

Evaluation of Different Wine varieties of Grapes Grafted on Dogridge Rootstocks

Patel Nidhi¹, Nitin Soni^{2*}, Praveen Kumar Ausari³, K.C. Meena², B.K. Patidar², Dharmendra Patidar², Ajay Haldar⁴ and Riya Thakur⁵

¹Research Scholar, Department of Horticulture, RVSKVV, Gwalior (Madhya Pradesh), India.

²KNK College of Horticulture, RVSKVV, Gwalior (Madhya Pradesh), India

³Ph.D. Research Scholar, Department of Horticulture, RVSKVV, Gwalior (Madhya Pradesh), India.

⁴Assistant Professor and HOD, SOAS, GHRU, Saikheda, Chhindwara (Madhya Pradesh), India.

⁵Scientist Horticulture, KVK, JNKVV, Chhindwara (Madhya Pradesh), India.

(Corresponding author: Nitin Soni*)

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ABSTRACT: An experiment was conducted in order to study the performance of different wine varieties grafted on Dogridge rootstock carried out during the year 2019-20 at Research farm, College of Horticulture, Mandasaur, Madhya Pradesh. The experiment conducted in factorial randomized block design with three replications. Grapes grafted of sixteen wine varieties on Dogridge Rootstock. Ten red wine varieties i.e., Cinsault, Convent Large Black, Grenache, Tempranillo, Cabernet France, Cabernet Sauvignon, Shiraz, Sangiovese, Carignane, Tsimlasky Chernyi and six white wine varieties i.e., Chenin Blanc, Sauvignon Blanc, Clariette, Gargenega, Viognier, Sirius. Evaluated, the Shiraz highest pruning weight (2.22 kg), girth of rootstock (6.51 cm) and girth of Scion (7.16 cm) in Chenin Blanc, girth of cane (0.80 cm) in Convent Large Black, number of mature cane per vine (48.30) in Sauvignon Blanc, number of fruitful canes per vine (23.55) in variety Tsimlasky Chernyi, period of panicle appearance (25.59) in shiraz, date of anthesis (41.12 days) in Grenache, days to fruit set (47.17 days) in Cinsault, days to fruit ripening (146.28 days) in variety Gargenega, number of bunches per vine observed in Chenin Blanc (53.12), bunch weight in Tempranillo (101.41 g), Berry weight in Convent Large Black (2.33 g), weight of 100 berries found in Convent Large Black (206.01 g), berry length in Convent Large Black (19.42 mm), berry diameter in Convent Large Black (18.75 mm), Number of seed per berry in Viognier (3.67).

Keywords: Dogridge, rootstock, grapes, wine varieties.

INTRODUCTION

Grapes (*Vitis vinifera* L.) is one of the most important fruit crops of the world, it belongs to family Vitaceae includes 12 genera and about 600 species. The most important genus of economic importance is *Vitis* form which maximum cultivated grapes belong. Genus *Vitis* includes about sixty species of which *Vitis vinifera* is the most important one contributing to about 90% of the world's grapes.

Grape production consumption of world according to FAO (Food and Agriculture Organization) 71% used for wine, 27% as fresh fruit consumption, 2% as dried fruit consumption, 2% as dried fruit. About 90% grapes produced are freshly consumed in India. About 20,000 acres of new vineyards for wine grape production have been planted in the 20 years in San Obispo and Santa Barbara countries. 10,000 tonnes of Bangalore Blue, Cabernet Sauvignon, Chenin Blanc, Chardonnay, Merlot, Pinot Noir and Uni Blanc are crushed to process into wine (Vijya *et al.*, 2018).

The major grape growing states are Maharashtra (83.5%), Karnataka (11.7%), Andhra Pradesh (0.3%), Punjab (2%) and Tamil Nadu (1.8%), Telangana (1%) amounting to nearly 90 percent of the total production (Anonymous, 2016).

