Effect of Spring Prunning on Bud Characteristics, Floral Stem Length and Quality Cut Flower Production of Hybrid Tea Rose Cultivars in Chitwan, Nepal

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ABSTRACT

An experiment was conducted in the Abloom flora of Gunjanagar-5, Chitwan, Nepal during March, 2013 to August, 2013 to study the effect of Spring Pruning on Growth and Production of Quality Cut Flower of HT Rose Cultivars. The experiment was laid out in three factorial split- split plot design with three replications. There were 12 treatments consisting of three popular Italian HT Rose varieties (High Magic, Lenopa and Confetti of three different color viz white, red and yellow respectively), two dates (1st on 8th March, 2013 and 2nd on 18th March, 2013) and Pruning (Pruned and non-pruned). High Magic pruned on 8th March 2013 produced flower having longest floral bud (3.554cm) and flower stem (41.008cm). Maximum flower diameter (2.863cm) was also recorded in High Magic pruned on 8th March, 2013. High Magic also produced larger mean number of cut rose flowers (23.833) followed by Confetti (14.250) and Lenopa (10.333) . Plants pruned on 1st date produced maximum mean number of flowers (20.889). Maximum (22.611) flowers per plot was counted in pruned plants. Among all cultivars, High Magic produced longer stem length in all dates of pruned and un-pruned condition followed by Lenopa and shorter stem length was produced by variety Confette in all conditions. Variety High Magic pruned on 18th March 2013 produced longer flower stem (44.750cm) whereas variety Confetti produced flowers having shorter stem length (24.333cm) in plants that were un-pruned on 8th March, 2013.

Key words: Pruning, variety, floral bud, floral stem, flower production.

INTRODUCTION

Rose (*Rosa spp*.) belongs to the family Rosaceae and is one of the most important woody perennials including shrubs, bushes of various sized ramblers and climbers as well as very small plants known as miniatures (Encyclopedia Americana, 1984; Gibson, 1984) and is one of the most economically important genus of ornamental, aromatic and medicinal plants with about 200 species and 20,000 cultivars widely distributed all over the world (Cuizhi and Robertson, 2003; Ritz et al, 2005). Rose is the most popular of all the flowers because of its beauty and fragrance and is called the "Queen of Flowers" (Schneider and Dewolf, 1995). The demand of rose cut flower is 7000-9000 sticks per day in Kathmandu and about 172 ropanies of land is covered under rose cultivation in Nepal (FAN, 2013).Roses respond well to pruning and are believed strictly to be pruned every year regularly. Pruning is the management of plant structure and fruiting wood and involves removal of plant's top and root system to facilitate and increase its usefulness (Hessayon, 1988). Pruning is a very important and necessary step which is beneficial for growth and increases the aesthetic values like profuse and larger blooms with inspiring colour and quality of the flowers (Gibson, 1984, Anderson, 1991). Chimonidou et al. (2000) observed that when flower stem was removed by pruning, flower initiated shortly after the start of axillary bud growth. However, Terada et al.(1997) reported that after the cut flower and pruning, growth rate decreased immediately. On the other hand, Uma and Gowda (1987) reported hard pruning delayed flowering while influenced other flower characters such as increased length, bud length and diameter. Roses need different types and timing of pruning depending on their variety (Hessayon, 1988). Repeated blooming roses such as floribunda and hybrid tea roses need a heavy annual pruning that is done in December-January (Schneider and

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Dewolf, 1995). Pruning also increases the percentage of high quality cut flowers (Han et al., 1997). Pruning can also be used for the size control of rose plants (Horan et al., 1995).

Availability of cut flowers in market is low in quality as well as in quantity. There is no standard time and intensity of pruning for the market oriented rose production in Nepal. Therefore, this research was conducted to determine the optimum time and intensity of rose pruning for efficient growth, yield and quality of cut flower in the farmer's field in Gunjanagar-5, Chitwan, Nepal from March, 2013 to August, 2013.

MATERIALS AND METHODS

One year old rose plants of common Italian rose cultivars viz. High Magic, Lenopa and Confetti having white, red and yellow color respectively were taken as test crops for the experiment. The combinations of varieties, date and pruning of rose were used as treatments in the experiment. There were 8 plants in each experimental plot. Observations were taken from middle four plants. Only those rose plants which have pruning treatments were pruned. Pruning was done in two different dates i.e., 8th March, 2013 and 18th March, 2013. While pruning, medium pruning was done with secateurs removing all dry, diseased, damaged, weak and criss-crossed branches. After pruning, cut ends were painted with fungicides paste (Bordeaux paint) in order to protect against the attack of pests like fungus. The experiment was laid out in three factorial split-split plot design having three factors with twelve treatment combinations replicated thrice.

