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THE INFLUENCE OF THE THICKNESS OF ROOTSTOCK AND SCIONS ON THE GROWTH AND QUALITY OF THE OBTAINED SHRUBS OF TWO *Rosa* × *hybrida* CULTIVARS. PART I. GROWTH PARAMETER OF THE ROSE SHRUBS

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Abstract. In 1999–2001 years two *Rosa* × *hybrida* cultivars, 'Casanova' and 'Korlingo', were obtained by bud-grafting on a thornless multiflora rootstock (*Rosa multiflora* Thunb.). The first factor studied was the rootstock quality: class I (base diameter Ø = 4–6 mm); class II (Ø = 3–4 mm); class III (Ø = 2–3 mm). The second factor studied was the scion size: thick scions (Ø = 6–8 mm); medium scions (Ø = 4–6 mm); thin scions (Ø = 2–4 mm). Plant mass of *Rosa* × *hybrida* shrubs was greater with class I than with class II or class III rootstocks. The shrubs obtained by bud-grafting on class I and class II rootstocks were higher than with III class rootstocks. Rose shrubs of greater height and mass were obtained by bud-grafting with medium scions, and shrubs of lowest height and mass were obtained with thin scions. The number of primary shoots was not significantly affected by either rootstock quality or scion size. Plant mass and plant height were greater in 'Casanova' than in 'Korlingo'.

Keywords: *Rosa* ×*hybrida*, bud-grafting, quality, rootstock, scion, *Rosa multiflora*

INTRODUCTION

Roses are very important ornamental plants grown both for cut flowers and in gardens and parks. Sixty percent of the total world acreage where cut flowers are grown is in Europe [Pertwee 1995]. With its steadily increasing rose shrub production, Poland is one of the main exporters of rose shrubs in Europe. From 1996 to 2001, the production rate was about 15.5 million shrubs a year [Marosz 2005]. In the future, highly efficient

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and specialized operations that produce high-quality plant material are the ones that are the most likely to be profitable.

Bud-grafting is a widely used method for vegetative propagation of woody plants. The rootstock is commonly believed to determine vigour, cold hardiness, blossoming time, blossom load, disease resistance, and longevity [Pessala 1977, Taschner 2002].

Rosa multiflora Thunb. rootstock can be used with most rose varieties, belonging to all varietal groups, which was confirmed with many years of research [Lundstad 1986, Kool et al. 1992, Falińska-Król and Hetman 2000].

In rose cultivation for the cut flower market, it is vital to plant high-quality shrubs [Hetman 1987, Han et al. 1994]. For profitable greenhouse production, it is necessary to plant strong, healthy one-year-old shrubs bud-grafted on selected I class rootstocks [Wiśniewska-Grzeszkiewicz 1986]. Primary shoots growing out from the base of the shrub determine the future potential yield of the rose shrubs. This is true both for the shoots that grow in the nursery and the shoots that grow during the first year in the greenhouse [Dubois et al. 1990, Marcelis 1993, 1994].

Research so far has shown that successful bud-grafting of roses depends on rootstock and scion quality [Hetman and Monder 2003 a, b]. With *Rosa* × *hybrida* [Hetman and Monder 2004 a, b] and floribundas [Monder and Hetman 2006 a, b], growth and quality are also affected by the developmental stage of the scion and the location of the scion on the rootstock.

The aim of the study was to prove the influence of rootstock quality and scion quality on the quality of the rose shrubs obtained by bud-grafting, and to specify possibilities and consequences of planting lower quality rootstock and using thinner scions on the final effect of production.

MATERIAL AND METHODS

The study was carried out with a thornless multiflora rootstock (*Rosa multiflora* Thunb.). The two *Rosa* × *hybrida* cultivars used were: 'Casanova', bred in 1964 by McGredy, and 'Korlingo', bred in 1985 at a nursery belonging to W. Kordes' Söhne. Both cultivars are grown for cut flowers [Jerzy et al. 1992]. The study was carried in the test fields of Botanical Garden – Centre for Biological Diversity Conservation of the Polish Academy of Sciences in Warsaw. The data were collected over three production seasons throughout 1999–2002.

