

## Effect of cane pruning on growth, yield and quality of grape varieties under Buldana district

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### ABSTRACT

The investigation was carried out with six treatments comprising age of Vine (4 years) with spacing 240 x 120 cm, Cane pruning severity treatment had significant effecting various phases of growth, yield and quality on the grape varieties viz., Thompson and shad seedless. Bud burst was maximum at terminal and first lateral bud position regardless of pruning severity levels and these buds were mostly fruitful. In Thompson seedless 7<sup>th</sup> leaf (P<sub>3</sub>) cane pruning treatment gave maximum bunches and higher yield, whereas in Shared seedless 6<sup>th</sup> leaf (P<sub>2</sub>) cane pruning treatment gave maximum bunches (32 bunches in Thompson seedless and 36.20 bunches per vine in Shared seedless) and high yield (8.4 kg in Thompson and 8.6 kg in Shared seedless) than rest of the treatments. Significantly the maximum berry weight, berry size and berry volume were obtained from 7<sup>th</sup> leaf (P<sub>3</sub>) treatment in Thompson seedless variety and 6<sup>th</sup> leaf (P<sub>2</sub>) treatment in Shared seedless variety. Maximum TSS : acid ratio and low acidity, high reducing sugar were obtained from treatment 7<sup>th</sup> leaf (P<sub>3</sub>) in Thompson seedless, whereas treatment 6<sup>th</sup> leaf (P<sub>2</sub>) in Shared seedless variety.

**Key words :** Cane pruning, Grape varieties, Growth, Yield and quality

### INTRODUCTION

Most of the fruit crops unlike grape which are evergreen seldom require pruning. Pruning in grape is carried out regulate the crop. It is done to concentrate the activity of the vine in the parts leaf after pruning and to induce the sprouting of the fruitful buds located in the middle portion of the cane which otherwise do not sprout.

Some times due to delay in marketing of the produce, proper rest period of 2-3 weeks do not get to the grape vines and thus become unfruitful after October pruning and this creates the problems to the cultivators. To overcome this situation new practice of pruning was developed in Maharashtra, which is known as sub-cane pruning. In this pruning system, there will be 60 to 80 per cent fruitfulness under even adverse condition was observed (Tambe *et al.*, 1998). Adequate cane maturity after April pruning is essential for fruit bud differentiation and in sub cane pruning system the shoots emerging after April pruning, the cane is allowed to grow up to 7-8 buds and then topped. The sprouts coming on digital buds of this shoots is again topped at 5<sup>th</sup> called at 7 + 5 sub cane or 8 + 5 sub cane pruning (Ranapise *et al.*, 2002). In this regard it is necessary to standardize the number of buds on main cane and sub cane by pruning to get maximum fruitfulness and yield in grape varieties.

### MATERIALS AND METHODS

Four year old healthy vines having uniform growth and vigour of varieties Thompson and Sharad seedless were selected for the experiment. These vines were trained on

extended 'y' trellies. The experiment was laid in Analysis of variance technique with four replications. Trees planted with spacing 240 x 120 cm.

Treatment details : Cane pruning (April pruning)

P<sub>1</sub> - Main cane pruning at 5<sup>th</sup> leaf, P<sub>2</sub> - Main cane pruning at 6<sup>th</sup> leaf, P<sub>3</sub> - Main cane pruning at 7<sup>th</sup> leaf, P<sub>4</sub> - Main cane pruning at 8<sup>th</sup> leaf, P<sub>5</sub> - Main cane pruning at 9<sup>th</sup> leaf, P<sub>6</sub> - Unpruned (Control)

(Note : Sub-cane was topped at 5<sup>th</sup> leaf in each treatment) Cane pruning (October pruning)

(Note : Sub cane was topped at 2<sup>nd</sup> leaf in each treatment and in control treatment main cane was pruned at 12<sup>th</sup> leaf)

### Pruning operations :

Vines selected for the experiment were pruned on march, 2006 for summer (foundation) pruning. The shoots emerged after April pruning. The cane was allowed to grow up to 5, 6, 7, 8 and 9 leaf and then topped. The sprouts canes on digital bud of there shoots were again topped at 5<sup>th</sup> leaf.

The vegetative growth obtained after this pruning in the month September for forward pruning. During the September pruning, the vines were pruned by retaining 2 buds on each sub-cane and in control treatment 12 buds retained on the main cane.

