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RESEARCH ARTICLE (Open Access)

Behavior of the “Golden Delicious” cultivar on some clonal rootstocks, in the conditions of Dibra region.

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Abstract

In this paper we bring data on the behavior of the cultivar "Golden Delicious" on five clonal rootstocks in the conditions of Dibra region. The obtained data showed that Golden, grafted onto the Pi Supporter 80 rootstock, provides a harmonious development between vegetation elements and elements of fructification, while ensuring early entry into production. On MM111 and MM106 rootstocks, a bigger growth is provided but the entry into production is delayed. The M9 rootstock has a more pronounced dwarfing effect, in the condition of this region.

Keywords: rootstock, Golden cultivar, ecological conditions, tree twigs

1. Introduction

The globalization of apple production requires more and more innovative solutions that lead to increased productivity and reduce costs without affecting quality.

The use of clonal rootstocks with weak growth, it is now a routine practice for intensive cultivation of apple in all cultivating countries. They manage to modify many of the vegetative and productive characters as a result of rootstock/ graft relationships [3, 1], therefore, they allow the increase of the orchard’s density, shorten the time of entry into production, facilitate the commission of agro-technical services and improve the quality of production [2, 4, 6, 7].

The M9 rootstock is the more usable, but not in all cases it carries the above advantages. This has led to the release, apart from it, of many selections obtained from this graft in various stations [5]. Their introduction into mass production requires an extensive study of their behavior in different conditions pedoclimatic, the compatibility with other apple cultivars on the market, and the impact on qualitative and quantitative indicators of production [7, 8]. Environmental conditions, without any doubt take primary importance and condition the wellbeing of the rootstock/graft coexistence and output indicators [9, 4, 8].

Currently, in the district of Dibra, the cultivar 'Golden Delicious’ accounts for about 30.5% in the structure of apple cultivars. It is found in the cold area as well as in the orchards located in low coastal area. Through this study we aimed to gain knowledge about the behavior of this cultivar grafted onto five vegetative grafts, in the conditions of Dibra region.

2. Materials and Methods

Dibra’s region is characterized by a Mediterranean mountain climate, but also with the presence of microclimates that are formed in different units as a result of refraction of the terrain. This leads to a variety of soils and other elements of climate. The average annual temperature fluctuates in the limits of -11.3 ° C. The colder month’s average is -0.1 ° C, while the average of the warmer months is 21^{o}C. The annual precipitation ranges in the average values of 719 - 751mm . In certain areas (Black Drin Valley), the amount of annual precipitation amounts to 1200 mm. Snowdrifts are annual and cover the territory for about 30 days a year.

It is worth mentioning also that apple in the Dibra region ranks first with about 447 ha, while the cultivar "Golden Delicious" takes the second place after the cultivar 'Starking "with about 30.6%. (Source: Statistics Debar DAF).

Given the above, through this study we aimed to clarify the behavior cultivar of the 'Golden Delicious' cultivar, grafted on some vegetative rootstocks.

The research involved rootstocks MM106, MM111, M9, Pajam 2 and Pi Supporter 80. The first three rootstocks are known to many apple cultivation areas, whereas in the studied region, the five rootstocks were introduced only after the year 2005.

The orchard was planted in the spring of 2011 under the scheme of randomized block, with three

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repetitions and five plants, for each iteration. Planting distances are 3.5x1, 6 m, with about 1644 plants / ha. The form of the crown is the vertical axis.

For each combination 6 trees were taken (2 for each repetition) on which we conducted several measurements related to the assessment of the elements that belong to the Crown architecture. The analyzed indicators for each combination are as follows:

Graft circumference, 10 cm above the grafting point.

Annual growth of the sprout

The number of tree twigs

Number of slim twigs

The number of short twigs & twigbags

The collected and commented below data, are statistically processed by analysis of variance. The authenticity is proven between the average test-Qamar Tukei 0.05 level.

3. The result and discussion

3.1 Graft's circumference

The collected data show that after two years of planting in a permanent site there is an easily distinguishable difference in the impact of the rootstock on the growth activity of the studied, 'Golden Delicious' cultivar. The largest increase is given by the MM111 rootstock, and behind it are ranked the MM106 and Pajam 2, which in this case behaves like a rootstock with strong growth, despite being a clone of the M9 rootstock. The M9 itself gives a weaker growth. Differences found between MM106 rootstock, Pajam2 and Pi Supporter 80, are small and not significant. Figure 1, 2.