Wine grapes belong to the species *Vitis vinifera*, but are grown primarily for wine production. Quality wines can only be produced from quality grapes. Fruit juice and wine form part of what are termed the “new age beverages” India is not traditionally a wine drinking country. The Indian wine industry has been steadily growing over the last ten years (Vijya *et al.*, 2018). Limited domestic consumption of wine and non-availability of standard wine varieties to produce good quality of wine of international standards, much emphasis was not given for research on wine production in India (Shikhamany, 2001).

Hedberg (1980) found that yields of all grafted cultivars were much higher than those of own rooted vines, especially those grafted on Ramsey and Dogridge rootstock. Rootstock vary in their root characters in terms of root density, root length etc., so different varieties behave differently for fruitfulness depending on environment, training system and position of shoot, pruning time etc. Never cultural practices such as use of rootstock leading to dense canopy may inhibit the successful induction and initiation of inflorescence and cause a decline in fruiting potential (Cook and Lider 1964).

MATERIAL AND METHODS

The field experiment of different sixteen wine varieties which were grafted on Dogridge rootstock characterization was conducted at Research farm, College of Horticulture, Mandsaur during the year 2019-20. The data was analyzed with Factorial Randomized Block Design with three replications.

Grapes grafted of sixteen wine varieties on 110R rootstock. Ten red wine varieties i.e., Cinsault, Convent Large Black, Grenache, Tempranillo, Cabernet France, Cabernet Sauvignon, Shiraz, Sangiovese, Carignane, Tsimlasky Chernyi and six white wine varieties i.e., Chenin Blanc, Sauvignon Blanc, Clariette, Gargenega, Viognier, Sirius. The plants were planted at spacing 3m × 2m. These grafted plants were maintained with uniform recommended practices. Irrigation was provided through drip irrigation system. Details of the methods and observation was recorded on the different parameters viz., pruning weight (Kg), girth of rootstock (cm), girth of cane (cm), number of mature canes per vine, number of fruitful canes per vine, period of panicle appearance (DAP), date of anthesis (DAP), days to fruit set (DAP), days to fruit ripening (DAP), number of bunches per vine, bunch weight (g), berry weight (g), weight of 100 berries (g), berry length (mm), berry diameter (mm), TSS(0Brix), Acidity (%), TSS: acidity ratio.

RESULTS AND DISCUSSION

A. Growth Parameters

Significantly higher pruning weight was found in Shiraz (2.22 kg) followed by Convent Large Black (1.90 kg), Chenin Blanc (1.28 kg). Whereas the minimum pruning weight in variety Sirius (0.21kg). The maximum girth of rootstock was found significantly in variety Chenin Blanc (6.51 cm) it was par with varieties Grenache (6.31 cm), Cabernet Sauvignon (6.19 cm). The minimum girth of rootstock was found in variety Sirius (2.87cm). The girth of scion in variety Chenin Blanc (7.16 cm) found maximum which was at par with Cabernet France (6.96 cm), Sauvignon Blanc (6.94 cm). Whereas, the minimum girth of scion was recorded in variety Sirius (3.30 cm). The maximum girth of cane in variety Convent Large Black (0.80 cm) followed by Chenin Blanc (0.75 cm), Cabernet Sauvignon (0.74 cm) which was found at par with each other. The minimum girth of cane found in variety Sirius (0.54 cm). Shows non-significant the highest number of mature canes were found in variety Sauvignon Blanc (48.30) followed by Cabernet Sauvignon (38.08), Shiraz (36.47). The minimum numbers of mature canes were found in variety Sirius (17.61). Significantly maximum number of fruitful canes per vine was observed in Tsimlasky Chernyi (23.55) which was at par with Chenin Blanc (23.29) it was followed by Cabernet Sauvignon (19.92) whole minimum number of fruitful canes per vine observed in variety Sangiovese (2.95). The highest days taken to panicle appearance was observed in variety Shiraz (25.59), Tsimlasky Chernyi (25.41), Viognier (25.25) while the minimum days to taken to panicle appearance

was observed in variety Chenin Blanc (20.91). Significantly maximum days taken to anthesis variety Grenache (41.12 days) followed by Cinsault (40.45 days) and Tempranillo (37.21). Significantly maximum days taken to fruit set was observed in Cinsault (47.17) followed by Grenache (46.04 days) and Clariette (45.72 days). While the minimum days taken to fruit set recorded in variety Viognier (38.94 days). The variety Cabernet Sauvignon required minimum number of days to ripening (123.83 days). The variety Gargenega required maximum number of days to fruit ripening (146.28 days) followed by Grenache (146.19 days), Carignane (144.08 days).

