

## The Effect of Agrotechnical Practices on the Growth and Productivity of Different Plum Variety-Rootstock Combinations

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**Cite:** Ion, G., Sava, G., Ghenadie, C., & Olga, M. (2026). The effect of agrotechnical practices on the growth and productivity of different plum variety-rootstock combinations. *Crystal Journal of Environmental Science, Innovation & Green Development*, 2(3), 01-05.

**Received:** February 03, 2026; **Accepted:** May 06, 2026; **Published:** May 14, 2026

### Abstract

The article presents the results of research conducted during 2020–2023 on the effects of agrotechnical practices on the growth and productivity of the plum cultivar *Super Prezident*, grafted onto two rootstocks: *Myrobalan* (*myrobalan plum*) and *Cubani-86*. The study provides scientific data on trunk diameter, tree height, crown width, average and total length of annual shoots, leaf surface area, pigment content in leaves, and fruit productivity during the 4th–7th years of tree growth.

### Keywords

Rootstock, Variety, Trunk Diameter, Chlorophyll Content, Leaf Area, Intensive Orchard System, Productivity

### Introduction

The establishment of plum plantations and their productivity largely depend on the variety–rootstock combination. In the Republic of Moldova, the main rootstock used and officially approved for plum cultivation is *Myrobalan* (*myrobalan plum*). Plum trees grafted onto *Myrobalan* exhibit medium to high vegetative vigor. The root system is characterized by high adaptability to the pedoclimatic conditions of Moldova, good resistance to diseases and pests, and broad adaptability to most soil types found in the country. Among the shortcomings, suckering in orchards can be mentioned. A promising rootstock for plum cultivation is the vegetative rootstock *Cubani-86*, of Russian origin, used for peach, apricot, and plum, and characterized by high growth vigor. It is highly resistant to drought, can be cultivated on heavy soils and under conditions of excessive moisture, is resistant to nematodes, root rot diseases, root cancer, cytosporosis, and tolerates high carbonate content in the soil. In addition, the *Cubani-86* is easily propagated by cuttings. Green, semi-lignified, and lignified shoots readily form roots, and the trees do not produce adventitious shoots in the orchard [1].

Conducting experiments in plum orchards grafted onto different rootstocks is necessary to objectively highlight the advantages of early tree fruiting, assess the potential for rapid recovery of capital investments in the studied plum variety, and obtain experimental data on yield. These data are essential for designing plantation establishment and defining appropriate technological processes under varying natural, agrotechnical, and economic conditions.

### Materials and Methods

The intensive plum orchard, established on an area of 3 ha and privately owned by “AMV-Grape” LLC, located in the village of Vadul lui Isac, Cahul district, was planted in compliance with the planting distance of 5.0 × 3.0 m, corresponding to 667 trees per hectare. The plum cultivar *Super Prezident* included in the study is a new, recently homologated variety, grafted onto two rootstocks - *Myrobalan* and *Cubani-86*. The crown is formed in a spindle form. The first variant consisted of the *Super Prezident* cultivar grafted onto the seedling rootstock *Myrobalan*, homologated in the Republic of Moldova, and served as the control. The

second variant consisted of the Super Prezident cultivar grafted onto the vegetative rootstock Cubani-86.

The number of replications in each variant was four. The number of trees per replication was 6–8. The replications were arranged in a randomized design. The research was carried out under field and laboratory conditions [2].

### Results and Discussions

During the research period (2020–2023), the plum cultivar Super Prezident was not affected by late spring frosts and exhibited good flowering.

Trunk diameter is the most stable and sensitive indicator for assessing tree growth processes, objectively reflecting their response to environmental conditions and agrotechnical practices.

The trunk diameter (Table 1) of the Super Prezident plum trees included in the study increased steadily regardless of the rootstock, recording an increment of 3.3–4.6 cm during the 4th and 7th years of vegetation. The obtained results demonstrate that the growth vigor of plum trees grafted onto the Cubani-86 rootstock during these four years was higher, accumulating a trunk diameter that was 1.2 cm greater than that of trees grafted onto Myrobalan. In addition, the trunk diameter of plum trees grafted onto the Cubani-86 rootstock at the end of the 6th year of vegetation was 1.3 cm greater than that of trees grafted onto Myrobalan. It can be concluded that the growth vigor of plum trees on the Cubani-86 rootstock is higher during the first 7 years compared to trees grafted onto the seedling Myrobalan rootstock [3].

