

PLUM ROOTSTOCK USE IN SOME PLUM PRODUCING COUNTRIES

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Abstract

*In Hungary, until the 2010s, the use of plum as a rootstock was rather monotonous, 'Myrobalan' being the most common. This is not the case in Europe and other parts of the world, where the use of the rootstock is much more colorful. All over the world, the aim is to increase the intensity and to select out the weak-medium rootstocks. In addition to 'Myrobalan' *Prunus cerasifera*, *P. insititia*, *P. domestica* plums and other species and hybrids are used as rootstocks. The choice of seedlings is based primarily on soil conditions, but eco- and patho-resistance are also important considerations. The use of rootstock varies from one growing area to another and from one plum-growing country to another. In my paper I will describe the rootstock use in these plum growing countries and in countries of importance in plum research.*

1 Introduction

In those parts of the world where hand-picked fruit is intensified and sold for fresh consumption, low growth and productivity benefits from rootstock use are important. Conversely, semi-intensive plantations with mechanical harvesting also have a justification for stronger-growing myrobalan rootstocks with good soil stabilization. These can be either seedlings or clone rootstocks. Clonal rootstocks have the advantage of genetic homology, so they are uniform in growth and produce a uniform crop.

Some rootstocks, such as 'Myrobalan', are widespread in all plum producing countries. Each country has a few well-established rootstocks, which are used in different soil conditions and different cultivation systems.

2 Botanical classification of plum rootstocks

The rootstocks used in plum cultivation and rootstock research are from the family *Rosaceae*, subfamily *Prunoidae* and genus *Prunus*. There are six broad groups of plum species based on their botanical affiliation. I. Myrobalan (*Prunus cerasifera* Ehrh. var. *cerasifera* Scheid. cv. *myrobalana*, 2n:16, 2n:24 for hybrids) seedlings, clonal rootstocks and hybrids; II. 'St. Julien' (*Prunus insititia* Jusl. ; 2n:40,48) and its hybrids; III. European plum (*Prunus domestica* L.; 2n:40,48) and its hybrids IV. *Prunus salicina* hybrids; V. P. Marianna, and VI. other species and hybrids [18].

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Table 1: Botanical classification of plum rootstocks worldwide

Kajtárné Czinege (2024) ed., based on [1]-[35].

| Myrobalan (<i>Prunus cerasifera</i> Ehrh. var. <i>cerasifera</i> Scheid. cv. <i>myrobalana</i>) | <i>Prunus insititia</i> | European plum (<i>Prunus domestica</i>) |
|--|--|---|
| Seedlings • Myrobalan 'C 162' • Myrobalan 'C 174' • Myrobalan 'C 359' • Myrobalan 'C 679' | • 'C83' | • 'Wangenheim' • 'Otesani 8' |
| Clonal rootstocks • 'Myrobalan A' • 'Myrobalan B' • 'Myrobalan P1254' • 'MY-BO-1' • 'MY-KL-A' • 'Myrobalan 29 C' • 'Hamyra' • 'Myruni' • 'Myrabi' • 'Miro' • 'Myrocal®Fercino' • 'Corcodus', • 'Myrobalan 2 V', • 'Myroval' • 'Ademir mirobalan' | • 'St. Julien A' • 'INRA St Julien GF 655/2' • 'St Julien Wädenswill' • 'St Julien d'Orleans • 'St Julien INRA 2' • 'St. Julien hybrid No. 2.' • 'Pixy' • 'Rival' (2003) • 'Adesoto' | • 'Otesani 8' • 'Brompton' • 'Black Damas' • 'Lószemű szilva' • 'Bódi szilva' • 'Fehér besztercei' • 'Kisnánai lószemű' • 'Ackermann' • 'Cammon Plum' • 'Wavit' • 'Penta' • 'Tetra' • 'Sharpe' • 'Garla' • 'Adara' |
| <i>Prunus salicina</i> hybrids | <i>P. Marianna</i> | Other species and varieties of hybrids |
| • 'Citation' <i>P. salicina</i> x <i>Persica vulgaris</i> • 'Ishtara®-Ferciana' <i>P. salicina</i> x (<i>P. cerasifera</i> x <i>P. persica</i>) • 'Jaspy® Fereley' <i>P. salicina</i> x <i>P. spinosa</i> • 'Julior® Ferdor' <i>P. insititia</i> x <i>P. domestica</i> | • Marianna <i>P. cerasifera</i> x <i>P. munsoniana</i> • 'Marianna GF 8-1': • 'Marianna 4001' | • 'Zöld ringlő' (<i>P. italica</i>) • Cerasus bessey • P. tomentosa • Blackthorn (<i>P. spinosa</i>) • INRA GF 31' <i>Prunus cerasifera</i> v. <i>mirobalana</i> x <i>P. salicina</i> • 'MRS 2/5' <i>P. cerasifera</i> x <i>P. salicina</i> • 'Myram' (<i>P. cerasifera</i> x <i>P. salicina</i>) x <i>Persica vulgaris</i> 'Yunnan' • 'Ishtara' <i>Prunus cerasifera</i> v. <i>mirobalana</i> x <i>Persica vulgaris</i> • 'Yumir' <i>P. cerasifera</i> x <i>P. salicina</i>) x <i>Persica vulgaris</i> • 'Prumina' <i>P. bessey</i> x <i>P. cerasifera</i> • 'Ferlenain' <i>P. bessey</i> x <i>P. cerasifera</i> • 'Micronette' <i>P. pumila</i> x <i>P. cerasifera</i> • 'Krymsk ®1' (VVA-1) <i>Prunus cerasifera</i> x <i>P. tomentosa</i> • 'Krymsk 86' <i>Prunus persica</i> x <i>P. cerasifera</i> • 'Krymsk 2' <i>Prunus incana</i> x <i>P. tomentosa</i> • 'INRA Damasd 1869' • 'Otesani 11' |

