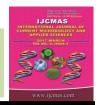


International Journal of Current Microbiology and Applied Sciences ISSN: 2319-7706 Volume 6 Number 3 (2017) pp. 1814-1826 Journal homepage: http://www.ijcmas.com



Original Research Article

https://doi.org/10.20546/ijcmas.2017.603.207

Effect of Pruning Severity and Season for Yield in Grapes (Vitis vinifera L.) Variety Muscat Hamburg

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ABSTRACT

Keywords

Grapes, Pruning, Trunk and cane girth, Internodal length, Number of canes, Yield.

Article Info

Accepted: 24 February 2017 Available Online: 10 March 2017 Grape vine originated in Armenia as one of the temperate fruit crop got acclimatized under tropical condition. A field investigation on standardization of pruning severity and season for yield in grape variety Muscat Hamburg was carried out during the period from 2014 to 2015 in the farmer's field, M.S.S. Farms, Kamayagoundanpatty, Cumbum Valley, Theni district in Tamil Nadu. The field experiment was undertaken by adopting Randomized Block Design with eleven treatments replicated thrice. The details of the severities on pruning treatments were: Pruning at 3, 5, 7, 9 bud levels, forward pruning and cane pruning during summer and rainy seasons. The results of the pruning experiment revealed that treatments, T₂ (Pruning at 3 bud level) and T₄ (forward pruning) recorded the highest trunk girth (4.65 and 4.40 cm). During both the season the treatment T₂ and T₁ (Pruning at 3 bud level) recorded the highest cane girth (0.64 and 0.56 cm) and internodal length (5.53 and 6.17 cm). The highest numbers of canes per vine (44.03 and 46.21), bud sprouting (16.00 and 16.09 days) and leaf area (235.20 and 239.27 cm²) were recorded in the treatment T₈ and T₇ (Pruning at 9 bud level) in summer and rainy season crops. The severities of pruning had exhibited pronounced effect on yield per vine. The treatments T₇ and T₈ (Forward pruning) registered the highest yield vine⁻¹ (13.60 and 17.92 kg yield⁻¹) during summer and rainy season crops.

Introduction

The grape (Vitis vinifera L.) is one of the table delicacies in India. It belongs to the family Vitaceae. It is one of the most delicious, refreshing and nourishing fruits of the world. It is fairly good source of minerals like calcium, phosphorus and iron and vitamins like B₁ and B₂. Its juice is a mild laxative and acts as a stimulant to kidneys. Viticulture in India is considered to be one of the most remunerative farming enterprises due to high monetary returns. Grape has been originally evolved as temperate fruit in

Mediterranean region. Later on domesticated in to Armenia and introduced in tropical countries like India during Mogul dynasty for growing it in backyards and also during colonial rule. Being a temperate crop, it exhibits distinct bud dormancy and enter into rest during winter season. Pruning is the most important operation in grape and its standardization is of utmost important in determining fruitfulness, yield and quality. Pruning practices adopted in the vineyard is largely dependent on vine growing

environment, variety and season. Further, pruning largely not only influences the productivity in terms of fruitfulness of a particular variety but also the quality of grape *viz.*, berry size, TSS and sugar.

At present in India, grape is grown in an area of about 1, 18, 700 ha with an annual production of 25.85 lakh MT and a productivity of 21.80 tonnes ha⁻¹ (Anon., 2015). The major grape growing states of India are Maharashtra, Karnataka, Telaugana, Andhra Pradesh and Tamil Nadu. Grape cultivation offers a great economic potential due to its higher yield and excellent monetary returns owing to the export to Gulf, European countries and some extent to the West Asian countries. India annually exports 1, 92,615 MT of grapes with a foreign exchange value of 1,616.45 crore rupees (Anon., 2015). In Tamil Nadu, grapevine is grown in an area of 2,800 ha with a production of 47.70 MT ha⁻¹ and productivity of 16.80 tonnes ha⁻¹ (Anon., grapevine is traditionally 2015). The cultivated in Theni, Dindigul and Coimbatore districts of Tamil Nadu. Owing to the salubrious climatic conditions prevailing in the Cumbum valley of Theni district, the grape vines are amenable for staggered pruning and continuous cropping in such a way for harvesting of five crops in two years which is an unique feature in Viticulture that cannot be observed anywhere in the world.