At the end of March, the rootstocks were planted on plots with an area of about 2.2 square meters. Twenty rootstocks were planted on each plot, with 3 different diameters of rootstock bases: class I (rootstock base Ø = 4–6 mm), class II (rootstock base Ø = 3–4 mm), and class III (rootstock base Ø = 2–3 mm).

Before planting, the soil at the site was analysed and fertilised with a multicomponent fertilizer "Azofoska" (INCO-VERTITAS S.A. Poland) in two doses: 45 $g \cdot m^{-2}$ in spring before planting and 40 $g \cdot m^{-2}$ in the last week of May. At the end of June, 25 $g \cdot m^{-2}$ ammonium nitrate was applied on the rootstocks.

Bud-grafting was carried out at the end of July. The buds were attached to the rootstock with Ocullette R20 grafting patches (O&I Fleischhauer, Germany). The buds were

from scions of three sizes: thick scions (Ø = 6–8 mm); medium scions (Ø = 4–6 mm); and thin scions (Ø = 2–4 mm).

In the last week of October, the bud-grafted rootstocks were heaped up with 10 cm of soil in order to protect the buds from frost. Early the next spring, the soil was removed, and the root bases were cut back to about 1.0 cm above the bud. Wild shoots were pruned away, the soil was analysed and fertilised with 85 $g \cdot m^{-2}$. of Azofoska. Current standard nursery practices were followed throughout the study period. Weeds were removed both mechanically and by hand. Chemical agents were used for disease and pest control.

At the end of September, after the shrubs had been dug up by hand with a spade and leaves had been removed, the following measurements and observations were made: plant height (cm); plant mass (g); the number of primary shoots.

The study was in a system of random blocks, with five repetitions. A repetition was one field with 20 rootstocks. The study was conducted throughout three development cycles of rose shrubs: 1999/2000, 2000/2001, and 2001/2002. All parameters were recorded for each plant on each plot. The data for each plot were averaged and statistically elaborated using analysis of variance for orthogonal data. The significance of the differences between the averages was determined by setting the smallest statistically significant difference of Tukey's trust ranges between average pairs at the significance level $\alpha = 0.05$.

WHEATHER CONDITIONS

Average monthly temperatures and precipitations upon readings made in the Botanical Garden from January to December in the years 1999 to 2002 are presented in figures 1 and 2.

In comparison with the average long-term monthly temperatures and temperatures in the decades of the last thirty-year period, the temperature in the years of the study was slightly higher. The winters were mild, snowfall was light, and average monthly temperatures were approximately 0°C. Only in December 2001 and December 2002 average temperatures were the lowest and negative.

In 1999, 2000 and 2002, the average annual precipitation was slightly lower than the long-term average. Every year, in May, June, and in 2000 also in April, precipitation was very low, and air temperature was high. The prolonged drought badly affected development of roses, and irrigation was necessary. Precipitation was sufficient in July and August, and exceptionally low in October 2000 (fig. 2).

RESULTS

Plant mass was strongly affected by rootstock quality. Plant mass was significantly higher with class I rootstocks (94.2 g) than with class II (80.3 g) and class III (73.7 g) rootstocks. Plant mass was not significantly affected by scion size for either of the cultivars tested (tab. 1).