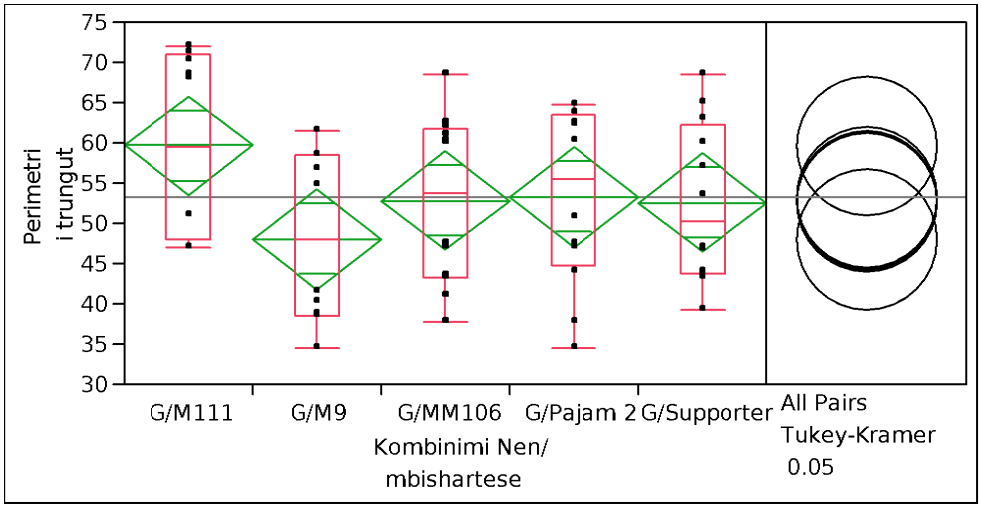

Figure 1: Fit Y by X Group. Oneway Analysis of trunk's circumference by combination rootstock/graft

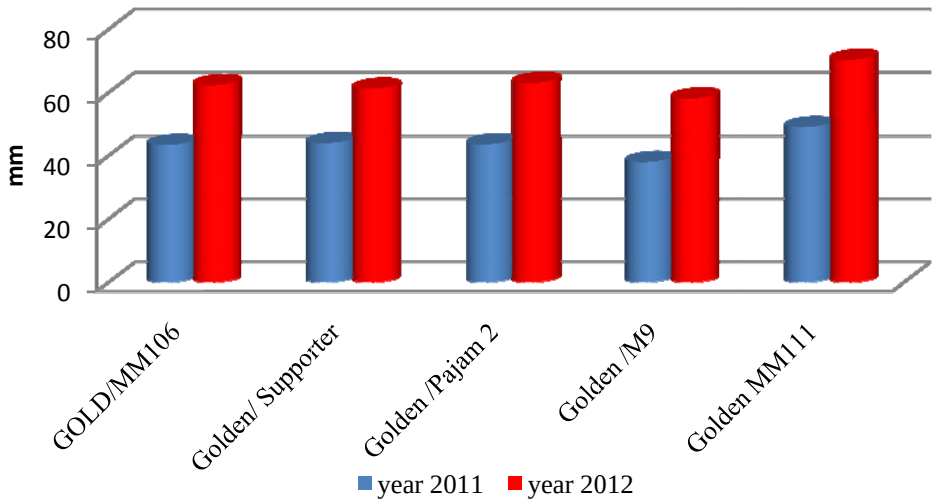

Figure 2. Tree trunks circunference

3.2 Sprout growth

At the end of the vegetation period was measured the annual sprout growth, from where resulted that the most growth of tree twig was provided on the MM106 rootstock, while the weaker growth was provided, even in the case, on the M9 rootstock. As seen, the dwarfing effect of the M9 rootstock is more pronounced for the "Golden Delicious" variety in the conditions of Dibra region. Figure 3.4. In the second year, in almost all variants it is observed a decrease in the intensity of sprout growth, but it was more pronounced on the three rootstocks that have provided the greatest increase (MM106, MM111 and Pajam2), the M9 has maintained the same growth rate in the second year. Figure 3.

