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**RH Ingole**

Ph. D Scholar, Department of Horticulture, V.N.M.K.V., Parbhani, Maharashtra, India

**TB Tambe**

Professor, Department of Horticulture, V.N.M.K.V., Parbhani, Maharashtra, India

**DH Bobade**

Ph. D Scholar, Department of Horticulture, V.N.M.K.V., Parbhani, Maharashtra, India

## Influences of various rootstocks on yield and quality of wine grape varieties (*Vitis vinifera* L)

RH Ingole, TB Tambe and DH Bobade

**Abstract**

The investigation was carried out at Instructional- cum- Research Farm of Department of Horticulture, College of Agriculture, Latur during the year 2010-2011. There were significant differences found in yield attributes viz; number of berries per bunch, weight of berry, number of bunches per vine, weight of bunch, yield kg per vine and yield Mt per hectare were maximum in Syrah-524 grafted on 110 R, quality attributes viz; Total Soluble Solids (<sup>0</sup>Brix), Acidity (%), juice (%), pH of Juice, Syrah -524 grafted on 110 R was found to be non significant in TSS and pH. Ugni Blanc-380 grafted on 110 R showed non significant in acidity. Viognier Noir-15 grafted on 1103 P was showed significant in juice per cent.

**Keywords:** yield, berry, bunch, quality, grape wine, rootstocks

**Introduction**

Grape (*Vitis vinifera* L) is an important temperate fruit crop of the world, which is well acclimatized to the subtropical climate and grown extensively in this climatic condition by adopting modified cultural practices. There are sixteen biproducts which are made from grapes viz, raisin, grape juice, squash, syrup, jam, jelly, vinegar, wine, pickles, chocolates, tartaric acid, oil, cattle feed etc. But looking to the world scenario of different bi- products, it was necessary to consider setting up of projects for manufacturing other value added products from grapes, such as good quality of wine so as to prevent losses, obtained more income and provide additional employment to rural people. Recently, the wine grape varieties, viz; Cabernet Sauvignon, Syrah, Pinot Noir, Cabernet Blanc, Ugni Blanc, Chenin Blanc are growing by using Dogridge rootstocks. 1103 P, 110 R, SO4 etc are vigorous growing rootstocks with dense and deep root system. There are some clones of wine varieties which are improved. It is need to see the influence of various rootstocks on yield and quality parameters in different wine grape varieties. Hence, the present investigation was carried out.

**Materials and Methods**

The experiment was carried out at instructional- cum- research farm. The clones of wine grapes varieties were used Ugni Blanc-380 grafted on 110 R, Sauvignon Blanc-160 grafted on SO4, Viognier Noir-15 grafted on 1103 P, Semillon-909 grafted on SO4, Syrah-524 grafted on 110 R, Cabernet Sauvignon-15 grafted on 1103 P, and Pinot Noir-15 grafted on 110 R, among these Syrah-524, Cabernet Viognier Noir-15 and Semillon-909 were whites varieties. Three rootstocks were used are 110 R, 1103 P and SO4. These grafts were planted with spacing 3m x 1.5m and trained on bower system. Yield observation were recorded like number of berries per bunch, length of berry, diameter of berry, weight of berry, number of bunches per vine, length of bunch, width of bunch, weight of bunch, yield kg per vine and yield Mt per hectare and quality parameters like Total Soluble Solids (<sup>0</sup>Brix), Acidity (%), juice (%), pH of Juice.

**Result and Discussion****A) Yield attributes****a) Berry attributes****I) Number of berries per bunch**

There was significant differences seen (Table 1) in terms of number of berries per bunch among the different grape wine varieties grafted on various rootstocks studied. The maximum numbers of berries per bunch were observed in Syrah-524 grafted on 110 R (146.92), however, it was at par Viognier Noir-15 grafted on 1103 P (137.63). It might be due to the size of bunch and shape which might be due to the different stages of growth and fruitfulness of grape wine varieties. This type of study was done by Havinal (2007) [4] and Kulkarni (2009) [7].