The vigor of varieties grafted on dogridge found more, the result supported by Jayalakshmi *et al.* (2019) with result high pruning weight can be attributed to high number of canes per vine as recorded. According to Satisha and Shikhamany (1999) pruning weight is important criteria in grapes to determine its vigor and growth.

High pruning weight may result greater number of canes directly related to vigorous vine growth reported by Soni *et al.* (2019).

The thickness of scion associated to varietal characters, graft compatibility with rootstock nutritional absorbing capacity of rootstock. There results were supported by Ghule *et al.* (2019) with their research studies.

Variation in the diameter of cane might be due to vigour of vine and also vine age is responsible (Monera *et al.*, 2018).

The early maturity of cane helps in storing sufficient reserve food material in canes along with the healthy vines (Somkumar *et al.*, 2014). Similarly, Satisha *et al.* (2010); Joshi *et al.* (2015) reported that the highest number of canes were recorded on dogridge rootstock.

Due to prevailing climatic conditions, dogridge rootstock performed well as a greater number of fruitful canes sprouted on own root, as per reported by Monera *et al.* (2018). Many factors such as climate, varieties, rootstock and their interaction effect, crop level influenced the fruit ripening as per Monera *et al.* (2018).

B. Yield Parameters

The mean number of bunches per vine was maximum in Chenin Blanc (53.12) followed by Tsimlasky Chernyi (49), Viognier (43.08). While minimum number of bunches was found in variety Cinsault (8.06). The maximum bunch weight was observed in variety Tempranillo (101.41 g) followed by Clariette (98.04 g), Grenache (83.02 g) and minimum weight of bunch was observed in variety Sirius (15.21 g). The maximum berry weight was observed in variety Convent Large Black (2.33 g) followed by Tempranillo (1.61 g) and Cinsault (1.60 g) while the minimum berry weight was observed in variety Cabernet Sauvignon (0.69 g).

The maximum 100 berry weight was showed in variety Convent Large Black (206.10 g) followed by Cinsault (187.59 g), Tempranillo (171.62 g) and minimum 100 berry weight was observed in variety Cabernet Sauvignon (74.67 g). These result support by Vijaya *et*

al. (2018), reported that the variation in 100 berry weight might be due to experimental conditions and rootstock.

The maximum berry length observed in variety Convent Large Black (19.42 mm) followed by Sirius (17.54 mm), Cinsault (16.53 mm) and minimum berry length was observed in variety Viognier (11.27 mm). Berry length significantly affected by the kind of rootstock similar results were reported by Rizk-Alla *et al.* (2011); Joshi *et al.* (2015) berry length contributes to the yield of vines.

The maximum berry diameter was observed in variety Convent Large Black (18.75 mm) followed by Sirius (15.75 mm), Cinsault (15.50 mm) and minimum berry diameter was observed in variety Cabernet Sauvignon (10.61 mm). The difference of berry diameter might be due to varietal characters, number of berries in bunch and nutritional management. Similar results observed by Rizk-Alla *et al.* (2011) in dogridge rootstock.

The maximum number of seeds per berry was recorded in variety Viognier (3.67) followed by Cabernet France (3.00), Convent Large Black (2.67), Cabernet Sauvignon (2.67), Sangiovese (2.67), Tsimlasky Chernyi (2.67), Clariette (2.67) and the minimum number of seeds per berry was observed in Cinsault (2.00), Granache (2.00), Shiraz (2.00), Cabernet Sauvignon (2.00), Carignane (2.00), Chenin Blanc

(2.00). The maximum weight of 100 seeds were found in variety Convent Large Black (6.32) which was at par Sauvignon Blanc (5.37), Chenin Blanc (5.19) while the minimum weight of 100 seed were found in variety Granache (2.51). The difference of 100 seed weight may be due to varietal characters and climatic condition.