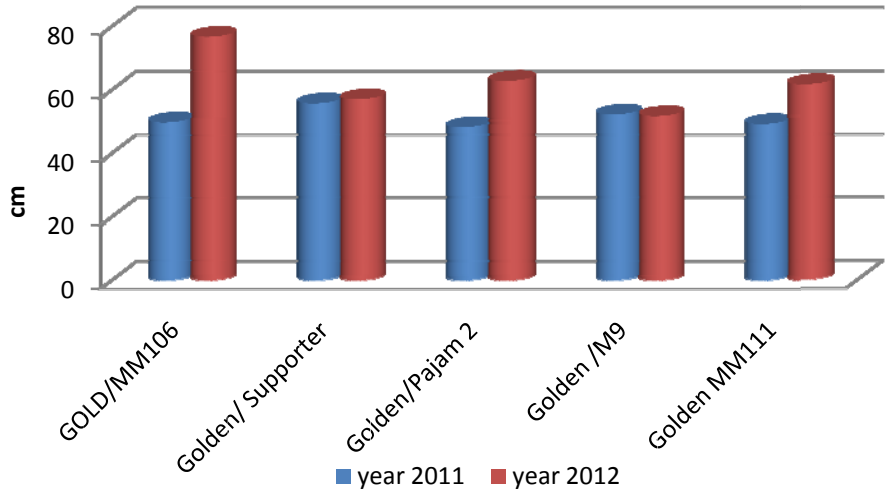

Figure 3: Yealy sprout grouth

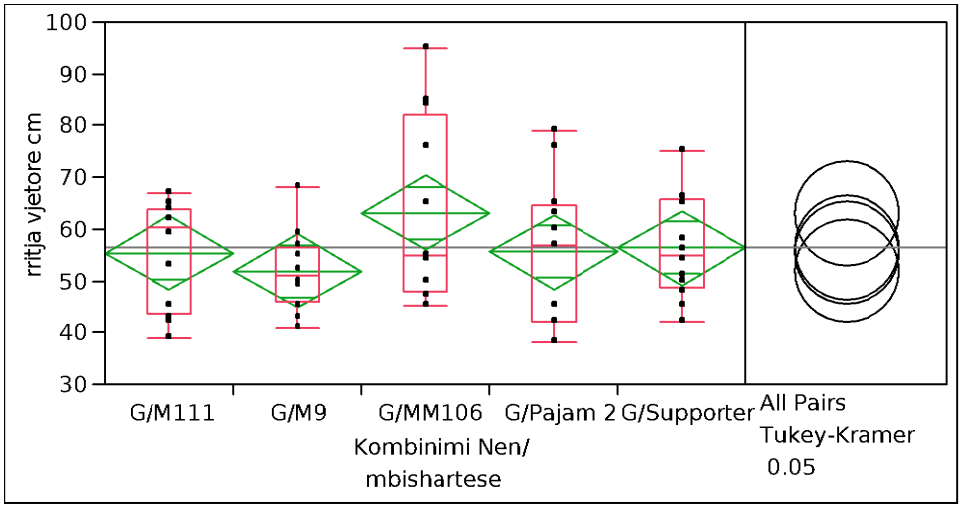

Figure 4: Oneway Analysis of yearly growth in cm By Combination rootstock/graft

3.3 Number of tree twigs (vegetative)

Rootstock has a great influence on the formation of the crown architecture elements. The number of tree twig expresses the rootstock’s power to supply the necessary graft nutrients. In our case, the Pi Supporter 80 rootstock has given a greater number of tree twig in the first two years in the orchard, in addition, in the second year, the number is significantly higher. **Figure** 5.6. The four other rootstocks have minor differences between them.

