Effects of Growth Regulators on the Rooting of Grape Cuttings[1]

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INTRODUCTION

Grapes have been grown in Puerto Rico ever since the early colonization days. They were brought and planted by Spanish settlers in patios and gardens for home consumption. Vines producing fair to good yields can be seen today growing around the Island.

As a possible means of diversifying the fruit industry in Puerto Rico grapes are being tested in search of types of good commercial value and productivity adapted to our conditions. The purpose of this study was to determine possibilities and usefulness of propagating grapes by treating cuttings with growth regulators.

MATERIALS AND METHODS

For this study, 15- to 25-cm. cuttings, including three nodes of cane wood, were taken from portions of the previous season's growth. The grape variety used was Florida Selection 1001. The cuttings were treated with the powdered form of commercial preparations of two root-inducing substances. One contained 0.3 percent of indolebutyric acid and the other 0.10 percent of naphthylacetamide, 0.05 of 2 methyl 1 naphthylacetic acid, and 0.02 of 2 methyl 1 naphthylacetamide. In this paper the letters IBA and NAA are used, respectively, for reference to these substances. The leaf areas of cuttings were kept at a maximum.

The treatments consisted of moistening the basal ends of the cuttings and immersing them in the appropriate hormone powder to a depth of 1 inch. The cuttings were placed in a shedhouse receiving 80-percent natural light. They also received an 8-second-per-minute overhead mist spray during the daylight hours.

The experimental design was a split-plot one in which the two hormone treatments and the control were studied in the whole plots. A subplot consisted of 20 cuttings, set 1½-inches deep in holes previously made in fumigated sand beds. The spacing was 2 inches between cuttings and 4 inches between rows. The cuttings were dug from the sand beds at 6-, 8-, and 10-week intervals, and records were taken for each treatments of the percent-

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age of rooted cuttings, number of roots per cutting, and length of roots in centimeters. All treatments were replicated four times.

RESULTS

EFFECT OF ROOT-INDUCING SUBSTANCES ON THE ROOTING OF THE CUTTINGS

Data on the percentage of rooted grape cuttings treated with the root-inducing substances and left in the sand beds for 6, 8, and 10 weeks are presented in table 1.

The mean rooting percentages for the control, IBA, and NAA treatments were 62.42, 47.92, and 40.00, respectively, the differences among which were not significant.

TABLE 1.—*Mean rooting percentages of grape cuttings treated with root-inducing substances and left in sand beds for 6, 8, and 10 weeks*

Treatments	Rooted cuttings after number of weeks indicated			
	6	8	10	Mean
Control	38.50	63.75	85.00	62.42
IBA	26.25	57.50	60.00	47.92
NAA	15.00	45.00	60.00	40.00
Mean	26.58	55.42	68.33	50.11

EFFECT OF DIFFERENCES IN PERIOD IN SAND BED

The results of the effect of the differences in time interval during which cuttings were in the sand bed on the rooting of grape cuttings are also presented in table 1. There were highly significant differences between the time intervals used in this experiment; the longer the time that the cuttings remained in the sand beds the higher the rooting percentages, regardless of the hormone treatment. The 10-week interval was significantly superior in this respect at the 1-percent level to the 6- and 8-week intervals, indicating that this is the best period of the three tested to leave the cuttings in the sand beds in order to get the best rooting percentage. The mean rooting percentages for the 6-, 8-, and 10-week intervals were 26.58, 55.42, and 68.33, respectively.

Regardless of the hormone treatments, the cuttings left in the sand beds for a 10-week period had a higher rooting percentage than those left for 6 and 8 weeks. These results were also significant at the 1-percent level.

The standard errors and least differences for significance between mean rooting percentages are shown in the following tabulation:

Comparison	*5 percent*	*1 percent*
Hormone treatments		
Difference between highest and lowest means	41.21	60.01
Difference between 2 adjacents	32.85	49.75
Standard error: 9.50 with 6 d.f.		
Time intervals		
Difference between highest and lowest	9.75	12.69
Difference between 2 adjacents	8.02	10.99
Standard error: 2.70 with 18 d.f.		
Between time intervals for same hormone treatments		
Difference between highest and lowest	16.89	21.99
Difference between 2 adjacents	13.90	19.05
Standard error: 4.68 with 18 d.f.		
Between any 2 hormones for same time intervals		
Difference between highest and lowest	42.50	61.04
Difference between 2 adjacents	33.98	50.92
Standard error 10.02		

AVERAGE NUMBER OF ROOTS PER CUTTING

Table 2 and figure 1 show the effect of root-inducing substances on the number of roots per cutting. Treating the cuttings with IBA definitely

TABLE 2.—*Mean number of roots per cutting of grapes treated with root-inducing substances and left in sand beds for 6, 8, and 10 weeks*

Treatments	Roots per cutting after number of weeks indicated			
	6	8	10	Mean
IBA	7.09	6.05	10.65	7.93
Control	5.02	5.25	5.09	5.12
NAA	3.45	4.46	5.58	4.49
Mean	5.18	5.25	7.10	5.84

increased the number of roots per cutting; however NAA had no effect. These findings on the number of roots due to indolebutyric acid agree with previous work done on grapes by Cowart and Savage (*2*),[3] Harmon (*3*), and Sharpe (*4*). Abrams and Jackson (*1*), working with acerola cuttings treated with indolebutyric acid, found that these produced a larger number of roots than those treated with naphthaleneacetic acid and the control. Therefore, the use of indolebutyric acid is justified from the standpoint of the survival of rooted grape cuttings.

