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C Jayalakshmi
Department of Fruit Science, HC & RI, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

S Saraswathy
Grapes Research Station, Tamil Nadu Agricultural University, Anaimalayanpatty, Rayappanpatty, Theni, Tamil Nadu, India

A Subbiah
Grapes Research Station, Tamil Nadu Agricultural University, Anaimalayanpatty, Theni, Tamil Nadu, India

K Ilamurugu
Department of Agricultural Microbiology, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

D Balachandar
Department of Agricultural Microbiology, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

Correspondence
S Saraswathy
Grapes Research Station, Tamil Nadu Agricultural University, Anaimalayanpatty, Rayappanpatty, Theni, Tamil Nadu, India

Evaluation of wine varieties of grapes (*Vitis vinifera* L.) during winter pruning under Cumbum valley condition of Tamil Nadu

C Jayalakshmi, S Saraswathy, A Subbiah, K Ilamurugu and D Balachandar

Abstract
An experiment was conducted in order to study the performance of wine varieties of grapes during winter pruning in the year 2017-2018 at Grapes Research Station, TNAU, Anaimalayanpatty, Theni, Tamil Nadu. The experiment was conducted in Randomized Block Design with three replications. The vines were trained on bower system with spacing of 3.0 m x 2.0 m and pruned during December. Of ten wine grapes varieties *viz.,* (Cabernet Sauvignon, Zinfandel, Shiraz, Merlot, Manjiri Medika, Muscat Hamburg, Chenin Blanc, Sauvignon Blanc, Symphony and Viognier) evaluated, the variety Manjiri Medika recorded the highest values for pruning mass (4.28 kg vine^{-1}), shoot length (134.80 cm), number of canes vine^{-1} (78.78), cane diameter (22.00 mm), number of berries bunch^{-1} (278.54), individual bunch weight (258.33 g) and yield (8.12 kg vine^{-1}). The variety Muscat Hamburg had registered earliness in bud sprouting (13.74 days) with shorter internodal length (2.56 cm) and highest individual berry weight (3.94 g). The maximum number of internodes (13.29) was recorded in the variety Zinfandel. Number of bunches vine^{-1} (37.60) was maximum in the variety Chenin Blanc.

Keywords: Winter pruning, growth, yield and varieties

Introduction
Grapes (*Vitis vinifera* L.) is one of the most delicious, refreshing and nourishing fruits of the world and it belongs to the family Vitaceae and is a fairly good source of minerals like Ca, P, and Fe, vitamins like B_1 and B_2 and polyphenolic antioxidants. Grapes berries are attractive for their unique colour, flavor and are utilized in many different ways, so its cultivation is becoming more popular. Coloured grapes are very rich in antioxidants and beneficial for high cholesterol patients. It is consumed as table, raisins and processed into wines and juices. Grapes juice acts as laxative and stimulant to kidney.

Most of the grapes cultivars grown in India are used for table purpose and the remarkable success in exploitation of vigour and fruitfulness are achieved in table grapes but there is a lack of research in development of varieties for the purpose of wine production in grapes. Due to limited domestic consumption of wine and non-availability of standard wine varieties to produce good quality wine of international standards, much emphasis was not given for research on wine production in India (Shikhamany, 2001) [11]. In order to meet the international standard in terms of yield and quality in wine grapes varieties become very much essential. However, the yield and quality of grapes differ with variety and location of cultivation. Hence, the current research work was initiated to evaluate ten different wine varieties of grapes during winter pruning season with a main objective to find out the best variety with high yield and quality suitable for Cumbum Valley condition of Tamil Nadu.

Materials and methods
An investigation was carried out with ten wine varieties to study their performance in terms of growth, yield and quality attributes in grapes at Grapes Research Station, TNAU, Anaimalayanpatty, Theni during 2017-2018. The wine varieties of grapes were established on dogridge rootstock using *in situ* grafting method the varieties included for study are Cabernet Sauvignon, Zinfandel, Shiraz, Merlot, Manjiri Medika, Muscat Hamburg, Chenin Blanc, Sauvignon Blanc, Symphony and Viognier. The vines were trained to Bower system by adopting a spacing of 3.0 m x 2.0 m. The design adopted for study is Randomized Block Design with three replications. The winter pruning was carried out during the first week of December. The spur pruning with 4-5 buds on short canes was practiced. The standard package of practices and viticulture operations were followed as per the recommendation of

National Research Center for Grapes. The weather parameter recorded during the cropping period is furnished in Table. 3. Observations were made on after pruning mass (kg vine^{-1}), number of days taken for bud sprouting, shoot length (cm), internodal length (cm), number of internodes, number of canes vine^{-1}, cane diameter (mm), number of berries bunch^{-1}, individual berry weight (g), individual bunch weight (g), number of bunches vine^{-1}, yield (kg vine^{-1}. The data collected on growth and yield attributes were subjected to statistical scrutiny as per the methods suggested by Panse and Sukhatme (1985) [5].