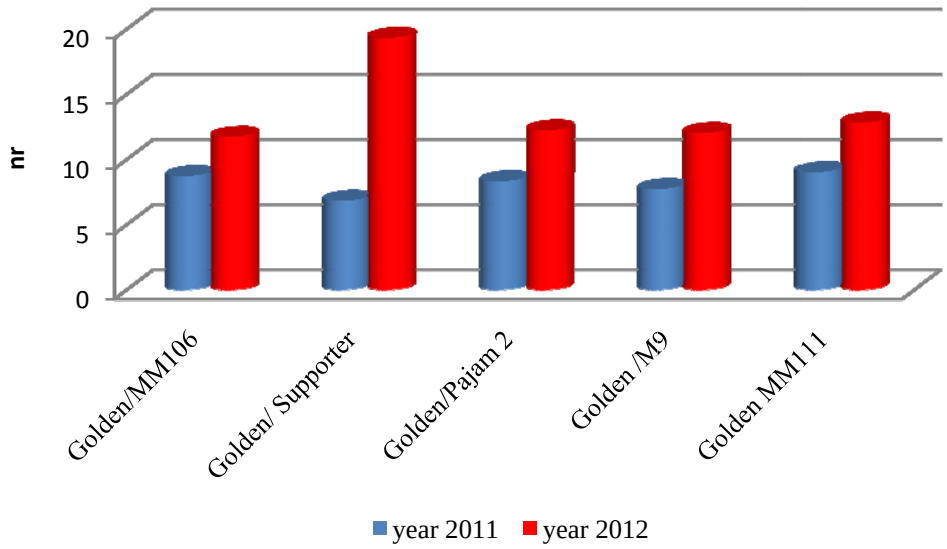

Figure 5: Number of tree twigs

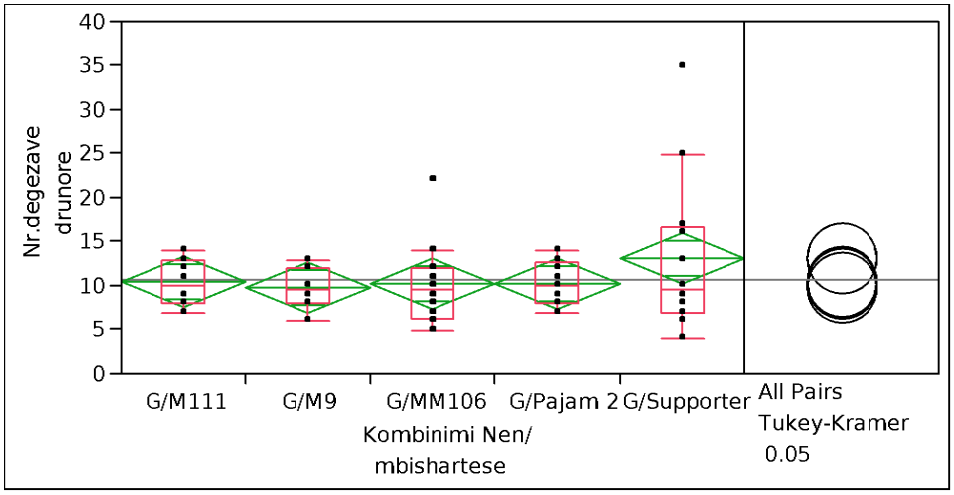

Figure 6: Oneway Analysis of Nr. of tree twigs by ombination rootstock/graft

3.4 Number of thin twigs

The impact of rootstock becomes more apparent when referring to the basic elements of fructification; thin twigs, short twigs and twigbags. Their presence in the early years of the life of the tree in the orchard expresses the dwarfing effect of the rootstock and the shortening of the unproductive period.

The data indicate that major changes are spotted especially on M9, Supporter and Pajam2 rootstocks, while Mm111 and Mm106 rootstocks, the changes are insignificant. More thin twigs are formed in the case of grafting on the M9 and less to Mm111 and Mm106. Interestingly, on the Supporter, the "Golden" forms more tree twigs and also forms a high number of thin twigs, which proves that on this rootstock, in the conditions of Dibra region, provides a sensational and harmonious growth among elements the crown. Figure 7.8.

3.5 Number of short and twigbags

Short twigs and twigbags are the basic elements of apples fructification. Their presence in the first years of life in the orchard shows the impact of the rootstock in the early fructification, but also in reducing the volume of the crown.

The data show that the Supporter and M9 rootstocks have secured the highest number of these twig, behind them is ranked Pajam 2 and further MM111 and MM106 rootstocks, creating two clearly distinct groups; Supporter and M9 with the highest number and MM111 and MM106 with the lowest number. The Pajam 2 rootstock occupies an intermediate position between the two groups.

Interestingly, it seems that for this indicator the Supporter rootstock ranked first by providing, as said above, a very harmonious development of the tree and early introduction in its production. So, it behaves as a strong rootstock for the vegetation indicators and as a dwarfing rootstock for the fructification elements. Figures 9, 10. Table 1.