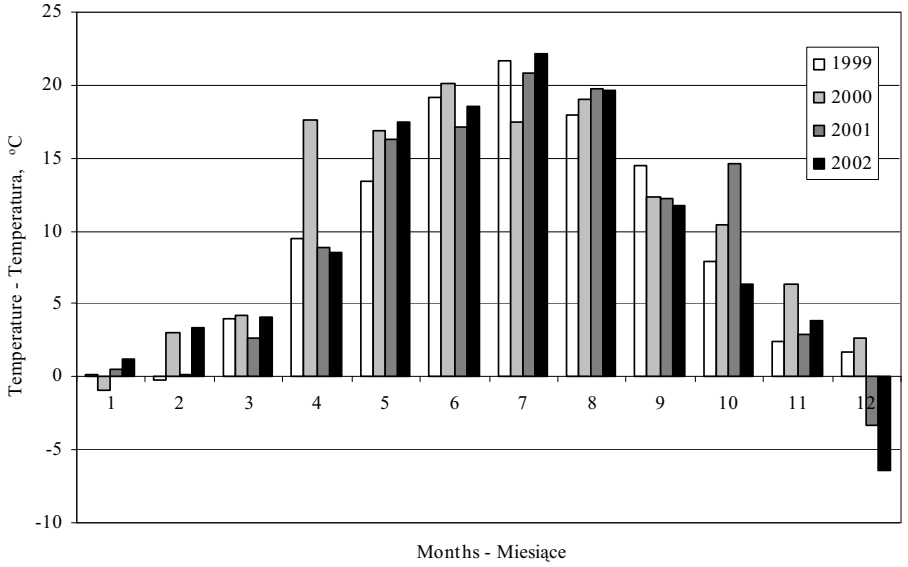

Fig. 1. Average monthly air temperature (°C) in years 1999–2002 in Botanical Garden
Rys. 1. Średnia miesięczna temperatura (°C) w latach 1999–2002 w Ogrodzie Botanicznym CZRB PAN

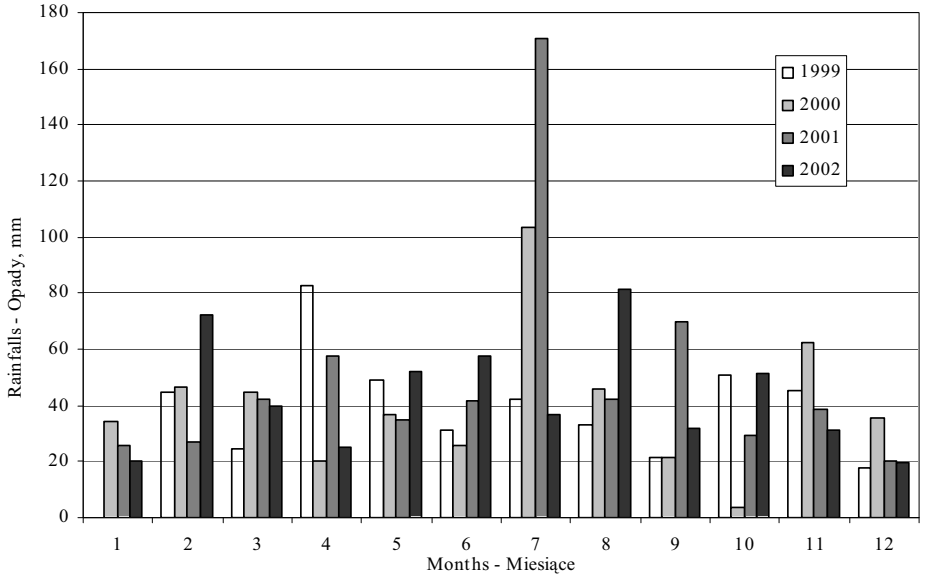

Fig. 2. Average sum of monthly rainfall (mm) in years 1999–2002 in Botanical Garden
Rys. 2. Średnia miesięczna suma opadów (mm) w latach 1999–2002 w Ogrodzie Botanicznym CZRB PAN

In 2000, plant mass for 'Casanova' was significantly higher with class I (91.0 g) rootstocks than with class III (67.7 g) rootstocks. For 'Korlingo', plant mass was significantly higher with class I (90.4 g) rootstock than with either class II (68.8 g) or class III (64.4 g) rootstocks. The same pattern was observed in the following years of the study (tab. 1).

There was a significant interaction between rootstock quality and scion size for both of the cultivars in average for three years. Plant mass was highest with class I rootstocks and thick scions (99.8 g). Plant mass was lowest with class III rootstocks and thick (64.2 g) and thin (74.9 g) scions. Plant mass was higher with class I rootstocks and thick, medium and thin scions than with class III rootstocks and thick scions (tab. 1).

In 2000, there was a significant interaction between rootstock quality and scion size for both of the cultivars tested. Plant mass was highest with class I rootstocks and scions of all size classes. Plant mass was lowest with class III rootstocks and thick scions. In 2001, the pattern was similar, although the differences were not significant. In 2002, plant mass was highest with class I rootstocks and thick scions, and lowest with class III rootstocks and thick scions (tab. 1).

