

NOTE

GA₃ CONCENTRATION FOR CONTROLLING FRUIT CRACKING IN POMEGRANATES¹

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ABSTRACT

In two experiments the effects of different concentrations of gibberellic acid (GA₃) in controlling fruit cracking of pomegranate (*Punica granatum* L.) were evaluated. Exp. I, in 1984, involved concentrations of 0, 50, 100, 150, 200, 250 and 300 ppm applied at three locations. Exp. II, in 1985, involved concentrations of 0, 125, 150, 175 and 200 ppm applied at one location. GA₃ at concentrations of about 150 ppm controlled fruit cracking. All concentrations increased sunburning of fruits. At these concentrations GA₃ did not increase the percentage of small fruit and winter-injured branches, nor did it reduce the fruit number in the succeeding year.

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غلظت اسیدجیبرلیک برای جلوگیری از ترکیدگی انار

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خلاصه

غلظتهای مختلف اسیدجیبرلیک برای جلوگیری از ترکیدگی انار در دو آزمایش بررسی شد. آزمایش اول، در سال ۱۳۶۳ شامل غلظتهای صفر، ۵۰، ۱۰۰، ۱۵۰، ۲۰۰، ۲۵۰ و ۳۰۰ قسمت در میلیون در سه محل بود. آزمایش دوم، در سال ۱۳۶۴، با غلظتهای صفر، ۱۲۵، ۱۵۰، ۱۷۵ و ۲۰۰ قسمت در میلیون در یک محل انجام شد. اسیدجیبرلیک در غلظت حدود ۱۵۰ قسمت در میلیون از ترکیدگی انار جلوگیری نمود. تمام غلظتهای آفتاب سوختگی میوه را افزایش داد. در این غلظتهای اسیدجیبرلیک درصد میوههای ریز و سرمازدگی شاخهها را افزایش نداد و موجب کاهش تعداد میوه در سال بعد نگردید.

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INTRODUCTION

The use of gibberellic acid (GA_3) as a means of controlling fruit cracking in pomegranates (*Punica granatum* L.) was first studied by Sharifi and Sepahi (5). Their treatments involved concentrations of 0, 250, 500 and 1000 ppm of the hormone applied on different dates. Even the lowest concentration (i.e. 250 ppm) controlled fruit cracking; however, there was no significant difference among dates of application. The hormonal application, especially at higher concentrations, resulted in leaf yellowing and abscission. Similar results have been reported with *Acer* and *Fraxinus* (2). The after effect of GA_3 application was further studied by Sepahi and Sharifi (4). They reported an increase in winter injury and a decrease in fruit number in the following year. Fruit reduction in the year following GA_3 application has been reported with pecans, apples, pears, apricots, peaches, almonds, oranges and lemons (6). This work was carried out to determine if lower concentrations could prevent fruit cracking, thus avoiding the undesirable after effects of high GA_3 concentrations.

MATERIALS AND METHODS

The study consisted of two experiments: Exp. 1 involved seven concentrations (0, 50, 100, 150, 250 and 300 ppm) of GA_3 applied on pomegranate trees at three locations in 1984. The treatments were applied according to a completely randomized design with seven replications. A dishwashing liquid at the rate of 0.15% was used as a wetting agent and the trees were sprayed to the point of run off. At location I, Badrood, the treatments were applied on Meykhosh cultivar on July 2 when about 89% of fruits were 4-6 cm in diameter (with the rest smaller or larger). At location II, Morche-Khort, trees of Shirine-ghermez cultivar were sprayed on July 12 with 92% of fruits 2-4 cm in diameter. At location III, Shahreza, a factorial combination of the same seven concentrations and

two dates were used on Gole cultivar; once on July 10 with 71% of fruits 2-4 cm and once on July 30 with 77% of fruits 3-5 cm in diameter. The percent cracked, sunburned and small fruits were determined. Analyses of variance were done after the arc-sine transformation of the data. In the following year measurements were made regarding the percent dead wood and fruit reduction, following the methods described elsewhere (6).

Based on results from Exp. I, Exp. II was carried out in Shahreza in 1985. The concentrations of 0, 125, 150, 175 and 200 ppm were applied on Mahabad cultivar on July 20 when 82% of fruits were 2-4 cm in diameter. Percent cracked, sunburned and small fruits were determined.

RESULTS AND DISCUSSION

Exp. I. There were significant differences among GA_3 concentrations regarding percent cracked and percent sunburned fruits at the three locations (Table 1). The results indicate a sharp reduction in percent cracking with concentrations of 50 and 100 ppm and a very slow reduction thereafter. The lowest concentration of GA_3 (50 ppm), on the average doubled the percentage of sunburning with no further increase due to higher concentrations. No significant difference between dates of application and no significant interaction between date and concentration was indicated at location III. There was no significant effect regarding percent small fruits at any of the locations. The regression of percent cracked on GA_3 concentration for the three locations and the overall means are depicted in Figure 1. The figure represents a close relation between percent cracking and log of concentration. There was practically no winter injury at location I and III and a little (average 2.1%) at location II, where data on percent dead wood were collected. The results, however, showed no significant effect due to any of the treatments. Regarding the reduction in fruit number, there was no

Table 1. Effects of GA₃ concentrations on the characteristics of pomegranates measured at the three locations in 1984.