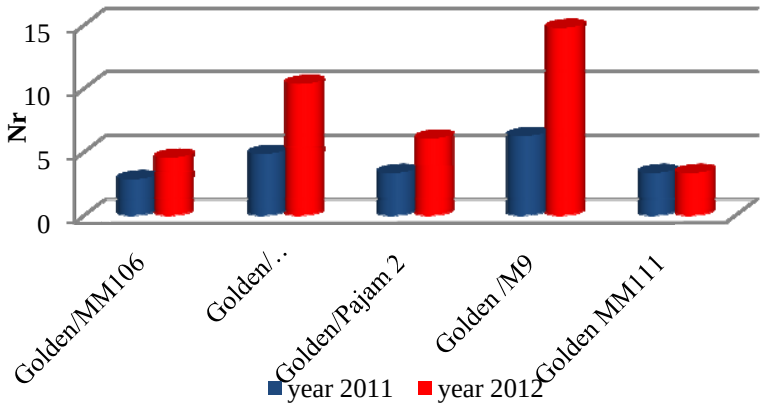

Figure 7: Number of thin twigs

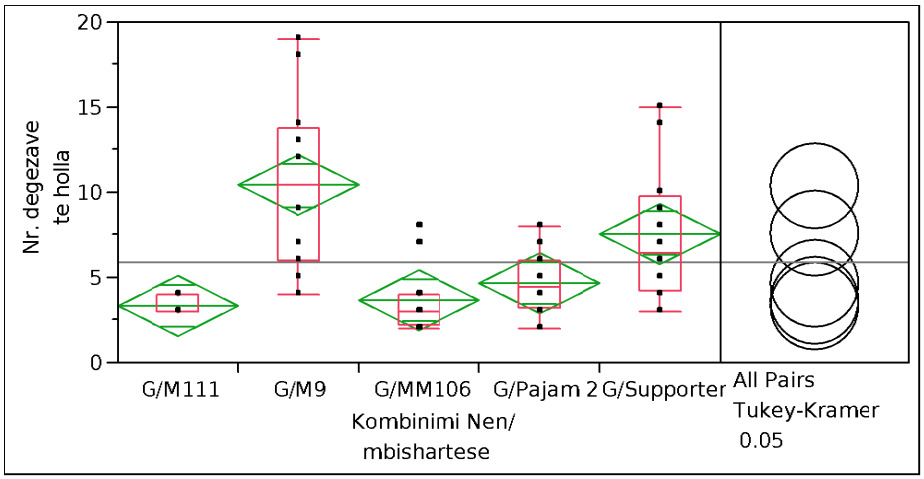

Figure 8: Oneway Analysis of Nr. of thin twigs by combination rootstock/graft.

