

GROWTH AND BEARING POTENTIAL OF PLUM CULTIVARS STANLEY AND POŽEGAČA ON THE TWO STOCK / INTERSTOCK COMBINATIONS AND ON MYROBALAN

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Abstract

Vegetative growth and bearing potential of plum cvs Stanley and Požegača on the two stock/interstock combinations in relation to generative myrobalan stock were investigated. In combination 1 rootstock was cv Sitnica, and as interstock vegetative rootstock Brompton. In combination 2 rootstock was cv Banjalučka bjelica and interstock cv Miškovača. In both combinations interstock length was 15 cm. At the time of evaluation the trees were in bearing and the signs of incompatibility were not observed at the graft unions. Both grafted cultivars had a substantially reduced growth habit with both stock / interstock combinations in relation to Myrobalan, nevertheless the reaction of cultivars was disparate. Požegača was the least vigorous with combination 1, and cv Stanley with combination 2. The highest bearing potential in both cultivars was recorded with combination 1. The highest occurrence of generative bud abortion was on myrobalan, and the lowest one in combination 1.

1. Introduction

Myrobalan seedling is mostly used rootstock for plum at Yugoslavia region, although some results in rootstock selection out of domestic population *P. domestica* and *P. cerasifera* are obtained, such as: B1 (Kapetanović and Prica, 1985), PCK (Ogašanović, 1996), or some selection which are currently under trial (Lučić, *et al.*, 1994). The aim of this work was to examine the possible application of less vigorous autochthonous plums as rootstocks and interstocks in relation to myrobalan in order to reduce the vigour of plum tree.

2. Material and methods

Investigations were carried out in the orchard established in spring 1986 by planting one-year-old nursery trees at 5x4 m distance on drained sloping pseudogley. In combination 1, the vegetative selection of moderately vigorous plum cv Sitnica from the area of northern Bosnia was used as rootstock, and Brompton as interstock. In combination 2 seedlings of two domestic plums were used, also from northern Bosnia: rootstock was Banjalučka bjelica, moderately vigorous, and the interstock was low vigorous cv Miškovača. Each cultivar/interstock/stock combination was planted in three replications, with 5 trees in each, and crowns were trained into pyramid shape. Vigour and bearing potential analyses were carried out during 6th and 7th year after planting. In the first year of investigation, trunk cross-sectional area at 15 cm above the scion / interstock union and the crown volume according to the ellipsoid formula were monitored. In both years, the following parameters were analysed: type of branching of a two-year-old branches based on share of different bearing branches, then the total number of vegetative, generative and aborted buds on them, as well as the bearing potential based on the total number of vegetative and normal generative buds per unit length of a two-year-old branch. Fruit spurs are very short growths with compacted nodes without visible internodes. Short bearing branches are growths up to 10 cm in length with

clearly visible internodes without colateral buds, while long bearing branches are over 10 cm in length. Mixed bearing branches are of different length and have colateral buds.

3. Results

According to both indicators of vigour cv Stanley was least vigorous in combination 2, and cv Požegača in combination 1. Both cultivars had the greatest surface of both a trunk cross and crown volume on myrobalan (Tab. 1).

It was assessed that during dormancy all the lateral and top growths on the two-year-old branches had generative buds. The average data of this analysis were given for both years (Tab. 2). The share of individual bearing branches categories was primarily a cultivar-specific trait, although combinations had certain influence. In all grafting combinations in cv Stanley the greatest share had spurs (41.4%, 47.8% and 53.0%), and the least one had long bearing branches (1.5%, 0.8%, 0.4%). In all three combinations in cv Požegača the greatest share was that of short bearing branches (57.8%, 62.5%, 61.6%). However, this cultivar showed the change in the structure of bearing shoots in combinations 1 and 2 in relation to myrobalan. Namely, the least spurs occurrence had Požegača with myrobalan (2.8%), while it had more mixed bearing branches (24.9%), and with combinations 1 and 2 spurs occurrence was considerably increased (20.1%, 17.6%), and the occurrence of mixed bearing branches was reduced (9.4%, 8.4%).

The number of vegetative buds of bearing branches recalculated on 1 m two-year-old branch was in both cultivars the highest on myrobalan. The lowest number of vegetative buds in cv Stanley was in combination 1, while in cv Požegača it was in combination 2. Nevertheless, statistically speaking, it was significant to point out the reduction of the number of vegetative buds that occur only in cv Požegača in relation to myrobalan with combination 2. The highest number of generative buds in both cultivars was with combination 1, and the lowest number of generative buds was in cv Stanley with combination 2, while in cv Požegača it was on myrobalan. There was no considerable difference in this indicator between combination 1 and myrobalan in cv Stanley, while all the differences were significant in cv Požegača. The number of abortive buds in both cultivars was the greatest on myrobalan, while the least one was with combination 1 in cv Stanley, and in cv Požegača with combination 2, with significant differences among all combinations of one cultivar.