Majority of the grape growing area in Tamil Nadu is occupied by the seeded grape variety Muscat Hamburg (*Panneer* or *Gulabi*). The seedless grape varieties *viz.*, Thompson Seedless, Tas-A-Ganesh, Sonaka and Sharad Seedless are also cultivated in a sizable area in Tamil Nadu. New seedless varieties like Fantasy Seedless, Crimson Seedless and seeded variety like Red Globe are also becoming popular in Tamil Nadu. The grape variety Muscat Hamburg (Syn. Panneer Dhiraksha or Gulabi) is a hardy variety that can thrive very well under peninsular Indian

tropical climate conditions especially prevailing in the grape growing tracts of Tamil Nadu. This is a highly fruitful variety with moderate vine vigour. Further there is no extremity of winter experienced in grape growing tracts of Tamil Nadu. Hence, the vines won't undergo dormancy and put forth continuous growth and thus favours staggered pruning and continuous cropping. Bunches are medium in size and compact, berries are small in size with marked deep purple skin colour, spherical in shape and seeded. The berries are sweet in taste with a TSS of 16- 18^{0} Brix.

Cane pruning is especially appropriate for cultivars producing small clusters that need the retention of extra buds. Long canes are profitable in order to enhance vine capacity by retaining more apically positioned buds, which are generally more fruitful than basal. Thus, cane pruning is particularly important for varieties that produce more basal buds. Extra care must be taken in selection of canes in such a way that posses more basal buds which are highly fruitful than normal canes. The lengthier could result in uneven short development owing to apical dominance (Jackson, 2008).

At present the grape growers of Tamil Nadu are found it very difficult for adopting scientific pruning practices based on fruitfulness over season and its interaction. Further, the grape vines putforth continuous vine growth without a distinct rest period under tropical peninsular climatic conditions results in difference on productivity. In keeping view of above points, the present study was undertaken in grape variety Muscat Hamburg.

Materials and Methods

The present investigation grape field trail was conducted during the year 2014-15 at the farmer field, M.S.S. Farms,

Kamayagoundanpatty, Cumbum Valley of Theni District, Tamil Nadu. The double pruning followed during was winter (December - January months) and summer season (May - June months) in grape variety Thompson Seedless so as to harvest the double crop during summer and rainy season respectively. The field experiment was undertaken by adopting Randomized Block Design with eleven treatments replicated thrice. The pruning treatments were imposed on ten year old vines of Muscat Hamburg with by adopting square system of planting and the vines were trained over pandal (bower) system. The selected vines were planted at a spacing of 3 x 2 m with uniformly maintained vine canopy. Data were collected from five randomly selected grape vines.

The details of the severities on pruning treatments were: T₁ - Pruning at 3 bud level in June and forward pruning in December, T₂ -Pruning at 3 bud level in December and forward pruning in June, T₃ - Pruning at 5 bud level in June and forward pruning in December, T₄ - Pruning at 5 bud level in December and forward pruning in June, T₅ -Pruning at 7 bud level in June and forward pruning in December, T₆ - Pruning at 7 bud level in December and forward pruning in June, T₇ - Pruning at 9 bud level in June and forward pruning in December, T₈ - Pruning at 9 bud level in December and forward pruning in June, T₉ - Pruning at 7 bud level in June and cane pruning at base in December, T₁₀ -Pruning at 7 bud level in December and cane pruning in June and T₁₁ - Cane pruning at base both during December and June months.

Method of pruning

The method of pruning consisted of removal of not only the past season's shoots at the level indicated but also the removal of unwanted old woods, dried, dead shoots and unthrifty growth during pruning.

Time of pruning

Winter pruning

Vines were pruned during the last fortnight of December, 2013 and fruits were harvested during the months of April, 2014.

