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Effect of leaf density and bunches per vine on quality parameters of wine grape (*Vitis vinifera* L.) cv. SHIRAZ

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ABSTRACT : The present investigation was carried out at the vineyard of Kolpa village, Tal. Latur, dist. Latur during the year 2009-2010. The experiment was laid out in Factorial Randomized Block Design with two replications. The treatments consisted of four leaf densities *i.e.* (12, 14, 16 and 18) leaves per shoot with four number of bunches *i.e.* (25, 30, 35 and 40) per vine maintained after October pruning.The observations on leaf length, leaf width, leaf area, weight of 100 berries TSS, acidity, reducing sugar, non-reducing sugar and juice per cent were recorded. The maximum leaf length (6.8 cm) was observed in leaf density of 18 leaves per shoot however, minimum (6.4 cm) was recorded in leaf density of 14 leaves per shoot.The treatment combination of 18 leaves per shoot and the vines on which 35 bunches were maintained, recorded the highest leaf area index (3.00), however, minimum (1.64) was observed in treatment combination of 14 leaves per shoot and 25 bunches per vine. Significantly optimum TSS (25.00 ^{0}Brix), acidity (1.03, %), reducing sugar (18.51 %), non-reducing sugar (0.89 %), pH of juice (3.2 %) and juice per cent (77.62 %) was recorded in treatment combination of 18 leaves per shoot and 35 bunches per vines were maintained.

KEY WORDS : Shoot, Leaf length, Leaf area index, TSS, Acidity, Juice per cent

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Grape (*Vitis vinifera* L.) is a temperate fruit crop and also cultivated under tropical and subtropical regions in the world. It is originated in Asia Minor in the region between Black Sea and Caspian Sea which belongs to the family Vitiaceae. It is one of the most delicious, refreshing and nourishing fruit. Ripe grapes are easily digestible. It is fairly good source of minerals like calcium, phosphorus, iron and vitamins like B_1 and B_2. Grape juice is a refreshing drink, a stimulant to kidneys and laxative. Ripe fruits are supposed to be the best table fruit. Wine making from grapes is a flourishing industry in many countries. Fruits are used for making jelly, syrup and raisin. India is fast emerging as one of the major grape growing country in the world. In India, it is cultivated under temperate, subtropical and tropical climates over an area of 80,000 ha with annual production of 18.78 lakh million tones (Anonymous, 2010) and productivity is 23.50 MT/ha. About less than 2 per cent grape production in India is exported successfully to Europe, USA, Middle East and South East of Asian countries, as against 0.1 per cent of all fruits. Wine grape production is 11,230 MT (Anonymous, 2010).

Maharashtra, Karnataka, Punjab, Andhra Pradesh, Tamil Nadu and Haryana are the major grape growing states in India. Maharashtra is the leading grape producing state, where the total area under grape cultivation is

107.034 (000 ha) ha with annual production of 925.189 (000 million tonns) and productivity about 8.644 matric tonns (Anonymous, 2010). The commercial cultivation was initially confined to Nasik, Pune, Sangli, Solapur, Satara and Ahmednagar in Western Maharashtra. However, it has been now well cultivated in Latur, Osmanabad and Beed districts of marathawada region. Area under grape cultivation in Maharashtra is about 1600 ha. About 60 per cent area is in Latur and Osmanabad district which are known as grape growing districts of Marathawada region. Further, grape cultivation has been extended in Beed and Aurangabad district. The long warm to hot dry summers and medium are most suited for best quality grape production.

The statistics on mode of utilization of grape in advanced countries revealed, that 80 per cent of the world production is utilized for wine making, 10 per cent for table purpose and 10 per cent for raisin making. In India, about 70 per cent is harvested during the month of March and April.The principal product of grape is wine. Leaf density is major art of canopy management. Healthy and fully grown leaves plays an important role in photosynthetic activities and directly or indirectly with quality production. For better fruit bud differentiation and quality wine production, it was essential to standardize the leaf density and crop load required for better quality of wine grape cv. SHIRAZ.

RESEARCH METHODS

The experiment was conducted on well established grapes vineyard grower's at Kolpa. Tal. Latur, Dist. Latur during 2009-2010. The soil of experimentel plot was medium black with depth varying from 0.45 to 0.9 m under laid with *Murum* sub stratum and having good texture, water holding capacity and well drained. The biochemical analysis of grape juice was carried out at Central Instrumentation cell (CIC), College of Agriculture, Latur, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani (M.S.).The grape vine of Syraz has been planted at 2.4×0.9 M^2 spacing. Kolpa is situated near Tahasil Latur, 05 km away from Latur on Latur- Nanded Road. The eight years old orchard of wine grape was selected and four leaf densities (12, 14, 16 and 18, per shoot) combines with four number of bunches (25, 30, 35 and 40 per vine) in Factorial Randomized Block Design with two replications.Observations were recorded on length of leaf (cm), length of width of leaf (cm), leaf area index (LAI), weight of 100 berries, juice per cent, reducing sugar, non-reducing sugar, acidity, TSS and statically analyzed as per methods suggested by Panse and Sukhatme (1985).