**Table 1:** Trunk diameter of Super Prezident plum trees depending on the rootstock in the intensive orchard located in Vadul lui Isac, Cahul district (2020–2023)

Variety	Rootstock	Trunk diameter, cm					Trunk diameter increase (2019–2023), cm
		2019	2020	2021	2022	2023	
Super Prezident	Myrobalan I-st var.	4.5	5.7	6.7	7.7	7.8	3.3
	Cubani-86 II-nd var.	4.7	6.7	7.9	9.1	9.3	4.6
	DL0,05	0.9	0.1	0.7	1.2	1.4	

At the end of the 7th year of vegetation, the average crown width of Super Prezident plum trees ranged from 2.01 m for trees grafted onto Myrobalan to 2.03 m for trees grafted onto the Cubani-86 rootstock. The greater tree height and crown

width of plum trees grafted onto the vegetative Cubani-86 rootstock indicate that their growth vigor is higher compared to trees grafted onto Myrobalan.

**Table 2:** Phytometric characteristics of Super Prezident plum trees depending on the rootstock in the intensive orchard located in Vadul lui Isac, Cahul district (2020–2023)

Variety	Root-stock	Tree height, m				Crown width, m			
		2020	2021	2022	2023	2020	2021	2022	2023
Super Prezident	Myrobalan I-st var.	2.8	3.0	3.1	3.0	2.19	2.11	2.00	2.01
	Cubani-86 II-nd var.	3.2	3.1	3.2	3.1	2.36	2.33	2.20	2.03
	DL0,05	0.3		0.3	0.3	0.2		0.2	0.2

**Table 3:** Characteristics of annual shoot (branch) growth of Super Prezident plum trees depending on the rootstock in the intensive orchard located in Vadul lui Isac, Cahul district (2020–2023)

Variety	Rootstock	Number of annual shoots, pcs				Total length of annual shoots, m				Average length of annual shoots, cm			
		2020	2021	2022	2023	2020	2021	2022	2023	2020	2021	2022	2023
Super Prezident	Myrobalan I-st var.	33.0	30.7	43.3	19.0	17.0	22.1	21.44	74.01	51.4	72.0	49.5	39.0
	Cubani-86 II-nd var.	40.0	38.4	25.5	23.4	26.7	40.7	10.71	83.77	66.6	106.0	41.4	35.8
	DL0,05	3.5	5.4	11.8	11.8					3.5	21.8	6.8	6.8

The length of annual shoots (branches) is one of the indicators reflecting the response of trees to climatic and technological growing conditions. According to the experimental data (Table 3), the average length of annual shoots during the research period 2020–2023 ranged from 39.0 to 72.0 cm in trees grafted onto Myrobalan and from 35.8 to 106.0 cm in trees grafted

onto the vegetative Cubani-86 rootstock. At the end of the 5th year of vegetation, under favorable growing conditions of that year, the average length of annual shoots was normal to high, ranging from 72.0 cm in trees grafted onto Myrobalan to 106.0 cm in trees grafted onto the vegetative Cubani-86 rootstock. In contrast, in 2022 and 2023, considering the hydrological

drought conditions of those years, the average shoot length decreased to 49.5–39.0 cm and 41.4–35.8 cm, respectively. The length and number of annual shoots are of great importance for the formation of flower/fruit buds in the following year and, in some cultivars, for fruit formation. The length of annual shoots largely depends on the pedoclimatic conditions of the year, the fruit load of the trees, and the agrotechnical practices applied in the orchard [4].

The total length and number of annual shoots varied across the years of research and according to the biological characteris-

tics of the rootstock, being higher in plum trees grafted onto the vegetative Cubani-86 rootstock, which exhibited greater growth vigor compared to trees grafted onto Myrobalan. According to the experimental data, the number of annual shoots during the research period 2020–2023 ranged from 19.0 to 43.3 in trees grafted onto Myrobalan and from 23.4 to 40.0 in trees grafted onto the Cubani-86 vegetative rootstock. This parameter largely depends on the pedoclimatic conditions of the year, the fruit load of the trees in the orchard, and the growth vigor of the rootstock.

