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Garden Roses (*Rosa x hybrida*) as a landscape architecture plants: Large blooms and compact growth

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Abstract. Garden roses (*Rosa x hybrida*) provide aesthetic value as landscape plants throughout the growing season. Plant architectural characteristics have been shown to be linked to crop yield and for roses, plant architecture affects their ornamental value and flower productivity. The formation of plant architecture starts from bud rate, which determines the positioning and number of shoots and flowers. Architectural analysis of roses in this study focused on morphological and vegetative part of roses, such as stem length and diameter, flowering stage, branching, and branching angles, number of flower stems. This group of plants can be erect shrubs, climbing or trailing with stems that often have thorns. Flowers vary in size and shape and are usually large and showy, in colours ranging from white, yellows, reds, pinks and purples. Roses have been characterized by both quantitative and qualitative morphological traits such as size, shape, and the color of petals, hips and sepals, inflorescence architecture, the length of the flower stems.

Keywords: Garden roses, landscape, plant architecture, color, shape

Introduction

Roses have made great contributions to the world as landscape plants and as cut flowers in the floral industry (Bendahmane et al., 2013). Architecture is also linked to yield in rose (number of flowers) as well as other crops such as: number of shoots and flowering stems per plants (Shimelis and Shiringani, 2010). Previous architectural analysis of roses focused on morphological, topological, and geometrical traits, such as stem length and diameter, succession, branching, and branching angles (Godin et al., 1999). Roses, the “Queen of the Flowers,” have been enjoyed for thousands of years. Their cultivation dates back to at least Greek and Roman times. Many varieties are descendants from ancient garden plants in China, Persia, and Turkey. The Romans, Greeks, and Persians used domesticated roses as ornaments and for medicinal use. The essential oils of roses are also commonly used in the perfume and cosmetic industries (Roberts et al., 2003). Chinese roses were introduced to Europe in 1400s, which lead to the development of ‘modern rose cultivars’ via the hybridization among Chinese, European and Middle Eastern roses (Raymond, 1999). Nowadays, there are 30,000 to 35,000 rose (*Rosa x hybrida*) cultivars in the world (Blechert and Debener, 2005; Gudin, 2003). Roses offer a range of color, shape, and scent that is unrivaled. Few plants are more varied in growth habit, height, foliage and form. Roses are adaptable plants that grow well in almost all parts of the world. Plant architecture is the result of growth and branching processes. The components of its variation include genetic, environmental factors and the genotype \times environment interaction (Crespel et al., 2014). Roses are adaptable plants that grow well in almost all parts of the world. They're most vigorous in warm-temperate regions, although some have adapted to subtropical or cold regions. In hot climates, some may flower most all year.

Objectives

The objectives of this study were to evaluate the aesthetic value as landscape plants for five garden roses cultivars and the levels of architectural traits, morphological, branching angle and vegetative part of roses.

Classification of garden roses

The American Rose Society recently approved a new classification scheme that reflects both the botanical and evolutionary progress of the rose. There are three main groupings: Species (i.e. wild roses); Old Garden Roses (classes in existence before 1867); and Modern Roses (classes not in existence before 1867).

Species Roses

Often referred to as “wild roses,” species roses are usually single-petaled (4-8 petals), once-blooming and have a bush size ranging from 0.30cm to 60 cm.

Old Garden Roses

Old garden roses were popular prior to the 20th century. A true Old Garden Rose predates 1867 (the year that La France, the first Hybrid Tea, was introduced). These are generally tough, durable shrubs that have stood the test of time; many are considerably more fragrant than their modern counterparts. Most are once blooming, and would be used in the landscape similar to a Lilac or Hydrangea. They often grow quite large, but can tolerate severe pruning every few years to maintain lower growth.

Rosa alba- Dating back before 100 A.D., Albas are the most elegant of all old roses, with tall, slender, upright bushes producing flowers of blush pink or white with charming, delicate beauty set against the perfect background of grey-green foliage.

Rosa Bourbons - Discovered in 1817 on the French Ile de Bourbon when a seedling from the Damask rose ‘Quatre Saisons’ and a China rose (believed to be ‘Old Blush’) sprouted up between the rows.

Rosa China - The China roses play a great part in the history of our modern roses, having given them their ever-blooming abilities. The plants are somewhat tender and may need protection in cold climates.

Modern Garden Roses

Modern Roses are those varieties bred after 1867. Most people imagine these types when they think of roses. Classification of Modern Roses can be complicated because many have Old Garden Roses in their ancestry, but they are largely classified by growth and flowering characteristics. Unlike Old Garden Roses which bloom once a year, Modern Roses bloom

continuously. They also have a larger bloom size and longer vase life, but lack fragrance, and are less hardy and disease resistant.