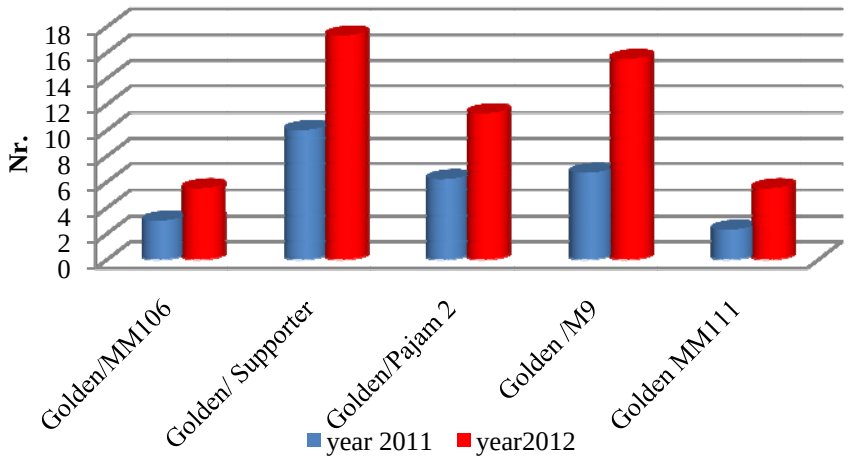

Figure 9: Number of short twigs and twigbags

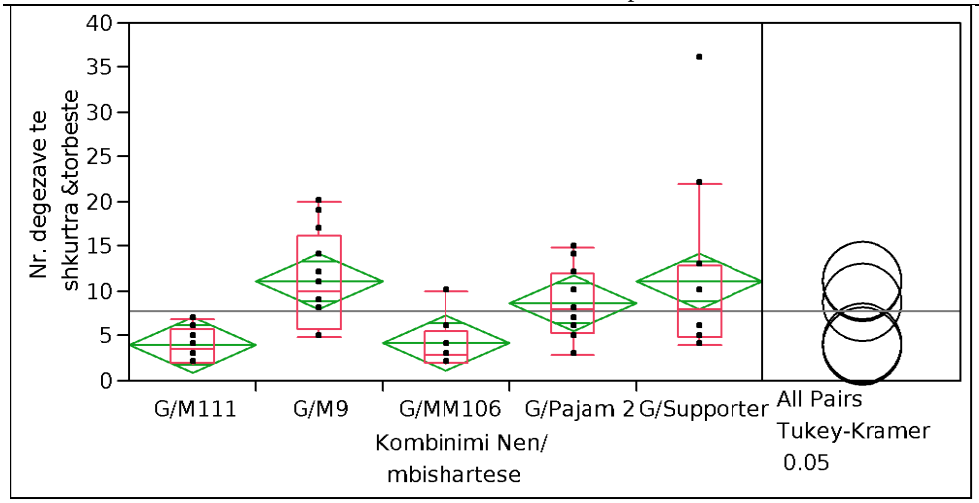

Figure 10: Oneway Analysis of Nr of short twigs and twigbags by combination rootstock/graft

Table 1: Data for the elements of the crown architecure.

Rootstock	*Tree Twigs*	*Thin Twigs*	*Short & torbeste twigs*	*∑ fructification elements*	*Tree twigs /fruit twigs ratio*
G/MM111	10.4	3.3	3.9	7.2	1.44
G/M9	9.8	10.4	11.1	21.5	0.45
G/MM106	10.2	3.7	4.3	8	1.27
G/Pajam 2	10.3	4.7	8.8	13.5	0.76
G/Supporter Pi 80	13.1	7.6	11.2	18.8	0.69

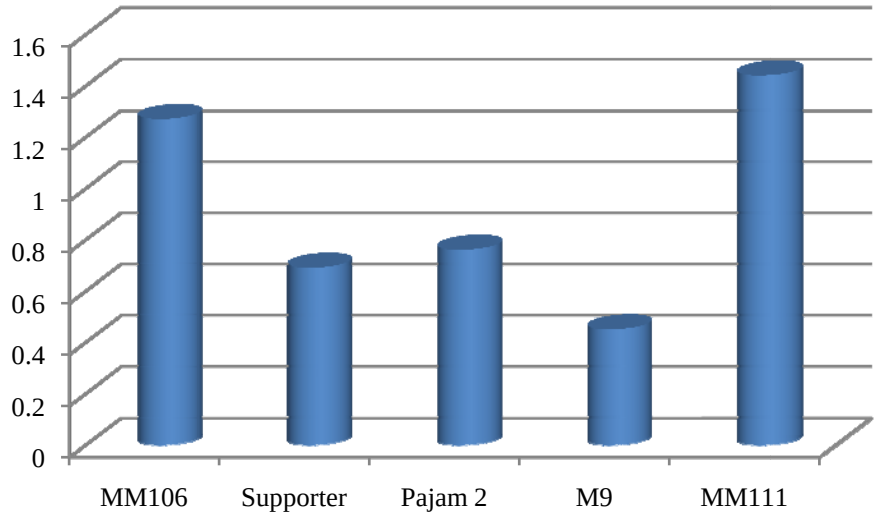

Figure 11: Tree twigs/fruit twigs

This fact becomes even more significant if we examine the relationship between the elements of vegetation, which is represented by the tree twigs, and the total of elements of fructification, represented by the thin twigs, short twigs and twigbags. The lowest coefficient in this ratio is held by the M9 rootstock and behind it are ranked its two clones; Supporter and Pajam 2. Table 1 Figure 11

4. Conclusions

From the obtained and analyzed data above we arrive at the following conclusions:

Cultivar Golden in the region of Dibra, grafted onto the Pi Supporter 80 rootstock provides a harmonious development between vegetation

elements and elements of fructification, while ensuring early entry into production.

Grafting on MM111 and MM106 rootstocks provided sensational growth but delayed entry into production.

The dwarfing M9rootstock has a more pronounced effect in the conditions of the region.

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