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AVOCADO ROOTSTOCK-SCION RELATIONSHIPS: A LONG-TERM, LARGE-SCALE FIELD RESEARCH PROJECT

SENSITIVITY OF AVOCADO ROOTSTOCKS TO INADEQUATE SOIL AERATION

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In the first paper of this series[1] we described an experimental system set up in Israel to study avocado rootstocks and rootstock-scion relationships. This system provides a facility for large-scale study of the influence of the rootstock and the source of the scion on the development and fertility of the tree for different avocado varieties and under different conditions of cultivation.

The second paper of the series[2] contained a summary of data from fruit-bearing orchards that had not been planned for experimental purposes. There were clear signs that the rootstock and the scion source were affecting the development and fertility of the avocado trees.

In this paper, we deal with the extensive experimental system described in the first publication. The orchards planted in 1968/69 have developed well and are now reaching the fruit-bearing stage. There has been a follow-up of the trees' development and their reaction to different soil and climatic factors, which will be presented in future papers. The present communication deals with the reaction of rootstocks to inadequate soil aeration.

Description of Experiment

The avocado plantation at Ometz was planted as an experiment in the autumn of 1969 on heavy, fairly compact soil with inadequate aeration and drainage. The lot was laid out according to the randomized block system, on an area of approximately 20 acres.

After the very rainy winter of 1971/72, many of the trees were found to have been damaged by the long period of waterlogging. In many trees, some of the leaves dried up and were shed, and in the course of time some of the trees died.

Since this lot had been planted specifically for experiments with and study of rootstock-scion combinations, it was possible to study the reaction of the rootstocks to conditions

of poor soil aeration.

Results

The results of a survey made in March, 1972 of the trees in the affected parts of the orchard are given in Table 1. In both varieties, but particularly in the Hass, there was considerable difference in the susceptibility of trees with different combinations. As a result of the high degree of variability found in this survey, the difference between the combinations as far as the degree of damage is concerned is not significant, though it is considerable. On the other hand, both varieties show an indisputable effect of the combination on the circumference of the tree above the graft.

With Hass, a high negative correlation (-0.68) was found between the circumference of the trunk and the degree of damage. Trees grafted on Wagschal rootstock were retarded in their development and showed particularly heavy damage.

Discussion and Conclusions

The fungus *Phytophthora cinnamomi* is not known to be active in Israel[3]; consequently, it is customary, unlike in other avocado-growing countries, to plant even on fairly heavy soil. Still, there can be no doubt that the avocado tree is sensitive to poor soil aeration and is affected by it even in the absence of the fungus. This sensitivity is now the main limiting soil factor to the expansion of the area planted to avocado in Israel. Consequently, it is of great importance to develop rootstocks that are more resistant to such conditions. The rootstock experiment at Ometz has uncovered considerable differences between different rootstock-scion combinations as far as tolerance to serious conditions of poor soil aeration is concerned. The experiment offers no possibility of distinguishing between the influence of the rootstock and that of the scion, for the plantation contains different scions grafted on different rootstocks; nevertheless, it may be assumed that the considerable difference in the degree of damage is connected with the different rootstocks and not with the different sources of the scions. Such a difference exists in Hass, where in one group 69% of the trees were severely damaged and in another group only 19%. This indicates the presence of a considerable genetic difference among the rootstocks in tolerance of poor soil aeration, and encourages the continuation of selection in this direction.

Practical Results of the Experiment

Further surveys of the trees of this orchard revealed a few exceptionally resistant trees growing in the area where most of the trees had suffered severe damage. Trees with high tolerance, of a combination which has shown high tolerance, would seem to have individual root-stocks which are particularly resistant. The trees concerned have been marked, and we intend to propagate their rootstocks vegetatively, in an attempt to preserve their characteristics. So far, shoots have been produced by two of these outstanding trees, of which cuttings have been taken for vegetative propagation.

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Summary

The avocado tree is highly sensitive to conditions of inadequate soil aeration, which caused severe damage to trees in an experimental orchard on compact soil that absorbed an excess of water in a rainy winter.

A survey of the trees in the affected area showed considerable, though not significant differences between different rootstocks. This finding encourages the systematic selection of rootstocks for resistance to unfavorable soil aeration conditions. In the experimental lot, a number of markedly resistant trees were selected for continuation of vegetable propagation of the rootstock.

TABLE 1: RESULTS OF SURVEY OF OMETZ ORCHARD, MARCH 1972

Variety	*Scion*	*Rootstock*	*Number of Trees Compared*	*Circumference of Trunk in cm* [1]	*Average Degree of Damage* [2]	*% of Trees with Grade 4-5 Damage*
Fuerte	Netzer 5	Gvar-Am 18	26	26.3 a[3]	2.43	42
	Netzer 10	Gvar-Am 18	27	21.8 b	2.21	37
	Netzer 20	Gvar-Am 18	27	21.7 b	1.95	30
	Barkai 19	Aharo- 1 nowitz	24	21.5 b	3.21	58
F value				**	N.S.	
Hass	Barkai 6	Shmit	16	24.4 ab	1.50	19
	Zrifin 1	Zofit 6	15	23.8 ab	2.06	33
	Barkai 30	Gvar-Am 6	14	25.9 a	1.50	22
	Barkai 13	Wagschal 5	15	21.6 b	3.38	69
F value				*	N.S.	

[1] *The circumference was measured on the grafted stem, above the graft.*

[2] *On a scale of 0-5, from 0 = no damage to 5 = death of the tree.*

[3] *Values followed by different letters are significantly different at P 0.05.*

* *Significant at the 5% level.*

** *Significant at the 1% level.*

N.S.: Not significant.

LITERATURE

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