Factors affecting the choice of rootstock in different countries depend on plum species and varieties grown, soil, intensity of cultivation and harvesting method. The use of rootstock is based on a multifactorial decision. To help the producers make decisions, rootstock research is carried out in each country to determine which rootstock is the ideal choice for each grower based on the above criteria. The ranking of plum producing countries by area and yield is shown in Figure 1.

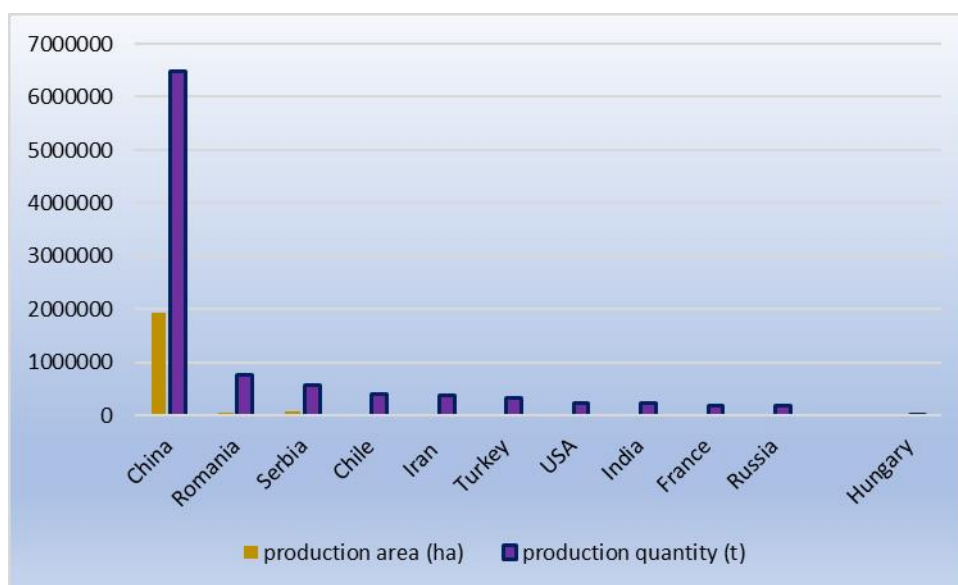


Figure 1: Important plum producing countries of the world (based on FAO, 2022, ed. Kajtár-Czinege, 2024)

Experimental results and experiences are not only from the major plum producing countries, observations and evaluations of rootstock combinations are still being carried out in many other countries. There are breeding centers whose research contributes significantly to the production of rootstock varieties.

3 Rootstocks used in plum producing, breeding and experimental countries)

However China is the largest plum producing country, little is known about the use of rootstock. It is hard to find international literature in this topic. According to [13], mainly *P. salicina* seedlings are used as rootstock.