Plant height was highest with class I (64.0 cm) and class II (62.9 cm) rootstocks, and lowest with class III rootstocks (58.0 cm). Similar tendencies was observed in all three years of the study with both of the cultivars tested. However, the differences were not significant except in 2002 for 'Casanova' and both cultivars combined (the shrubs were significantly highest with the class I and lowest with lass III rootstocks), and with the three-year mean for 'Casanova' (tab. 2).

Plant height was not significantly affected by scion size. However, plant height tended to be higher with thin scions for 'Casanova', and with medium scions with 'Korlingo'. In 2002, plant height for 'Korlingo' was significantly higher with medium (65.7 cm) scions than with thin scions (57.2 cm) (tab. 2).

There was no significant interaction between rootstock quality and scion size. For both cultivars, however, the three year mean for plant height was highest with class I rootstocks and thick scions, and lowest with class III rootstocks and thick scions (tab. 2).

Shoot count was not significantly affected by either rootstock quality or scion size for either of the cultivars tested. There was no significant interaction between rootstock quality and scion size for either of the cultivars tested (tab. 3).

There was not significant interaction between rootstock quality and scion size for both of the cultivars tested for shoot count (tab. 3).

In 2000 and 2001, plant mass was higher for 'Casanova' than for 'Korlingo'. In 2001, the difference was statistically significant (119.0 g and 97.7 g). In all three years of the study, plant height was higher for 'Casanova' than for 'Korlingo'. In 2001, the difference was statistically significant ('Casanova' 76.3 cm and 'Korlingo' 54.6 cm). Shoot count was the same for both cultivars except in 2001, when shoot count was significantly higher for 'Casanova' (3.4) than for 'Korlingo' (3.1) (tab. 1–3).

All of the growth parameters varied widely from year to year. The weather conditions can affected to quality of roses. For both cultivars, plant mass was highest in 2001 (108.3 g), and lowest in 2002 (64.1 g). Plant height was highest in 2001 (65.4 cm) and 2002 (62.3 cm), and lowest in 2000 (57.2 cm). For 'Casanova', plant height was higher

Table 1. The influence of the quality of rootstock and scions on the mass (g) of obtained roses shrubs
Tabela 1. Wpływ jakości podkładki i zrazów na masę (g) uzyskanych krzewów róż

Year Lata	Cultivar C Odmiana C	'Casanova'			'Korlingo'			The average for both cultivars Średnia dla obu odmian			'Casanova'	'Korlingo'	Average Średnia
	thickness of scions B grubość zrazów B thickness of the rootstock A grubość podkładki A	thick (ø 6–8 mm) grube	medium (ø 4–6 mm) średnie	thin (ø < 4 mm) cienkie	thick (ø 6–8 mm) grube	medium (ø 4–6 mm) średnie	thin (ø < 4 mm) cienkie	thick (ø 6–8 mm) grube	medium (ø 4–6 mm) średnie	thin (ø < 4 mm) cienkie	average A średnia A	average A średnia A	average A średnia A
2000	class I (4–6 mm)	95.2	91.5	86.2	84.5	88.8	98.0	89.9 B	90.2 B	92.1 B	91.0B*	90.4 B	90.7 B
	class II (3–4 mm)	76.6	77.2	63.7	65.5	69.3	71.7	71.0AB	73.3AB	67.7AB	72.5AB	68.8 A	70.7 A
	class III (2–3 mm)	64.4	66.6	72.1	53.8	70.9	68.3	59.1 A	68.8AB	70.2AB	67.7 A	64.4 A	66.0 A
	average B – średnia B	78.7	78.4	74.0	67.9	76.3	79.3	73.3	77.4	76.7	77.1 B	74.5 A	75.8 B
2001	class I (4–6 mm)	136.0	116.1	139.3	118.7	98.1	94.4	127.3	107.1	116.8	130.5	103.7	117.1 B
	class II (3–4 mm)	112.9	117.3	128.1	111.0	99.9	97.9	112.0	108.6	113.0	119.4	102.9	111.2 AB
	class III (2–3 mm)	92.2	122.0	107.0	89.8	94.9	74.8	91.0	108.5	90.9	107.0	86.5	96.8 A
	average B – średnia B	113.7	118.5	124.8	106.5	97.6	89.0	110.1	108.1	106.9	119.0 C	97.7 B	108.3 C
2002	class I (4–6 mm)	77.8AB	62.0AB	82.5 B	86.7	83.2	56.7	82.3 B	72.0AB	69.6AB	74.1	75.5	74.8 B
	class II (3–4 mm)	68.6AB	48.0AB	44.8 A	61.9	66.2	64.7	65.2AB	57.1AB	54.8AB	53.8	64.3	59.0 A
	class III (2–3 mm)	48.0AB	44.8 A	57.5AB	37.1	93.1	69.9	42.6 A	69.0AB	63.7AB	50.1	66.7	58.4 A
	average B – średnia B	64.8	51.6	61.6	61.9	80.8	63.8	63.4	66.2	62.7	59.3 A	68.8 A	64.1 A
Average A Średnia A	class I (4–6 mm)	103.0	89.9	102.7	96.7	90.0	83.0	99.8 C	90.0BC	92.8BC	98.5 B	89.9 B	94.2 B
	class II (3–4 mm)	86.0	80.9	78.9	79.5	78.5	78.1	82.7 A–C	79.7 A–C	78.5 A–C	81.9 A	78.7 AB	80.3 A
	class III (2–3 mm)	68.2	77.8	78.9	60.2	86.3	71.0	64.2 A	82.1 A–C	74.9 AB	74.9 A	72.5 A	73.7 A
	average B – średnia B	85.7	82.8	86.8	78.8	84.9	77.4	82.3	83.9	82.1	85.1	80.4	82.7