**Correspondence****RH Ingole**

Ph.D Scholar, Department Of Horticulture, V.N.M.K.V., Parbhani, Maharashtra, India

**II) Length of berry (mm)**

The data on length of berry is presented in (Table1) the maximum length of berry was recorded in Ugni Blanc-380 grafted on 110 R (18.50 mm), however, it was at par with Viogneur Noir-15 grafted on 1103 P (17.90 mm). This difference in length of berry might be due to genetical influence in shape of the berry where some were with round berries. This type of study was done by Richard *et al.*, (1999)<sup>[9]</sup>, Havinal (2007)<sup>[4]</sup> and Kulkarni (2009)<sup>[7]</sup>.

**III) Diameter of berry (mm)**

The result on diameter of berries (Table 1) showed variation in diameter of berries. The maximum diameter of berry was recorded in Ugni Blanc-380 grafted on 110 R (13.75 mm), however, it was at par with Syrah-524 grafted on 110 R (13.26 mm). This type of study was done by Kadu (2002)<sup>[6]</sup> gave the diameter of berries range from 10.00 to 15.00 mm which was reported by Havinal (2008)<sup>[5]</sup> and Kulkarni (2009)<sup>[7]</sup>.

**IV) Weight of berry (g)**

The result on weight of berry presented in (Table 1) revealed a wide range from 1.35g to 1.82 g. In this respect, Ugni Blanc-360 grafted on 110 R had the highest weight of berry (1.82 g), however, it was at par Syrah-524 grafted on 110 R (1.68 g). The variation in the weight of berry might be due to the difference in diameter of berry and length of berry. This type of study was done by Richard *et al.*, (1999)<sup>[9]</sup> where, grape wine variety Merlot had 1.10 g of average single weight of berry.

**b) Bunch attributes****I) Number of bunches per vine**

The data presented in (Table 2). Number of bunches per vine revealed that significantly maximum number of bunches per vine (39.88) were recorded in Syrah-524 grafted on 110 R. The minimum number of bunches per vine was recorded in Pinot Noir-15 grafted on 110 R (15.96). Affonso and Striegler, (1999)<sup>[11]</sup> recorded a 59 to 124 bunches in six wine grape varieties, range from 131 to 162 bunches per vine recorded by Walker *et al.*, (2000)<sup>[12]</sup> in variety Shiraz which were evaluated rootstocks under study and reported that there was no effect of rootstock on number of bunches per vine, weight of bunch, weight of berry and yield. Kadu (2002)<sup>[6]</sup> recorded a range of 5.17 to 33.43 bunches per vine in 15 grape varieties. Martin *et al.*, (2006)<sup>[8]</sup> recorded range of 55 to 74 bunches per vine in different clones of Pinot Noir. This type of study was also done by Havinal (2007)<sup>[4]</sup> and Kulkarni (2009)<sup>[7]</sup>. It might be due to the difference between number of canes, drop of flower buds or berries, disease

intensity on flower buds and at the stage of berry development.

**II) Weight of bunch (g)**

The data presented in (Table 2) revealed that the highest average weight of bunch was recorded by Syrah-524 grafted on 110 R (248.31 g), which was significantly higher than other varieties. The similar type of study was done by Kadu (2002)<sup>[6]</sup>, Havinal (2007)<sup>[4]</sup> and Kulkarni (2009)<sup>[7]</sup> in different wine grape varieties and recorded a range of bunch weight from 28.90 g to 317.0 g, 114.83 g to 147.76 g and 97.69 g to 165.88 g, respectively. The weight of bunches all the varieties studied are within the range. This difference in weight of bunch might be due to difference between size of berry and weight and also due to size of canopy where the high weight of bunch was observed in varieties which had large canopy size.

**III) Length and width of bunch (cm)**

The length of bunch of grape wine varieties grafted on various rootstocks studied. The maximum length of bunch was noted in Syrah-524 grafted on 110 R (11.04 cm). The minimum length of bunch was recorded in Pinot Noir-15 grafted on 110 R (7.11 cm). Similarly with respect to width of bunch seven wine grape varieties grafted on different rootstocks had the range 3.53 cm to 4.61 cm. The maximum width of bunch was recorded in Semilon-909 grafted on SO4 (4.61 cm). The similar type of study was done by Havinal (2007)<sup>[4]</sup>, recorded the range of 6.22cm to 11.00cm length of bunch in 12 wine grape varieties.