For the use of **Romanian** plum rootstocks, see the work of ACHIM and BOTU [1][3][4][5][6][7]. ACHIM [1] reported in their study on the results of the Romanian rootstock breeding of the 'Otesani 16'; 'Oteşani 8'; 'Oteşani 11'; 'Miroval'; 'Rival'; 'Pinval'; 'Oltval'; 'Corval', 'Mirobalan C5', 'Mirobalan Dwarf', 'Rosior Varatic' [3][4][5][6][7]. These rootstocks are proposed for intensive and organic production systems. BOTU [6] reports on the 'Rival' rootstock in their studies.

Serbian and **Bulgarian** plum production is also famous and important, but little is known about their rootstock use. According to HROTKÓ [13], their main rootstock is the 'Myrobalan' seedling (*zslutaja dzsanka*). In Serbia, a rootstock study was started in 2009 with 'Myrobalan' seedlings, 'Fereley', 'St. Julien A' and 'Pixi' rootstocks grafted with čačak varieties. The study investigated the effect of the rootstocks on fruit quality [35], and similar studies were started in 2010 with the same rootstocks [29].

In **Bulgaria**, a trial with 'Garnem', 'GF677', 'Myrobalan' seedling, 'Isthara' and 'Wavit' was started in spring 2016, to investigate their growth vigor and yield effects [34].

The **Polish** researchers, on the other hand, give a detailed report on the rootstocks studied in Poland. In Poland, the most widely used plum rootstocks are the seedling 'Myrobalan' and the rootstock 'Wangenheim' [33]. SITAREK [32] reports on two new plum rootstocks, the seedling rootstocks 'Erunosid' and 'Wala'. GRZYB and SITAREK [11][12] report on the effects of *P.*

divaricata, 'Wangenheim Prune', 'Jaspi', 'St. Julien GF 655/2', 'Ishtara', 'St. Julien A' on growth, yield and fruit quality. GRZYB [10] reports four "new" plum varieties in his work: 'Agata', 'Amelia', 'Anna', 'Alina'. The rootstock 'Amelia', selected from seedlings of 'Myrobalan', can be used in sandy soils, with strong growth and favorable effects on productivity and fruit quality [31].

The **German** rootstock breeding resulted in the Plum Pox Virus (PPV) resistant 'Docera' and 'Dospina', which were also tested with clones of different growth stages at the University of Munich [27].

The most notable plum rootstock in **Italy** is 'Marianna plum', but they also use Myrobalan 29C (*P. cerasifera*), MrS 2/5 (*P. cerasifera* × *P. spinosa*), GF 677 (*P. persica* × *P. amygdalus*), 'Tetra' (Regina Claudia Verde free-pollinated seedlings), and 'Penta' (Imperial Epineuse free-pollinated seedlings) in their experiments [30].

For more information on the rootstock in **Czech** plum research, see MÉSZÁROS et al. (2015). He used high yielding 'Myrobalan' cultivars such as 'Myrobalan SE 4043'; 'Myrobalan SE 4044', 'MY-KL-A'. He used lower yielding vegetatively propagated rootstocks such as 'Pixy', 'Damas C SE 4045', as well as 'Myrobalan' seedlings, 'GF43', 'GF655/2', and 'St. Julien A'. BLAŽEK and PISTÉKOVA [2], KOSINA [20] used the rootstock 'St. Julien A' in their studies. In the Czech Republic, further experiments were set up with 'Ishtara', 'St. Julien A', 'Torinel', 'Citation' and 'Penta' [35]. Furthermore, the growth reducing and fruit quality effects of plum cultivars were investigated on 'Krymsk1', 'Krymsk2' and 'Mrs.2/5' [17].

In the research of **Denmark** PEDERSEN [28] reports on rootstock behavior of 'St. Julien GF 655/2', 'Ishtara Ferciana', 'Julior Ferdor', 'Marianna GF 8-1', 'Myran@Yumir', 'Myrobalan B', 'Myrobalan P 1254', 'Myrocal@Fercino', 'Plumina@Ferenain', 'St. Julien Hybrid No. 2', 'Wangenheim', 'Torniel@Avifel' in his study.

In **Latvian** rootstock research, LEPSIS and DEKENS [21] studied 'Myrobalan', 'Hamyra', 'Marianna GF8-1', 'Pixy', 'St. Julien Wädenswill', 'Wangenheims Cweche', 'St. Julien A', 'St. Julien Noir', 'St. Julien d'Orleans', 'St. Julien INRA 2', 'St. Julien GF655/2', 'Brompton', 'Ackermann' and the rootstock 'GF 5/22'.

