International Journal of Agricultural Sciences
Volume 9 | Issue 1| January, 2013 | 154-158

RESEARCH PAPER

Pruning studies in some white wine grape varieties for yield and quality parameters under Western Maharashtra conditions

S.U. CHALAK*, S.S. KULKARNI AND A.V. KISHRSAGAR
Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri, AHMEDNAGAR (M.S.) INDIA
(Email : sunilchalak@gmail.com)

Abstract : Present investigation, the effect of five different pruning treatments (4, 6, 8, 10 and 12 buds / cane) was studied on four white wine grape cultivars (Viognier, Ugni Blanc, Sauvignon Blanc and Chenin Blanc). The response of each variety for yield and quality parameters *viz.*, yield/vine, yield/ha, juice yield/ha and Brix yield was different for different pruning treatments. The acidity was positively correlated with bud number per vine and vis a vis. The TSS and TSS: acid ratios were found in desirpable treat in severely pruned treatments. However, effect on juice recovery was non significant.

Key Words : Pruning , Wine grape, Quality

View Point Article : Chalak, S.U., Kulkarni, S.S. and Kishrsagar, A.V. (2013). Pruning studies in some white wine grape varieties for yield and quality parameters under Western Maharashtra conditions. *Internat. J. agric. Sci.*, **9**(1): 154-158.

Article History : Received : 07.10.2012**; Revised :** 20.09.2012**; Accepted :** 11.11.2012

INTRODUCTION

The grape is one of the ancient fruit crop of India, which is cultivated on an area of 1,11,000 ha. with production of 12.35 lakh MT and productivity of 11.10 MT/ha. (NHB, 2011). Approximately, 78 per cent of the total production, irrespective of the variety, is consumed as fresh in India (Chaddha, 2008). Arrival of more than 70 per cent of the total production in short span of time, *i.e.* March – April, lack of cold storage facilities and single type of market *i.e.* fresh fruit trade, creates gult in market, this leads to fall in prices. Hence, there is an urgent need to diversify grape uses, such as wine and juice which can solve the market problems. Thus, the development of suitable wine technology is a potential area for future research.

MATERIALS AND METHODS

The research was conducted during year 2007-08 at All India Co-ordinated research Project on grapes, MPKV, Rahuri on five year old, own rooted wine grape varieties planted with 3.0 x 1.5M spacing,. The experiment was laid out in Split Plot Design with four main plot treatments *i.e.* varieties {Vignier (M_1), Ugni Blanc (M_2), Sauvignon Blanc (M_3) and Chenin Blanc (M_4)} and five sub-plot treatments *i.e.* pruning levels {(4 (S_1), 6 (S_2), 8 (S_3), 10 (S_4) and 12 (S_5) buds/cane)} with three replications. Pruning was done in October 2007. Twenty five canes were maintained on each vine and observations were recorded on two vines of each replication.

RESULTS AND DISCUSSION

The data for main and subplots are presented Table 1 and subsequently for interactions.

Yield :

The data presented in Table 1 revealed that there were significant differences in main plots and for interaction effect. However, non-significant differences were recorded in sub plot treatments. Within main plot treatments the maximum yield

* Author for correspondence

(12.26 kg/vine; 27.24 MT/ ha) was recorded in the variety Chenin Blanc which was significantly superior over the rest of varieties under study.

The yield was observed to be significant for the same variety and different pruning treatments. The variety Viognier recorded maximum yield (6.87 kg/vine; 15.26 MT/ha) in 8 buds/ cane pruning treatment. In respect of variety Ugni Blanc, it was maximum (5.05 kg / vine; 11.23 MT/ ha) in 4 buds/cane pruning treatment. The maximum yield (5.16 kg/vine; 11.46 MT/ha) was recorded in the variety Sauvignon Blanc in 4 buds/cane pruning treatment. The variety Chenin Blanc recorded maximum yield (16.90 kg/ vine; 37.54 MT/ ha) in 12 buds/cane pruning treatment (Table 2 and 3).

