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# The effect of rootstock on vegetative development and flower production in modern garden roses (*Rosa canina* L.)

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## Abstract

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Production of roses depends on cultivar, rootstock and growing conditions. The use of rootstocks can be highly positive compared with their own roots, especially in the open. Generally in Kosovo roses propagated by grafting, during a year produced about 120-150 thousand seedlings. In Kosovo the most frequent rootstocks for roses are species *Rosa canina* var. *laxa*. The purpose of this research was to study level of compatability of rootstock *Rosa canina* var. *laxa*, with two groups of modern garden rose: Floribunda Roses and Polyantha Roses, with eight cultivars for each group. Roses are usually propagated by grafting, which is one of the many grafting techniques. A rose rootstock can influence the scion in terms of growth and development in various aspects. Most important are adaptation to certain pH values and drainage conditions of the soil, climatic factors, disease resistance, plant longevity, compatibility, productivity and flower quality. The experiment was conducted during 2018-2020, tested in a commercial farm in Kamenica, Kosovo. During the vegetation are measured these parameters: number and diameter of roots, length of flower stems, diameter of structural shoots, number of flowers, etc. There was found a significant level of compatibility between rootstock *Rosa canina* var. *laxa* with all tested roses cultivars.

*Keywords:* rootstock; vegetative development; flower stems; garden roses; Kosovo

## Introduction

The rose is the most important garden plants in the Republic of Kosovo. *Roses* (genus: *Rosa*) are woody plants belonging to the family *Rosaceae* which is in the order Rosales. Roses are types of flowering shrubs that are famed for their beauty, scent, and wonderful flowers. There are also many different types of roses that are suitable for almost any garden environment. Some miniature rose bushes are perfect for growing indoors in containers. In general, roses are classified by 3 main categories:modern garden roses, wild roses and old garden roses. There are over 300 species of roses in total and thousands of cultivars and hybrids. The classification of modern roses includes all roses that have been cultivated since 1867. The first of the modern roses was a hybrid developed by Jean-Baptiste Guillot. This was a cross between a hybrid perpetual rose and a tea rose.

Interest in use of rootstocks was in the first place lying in the rapid economic multiplication of desirable scion cultivars that are unable to raise on their own roots. For roses rootstocks are used for several reasons, including economical aspects of propagation, flower production, flower quality, adaptation to different kinds of soil and disease resistance (Edwards, 1955; Votruba, 1981). A rose rootstock can influence the scion in terms of growth and development in various aspects. Most important are adaptation to certain pH

values and drainage conditions of the soil, climatic factors, disease resistance, plant longevity, compatibility, productivity and flower quality (Berg & Vand, 1987).

Production of roses depends on cultivar, rootstock and growing conditions (Vecera, 1967). The use of rootstocks can be highly positive compared with their own roots, especially in the open (Pessala,1997). Rootstock use has been based on the observation that performance and flower productivity in grafted plants is higher than those in plants growing on their own roots (Cabrera, 2002). The effect of the rootstock on the number and diameter of branches formed and the good branching capacity in the plant was confirmed (Kool & Van de Pol, 1992). Differences in flower quality as influenced by rootstock were reported by (Fush, 1994). The physiology of flowering in roses was reviewed by and Zieslin (1992).

Plant propagation by grafting is one of the oldest horticultural practices and one that has intrigued the gardening and non-gardening public alike (Acker & Sholten,1995). Grafting is a process of propagation where a piece of one rose is fused onto another rose (Cottini, 2002). This is usually done because the rose that the graft is made on is stronger and can tolerate more stress or the host plant is more disease-resistant. Grafting can also be done to have a rose bush with more than one color flower. One method of grafting is called the T-bud method. *Rosa canina* var. *laxa* – real name is *Rosa cordifolia froebelii* Rehd. The first to work on multiplication of this rootstock was Froebel from Zurich (Switzerland) in 1890. It is mostly thornless, has a highly developed root system and grows quite deep in the ground. It is mainly suitable for heavy and calcareous soils, it has the strongest root system of all rootstocks (Atman, 2000). The purpose of this research was to study level of compatability of rootstock *Rosa canina* var. *laxa,* with two groups of modern garden rose: Floribunda and Polyantha Rose.