Ground cover Roses- Also known as “landscape” roses, this type of rose was developed to fulfill the desire for a garden rose that offers color, form, and fragrance, but is also easy to care for.

Floribunda Roses- Are a cross between a Hybrid Tea and Polyantha roses. Each stem produces a cluster of large blossoms in the classic Hybrid Tea shape. Floribundas can be found in a variety of colors including orange, yellow, pink, purple, and white.

Hybrid Tea Roses- Hybrid Tea roses have been the favorite of the Modern Roses, and come in a very diverse range of colors. They are known for their long, upright stems, which make them an extremely popular cut flower. Hybrid tea roses have large, well-formed, pointed blooms.

Rambling Roses- Are vigorous growers with numerous clusters of small to medium-sized blossoms, and long, flexible canes. They are often once blooming, but may be repeat or continuous.

Miniature and Miniflora- These classes have increased in popularity due to their novelty and versatility. They can be used for edging beds, growing in containers and rockeries or even for taking indoors as temporary pot plants for decoration. The height of the average plant is about 30-45 cm , and flower form and foliage are indeed miniature versions of both hybrid teas and floribundas. Miniflora roses are a new classification adopted by the ARS in 1999 to recognize another step in the evolution of the rose, intermediate bloom size and foliage falling between miniatures and floribundas.

Material and Methods

Five garden roses cultivars were evaluated for two seasons, April and November of 2017 and 2018 in area of Prishtina. Architectural analysis of roses in this study focused on morphological and vegetative part of roses, such as stem length and diameter, flowering stage, branching, and branching angles, diameter of shoots, number of flower stems, primary shoot and color. In this study garden roses cultivars are: Hybrid Teas 'Gold Wedding'; Hybrid Teas 'Double Delight'; Hybrid Teas 'Mister Lincoln'; Hybrid Teas 'Graham Thomas' Hybrid Teas 'Vaj Vicend'. The plants were planted in soil in raised beds in April. The grafted plants and the own rooted ones were planted in open fields in distance 1 x 1 m. The scheme of experiment was a randomized complete block design with four replications.





Fig. 1 Garden rose cultivars in our study; 2017/2018; plant height; length of flower stems; succession; branching; diameter of shoots, area of Prishtina

Results and Discussion

Plant architecture, number of branches and vegetative part of roses

Plant architecture of rose characterize on four categories such as: vegetative traits, reproductive traits, flower branch and branching angles. Plant architecture was divided into the following traits: the number of nodes on the vegetative part and reproductive part, and the primary branch (Figure 2).

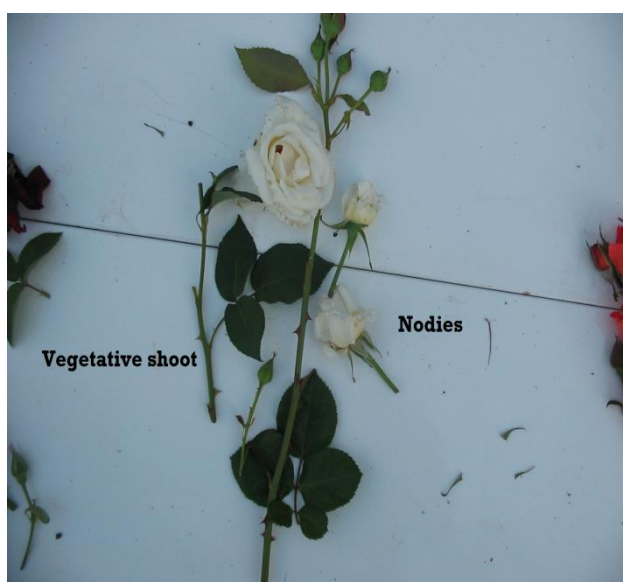


Fig. 2 Plant architecture (vegetative part of roses, number, length of nodes and internode length, primary branch) on rose Hybrid Teas ‘Vaj Vicend’

The length of the reproductive shoot and the number of nodes on the branch, (figure 3 and 4) also differed among the garden rose in our study. The number of flowers of both primary and secondary shoots differed among garden roses. The formation of plant architecture starts from bud rate, which determines the positioning and number of shoots. The initiation period determines the expansion and orientation of leaves and internodes, and floral transition determines the number of flowers and bloom period. Additionally, stems along with leaves determine the shape and growth type of plant, which is very important for aesthetic quality. The formation of vigorous shoots on the basal part of the plant, known bottom-break or 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.