Summer pruning

Vines were pruned during the last fortnight of May, 2014 and fruits were harvested in the month of September - October, 2014.

Statistical analysis

The data collected on growth, yield and quality attributes were subjected to statistical scrutiny as per the methods suggested by Panse and Sukhatme (1985). The significance of the mean difference between the treatments was determined by computing the standard error and critical difference.

Results and Discussion

Pruning is one of the important cultural operations in grape and standardization of pruning levels for any grape cultivar is of utmost importance for obtaining optimum yield and quality. In grape variety Muscat Hamburg, the highest trunk girth was recorded in the treatment T2 (Pruning at 3 bud levels) during summer and rainy seasons (Table 1). During crop growth it was increased, which might be due to better absorption and accumulation of nutrient in the plant tissue. Similar results were obtained by Srivastava and Soni (1989), Chitkara et al., (1972) and Gopalaswamy and Rao (1972). Number of canes per vine serves as the base for determining the vine vigour and producing in the term of fruiting spur and renewal spur production. Among the different pruning severity imposed, the maximum number of canes per vine formed in the treatments T7

and T8 (Forward pruning) in grape var. Muscat Hamburg during summer and rainy seasons (Table 2).

Another major criterion to judge the vigour of grape vine is the cane girth as well as internodal length. In a well maintained vineyard, the vines with thicker canes and shorter internodes are known to bear a good bunch as it is reflecting an optimum vigour in vines Ghugare and Mukherjee, (1967); Rangareddy (1996), Somkuwar and Ramteke (2006) and Chalak (2008). In the present study, it was evident that in the treatment T2 and T1 (Pruning at 3 bud levels) had high girth of canes in both the pruning seasons leading to good crops (Table 3). This could be become of the high fruitfulness as a result of high cane girth and shorter internode for better accumulation of carbohydrates food reserves, which are pre requires for flower bud initiation, differentiation and delay sprout in grapes. Further it would also positively influence the leaf area and better absorption and accumulation of nutrient in the plant tissue. Similar results were obtained by Srivastava and Soni (1989), Chitkara et al., (1972) and Gopalaswamy and Rao (1972). However, the varietal variations have also been considered in deciding upon optimum cane girth. Besides, the internodal length in treatments T7 and T8 in grape var. Muscat Hamburg fairly shorter than others (Table 4). Mullins et al., (1992) pointed out a direct relationship between the internodal length and shoot growth.

The bud load on grape vine has a profound role on bud sprouting. Bud burst marks the beginning of seasonal growth and reproductive behaviour in grape. The observation on number of days taken for bud sprout after pruning in grape var. Muscat Hamburg found to be the earliest in the treatment T8 and T7 during summer and rainy

seasons (Table 5) in the present investigation may be due to quicker release of dormant buds by removal of apical dominance by pruning. With less number of buds available on the shoot, the reserves directed from trunk could have contributed to early release of buds. This kind of similar phenomena was reported by earlier workers also (Godara *et al.*, (1977); Kumar and Tomer (1978), Palma *et al.*, (2000), Chalak (2008), Kohal *et al.*, (2013) and Abdel Mohsen (2013).

Physiologically, leaf area is found to largely influence the photosynthetic efficiency and transport most of the photosynthates required the development of growth for development activity of reproductive structures. Hence, synthesize the estimation of leaf area is an essential growth process and is often important vegetative and physiology in predisposing the growth and development, which largely influence the crop productivity. The important growth parameter leaf area was observed during both the seasons indicated higher leaf area in rainy and summer seasons, in the treatments T8 and T7 (Pruning at 9 bud level), in variety Muscat Hamburg (Table 6). The findings of the present investigation are in consonance with Edson et al., (1993); Gicheol and Chool (1999), Chougule (2004) and Brandon et al., (2012).