Response of each variety to different pruning treatments was different. The varieties comparatively having low vigour (Viognier, Ugni Blanc and Sauvignon Blanc) recorded their higher yields in heavily pruned treatment (4 and 6 buds/cane). This was might be due to more number of bunches and higher bunch weight. However, the variety Chenin Blanc responded positively to the number of buds retained on a cane. This variety recorded higher number of bunches in light pruning intensity (10 and 12 buds/cane) treatments, which ultimately leads to higher yields though the average weight of bunch was less. These results are in accordance with Clingeleffer (1989), Avenant (1998) and

Table 1: Effect of various treatments on yield and quality parameters

Treatments	Yield/ vine (kg.)	Yield/ ha. (MT)	TSS (°Brix)	Acidity (%)	TSS:Acidity Ratio	pH	Juice recovery (%)	Juice yield /ha (hectoliter)	Brix yield (kg / ha)
M_1	5.64	12.54	19.73	0.77	26.02	3.84	78.37	98.28	1948.66
M_2	3.68	8.18	18.73	0.69	28.48	3.44	74.43	60.93	1159.98
M_3	4.02	8.94	20.29	0.82	25.31	3.64	72.50	64.81	1334.28
M_4	12.26	27.24	18.30	0.82	22.50	3.60	83.30	226.98	4119.41
S.E.±	0.46	1.03	0.18	0.02	0.53	0.007	0.12	8.22	143.92
C.D.	1.59	3.55	0.63	0.06	1.47	0.024	0.40	28.45	498.05
S_1	6.36	14.12	20.92	0.66	32.31	3.64	77.16	110.53	2275.97
S_2	6.35	14.10	20.05	0.70	29.17	3.63	77.19	110.79	2190.64
S_3	6.27	13.94	19.01	0.79	24.16	3.64	76.95	109.81	2071.63
S_4	6.43	14.28	18.42	0.85	21.77	3.63	77.25	114.28	2081.25
S_5	6.61	14.69	17.92	0.88	20.48	3.63	77.21	118.33	2083.42
S.E.±	0.39	0.86	0.15	0.01	0.50	0.01	0.13	13.78	136.36
C.D.at5%	N.S.	N.S.	0.45	0.03	1.47	N.S	N.S.	N.S.	N.S.
Interaction	Sig.	Sig.	Sig.	Sig.	Sig.	N.S.	N.S.	Sig.	Sig.

NS= Non- significant, Sig= Significant

Table 2 : Interaction effect of treatments on yield/vine (kg)

Main treatment / sub treatment	S_1	S_2	S_3	S_4	S_5	S.E.±	C.D.
M_1	5.46	6.49	6.87	5.69	3.70	0.77	2.23
M_2	5.05	4.08	2.59	3.07	3.63		
M_3	5.16	4.91	4.85	2.99	2.21		
M4	9.75	9.91	10.79	13.96	16.90		
S.E.±			1.36				
C.D.			2.99				

Table 3 : Interaction effect of treatments on yield/ha (MT)

Main treatment / sub treatment	S_1	S_2	S_3	S_4	S_5	S.E.±	C.D.
M_1	12.14	14.42	15.26	12.65	8.23	1.72	4.95
M_2	11.23	9.06	5.75	6.82	8.06		
M_3	11.46	10.91	10.77	6.63	4.92		
M4	21.66	22.03	23.98	31.01	37.54		
S.E. ±			3.03				
C.D.			6.64				

Milter and Howell (1998) in wine grapes and Thatai *et al.* (1987), Joon and Singh (1983) and Singhrot *et al.* (1977) in table grapes.

TSS (^{0}Brix):

Statistically significant differences due to various treatments were recorded on main plots (varieties), sub plots (pruning levels) and on interaction.

Among the main pot treatments, maximum TSS (20.29%) was recorded in the variety Sauvignon Blanc which was significantly superior over the rest of varieties. In respect of sub plot treatments it was maximum (20.92%) in 4 buds/cane pruning treatment, which was significantly superior over the rest of pruning treatments (Table 1).