[3] Numbers in parentheses refer to Literature Cited pp. 76.

Leaving the cuttings in the sand beds for 10 weeks effected a significant difference over 6 and 8 weeks in the number of roots produced. There was no significant difference between 6- and 8-week intervals, indicating that 10 weeks is the optimum period for producing a larger number of roots.

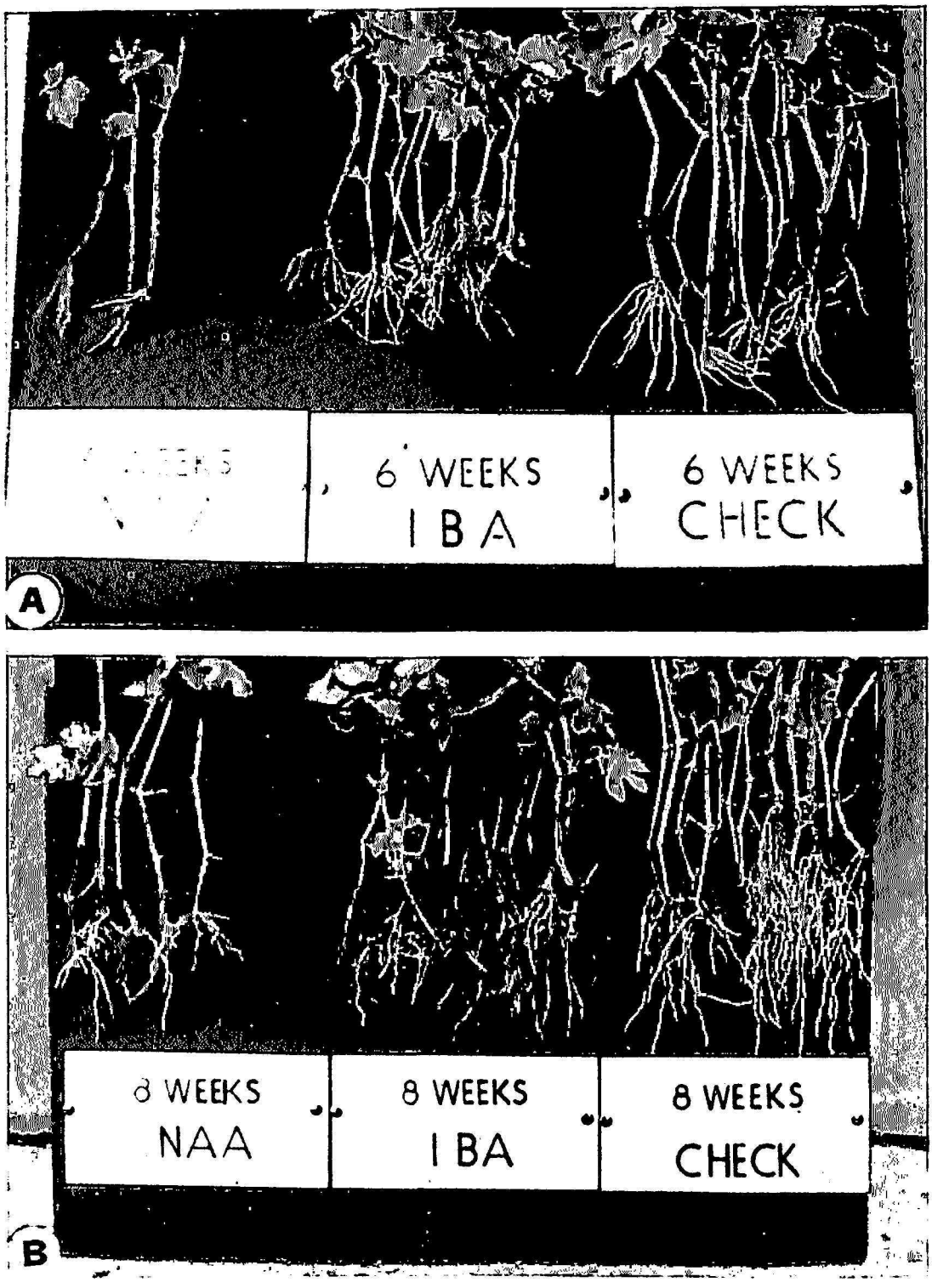

FIG. 1.—The effect of root-inducing substances on the rooting of grape cuttings: A, 6 weeks after planting and B, 8 weeks after planting.