## Materials and Methods

In this research was to study level of compatability of rootstock *Rosa canina* var. *laxa,* with two groups of modern garden rose: Floribunda and Hybrid tea rose, with eight cultivars for each group. The Floribunda rose's species (Eifill Tower, Queen Mother, Kings Ranson, Papa Meilland, Summer Fashion, Bourbon Queen, Fragarant Delight, Cristophor Colombo) and Polyantha Rose (Anne Denneke, Ingrid Bergman, Charles de Gaulle, Double Delight, Mister Lincoln, Norita, Vaj Vcend, 'Summer Nights), were grafted in one rootstock which is *Rosa canina* var. *laxa.* The experiment was conducted during 2018-2020. The plants were planted in soil in raised beds on April, 2018. Propagation of grafting was conducted in August, with buds in the form T-budding, at high of 5 cm from soil level, on a same rootstock of *Rosa canina* var. *laxa*. The steps of the T-Buding process are as follows: a) Make a vertical cut with a length of about 2.5 cm in the area of the substrate; b) On top of the vertical cut, make a horizontal cut (13 mm); c) making an 'T' shape; d) Insert the knife into the cutting a little and the peel of the peel is lost; e) For the seedling bud, choose the flowering seedling that has three to four growing buds; i) Choose the healthy and sprouting bud and cut with a deep sloping cut; e)Remove wood materials if they are present inside the bud; f)Insert the fetal bud inside it and match it tightly;wrap with adhesive tape or grafting. The grafted plants and the own rooted were planted in open fields in distance 60 x 15 cm, with respect to watering, fertilization and disease protection. Scheme of experiment was a randomized complete block design with four replications,with five cultivars for each group of roses. All data was analyzed for variance using the statistical package Genstat, Systat or SPPS, further analysis using rang test with a critical level (P-value) of 5%. During the vegetation are measured these parameters: Number of structural shoots 50 cm above ground, length of flower stems, plant height, number and diameter of roots, length number of branches, number of flowers (Figure 1).

## Results and Discussion

***Dynamic of growth in length (cm) of flower stems as influenced by the rootstock on Rosa floribunda cultivars***

The formation of vigorous shoots an the basal part of the plant, known bottom-break an renewal canes, structural shoots 60 cm above ground level and 5 mm diameter, play an important role in growing roses, production and quality of flowers. Bottom-breaks and renewal canes are important elements in the structure of the rose bush. Their formation is controlled by a varying degree of correlative inhibition. The present results, recently confirmed by Kool & Van de Pol (1991b) and De Vries (1993), show that rootstocks affect bottom-break formation and formation of other structural shoots. Gowing conditions (such as climate, growing technique or utilized plant material) may be an important interfering factor. Interaction between rootstock and hybrid rose cultivars and data concerning bush development was analyzed per period (May-October).

Dynamics growth of flower stems during the vegetation was warious depending on cultivars. Different roses cultivars produced length of flower stems infuluenced by *Rosa canina* var. *laxa*, among the cultivar Eifell Tower produced maximum length of flower stems (113.2 cm) followed by Critsophor Colombo (109.5 cm) and Queen Mother (104.6

cm) height. Other cultivars are in the interval between the values mentioned above (Figure 2).

***Dynamic of growth in length (cm) of flower stems as influenced by the rootstock on Polyantha Rose cultivars***

Dynamic growth of flower stems during the vegetation was warious depending on cultivars. Different cultivars produced length of flower stems infuluenced by *Rosa canina* var. *laxa*. The cultivars Vaj Vicend produced maximum length of flower stems (111.6 cm) followed by Summer Night (104.3 cm) and Norita (103.6 cm) height. Other cultivars are in the interval between the values mentioned above (Figure 3).

