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The effect of rootstocks on leaf surface in two different apple cultivars

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Abstract. This field experiment was designed to assess the effect of rootstocks M9 and MM106 on leaf surface in two different apple cultivars Idared and Granny Smith. The experiment was conducted in Kosovo (Anamorava region), in apple orchard using a nested experimental design. During the experiment based on two-way analysis of variance, we found significant changes on the leaf surface among cultivars, but no differences among rootstocks. The results obtained in the agro-ecological conditions of Kosovo, where it is stated clearly that in average the leaf surface have higher values of the two combinations grafts has reached the rootstock MM106 (Granny Smith 27.42 cm² and Idared 25.03 cm²), while the grafts M9 values are relatively low (Idared 24.65 cm² and Granny Smith 27.04 cm²). The changes introduced showed to be as result of heritable characteristics of cultivar and rootstock.

Keywords: apple, Idared, Granny Smith, leaf surface,

1 Introduction

Apple due to inherited traits, in particular, the ability to adapt to different agro-ecological conditions, high nutritional value, high yields, achieving high positive financial returns as well as a range of other advantages, both in the world as well as Kosovo, is the most widespread type of tree. For no other type of fruit, are there such great opportunities for the selection of sub grafting and cultivars, such as for apple Zajmi 1997 [16].

The objectives of this research has been a year through the leaf surface tracking both cultivars and rootstocks widespread in Kosovo and combinations between them Idared on M 9 (East-Malling), as grafts with poor abundance and MM 106 (Malling-Merton) as rootstocks with medium abundance, and Granny Smith are also on these grafts respectively on M 9 and MM 106, to conclude reciprocal influences of these combinations in agro-ecological conditions of Anamorava region.

Data on the virtues of sub grafts and cultivars we encounter at these authors: Çakalli & Thomai (2005) [1], Gliha (1978) [2], Gvozdenović (2007) [4], Masseron
Material and methods

The experimental set up was a nested or hierarchical design whereby the categories of nested factor within each level of the main factor are different. The surveys were carried out on the four years old orchard on the area of 2.80 ha. Planting distances in grafts M 9 for the two cultivars (Idared and Granny Smith) were 4 x 1.3 m; while the MM 106 grafts both cultivars were planted 4 x 1.7 m.

In orchard were set and marked trees, which were involved in the experiment, at 20 cm above the graft site were marked by black color. The experiment was performed in four repetitions. In one plot were taken five trees for processing per each combination, which means they were generally included 80 trees. The leaf surface was determined by measurements of 10 leaves selected randomly for each tree involved in the experiment. Measuring the leaf surface was done by the millimeter paper, and values were expressed in cm²/foliage.

Data from the measurements were analysed using two-way ANOVA with post hoc testing (LSD test) with StatPlus software (AnalystSoft Inc., Alexandria, VA, USA).

Results and discussion

Figure 1. Leaf surface in cm²

The results of the leaf surface, expressed in cm², are presented in the figure showing that the rootstock MM 106 (Granny Smith 27.42 cm² and Idared 25.03 cm²) has reached larger average surface of the leaf, whilst the rootstock M 9 (Idared 24.65 cm² and Granny Smith 27.04 cm²) has lower average surface of the leaf. Based on the analysis of variances there were significant differences on the leaf surface among cultivars, but no differences among rootstocks. There we can conclude that the
average surface of Granny Smith cultivar compared to Idared is greater in both combinations. The changes introduced are primarily a result of the hereditary properties of the rootstock and the cultivar. Our results showing that MM 106 rootstock is more fertile (abundant) for the most parameters compared to M 9 match with a range of authors, such as: Gvozdenović, Dulić (1982) [3], Kapetanović (1984) [4], Mišić (1994) [9], Zajmi (1997) [16], Štampar (2009) [11], Trillot et al. (2002) [12], Krpina (2004) [6], Zajmi (1986) [15].

![Photo 1. Measuring the leaf surface](image)

### 1.3 Conclusions

Based on our yearly research conducted under agro ecological conditions of the orchard in Anamorava region, in an area of 2.8 ha, where common technology has been applied to the cultivation of apples, we can draw the following conclusions: both cultivars, Idared and Granny Smith in combination with M 9 and MM 106 rootstocks to the leaf surface and in general for the growth and development of apples, prove that under these agro ecological conditions the hereditary properties of rootstocks and cultivars and their mutual influence were introduced. Based on the results obtained by analysis of variance it can be concluded that MM 106 rootstock is more abundant compared to M 9. In both combinations the cultivar Granny Smith has shown a slightly larger surface in comparison with Idared cultivar.

### References