

Effect of Spur-pruning on Growth and Production of Grape (*Vitis Vinifera* L.)

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It is a recognized fact that the yield of the grape-vine depends upon its age and the number of fruiting spurs it has developed under the influence of a particular system of culture and pruning. According to Winkler (10), the capacity of a vine varies directly with the number of shoots that develop. The total leaf area, irrespective of the rate of elongation of shoot, determines the capacity. A grower may be better paid for the extra time spent in pruning than for any other vineyard practice. Shoemaker (9) has emphasized that the control of pruning severity is often the best single procedure to obtain larger yield, higher quality, and more uniform production.

In North India, where there are distinct summer and winter seasons, the grape-vine grows only in summer and passes into dormancy in the winter by shedding its leaves. It is, therefore pruned only once soon after the rest is over. The varieties like Thompson seedless and Anab-e-shahi, which are prolific growers require cane-pruning for increased productivity. However, the varieties which are fruitful on the buds borne at the base of the past season's growth respond favourably to the short-spur method of pruning. The short-spur pruning is applicable to the acclimatized commercial varieties of grape like Bhokari, Gulabi, Motia, Muscat, Hamburg and Black Hamburg. Loomis (6) investigated the effect of severity of pruning on muscadine grape and observed that spur-pruning gave greater yields of fruit than cane pruning. Gopalkrishna and Kerawala (4) obtained higher yields from the vines pruned lightly, i.e., by retaining 6 buds per cane compared to those pruned to 3 buds per cane at Ganeshkhind Fruit Experiment Station, Poona. Most of the viticulturists have recommended the suitable method of

pruning for the grape varieties for that region, but no experimental evidence is available for North India to indicate the most desirable length to which the cane growth should be cut for maximum production. Therefore, in order to elucidate information of this nature, studies were undertaken to find out the response of spur-pruning on the growth and production of grape (*Vitis vinifera* L.). The results obtained therefrom comprise the subject matter of this paper.

METHODS AND MATERIALS

Four-year-old vines spaced at 3.0×3.5 meters apart, of each of Bhokari and Gulabi varieties were selected from the varietal plot for the pruning trial at the Horticultural Garden, Government Agricultural College, Kanpur. The vines have been trained on the trellised roof of an arbour, made of angle iron poles. The material consisted of 4 vines of each variety, under uniform cultural treatments. These were divided into two randomized blocks of two vines each.

The treatments were—

1. Canes pruned to spurs with one bud,
2. Canes pruned to spurs with two buds,
3. Canes pruned to spurs with three buds,
4. Canes pruned to spurs with four buds, and
5. Canes pruned to spurs with five buds.

Total number of spurs under the experiment—Bhokari—75

Gulabi—95

The vines were pruned in the second week of January, 1967. Cultural and manurial operations and spraying of Bordeaux mixture, etc., were also given to the vines, as and when required.

OBSERVATIONS

1. *Dates of Sprouting.*—The date of sprouting of spurs under different treatments was noted and the average quantitative data are summarized in Table I.

A perusal of Table I shows that on an average in both varieties the spur with 5 buds sprouted earlier than the remaining treatments. The analysis of variance further shows that the sprouting of buds under different treatments in Bhokari occurred earlier than Gulabi and it was highly significant.

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Table I.—Effect of 1 to 5 bud spur-pruning on sprouting of grape varieties
(Number of days from pruning till sprouting)

Bud Number	Number of days taken in the sprouting of buds under different treatments					Average
Varieties	1-bud	2-bud	3-bud	4-bud	5-bud	
Bhokari	51.0	49.9	45.8	46.9	46.3	47.98
Gulabi	58.3	56.3	56.5	54.8	53.6	55.9
Average	54.65	53.10	51.15	50.85	49.95	

C.D. at 5%
 For varieties — 2.375
 For Units — 3.777

Table II.—Appearance of inflorescence bud and first flower opening in spur pruning after sprouting under different treatments

Number of buds per spur	Number of days taken for the appearance of			
	inflorescence bud in		opening of first flower in	
	Bhokari	Gulabi	Bhokari	Gulabi
1	5.2	3.5	28.5	25.2
2	4.3	4.2	28.7	25.4
3	4.9	3.6	29.2	26.2
4	4.7	3.4	28.7	25.2
5	4.2	3.4	28.3	25.6
Average	4.66	3.62	28.68	25.52

C. D. at 5%
 For varieties — 0.972
 For units — 1.051

2. *Appearance of inflorescence bud and first flower opening* : The sprouted buds were carefully watched and the time taken in the emergence of protuberances of inflorescence bud and first flower opening from sprouting was recorded and the data are given in Table II.

