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Improving Flower Yield of Two Essential Oil Bearing *Rosa* Species Through Pruning Severity

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Abstract: *Rosa centifolia* and *Rosa damascena* are famous essential oil producing *Rosa* species in Pakistan. Pruning is important and common practice used to enhance flowering. In this experiment effect of different pruning types was observed on flowering of above mentioned *Rosa* species grown at Rosa project, University of Agriculture, Faisalabad, Pakistan. Light (15 cm), medium (10 cm) and severe (5 cm) pruning was practiced on the plants in the month of November, 2013. The data of number of branches, flower shoot length, 100 petals weight, flower weight, number of petal per flower, weight of petals per flower, number of buds per plant, number of cut flowers per plant, total number of flowers per plant was recorded. Both the species produced similar results except 100 petals weight, which was 5.34 g in *R. centifolia* and 5.21 g in *R. damascena*. Severe pruning produced maximum flower shoot length (2.11 cm), flower weight (2.99 g), number of petal (60.11) and weight of petals per flower (2.09 g), while medium pruning produced maximum number of branches (33.70), number of buds per plant (284.17), number of cut flowers (251.56) and total number of flowers per plant (541.17). Unpruned plants produced minimum result in all parameters, which proved pruning effective for increasing yield of *R. centifolia* and *R. damascena*. Medium pruning enhances flowering in *R. centifolia* and *R. damascena*, which will be helpful for their essential oil extraction business in Pakistan.

Key words: *Rosa* species, *Rosa centifolia*, pruning, flower, yield

INTRODUCTION

Rose is famous among floricultural crop (Senapati and Rout, 2008; Heinrichs, 2008), used for comforting purpose throughout the human history. The genus *Rosa* consisting of about 200 species and 20000 cultivars (Ritz *et al.*, 2005), used in the food, cosmetics (Kaur *et al.*, 2007) and the medicinal industry (Basim and Basim, 2003; Ozkan *et al.*, 2004). Rose oil is one of the most expensive oils in the world (Baydar and Baydar, 2005) with antimicrobial, anti HIV and antioxidant effect (Buckle, 2003; Ozkan *et al.*, 2004) and was first discovered by Geronimo Rossi in 1574 during working with rose water (Parry, 1925; Gordon, 1953). Annual rose oil production in the world is 4.25 tons with increasing trends (Narayan and Kumar, 2003) and main rose oil producing countries are Bulgaria, Turkey and Iran with India, China and Northern Africa (Rusanov *et al.*, 2005). Among roses *R. centifolia* and *R. damascena* are famous essential oil bearing species, used for the extraction of rose oil and water in the world as well as in Pakistan. Business of essential oil extraction of roses is increasing in Pakistan, which increasing the demand of

good quality flowers of *R. centifolia* and *R. damascena*. Rose growers in the country are trying to enhance their yield to fulfill the increasing demand.

Pruning is regular and productive technique practiced in ornamental plants (Sarkka and Erikson, 2003) for controlling the growth, enhancing the yield and shaping the plant. In case of ornamental flowering plants, pruning is practiced for enhancing the flower yield because cell activities in the older plant branches may be effected, which ultimately decrease the plant growth and flowering (Zieslin and Mor, 1981). Through pruning of dead, broken, diseased, old and crowded branches is to recover growth of plant, which depends on the pruning height, plant development stage and position (Li *et al.*, 2009). Wang (2008) observed the positive effect of pruning on growth and flowering of wild azalea plants. Malhotra and Kumar (2000) also noticed that pruning intensity is an important factor for enhancing flower production in roses.

The aim of this study was to evaluate the best pruning types for enhancing the growth and flowering of *R. centifolia* and *R. damascena*.

MATERIALS AND METHODS

The experiment was performed at the Rosa project, University of Agriculture, Faisalabad, Pakistan on 12 years old field grown plants of *R. centifolia* and *R. damascena* in 2014. Plants were planted at 3-3 feet R-R and P-P distance and all other cultural practices were routinely performed.

Three different types of treatments (light, medium and sever pruning) were done in the month of November 2014 according to the Randomized Complete Block Design (RCBD) having three replication and three plants in one replication. In light pruning, branches were pruned at distance of 15 cm from the basal end with a clean sharp pruning knife. In medium pruning all the branches were cut to 10 cm height, while severe pruning was done by removing all branches to a height of 5 cm. The control plants were unpruned.