**c) Yield (kg/vine, mt/ha)**

The maximum yield per vine and yield per hectare was recorded in (Table 1) Syrah-524 grafted on 110 R (9.11 kg/vine, 19.89 Mt/ ha). The minimum yield per vine and yield per hectare was recorded in Pinot Noir-15 grafted on 110 R (2.39 kg/vine, 5.21 Mt/ ha). Walker *et al.*, (2000)<sup>[12]</sup> recorded 14.8 kg to 19.2 kg per vine Shiraz. Kadu (2002)<sup>[6]</sup> reported the range of yield per vine was (0.37 to 6.82 kg/vine and 1.66 to 30.33 Mt/ha) in different grape wine varieties. Martin *et al.*, (2006)<sup>[8]</sup> recorded the yield per vine with the range of 7.20 kg to 10.00 kg in different clones of chrdonnay. Havinal (2008)<sup>[5]</sup> recorded the yield per vine with the range of (2.27 to 12.19 kg / vine and 5.04 to 27.09 Mt/ha) in twelve wine grape varieties and Kulkarni (2009)<sup>[7]</sup> (5.41 kg to 9.07 kg / vine and 14.42 to 24.19 Mt/ha) in six wine grape varieties. The variation in the yield per vine and yield per hectare might be due to the varietal character or due to difference in number of bunches per vine, weight of bunch which had direct effect on yield per vine and yield per hectare.

**Table 1:** Effect of various rootstocks on yield attributes on wine grape varieties

Treatment No.	Treatments	Number of berries per bunch	Length of berry (mm)	Diameter of berry (mm)	Weight of berry (g)	Number of bunches per vine	Weight of bunch (g)	Length of bunch (cm)	Width of bunch (cm)	Yield (kg/vine)	Yield (Mt/ ha)
T <sub>1</sub>	Ugni Blanc -380 grafted on 110R	115.14	18.50	13.75	1.82	28.19	210.71	10.13	3.87	5.96	13.01
T <sub>2</sub>	SauvignonBlanc-160 grafted on SO4	103.18	15.45	12.03	1.44	20.92	148.58	8.51	3.59	3.42	7.46
T <sub>3</sub>	Viognier Noir-15 grafted on 1103P	137.63	17.90	12.94	1.56	37.86	216.07	9.98	3.74	7.98	17.42
T <sub>4</sub>	Semilon-909 grafted on SO4	98.76	17.40	12.63	1.50	19.25	148.16	9.46	4.61	2.86	6.24
T <sub>5</sub>	Syrah-524 grafted on 110R	146.92	17.73	13.26	1.68	39.88	248.31	11.04	4.22	9.11	19.89
T <sub>6</sub>	Cabernet Sauvignon-15 grafted on 1103 P	105.60	14.13	11.17	1.38	17.19	145.72	10.43	3.53	2.51	5.47
T <sub>7</sub>	Pinot Noir-15 grafted on 110R	84.22	14.11	10.96	1.35	15.96	114.49	7.11	4.01	2.39	5.21
	S.E.±	3.19	0.22	0.21	0.046	0.63	5.49	0.024	0.0097	0.20	0.44
	C.D. at 5%	9.83	0.68	0.66	0.14	1.95	16.91	0.075	0.030	0.62	1.36

**B) Quality attributes****I) Total Soluble Solids (<sup>0</sup>Brix)**

The data on total soluble solids (Table 2) had non significant influence by wine grape varieties grafted with various rootstocks studied. The maximum TSS (23.09 <sup>0</sup>B) was recorded in Syrah-524 grafted on 110 R and minimum in Ugni Blanc-380 grafted on 110 R (22.04 <sup>0</sup>B). However, remaining wine grape varieties grafted on various rootstocks were lies in the range of 22.78 <sup>0</sup>B to 22.34 <sup>0</sup>B. Similar study was done by several workers, where the ranges of 11.5 <sup>0</sup>Brix to 27.0 <sup>0</sup>Brix in different wine grape varieties by Singh (1995) [10]. The similar study was also done by Vasconcelos and Castangnoli (2000) [11] and Martin *et al.*, (2006) [8]. Havinal (2008) [5] recorded the TSS with the range of 20.53 <sup>0</sup>B to 23.8 <sup>0</sup>B in twelve wine grape and Kulkarni (2009) [7] recorded the TSS with the range of 19.73 <sup>0</sup>B to 21.19 <sup>0</sup>B in six wine grape varieties. This variation in TSS among the varieties grafted on various rootstocks might be mainly due to the differential in maturity.