### RESULTS AND DISCUSSION

The results obtained from the present investigation are summarized below :

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**Table 1 : Effect of cane pruning on days required for bud burst and bud sprouted per shoot in variety Thompson seedless and Sharad seedless**

Treatments	Thompson seedless		Sharad seedless	
	No. of days required for bud burst	No. of buds sprouted per spur	No. of days required for bud burst	No. of buds sprouted per spur
P <sub>1</sub> – Main cane pruning at 5 <sup>th</sup> leaf	9.33	3.32	9.60	3.32
P <sub>2</sub> – Main cane pruning at 6 <sup>th</sup> leaf	9.66	3.33	9.66	3.66
P <sub>3</sub> – Main cane pruning at 7 <sup>th</sup> leaf	10.00	3.65	10.66	3.85
P <sub>4</sub> – Main cane pruning at 8 <sup>th</sup> leaf	11.33	3.66	11.66	4.15
P <sub>5</sub> – Main cane pruning at 9 <sup>th</sup> leaf	11.66	4.06	11.66	4.25
P <sub>6</sub> – Unpruned (control)	12.33	4.66	12.33	4.33
'F' test	Sig.	Sig.	Sig.	Sig.
S.E. ±	0.38	0.40	0.33	0.30
C.D. (P=0.05)	1.14	1.21	0.98	0.90

**Growth:****Bud burst :**

The different severity of cane pruning had exhibited significant effect on the period required for bud burst in both the varieties of grape *i.e.* Thompson seedless and Sharad seedless. In variety Thompson seedless (Table 1), the grape vine pruned at 5<sup>th</sup> leaf (P<sub>1</sub>) hastened the bud bursting by about 3 days (9.33 days) as compared to unpruned (P<sub>6</sub>) grape vine (12.33 days). Similarly, in variety Sharad seedless also vine pruned at 5<sup>th</sup> leaf stage took 9.6 days for bud bursting which was about 3 days earlier than unpruned (P<sub>6</sub>) vine (12.39 days). Thus from the above results, it is clear that, with the decrease in pruning severity, the time required for bud burst was increased.

In respect of number of buds sprouted per spur were significantly inflamed by the cane pruning treatment. Maximum buds sprouted per spur in variety Thompson seedless (4.66) were observed in treatment P<sub>6</sub> and minimum buds sprouted per spur (3.32) in treatment P<sub>1</sub>. However, in Sharad seedless maximum (4.33) and minimum (3.32) buds sprouted per spur were observed in treatment P<sub>6</sub> and P<sub>1</sub>, respectively.

Number of buds sprouted per spur were increased

with increase in pruning severity. These findings are in close conformity with the observations recorded by Tijare (1965) and Kapoor (1967) in Nagpur conditions and Patil (1975), Gautam (1998), Kulkarni (1999) under Akola conditions.

**Leaf growth :**

In Thompson seedless variety, maximum number of leaves and leaf area (11.6 and 1128.2 cm<sup>2</sup>, respectively) were found in P<sub>3</sub> treatment (cane pruning at 7<sup>th</sup> leaf) and significantly minimum leaf growth and leaf area (9.3 and 1063.7 cm<sup>2</sup>) in P<sub>6</sub> treatment (Unpruned).

While in case of Sharad seedless variety, maximum number of leaves and leaf area (12.66 and 1082.90 cm<sup>2</sup>, respectively) were observed in treatment P<sub>2</sub> (cane pruning at 6<sup>th</sup> leaf) and minimum number of leaves (9.62 and 1073.2 cm<sup>2</sup>) were found in P<sub>6</sub>. They pointed out necessity of higher temperature for better regulative growth (Table 2). Vegetative growth increases with increasing severity. It has also been established that the growth equilibrium of shoot is considerably distributed as a result of the heavy amount of bearing (Garner *et al.*, 1952). Due to severe pruning carbohydrates accumulated before pruning in the