**Table 4:** Leaf area and leaf mass of Super Prezident plum trees depending on the rootstock in the intensive orchard located in Vadul lui Isac, Cahul district (2020–2023)

Rootstock (Experimental variant)	Mass of 100 leaves, g				Leaf area of one leaf, cm <sup>2</sup>			
Myrobalan I-st var.	111.0	106.5	113.4	109.4	26.4	25.4	26.7	25.2
Cubani-86 II-nd var.	112.5	110.8	121.5	111.7	28.1	26.3	27.3	26.6

The leaf area of plum trees grafted onto the Cubani-86 rootstock was 28.1 cm<sup>2</sup> (2020), 26.3 cm<sup>2</sup> (2021), 27.3 cm<sup>2</sup> (2022), and 26.6 cm<sup>2</sup> (2023), whereas for trees grafted onto Myrobalan

it was 26.4, 25.4, 26.7, and 25.2 cm<sup>2</sup>, respectively. A similar trend was observed for the mass of 100 leaves (Table 4).

**Table 5:** Chlorophyll content in the leaves of Super Prezident plum trees depending on the rootstock in the intensive orchard located in Vadul lui Isac, Cahul district (2020–2023)

Rootstock Experimental variant)	Chlorophyll content, mg/dm <sup>3</sup>											
	A				B				A+B			
	2020	2021	2022	2023	2020	2021	2022	2023	2020	2021	2022	2023
Myrobalan I-st var.	3.96	3.16	4.13	4.28	2.11	2.18	1.38	2.09	6.07	5.34	5.52	6.37
Cubani-86 II-nd var.	3.38	3.49	4.43	4.56	2.06	2.15	1.21	2.14	5.46	5.64	5.64	6.70

**Table 6:** Pigment content in the leaves of Super Prezident plum trees depending on the rootstock in the intensive orchard located in Vadul lui Isac, Cahul district (2020–2023)

Rootstock (Experimental variant)	Carotenoids, mg/dm <sup>3</sup>				A+B/ Carotenoids			
	2020	2021	2022	2023	2020	2021	2022	2023
Myrobalan I-st var.	1.32	1.41	1.53	1.721	4.59	3.80	3.59	3.70
Cubani-86 II-nd var.	1.07	1.33	1.61	1.738	5.12	4.25	3.50	3.85

The pigment content in the leaves, including chlorophyll A and B and carotenoids, is presented in Tables 5 and 6. In plum trees grafted onto the Myrobalan rootstock, the total chlorophyll A + B content was 6.07 mg/dm<sup>3</sup> in 2020, 5.34 mg/dm<sup>3</sup> in 2021, 5.52 mg/dm<sup>3</sup> in 2022, and 6.37 mg/dm<sup>3</sup> in 2023. For trees grafted onto the Cubani-86 rootstock, the corresponding values were

5.46, 5.64, 5.64, and 6.70 mg/dm<sup>3</sup>, respectively, and the chlorophyll A + B / carotenoids ratio was higher in trees grafted onto Cubani-86. In conclusion, it can be stated that plum trees grafted onto the Cubani-86 rootstock exhibited larger leaf areas and higher pigment and nutrient content [5].

**Table 7:** Fruit set in Super Prezident plum trees depending on the rootstock in the intensive orchard located in Vadul lui Isac, Cahul district (2020–2023)

Variety	Rootstock	Average number of flowers per tree, pcs				Average number of fruits per tree, pcs				Fruit set, %			
		2020	2021	2022	2023	2020	2021	2022	2023	2020	2021	2022	2023
Super Prezident	Myrobalan I-st var.	225.3	565.6	847.6	1468.6	41.7	124.2	157.4	306.0	18.5	21.9	18.5	20.8
	Cubani-86 II-nd var.	567.9	619.1	1651.4	1789.3	132.7	153.7	340.5	409.7	23.4	24.8	20.6	22.9
	DL0,05	69.7	39.7	25.4	25.4	15.2	10.6	18.6	18.6				

Due to the greater growth vigor of the Super Prezident plum variety grafted onto the vegetative Cubani-86 rootstock compared to those grafted onto Myrobalan, the number of fruits during the research years was higher by 3.2 times in 2020, 1.2 times in 2021, 2.2 times in 2022, and 1.3 times in 2023 (Table 7). Fruit set was satisfactory and varied among the experimental variants, ranging from 18.5% to 23.4% in 2020, 21.9% to 24.8% in 2021, 18.5% to 20.6% in 2022, and 20.5% to 22.9% in 2023.