4. Discussion

On the basis of vigour parameters the following conclusion can be drawn: the major aim of the application of stock/interstock combinations is realized, namely, the vigour of cultivar in relation to grafting combination on myrobalan was considerably reduced, but the reaction of cultivars was disparate. Although these cultivars behave differently in the applied grafting combinations, it is evident that the influence of stock / interstock combinations was much stronger shown in cv Požegača than in cv Stanley. Such reduction of a trunk cross section surface in the least vigorous combination in relation to myrobalan in cv Požegača (combination 1) amounted to 47% and in cv Stanley (combination 2) 39%. Crown volume reduction in cv Požegača with combination 1 amounted to 70%, and in cv Stanley in combination 2 to 53%, in relation to grafting combinations on myrobalan.

In this investigation grafting combinations had no considerable influence on the structure of bearing branches in cv Stanley, nevertheless, in cv Požegača in combinations 1 and 2 it came up to an increase of fruit spurs occurrence and reduction of mixed bearing branches in relation to the combination with myrobalan.

Vigour reduction in combinations 1 and 2 in both cultivars resulted in reduction of vegetative buds number in relation to combination with myrobalan, but because of the structure of bearing growths, the number of vegetative buds was, in general, much greater in cv Požegača, and different reaction of cultivars in vigour indicators can be explained by it. Namely, Požegača had a thicker trunk, while Stanley has a greater crown volume, which may sound illogical. However, if the structure of bearing branches and the structure of buds on

these bearing branches of these two cultivars are taken into account, it will be evident that Požegača with greater occurrence of longer bearing branches and with larger number of vegetative buds does have higher both branching ability and the ability to create more compacted crown in relation to cv Stanley that had larger dimensions but less compacted crown, because of greater occurrence of spurs which are formed on long branches developed during the first years after planting.

The number of generative buds was greater in combinations 1 and 2 in relation to myrobalan in cv Požegača, and in cv Stanley it was larger with more vigorous combinations: on myrobalan and in combination 1, primarily because of the structure of bearing branches and a fairly larger number of generative buds of cv Stanley in relation to Požegača can be explained by this: Stanley had many spurs, while Požegača had many short bearing branches which had more vegetative buds. During bearing potential analysis the phenomenon of generative buds aborting was to be taken into account. The aborted buds are lateral generative buds of shoot nodes with interrupted differentiation (Mičić *et al.*, 1992). If the number of these buds is expressed relatively in relation to the total number of buds which are included in generative differentiation then the order of combinations is the following one: in cv Stanley in combination 1 12% of buds aborted, on myrobalan 19%, and in combination 2 20% of buds aborted. If the numbers of generative and vegetative buds are compared as an assumption of the real bearing potential, the order of combinations is the following one: Požegača had a more propitious relation in combinations 1 and 2 (1.13; 0.75) than on myrobalan (0.40), and in cv Stanley that relation is better in combination 1 and on myrobalan (1.47; 1.21) than in combination 2 (0.95), but, in general, its relation is a more propitious one than Požegača. According to these analyses cv Stanley had a higher bearing potential in more vigorous combinations, while cv Požegača had it in the least vigorous combination.

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Table 1 - Trunk cross-sectional area at 15 cm above the scion/interstock union and crown volume in 6th year after planting

Stock /interstock	Trunk cross-sectional area (cm ²)			Crown volumen (m ³)		
	Stanley	Požegača	Average	Stanley	Požegača	Average
Combination 1	78.85	50.52	63.75	6.2	2.03	4.11
Combination 2	52.93	66.91	59.72	4.8	3.69	4.25
Myrobalan	85.63	94.68	90.25	10.2	6.85	8.51
Average	72.08	69.69	70.58	7.1	4.18	5.62
Lsd	trunk cross area		crown volumen			
	5 %	1 %	5 %	1 %		
interaction	7.71	10.81	1.22	1.72		

Table 2 - The share of different bearing branches on two-year-old growth (%)

Stock/ interstock	Cultivar	Bearing branches			
		Spurs	Short	Long	Mixed
Combination 1	Stanley	41.4	35.2	1.5	21.9
	Požegača	20.1	57.8	12.7	9.4
Combination 2	Stanley	47.8	29.2	0.8	22.2
	Požegača	17.6	62.5	11.5	8.4
Myrobalan	Stanley	53.0	31.7	0.4	14.9
	Požegača	2.8	61.6	10.7	24.9
Average	Stanley	47.4	32.1	0.9	19.6
	Požegača	15.0	60.4	11.8	12.8

Table 3 -The average number of vegetative, generative and aborted buds per 1 m length of two-year-old growth

	Number of vegetative bud			Number of generative bud			Number of aborted bud		
	Stanley	Požegača	Average	Stanley	Požegača	Average	Stanley	Požegača	Average
Combination 1	144.6	183.2	163.9	212.6	207.6	210.1	30.8	25.9	28.3
Combination 2	156.8	178.1	167.4	148.6	134.7	141.6	38.3	18.4	28.3
Myrobalan	168.6	211.4	190.0	205.4	85.7	145.5	48.0	33.8	40.9
Average	156.6	190.9	175.2	188.9	142.6	167.1	39.2	26.2	32.5
LSD	vegetative buds		generative buds		aborted buds				
combination	5 %	1 %	5 %	1 %	5 %	1 %			
x cultivar	28.83	38.1	36.96	48.84	1.34	1.77			