

Performance of Some Grape Cultivars for Commercial Cultivation in West Bengal

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Abstract

The experiment was carried out for two consecutive years during 2010 and 2012 at the experimental grape orchard at Horticultural Research and Development Farm, Govt. of W.B, Taldangra, Bankura. The experiment was conducted in randomized block design with four replications. The vines were trained on 'Y'-trellis system and spacing of 2×3 m². The vine was pruned on 30th January. As per fruit maturity, the cultivars Pusa Navrang were considered to be the earliest harvesting. Among the twelve cultivars, maximum fruit yield was recorded in Arka Neelamani (7.81 kg vine⁻¹). The number of bunches/vine were varied significantly among the cultivars with number of bunches/vine highest in cultivar Arka Trishna. But bunch weight was highest in cultivar Arkavati (264.2 g). Size of the bunch was maximum in Arka Kanchan. However, different cultivars of grape exhibited significant variation with respect to average ten berries weight. The ten berries weight was highest in Arka Magestic. The cultivars Arka Trishna gave the highest juice %, total soluble solids, lowest acidity, highest TSS/acid ratio and sugar content. Ascorbic acid content highest was recorded from cultivar Pusa Navrang as compared to other cultivars. Incidence of major insects and diseases determine the economic feasibility of a cultivar in the area. It appears from the good performed cultivars less incidence of major insects and diseases during flowering to fruiting period. On the basis of marketable yield, fruit quality and tolerance to pest, cultivars Arka Neelamani for table purpose can be recommended for commercial cultivation under Bankura conditions of West Bengal.

Keywords: Grape, cultivars, laterite soil, performance

1. Introduction

Viticulture in India assumes an important position in horticulture crop in view of its area, production, value addition and job creation in both rural and urban areas. Among all the horticultural crops, grapes have received a special importance in view of its value addition into raisins and wines. Traditionally, grapes are one of the most important fruit crops of temperate zone of the world, but presently its cultivation is becoming also popular in the tropical and subtropical regions of the world. There has been a steady increase in the area and production of grape in the country as a result of identification and development of suitable cultivars and standardization of their agro-techniques.

In western part of West Bengal, which covers 5 districts viz., Bankura, Birbhum, Paschim Midnapur, Purulia and some part of Burdwan where the soil is red and laterite is highly suitable for cultivation of grapes on commercial scale as the area receives low rainfall during January to May and experiences

a long dry spell during summer. It is well known that bright sunlight and rainless days essential during flowering and fruiting of grapes (Ghosh et al., 2008). Early ripening varieties and those that are less sensitive to rain have better possibility for commercial cultivation under western part of West Bengal conditions. Therefore, main objective of the present investigation was undertaken to evaluate different cultivars of grape for commercial cultivation in western parts of West Bengal. Hence, an attempt has been made in this aspect.

2. Materials and Methods

The experiment was carried out at experimental grape orchard at Horticultural Research and Development Farm, of by Govt. of West Bengal, at Taldangra in the district of Bankura, West Bengal, India. Geographically the farm is situated at 23°01'60" N latitude and 87° 06'00" E longitude at an elevation of 88.0 meters above main sea level. The site is sub-tropical climate with little summer rainfall. The average precipitation (June to October) in this area about 1100 mm. The maximum



and minimum temperature during summer months varies between 40 °C and 24 °C respectively while during winter it ranges between 25.5 °C and 11.2 °C. The soil of the orchard was laterite having pH 6.0, Organic Carbon 0.55%. Available (natural) soil content of nitrogen (N), phosphorus (P₂O₅) and potassium (K₂O) was 294.30, 40.62 and 121.11 kg ha⁻¹ respectively. Rooted cuttings of twelve cultivars collected from different parts of India, were planted in the collection block at 2×3 m² distance, during January, 2008 and vines were trained on 'Y' trellis system.

The experimental material consisted of twelve cultivars, viz., Arka Neelamani, Pusa Navrang, Arkavati, Black Prince, Arka Shyam, Madhu Angur, Arka Kanchan, Arka Trishna, Carolina Black Rose, Arka Soma, Arka Chitra, Arka Magestic. The experiment was carried out for two consecutive years during 2010 and 2012. The experiment was conducted in randomized block design with four replications. The observations were vine yield and physical characteristics of fruits were recorded when the fruits were ready for harvest. For chemical analysis of the fruits, the methods were followed as described by A.O.A.C. (1990).