Fruit yield is one of the main indicators for assessing the influence of environmental factors and those under study. For plum

trees, the fourth-year marks the onset of fruiting. Analysis of the results shows that the average fruit weight varies little depending on the rootstock (Table 8). However, the average yield per tree differs considerably among the experimental variants. It was found that the fruit yield per tree at the end of the fourth year of vegetation for the Super Prezident plum grafted onto the Cubani-86 vegetative rootstock was 7.43 kg, compared to 2.42 kg for trees grafted onto Myrobalan. In the fifth year after planting, yields were 11.1 kg and 8.8 kg, respectively; in the sixth year, 24.00 kg and 11.40 kg; and in the seventh year, 26.02 kg and 20.01 kg (Table 8) [6].

**Table 8:** Fruit productivity of Super Prezident plum trees depending on rootstock in the intensive orchard located in Vadul lui Isac, Cahul district (2020–2023)

Variety	Rootstock	Average number of fruits per tree, pcs				Average fruit weight, g			
		2020	2021	2022	2023	2020	2021	2022	2023
Super Prezident	Myrobalan I-st var.	41.7	124.2	157.4	306.0	58	71.1	72.4	65.4
	Cubani-86 II-nd var.	132.7	153.7	140.5	409.7	56	72.3	70.5	63.6
	DL0,05	15.2	10.7	10.6		2.0	0.9	0.9	

Thus, the more intensive growth during the first four to seven years of vegetation and the higher crown parameter values of the Super Prezident plum grafted onto the Cubani-86 vegetative rootstock contributed to a fruit yield per tree that was

307% higher in 2020, 126% higher in 2021, 211% higher in 2022, and 130% higher in 2023 compared to trees grafted onto the standard Myrobalan rootstock.

**Table 9:** Productivity of Super Prezident plum trees depending on rootstock in the intensive orchard located in Vadul lui Isac, Cahul district (2020–2023)

Variety	Rootstock	Average yield per tree, kg				Average yield per hectare, t			
		2020	2021	2022	2023	2020	2021	2022	2023
Super Prezident	Myrobalan I-st var.	2.42	8.8	11.40	20.01	1.61	5.87	7.60	13.35
	Cubani-86 II-nd var.	7.43	11.1	24.00	26.02	4.96	7.40	16.01	17.36

The average yield per hectare of the Super Prezident plum grafted onto the Cubani-86 vegetative rootstock during the study years was 4.96, 7.40, 16.01, and 17.36 t/ha, while for the same variety grafted onto Myrobalan it was 1.61, 5.87, 7.60, and 13.35 t/ha. The yield increase of Super Prezident plum on the Cubani-86 rootstock was 3.35 t/ha in 2020, 1.53 t/ha in 2021, 8.41 t/ha in 2022, and 4.01 t/ha in 2023. Therefore, according to the data obtained, the Super Prezident plum grafted onto the Cubani-86 vegetative rootstock grows more intensively during the first four to seven years, enters fruiting earlier, and is more productive compared to trees grafted onto the standard Myrobalan seedling rootstock [7].

### Conclusions

The results obtained demonstrate that the growth vigor of plum trees grafted onto the Cubani-86 rootstock during the 4th to 7th years of vegetation is greater, resulting in a trunk thickness difference of 1.3 cm compared to trees grafted onto the Myrobalan rootstock. The higher values of tree height and crown width in plum trees grafted onto the Cubani-86 vegetative rootstock

indicate that the growth potential of trees on this rootstock is greater than that of trees grafted onto Myrobalan.