The rootstock and nutritional management practices directly influenced the yield of vine found by Monera *et al.* (2018). Similarly, Joshi *et al.* (2015) reported that yield/ha influenced by number of bunches per vine.

High vigour resulted in more node being increased the number of bunches per vine reported by Cirami *et al.* (1984).

Bunch weight associated with age of the plants, berry weight, berry size, number of berries per bunch and nutritional value, Similar results have also been reported by Satisha *et al.* (2010). The similar type of study carried out by Kadu (2002) in different wine varieties of grapes recorded in a range from 28.90 g to 317.0 g, and results observed by Kulkarni (2009) 97.69 to 165.88 g were also same.

The berry weight may be dependent on rootstock genotype and weather condition reported by Stevens *et al.* (2008). Berry weight was strongly affected by rootstock observed by Andrew *et al.* (2001).

Table 1: Growth parameters of different wine varieties of grapes grafted on dogridge rootstocks.

Rootstock	Varieties	Symbol	Pruning weight (kg)	Girth of rootstock (cm)	Girth of Scion (cm)	Girth of cane (cm)	Number of mature cane per vine	Number of fruitful canes per vine	Period of panicle appearance (DAP)	Date of anthesis (DAP)	Days to fruit set (DAP)	Days to fruit ripening (DAP)
110R	Cinsault	R1V1	0.39	4.20	4.67	0.73	19.44	2.78	20.08	38.86	44.42	137.17
	Convent Large Black	R1V2	1.21	4.62	5.71	0.77	30.93	12.32	18.41	32.56	40.78	128.83
	Grenache	R1V3	0.61	5.14	5.95	0.70	29.25	10.70	19.82	37.96	42.44	142.42
	Tempranillo	R1V4	1.08	4.27	4.22	0.68	17.87	15.86	18.91	34.42	41.30	141.00
	Cabernet France	R1V5	0.37	3.56	4.26	0.71	24.22	9.08	20.42	31.84	40.17	138.00
	Cabernet Sauvignon	R1V6	0.55	3.80	4.93	0.73	34.06	16.55	23.25	28.78	38.22	121.32
	Shiraz	R1V7	2.14	5.64	5.88	0.78	32.83	8.41	21.05	31.78	41.06	129.72
	Sangiovese	R1V8	0.67	4.23	4.45	0.59	26.01	1.89	23.03	32.39	38.50	140.80
	Carignane	R1V9	0.21	3.52	4.60	0.70	22.72	8.64	20.89	32.92	37.53	142.54
	Tsimlasky Chernyi	R1V10	0.16	3.94	4.35	0.67	26.28	18.70	21.55	32.60	38.32	138.90
	Chenin Blanc	R1V11	1.88	5.69	6.95	0.79	31.96	18.38	17.09	31.90	39.32	129.36
	Sauvignon Blanc	R1V12	0.87	4.83	5.78	0.74	46.42	7.84	20.13	31.47	36.69	122.29
	Clariette	R1V13	0.60	4.83	4.74	0.69	23.07	7.60	18.40	33.05	42.83	132.84
	Gargenega	R1V14	0.40	4.31	4.29	0.68	25.45	2.57	21.32	34.64	41.36	142.83
	Viognier	R1V15	0.53	4.46	3.99	0.64	17.50	14.31	21.42	27.83	36.17	138.98
	Sirius	R1V16	0.12	4.15	5.33	0.66	15.50	3.45	22.31	27.78	36.25	134.88
Dogridge	Cinsault	R2V1	0.56	4.56	5.34	0.65	26.61	3.46	23.08	40.45	47.17	139.50
	Convent Large Black	R2V2	1.90	5.19	6.29	0.80	33.35	14.93	22.16	35.37	43.00	131.40
	Grenache	R2V3	0.94	6.31	6.35	0.72	36.17	12.24	23.07	41.12	46.04	146.19
	Tempranillo	R2V4	0.64	4.55	5.04	0.63	22.18	17.24	21.59	37.21	45.10	142.73
	Cabernet France	R2V5	0.35	3.39	4.23	0.73	26.44	10.36	22.24	35.29	45.40	141.00
	Cabernet Sauvignon	R2V6	1.15	6.19	6.96	0.74	38.08	19.92	25.08	32.02	41.03	123.83
	Shiraz	R2V7	2.22	5.11	6.13	0.69	36.47	10.39	25.59	35.39	43.01	131.90
	Sangiovese	R2V8	0.53	3.83	4.57	0.69	30.55	2.95	24.32	36.26	42.14	142.97
	Carignane	R2V9	0.32	3.94	5.23	0.58	27.67	12.14	24.59	34.91	42.83	144.08
	Tsimlasky Chernyi	R2V10	0.25	3.90	4.60	0.56	30.38	23.55	25.41	35.14	42.17	141.40
	Chenin Blanc	R2V11	1.28	6.51	7.16	0.75	34.67	23.29	20.91	34.83	42.33	132.25
	Sauvignon Blanc	R2V12	0.43	5.56	6.94	0.74	48.30	11.03	23.09	36.02	40.14	125.34
	Clariette	R2V13	0.31	5.47	5.46	0.65	26.24	10.70	23.08	36.01	45.72	134.77
	Gargenega	R2V14	0.72	4.41	4.93	0.57	32.35	5.65	24.87	34.42	43.26	146.28
	Viognier	R2V15	0.43	4.61	5.33	0.58	19.64	16.88	25.25	30.61	38.94	140.80
	Sirius	R2V16	0.21	2.87	3.30	0.54	17.61	6.12	25.05	30.54	39.14	138.83
SEM±	-	0.19	0.28	0.31	0.03	2.18	0.40	0.47	0.50	0.36	0.46	
CD@0.05%	-	0.53	0.79	0.88	0.09	NS	1.14	1.32	1.42	1.01	NS	