Results and discussion

Data are presented in Table 1. The results of the study revealed that maximum pruning mass was recorded in Manjiri Medika (4.28 kg vine^{-1}), while the minimum was registered in Zinfandel (1.32 kg vine^{-1}). The difference in the pruning weight among the varieties may be attributed to the difference in the vigour of vine resulting from assimilation of carbohydrates due to more number of canes, number of leaves produced and other growth parameters results in more dry matter production. High pruning weight can be attributed to high number of canes per vine as recorded in this experiment. Temperature also plays a major role in pruning weight along with genetic factors Satisha and Shikhamany, 1999 [9].

Muscat Hamburg recorded an early bud sprouting (13.74 days), while in Merlot (22.88 days) delayed bud sprouting was observed. Bud burst is a varietal character as it marks the beginning of seasonal growth and it is strongly influenced by temperature. The data on the parameter clearly indicates that prevailing temperature after pruning effects the time required for bud break in the same variety and the influence of temperature is more than that of variety. Italia at Hyderabad took more than 15 days for bud break and at Venezuela another tropical country, took less than 12 days for bud break (Pina and Bautista, 2006) [6]. Further, lowest number of days taken for bud break was registered during the first year of studies over the second year. This may be due to ideal climatic conditions prevailing during the first year of study i.e. warmer climatic conditions observed during the bud break period and also may be due to consecutive higher levels of stored carbohydrate reserves.

The grapes variety Manjiri Medika recorded maximum shoot length (134.80 cm) whereas, the minimum shoot length (67.46 cm) was registered in Cabernet Sauvignon. Shoot growth is strongly influenced by temperature, soil moisture, grapevine nutrient and reserve status, pruning level, plant age or genetic characteristics of the rootstock or scion (Keller, 2010) [4].

Manjiri Medika recorded shorter internodal length (2.56 cm), while Merlot (4.97) registered the longer internodal length. Mostly shorter internodes accumulate higher carbohydrates food reserves, which are pre requisite for flower bud initiation (Somkuwar and Ramteke, 2008) [12].

The variety Zinfandel recorded maximum number of internodes (13.29), while the minimum number of internodes (10.59) was recorded in Cabernet Sauvignon. This difference in the number of internodes among the varieties may be due to the canopy size, number of leaves which were responsible for photosynthetic activity of the vine (Richard *et al*. 2000).

The highest number of canes vine^{-1} was also registered in the variety Manjiri Medika (78.78) and least in Viognier (30.74). Number of canes per vine serves as the base for determining the vine vigour which ultimately pre disposes the fruiting spur and renewal spur production. These differences in the number of canes may be due to the differences in vigour which might be due to genotypes expression of the varieties (Ratnacharyulu, 2010) [7].

The variety Manjiri Medika recorded well pronounced cane thickness (22.00 mm) while thinner canes (15.93 mm) was observed in Viognier. In a well maintained vineyard, the vines with thicker canes and shorter internodes are known to bear a good crop as it is reflecting an optimum vigour in the vines. More photosynthates were partitioned rigorously during peak vegetative phase. This might have deposited more food material at basal portion of the shoot. Thus, the cane diameter was more at lower buds and was less at distal end buds (Chalak *et al.* 2012) [1]. This might be positively correlated for fruit bud initiation in grapes.

The data recorded on yield attributing parameters are presented in the Table 2. The maximum number of berries bunch^{-1} (278.54) was recorded in Manjiri Medika. The minimum number of berries bunch^{-1} (43.65) was recorded in Zinfandel. The variation in the berry weight might be due to variation in the diameter of the berries and also due to number of berries per bunch (Thakur *et al.,* 2008) [13]. Reduction in number of berries per bunch there will be increased berry length and diameter due to efficient utilization of nutrients into fruiting. The reduction of berry weight in Tempranillo may be due to competition for metabolites with greater number of berries per bunch.