**Table 2 : Effect of cane pruning on number of leaves and leaf area in variety Thompson seedless and Sharad seedless**

Treatments	Thompson seedless		Sharad seedless	
	Leaves per shoot	Leaf area per shoot (cm <sup>2</sup> )	Leaves per shoot	Leaf area per shoot (cm <sup>2</sup> )
P <sub>1</sub> – Main cane pruning at 5 <sup>th</sup> leaf	10.3	1069.6	10.1	1070.80
P <sub>2</sub> – Main cane pruning at 6 <sup>th</sup> leaf	10.6	1076.2	12.66	1082.90
P <sub>3</sub> – Main cane pruning at 7 <sup>th</sup> leaf	11.6	1128.2	11.64	1089.40
P <sub>4</sub> – Main cane pruning at 8 <sup>th</sup> leaf	11.3	1106.2	11.66	1086.03
P <sub>5</sub> – Main cane pruning at 9 <sup>th</sup> leaf	10.00	1075.9	10.26	1079.80
P <sub>6</sub> – Unpruned (control)	9.3	1063.7	9.62	1073.20
'F' test	Sig.	Sig.	Sig.	Sig.
S.E. ±	0.38	12.3	0.33	1.35
C.D. (P=0.05)	1.14	36.6	0.98	4.02

**Table 3 : Effect of cane pruning on period required for commencement of flowering and maturity in variety Thompson seedless and Sharad seedless**

Treatments	Thompson seedless		Sharad seedless	
	Days required for flowering	Days required for maturity	Days required for flowering	Days required for maturity
P <sub>1</sub> – Main cane pruning at 5 <sup>th</sup> leaf	15.32	113.00	15.00	104.7
P <sub>2</sub> – Main cane pruning at 6 <sup>th</sup> leaf	15.65	115.60	15.30	102.4
P <sub>3</sub> – Main cane pruning at 7 <sup>th</sup> leaf	16.70	112.20	16.30	104.5
P <sub>4</sub> – Main cane pruning at 8 <sup>th</sup> leaf	18.00	118.30	17.70	105.2
P <sub>5</sub> – Main cane pruning at 9 <sup>th</sup> leaf	19.30	120.40	19.10	106.3
P <sub>6</sub> – Unpruned (control)	20.70	127.00	19.70	110.0
'F' test	Sig.	Sig.	Sig.	Sig.
S.E. ±	0.38	0.81	0.43	0.60
C.D. (P=0.05)	1.14	2.42	1.27	1.79

vine are diverted towards regulative growth thereby increasing shoot length. As shoot length increases, number of leaves and leaf area also increased. Present findings are in close agreement with the findings of Tijare (1965), Kapoor (1967) under Nagpur conditions, Gondare (1997), Gautam (1997), Kulkarni (1999) they pointed out that, vegetative growth increased with reduction in bud load.

#### Flowering :

Commencement of flowering was significantly affected pruning time and severity. The number of days required for commencement of flowering was minimum (15.32 days) in P<sub>1</sub> treatment (Pruning at 5<sup>th</sup> leaf) and maximum period (20.70 days) in P<sub>6</sub> treatment (unpruned) in variety Thompson seedless, whereas, in Sharad seedless, minimum period (15 days) was noticed in treatment P<sub>1</sub> and maximum period (19.70 days) required

**Table 4 : Effect of cane pruning on yield of variety Thompson seedless and Sharad seedless**

Treatment	Thompson seedless		Sharad seedless	
	Yield per vine (kg)	Yield per ha. (tones)	Yield per vine (kg)	Yield per ha. (tones)
P <sub>1</sub> – Main cane pruning at 5 <sup>th</sup> leaf	7.30	16.28	7.40	16.46
P <sub>2</sub> – Main cane pruning at 6 <sup>th</sup> leaf	7.80	17.67	8.60	21.20
P <sub>3</sub> – Main cane pruning at 7 <sup>th</sup> leaf	8.40	21.21	7.60	16.70
P <sub>4</sub> – Main cane pruning at 8 <sup>th</sup> leaf	7.00	15.93	7.06	15.35
P <sub>5</sub> – Main cane pruning at 9 <sup>th</sup> leaf	6.10	13.78	6.46	14.30
P <sub>6</sub> – Unpruned (control)	5.30	12.70	5.33	13.16
'F' test	Sig.	Sig.	Sig.	Sig.
S.E. ±	0.23	0.17	0.14	0.23
C.D. (P=0.05)	0.70	0.51	0.42	0.68