Fig. 3 Plant architecture (number, length of nodes, shoot of primary) on the reproductive part of rose and the number of flowers on garden rose Mister Lincoln

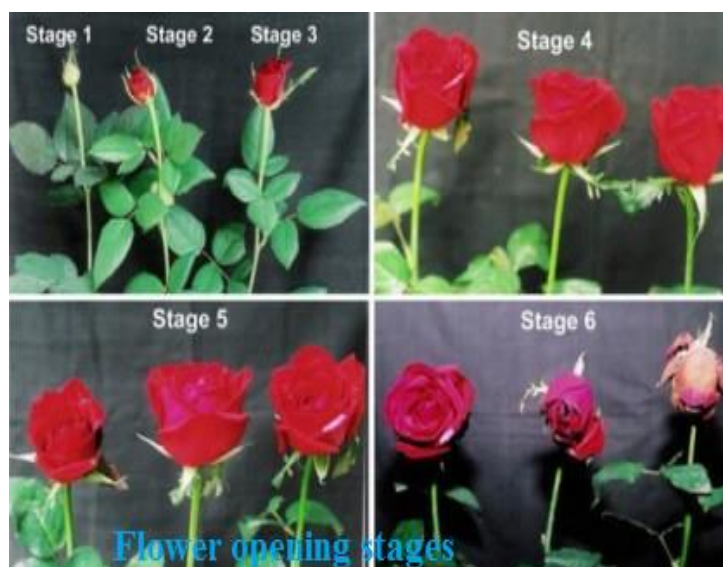


Fig. 4 Plant architecture: Flower opening stages in roses, succession, branching. reproductive part, primary shoot on garden rose; Hybrid Teas Mister Lincoln

Diameter of structural shoots, diameter flowers number of flowers/plant

Regarding the diameter of structural shoots according to the cultivars and influence by the rootstocks *Rosa canina* 'Laxa', the highest diameter was achieved with the cultivar 'Vaj Vicend' (6.5 mm), while the lowest diameter with the cultivar 'Graham Tomas' (4.6 mm). The other cultivars were between these specified values (Table 1).

Table 1. Diameter of structural shoots (mm), diameter flowers (cm), number of flowers /plant

Cultivars	Diameter of flowers (cm)	Number of flowers	Diameter of structural shoots (mm)	Color
Vaj Vicend	6.3	21.5	6.5	White
Graham Tomas	7.5	23.6	4.6	Red
Double Delight	6.6	24.2	5.7	Orange
Gold Wedding	6.1	18	5.5	Yellow
Mister Lincoln	6.9	17.7	5.8	Red

The diameter of flowers is a feature of the cultivar, from our study about the mentioned rootstocks we have achieved the highest value in cultivar ‘Graham Tomas’ with 7.5 cm and the lowest one in cultivar ‘Gold Wedding’ with a diameter of 6.1 cm. During the growth of shoots, the plant produces flowers even in the first year after grafting. This number is different the highest is achieved in ‘Double Delight’ with 24.2 flowers and the lowest in ‘Mister Lincoln’ with 17.7 flowers per plant.

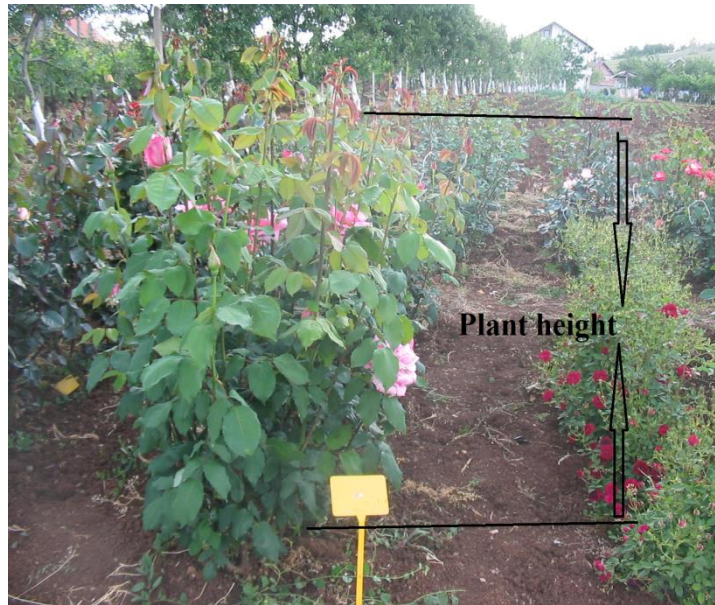
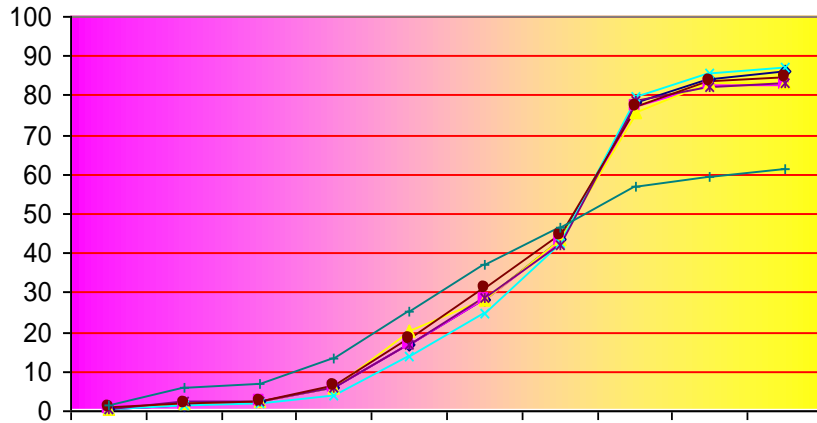