Muscat Hamburg recorded maximum weight of berries (3.94 g), followed by Manjiri Medika (2.84 g). Minimum individual berry weight was recorded by Viognier (1.31 g). The variation in the berry weight might be dut to the difference in diameter and length of berries was reported by Richard *et al.* (1999) [8].

The variety Manjiri Medika had recorded higher individual bunch weight (258.33 g) and minimum (48.60 g) was recorded in the variety Cabernet Sauvignon. Bunch weight is an important yield attribute. The differences in the bunch weight in different varieties may be attributed to inherent genetic character of the variety, difference in number of canes, number of berries per bunch and berry size and also very according to vine canopy size where the high bunch weight was observed in the varieties which had large canopy size (Havinal *et al.,* 2008) [3].

The number of bunches vine^{-1} (37.60) was found to be maximum in the variety Chenin Blanc and minimum number of bunches vine^{-1} (15.19) was recorded in Zinfandel. The bunch characteristics have significant correlation with the fruit yield. Number of bunches per vine differs significantly with the variety, nutrition of the vine and probable site of growing. The productivity of bunches, bunch weight and length appears to be a genetic phenomenon, but the climate and soil nutrient status also contribute to certain extent. This difference in the number of bunches per vine may be attributed to varietal character due to more number of canes or immaturity of canes in different varieties. Similar line of work in grapes was reported by Havinal (2007) [2].

The maximum fruit yield (8.12 kg vine^{-1}) was recorded in Manjiri Medika. The minimum fruit yield (1.36 kg vine^{-1}) was recorded in Cabernet Sauvignon. The difference in the yield per vine in different grape cultivars might be due to the differences in weight of the bunch, number of bunches, weight of the berries and age of the vines besides their successful adoption to the varying agro-climatic conditions under which they are cultivated (Havinal *et al.,* 2008) [3].

Thus it can be concluded that the variety Manjiri Medika recorded the higher pruning mass (4.28 kg vine^{-1}), shoot length (134.80 cm), number of canes vine^{-1} (78.78), cane

diameter (22.00 mm), number of berries bunch^{-1} (278.54), individual bunch weight (258.33 g), yield (8.12 kg vine^{-1}). The variety Muscat Hamburg had recorded earliness in bud sprouting (13.74 days) with shorter internodal length (2.56 cm) and highest individual berry weight (3.94 g). The maximum number of internodes (13.29) was recorded in the variety Zinfandel. Number of bunches vine^{-1} (37.60) was maximum in the variety Chenin Blanc. Whereas the lowest values for pruning mass (1.32 kg vine^{-1}) and number of bunches vine^{-1} (15.19) in Zinfandel, shoot length (67.46 cm), number of internodes (10.59), bunch weight (48.60 g) and yield (1.36 kg vine^{-1}) in Cabernet Sauvignon, number of cans vine^{-1} (30.74), cane diameter (15.93 mm) and individual berry weight (1.31 g) in Viognier, Number of berries bunch^{-1} (43.65) in Manjiri Medika, and maximum internodal length (4.67 cm), bud sprouting (21.96 days) in Merlot were registered accordingly.

Table 1: Evaluation of wine grapes (*Vitis vinifera* L.). varieties on growth attributes

Treatments / Varieties	Pruning mass (kg vine^{-1})	Number of days taken for bud sprouting	Shoot length (cm)	Internodal length (cm)	Number of internodes	Number of canes vine^{-1}	Cane diameter (mm)
Cabernet Sauvignon	1.54	19.50	67.46	3.99	10.59	44.08	17.77
Zinfandel	1.32	21.96	75.55	4.11	13.29	50.21	17.07
Shiraz	3.12	19.19	78.24	2.84	12.54	59.21	18.80
Merlot	1.90	22.88	71.61	4.97	11.49	39.82	18.37
Manjiri Medika	4.28	16.02	134.80	3.12	10.70	78.78	22.00
Muscat Hamburg	3.78	13.74	104.00	2.56	11.19	65.48	20.58
Chenin Blanc	2.96	15.14	83.01	2.77	11.53	51.20	18.23
Sauvignon Blanc	2.61	17.95	79.32	2.90	11.15	39.03	16.97
Symphony	1.99	18.49	73.85	3.28	11.36	35.56	16.57
Viognier	1.34	20.98	71.99	2.79	10.99	30.74	15.93
S.Ed	0.48	2.01	8.34	0.64	0.83	5.58	1.86
CD (0.05%)	1.08	4.18	16.87	1.43	1.67	11.29	3.73