Data of nine different parameters were recorded. Flower shoot length was measured by ruler, while flower weights, 100 petal weight, weight of flowers per plant were measured by electric balance. Other parameters like number of branches, number of petals per flower, number of buds (unopened flower) per plant, number cut flower (when flowers were ready to cut) per plant and total number of flowers (Number of bud+number of Cut flower) per plant were counted.

All the composed data was analyzed statistically using SAS statistical analysis (Version 9.3) technique and means were compared for significance among treatments by using Least Significance Difference (LSD) test at $p < 0.05$ (Steel *et al.*, 1997).

RESULTS

Number of branches: *R. centifolia* and *R. damascena* produced non significant results regarding number of branches per plant. Number of branches were maximum (33.70) in medium type pruning followed by sever and light pruning, which produced 15.41 and 14 number of branches, respectively, compared to 13.44 number of branches in control plants as shown in Fig. 1.

Flower shoot length: In case of flower shoot length, both rose species showed similar results. Maximum shoot length (2.11 cm) was observed in sever pruning followed by medium pruning (2.08 cm), while light pruning produced (1.45 cm) shoot length. But minimum shoot length (1.38 cm) was observed in the control plants (Fig. 2).

100 petals weight: Sever pruning proved best in by producing maximum weight of 100 petals (5.34 g) in *R. centifolia*, medium and light types of pruning were after that by producing 4.51 g and 4.27 g weight, respectively. But least weight of 100 petals (4.30 g) was produced by control plants. In case of *R. damascena* sever pruning produced maximum weight of 100 petals

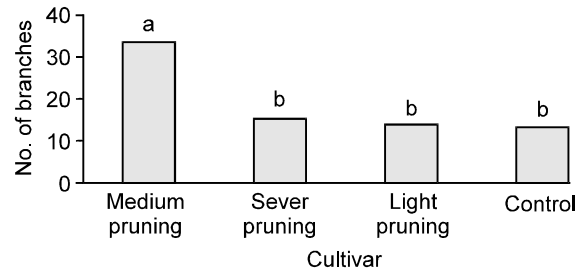


Fig. 1: Effect of different treatments on number of branches

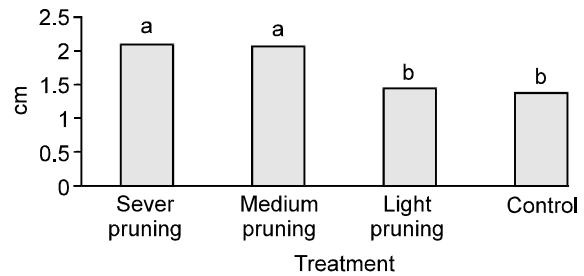


Fig. 2: Effect of different treatments on flowering shoot length

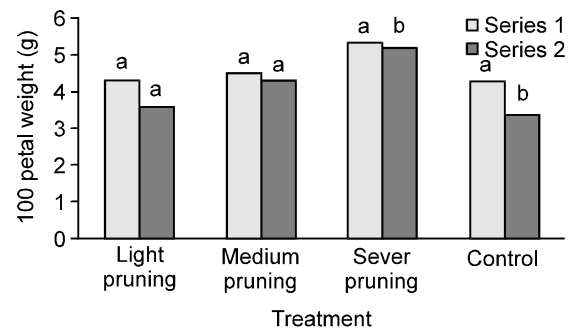


Fig. 3: Effect of different treatments on 100 petal weight

(5.21 g) followed by medium pruning (4.31 g) and light pruning (3.57 g) compared to (3.36 g) in control plants (Fig. 3).

Flower weight: Data in the Fig. 4 showed that there was non significant difference among the species and sever pruning produced highest flower weight (2.99 g), while medium pruning produced 2.67 g flower weight. But light pruning and control plants were least effective by producing 2.05 and 1.92 g flower weight, respectively.