The mean number of roots for the 6-, 8-, and 10-week intervals was 5.18, 5.25, and 7.10 roots per cutting, respectively.

The standard errors and least differences for significance between mean number of roots per cutting are shown in the following tabulation:

Comparison	*5 percent*	*1 percent*
Hormone treatments		
Difference between highest and lowest	1.07	1.55
Difference between 2 adjacents	.85	1.29
Standard error: 0.25 with 6 d.f.		
Time intervals		
Difference between highest and lowest	1.61	2.09
Difference between 2 adjacents	1.32	1.81
Standard error: 0.45 with 18 d.f.		
Between time intervals for same hormone treatments		
Difference between highest and lowest	2.78	3.62
Difference between 2 adjacents	2.29	3.13
Standard error: 0.77 with 18 d.f.		
Between any 2 hormones for same time interval		
Difference between highest and lowest	2.50	3.32
Difference between 2 adjacents	2.05	2.86
Standard error: 0.68		

LENGTH OF ROOTS

The results on the average length of the roots of grape cuttings treated with root-inducing substances and left in the sand beds for 6-, 8-, and 10-weeks are presented in table 3. There were no significant differences between the effects of the hormone treatments on the average root length of the grape cuttings. Cuttings left in the sand beds for 8 and 10 weeks had longer roots than those left for 6 weeks. These differences were found to be highly significant, *i.e.*, the average root length increased consistently with the time that the cuttings were left in the sand beds.

TABLE 3.—*Mean length (centimeters) of roots of grape cuttings treated with root-inducing substances and left in sand beds for 6, 8, and 10 weeks*

Treatments	Root length after number of weeks indicated			
	6	8	10	Mean
IBA	5.30	7.14	9.65	7.36
NAA	2.83	6.60	9.96	6.46
Control	4.09	6.58	7.90	6.19
Mean	4.07	6.77	9.17	6.67

The standard errors and least differences for significance between mean lengths of roots are shown in the following tabulation:

Comparison	*5 percent*	*1 percent*
Hormone treatments		
Difference between highest and lowest	2.07	3.01
Difference between 2 adjacents	1.65	2.50
Standard error: 0.48 with 6 d.f.		
Time intervals		
Difference between highest and lowest	2.03	2.64
Difference between 2 adjacents	1.67	2.29
Standard error: 0.56 with 18 d.f.		
Between time intervals for same hormone treatment		
Difference between highest and lowest	3.52	4.58
Difference between 2 adjacents	2.89	3.96
Standard error: 0.97 with 18 d.f.		
Between any 2 hormones for same time interval		
Difference between highest and lowest	3.52	4.76
Difference between 2 adjacents	2.87	4.06
Standard error: 0.93		

DISCUSSION

The results of this study did not indicate that IBA and NAA have any significant influence on the rooting percentage of grape cuttings. However, the cuttings do respond to treatment with indolebutyric acid as to the number of roots produced. These results are partly in accordance with those of Cowart and Savage (*2*) and Harmon (*3*), who reported that indolebutyric and naphthaleneacetic acids apparently stimulated root promotion in grape cuttings, as judged by the number and quality of the roots formed. Cowart and Savage (*2*) reported that propagation of grapes by cuttings is not encouraged, but in this experiment it was found that 85 percent of the cuttings in the control treatment rooted when they were left in the sand beds for 10 weeks. This tends to indicate that the time the cuttings are left in the sand beds has a greater effect on the rooting of grape cuttings than the root-inducing substances.

SUMMARY

The effects of root-inducing substances and time intervals were studied on the rooting of grape cuttings of Florida Selection 1001 left in sand beds 6, 8, and 10 weeks. Observations were made on the number of rooted cuttings, and the number and length of roots per cutting. The major results were as follows:

1. Root-inducing substances had no significant effect on the rooting percentage of grape cuttings.

2. The time the cuttings remained in the sand beds did have highly significant effects on the rooting percentages and on the number and length of roots per cutting, regardless of hormone treatments.

3. In these respects the 10-week period was better than the 6- or 8-week periods.

4. Indolebutyric acid had the greatest effect on the number of roots produced by grape cuttings, which is of importance in the establishment of these cuttings.

RESUMEN

El efecto de hormonas de crecimiento e intervalos de tiempo se estudió en este experimento con relación al arraigo de esquejes de uvas parras. Los resultados fueron como sigue:

1. Las hormonas de crecimiento no surtieron efectos significativos sobre el porcentaje de esquejes que arraigaron.

2. El tiempo que se dejaron los esquejes en la arena demostró tener influencia significativa sobre el porcentaje de esquejes que arraigaron, así como en el número y longitud de las raíces en cada uno, independientemente del tratamiento de hormonas que recibieran.

3. El tratamiento de diez semanas resultó mejor que el de 6 y 8, en cuanto a dejar los esquejes en la arena.

4. El ácido indolebutírico aumentó el número de raíces por esqueje, lo cual es de importancia para el arraigo de estos esquejes.

LITERATURE CITED

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