The effect on TSS was observed to be significant in respect of same variety and different pruning treatment. The variety Viognier, Ugni Blanc and Chenin Blanc recorded maximum TSS (21.43%, 21.33% and 19.42%, respectively) in 4 buds/cane pruning treatment. However Sauvignon Blanc recorded maximum TSS (21.50%, 21.67%, 19.93%, 19.67% and 18.67%) in 4, 6,8,10 and 12 buds/cane pruning treatment (Table 4).

Acidity :

Statistically significant differences were recorded with respect to main plots, sub plots and interaction. Within main plot treatments, the maximum acidity (0.82%) was recorded in the variety Sauvignon Blanc and Chenin Blanc, which were at par with Viognier (0.77%). Among sub plot treatments it was maximum (0.88%) in 5 buds/cane pruning treatment (Table 1). In respect of same variety and different pruning treatments effect on acidity was observed to be significant. The variety Viognier, Ugni Blanc, Sauvignon Blanc and Chenin Blanc recorded maximum acidity (0.85%, 0.83%, 0.93% and 0.90%, respectively) in 12 buds/cane pruning treatment (Table 5).

TSS: Acid ratio :

Significant differences were recorded with respect to main plots, sub plots and interaction. Among the main plot treatments, the TSS:acid ratio was maximum (28.48) in Ugni Blanc which was significantly superior over the rest of varieties, within sub plot treatments it was maximum (32.31) in 4 buds/cane pruning treatment which was significantly superior over the rest or pruning treatment(Table 1).

The effect on TSS : acid ratio was observed to be signific ant in respect of same variety and different pruning treatments. The variety Viognier, Ugni Blanc, Sauvignon Blanc and Chenin Blanc recorded maximum TSS: acid ratio (32.48%, 40.22 %,

Table 4 : Interaction effect of treatments on TSS (%)

Main treatment / sub treatment	S_1	S_2	S_3	S_4	S_5	S.E.±	C.D.
M_1	21.43	20.47	19.77	19.00	18.00	0.31	0.91
M_2	21.33	19.17	18.33	17.17	17.67		
M_3	21.50	21.67	19.93	19.67	18.67		
M4	19.42	18.92	18.00	17.83	17.33		
S.E.±			0.55				
C.D.			1.21				

Table 5 : Interaction effect of treatments on acidity (%)

Main treatment / sub treatment	S_1	S_2	S_3	S_4	S_5	S.E.±	C.D.
M_1	0.67	0.75	0.77	0.82	0.85	0.02	0.06
M_2	0.53	0.55	0.74	0.82	0.83		
M_3	0.71	0.72	0.84	0.89	0.93		
M_4	0.75	0.78	0.82	0.85	0.90		
S.E. ±			0.04				
C.D.			0.09				

Table 6 : Interaction effect of treatments on TSS: acid ratio

Main treatment / sub treatment	S_1	S_2	S_3	S_4	S_5	S.E.±	C.D.
M_1	32.48	27.34	25.93	23.09	21.28	1.01	2.93
M_2	40.22	35.24	24.80	20.86	21.27		
M_3	30.55	29.96	23.85	22.09	20.07		
M4	25.97	24.16	22.05	21.04	19.30		
S.E. ±			1.74				
C.D.			3.78				

30.55 %, and 25.97 %, respectively) in 4 buds/cane pruning treatment (Table 6).

The TSS and TSS: acid ratio increased as the intensity of pruning increased. In the increased pruning intensity numbers of leaves on the vine were less as compared with lower pruning intensity. This might have resulted in more exposure of the bunches to the sunlight which might have increased the TSS. The predominant acids of grape *viz.*, malic and tartaric acid are synthesized in leaves (Winkler, 1962; Stafford and Locewns, 1958 and Stafford, 1959). These acids are translocated from leaves to the bunch (Genevois, 1959 and Galet, 1939).

This higher quantum of acids might have deposited in bunch during development and this resulted in higher acidity in lower intensity pruning treatments. These results are in agreement with Avenant (1998) and Kilby (1999) with respective wine grapes and Lawande (1973), Thatai (1987), Kumar and Tomer (1978), Joon and Singh (1983) and Somkuwar and Ramteke (2007) in table grapes.

pH :

Statistically significant differences were recorded with respect to main plots. However, effect on sub plot and interaction was non significant. Within main plots it was observed that pH was maximum (3.84) in Viognier which was significantly superior over the rest of varieties (Table 1). It is the varietal response of each variety for pH. Interaction effect was non significant because effect of pruning treatment was non-significant.