All the intercultural operations like hoeing, weeding, side dressing, irrigation, earthing up; mulching and plant protection measures were done regularly. The rose cut flowers were harvested at bud stage. Flowers were harvested from April 2013. Harvesting was carried out manually during evening with secateur retaining 5 cm stem from the branch attachment. Harvested flower of each plot were recorded in data sheet. Observations were recorded for several vegetative characters viz. plant height, cane characteristics, days to stem bud initiation, leaf characteristics and yield attributing parameters such as days to floral initiation, flower stem characteristics, flower bud characteristics and number of flowers harvested.

RESULTS AND DISCUSSION

Floral bud characteristic

Length of floral bud

The effect of variety on flower bud length was found to be significantly different with mean value 3.428cm (Table 1). The rose variety High Magic produced the flower having longest floral bud (3.554cm) which was at par with rose variety Lenopa (3.232cm) and shortest bud (3.499cm) was produced from rose variety Confetti. Plant pruned in 1st date i.e. 8th March 2013 produced flower with higher bud length (3.58cm) than flower pruned in 2nd date i.e., 18th March 2013(3.276cm). It might be due to increase in temperature during April that the plant pruned later produced small bud length. Flower bud length showed significantly no differences with the pruning.

Diameter of floral bud

Cultivars showed highly significant difference on the bud diameter of cut rose flowers (Table 2). Cultivar High Magic produced the highest flower bud diameter (2.714cm) and the smallest flower bud diameter (2.217cm) was produced from rose cultivar confetti where as cultivar Lenopa produced similar bud diameter (2.662 cm) as High Magic. Hessayon (1988) also reported varying flower diameters in different rose cultivars. Higher carbohydrate available for the individual flower stem in pruned rose plants helps in better vigor of plant having higher flower bud diameter. Mukhopadhyay *et al.*, (1987) have also found the similar result. The effect of time of pruning on floral bud diameter was found to be non- significant.

The statistical analysis showed that flower bud diameter was found to be significantly influenced by pruning (Table 2). The rose plant which was pruned produced flower bud having the highest bud diameter (2.661cm) whereas the lowest flower bud diameter (2.401cm) was produced by rose plants that were not pruned. Mukhopadhyay *et al.*, (1987) have also found similar result. According to him, higher carbohydrate available for the individual flower stem in pruned rose plants helps in better vigor of plant having higher flower bud diameter. Physiologically, fresh buds after pruning grow vigorously compared to older branches. Pruning mainly encourages the new growth with higher amount of plant reserved food materials, which are coincided with diameter.

Floral Stem Characteristics

Length of flower stick

The effect of variety on flower stem length was found to be significantly different with mean value 36.696 cm (Table 1). The rose variety High Magic produced the flower having longest stem (41.008cm) after harvest which was at par with rose variety Lenopa (38.983cm) and the shortest stem (30.097cm) was produced from rose variety Confetti. The effect of time of pruning on floral stem length was not significant. This may be due to short time difference between two pruning dates. Deepauw (1985) also reported that length of rose was only slightly affected by time of pruning. Stem length was not significantly different. This may be due to exhaustion of carbohydrate in stem due to heavy flowering in winter season. Mortenson and Gislerod (1999) also observed that heavy pruning during July decreased the stem length of rose plants.

Table 1. Effect of spring pruning on length of flower stick and floral bud of HT Rose cultivars in Chitwan district of Nepal (2013)

	Length of flower stick and length of flower bud harvested	
Treatments	Length of flower stick(cm)	Length of flower bud(cm)
A. Variety		
High Magic	41.008[a]	3.554[a]
Lenopa	38.983[a]	3.232[a]
Confetti	30.097[b]	3.499[b]
SEm±	0.9179	0.0648
$LSD_{0.05}$	3.604*	0.2535*
B. Time of pruning		
1st	36.256	3.581[a]
2nd	37.136	3.276[b]
SEm±	1.0737	0.0403
$LSD_{0.05}$	Ns	0.1389**
C. Pruning		
Pruned	37.453	3.466
Non-pruned	35.939	3.391
SEm±	0.9515	0.0426
$LSD_{0.05}$	Ns	NS
Mean	36.696	3.428
CV%	11.00	5.27

Treatments means followed by the common letter (s) within column are non-significantly different among each other based on DMRT at 5% level of significance. DAP = Days after Pruning, LSD = Least significant difference, SEm = Standard error of mean and CV = Coefficient of variation.