RESEARCH FINDINGS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under following heads :

Leaf length (cm) :

The data presented in Table 1 revealed that leaf length was significantly influenced by number of leaves per shoot and number of bunches per vine. The maximum leaf length (6.8 cm) was observed in leaf density of 18 leaves per shoot, which was significantly higher than the leaf density of 16(6.7 cm) and leaf density of 12 leaves per shoot (6.5 cm). However, the minimum leaf length (6.4 cm) was recorded in leaf density of 14 leaves per shoot. The highest leaf length (6.9 cm) was recorded by vine on which 35 bunches per vine were maintained it was significantly higher over than the vines of 30 bunches (6.8 cm), 25 bunches (6.7 cm) per vine while the lowest leaf length (6.5 cm) was recorded by vines of 40 bunches per vine.

The interaction effect between number of leaves and number of bunches was significantly influenced on leaf length.The maximum leaf length (7.4 cm) was observed in treatment combination of 18 leaves per shoot and by vines of 35 bunches per vine, followed by (7.3 cm) in treatment combination of 18 leaves and 30 bunches per vine were maintained. However, the lowest leaf length (6.0 cm) was recorded in treatment combination of 14 leaves per shoot and 25 bunches per vine. Zamboni *et al*. (1997) also reported similar results, that the vines with low number of nodes developed a larger leaf size compared with those having the higher number of nodes.

Leaf width (cm) :

The leaf width was significantly influenced by number of leaves per shoot and number of bunches per vine. The maximum leaf width (9.8 cm) was observed in leaf density of 18 leaves per shoot, which was significantly higher in leaf density of 12 leaves per shoot (9.6 cm). However, the minimum leaf width (9.4 cm) was recorded in leaf density of 14 leaves per shoot. The maximum leaf width (9.5 cm) was recorded by vines on which 35 bunches were maintained per vine which was significantly higher than the 30 bunches (9.4 cm) and 25 bunches (9.3 cm) per vine. However, the minimum leaf width (9.2 cm) was recorded in vines of 40 bunches were maintained. The interaction effect between number of leaves per shoot and number of bunches per vine was significant. The treatment combination of 18 leaves per shoot and 35 bunches per vines recorded the highest leaf width (9.9 cm), followed by in treatment combination of 18 leaves per shoot and 30 bunches per vine were maintained (9.8 cm). However, the minimum leaf width (9.0 cm) was recorded in treatment combination of 14 leaves per shoot and 25 bunches per vine. Zamboni *et al*. (1997) reported, that the vines with low number of nodes developed a larger leaf size compared with those having the higher number of nodes.

Leaf area index (LAI) :

The leaf area index (LAI) was significantly

Table 1: Effect of number of leaves and number of bunches on leaf and quality parameters of wine grape cv. SHIRAZ

