

Influence of Geneva rootstocks on vegetative and generative characteristics of the apple cultivar 'Topaz' in a replanted orchard

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Abstract

In autumn 2010, in a replanted orchard in the research center of the University of Natural Resources and Life Sciences in Vienna, the apple cultivar 'Topaz' was planted on the rootstocks M9 (clone T337) with interstem, CG11, CG13, CG 16, CG41, CG202, M7 and MM111. The trees were grown according to organic production rules. They were tested for eight years, results of growth, yield and fruit quality are presented and discussed, conclusions and recommendations are given. CG11 and CG41 showed good results, even if the tree losses due to crown rot (*Phytophthora cactorum*) in combination with the highly susceptible cv. Topaz were higher compared to the standard M9 with interstem.

Keywords: M9, interstem, CG11, CG13, CG16, CG 41, CG 202, M7, MM111

Introduction

The apple replanting disease (ARD) is a major problem in replanted apple orchards. For organic growers, besides bio-fumigation the use of tolerant rootstocks is an efficient way in the regulation. Some of the rootstocks from Cornell Geneva (USA), which were mainly bred for fire blight (*Erwinia amylovora*) resistance, are also highly tolerant to ARD.

In a field trial in a replanted apple orchard different rootstocks were evaluated and compared with the standard rootstock M9 in combination with 'Topaz', one of the mainly used cultivars in Austria and Germany in organic production.

Materials and Methods

The trial was established in the research orchard of the University in the North-East of Vienna. The mean yearly temperature at the site is around 10 °C, the yearly rainfall about 550mm. The soil is a chernozem with a pH of 7.6 and a high lime-content (15%).

The cultivar 'Topaz' was grafted on the following rootstocks: M9 (clone T337) with interstem ('Summerred' between 20 and 65 cm), CG (=Cornell Geneva) 11, CG13, CG16, CG41, CG202, M7 and MM111. The two-year old trees (5 repetitions with 4 trees, in total 20 trees) were planted in autumn 2010 in a previously cleared apple orchard exactly in the same rows as before they were standing on M9. The planting distance in the rows was 3.5 m, and varied between 1.1 (M9, CG11, CG13 und CG16), 1.3 on CG41, 1.45 on CG202, 1.6 on M7 and 1.8 meter on MM111 in the row. The orchard was managed according organic production rules. All observations and evaluations were done following scientific rules.

Results and Discussion

Some trees on CG202 (4 trees died, 1 tree damaged), CG41 (3), CG11 (2), MM111 and CG16 (each 1) died during the trial, which was partly due crown rot (*Phytophthora cactorum*), to which Topaz is very sensitive. Pest infestation (e.g. *Dysaphis plantaginea*) did not differ.

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In 2019, after nine years, MM111 showed the strongest vigor, followed by M7 and CG202. CG16, CG13 and CG41 were similar to CG202. M9 and CG11 grew weaker (tab.1).

In the total of years, M7 showed the highest yield per tree, followed by MM111, CG11 and CG41. CG16, CG202 and M9 were narrow behind (tab. 1).

Considering also the growth, the total specific yield of CG11 was the highest followed by M9 and CG41, which was higher than CG13, CG202 and M7; at the end stays MM111 (tab. 1).

Table 1: Sum of yields in kg/tree from 2012-19, stem cross section in autumn 2019 and specific yield per tree of 'Topaz' on different rootstocks

	Sum of yield 2012-19		Stem cross section End 2019		specific total yield 2012-19	
	kg/tree	*	cm ²	*	kg/cm ² 2019	*
M 9 with interstem	45,8	ab	35,9	a	1,36	de
CG 11	54,1	bcd	36,5	a	1,50	e
CG 13	43,0	a	42,1	ab	1,05	b
CG 16	49,3	abc	41,9	ab	1,18	bc
CG 41	52,9	bcd	41,3	ab	1,29	cd
CG 202	51,6	abc	46,2	b	1,10	b
M 7	60,8	d	57,1	c	1,09	b
MM 111	56,7	cd	75,0	d	0,78	a

* different letters indicate significancy (ANOVA with post-hoc SNK-test, p<0.05)

In five years, the mean fruit size did not differ very much between the variants. M9 (172g), M7 (170g), CG202 (169g) and MM111 (168g) showed a slightly higher fruit weight compared to CG41 (161g), CG11 (160g), CG13 (159g) and CG16 (155g).

CG11 and CG13 showed a significantly higher fruit firmness compared to all other rootstocks.

Conclusions

The standard M9 with interstem showed good plant health and yield results. CG11 grows similarly and was even slightly better in yield. CG41 grows 10% more with good yield results, and is therefore ideal for replanting orchards. The other tested rootstocks from Geneva cannot be recommended. Since tree losses due to crown rot besides others could be found also on CG11 and CG41, in combination with the highly susceptible cultivar Topaz an interstem-grafting is probably also needed for these rootstocks.

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Citation of the full publication

The citation of the full publication will be found on Ecofruit website as soon as available.