These results are in conformation with Schalkwyk and Archer (2008), Havinal (2007) and Karibasappa and Adsule (2008).

Juice recovery (%) :

Juice recovery was non significant with respect to sub plot and interaction. However it was significant for main plots. Within main plot treatments it was observed that the maximum juice recovery (83.30%) was recorded in the variety Chenin Blanc which was significantly superior over the rest of varieties(Table 1).

Juice yield (hectoliters) :

Statistically significant differences were recorded on main plots and interaction. However, effect on subplots was non significant. Within main plot treatments it was observed that the variety Chenin Blanc recorded maximum juice yield (226.98 hectoliters/ha) which was significantly superior over the rest of varieties (Table 1). The variety Chenin Blanc recorded maximum juice yield (313.05 hectoliters/ha in 12 buds/cane pruning treatment) (Table 7).

The result showed that the effect of pruning treatments on juice recovery was non significant indicating that the pruning intensity did not affect the recovery. In respect of juice yield, the main plots reveled significant differences however, the effect of pruning treatments was non significant. The interaction effect was significant indicating varietal response for juice recovery and thereby for juice yield.

Brix yield :

Statistically significant differences were recorded on main plots and interaction. However, effect on sub plot was non significant.Among main plot treatments the brix yield was observed to be maximum (4119.41 kg/ha) in Chenin Blanc, which was significantly superior over the rest of varieties.

The variety Viognier recorded maximum brix yield (2353.11 kg/ha.) in 8 buds/cane pruning treatment. The variety Ugni Blanc and Sauvignon Blanc recorded highest yield (1784.4 kg/ha and 1789.53 kg/ha, respectively) in 4 buds/cane pruning treatment. The variety Chenin Blanc recorded maximum brix

Table 7: Interaction effect of treatments on Juice yield (hectoliters / ha.)

Main treatments / sub treatments	S_1	S_2	S_3	S_4	S_5	S.E. ±	C.D.
M_1	95.15	113.51	119.00	99.37	64.38	13.78	39.72
M_2	83.69	67.43	42.54	50.65	60.35		
M_3	83.21	79.19	77.97	48.14	35.55		
M4	180.08	183.05	199.73	258.97	313.05		
S.E. ±			24.31				
C.D.			53.24				

Table 8 : Interaction effect of treatments on Brix yield (kg / ha)

Main plot treatment / sub plot treatment	S_1	S_2	S_3	S_4	S_5	S.E. ±	C.D.
M_1	2044.41	2297.12	2353.11	1888.05	1160.59	272.72	786.00
M_2	1784.44	1290.47	784.85	871.88	1068.28		
M_3	1789.53	1713.85	1554.74	947.93	665.36		
M4	3485.48	3461.13	3593.84	4617.14	5439.46		
S.E. ±			469.00				
C.D.			1016.26				

yield (5439.46 kg/ha) in 12 buds/cane pruning treatment (Table 8).

The results showed that the effect of pruning treatments on juice recovery was non significant indicating that the pruning intensity did not affect the recovery. In respect of juice yield, the main plots reveled significant difference however, the effect of pruning treatments was non significant. The interaction effect was significant indicating varietal response for juice recovery percentage and thereby for juice yield. Brix yield is the product of juice yield and TSS (^{0}Brix). Results of juice yield coincided with Brix yield. The varieties with respect to TSS and juice yield reveled significant effects resulted in to significant interactions. Thus, the variety plays an important role for Brix yield. These results are in agreement with Havinal (2007), Karibasappa and Adsule (2008).

Conclusion :

It can be concluded that, for higher Brix yield the variety Viognier be pruned at 8 buds/cane, Ugni Blanc and Sauvignon Blanc at 4 buds/cane, and Chenin Blanc at 12 buds/cane. Quality parameters *viz.,* TSS, acidity, TSS : acid ratio and pH are of immense importance in wine grape cultivation. It is important to note that these parameters were found in desirable treat with 4 buds/cane pruning treatment.