*Means followed by the same letter do not differ significantly at α = 0.05
*Średnie oznaczone tą samą literą nie różnią się istotnie na poziomie α = 0,05

Table 2. The influence of the quality of rootstock and scions on the height (cm) of obtained roses shrubs
Tabela 2. Wpływ jakości podkładek i zrazów na wysokość (cm) uzyskanych krzewów róż

Year Lata	Cultivar C Odmiana C	'Casanova'			'Korlingo'			The average for both cultivars Średnia dla obu odmian			'Casanova'	'Korlingo'	Average Średnia
	thickness of scions B grubość zrazów B thickness of the rootstock A grubość podkładki A	thick (ø 6–8 mm) grube	medium (ø 4–6 mm) średnie	thin (ø < 4 mm) cienkie	thick (ø 6–8 mm) grube	medium (ø 4–6 mm) średnie	thin (ø < 4 mm) cienkie	thick (ø 6–8 mm) grube	medium (ø 4–6 mm) średnie	thin (ø < 4 mm) cienkie	average A średnia A	average A średnia A	average A średnia A
2000	class I (4–6 mm)	64.1	61.2	63.6	54.1	56.9	57.0	59.1	59.0	60.3	62.9	56.0	59.5
	class II (3–4 mm)	57.4	59.3	57.8	59.4	56.9	59.0	58.4	58.1	58.4	58.2	58.4	58.3
	class III (2–3 mm)	54.4	51.8	60.3	52.0	51.5	52.2	53.2	51.7	56.2	55.5	51.9	53.7
	average B – średnia B	58.6	57.4	60.6	55.2	55.1	56.1	56.9	56.3	58.3	58.9A*	55.4 A	57.2 A
2001	class I (4–6 mm)	79.9	82.2	75.3	55.3	55.9	50.9	67.6	69.0	63.1	79.1	54.0	66.6
	class II (3–4 mm)	74.8	81.0	77.0	58.5	55.4	56.6	66.7	68.2	66.8	77.6	56.8	67.2
	class III (2–3 mm)	64.9	76.4	75.5	48.9	61.5	48.4	56.9	68.9	61.9	72.2	52.9	62.6
	average B – średnia B	73.2	79.8	75.9	54.2	57.6	51.9	63.7	68.7	63.9	76.3 B	54.6 A	65.4 B
2002	class I (4–6 mm)	70.5	66.0	71.1	68.1	67.1	52.9	69.3	66.5	62.0	69.2 B	62.7	66.0 B
	class II (3–4 mm)	69.2	58.7	69.0	57.7	66.6	57.4	63.5	62.7	63.2	65.6AB	60.6	63.1AB
	class III (2–3 mm)	51.0	54.8	61.2	55.1	63.4	61.2	53.0	59.1	61.2	55.6 A	59.9	57.8 A
	average B – średnia B	63.6	59.8	67.1	60.3AB	65.7 B	57.2 A	61.9	62.8	62.1	63.5 A	61.0 B	62.3 B
Average A Średnia A	class I (4–6 mm)	71.5	69.8	70.0	59.2	60.0	53.6	65.3	64.9	61.8	70.4 B	57.6	64.0 B
	class II (3–4 mm)	67.2	66.3	67.9	58.5	59.6	57.7	62.8	63.0	62.8	67.1 B	58.6	62.9 B
	class III (2–3 mm)	56.8	61.0	65.6	52.0	58.8	53.9	54.4	59.9	59.8	61.1 A	54.9	58.0 A
	average B – średnia B	65.1	65.7	67.9	56.6	59.5	55.1	60.8	62.6	61.5	66.2	57.0	61.6