Pruning severity and cane pruning the latter has uniformly been shown to favour yield and the former lower the yield. Yield is the manifestation of morphological, growth, physiological and biochemical traits (Nagajothi and Jeyakumar, 2014). The severity of pruning had pronounced effect on yield per vine in both seasons in a year. In the present investigation, in the treatment T7 and T8 registered the highest yield per vine in grape var. Muscat Hamburg during summer and rainy seasons (Table 7).

Table.1 Effect of season and severity of pruning on trunk girth (cm) in grape variety Muscat Hamburg

	Trunk girth (cm)	
Treatments	Summer season crop	Rainy season crop
T_1	4.31	3.91
T_2	4.65	4.25
T_3	4.39	4.04
T_4	4.47	4.40
T_5	3.97	3.98
T_6	4.42	4.23
T_7	3.68	3.85
T_8	4.07	3.90
T_9	4.28	3.57
T_{10}	4.21	4.01
T_{11}	4.30	4.05
SE (d)	0.12	0.11
CD (0.05)	0.26	0.24

Table.2 Effect of season and severity of pruning on number of canes per vine in grape variety Muscat Hamburg

	Number of canes	
Treatments	Summer season crop	Rainy season crop
T_1	39.31	42.82
T_2	42.61	40.13
T_3	38.65	45.00
T_4	43.20	41.03
T_5	38.03	43.47
T_6	43.53	40.01
T_7	38.52	46.21
T_8	44.03	41.12
T_9	41.38	42.52
T_{10}	42.00	42.59
T_{11}	37.20	38.32
SE (d)	1.17	1.21
CD (0.05)	2.51	2.60

Table.3 Effect of season and severity of pruning on cane girth (cm) in grape variety Muscat Hamburg

	Cane girth (cm)	
Treatments	Summer season crop	Rainy season crop
T_1	0.60	0.56
T_2	0.64	0.54
T_3	0.58	0.55
T_4	0.61	0.53
T_5	0.55	0.51
T_6	0.56	0.48
T_7	0.50	0.46
T_8	0.53	0.43
T_9	0.56	0.50
T_{10}	0.54	0.44
T_{11}	0.57	0.52
SE (d)	0.02	0.01
CD(0.05)	0.04	0.03

Table.4 Effect of season and severity of pruning on internodal length (cm) in grape variety Muscat Hamburg

	Internodal length (cm)	
Treatments	Summer season crop	Rainy season crop
T_1	5.07	6.17
T_2	5.53	5.31
T_3	4.87	5.65
T_4	5.32	5.13
T_5	3.59	4.18
T_6	3.95	3.83
T_7	5.12	5.60
T_8	5.31	5.34
T_9	4.23	4.75
T_{10}	4.49	4.44
T_{11}	4.50	4.77
SE (d)	0.14	0.15
CD (0.05)	0.29	0.31

Table.5 Effect of season and severity of pruning on bud sprouting (days) in grape variety Muscat Hamburg

	Bud sprouting (days)	
Treatments	Summer season crop	Rainy season crop
T_1	18.40	18.04
T_2	19.20	19.00
T_3	18.20	19.73
T_4	19.20	18.75
T_5	17.22	17.82
T_6	16.30	17.20
T_7	17.02	16.09
T_8	16.00	17.46
T_9	16.60	19.65
T_{10}	17.70	18.52
T_{11}	20.22	21.02
SE (d)	0.50	0.53
CD (0.05)	1.08	1.13

Table.6 Effect of season and severity of pruning on Leaf area (cm2) in grape variety Muscat Hamburg

	Leaf area (cm²)	
Treatments	Summer season crop	Rainy season crop
T_1	174.48	177.32
T_2	175.72	180.00
T_3	179.10	222.60
T_4	205.32	184.48
T_5	183.26	230.13
T_6	229.12	208.56
T_7	202.45	239.27
T_8	235.20	207.59
T_9	183.28	187.44
T_{10}	168.21	167.49
T_{11}	119.20	121.29
SE (d)	5.52	5.69
CD(0.05)	11.84	12.21

Table.7 Effect of season and severity of pruning on yield per vine (kg) in grape variety Muscat Hamburg