In **Norway**, a plum rootstock trial with 'St. Julien A', 'Ute', 'Wavit', and 'VVA1' was initiated in 2006 [24].

In the **Netherlands**, 'Krymsk1' (*P. tomentosa* × *P. cerasifera*) is being studied as a dwarfing rootstock [22][23].

Several **Spanish** Myrobalan and Marianna plums are being investigated for their potential to reduce growth, such as 'Adara', 'Ademyr', 'Myral'. As well as poor growth plums (Subgenus *Prunophora*) such as 'Adesoto 101', 'Alguazas', 'Montizo', 'Monpol', 'Constanti' [8][9]. In addition to 'Adesoto 101@', the rootstocks 'Adafuel', 'Adarcias', 'Adara', 'Ademyr' were also selected in Zaragoza [26]. 'Adesoto' is adapted to firm, calcareous soils. It is a high pH and drought tolerant rootstock [15]. Also of Spanish origin is 'Replantpac', produced in Barcelona as a hybrid. This rootstock is very popular in Spain [15].

In **France**, plum 'Marianna' is used in poorer soil conditions, with early fruiting and excellent yield [14]. 'Marianna GF8-1' is the most widely used plum variety.

4 Plum rootstocks in experiments and in use in Hungary

In addition to 'Myrobalan', experimental studies have been conducted in Hungary with 'St Julien A' and 'St Julien GF655/2', 'MY-BO', 'MY-KL-A', 'Marianna 8-1', 'Fereley', 'Wangenheim' and 'WaVit' [16][18][19]. The monotony that characterizes the use of the rootstocks in Hungary seems to be changing. Whereas before the 2010s, there was a monotonous 'Myrobalan' use of rootstocks. This could be explained by our semi-intensive plum production at the time, by the use of high trunked vase, funnel canopy and mechanical shaker harvesting. From the early 2020s, the *Prunus insititia*, 'St. Julien GF655/2' and 'St Julien A' rootstocks have also appeared and become significant. Today they are not only imported, but also propagated vegetatively and even *in vitro*. In addition to this, grafting on WaVit rootstocks is also carried out by different nurseries.

Instead of the traditional 'Myrobalan' seedling rootstocks, the 'Myrobalan 'C 29' rootstock may be a promising alternative in terms of both growth and adaptability to cultivation techniques.

It would also be beneficial to change to 'Marianna' rootstocks, due to their tolerance to draught and high calcerous soil. These rootstocks have adapted well to the ecological conditions that have changed in recent years, with an increasingly arid climate.

The study of the rootstocks includes both vegetative and generative performance of the grafts. Table 2. shows the effects of the rootstocks on growth vigor.

Table 2: Classification of rootstocks by growth vigor (ed. Kajtárné Czinege, 2024)

| weak | weak – moderate vigour | moderate | vigorous | very vigorous |
|-----------------------|------------------------|--------------------------------|------------------|-------------------|
| 'Prumina' | 'Otesani 8' | 'Otesani 11' | 'Myrobalan C29,' | 'Marianna GF 8-1' |
| 'Ferlenain' | 'Citation' | 'MY-BO-1' | 'Myram' | Mirobalan |
| 'Micronette | 'Ishtara ' | 'MY-KL-A' | 'Bromptom' | 'C162', 'C174', |
| 'Krymsk 1' | 'Fehér Besztercei' | <i>Prunus insititia</i> –'C83' | 'Fereley' | 'C359', 'C679' |
| <i>Cerasus bessey</i> | 'Wangenheim' | 'St. Julien A' | 'Adefuel' | 'Myrocal' |
| <i>Prunus spinosa</i> | 'Tetra' | 'St. Julien GF 655/2' | | 'Corcodus,' |
| | | 'St. Julien d'Orleans' | | 'Myrobalan 2', |
| | | 'St. Julien INRA2' | | 'Myroval' |
| | | 'INRA Damasd 1869' | | 'Krymsk 86' |
| | | 'Pixi', 'Ackermann' | | 'Black Damas' |
| | | 'Cammon plum' | | 'Hamyra' |
| | | 'Rival', 'Garla' | | |
| | | 'Penta', 'Ferciana' | | |
| | | <i>Prunus tomentosa</i> | | |
| | | 'Adarcias' | | |
| | | 'Adesotto 101' | | |

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