Table 2: Evaluation of wine grapes (*Vitis vinifera* L.). varieties on yield attributes

Treatments / Varieties	Number of berries bunch^{-1}	Individual berry weight (g)	Individual bunch weight (g)	Number of bunches vine^{-1}	Yield (kg vine^{-1})
Cabernet Sauvignon	72.68	1.66	48.60	27.94	1.36
Zinfandel	43.65	2.52	100.24	15.19	1.54
Shiraz	183.09	2.14	161.09	35.79	5.77
Merlot	85.59	2.35	131.30	15.81	2.11
Manjiri Medika	278.54	2.84	258.33	31.34	8.12
Muscat Hamburg	269.75	3.94	252.10	23.39	5.86
Chenin Blanc	99.22	2.04	128.54	37.60	4.86
Sauvignon Blanc	53.47	1.99	89.40	30.46	2.74
Symphony	115.27	2.54	157.22	29.99	4.72
Viognier	95.33	1.31	72.11	21.62	1.56
S.Ed	3.69	0.27	2.74	2.47	0.38
CD (0.05%)	7.53	0.58	5.63	5.02	0.75

Table 3: Monthly meteorological data for the experimental period (2017-18) recorded at the Grapes Research Station, Anaimalayanpatty

Month	Temperature (^{0}C)		Relative Humidity (%)	Rainfall (mm)
	Maximum	Minimum		
May 2017	34.80	23.30	74.64	97
Jun 2017	31.20	23.60	73.03	44
Jul 2017	31.70	24.30	69.67	28
Aug 2017	31.60	23.20	68.93	60
Sep 2017	30.70	22.50	68.03	214
Oct 2017	31.40	22.30	71.87	113
Nov2017	30.00	21.20	75.80	233
Dec 2017	28.80	19.60	74.29	64
Jan 2018	30.60	16.80	76.83	2
Feb 2018	32.00	17.30	73.17	21
Mar 2018	33.19	21.32	76.77	22
Apr 2018	35.25	22.58	76.03	25
May 2018	33.19	23.09	79.09	181

Reference

1. Chalak SU, Kulkarni SS, Kishrsagar AV, Nimbalkar CA. Pruning studies in some white wine grape varieties for yield and yield contributing parameters under Western Maharashtra conditions. Asian J Hort. 2012; 7(2):1468-1472.
2. Havinal MN. Screening of wine grape varieties for growth, yield and fruit quality parameters. Msc. Thesis, Dept. of Hort, Mahatma Phule krishi vidyapeeth, Rahuri, Maharashtra, 2007.

3. Havinal MN, Tambe TB, Patil SP. Comparative studies on vine vigour and fruitfulness of grape wine varieties. Asian J Hort. 2008; 3(1):180-182.
4. Keller M. The science of grapevines: anatomy and physiology, 2010.
5. Panse VS, Sukhatme PV. Statistical methods for agricultural workers (4th Ed.). Indian Council of Agricultural Research, New Delhi, 1985, pp.70-72.
6. Pina S, Bautista D. Evaluation of vegetative growth on several table grape cultivars under semiarid tropic conditions in Venezuela. Rev. Fac. Agron. 2006; 23:402-413.
7. Ratnacharyulu SV. Evaluation of coloured grapes varieties for yield, juice recovery and quality. M.Sc., Thesis. Grapes Research Station, Andhra Pradesh Horticultural University, Rajendranagar, Hyderabad, A. P, 2010.
8. Richard C, Ewart A, Furkaliev J. The viticultural and morphological evaluation of Arinarnoa, Arriloba and Barbera. Aus. Grapes Grower Wine Maker, 1999, 60-64.
9. Satisha J, Shikhamany SD. Annual Report. National Research Centre for Grapes, Pune, 1999, pp.8.
10. Shanmugavelu KG. Vitculture in India. Agro-Botanical Publ. Bikaner, 1989, 84-90.
11. Shikhamany SD. Hand book of Horticulture. ICAR Publication. New Delhi, 2001, 182-188.
12. Somkuwar RG, Ramteke SD. Effect of shoot orientation on growth, biochemical changes and fruitfulness in grape (*Vitis vinifera* L.) variety Thompson Seedless. J. Plant Sci. 2008; 3(2):182-187.
13. Thakur A, Arora NK, Singh SP. Evaluation of some grape varieties in the Arid Irrigated region of North West India. Acta Hort. 2008; 785:79-83.