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The Effect of the Mineral Nutrition and pH of the Rooting Substrate on Rooting and Mineral Content of Cherry Rootstock Greencuttings

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Summary

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The conventional propagation methods (mound layering) and the in-vitro methods (with new weakly growing cultivars) are the common propagation methods for cherry rootstocks. The aim of this research was to optimize the cutting-propagation method with cherry rootstocks.

Two pH levels (4.5 and 7.3) and four slow release fertilizer levels (0, 0.2, 0.4 and 0.6 g N/l substrate) were tested under fog conditions to find the optimum combination of these parameters with the weakly growing 'Gisela' rootstock. pH did not have any significant influence on the rooting and over-wintering of the cuttings. The 0.4 g variant had the best rooting and over-wintering results, in the autumn these cuttings contained the lowest percentage of nitrogen. The highest percentage of nitrogen and potassium in the cuttings was found with the 0.6 g variant. These cuttings rooted and overwintered less successfully than the cuttings with the 0.4 g variant.

Introduction

In nurseries the propagation of cherry rootstocks is carried out mostly through convetional propagation methods (mound layering) or by in-vitro methods (new weakly growing cultivars). Both propagation methods have many significant disadvantages. The mound-layering-propagation method is often ineffective and

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needs a lot of work. With the in-vitro-propagation method the most important disadvantage is the high price of the resulting plants. Because of this, the cutting-propagation method may play an important role in the production of cherry rootstocks in the future.

A simple and cheap system for greencutting propagation with cherry rootstocks was developed by OSTERC & SPETHMANN 1998. Many experiments with woody plants showed the importance of the mineral nutrition and pH of the rooting substrate for the rooting, growing and over-wintering of the cuttings (SPETHMANN 1997). We wanted to optimize these parameters with the cherry rootstocks, especially with respect to the rooting and over-wintering of the cuttings.

Materials and Methods

The experiment was carried out in an unheated plastic house under a fog system at the experimental station of the Section Tree Nursery Science at the University of Hannover in 1997. Four levels (0, 0.2, 0.4 and 0.6 g N/l substrate) of the slow release fertilizer "Osmocote-Plus 3-4M (15+11+13+2)" and two pH levels (4.5 and 7.3) were tested with the 'Gisela' rootstock in a two-factors experiment with 4 replications and 20 cuttings per replication. The cuttings were cut in the middle of June at the experimental station. Before being put in the rooting substrate (peat/sand in a 3:1 ratio) the cuttings were treated with 0.5 % IBA (with 10 % Euparen on talcum basis). Data was collected in the autumn of 1997 and the spring of 1998. On both occasions all the cuttings per replication (20 cuttings) were evaluated. The percentage of viable-rooted cuttings was counted each time. The data from spring 1998 represented the over-wintering results. The mineral analysis of all viable cuttings per replication was made in the autumn. All plant parts were analysed. Plants were washed out in water, ground and dried at 105 °C. The nitrogen content was determined by the Kjeldahl method, potassium levels using the flame-photometric method, calcium and magnesium contents by atomic absorption spectroscopy (AAS) and phosphorus was detected with the spectrophotometric method. The experiment was evaluated by Anova, the analyses of averages were tested with the Duncan-test at $\alpha = 5$ %. For evaluation the statistics program Ncss was used.

Results and Discussion

The best rooting, both in autumn 1997 and in spring 1998, was observed for the higher pH level (Table 1). These results do not support the findings of MLASOWSKY 1996, where the best rooting of oak cuttings was observed with the lowest pH levels (3.2 - 4.5). HARBAGE & al. 1998 also showed similar results: in the in-vitro cuttings by two apple cultivars the highest percentage of IBA taken up from the medium and the best rooting were measured at a low pH level (4.0). In our experiment the 0.4 g fertilizer level showed the best rooting of cuttings in the autumn and the best over-wintering results. In the autumn, the cuttings with this treatment contained the lowest level of nitrogen, phosphorus, magnesium and calcium. In the autumn, the worst rooting results were measured in the control variant, and in the spring with the 0.6 g and 0.2 g variants. In the autumn, the cuttings with these treatments contained the highest percentage of nitrogen and potassium. The interaction between pH and fertilization did not show any significant difference (Table 1). The results of MAC CARTHAIGH & EBLE 1989 did not show better rooting results with "Osmocote" fertilizer added to the rooting substrate. Differences between fertilized and unfertilized substrate were found with oak cuttings (HARMS 1992). MLASOWSKY 1996 showed that by adding "Osmocote" to the substrate of oak cuttings the rooting success was improved. According to JOHNSON & HAMILTON 1977 the rooting of *Juniperus conferta* and *Ligustrum japonicum* was quicker at lower "Osmocote" levels. The addition of "Osmocote" minimized the number of dead-rooted cuttings, thus the rooting percentages were higher by adding "Osmocote".

Table 1. Percentages of viable-rooted cuttings in autumn 1997 and in spring 1998 and mineral contents of the green parts of the cuttings in autumn 1997 by the 'Gisela' rootstock (Anova, $\alpha = 5$ %).

factor	treatment	rooting (%)		mineral content (% dry matter)				
		autumn 1997	spring 1998	N	P	K	Mg	Ca
pH value	4.5	71.3	41.9	1.54	0.21 b	0.61	0.17	0.60 a
	7.3	84.4	48.1	1.63	0.16 a	0.63	0.16	0.79 b
	SD	16.1	15.0	0.27	0.02	0.09	0.02	0.10
fertilization	0	49.4 a	62.4 b	1.51	0.20	0.53 a	0.18	0.87 b
	0.2	86.9 b	22.5 a	1.60	0.18	0.65 b	0.16	0.64 a
	0.4	95.0 b	70.6 b	1.45	0.17	0.59 ab	0.16	0.62 a
	0.6	80.0 b	24.4 a	1.80	0.19	0.72 c	0.16	0.65 a
	SD	24.7	23.0	0.42	0.05	0.06	0.04	0.15

Statistically significant differences between treatments are marked with a different letter.
Legend: SD: significant difference

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