	Yield per v	vine (kg)
Treatments	Summer season crop	Rainy season crop
T_1	11.78	10.87
T_2	9.34	13.01
T_3	11.94	12.14
T_4	10.12	15.19
T_5	13.12	13.29
T_6	12.01	16.76
T_7	13.60	13.92
T_8	11.19	17.92
T_9	9.65	10.01
T_{10}	7.03	10.24
T_{11}	7.25	9.15
SE (d)	0.31	0.38
CD (0.05)	0.66	0.82

Fig.1 Effect of season and severity of pruning on trunk girth (cm) in grape variety Muscat Hamburg

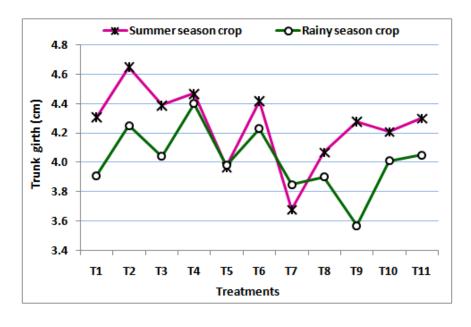


Fig.2 Effect of season and severity of pruning on number of canes per vine in grape variety Muscat Hamburg

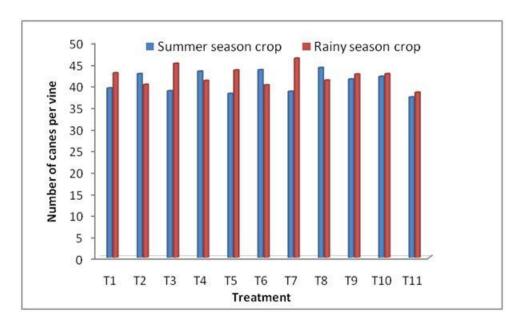


Fig.3 Effect of season and severity of pruning on cane girth (cm) in grape variety Muscat Hamburg

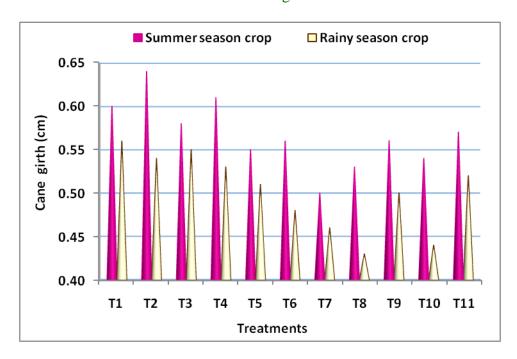


Fig.4 Effect of season and severity of pruning on internodal length (cm) in grape variety Muscat Hamburg

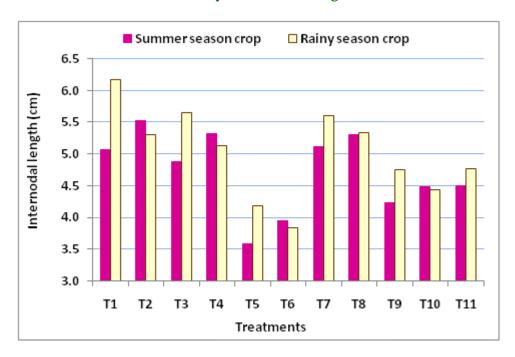


Fig.5 Effect of season and severity of pruning on bud sprouting (days) in grape variety Muscat Hamburg

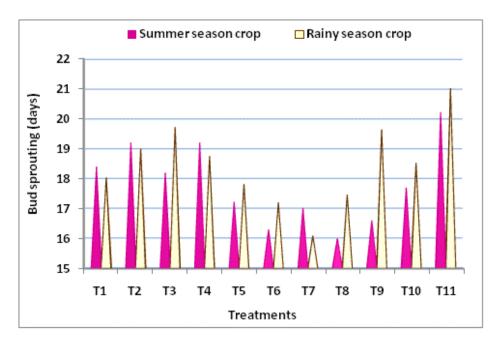


Fig.6 Effect of season and severity of pruning on Leaf area (cm2) in grape variety Muscat Hamburg

