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Effect of different date of pruning on production of quality grapes

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Abstract

In grape cultivation, correct time of pruning very important for productive and healthy over the life of vine. The aim of this research to standardize the proper time of pruning for production of quality grape. The investigation was therefore under taken in this direction. The experiment was conducted at Bolpur, West Bengal, India, during 2012 to 2014. The experiment was laid out in Factorial R.B.D with four different pruning time and six different cultivars with three replications. There is 4 different date of pruning (20th & 30th January, 10th & 20th February) and 6 cultivars (Arka Neelamani, Pusa Navrang, Madhu Angur, Arka Kanchan, Arka Trishna and Arka Soma) with 24 treatments are details of the experiments. The results indicated that Arka Neelamani gave the best quality of grapes, when vines were pruned on 20th February. On the basis of present findings, it can be concluded that 10th to 20th February appropriate time of pruning for grapes under West Bengal climatic condition.

Keywords: Grape, pruning, time, cultivar & yield

1. Introduction

Grape (*Vitis vinifera* L.) is one of the important export oriented fruit crops in India and it's commercially grown in different regions in the country having varied climatic conditions. In all commercial regions of the country, table grapes, which accounted for 80%, are produced for fresh consumption and export, 18% for raisin and rest 2% for juice and wine only Singh, (2011) [14]. In viticulture, the most important and expensive cultural operation is pruning. Regular, purposeful pruning is essential for controlling the number, position and vigor of fruiting canes and yield and quality of berry. Correct and proper fruiting is an absolute if table grape vines are to be kept productive and healthy over the life of vine. Judicious pruning of fruitful canes is absolutely essential for proper fruiting. For regular production and to improve fruit quality, regular pruning is very much essential. The pruning requirement varied from variety to variety as well as region to region which need to standardized. The time of pruning varies greatly with the variety and local climatic conditions in different grape-growing regions in India. Climate has a profound influence on the type and time of pruning Chadha and Shikhamany, (1999) [4]. As there was no attempt was made to find out proper time of pruning on different cultivar of grapes under this climatic condition. The aim of this research was to standardize the proper time of pruning for production of quality grapes under this climatic condition.

2. Materials and Methods

The experiment was conducted at Malancha Farm under Srinekatan Shantinekatan Development Authority, Bolpur, Birbhum, West Bengal, India, during 2012 to 2014. Geographically the farm is situated at 23°67' N latitude and 87° 72' E longitude at an elevation of 58 meters above main sea level.

The site is sub-tropical with little rainfall during summer. The average precipitation (June to October) in the area about 1100 mm. The maximum and minimum temperature during summer months varies between 41 °C and 24 °C respectively while during winter it ranges between 25.5 °C and 9.2 °C. The soil of the orchard was laterite having pH 6.0, Organic Carbon 0.58%. Available (natural) soil content of nitrogen (N), phosphorus (P₂O₅) and potassium (K₂O) was 313.5, 32.51 and 111.0 kg per hectare respectively.

The experiment was laid out in Factorial Randomized Block Design with four different pruning time and six different cultivars with three replications. There is four different date of pruning (20th January, 30th January, 10th February and 20th February) and six cultivars

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(Arka Neelamani, Pusa Navrang, Madhu Angur, Arka Kanchan, Arka Trishna and Arka Soma) with twenty four treatments are details of the experiments. Four-year-old grapevines were trained on 'Y' trellis system and planting distance at 2m x 3m All vines were kept under uniform cultural practices.

2.1 Observations recorded

Vine physical and chemical characteristics of fruits were recorded when the fruits were ready for harvest.

2.1.1 Yield

The yield of three vines in each treatment was recorded and average yield per vine was calculated and expressed in kilogram.

2.1.2 Juice Percentage

The juice percentage was determined with taken 50 g berries and juice was extracted and measured in a measuring cylinder and expressed in percentage.

2.1.3 Total Soluble Solids (TSS)

Randomly selected twenty berries were taken for juice extraction and total soluble solids of the juice were determined by using a hand refractometer and expressed in $^{\circ}$ brix. A few drops of cloth strained fruit juice was installed on the plate, from each sample to record the refractometer reading, calibrated in 0° Brix at 20° C Mazumdar and Majumdar, (2003) ^[9].