Treatments	Leaf length (cm)	leaf width (cm)	Leaf area index	Weight of 100 berries	Juice %	Reducing sugar (%)	Non reducing sugar (%)	Acidity (%)	TSS
No. of leaves (L)									
$L_{1\,(12)}$	6.5	9.5	2.04	175	76.89	16.48	0.86	0.95	23.65
$L_{2\,(14)}$	6.4	9.4	1.83	170	75.00	15.69	0.85	0.89	23.19
$L_{3\,(16)}$	6.7	9.6	2.10	178	79.59	17.70	0.88	0.98	23.80
$L_{4\,(18)}$	6.8	9.8	2.49	183	79.61	18.51	0.89	1.03	25.00
S.E. ±	0.02	0.03	0.03	0.32	0.006	0.33	0.02	0.003	0.33
C.D.	0.06	0.09	0.09	0.66	0.018	1.01	NS	0.009	1.00
No. of bunches (B)									
$B_{1\,(25)}$	6.7	9.3	2.19	175	77.09	17.15	0.87	0.94	23.16
$B_{2\,(30)}$	6.8	9.4	2.26	177	78.63	18.25	0.89	0.95	24.00
$B_{3\,(35)}$	6.9	9.5	2.78	182	79.38	18.28	0.90	1.04	24.62
$B_{4\,(40)}$	6.6	9.2	2.00	167	75.30	16.26	0.85	0.91	22.77
S.E. ±	0.02	0.03	0.02	0.33	0.007	0.23	0.02	0.003	0.35
C.D.	0.07	0.09	0.06	0.99	0.021	0.72	NS	0.009	1.05
Interactions(LxB)									
L_1B_1	6.7	9.6	1.65	170	76.68	16.28	0.84	0.84	23.48
L_2B_1	6.0	9.0	1.64	168	72.62	14.83	0.88	0.98	20.17
L_3B_1	6.7	9.2	2.18	179	78.41	17.59	0.86	0.96	23.51
L_4B_1	6.6	9.3	1.86	183	80.68	19.90	0.88	1.00	24.84
L_1B_2	6.5	8.7	1.73	179	76.22	15.96	0.92	0.91	22.41
L_2B_2	7.3	9.7	1.97	176	77.73	17.95	0.88	0.95	23.43
L_3B_2	6.5	9.2	1.86	181	79.34	17.81	0.85	0.97	24.00
L_4B_2	7.3	9.8	2.79	195	80.73	20.23	0.88	1.01	25.88
L_1B_3	6.2	9.6	1.69	176	77.62	17.00	0.95	0.94	24.83
L_2B_3	6.1	8.9	1.81	161	76.11	15.56	0.88	0.92	23.57
L_3B_3	6.8	9.6	2.78	177	80.00	19.00	0.84	0.98	23.87
L_4B_3	7.4	9.9	3.00	193	84.25	21.76	0.88	1.30	28.33
L_1B_4	6.5	9.2	2.28	156	73.85	14.96	0.86	0.87	25.34
L_2B_4	6.8	9.4	2.19	173	77.00	16.51	0.88	0.94	24.14
L_3B_4	6.5	9.1	2.13	176	80.65	19.00	0.84	1.00	21.15
L_4B_4	6.7	9.1	2.17	162	71.73	14.58	0.88	0.82	23.61
S.E. ±	0.05	0.06	0.03	0.65	1.03	0.06	0.04	0.007	0.70
C.D.	0.16	0.18	0.09	1.95	3.09	0.19	NS	NS	2.11

NS= Non-significant

influenced by number of leaves per shoot and number of bunches per vine. The maximum leaf area index (LAI) (2.49) was observed in leaf density of 18 leaves per shoot which was significantly higher (2.10) than the leaf density of 16 leaves per shoot and (2.04) 12 leaves per shoot. However, the minimum leaf area index (LAI) (1.83) was recorded in leaf density of 14 leaves per shoot.The leaf area index was significantly influenced by number of bunches per vine. The maximum leaf area index (LAI) (2.78) was recorded by vines on which 35 bunches were maintained, which was significantly higher than the vines of 30 bunches (2.26) and 25 bunches (2.19) were maintained per vine, while minimum leaf area index (LAI) (2.00) was found on which 40 bunches were maintained per vine.

The interaction effect between number of leaves per cane and number of bunches per vine was significant. The treatment combination of 18 leaves per shoot and the vines on which 35 number of bunches were maintained, recorded the highest leaf area index (LAI) (3.00) followed by in treatment combination of 18 leaves per shoot and the vines of 30 bunches per vine (2.79). However, the minimum leaf area index (LAI) (1.64) was observed in treatment combination of 14 leaves per shoot and 25 bunches per vine. It is clear that, the retention of maximum leaf area index per vine significantly increase yield per vine and quality of berries. The results are in conformity with the findings of Kobalt and Candolfivasconcelos (1995) and Smithyan *et al.* (1997).

Weight of hundred berries (g) :

The weight of 100 berries was significantly influenced by number of leaves per shoot and number of bunches per vine. The maximum weight of 100 berries (183 g) was observed in leaf density of 18 leaves per shoot, which was significantly higher than the leaf density of 16 leaves (178 g) and 12 leaves per shoot (175 g), respectively. However, the minimum weight of 100 berries (170 g) was recorded in leaf density of 14 leaves per shoot. Weight of 100 berries significantly influenced by number of bunches per vine. The highest weight of 100 berries was recorded by vines on which 35 bunches were maintained (182 g), which was significantly higher than 30 bunches were maintained per vine (177 g) and the vines of 25 bunches (175 g) per vine, respectively. However, the lowest weight of hundred berries (167 mm) was observed by vines on which 40 number of bunches were maintained per vine. As per the data in the treatment of small leaf area, there was increased berry weight might be due to the increased reserve food material and higher photosynthesis present in well matured cane. These results are in conformity with the findings of Freeman (1983); Reynolds *et al.* (1986) and Reynolds *et al.* (1994).