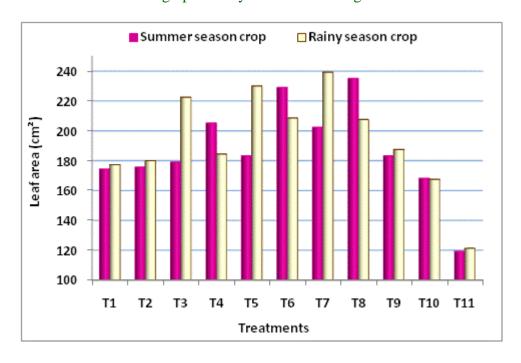
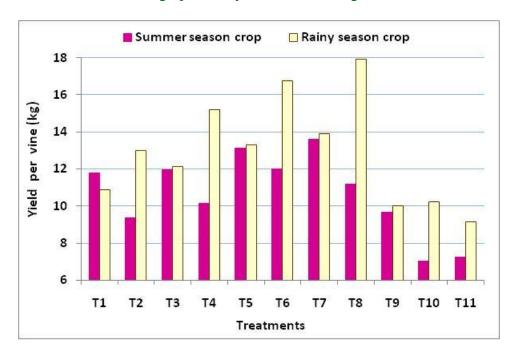


Fig.7 Effect of season and severity of pruning on yield per vine (kg) in grape variety Muscat Hamburg



In the present study, it was found that the shortest pruning with two buds was considerably less productive. The increase in yield per vine might be due to adequate number of canes; increase in both number of bunches per vine, which received sufficient supply of food materials like carbohydrates, protein, minerals and also the individual bunch weight. The results obtained in the present investigation are in corroboration with the findings of Jackson *et al.*, (1984); Dhillon (2004), Fawzi *et al.*, (2010) and Kohale *et al.*, (2013).

In conclusion the pruning severity maintained at 3 bud level registered higher value for the vegetative parameters. Whereas the pruning severity followed at higher bud level from 7th to 9th node was found to be best for enhancing the yield per vine in grape variety Muscat Hamburg during summer and rainy season crops.

References

- Abdel-Mohsen, M.A. 2013. Application of various pruning treatments for improving productivity and fruit quality of Crimson Seedless grapevine. World J. of Agri. Sci., 9 (5): 377 382.
- Anonymous. 2015. Grapes area, production, productivity and export. (National Horticulture Data Base), **National** Horticulture Board, Ministry Agriculture and Farmer Welfare. Gurgaon, Haryana.
- Brandon, S., D.D. Archbold and Kurtural, S.K. 2012. Effects of balanced pruning severity on Traminette (*Vitis spp.*) in a warm climate. *American J. Enol. & Viticulture*, 63(2): 284 290.
- Chalak, S.U. 2008. Effect of different levels of pruning on various wine grape varieties for yield and quality. M.Sc., (Hort.) Thesis submitted to MPKV, Rahuri.
- Chitkara, S.D., J.P. Singh and Bakshi, J.C. 1972. Influence of different levels of nitrogen on vigour, shoot composition relationship with fruit but differentiation, yield and quality of fruit in Thompson Seedless grape (*Vitis vinifera* L.). *Haryana J. Hort. Sci.*, 1(1/4): 1-11.
- Chougule, R.A. 2004. Studies on sub-cane