Table 6. Plant architecture: Plant height (cm), vegetative part , growth, flower stem, diameter of structural shoots on rose cultivar Garham Tomas

Vegetative stage of the rose plants in Kosovo

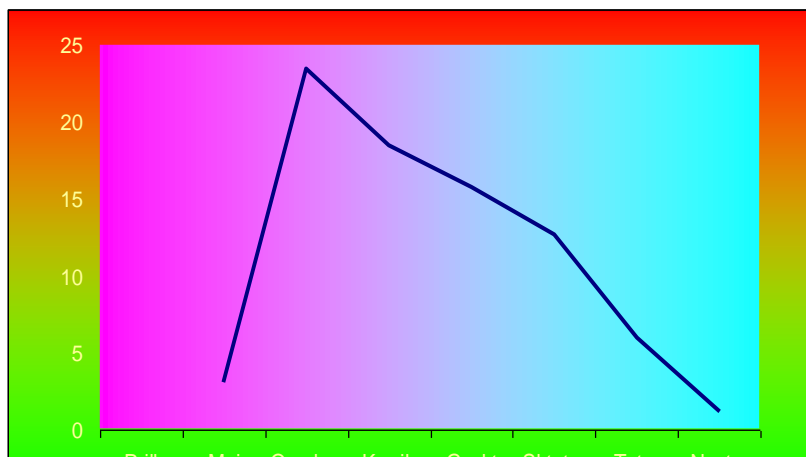
The beginning of the vegetative stage of the rose plant in Kosovo climate conditions is the end of March or the beginning of April, while the end of growth is October. Growth of flowering stems is done according to a dynamic where in the first stages we have the largest growth until the end of June, when the flowering ends with a flower. Higher growth was achieved at the Vaj vicend cultivar (96.9 cm) and lower at the Mister Licoln cultivar (70.3 cm). The other cultivars are at average values between them (Graph 1).



Graph 1. Vegetative stage of the rose plants; Kosovo climate conditions

Flowering stage of the rose plants in Kosovo

Climatic factors (light and temperature) are very important factors in the development of the flowering stage of the rose plant. Flowering beginning in mid-May, where we have 2.5-4.5 flowers per plant depending on cultivars (Graph 2). The most intense flowering stage for all cultivars was reached in June with 33.5 flowers per plant, depending on the cultivars. The decrease in the number of flowers continues in October as we have 8.55 flowers per plant. While flowering end in mid-November where we have 1.1-1.4 flowers per plant.



Graph 2. Flowering stage of the rose plants; Kosovo climate conditions, 2017/2018 succession, branching, years of study, area of Prishtina

Conclusions

Garden roses are predominantly hybrid roses that are grown as ornamental plants in private or public gardens. The beginning of the vegetative stage of the rose plant in Kosovo climate conditions is the end of March or the beginning of April, while the end of vegetative growth is October. Plant architecture of roses is linked to flower yield and ornamental value. The formation of plant architecture starts from bud rate, which determines the positioning and number of shoots and flowers. Plant architecture of garden roses was divided into the following traits: the number of nodes on the vegetative part, reproductive part and the primary and secondary branch. Criteria to determine the horticultural quality of ornamental plants include plant architecture, flower characteristics, and resistance to biotic and abiotic stresses. Roses offer a range of color, shape, and scent that is unrivaled.

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