Juice (%) :

The data on juice per cent was significantly influenced by number of leaves per shoot and number of bunches per vine. The juice yield significantly influenced by number of leaves. The highest juice per cent (79.61) was recorded in leaf density of 18 leaves per shoot, followed by the leaf density of 16 leaves per shoot (79.59%) and 12 leaves per shoot (76.89%). However, the minimum juice per cent (75.00%) was observed in leaf density of 14 leaves per shoot. The maximum juice per cent was recorded by vines on which 35 bunches were maintained (79.38%) per vine, which was followed by vines of 30 bunches and 25 bunches (78.63 %) and (77.09 %) were maintained per vine, respectively. The lowest juice per cent (75.30 %) was found in 40 bunches per vine, respectively.

The interaction effect between number of leaves per shoot and number of bunches per vine was significantly influenced on juice per cent. The treatment combination of 18 leaves per shoot and by vines on which 35 bunches were maintained, recorded the highest (84.25 %) juice per cent, followed by vines of 30 and 25 bunches (80.73 %) and (80.68 %) were maintained per vine. The minimum juice per cent (72.62 %) was noticed in treatment combination of 14 leaves and 25 bunches per vine.

Reducing sugar (%) :

The data presented in Table 1 revealed that, reducing sugar was significantly influenced by number of leaves per shoot and number of bunches per vine. The maximum reducing sugar (18.51 %) was recorded in leaf density of 18 leaves per shoot, followed by leaf density of 16 (17.70 %) and 12 (16.48/%) leaves per shoot, however, minimum (15.69 %) was recorded in leaf densities of 14 leaves per shoot. Maximum reducing sugar (18.28 %) was recorded by vines on which 35 bunches were maintained, followed by vines of 30 (18.25%) and 25 (17.15%) bunches were maintained. However, the minimum reducing sugar (16.26 %) was noticed by vines on which 40 bunches were maintained per vine.

The interaction effect between the number of leaves per shoot and number of bunches per vine was found to be significant. The treatment combination of 18 leaves per shoot and the vines on which 35 bunches were maintained, recorded the highest reducing sugar (21.76 %), followed by the treatment combination of 18 leaves per shoot and by vines of 30 bunches (20.23 %) were maintained. The lowest reducing sugar (14.83 %) was noticed under the treatment combination of 14 leaves per shoot and 25 bunches per vine. It is evident from the data that increase in reducing sugar due to increase in total leaf area on the bearing canes and in addition to leaf area, leaves are exposed to adequate light. These results are in conformity with the finding of Chadha *et al.* (1974) and Chemma *et al.* (2003).

Non-reducing sugar (%) :

The data presented in Table 1 revealed that the non-reducing sugar was significantly influenced by number of leaves per shoot and number of bunches per vine. The maximum non-reducing sugar (0.89 %) was observed in leaf density of 18 leaves per shoot, which was significantly higher than the leaf density of 16 leaves per shoot (0.88 %) and 12 leaves per shoot (0.86%).

However, the minimum non-reducing sugar (0.85%) was recorded in leaf density of 14 leaves per shoot. Non-reducing sugar was significantly influenced by number of bunches per vine. The maximum non-reducing sugar (0.90 %) was observed by vines on which 35 bunches were maintained, followed by vines of 30 bunches were maintained (0.89 %) and vines of 25 bunches were maintained per vine (0.87 %). However, the lowest non-reducing sugar (0.85%) was noticed by vines of 40 bunches were maintained.

The interaction effect between number of leaves per shoot and number of bunches per vine was found to be non- significant. From these results, there was reduction in non-reducing sugar with the increase in leaf area due to less accumulation of carbohydrate in berry. The similar results are also reported by Chadha *et al.* (1974) and Chemma *et al.* (2003).

Acidity (%) :

The acidity was significantly influenced by number of leaves per shoot and number of bunches per vine. The maximum acidity (1.03 %) was observed in leaf density of 18 leaves per shoot, which was significantly higher than the leaf density of 16 leaves (0.98 %) and 12 leaves per shoot (0.95 %).The minimum acidity (0.89 %) was recorded with the leaf density of 14 leaves per shoot. Similarly, the highest acidity (1.04%) was observed by vines on which 35 bunches were maintained, followed by vines of 30 bunches (0.95 %) and 25 bunches (0.94/ %) per vine. However, the lowest acidity (0.91%) was noticed by vines on which 40 bunches were maintained.