2.1.4 Acidity

The acidity was determined in terms of tartaric acid by diluting the juice extracted from ten gram of sample and filter through muslin cloth and made up to known volume with distilled water (100 ml) then titrating the same against standard NaOH using Phenolphthalein as an indicator. The appearance of light pink colour was recorded as the end point. The result was explained in terms of per cent acidity of the fruits A.O.A.C., (1990) ^[11].

2.1.5 TSS/acid ratio

The soluble solids: acid ratio was determined by dividing the total soluble solids with total acidity percentage.

2.1.6 Total Sugar and Reducing Sugar

The total and reducing sugar content of fruits were determined with the help of Fehling's solution A & B by Lane and Eynon method using methylene blue as an indicator and expressed in percentage A.O.A.C., (1990) ^[11].

2.1.7 Ascorbic acid

Ascorbic acid content of the berries was estimated by using 2,6-dichlorophenol indophenols dye which is reduced by acid to a colourless from Ranganna, (1977) ^[12].

2.2 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 in dormant condition. After the pruning, the vine was treated with hydrogen cyanamid 50 SL @ 30 ml per liter and 0.2% blitox.

2.3 Statistical analysis

The data were analyzed statistically and test of significance were done by following the statistical method Factorial RBD

as described by Gomez and Gomez (1984) ^[7]. The significance of the mean difference between the treatments was determined by computing the standard error and critical difference.

3. Results and Discussion

3.1 Yield per vine

The results indicated that bunch yield per vine was significantly varied due to different date of pruning in during investigation (Table 1). The berry yield per vine was highest when vines were pruned on 30th January (2.04 kg/vine) and also bunch yield was varied significantly among the different cultivars. The data showed that highest yield was recorded from cultivar Pusa Navrang (3.06 kg) followed by Arka Trishna (1.78 kg) and Arka Neelamani (1.20 kg). The interaction effect between different pruning dates and different cultivars also significant influenced on yield per vine. Among the cultivars, Pusa Navrang gave the highest bunch yield when vines were pruned on 20th January (4.69 kg per vine) and 30th January (4.39 kg per vine). The next higher yield (3.42 kg per vine) was recorded from Arka Trishna when vines were pruned on 30th January. Highest yield from 30th January pruned vines may due to higher fruitfulness percentage of the spurs. Increasing in fruit yield with 30th January pruning was also noted by Ghosh *et al.*, (2012) ^[6] in cultivar Arka Neelamani under West Bengal condition. Salunkhe *et al.*, (2008) ^[13] reported that highest yield was recorded when the vines pruned on 22nd October in Thompson seedless cultivar under Ahmednagar region in Maharashtra. Bhat and Hulamani, (1994) ^[2] reported that pruning on first fortnight of April appeared to be the appropriate time for pruning the vines under Dharwad conditions with regard to yield attributes characters. Chadha and Mand, (1969) ^[3] found that the yield was higher when vines were pruned from 26th January to 5th February under North India condition. In Akola region of Maharashtra, pruning on first October resulted in higher yield in the cultivar Anab-e-Shahi as reported by Patil (1975) ^[11].

3.2 Juice content

It was revealed from the data presented in Table 1 that influence of different date of pruning treatments exhibit significant variation with respect to juice content in grape. Highest juice content was measured when vines were pruned on 30th January (73.69 %). The juice percentage was found maximum in Arka Neelamani (77.25 %). The interaction effect between different date of pruning and cultivars exhibited significant variations with respect to juice content in grape. The juice recovery percentage was highest in cultivar Arka Trishna (78.05), followed by Arka Neelamani (77.97), when vines were pruned on 30th January. Pal and Ghosh, (2018) ^[10] observed that Arka Trishna gave the highest juice content was recorded when vines were pruned on 10th February.

3.3 Total soluble solids

It was observed from the data in Table 1 showed that different date of pruning exhibit significant variation with respect to total soluble solids of grape. The highest total soluble solids content of the berry was measured when vines were pruned on 20th February (18.5^o brix). It was clear from the table total soluble solids content was recorded highest in Arka Neelamani (19.6^o brix). Due to interaction effect between different dates of pruning and cultivars differed significantly among the treatments. The data depicted that highest total

soluble solids content of berries were measured in Arka Neelamani (20.7 ° brix), when vine were pruned on 20th February. Ghosh *et al.*, (2012) ^[6] also reported the highest TSS content in berries from the vines that were pruned on 20th January in Arka Neelamani cultivar under West Bengal condition. Kohale *et al.*, (2013) ^[8] reported that pruning on 15th September resulted in highest TSS content of Sharad Seedless grape under Rahuri region of Maharashtra.