*Means followed by the same letter do not differ significantly at α = 0.05
*Średnie oznaczone tą samą literą nie różnią się istotnie na poziomie α = 0,05

Table 3. The influence of the quality of rootstock and scions on number of basal shoots of obtained roses shrubs
Tabela 3. Wpływ jakości podkładek i zrazów na liczbę pędów I rzędu uzyskanych krzewów róż

Year Lata	Cultivar C Odmiana C	'Casanova'			'Korlingo'			The average for both cultivars Średnia dla obu odmian			'Casanova'	'Korlingo'	Average Średnia
	thickness of scions B grubość zrazów B thickness of the rootstock A grubość podkładki A	thick (ø 6–8 mm) grube	medium (ø 4–6 mm) średnie	thin (ø < 4 mm) cienkie	thick (ø 6–8 mm) grube	medium (ø 4–6 mm) średnie	thin (ø < 4 mm) cienkie	thick (ø 6–8 mm) grube	medium (ø 4–6 mm) średnie	thin (ø < 4 mm) cienkie	average A średnia A	average A średnia A	average A średnia A
2000	class I (4–6 mm)	2.8	2.5	2.5	3.0	3.0	3.2	2.9	2.8	2.9	2.6	3.1	2.8
	class II (3–4 mm)	2.8	2.6	2.6	2.9	2.9	3.1	2.9	2.8	2.9	2.7	3.0	2.8
	class III (2–3 mm)	2.3	2.6	2.8	2.6	2.9	3.3	2.4	2.7	3.0	2.6	2.9	2.7
	average B – średnia B	2.6	2.6	2.6	2.8	2.9	3.2	2.7	2.8	2.9	2.6A*	3.0	2.8 A
2001	class I (4–6 mm)	3.2	3.2	3.1	3.3	2.9	2.8	3.3	3.1	3.0	3.2	3.0	3.1
	class II (3–4 mm)	3.4	3.6	3.1	3.3	3.4	3.0	3.3	3.5	3.0	3.3	3.2	3.3
	class III (2–3 mm)	3.7	3.5	3.6	3.1	3.2	2.9	3.4	3.4	3.3	3.6	3.1	3.3
	average B – średnia B	3.4	3.4	3.2	3.2	3.2	2.9	3.3	3.3	3.1	3.4 C	3.1	3.2 C
2002	class I (4–6 mm)	3.2	3.1	3.2	2.9	3.5	2.5	3.1	3.3	2.8	3.2	3.0	3.1
	class II (3–4 mm)	3.3	2.9	3.3	3.0	3.6	3.1	3.1	3.2	3.2	3.2	3.2	3.2
	class III (2–3 mm)	2.7	2.9	3.3	2.7	2.7	2.6	2.7	2.8	3.0	2.9	2.7	2.8
	average B – średnia B	3.1	3.0	3.2	2.9	3.3	2.8	3.0	3.1	3.0	3.1 B	3.0	3.0 B
Average A Średnia A	class I (4–6 mm)	3.1	2.9	2.9	3.0	3.2	2.8	3.1	3.1	2.9	3.0	3.0	3.0
	class II (3–4 mm)	3.2	3.0	3.0	3.1	3.3	3.1	3.1	3.2	3.0	3.1	3.2	3.1
	class III (2–3 mm)	2.9	3.0	3.2	2.8	2.9	2.9	2.9	3.0	3.1	3.0	2.9	3.0
	average B – średnia B	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.1	3.0	3.0	3.0	3.0