Table II shows that in all the treatments the inflorescence buds made their appearance in 4.2 to 5.2 days in Bhokari and 3.4 to 4.2 days in Gulabi from the date of sprouting of spur-buds. On an average, the first flower bud opened after 28.68 and 25.52 days of inflorescence emergence in Bhokari and Gulabi, respectively. Within a variety, there was no significant difference in first flowering dates among various treatments. However, the difference between the number of days taken in the appearance of first flower between the two varieties was significantly different.

3. *Position of Panicle on Emerging Shoot.*—The position of each panicle on the fruiting shoot as influenced by 1 to 5-bud spur pruning is given in Table III.

It is evident from Table III that there were mostly two panicles on every fruiting shoot of Bhokari except 1-bud spur shoots, whereas a third panicle was borne on all the emerging shoots of Gulabi, excepting in 3-bud spurs. The usual position of panicle was found to be opposite the leaves at nodes 2nd to 5th and from 2nd to 8th node of the newly emerged spring shoots of Bhokari and Gulabi, respectively.

4. *Bud Burst and Emergence of Bearing Shoots.*—The effect of 1 to 5-bud spur pruning on bud burst and emergence of bearing shoots in grape varieties is given in Table IV.

The records of Table IV show that 1 and 2-bud spurs exhibited cent percent. bud burst, whereas the percentage of bud burst in the basal buds in 3 to 5-bud spurs was the lowest and it increased progressively towards the buds located away from the base. The 5-bud spurs gave the highest total percentage of bearing of 270 and 257 against 75 and 62.5 per cent. in 1-bud spurs in Gulabi and Bhokari, respectively.

5. *Total Number of Clusters Borne.*—The average number of bunches per spur under different treatments are presented in Table V.

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**Table III—Effect of 1 to 5-bud spur pruning on emergence of panicle on shoot nodes
(Number of panicles borne on new shoot nodes)**

Number of buds per spur	Bhokari		Gulabi		
	No. of panicles borne on node number		No. of panicles borne on node number		
	1st panicle	2nd panicle	1st panicle	2nd panicle	3rd panicle
1	3-5th node	—	2-4th node	4-6th node	6th node
2	3-4th "	4-5th node	3-4th "	5-6th "	7-8th "
3	3-4th "	4-5th "	3-4th "	5-6th "	7-8th "
4	3-4th "	4th "	4-5th "	5-6th "	6th "
5	2-3rd "	4th "	2-4th "	4-5th "	5-6th "

**Table IV—Bud burst and emergence of bearing shoots under different treatments in grape
varieties Bhokari and Gulabi**

No. of Buds per spur	1st node		2nd node		3rd node		4th node		5th node	
	% bud burst	% bear- ing	% bud burst	% bear- ing	% bud burst	% bear- ing	% bud burst	% bear- ing	% bud burst	% bear- ing
<i>Bhokari</i>										
1	100	62.5								
2	100	72	100	90						
3	41.6	33.3	58.3	50	91.6	80				
4	8.3	8.3	25	25	91.6	80	91.6	80		
5	41.6	33.3	41.6	25	75	66.6	75	58.3	83	75
<i>Gulabi</i>										
1	100	75								
2	100	25	100	75						
3	28.5	28.5	85.7	71	100	85				
4	20	20	40	40	100	80	100	80		
5	30	20	30	30	50	50	80	80	100	90

Table V—Effect of 1 to 5-bud spur pruning on total number of clusters borne

Varieties	Number of clusters borne on spurs containing buds of					Average
	1	2	3	4	5	
Bhokari	0.62	2.12	2.33	3.12	5.83	2.804
Gulabi	1.25	2.00	2.46	4.16	4.50	2.874
Average	0.93	2.06	2.39	3.64	5.16	

C. D. at 5%
 For Varieties — 1.9
 For Units — 1.198

Table VI—Effect of 1 to 5-buds spur pruning on cluster size

Number of Buds per spur	Cluster size in Bhokari in cm.		Cluster size in Gulabi in cm.	
	Length	Breadth	Length	Breadth
1	8.2	6.8	9.8	6.3
2	8.3	7.0	10.5	7.5
3	9.8	7.2	10.6	7.5
4	9.8	7.4	11.2	7.8
5	10.4	8.1	11.3	8.2
Average	9.3	7.3	10.68	7.46

From Table V, it is evident that the number of clusters per spur increased with the increase in number of buds per spur. The spurs with 5 buds produced the maximum average number of clusters in both the varieties, which are significantly superior to the number of clusters borne in 1 to 4-bud spurs in Bhokari and 1 to 3-bud spurs in Gulabi. The difference between the average number of clusters borne in two varieties, as well as their interactions, were statistically not significant.