The pruning operation was done during last week of January. Immediately after pruning, followed by pasting of *Dorbreak* (Hydrogen cyanamide at 1.5%), a bud breaking chemical. All other cultural practices like manuring and fertilization, Irrigation, application of growth regulators, weeding, plant protection, etc. were carried out uniformly to all the vines. The data were analyzed statistically and test of significant were done by following the method RBD as described by Pance and Sukhatme (1985).

3. Results and Discussion

3.1. Pruning to harvesting period

The data presented Table 1 reveals that cultivar Arka Chitra took minimum of 15.12 days for flower bud development after pruning while in Madhu Angur it was 24.37 days. The cultivar Arka Neelamani took maximum of 31.50 days required for floral bud initiation to fruit set while Arka Chitra took minimum of 17.37 days. Arka Trishna required 78.87 days for fruit set to maturity and Pusa Navrang required only 51.37 days for maturity from fruit set. Among the 12 cultivars, Pusa Navrang was early cultivar and Arka Trishna and Arka Kanchan was late cultivar. The studies are in confirmation with the earlier works made by Ghosh et al. (2012).

3.2. Physiological behaviour of pruned fruiting spur

It appears from the Table 2 noted that among the 12 cultivars, the physiological behaviour of pruned fruiting spur in term of fruitfulness of spur was found highest in Arka Trishna (98.37%) followed by Arka Neelamani (89.94%) and Arka Shyam (72.09%). The fruitfulness of spur in different cultivars of grapes mainly depends on different agro-climacteric condition and horticultural practices that are followed. No much literature is available regarding fruitfulness behaviour

Table 1: Time taken for floral bud initiation, fruit set, fruit maturity and date of harvesting of grape grown in Bankura district

Cultivars	1	2	3	4
Arka Neelamani	18.87	31.50	57.75	20 th May
Pusa Navrang	18.87	23.12	51.37	05 th May
Arkavati	21.00	23.87	64.00	20 th May
Black Prince	21.00	22.37	74.75	30 th May
Arka Shyam	21.12	24.50	71.87	29 th May
Madhu Angur	24.37	19.75	68.50	24 th May
Arka Kanchan	18.50	31.25	71.00	01 st June
Arka Trishna	19.87	18.87	78.87	30 th May
Carolina Black Rose	24.25	22.25	65.37	23 rd May
Arka Soma	18.25	24.37	64.62	19 th May
Arka Chitra	15.12	17.37	69.37	14 th May
Arka Magestic	24.25	18.50	60.00	14 th May
CD ($p=0.05$)	0.66	0.70	1.40	-

1: Time taken for floral bud initiation after pruning (Days after pruning); 2: Time taken from floral bud initiation to fruit set (Days); 3: Time taken from fruit set to maturity (days); 4: Date of Harvesting

of various cultivars in different climatic zones of India.

3.3. Vine yield and physical characteristics of Berry

The data clear from Table 2 showed that yield and physical characteristics of fruits of different cultivars varied significantly. Highest yield vine⁻¹ was recorded from cultivar Arka Neelamani (7.81 kg) followed by Arka Shyam (2.64 kg) and Arka Trishna (2.63 kg). Highest number of bunch/vine was counted from Arka Trishna (29.62), followed by Arka Shyam (28.37) and Arka Neelamani (27.50). These three cultivars did not significantly differ with each others. The increase in number of bunches/vine in Arka Trishna may be due to highest fruitfulness of spur. Similar results have also been reported by Ghosh et al., (2012) under Jhargram condition. The varietal suitability in different regions of India has been reported by Chadha and Sikhmanany (1999). Various grape varieties have been found to perform well in various regions owing to different climatic and other environmental conditions. Many varieties which are doing extremely well in one region may have not doing so well in other regions. Chadha (2008) reported that the cultivar Perlette is grown as commercially in northern part of India. While Thompson Seedless and Sharad Seedless among the seedless cultivars, and Anab-e-Shahi, Gulabi and Bangalore Blue among the seeded cultivars are cultivated in Maharashtra and southern states. Kumar and Rajan (2008) reported that Flame seedless and Pusa Navrang could be commercially grown in North Indian condition. Kumar et al. (2002) reported that under north India condition respond Beauty seedless and Flame seedless most suitable cultivars for commercial

