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EFFECT OF SOME PLANT HORMONES ON THE ROOTING CAPACITY OF AVOCADO CUTTINGS

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The following is a preliminary report on work started in October, 1968, during the sabbatical leave of C. D. Gustafson. The project is being continued by Dr. Kadman, at the Volcani Institute of Agricultural Research, Israel.

Vegetative propagation of avocado cuttings is of primary importance if uniformity of genetic characteristics, such as tolerance of rootstocks to a saline condition, highly calcareous soil, and resistance to root rot diseases, is desired.

Much effort has been devoted during the last years at the Volcani Institute of Agricultural Research, Israel, to trials on the rooting of avocado cuttings. Many different treatments have been tried. Results, however, have been mostly inconsistent.

Many types of experimental trials have been conducted. Among them was the use of plant hormones as a possible way to increase the rooting capacity of avocado cuttings. In most cases, the plant hormones used did not affect the rate of rooting. They did, however, improve the development of the root system.

It has been suggested that the common forms of plant hormones used were of insufficient absorption and mobility capacity within the cuttings. It has been decided, therefore, to try additional forms of hormones, with the aim of increasing the rooting percentage and decreasing the time of rooting.

MATERIALS AND METHODS

The experiments described have been carried out in a glasshouse, under intermittent mist spray during daytime, of four seconds every 90 seconds, controlled automatically by an electric timer and valve, which supplies a relative humidity of nearly 100%. Eight concrete beds, 250 x 75 x 30 cm in depth were used. The rooting medium of coarse vermiculite (No. 6) provides the best aeration and drainage conditions. Constant bottom heat of 25 °C was maintained by means of an electric cable with concrete heating plates buried in the vermiculite.

Types selected as rootstocks for this experiment were: Fuchs 20, a West Indian seedling selection from the rootstock selection experiments; and Gvar-Am 13, a Mexican type found in Israel and selected from a series of rootstock tests. The West Indian type shows relatively good tolerance to high salinity conditions, and calcareous

soils. The Mexican type shows good tolerance under saline conditions.

On November 6, 1968, 260 semi-hardwood cuttings from each of the above mentioned types were taken; all of them tip cuttings (including leaves) from the last spring flush (8-months-old) of growth. The cuttings were selected and grounded in as uniform groups as possible.

All were cut to a length of about 30 cm, and the two basal pairs of leaves removed. The cuttings then were divided into groups of 20 each, and treated with the various hormones.

Three different plant hormones of the auxin groups were used: 1. K.I.B.A. (Potassium salt of I.B.A. (indole butyric acid)) 2. N.A.A. (Naphthalene acetic acid) and 3. I.A.A. (indole acetic acid). Different concentrations of each were prepared in aqueous solution. In addition, two controls, a water and a dry, were used as checks for comparison with the treated cuttings. Altogether there were 26 treatments in groups of twenty cuttings each, totaling 560 cuttings.

Table 1: Hormone Treatments

Group Number	Type	Hormone	Concentration	Treatment
1	Gvar-Am 13	IAA	10 ppm	24 hours dipping
2	"	"	100 "	" " "
3	"	"	500 "	" " "
4	"	"	5000 "	2 seconds "
5	"	NAA	10 "	24 hours "
6	"	"	100 "	" " "
7	"	"	250 "	" " "
8	"	"	2500 "	2 seconds "
9	"	KIBA	10 "	24 hours "
10	"	"	100 "	" " "
11	"	"	500 "	" " "
12	"	Control	water	" " "
13	"	"	dry	Immediate insertion
14	Fuchs 20	IAA	10 "	24 hours dipping
15	"	"	100 "	" " "
16	"	"	500 "	" " "
17	"	"	5000 "	2 seconds "
18	"	NAA	10 "	24 hours "
19	"	"	100 "	" " "
20	"	"	250 "	" " "
21	"	"	2500 "	2 seconds "
22	"	KIBA	10 "	"
23	"	"	100 "	" " "
24	"	"	500 "	" " "
25	"	Control	water	24 hours "
26	"	"	dry	Immediate insertion

Table 1 gives the variety, the type of hormone used, and the treatment. Immediately after the treatments all cuttings were inserted into the rooting media to a depth of about 8-10 cm.

RESULTS AND DISCUSSION

On January 20, 1969, the first survey of rooted cuttings was made. Each month a similar observation and counting of rooted cuttings was conducted. Results to date are shown in Table 2.