***Statistical analysis of the dynamic growth of flower stems and diameter***

Analysis of variance confirms that there are statistically differences regarding the length of flowering shoots and their diameter. Exactly and with a high level of authenticity these changes are related to the genetic characteristics of cultivars,


**Fig. 1. Seedlings produced by *Rosa canina* var. *laxa*, in the agro-climatic conditions of Kosovo, Kamenica, year of study 2018-2020, groups of garden roses (Floribunda and Polyantha Rose)**

while the rootstock has had an impact on the development of flower stems. The climatic conditions of different years of study have also had significant effects on these indicators (Table 1, Table 2, Table 3 and Table 4).

***Influence of Rootstock on number of flower stems (per plant) and diameter (mm) of structural shoots 50 cm above ground level on Rosa floribunda cultivars***

Potential flower production is determined by the number of buds per plant but, in addition, their readiness and number to break and time required to develop a flower, as well as the percentage of blind shoots, are equally important (Carpenter & Anderson, 1972; Halevy, 1986). In the present experiment the longest time between two successive harvests was recorded following the harvest of end September. In the roses it is important to be established an optimal number of flower stems (3-5) with a diameter of 4-5 mm, serving during the pruning to form the sprouts production area for the coming year. For the *Rosa floribunda* cultivars, the biggest number of flower stems as the average of two years of study, we had at the cultivar

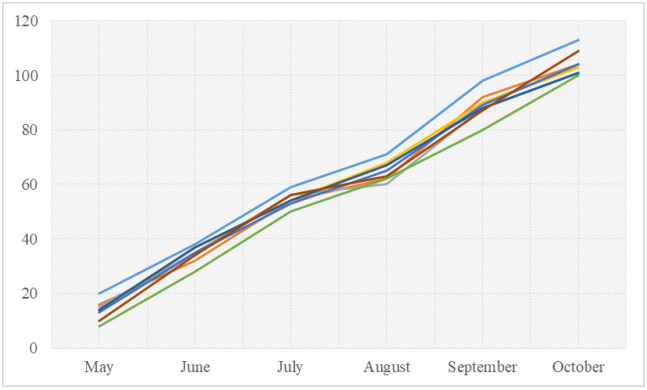


**Fig. 2. Dynamic of growth in length (cm) of flower stem on *Floribunda* cultivars as influenced by the rootstock**

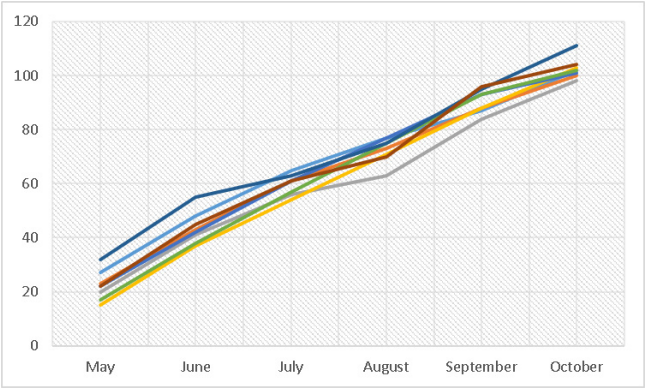


**Fig. 3. Dynamic of growth in length (cm) of flower stem on *Polyantha* cultivars as influenced by the rootstock**

**Table 1. Analysis of variance for index length of flower stems and diameter of the experimental period of two years for *Rosa Floribunda* as influenced by rootstock**

| Sources of variation | Length of flower stems | | Diameter of flower stems | |
|---|---|---|---|---|
| | Value F | Probability | Value F | Probability |
| Year | 1074.32 | 0.000 | 2937.36 | 0.000 |
| Cultivar | 1623.65 | 0.000 | 384.57 | 0.000 |
| Year x Cultivar | 32.41 | 0.000 | 10.54 | 0.000 |