*Means followed by the same letter do not differ significantly at $\alpha = 0.05$
*Średnie oznaczone tą samą literą nie różnią się istotnie na poziomie $\alpha = 0,05$

in 2001 (76.3 cm) than in 2000 (58.9 cm) and 2002 (63.5 cm). For 'Korlingo', plant height was higher in 2002 (61.0 cm) than in 2000 (55.4 cm) and 2001 (55.4 cm). For 'Casanova', shoot count was highest in 2001 (3.4), and lowest in 2000 (2.6). For 'Korlingo', shoot count was about the same in all three years of the study. For both cultivars combined, shoot count was highest in 2001 (3.2), and lowest in 2000 (2.8) (tab. 1–3).

DISCUSSION

For both *Rosa* × *hybrida* cultivars, plant mass was highest with class I rootstocks, and plant height was greatest with class I and class II rootstocks. In apple-trees, however, bud-grafts were often highest with lowest quality rootstocks. On the other hand, the total shoot length in apple-trees was higher with thick and medium rootstocks than with thin rootstocks, regardless of the rootstock type used [Kiczorowski 2003].

For both cultivars in this study, the number of primary shoots was not significantly affected by either rootstock quality or scion size. However, in Kiczorowski's studies [2003] with apple-trees, the number of sylleptic shoots was highest with thick rootstocks in comparison with the thinnest rootstocks [Kiczorowski 2003].

In this study, growth parameters depended on the cultivar tested, and varied from year to year. This is consistent with other studies on apples, plums and roses [Czynczyk and Grzyb 1987, Kiczorowski 2003, Pudelska 2003]. In roses, plant mass can vary by as much as 27% from year to year [Pudelska 2003].

CONCLUSIONS

1. The 'Casanova' and 'Kardinal' shrubs growing on the Class I rootstocks have greater mass than the shrubs growing on Class II or Class III rootstocks.
2. The 'Casanova' and 'Kardinal' shrubs are higher with medium scions, and lowest with thin scions.
3. The 'Casanova' shrubs are higher and heavier than 'Kardinal'. The number of primary shoots is about the same in both cultivars.
4. The rootstock quality or scion size don't have an effect on number of primary shoots.

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WPŁYW JAKOŚCI PODKŁADEK I ZRAZÓW NA WZROST I JAKOŚĆ UZYSKANYCH KRZEWÓW DWÓCH ODMIAN RÓŻ Z GRUPY WIELKOKWIATOWYCH. CZĘŚĆ I. PARAMETRY WZROSTU KRZEWÓW

Streszczenie. W latach 1999–2001 na podkładce *Rosa multiflora* Rhunb., typ bezkolcowy, wyboru I (szyjka korzeniowa Ø = 4–6 mm), II (szyjka korzeniowa Ø = 3–4 mm) i III (szyjka korzeniowa Ø = 2–3 mm), okulizowano oczka dwóch odmian z grupy wielkokwiatowych, 'Casanova' i 'Korlingo', pobieranych ze zrazów o trzech różnych grubościach (grube Ø = 6–8 mm; średnie Ø = 4–6 mm; cienkie Ø = 2–4 mm). Największą masę miały krzewy okulizowane na podkładkach I wyboru w porównaniu z masą krzewów uzyskanych przy okulizacji podkładek II i III wyboru. Krzewy otrzymane przy okulizacji podkładek I i II wyboru były wyższe niż uzyskane przy okulizacji podkładek III wyboru. Krzewy o największej masie i wysokości uzyskano z oczek pochodzących ze zrazów średniej grubości, a najniższe i o najmniejszej masie – ze zrazów cienkich. Jakość podkładek i zrazów nie wpłynęła na liczbę pędów I rzędu u badanych odmian. Masa i wysokość krzewów były większe u 'Casanova' niż u 'Korlingo.

Słowa kluczowe: *Rosa* × *hybrida*, okulizacja, jakość, podkładka, zraz, *Rosa multiflora*

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