Table 2: Number of root cuttings according to treatment

	Treatment Group			Jan.	Feb.	Mar.	Apr.	May	Total	%
1.	Gvar-Am 1	IAA	10 ppm	0	0	1	1	2	4	20
2.	"	"	100 "	0	1	0	1	6	8	40
3.	"	"	500 "	1	4	0	0	1	6	30
4.	"	"	5000 "	0	0	0	0	1	1	5
5.	"	NAA	10 "	0	0	2	3	2	7	35
6.	"	"	100 "	2	0	1	0	0	3	15
7.	"	"	250 "	2	3	1	2	0	8	40
8.	"	"	2500 "	0	0	0	2	3	5	25
9.	"	KIBA	10 "	0	0	3	0	1	4	20
10.	"	"	100 "	0	1	4	1	0	6	30
11.	"	"	500 "	0	2	6	4	2	14	70
12.	"	Control	water	0	0	0	2	1	3	15
13.	"	"	dry	0	0	0	4	2	6	30
14.	Fuchs 20	IAA	10 ppm	0	0	0	2	0	2	10
15.	"	"	100 "	0	0	1	1	0	2	10
16.	"	"	500 "	0	0	0	0	0	0	0
17.	"	"	5000 "	0	2	6	0	0	8	40
18.	"	NAA	10 "	0	0	1	1	0	2	10
19.	"	"	100 "	0	0	1	1	0	2	10
20.	"	"	250 "	0	0	0	0	0	0	0
21.	"	"	2500 "	0	1	1	0	0	2	10
22.	"	KIBA	10 "	1	3	7	0	1	12	60
23.	"	"	100 "	0	2	0	1	1	4	20
24.	"	"	500 "	0	0	0	0	1	1	5
25.	"	Control	wet	0	2	1	1	0	4	20
26.	"	"	dry	0	3	4	1	0	7	35

Results of these preliminary tests indicate that Gvar-Am 13, a Mexican type rootstock, generally roots better than the West Indian type, Fuchs 20. This agrees with results obtained in former experiments. There were individual differences between variety and treatment. For instance, using potassium-indole-acetic acid (K.I.B.A.) at a concentration of 500 ppm on Gvar-Am 13, a 70% rooting occurred. With the Fuchs 20 variety, a 60% rooting took place with K.I.B.A. at 10 ppm concentration. The 500 ppm concentration of K.I.B.A. on Fuchs 20 resulted in only 5% rooting, while 10 ppm K.I.B.A. Gvar-Am 13 gave a 20% rooting. Gvar-Am 13 variety rooted with similar percentage when treated with Indole-acetic acid (IAA), naphthalene acetic acid (NAA) and potassium Índole butyric acid (KIBA). IAA gave a 30% rooting when averaging the three treatments of 10, 100, and 500 ppm. All treatments were similar in rooting, 20, 30, and 40%. With NAA the rooting percentage was likewise an average of 30%, but individual treatments were 15, 35, and 40%. KIBA had the highest average rooting of 40%, with individual treatments of 20, 30, and 70%. Controls showed 15% under wet treatment and 30% dry.

Fuchs 20 variety resulted in low percentage of rooting with all treatments, except 10 ppm KIBA. IAA and NAA gave only 10% rooting. KIBA gave 28% based mainly upon on the 60% with 10 ppm concentration since the other treatments of 100 ppm and 500 ppm resulted in only 20% and 5% rooting respectively. Water control gave 20% rooting, while the dry control resulted in 35% rooting.

Rooting occurred within 10 weeks after experiment began. Six cuttings rooted, five Mexican and one West Indian at this time. Distribution and number of roots formed on the cuttings varied highly between the different treatments, as well as within the same treatment.

CONCLUSIONS

The use of potassium-indole butyric acid resulted in a higher percentage of rooting with Gvar-Am 13, even though the rooting with IAA and NAA was generally good, compared with the same treatments on the Fuchs 20 variety.

The high variability in the behavior of cuttings to root could be attributed to the physiological condition of the cuttings. This includes the presence, or lack of, endogenic root inhibitors or promotors, the reserve food material within the cutting, etc. Because of this high variability in rooting, it will be necessary to use more than the 20 cuttings used in this experiment. Since KIBA gave the best results, it is now planned to use this material on many more cuttings per treatment with different concentrations from low dosages (long dipping) up to very high concentrations (quick dipping).