3.4 Acidity

Highest acidity percentage (0.64 %) of berries was measured under the vines were pruned on 10th February and lowest when vines were pruned on 20th February (0.57 %). Among the cultivars Pusa Navrang gave the highest acidity content

(0.77 %) and lowest was recorded from Arka Neelamani and Arka Trishna (0.55 %). Interaction effect, significantly highest acidity content was recorded in Pusa Navrang (D₃V₂), when vine were pruned on 10th February (0.80 %) and lowest in Arka Trishna (D₂V₅), when vine were pruned on 30th January (0.49 %). Ghosh *et al.*, (2012) ^[6] also reported the lowest acidity content in berries from the vines that were pruned on 20th January in Arka Neelamani cultivar under West Bengal condition. Pal and Ghosh, (2018) ^[10], also reported that lowest acidity content in was recorded when vine were pruned on 20th February in Arka Trishna cultivar. Gautam, 1997 ^[5] also reported that pruning on 20th September given low acidity content of berry under Maharashtra condition.

Table 1: Effect of different date of pruning on berry quality parameter of different cultivars of grape

| Treatments | Yield per vine (kg) | Juice (%) | T.S.S (° brix) | Acidity (%) |
|--|---------------------|-----------|---------------------------------|-------------|
| Date of Pruning (D) | | | | |
| D ₁ | 1.70 | 72.29 | 17.2 | 0.61 |
| D ₂ | 2.04 | 73.69 | 17.2 | 0.62 |
| D ₃ | 0.75 | 68.68 | 18.1 | 0.64 |
| D ₄ | 0.38 | 68.85 | 18.5 | 0.57 |
| S. Em (±) | 0.03 | 0.35 | 0.10 | 0.01 |
| CD at 5% | 0.09 | 0.97 | 0.29 | 0.03 |
| Cultivars (V) | | | | |
| V ₁ | 1.20 | 77.25 | 19.6 | 0.55 |
| V ₂ | 3.06 | 69.80 | 15.6 | 0.77 |
| V ₃ | 0.24 | 71.40 | 17.3 | 0.62 |
| V ₄ | 0.49 | 68.91 | 17.1 | 0.60 |
| V ₅ | 1.78 | 71.31 | 18.6 | 0.55 |
| V ₆ | 0.55 | 66.59 | 18.2 | 0.56 |
| S.Em(±) | 0.04 | 0.51 | 0.12 | 0.01 |
| CD at 5% | 0.11 | 1.43 | 0.35 | 0.03 |
| Interaction | | | | |
| D ₁ V ₁ | 1.66 | 77.10 | 19.9 | 0.57 |
| D ₁ V ₂ | 4.69 | 75.80 | 16.0 | 0.78 |
| D ₁ V ₃ | 0.24 | 72.60 | 15.2 | 0.65 |
| D ₁ V ₄ | 0.79 | 70.02 | 15.0 | 0.58 |
| D ₁ V ₅ | 1.94 | 72.69 | 18.1 | 0.56 |
| D ₁ V ₆ | 0.88 | 66.78 | 18.1 | 0.53 |
| D ₂ V ₁ | 2.61 | 77.97 | 18.6 | 0.56 |
| D ₂ V ₂ | 4.39 | 69.98 | 15.8 | 0.73 |
| D ₂ V ₃ | 0.27 | 77.55 | 15.0 | 0.72 |
| D ₂ V ₄ | 0.79 | 72.48 | 17.6 | 0.60 |
| D ₂ V ₅ | 3.42 | 78.05 | 18.8 | 0.49 |
| D ₂ V ₆ | 0.75 | 66.10 | 17.2 | 0.62 |
| D ₃ V ₁ | 0.28 | 77.00 | 19.7 | 0.58 |
| D ₃ V ₂ | 2.06 | 65.93 | 15.7 | 0.80 |
| D ₃ V ₃ | 0.31 | 68.07 | 18.7 | 0.59 |
| D ₃ V ₄ | 0.22 | 67.52 | 17.8 | 0.73 |
| D ₃ V ₅ | 1.19 | 68.10 | 18.2 | 0.61 |
| D ₃ V ₆ | 0.45 | 65.43 | 18.9 | 0.57 |
| D ₄ V ₁ | 0.23 | 76.92 | 20.7 | 0.50 |
| D ₄ V ₂ | 1.08 | 67.47 | 14.9 | 0.78 |
| D ₄ V ₃ | 0.13 | 68.63 | 19.6 | 0.53 |
| D ₄ V ₄ | 0.14 | 65.63 | 18.0 | 0.52 |
| D ₄ V ₅ | 0.57 | 66.42 | 19.4 | 0.54 |
| D ₄ V ₆ | 0.13 | 69.60 | 18.7 | 0.53 |
| S.Em(±) | 0.08 | 1.02 | 0.25 | 0.02 |
| CD at 5% | 0.22 | 2.87 | 0.70 | 0.07 |
| D ₁ : Date of pruning 20 th January | | | V ₁ : Arka Neelamani | |
| D ₂ : Date of pruning 30 th January | | | V ₂ : Pusa Navrang | |
| D ₃ : Date of pruning 10 th February | | | V ₃ : Madhu Angur | |
| D ₄ : Date of pruning 20 th February | | | V ₄ : Arka Kanchan | |
| | | | V ₅ : Arka Trishna | |
| | | | V ₆ : Arka Soma | |