The interaction effect between the number of leaves per cane and number of bunches per vine was found to be non-significant. It is manifest from the data the reduction in total soluble solids and increase in acidity due to increase in leaf area due to inadequate food material. In addition to leaf area, temperature during ripening period influences the acid content of berry. These results are inconformity with the findings of Morris *et al.* (1984) and Cheema *et al.* (2003).

Total soluble solids (TSS °Brix) :

The total soluble solids was significantly influenced by number of leaves per shoot and number of bunches per vine. The maximum TSS (25.00 °Brix) in leaf density of 18 leaves per shoot, was significantly higher over the leaf density of 16 leaves per shoot (23.80 °Brix) and 12 leaves per shoot (23.65 °Brix). However, the minimum TSS (23.19 °Brix) was noticed in leaf density of 14 leaves per shoot per vine. Similarly, the highest TSS (24.62 °Brix) was observed by vines on which 35 bunches were maintained per vine, which was significantly more than the vines of 30 bunches were maintained per vine (24.00 °Brix) and the vines of 25 bunches per vine (23.16 °Brix), respectively. However, the minimum TSS (22.77 °Brix) was noticed by vines on which 40 number of bunches were maintained per vine

The interaction effect between number of leaves per shoot and number of bunches per vine had significant influence on total soluble solids. The treatment combination of 18 leaves per shoot and by vines on which 35 number of bunches were maintained, recorded the highest TSS (28.33 °Brix), followed by vines of 30 number of bunches and treatment combination of 18 leaves (25.88 °Brix), 40 number of bunches and 12 leaves (25.34 °Brix) per vine. However, the lowest TSS (20.17 °Brix) was noticed under treatment combination of 14 leaves per shoot and the vines of 25 bunches per vine. The results revealed that the crop load affected the quality of fruit, because the reserve food material is distributed through more number of bunches per vine, which resulted into decrease in total soluble solids and increased the titratable acidity. The observations are in agreement with those reported earlier by Chadha *et al*. (1974); Morris *et al*. (1984); Miller and Howell (1998); Vasconcelos and Castangonli (2002).

REFERENCES

Chadha, K. L., Singh, S. and Kumar, H. (1974). Effect of severity on time ripening, yield and quality of Khandhari grapes. (*Vitis vinifera* L.). *Haryana J. Hort. Sci.,* **3** : 39 - 43.

Cheema, S. S., Singh, P. and Dhillon, W. S. (2003). Effect of crop regulation and canopy management in fruit quality and disease incidence in grape. *Indian J. Hort*., **60** (3) : 208 - 213.

Freeman, B.M. (1983). Effect of irrigation and pruning of Shiraz grape vines on sub sequent red wine pigments.*Am. J. Enol. Vitic.,* **34** (1) : 23-26.

Kobalt, W. and Candolfivasconcelos, C. (1995). Development of the canopy and grape quality. *Obst-und-Weinbau.,***131** (18): 468 - 470.

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

Morris, J.R., Sims, C.A., Bourque, J.E. and Okaes, J.L. (1984). Influence of training system, pruning severity of spur length on yield and quality of six French –American hybrid grape cultivar. *Am. J. Enol. Vitic*., **35** (1) : 156 - 159.

Panse, V.G. and Sukhatme, P.V. (1985). *Statistical methods for agricultural workers* (4 thEd.) ICAR.Publ. NEW DELHI, INDIA.

Reynolds, A.G., Pool, R.M. and Matick, L.R. (1986). Effect of shoot density and crop control on growth, yield, fruit composition and wine quality of Seyval Blanc grapes. *J. Amer. Soc. Hort. Sci*., **111** (1) : 55 - 63.

Reynolds, A.G., Wardle, D.A. and Dever, M. (1994). Shoot density effects on Riesling grapevines interaction with cordon Age. *Am. J. Enol.Vitic.,* **45** (1) : 435 - 443.

Smithyan, R.P., Howell, G.S. and Miller, D.P. (1997). Influence of canopy configuration on vegetative development, yield and fruit composition of Seyval Blanc grapevines. *Am. J. Enol. Vitic.,* **48** (4) : 482 - 491.

Vasconcelos, M.C. and Castangoli, S. (2002). Leaf canopy structure and vine performance. *Am. J. Enol. Vitic.,* **51** (4) : 390 - 396.

Zamboni, M., Bavaresco, L., Komjane, R., Poni, S., Iacono, F. and Intrierf, C. (1997). Influence of bud number on growth, yield, grape and wine quality of Pinot Noir and Sauvignon. *Acta Hort.,* **427**: 411-417.

WEBLIOGRAPHY :

Anonymous (2010). *www.fao.org.*, FAO STAT (prod., stat.)

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