**II) Acidity (%)**

There was non significant influence on titrable acidity (Table 2) by different varieties grafted on various rootstocks studied in present investigation. The highest acidity was recorded in Ugni Blanc-380 grafted on 110 R (0.78 %). The minimum acidity was recorded in Syrah-524 grafted on 110 R (0.73 %). This type of work done by Ethiraj and Suresh (1982) [3] were reported the range of 0.50 per cent

to 1.85 per cent in different grape varieties. Havinal (2008) [5] recorded the acidity with the range of 0.76 per cent to 0.94 per cent in twelve wine grape varieties and Kulkarni (2009) [7] recorded the acidity with the range of 0.93 per cent to 1.48 per cent in six wine grape varieties. This difference of titrable acidity content of grape wine varieties might be due to the effect of TSS and sugars biochemical changes at the time of ripening process.

**III) Juice (%)**

The highest juice per cent was recorded in (Table 2) Viognier Noir-15 grafted on 1103 P (75.94 %). The minimum juice per cent was recorded in Sauvignon Blanc-160 grafted on SO4 (72.85 %). A range 65.63 to 8.85 per cent juice reported by Kadu (2002) [6], and Kulkarni (2009) [7] was reported that juice per cent a range 68.03 per cent to 85.58 per cent.

**IV) pH**

There was non significantly maximum juice pH was recorded in (Table 2) Syrah-524 grafted on 110 R (3.46). The minimum pH was recorded in Semilon-909 grafted on SO4 (3.41). This range of pH obtained from the wine grape varieties in present investigation were in accordance of literature of previous studies, were pH 3.2 to 3.5 was reported by Anony (2007) [2], similar results were reported by Havinal (2008) [5] and Kulkarni (2009) [7].

**Table 2:** Effect of various rootstocks on quality attributes of wine grape varieties.

Treatment No.	Treatments	TSS ( <sup>0</sup> B)	Acidity (%)	Juice (%)	pH
T <sub>1</sub>	Ugni Blanc -380 grafted on 110R	22.04	0.78	74.94	3.42
T <sub>2</sub>	SauvignonBlanc-160 grafted on SO4	22.48	0.76	72.85	3.43
T <sub>3</sub>	Viognier Noir-15 grafted on 1103P	22.78	0.74	75.94	3.45
T <sub>4</sub>	Semilon-909 grafted on SO4	22.66	0.75	73.65	3.41
T <sub>5</sub>	Syrah-524 grafted on 110R	23.09	0.73	74.61	3.46
T <sub>6</sub>	Cabernet Sauvignon-15 grafted on 1103 P	22.34	0.77	75.19	3.42
T <sub>7</sub>	Pinot Noir-15 grafted on 110R	22.42	0.77	75.04	3.43
	S.E.±	0.75	0.01	0.01	0.02
	C.D. at 5	NS	NS	0.05	NS

**Conclusion**

Considering the significant influence on *viz.*, yield attributes and quality attributes, it can be concluded that the wine grape variety Syrah -524 grafted on 110 R was found to be significantly better in number of berries per bunch, number of bunches per vine, weight of bunch, length of bunch. While, Ugni Blanc-380 grafted on 110 R was to be significantly better in length of berry, diameter of berry and weight of berry. Whereas, Semilon-909 grafted on SO4 was to be found significantly better in width of bunch. While, Syrah-524 grafted on 110 R was found to be significantly higher in yield. The wine grape variety Syrah -524 grafted on 110 R was found to be non significant in quality parameters like TSS, and pH. While, Ugni Blanc-380 grafted on 110 R showed non significant in acidity. Whereas, Viognier Noir-15 grafted on 1103 P was showed significant in juice per cent.

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