Table 2: Vine yield and bunch physical characteristics of different cultivars of grape grown in Bankura district

Cultivars	Fruitfulness of spur (%)	Yield vine ⁻¹ (kg)	No. of bunches vine ⁻¹	Bunch weight (g)	Length of bunch (cm)	Breadth of bunch (cm)	10 Berries weight (g)
Arka Neelamani	89.94	7.81	27.50	236.0	15.4	10.7	29.46
Pusa Navrang	66.40	1.57	10.12	147.6	13.0	8.8	12.39
Arkavati	45.10	1.83	6.75	264.2	15.3	10.2	27.06
Black Prince	17.49	0.39	1.75	209.5	11.8	6.1	24.16
Arka Shyam	72.09	2.64	28.37	85.3	12.9	5.4	17.44
Madhu Angur	8.04	0.14	1.12	132.8	12.5	9.9	29.00
Arka Kanchan	38.20	0.92	3.75	249.0	14.4	11.9	24.95
Arka Trishna	98.37	2.63	29.62	90.9	11.5	7.3	30.52
Carolina Black Rose	19.02	0.54	3.12	177.2	13.0	9.6	28.99
Arka Soma	10.27	0.22	1.62	132.9	11.6	9.4	24.17
Arka Chitra	12.02	0.18	1.37	135.2	11.6	8.8	24.20
Arka Magestic	18.00	0.36	2.00	185.8	11.8	10.8	35.73
CD ($p=0.05$)	1.52	0.35	2.37	13.63	1.85	0.54	1.16

cultivation. Karibasappa and Adsule (2008) reported that the cultivar Pusa Navrang gave the highest (19 t ha⁻¹) yield vine⁻¹ under Pune condition of Maharashtra.

The bunch weight was highest from Arkavati (264.20 g), followed by Arka Kanchan (249.00 g) and Arka Neelamani (236.00 g). Size (length×breadth) of the bunch was recorded highest in Arka Kanchan (14.4×11.9 cm²) followed by Arka Neelamani (15.4×10.7 cm²) and Arkavati (15.3×10.2 cm²). The maximum ten berries weight was recorded from Arka Magestic (35.73 g), followed by Arka Trishna (30.52 g) and Arka Neelamani (29.46 g). The studies are in confirmation with

the results of Ghosh et al. (2012) under Jhargram condition.

3.4. Chemical characteristics of Berry

The chemical composition of fruits of different grape cultivars has been presented in Table 3. Highest juice content (77.84%), total soluble solids (20.8° brix), TSS/acid ratio (48.37) highest total sugar (14.90%) and reducing sugar (12.69%) were recorded from cultivar Arka Trishna followed by Arka Neelamani. The acid content was lowest in Arka Trishna (0.43%) followed by Arka Neelamani (0.49%) and highest was recorded from Arka Magestic (0.87%). The ascorbic acid content was highest in Pusa Navrang (8.00 mg/100 ml

Table 3: Fruit quality characteristics of different cultivars of grape grown in Bankura district