Diameter of flower stem

The difference in Flower stem diameter was non-significant with all three treatment factors. This might be due to very small differences in diameter of stem with in cultivars. Flower stem diameter is larger only during the heavily pruned condition. It is because there are small numbers of branch in heavily pruned plant and all nutrient coming to the share of each stem. Similar results have been reported by Bajawa and Sarowa, (1977).

Table 2. Effect of spring pruning on diameter of flower stick and floral bud of HT Rose cultivars in Chitwan District of Nepal (2013)

Treatments	Diameter of flower stick and flower bud harvested	
	Diameter of flower stick (cm)	Diameter of flower bud (cm)
A. Variety		
High magic	1.013	2.714 [a]
Lenopa	0.989	2.217[b]
Confetti	0.788	2.662[a]
Sem	0.0825	0.0188
$LSD_{0.05}$	Ns	0.07169**
B.Time of pruning		
1st(8th March 2013)	0.958	2.496
2nd(18th March, 2013)	0.902	2.566
Sem	0.0580	0.0385
$LSD_{0.05}$	Ns	Ns
Pruning		
Pruned	0.867	2.661
Non-pruned	0.994	2.401
Sem	0.0739	0.0660
$LSD_{0.05}$	Ns	0.2028 **
CV, %	33.68	11.06
Mean	0.957	2.531

Treatments means followed by the common letter (s) within column are non-significantly different among each other based on DMRT at 5% level of significance. DAP = Days after Pruning, LSD = Least significant difference, SEm = Standard error of mean and CV = Coefficient of variation.

Interaction effect of cultivars and date of pruning on floral bud diameter

Statistical analysis revealed that the flower bud diameter was significantly different for both the cultivars and pruning time. Maximum flower diameter (2.863cm) was recorded in variety High Magic pruned on 8th March 2013. The lowest flower diameter (2.150cm) was obtained from variety confetti pruned on 8th March, 2013. Hessayon (1988) also reported varying flower diameters in different rose cultivars.

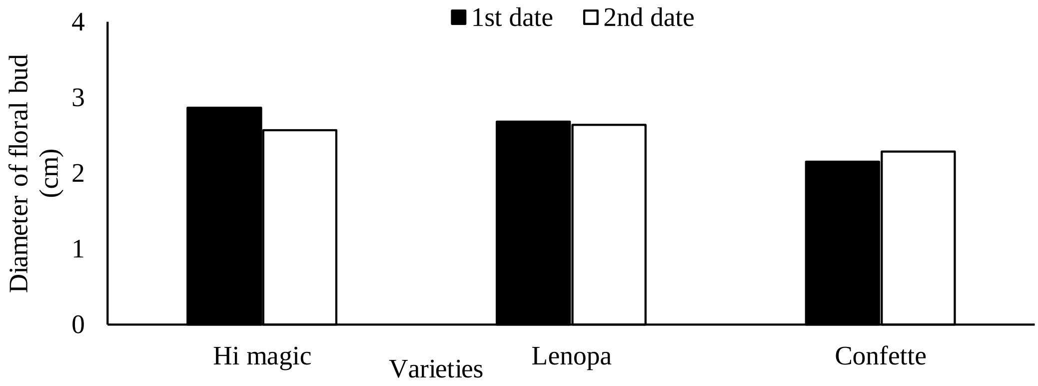

Figure 1. Interaction effect of cultivars and date of pruning on diameter flower bud

Interaction effect of varieties, dates and pruning in length of floral stick of HT rose cultivars in Chitwan (2013)

The interaction effect between varieties and date of pruning on length of flower stem seems to be significant statistically (Fig. 2). Among all cultivars, High Magic produced longer stem length in all dates of pruned and un-pruned condition followed by Lenopa and shorter stem length was produced by variety Confetti in all condition. Variety High Magic pruned on 18th March, 2013 produced longer flower stem (44.750cm) whereas variety Confette produced shorter stem length flower (24.333cm) in plants that were un-pruned on 8th March, 2013.