REFERENCES

Avenant, J.H. (1998). The effect of pruning levels on the performance of Festival Seedless. *Deciduous Fruit Grower,* **48** (5) : 7-13.

Chadha, K.L. (2008). Indian viticultural scenario. *Acta Hort.,* **785** : 59-68.

Clingeleffer, A.R. (1989). Effect of varying node number per bearey on yield and juice composition of Cabernet Sauvignon grape vines. *Australian J. Exp. Agric.,* **29** : 701-705.

Galet, M.M. (1939). The influence of leaf area on growth of grapes. *Agron. Lusitana,* **1** : 441-449.

Genevois, C.Z. (1959). Vine pruning in California Univ. *Calif. Agri. Exp. Sta. Bull.,* 241.

Havinal, M.H. (2007). Screening of wine grape varieties for growth, yield and fruit quality parameters. M.Sc. (Ag.). Thesis, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar, M.S. (INDIA).

Indian Horticultural Data Base (2011). National Horticultural Board, Ministry of Agricultural, Government of India, pp. 68-72.

Joon, M.S. and Singh, I.S. (1983). Effect of intensity of pruning on ripening, yield and quality of Delight grapes. *Haryana J. Hort. Sci.,* **12** (1-2) : 44-47.

Karibasappa, G.S. and Adsule, P.G. (2008). Evaluation of wine grape genotypes by National Research Center for Grapes at their Farm at Pune, Maharashtra (India). *Acta Hort.,***785** : 497-504.

Kumar, H. and Tomer, N.S. (1978). Pruning studies on Himrod cultivar of grape. *Haryana J. Hort. Sci.,* **7** (1-2) : 18-20.

Lawande, K.E. (1973). Studies in the effect of cane pruning with varying number of buds in comparison with spur pruning in Thompson Seedless (*Vitis vinifera* L.). M.Sc. (Ag.) Thesis, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar, M.S. (INDIA).

Miller, D.P. and Howell, G.S. (1998). Influence of vine capacity and crop load on canopy development, morphology and dry matter partitioning in cancord grapevines. *Am. J. Enol. Vitic.,* **49** (2) : 183-190.

Singhrot, R.S., Singh, J.P. and Gupta, O.P. (1977). Effect of pruning levels on productiveness of Thompson seedless cultivar of grape (*Vitis vinifera* L.). *Haryana J. Hort. Sci.,* **6** (1-2) : 37-40.

Somkuwar, R.G. and Ramteke, S.D. (2007). Effect of bunch retention and quality and yield in Sharad Seedless. Annual Report 2006-07, National Research Center for grapes, Pune (M.S.) INDIA 20 pp.

Stafford, H. (1959). Distribution of tartaric acid in the leaves of certain angiosperms. *Amer. J. Bot.* **46** : 347-352.

Stafford, H. and Loewans, F.A. (1958). Fixation of C_{14} O_2 into tartaric acid and malic acid of excised grape leaves. *Plant Physiol.,* **33**: 194-199.

Thatai, S.K., Chohan, G.S. and Kumar, H. (1987). Effect of pruning intensity on yield and fruit quality in perlette grapes trained on head system. *Indian J. Hort.,* **44** (1 &2) : 66-71.

Winkler, A.J. (1962). *General viticulture*. Univ. Calif. Press. Berkeley, Los Angeles, LONDON, UNITED KINGDOM.

■ WEBLIOGRAPHY

Kilby, M.W. (1999). Pruning methods affect yield and fruit quality of Merlot and Sauvignon Blanc, grape vines. *http://ag.arizona.edu/pubs/crops/az 105//az/05/18.html*.

Schalkwyk, D.V. and Archer, E. (2008). The effect of alternative pruning methods on viticultural oenological perfarmence (Part 1): Cabernet Sauvignon in Stellenbosch area. Wynbore a technical guide for wine producers. *http://www. wynboer.co.za/recentarticles/2008 07-pruning* pp3.

_*_*_*_*_