The average length of annual shoots during the research period 2020–2023 ranged from 39.0 to 72.0 cm in trees grafted onto Myrobalan and 35.8–106.0 cm in trees grafted onto the Cubani-86 vegetative rootstock. At the end of the 5th year of vegetation, considering favorable growth conditions, the average shoot length was medium to high, ranging from 72.0 cm in trees grafted onto Myrobalan to 106.0 cm in trees grafted onto the Cubani-86 rootstock. In the drought years of 2022 and 2023, the values decreased accordingly to 49.5–39.0 cm and 41.4–35.8 cm. The length and number of annual shoots are highly important for the formation of fruit buds for the following year and, in some varieties, also for fruit development. The length of annual shoots largely depends on the pedoclimatic conditions of the year, the fruit load of the trees, and the agrotechnical measures applied in the orchard.

The total length and number of annual branches varied depending on the biological characteristics of the rootstock and were greater in plum trees grafted onto the Cubani-86 vegetative rootstock, which is characterized by greater growth vigor compared to trees grafted onto Myrobalan.

The leaf surface area of plum trees grafted onto the Cubani-86 rootstock was 28.1 cm<sup>2</sup> in 2020, 26.3 cm<sup>2</sup> in 2021, 27.3 cm<sup>2</sup> in 2022, and 26.6 cm<sup>2</sup> in 2023, whereas in trees grafted onto Myrobalan it was 26.4, 25.4, 26.7, and 25.2 cm<sup>2</sup>, respectively. The same correlation was also observed for the mass of 100 g of leaves.

In plum trees grafted onto the Myrobalan rootstock, the sum of chlorophyll A+B was 6.07 mg/dm<sup>3</sup> in 2020, 5.34 mg/dm<sup>3</sup> in 2021, 5.52 mg/dm<sup>3</sup> in 2022, and 6.37 mg/dm<sup>3</sup> in 2023. In trees grafted onto the Cubani-86 rootstock, the corresponding values were 5.46, 5.64, 5.64, and 6.70 mg/dm<sup>3</sup>, respectively, and the A+B/carotenoid ratio was higher in trees grafted onto Cubani-86. In conclusion, plum trees grafted onto the Cubani-86 rootstock exhibited a larger leaf area and a higher content of pigments and nutrients.

The more intensive growth during the first four to seven years of vegetation and the higher crown parameter values of the Super Prezident plum variety grafted onto the Cubani-86 vegetative rootstock resulted in a per-tree yield that was 307% higher in 2020, 126% higher in 2021, 211% higher in 2022, and 130% higher in 2023 compared with the homologated Myrobalan rootstock.

The production increase of the Super Prezident plum variety grafted onto the Cubani-86 vegetative rootstock amounted to

3.35 t/ha in 2020, 1.53 t/ha in 2021, 8.41 t/ha in 2022, and 4.01 t/ha in 2023. Thus, according to the obtained data, the Super Prezident plum variety grafted onto the Cubani-86 vegetative rootstock exhibited more intensive growth, entered fruiting earlier, and showed higher productivity during the first 4–7 years compared to trees grafted onto the Myrobalan seedling rootstock.

#### Note

The research was carried out within the framework of the “State Program” 20.80009.5107.22, “Development and modernization of sustainable and ecological technologies for fruit and berry species under climate change conditions”, (2020–2023).

#### References

1. Babuc, V. (2012). Fruit growing. Chisinau: Central Printing House. ISBN 978-9975-55-067-5.
2. Balan, V., Cimpoș, Gh., & Barbăroșie, M. (2001). Fruit growing. Chișinău: Museum. ISBN 9975-906-39-7.
3. Brumă, S. (2004). Ecological technologies for the maintenance of fruit trees. Iași: Terra Nostra. ISBN 1584-0735.
4. Grigore, M. (1998). Organic fruit growing. Bucharest: Ceres Publishing House. ISBN 973-40-0439-5.
5. Donică, I. (2018). Research and achievements in fruit growing. Chisinau: Printing House of the Academy of Sciences of Moldova. ISBN 978-9975-62-414-5.
6. Popa, S., Cumanici, A., Braghiș, A., et al. (2019). Plum production. Chișinău: Print Caro. ISBN 978-9975-56-707-7.
7. Zhuravel, A. M., Rapcha, M. P., Koroid, A. S., & Gritskan, S. V. (2007). Plum. Chișinău: Tipografia A.Ș.M. ISBN 978-9975-62-175-5.