Table 2: Yield and biochemical parameters of different wine varieties of grapes grafted on dogridge rootstocks.

Rootstocks	Varieties	Symbol	Number of bunches per vine	Bunch weight (g)	Berry weight (g)	Weight of 100 berries (g)	Berry length (mm)	Berry diameter (mm)	Number of seed per berry	Weight of 100 seeds (g)	TSS (°Brix)	Acidity %	TSS Acidity ratio
110R	Cinsault	R ₁ V ₁	6.91	60.38	1.15	176.06	15.11	14.64	2.00	3.27	12.77	0.62	20.61
	Convent Large Black	R ₁ V ₂	30.12	67.16	1.92	193.07	15.28	15.98	2.33	6.15	17.55	0.63	27.85
	Grenache	R ₁ V ₃	40.28	80.04	1.26	122.98	13.61	12.54	2.00	2.69	14.92	0.65	22.92
	Tempranillo	R ₁ V ₄	26.56	98.74	1.38	162.85	12.74	12.12	2.67	3.97	18.86	0.64	29.48
	Cabernet France	R ₁ V ₅	13.14	20.79	0.67	98.45	10.23	9.69	3.00	5.88	17.85	0.65	24.01
	Cabernet Sauvignon	R ₁ V ₆	35.03	22.76	0.51	70.85	10.47	9.56	2.00	4.29	15.75	0.62	25.54
	Shiraz	R ₁ V ₇	15.94	51.05	1.12	106.15	12.31	11.76	2.33	5.16	17.02	0.68	25.02
	Sangiovese	R ₁ V ₈	12.42	31.59	1.17	117.25	11.55	11.02	2.67	3.48	16.83	0.71	23.72
	Carignane	R ₁ V ₉	12.00	51.58	1.15	120.25	12.58	12.20	2.00	3.86	16.53	0.74	22.34
	Tsimlasky Chernyi	R ₁ V ₁₀	45.98	52.03	1.17	114.53	12.29	11.73	2.33	3.61	18.87	0.63	30.13
	Chenin Blanc	R ₁ V ₁₁	50.09	72.18	1.15	122.44	12.21	11.74	2.00	5.75	16.58	0.62	26.60
	Sauvignon Blanc	R ₁ V ₁₂	24.93	29.46	1.29	132.99	12.39	12.10	2.33	5.22	17.90	0.59	27.84
	Clariette	R ₁ V ₁₃	16.75	94.97	1.32	131.96	12.75	13.48	2.67	4.42	15.90	0.58	27.26
	Gargenega	R ₁ V ₁₄	6.14	67.38	0.91	103.18	11.85	11.49	2.33	4.60	14.94	0.60	25.05
	Viognier	R ₁ V ₁₅	40.80	37.69	1.07	110.74	9.53	9.63	3.33	3.17	15.67	0.72	21.78
	Sirius	R ₁ V ₁₆	8.16	11.99	1.02	106.76	14.19	13.89	2.00	2.53	14.57	0.73	23.38
Dogridge	Cinsault	R ₂ V ₁	8.06	63.27	1.60	187.59	16.53	15.50	2.00	3.59	15.17	0.64	23.83
	Convent Large Black	R ₂ V ₂	32.05	70.31	2.33	206.10	19.42	18.75	2.67	6.32	19.75	0.67	29.35
	Grenache	R ₂ V ₃	43.06	83.02	1.32	129.04	14.31	13.25	2.00	2.51	18.17	0.71	25.48