Number of petals per flower: Same results were recorded from both species for number of petals per plant. Sever pruning was most effective by producing 60.11 number of petals compared to 57.08 in medium pruning, while light pruning produced 50.45 number of

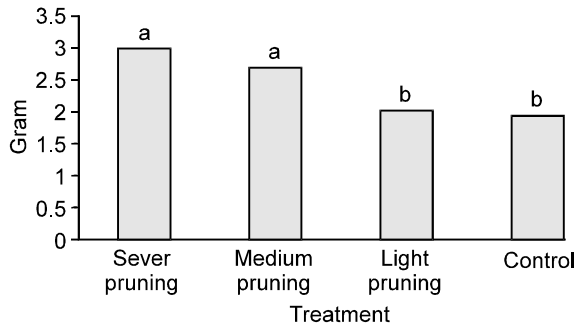


Fig. 4: Effect of different treatments on flower weight

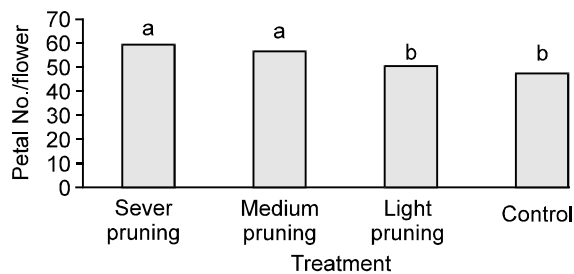


Fig. 5: Effect of different treatments on number of petals per flower

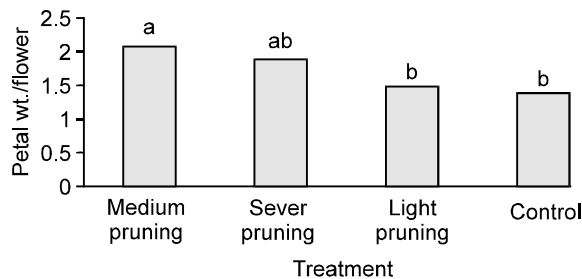


Fig. 6: Effect of different treatments on weight of petals per flower

petals followed by minimum number of petals (48.25) in unpruned plants as shown in Fig. 5.

Weight of petals per flower: According to the data presented in Figure 6, sever pruning showed maximum (2.09 g) weight of petals per flower followed by 1.90 g in medium pruning. Light pruning was after medium pruning by producing 1.5 g petal weight but minimum (1.4 g) petal weight per flower was noticed in control plants. There was non significant difference among the species.

Number of buds per plant: Maximum numbers (284.17) of buds per plant were produced by medium pruning while minimum numbers (100.00) of buds per plant were recorded in unpruned plants (Fig. 7). Light pruning

also produced satisfactory results by producing 212.06 numbers of buds per plant. But sever pruning produced 120.22 numbers of buds per plant. Response of both the species was similar to pruning in case of number buds per plant.

Number of cut flowers per plant: In both the species medium pruning produced highest (251.56) number of cut flowers per plant while sever pruning and light pruning were after that by producing 163.83 and 88.50 number of cut flowers per plant but unpruned plant produced least (70.00) number of cut flowers per plant (Fig. 8).

Total number of flowers per plant: According to the data presented in Fig. 9, medium pruning produced maximum (514.17) number of flowers per plant and was most suitable as compared to other treatments. Light pruning was next to medium pruning by producing 381.44 number of flower but sever pruning followed by control was least effective by producing 206.50 and 186.45 number of flower per plant. Results were again similar for both species.

DISCUSSION

Pruning is an effective cultural practice of flowering plants, use throughout their life cycle for better growth and flowering. It also cause revival of growth and enhancing flower formation in plants (Parsons, 1956). Saffari *et al.* (2004) found pruning effective for better growth. Early winter pruning is recommended in roses as cut branched are used as plant material for next planting year for avoiding zero harvest (Topalov and Irinchev, 1967). Pruning showed a positive effect on the flower shoot length of both *R. centifolia* and *R. damascena*. Similar results were also reported by Wang (2008) during the work on azalea plants. Early winter pruning increases the thickness flowering shoot, which positively affect the stem length in roses (Younis *et al.*, 2013). Holley (1973) also observed the enhancing of stem length by increase in stem diameter.