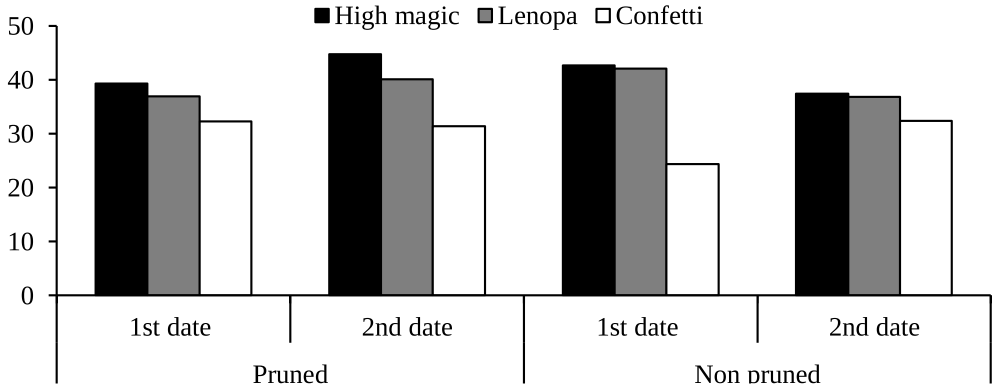

Figure 2. Effect of varieties, time and pruning in length of flower stick of HT Rose cultivar in Chitwan (2013)

Number of flowers

Effect of varieties, date and pruning on Number of flowers harvested

Significant variation was seen among different varieties on total number of flower production (Table 3). High Magic produced larger number of cut rose flowers (23.833) followed by Confette (14.250) and Lenopa (10.333) respectively. The maximum number of flowers produced in cv. High Magic was perhaps produced due to its better adaptability in the environment compared to others. Similar results were observed by Khattak and Khattak (2001) who showed that the number of flowers in rose cultivars was affected differently. The effect of pruning date was seen significant with producing flower. Plant pruned in 1st date produced maximum number of flower (20.889) followed by 2nd date pruned (11.389). This might be due to heavy infestation of insect pest and increase in temperature that the plants pruned in later date failed to produce quality flower.

Pruning also had a significant effect on flower production (Table 3). Maximum (22.611) flowers per plot were counted in treatments with pruned plants, whereas minimum flowers (9.667) were observed in un-pruned plants. Here, it is worth mentioning that the pruned plants were cut back to about 22 cm, and while they were sprouting and producing branches, the un-pruned plants were still flowering. The pruned plants were not flowering for around a month time and during this time the un-pruned ones were flowering and those flowers were counted. That is one of the reasons why the un-pruned produced more flowers. When we took the flower production after pruned plant start flowering, number of flowers produced were maximum in the pruned plants. Mortensen and Gislerod (1994) also observed that hard pruning in July decreased the yield and stem length of flowers.

Table 3. Effect of Spring Pruning on Number of flowers harvested in HT Rose Cultivars in Chitwan district, Nepal (2013)

Treatments	Number of flowers
A. Variety	
High Magic	23.833[a]
Lenopa	10.333[b]
Confetti	14.250[b]
Sem	2.3122
$LSD_{0.05}$	7.389[*]
B.Time of pruning	
1st Date	20.889[a]
2nd Date	11.389[b]
Sem	2.4429
$LSD_{0.05}$	5.317[*]
C. Pruning	
Pruned	22.611[a]
Non-pruned	9.667[b]
Sem	1.5366
$LSD_{0.05}$	4.735[**]
Mean	16.139
CV,%	40.39

Treatments means followed by the common letter (s) within column are non-significantly different among each other based on DMRT at 5% level of significance. DAP = Days after Pruning, LSD = Least significant difference, SEm = Standard error of mean and CV = Coefficient of variation.

CONCLUSION

Varieties and pruning affect all the vegetative and yield attributing parameters of rose. Early pruning on High Magic and Lenopa performed significantly better as compared to later pruning on Confetti and plants remained as un-pruned. Similarly the performance of rose flowers was also found significantly different with date. Among all varieties, High Magic pruned on 8th March, 2013 performed better in all vegetative growth and yield attributing characteristics but plant height was found the highest in un-pruned rose plants.

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