3.6 Sugar content

The data clear from Table 2 that the total sugar and reducing sugar content was recorded highest when vines were pruned on 20th February (14.22 % and 12.22 %). From the data it was found that total sugar and reducing sugar content were highest in Arka Neelamani (15.88 % and 12.90 %). Due to interaction effect between different dates of pruning and cultivars significantly influenced between the treatments. Highest total sugar and reducing sugar content were recorded in Arka Neelamani, when vines were pruned on 20th February (16.66 % and 13.66 %). Similar result was reported by Pal and Ghosh, (2018) [10].

3.7 TSS/acid ratio

Fruit quality in grapes is expressed mainly as T.S.S./acid ratio content. TSS/acid ratio indicates the organoleptic taste of the fruit which appeal the consumer's acceptance. TSS/ acid ratio in grapes were significantly differed in different pruning treatments (Table 2). The study TSS/acid ratio was recorded highest when vines were pruned on 20th February (34.53). It was revealed from the data TSS/acid ratio of out of six cultivars Arka Neelamani (37.27) gave the highest. Due to interaction effect, significantly highest TSS/acid ratio was recorded in Arka Neelamani (41.56), when vine were pruned on 20th February. Salunkhe *et al.*, (2008) [13] reported that fruit quality was highest when the vines were pruned on 22nd October in Thompson Seedless cultivar under Ahmednagar

region in Maharashtra while, Kohale *et al.*, (2013) [8] reported that pruning on 15th September resulted in highest sugar content of Sharad Seedless grape under Rahuri region of Maharashtra.

3.8 Ascorbic acid

It is observed from the data presented in Table 2 that highest ascorbic acid content (5.21 mg/100 ml juice) was recorded when vines were pruned on 30th January. The cultivar Pusa Navrang gave the highest ascorbic acid content (5.90 mg/100ml juice). Among the treatment combinations, significantly highest ascorbic acid content was recorded from cultivar Pusa Navrang (8.03 mg/100 ml juice), when vines were pruned on 30th January. The cultivar Arka Trishna gave the highest ascorbic content when vines were pruned on 10th February reported by Pal and Ghosh, 2018.

4. Conclusion

Present study in view it can be concluded that proper time of pruning is very essential for improving quality of grapes. Among the cultivars Arka Neelamani and Arka Trishna responded very well to various date of pruning and it can be concluded that 30th January best time of pruning for improving the berry production and 20th February appeared to be the appropriate time for pruning the vines under West Bengal climatic conditions with regard to obtained best quality of berry.