**Table 5 : Effect of cane pruning on yield contributing characters in variety Thompson seedless and Sharad seedless**

Treatment	Thompson seedless				Sharad seedless			
	No. of bunches per vine	Length of bunch (cm)	No. of berries per bunch	Bunch weight (g)	No. of bunches per vine	Length of bunch (cm)	No. of berries per bunch	Bunch weight (g)
P <sub>1</sub> – Main cane pruning at 5 <sup>th</sup> leaf	25.50	16.63	98.00	203.20	30.70	17.80	96.00	235.30
P <sub>2</sub> – Main cane pruning at 6 <sup>th</sup> leaf	27.30	18.22	97.00	205.50	36.20	18.20	108.00	274.70
P <sub>3</sub> – Main cane pruning at 7 <sup>th</sup> leaf	32.00	18.96	109.20	233.90	30.50	17.90	84.30	243.60
P <sub>4</sub> – Main cane pruning at 8 <sup>th</sup> leaf	25.00	17.00	92.70	217.10	29.40	17.70	74.60	236.10
P <sub>5</sub> – Main cane pruning at 9 <sup>th</sup> leaf	22.60	16.34	85.60	186.70	28.32	17.30	65.00	222.20
P <sub>6</sub> – Unpruned (control)	19.00	15.13	77.30	177.90	24.00	16.20	60.30	198.80
'F' test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
S.E. ±	0.57	0.22	1.71	1.90	0.68	0.09	1.70	2.09
C.D. (P=0.05)	1.71	0.68	4.80	5.55	1.07	0.29	5.01	6.21

**Table 6 : Effect of cane pruning on physical characteristics of berry in variety Thompson seedless and Sharad seedless**

Treatment	Thompson seedless				Sharad seedless			
	Berry wt (g)	Length of berry (cm)	Diameter of berry (cm)	Juice (%)	Berry wt (g)	Length of berry (cm)	Diameter of berry (cm)	Juice (%)
P <sub>1</sub> – Main cane pruning at 5 <sup>th</sup> leaf	2.00	1.86	1.46	62.89	2.43	2.20	1.40	64.49
P <sub>2</sub> – Main cane pruning at 6 <sup>th</sup> leaf	2.23	2.13	1.56	63.00	2.70	2.53	1.63	64.25
P <sub>3</sub> – Main cane pruning at 7 <sup>th</sup> leaf	2.40	2.36	1.73	62.65	2.56	2.40	1.50	64.20
P <sub>4</sub> – Main cane pruning at 8 <sup>th</sup> leaf	2.20	1.70	1.40	62.70	2.43	2.25	1.33	63.80
P <sub>5</sub> – Main cane pruning at 9 <sup>th</sup> leaf	1.9	1.53	1.16	62.85	2.23	2.07	1.13	64.18
P <sub>6</sub> – Unpruned (control)	1.83	1.37	0.93	62.86	2.06	1.96	1.10	64.13
'F' test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
S.E. ±	0.05	0.05	0.03	0.84	0.06	0.090.05	0.04	0.87
C.D. (P=0.05)	0.15	0.15	0.11	-	0.19	0.18	0.14	-

in P<sub>6</sub> for commencement of flowering with delay in pruning time and consequent lowering temperature, the time required for flowering was increased (Table 3). These results are agree with the findings of Tijare (1965) and Kapoor (1967) under Nagpur conditions, Reddy and Satyanarayana (1979) who noted that vines pruned in September gave early flowering under Hyderabad conditions.

#### Yield :

Yield of grapes was significantly affected by cane pruning severity (Table 4). The results obtained in present study in respect of number of bunches, bund length, number of berries per bunch and bunch weight showed that P<sub>3</sub> cane pruning severity (Pruning at 7<sup>th</sup> leaf) treatment was significantly superior than the rest of treatment in variety Thompson seedless, while in case of Sharad seedless treatment P<sub>2</sub> (Cane pruning at 6<sup>th</sup> leaf) produced significantly maximum number of berries per bunch and bunch weight than the rest of the pruning treatments.

Significantly lower yield was obtained from control treatment in both varieties. Higher yield obtained in P<sub>3</sub>

treatment in Thompson seedless and P<sub>2</sub> treatment in variety Sharad seedless due to more number of bunches and more bunch weight. The increased berries per bunch and weight could be explained on the basis of leaf area available for greater carbohydrates accumulation. Lower yield obtained in P<sub>6</sub> treatment due to less number of bunches and berries per bunch and bunch weight (Table 5). These results are in conformity with the results reported by Sharma *et al.*, (1997), Kapoor (1967), Gautam (1997), Kulkarni (1999) on Akola condition.