Flower weight, number and weight of petals per flower increases by severe pruning practice in early winter in both *R. centifolia* and *R. damascena*. Schneider and Dewolf (1995) also recommended sever pruning in floribunda and hybrid tea roses for higher flower yield. Severe pruning is suggested for better growth in roses (Hessayon, 1988).

Maximum number of branches and flower per plant were produced from the plants of *R. centifolia* and *R. damascena* subjected to medium pruning in the present study. Flower yield depends on the number of branches on which flower buds are produced (Younis *et al.*, 2013). Saffari *et al.* (2004) recorded increase in number of branches of roses with pruning. Previously, medium pruning have recommended in different garden

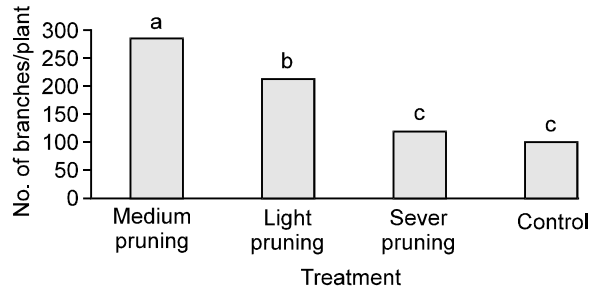


Fig. 7: Effect of different treatments on weight of buds per plant

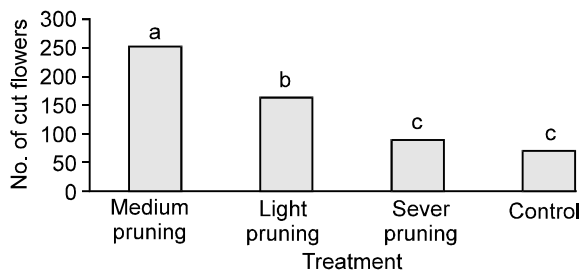


Fig. 8: Effect of different treatments on number of cut flowers per plant

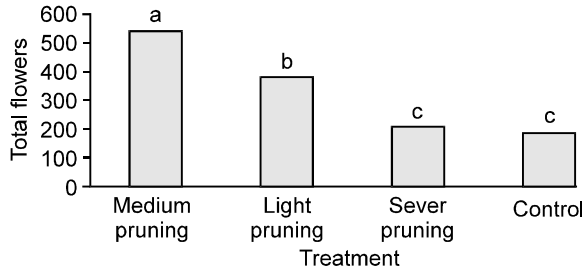


Fig. 9: Effect of different treatments on total number of flowers per plant

roses like floribundas, hybrid teas, grandifloras and tree roses because of their better response to medium pruning (Denison, 1979). Number of flowers in both *Rosa* species (*R. centifolia* and *R. damascena*) was the ultimate goal for increasing the yield and to fulfill their growing demand. Pruning also positively effects the relative water content (RWC), which helps in increasing number of flowers (Saifuddin *et al.*, 2010). Pruning practice increases the light infiltration and distribution in plants canopy, which changes the photosynthetic ability and quantum yield of leaves (Admasu and Struikb, 2000; Hossain *et al.*, 2007). Hossain and Fusao (2008) recorded the increase in flower buds, sugar content and N, P and K content in leaf with pruning. After pruning the plants of *R. centifolia* and *R. damascena* performed better and showed higher results as compared to the unpruned plant, which generate unsatisfactory results in

case of all parameters. These results are unswerving with findings of Hassanein (2010) who documented superior results of pruned plant than unpruned plants of cultivar (Eiffel tower) of hybrid tea roses. Pruning is a basic practice for controlling aging and encouraging the flowering in plant form the ancient times lower yield factors of roses (Parsons, 1956). Hassanein and Dorion (2006) have been observed stress in unpruned plants, which ultimately causes decrease in growth and flower yield of plants. For better growth and flower yield of oil bearing roses continuous rejuvenating is necessary.

Conclusion: Both species (*R. centifolia* and *R. damascena*) responded well to pruning. Medium pruning was best for producing more number of buds and flower in both species. In case of flower weight, petal weight and number per flower severe pruning showed highest results.

Medium pruning is recommended for higher flower yield in *R. centifolia* and *R. damascena* species of roses used for essential oil extraction in Pakistan.

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