Table 2: Effect of different date of pruning on berry quality parameter of different cultivars of grape

| Treatments | TSS / acid ratio | Total sugar (%) | Reducing sugar (%) | Ascorbic acid (mg/100 ml juice) |
|-------------------------------|------------------|-----------------|--------------------|---------------------------------|
| Date of Pruning (D) | | | | |
| D ₁ | 29.69 | 13.60 | 11.85 | 4.13 |
| D ₂ | 29.27 | 13.64 | 12.08 | 5.21 |
| D ₃ | 29.92 | 13.88 | 12.14 | 4.41 |
| D ₄ | 34.53 | 14.22 | 12.22 | 4.55 |
| S. Em (±) | 0.53 | 0.15 | 0.13 | 0.12 |
| CD at 5% | 1.49 | 0.41 | 0.36 | 0.32 |
| Cultivars (V) | | | | |
| V ₁ | 37.24 | 15.09 | 12.90 | 4.54 |
| V ₂ | 20.51 | 12.72 | 11.96 | 5.90 |
| V ₃ | 29.19 | 14.03 | 11.71 | 4.64 |
| V ₄ | 29.78 | 12.72 | 11.23 | 3.94 |
| V ₅ | 35.09 | 14.09 | 12.53 | 4.57 |
| V ₆ | 33.32 | 14.35 | 12.11 | 3.86 |
| S.Em(±) | 0.65 | 0.18 | 0.16 | 0.14 |
| CD at 5% | 1.82 | 0.51 | 0.44 | 0.40 |
| Interaction | | | | |
| D ₁ V ₁ | 36.69 | 13.96 | 11.83 | 3.33 |
| D ₁ V ₂ | 20.60 | 13.14 | 12.09 | 6.24 |
| D ₁ V ₃ | 24.87 | 12.82 | 10.85 | 3.71 |
| D ₁ V ₄ | 27.29 | 13.16 | 11.05 | 3.67 |
| D ₁ V ₅ | 33.01 | 13.79 | 12.44 | 4.24 |
| D ₁ V ₆ | 35.70 | 14.73 | 11.84 | 3.57 |
| D ₂ V ₁ | 34.93 | 14.65 | 12.88 | 4.91 |
| D ₂ V ₂ | 22.10 | 12.47 | 11.53 | 8.03 |
| D ₂ V ₃ | 21.74 | 12.45 | 11.40 | 5.07 |
| D ₂ V ₄ | 29.70 | 12.79 | 11.92 | 3.50 |
| D ₂ V ₅ | 39.16 | 14.55 | 12.61 | 5.62 |
| D ₂ V ₆ | 28.02 | 14.92 | 12.14 | 4.11 |
| D ₃ V ₁ | 35.81 | 15.10 | 13.24 | 4.88 |
| D ₃ V ₂ | 20.05 | 11.59 | 10.36 | 4.55 |
| D ₃ V ₃ | 32.33 | 15.02 | 12.00 | 4.62 |
| D ₃ V ₄ | 26.70 | 12.28 | 10.64 | 3.98 |
| D ₃ V ₅ | 30.59 | 14.54 | 12.61 | 4.43 |
| D ₃ V ₆ | 34.02 | 14.72 | 12.97 | 4.00 |
| D ₄ V ₁ | 41.56 | 16.66 | 13.66 | 5.05 |
| D ₄ V ₂ | 19.29 | 13.69 | 11.85 | 4.78 |

| | | | | |
|--|-------|-------|---------------------------------|------|
| D ₄ V ₃ | 37.80 | 15.83 | 12.57 | 5.15 |
| D ₄ V ₄ | 35.41 | 12.65 | 11.33 | 4.61 |
| D ₄ V ₅ | 37.59 | 13.47 | 12.45 | 3.98 |
| D ₄ V ₆ | 35.56 | 13.02 | 11.49 | 3.75 |
| S.Em(±) | 1.30 | 0.36 | 0.31 | 0.28 |
| CD at 5% | 3.64 | 1.02 | 0.87 | 0.79 |
| D ₁ : Date of pruning 20 th January | | | V ₁ : Arka Neelamani | |
| D ₂ : Date of pruning 30 th January | | | V ₂ : Pusa Navrang | |
| D ₃ : Date of pruning 10 th February | | | V ₃ : Madhu Angur | |
| D ₄ : Date of pruning 20 th February | | | V ₄ : Arka Kanchan | |
| | | | V ₅ : Arka Trishna | |
| | | | V ₆ : Arka Soma | |

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