#### Berry characters :

##### Physical characteristics :

As regards cane pruning severity P<sub>3</sub> treatment (pruning at 7<sup>th</sup> leaf) in variety Thompson seedless and P<sub>2</sub> treatment (pruning at 6<sup>th</sup> leaf) in variety Sharad seedless gave maximum berry weight, berry size (length and diameter) and berry volume in both the varieties (Table 6). The average weight and size of the berry depends on the number of leaves and leaf area available for supply of carbohydrates at the time of berry development. The increased juice percentage and berry volume with the

**Table 7 : Effect of cane pruning on chemical composition of grape juice in variety Thompson seedless and Sharad seedless**

Treatment	Thompson seedless				Sharad seedless			
	TSS ( <sup>o</sup> Brix)	Acidity (%)	TSS acid ratio	Reducing sugar (%)	TSS ( <sup>o</sup> Brix)	Acidity (%)	TSS acid ratio	Reducing sugar (%)
P <sub>1</sub> – Main cane pruning at 5 <sup>th</sup> leaf	18.17	0.70	24.23	15.92	16.49	0.76	21.72	14.73
P <sub>2</sub> – Main cane pruning at 6 <sup>th</sup> leaf	18.36	0.66	28.68	15.71	17.41	0.58	30.12	15.68
P <sub>3</sub> – Main cane pruning at 7 <sup>th</sup> leaf	18.37	0.58	31.67	16.17	17.51	0.64	21.36	14.60
P <sub>4</sub> – Main cane pruning at 8 <sup>th</sup> leaf	18.87	0.68	27.86	15.71	16.83	0.75	22.45	14.66
P <sub>5</sub> – Main cane pruning at 9 <sup>th</sup> leaf	18.34	0.70	25.92	15.46	16.40	0.78	21.04	14.52
P <sub>6</sub> – Unpruned (control)	17.71	0.70	25.45	15.63	16.54	0.81	20.43	14.20
'F' test	NS	Sig.	Sig.	Sig.	NS	Sig.	Sig.	Sig.
S.E. ±	0.67	0.019	0.16	0.03	0.51	0.005	0.22	0.03
C.D. (P=0.05)	-	0.058	0.47	0.09	-	0.017	0.67	0.09

NS-Non significant

severity of pruning explained on the basis of additional weight gained by the berries.

#### *Chemical compositions :*

The quality of the table grape is juiced by the various organic and inorganic components present in the juice. In grape, a variety is judged as superior or inferior depending upon its TSS content percentage of sugar and juice, the acid content of juice and sugar acid blend for the taste. The data obtained in respect of TSS, acidity, TSS : acid ratio, reducing sugar presented in Table 7 for Thompson seedless and Sharad seedless variety of grape. In respect of cane pruning severity it is observed that TSS was not affected by pruning treatment. The significantly minimum acidity, height TSS acid ratio and reducing sugar were noticed in treatment P<sub>3</sub> (pruning at 7<sup>th</sup> leaf) in Thompson seedless and treatment P<sub>2</sub> (pruning at 6<sup>th</sup> leaf) in Sharad seedless, respectively (Table 7).

These results occurred mainly due to maximum leaf which are available per bunch compared to other treatments. Maximum leaf area available which might have synthesized carbohydrates which diverted towards developing berries and reduce acidity.

Similar results were obtained by Balkrishnan and Madhav Rao (1963) under Coimbatore condition and Rajurkar (1974), Gautam (1997) and Kulkarni (1999) under Akola condition. They pointed out that, sever pruning increases reducing sugar and TSS : Acid ratio and lower the acidity.

#### *Conclusion :*

From the above results it can be suggested that among the different cane pruning severity treatments seven buds per cane pruning treatment resulted in significantly maximum growth and highest yield of good quality grape in variety Thompson seedless.

Whereas, in Sharad seedless variety six buds per cane pruning treatment was found significantly superior than the rest of the treatments.

Since the result presented have pertained to only one season, therefore, it will be desirable to continue further study for confirmation of the result.

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