	Tempranillo	R ₂ V ₄	28.73	101.41	1.61	171.62	14.51	14.37	2.33	4.33	20.87	0.69	30.39
	Cabernet France	R ₂ V ₅	14.92	23.44	1.01	101.90	12.73	11.42	3.00	4.57	20.72	0.68	30.31
	Cabernet Sauvignon	R ₂ V ₆	37.11	23.13	0.69	74.67	11.40	10.61	2.67	4.75	20.67	0.69	30.11
	Shiraz	R ₂ V ₇	18.03	55.34	1.22	115.66	13.89	12.31	2.00	5.04	19.25	0.70	27.38
	Sangiovese	R ₂ V ₈	14.58	35.94	1.27	120.68	14.44	12.30	2.67	4.35	20.33	0.75	27.12
	Carignane	R ₂ V ₉	15.07	54.71	1.25	126.96	13.78	12.87	2.00	3.67	18.50	0.78	23.50
	Tsimlasky Chernyi	R ₂ V ₁₀	49.00	54.54	1.24	120.78	14.35	13.42	2.67	2.97	21.16	0.66	32.08
	Chenin Blanc	R ₂ V ₁₁	53.12	76.04	1.29	123.29	15.86	13.51	2.00	5.19	18.30	0.66	27.73
	Sauvignon Blanc	R ₂ V ₁₂	27.29	31.69	1.42	140.75	13.63	12.88	2.33	5.37	19.48	0.63	31.12
	Clariette	R ₂ V ₁₃	19.16	98.05	1.40	142.02	14.19	13.23	2.67	4.59	17.25	0.61	28.13
	Gargenega	R ₂ V ₁₄	8.38	71.26	1.09	107.67	12.67	13.18	2.00	3.61	17.28	0.62	28.04
	Viognier	R ₂ V ₁₅	43.08	41.14	1.28	111.76	11.27	11.27	3.67	5.19	18.00	0.76	23.69
	Sirius	R ₂ V ₁₆	10.33	15.21	1.13	78.26	17.54	15.75	2.00	3.40	16.25	0.77	21.19
CD @0.05%	-	NS	NS	0.18	NS	0.25	0.29	0.22	0.33	0.29	0.01	0.63	
SEM±	-		0.33	0.72	0.06	6.21	0.71	0.82	NS	NS	0.81	NS	2.62

CONCLUSIONS

It is concluded that the findings of one year trials the results of present experiment showed that the Dogridge rootstock performed well with respect to different wine varieties of grapes which were grafted over it and has been found most appropriate rootstock under the agro-climatic conditions of Malwa Plateau region for screening the growth, yield, quality and organoleptic parameters of the fruits. The performance of varieties raised on Dogridge rootstock was promising.

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Conflict of Interest. It is declared that there is no conflict of interest between the Authors of this paper.

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