Cultivars	Juice (%)	TSS (°Brix)	Acidity (%)	TSS/acid ratio	Total sugar (%)	Reducing sugar (%)	Ascorbic acid (mg/100 ml juice)	Berry colour	J u i c e colour
Arka Neelamani	73.49	20.5	0.49	41.83	13.87	12.56	3.94	Reddish black	Ivory
Pusa Navrang	70.83	15.0	0.80	18.78	11.74	10.79	8.00	Black	Red
Arkavati	67.21	17.8	0.55	33.25	12.46	11.16	4.35	Greenish yellow	Ivory
Black Prince	67.32	19.0	0.60	31.74	14.80	12.24	3.71	Reddish black	Ivory
Arka Shyam	68.67	16.1	0.74	22.34	12.76	11.99	3.94	Black	Ivory
Madhu Angur	70.86	18.4	0.56	32.66	14.06	12.21	3.47	Reddish black	Ivory
Arka Kanchan	68.70	16.3	0.58	27.75	12.20	11.00	3.60	Greenish yellow	Ivory
Arka Trishna	77.84	20.8	0.43	48.37	14.90	12.69	5.24	Rusty-brown	Ivory
Carolina Black Rose	74.45	18.1	0.60	30.20	13.93	12.01	3.83	Reddish black	Ivory
Arka Soma	67.30	17.4	0.69	25.03	13.67	12.14	3.64	Greenish yellow	Ivory
Arka Chitra	69.45	16.8	0.69	24.45	13.55	11.83	3.48	Greenish yellow	Ivory
Arka Magestic	67.49	14.7	0.87	16.93	10.97	10.18	3.27	Reddish Black	Ivory
CD ($p=0.05$)	1.74	0.56	0.05	2.13	0.66	0.88	1.32	--	--



of juice) and lowest in Arka Magestic (3.27 mg/100 ml of juice). Results of the present observation are in line with the findings of Ghosh et al. (2005) under Jhargram condition. It was interesting to note fruit quality of different cultivars of grape under Bankura condition was better as compared to same cultivars under Bhatinda condition of Punjab (Thakur et al., 2008) under Bhatinda condition maximum TSS of 18.23% and lowest acidity 0.68% was recorded in Deligate while under Bankura condition highest TSS of 19.8° brix with 0.43% acidity was recorded from Arka Trishna. Singh et al. (1998) also stated that the fruit quality of Arka Neelamani was superior because of high sugar content and crispy pulp of berries.

3.5. Colour of berry and Juice

The data presented in Table 3 revealed that colour of berry was reddish black in Arka Neelamani, Black Prince, Madhu

Angur, Carolina Black Rose and Arka Magestic; black in Pusa Navrang and Arka Shyam; greenish yellow in Arkavati, Arka Kanchan, Arka Soma and Arka Chitra; and rusty brown in Arka Trishna. Juice colour was ivory in Arka Neelamani, Arkavati, Black Prince, Arka Shyam, Madhu Angur, Arka Kanchan, Arka Trishna, Carolina Black Rose, Arka Soma, Arka Chitra and Arka Magestic; red in Pusa Navrang.

3.6. Incidence of pests

Incidence of major insects and diseases determine the economic feasibility of a cultivar in an area. It appears from the Table 4 that most of the good performed cultivars showed less incidence of major insects (thrips, mealy bug and flea beetle) and diseases (anthracnose and downy mildew) during flowering and fruiting period.

Table 4: Incidence of insects and diseases of different cultivars of grape grown in Bankura district

Cultivars	Thrips	Mealy bug	Flea beetle	Anthracnose	Downey mildew
Arka Neelamani	Resistance	Tolerance	Resistance	Resistance	Resistance
Pusa Navrang	Resistance	Tolerance	Resistance	Resistance	Resistance
Arkavati	Susceptible	Tolerance	Susceptible	Resistance	Resistance
Arka Shyam	Tolerance	Tolerance	Resistance	Resistance	Resistance
Madhu Angur	Susceptible	Tolerance	Susceptible	Resistance	Resistance
Arka Kanchan	Tolerance	Tolerance	Resistance	Resistance	Resistance
Arka Trishna	Resistance	Tolerance	Resistance	Resistance	Resistance
Carolina Black Rose	Susceptible	Tolerance	Susceptible	Resistance	Resistance
Arka Soma	Resistance	Tolerance	Susceptible	Resistance	Resistance
Arka Chitra	Resistance	Tolerance	Susceptible	Resistance	Resistance
Arka Magestic	Susceptible	Tolerance	Susceptible	Resistance	Resistance

3. Conclusion

The cultivar Arka Neelamani can be recommended for commercial cultivation in Bankura district of West Bengal and as it gave highest yield attributing characters and second best in quality of fruit. The cultivars Arka Shyam and Arka Trishna can also be consider for good yield and quality.

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