- pruning and cycocel application in relation to the canopy management in grapes. M.Sc., (Hort.) Thesis submitted to MPKV, Rahuri.
- Dhillon, W.S. 2004. Standardization of pruning intensity in grape cv. Perlette. *Har. J. Hort. Sci.*, 33(3-4): 172-174.
- Edson, C.E., G.S. Howell and Flore, J.A. 1993. Influence of crop load on photosynthesis and dry matter partitioning of Seyval grapevines. *American J. Enol. Viticulture*, 44(22): 139 147.
- Fawzi, M.I.F., M.F.M. Shahin and Kandil, E.A. 2010. Effect of bud load on bud behavior, yield, cluster characteristics and some biochemical contents of the cane of Crimson Seedless grapevines. *J. American Hort. Sci.*, 6(12): 187 194.
- Ghugare, J. B., and Mukherjee, S. K. 1967. The relationship between diameter of cane and behavior of fruiting in Pusa Seedless. *Indian J. Hort.*, 25(10): 163 169.
- Gicheol, S., and Chool, K. K. 1999. Effect of pruning and debudding on the growth, nutrition and berry setting of *Vitis labrusca* B. cv. Kyoho. *J. Korean Soc. Hort. Sci.*, 40(2): 221 224.
- Godara, N.R., O.P. Guptha and Singh, J.P. 1977. Evaluation of various levels of pruning in Perlette cultivar of grapes (*Vitis vinifera* L.). In: Viticulture in tropics (Eds: K. L. Chadha, G. S. Randhawa and R. N. Pal.). Hort. Soc. of India, Bangalore. 204 211.
- Gopalaswamy, N., and Rao, V. N. M. 1972, Effect of graded dose of K on yield and quality of grapes cv. Anab-E-Shahi. South Indian Hort., 20: 41 - 49.
- Jackson, R.S. 2008. Wine science: principles, practice, perception. 3rd Edn. San Diego: Academic Press.
- Jackson, D.I., G. F. Steans and Hemmings, P. C. 1984. Vine response to increased

- node number. *American J. Enol. Viticulture*, 35 (3): 161 163.
- Kohale, V.S., S.S. Kulkarni, S. A. Ranpise and Garad, B.V. 2013. Effect of pruning on fruiting of Sharad Seedless grapes. *Bioinfolet*, 10(1b): 300 302.
- Kumar, H., and Tomer, N.S. 1978. Pruning studies on Himrod cultivar of grape. *Haryana J. Hort. Sci.*, 7(1-2): 18 20.
- Mullins, M. G., A. Bouquet and Williams, L. E. 1992. Biology of the grapevine. Cambridge Univ. Press. New York. 239.
- Nagajothi, R., and Jeyakumar, P. 2014.
 Differential Response of Trifloxystrobin in Combination with Tebuconazole on Growth, Nutrient Uptake and Yield of Rice (*Oryza Sativa* L.). *Intl. J. Agri. Environ. Biotechnol.*, 6(1): 87 93.
- Panse, V.G., and Sukhatme, P.V. 1985. Statistical Methods for Agricultural Workers, Indian Council for Agricultural Research, New Delhi, pp:

- 115 130.
- Palma, L., V. Novello and Tarricone, L. 2000. Blind buds, fruitfulness and balance between vegetative and reproductive growth of grape cv. Victoria as related to bud load and pruning system during vine canopy establishment. *Rivista di frutticoltura e di orthofloricoltura*, 62(3): 69 74.
- Rangareddy, B., 1996. Preliminary studies on the relationship of shoot thickness to capacity for production in Anab-E-Shahi grape. *Andhra Agric. J.*, 13(5): 174 177.
- Somkuwar, R.G., and Ramteke, S.D. 2006. Yield and quality in relation to different crop load on Tas-A-Ganesh table grapes (*Vitis vinifera* L.). *J. Plant Sci.*, 1(2): 176 181.
- Srivastava, K.K., and Soni, S.L. 1989. Effect of N, P and K on growth, yield and some physical characteristics of Perlette grapes (*Vitis vinifera* L.). *Haryana J. Hort. Sci.*, 18(3-4): 192 196.

How to cite this article:

Raj Kumar, A., S. Parthiban, A. Subbiah and Sangeetha, V. 2017. Effect of Pruning Severity and Season for Yield in Grapes (*Vitis vinifera* L.) Variety Muscat Hamburg. *Int.J.Curr.Microbiol.App.Sci.* 6(3): 1814-1826. doi: https://doi.org/10.20546/ijcmas.2017.603.207