GA ₃ conc. ppm	cracking (%)			sunburning (%)			small fruits (%)		
	Badrood	Morche Khort	Shahreza Ave.	Badrood	Morche Khort	Shahreza Ave.	Badrood	Morche Khort	Shahreza Ave.
0	36a	39a	16a	27bc	2d	12b	7	6	4
50	30ab	12a	7a	52a	14c	16ab	9	14	8
100	13bc	7b	6bc	45ab	14bc	17ab	12	8	8
150	12bc	4b	4bc	41ab	19bc	24ab	4	6	6
200	12bc	8b	4bc	20c	14bc	25ab	9	11	4
250	12bc	3b	2bc	30bc	20bc	22ab	5	8	7
300	3c	3b	2bc	37abc	27a	26a	6	11	5

[†]Mean separations at 5% level by Student-Newman-Keuls' test.

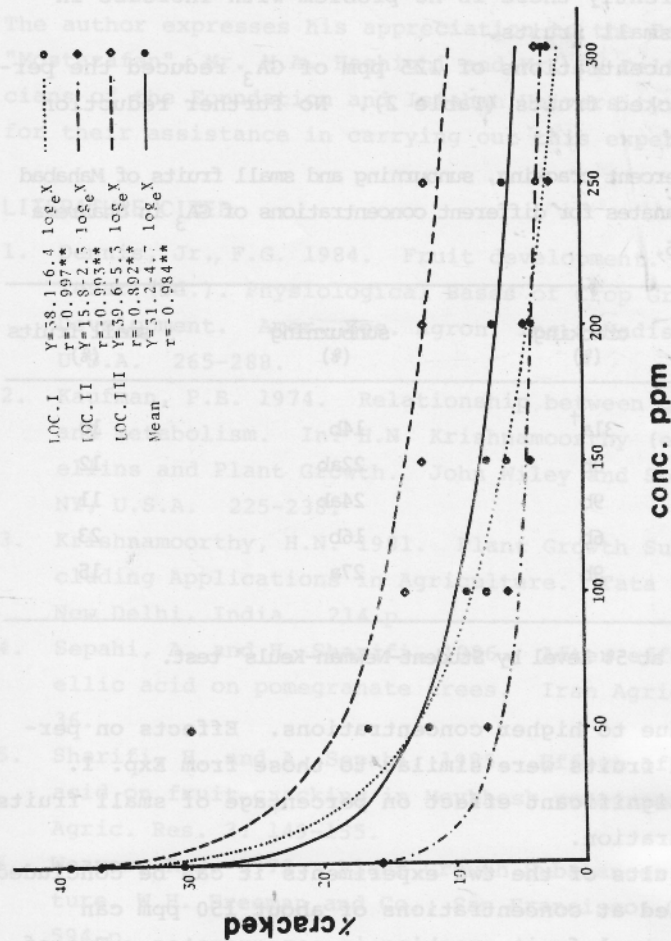


Fig. 1. Regression of percent cracking on GA_3 concentration for different locations. The r values (all significant at 1% level) represent the correlation of percent cracking on log of concentration.

significant effect due to any of the treatments at any of the locations. Within the range of concentrations used in this experiment, apparently there is no problem with increase in percentage of small fruits.

Exp. II. Concentrations of 125 ppm of GA_3 reduced the percentage of cracked fruits (Table 2). No further reduction

Table 2. Mean percent cracking, sunburning and small fruits of Mahabad pomegranates for different concentrations of GA_3 in Shahreza in 1985.

Conc.	cracking (%)	sunburning (%)	small fruits (%)
0	31a [†]	14b	10
125	8b	22ab	12
150	9b	24ab	11
175	6b	16b	23
200	9b	27a	15

[†]Mean separation at 5% level by Student-Newman-Keuls' test.

was obtained due to higher concentrations. Effects on percent sunburned fruits were similar to those from Exp. I. There was no significant effect on percentage of small fruits due to concentration.

From the results of the two experiments it can be concluded that GA_3 applied at concentrations of about 150 ppm can effectively control fruit cracking in pomegranates. Two of the possible explanations regarding GA_3 's controlling fruit cracking are an increase in the plasticity of the skin and an increase in its growth (relative to the berries). An increase in plasticity of the cell wall (up to 20%), has been reported by the application of GA_3 on *Avena* (2). A localized effect of GA_3 on fruit growth has been reported with apples

- (1). Further work should be done, especially regarding the time of application and its effect on sunburning.

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