6. *Cluster Size*.—The data on size of clusters produced under various treatments of spur pruning are presented in Table VI.

The size of cluster increased with the increase in number of buds per spur. The largest size of cluster was produced by the spurs pruned to 5 buds. However, the difference between the treatments, grape varieties and their interactions did not disclose any significant effect on the cluster size.

DISCUSSION

The date of sprouting influenced by various treatments showed that the spur with 5 buds sprouted earlier with an average of 49.95 days as compared with 54.65 days taken by 1-bud spurs (Table I). This apparently shows that the sprouting was delayed with the increase in severity of pruning. These results are in conformity with the findings of Singh and Sharma (8) who also observed that sprouting was progressively delayed with the increase in severity of pruning of phalsa.

The performance in respect of bud burst and bearing shoots of two grape varieties was also greatly influenced by the different treatments of spur pruning (Table IV). The bud burst was cent per cent. in 1 and 2-bud spurs, but with further decrease in severity of pruning, the percentage of bud burst decreased more in Bhokari than in Gulabi. This is in complete agreement with the results of Loomis (7), who observed that on the longer spur, not all buds grew, but on the 1 and 2-bud spurs, every bud grew. The percentage of bearing shoots was highest (270% in Gulabi and 257% in Bhokari) in 5-bud spur and decreased with the increase in severity of pruning. This is due to presence of more buds on 5-bud spur, resulting in more percentage of fruitful shoots. The percentage of bearing shoots on 1-bud spur was 62.5 and 70 on Bhokari and Gulabi varieties, respectively, which clearly indicates that the shoot emerged from their basal buds, were not completely fruitful.

The highest average number of clusters (5.16) were obtained from spurs receiving light pruning, i.e., spur with 5 buds, followed in descending order by those pruned with 1 to 4 buds per spur (Table V). This clearly indicates that the number of clusters decreased with the increase in severity of pruning. This may be due to reduction in number of bearing shoots in case of severely pruned spurs. The spur that received lighter pruning gave more number of fruiting shoots than heavier pruned spurs. Loomis (7) has also found that vines pruned to 4-bud spurs yielded more than those pruned to shorter spurs. On the other hand, Daniel (2) also observed that the total number of inflorescences was higher in lightly pruned canes than in others.

The size of cluster was slightly increased in 5-bud spur than the severely pruned spurs. This also seems to be influenced by more number of berries per bunch than more severe pruning. Similar results were obtained in Anab-e-shahi grape by Daniel (2).

SUMMARY

Sprouting was progressively delayed with the increase in severity of pruning. Spur with 5-buds was found to advance sprouting with an average period of 49.95 days as compared against 54.65 days with 1-bud spur.

Number of days required for fruit bud appearance increased with increase in severity of pruning, but the difference was not significant. The severity of pruning has no effect on flowering of grapes.

There was an increase in number of clusters per spur with decrease in severity of pruning. The highest number of 5.16 clusters was obtained from the vines pruned to 5-buds per spur.

The size of cluster increased with the increase in number of buds per spur. Largest size of cluster was produced by spur with 5-buds.

The position of blossom cluster was found opposite the leaves at nodes 2nd to 5th and 2nd to 8th in spring shoot of Bhokari and Gulabi, respectively. There were 2 and 3 clusters per shoot on Bhokari and Gulabi vines.

Bud burst was cent per cent. on one and two-bud spurs, whereas it decreases with decrease in severity of pruning. The highest percentage of bearing shoots was found with 5-bud spur, and it decreased with increase in severity of pruning.

On the basis of the results obtained above, it can be concluded that the Bhokari and Gulabi vines can be pruned to 3-5 buds per spur with advantage for favourably increasing the number of bearing shoots and number and size of clusters and subsequently the yield of grapes.

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