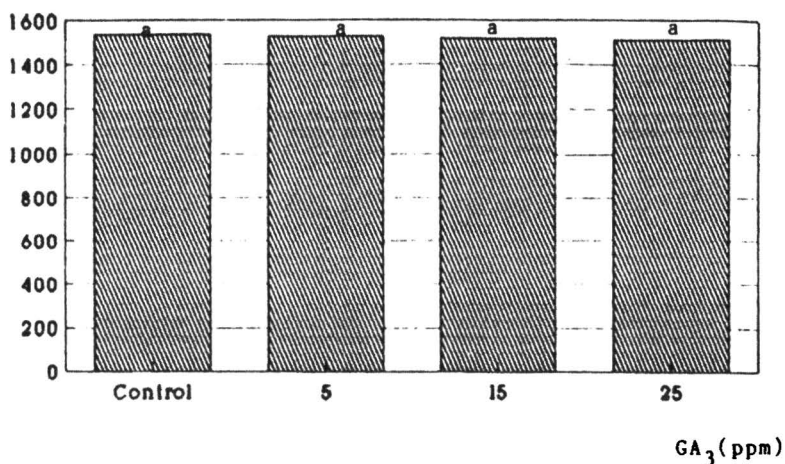


Figure 3. Effect of GA₃ on Eggplant (*Solanum melongena* L.) 'Jira' Yield. Experiment 2.

Fruit Length (cm)

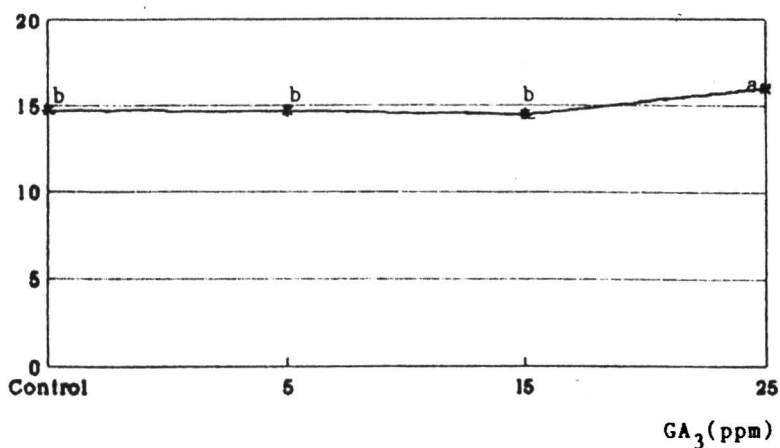


Figure 4. Effect of GA₃ on Eggplant (*Solanum melongena* L.) 'Jira' Fruit Length. Experiment 2.

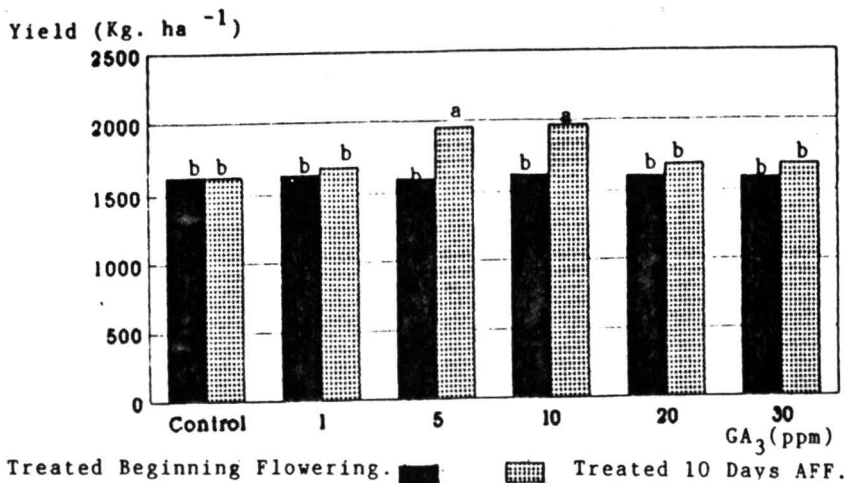


Figure 5. Effect of GA₃ on Eggplant (*Solanum melongena* L.) 'Jira' Yield. Experiment 3

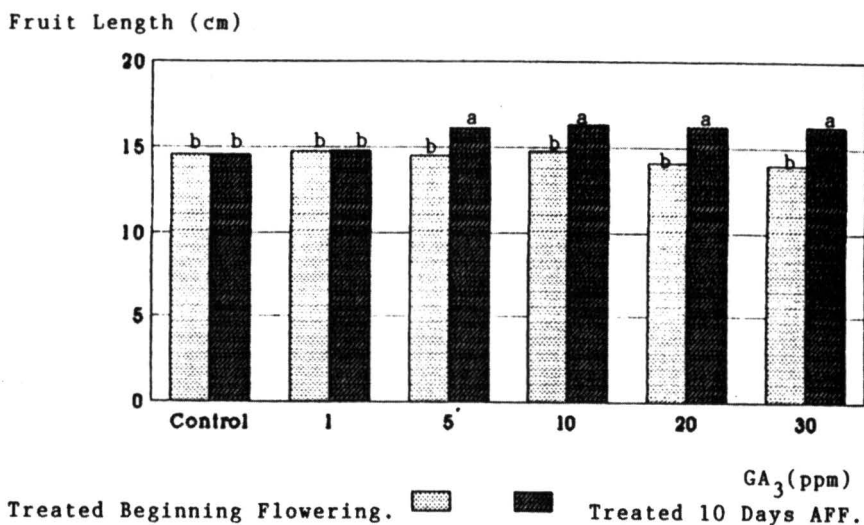


Figure 6. Effect of GA₃ on Eggplant (*Solanum melongena* L.) 'Jifa' Fruit Length. Experiment 3.