**Table 2. Analysis of variance for index length of flower stems and diameter of the experimental period of two years for *Rosa Polyanthas* influenced by rootstock**

| Sources of variation | Length of flower stems | | Diameter of flower stems | |
|---|---|---|---|---|
| | Value F | Probability | Value F | Probability |
| Year | 1081.12 | 0.000 | 2951.21 | 0.000 |
| Cultivar | 1645.21 | 0.000 | 379.34 | 0.000 |
| Year x Cultivar | 30.61 | 0.000 | 11.21 | 0.000 |

**Table 3. Analysis of variance for flower diameter of the experimental period of two years for *Rosa Floribunda* as influenced by rootstock**

| Sources of variation | Diameter of flowers | |
|---|---|---|
| | Value F | Probability |
| Year | 0.20 | 0.000 |
| Cultivar | 206.17 | 0.000 |
| Year x Cultivar | 4.84 | 0.000 |

**Table 4. Analysis of variance for flower diameter of the experimental period of two years for *Rosa Polyantha* as influenced by rootstock**

| Sources of variation | Diameter of flowers | |
|---|---|---|
| | Value F | Probability |
| Year | 0.10 | 0.000 |
| Cultivar | 208.34 | 0.000 |
| Year x Cultivar | 4.34 | 0.000 |

Kings Ranson with 6.7 flower stems per plants, and the lowest at the cultivar Summer Fashion with 4.9, while the other cultivars were between the values mentioned above. Diameter of Flower stems influenced by Rootstock, was maximum by Queen Mother (9.4 mm), followed by Cristophor Colombo (9.3 mm) and Papa Meilland (8.4 mm) diameter (Figure 4).

***Influence of Rootstock on number of flower stems (per plant) and diameter(mm) of structural shoots 50 cm above ground level on Polyantha Rose cultivars***

The biggest number of flower stems as the average of two years of study, we had at the cultivar Duble Delight with 6.3 flower stems per plants, and the lowest at the cultivar Anne Denneke with 5.7, while the other cultivars were between the values mentioned above. Diameter of Flower stems influenced by Rootstock, was maximum by Summer Night (9.4 mm), followed by Ingrid Bergman (9.3 mm) and Norita (8.4 mm) diameter (Figure 5).

***Length and diameter of roots on Rosa floribunda cultivars***

The highest length of roots in the two years of study has been achieved at the cultivar Fragarant Delight (37.4 cm),

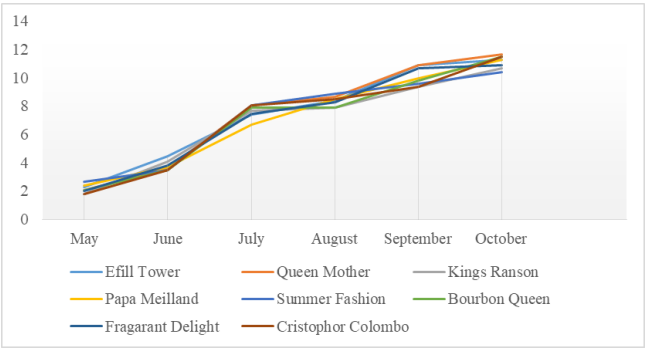


**Fig. 4. Diameter (mm) of structural shoots 50 cm above ground level on *Rosa floribunda* cultivars of the experimental period of two years**

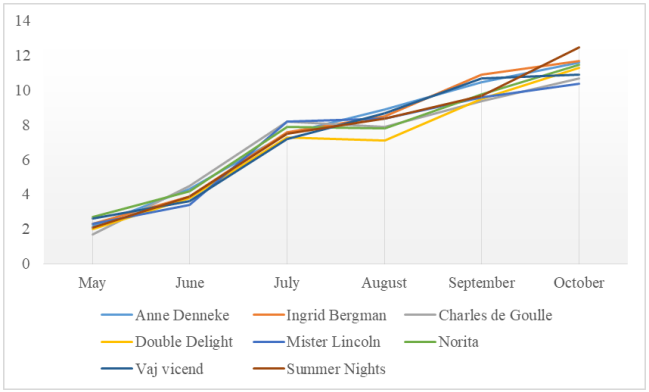


**Fig. 5. Diameter (mm) of structural shoots 50 cm above ground level on *Rosa floribunda* cultivars of the experimental period of two years**

**Table 5. Number of structural shoots 50 cm above ground, diameter of flowers, length and diameter of roots on *Rosa floribunda* cultivars**

| Cultivars/Floribundas | Number of structural shoots | Diameter of flowers, cm | Length of roots, cm | Diameter of roots, mm |
|---|---|---|---|---|
| Efill Tower | 5.8 | 12.3 | 32.2 | 6.78 |
| Queen Mother | 4.6 | 11.3 | 34.5 | 7.26 |
| Kings Ranson | 6.7 | 10.5 | 30.5 | 7.23 |
| Papa Meilland | 5.3 | 11.4 | 35.6 | 6.12 |
| Summer Fashion | 4.9 | 9.8 | 29.2 | 8.12 |
| Bourbon Queen | 6.3 | 9.8 | 33.5 | 7.87 |
| Fragarant Delight | 5.6 | 10.4 | 37.4 | 7.21 |
| Cristophor Colombo | 6.2 | 11.1 | 29.8 | 7.65 |

**Table 6. Structural shoots 50 cm above ground, diameter of flowers, lenght and diameter of roots on *Polyantha Rose* cultivars**

| Cultivars/Polyantha Rose | Number of structural shoots | Diameter of flowers, cm | Length of roots, cm | Diameter of roots, mm |
|---|---|---|---|---|
| Anne Denneke | 5.7 | 11.3 | 29.6 | 6.12 |
| Ingrid Bergman | 6.2 | 10.5 | 31.20 | 7.43 |
| Charles de Goulle | 5.9 | 10.6 | 34.33 | 8.23 |
| Double Delight | 6,6 | 11.2 | 32.1 | 6.78 |
| Mister Lincoln | 5.9 | 9.7 | 34.4 | 7.8 |
| Norita | 6.3 | 10.4 | 32.1 | 8.23 |
| Vaj Vicend | 5.8 | 9.3 | 37.2 | 7.78 |
| Summer Nights | 5.9 | 10.4 | 32.8 | 7.21 |

while the lowest one at the cultivar Summer Fashion (29.2 cm), the average values of other cultivars being between them. The highest diameter of roots was reached at the Summer Fashion (8.12 mm), the lowest one at the cultivar Papa Meilland (6.12 mm), the average values of other cultivars being between them (Table 5).

***Length and diameter of roots on Rosa Polyantha cultivars***

The highest length of roots in the two years of study has been achieved at the cultivar Vaj vicend (37.20 cm), while the lowest one at the cultivar Anne Denneke (29.6 cm), the average values of other cultivars being between them. The highest diameter of roots was reached at the Norita (8.23 mm), the lowest one at the cultivar Anne Denneke (6.12 mm), the average values of other cultivars being between them (Table 6).

## Conclusions

The interactions (relationships) between these two plant parts (rootstock and scion) are of much significance for garden roses cultivars in our study. Analysis of variance confirms that there are statistically differences regarding the length of flowering shoots and their diameter. There was found a significant level of compatibility between rootstock *Rosa canina* var. *laxa* with all tested cultivars of groups *Floribundas* and *Polyantha Rose*. Rootstock *Rosa canina* var. *laxa*, had an impact on the growth of flowering shoots, diameter of shoots, flower diameter for all tested roses cultivars. This confirms the ability of using this rootstock in large scale commercial rose production in Kosovo climatic and soil condition. Rootstocks has a great effect in adaptation to certain pH values and drainage conditions of the soil, climatic factors, disease resistance, plant longevity, productivity and flower quality. This rootstock recommended to be used for the propagation of garden roses in the Republic of Kosovo.

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