Selection and performance evaluation of Black Pepper Clone Suitable for Coorg region of Karnataka

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Abstract

A high yielding clone CHES Selection, of black pepper was evaluated with 10 released varieties for 13 years at CHES (Central Horticultural Experimental Station), Chettalli and KVK (Krishi Vigyan Kendra), Gonikoppal. The comparative performance of this selection revealed that the yield of green berries of 13 year old vine was higher (9.97 kg/vine) than the leading variety of Coorg region i.e. Panniyur -1 (6.71 kg/vine).This clone produced higher yield than all other varieties evaluated. The average spike length was 14.68 cm which was higher than other varieties. The number of berries per spike (93.93) , weight of berries (5.45g/100) and percent recovery (37.22 %) were also higher in the CHES selection than other varieties. This selection was also found superior than the leading variety Panniyur -1 in an observation trial at KVK, Gonikoppal. On this basis this lines was identified and named as Arka Coorg Excel (IC599082) and recommended for the cultivation in the Coorg region of Karnataka.

Key words: Black pepper, varieties, evaluation , yield, spike, berries

Introduction

Black pepper (*Piper nigrum*) the whole dried fruit from perennial vine *Piper nigrum* L. is the world's most important spice and is considered 'The King of Spices. It is mainly used as spice and medicine (3). India, better known as the 'home of spices, has consistently been the major player in production, consumption and export of spices. India has 38% share of total area among spice producing countries, contributing 18.7% to total black pepper production (1). Kerala and Karnataka are largest producers of black pepper in India contributing more than 90 percent area as well as production. Although India is the largest producer and consumer of black pepper in the world but

productivity of black pepper is only 0.5 tonnes per hectare, which is comparatively lower than several other black pepper producing countries. The area of black pepper has increased rapidly in Karnataka but where it is mainly grown as intercrops with other crops such as coffee, areca nut etc. but the productivity of black pepper is comparatively lower in Karnataka (0.285 t/ha) than Kerala (0.452 kg/ha) (2). There are several reasons for the lower productivity in the region these includes suitability of varieties, water and nutrient management, diseases etc. Several varieties of black pepper have been released in the India but most of these varieties are suitable for higher temperature and less foggy conditions. The Coorg region of Karnataka is emerging as potential contributor for black pepper production in the recent years. Since the planters of this region cultivating black pepper as inter crop in the coffee or cardamom plantations, so their income per unit area of land is more when compare to pure crop. Higher elevation (600-1400 m msl) and foggy climate are the major constraints for the higher productivity in this area. In order to address the problem a local selection was selected and compared with the existing released varieties to identify a high yielding variety for increasing the production and productivity in the .

Materials and methods

A promising selection of black pepper was indentified at CHES, Chettalli during 1990,s. This elite clone /selection have bigger leaves, high yield, and bold berries (Table 1). This elite selection (CHES) selection which was later on named as Arka Coorg Excel- (IC599082) was compared with ten black pepper varieties namely Panniyur-1, Panniyur-2, Panniyur-3, Panniyur-4, Panniyur-5, Choumala, Sreekara, Subakara, Panchami and Pournami. These ten released varieties and one Chettalli selection were planted in 2000 at Central Horticultural Experiment Station (CHES), Chettalli (Lat: 12^0 23'; Long: 75^0.50' Altitude: 970 m msl.) and evaluated for 13 years. The dadap (*Erythrina indica*) trees were used as support trees for all the planted which were planted at 6 m distance both the way. An observation trial was also laid out at Krishi Vigyan Kendra (KVK), Gonikoppal (12.1857° N, 75.9245° E, Altitude 848 m msl) with one leading variety Panniyur-1 and CHES selection with dadap (*Erythrina indica*) trees planted at 6 m distance. The experiment was maintained under standard management practices under rain fed conditions. The Observations were recorded on growth and yield traits such as plant height, girth , leaf length (cm), leaf width (cm), spike length (cm), number of berries per spike, weight of green berries per spike (g), weight of dry

berries per spike (g), per cent recovery, weight of hundred berries, green yield (Kg/vine), dry yield (kg/vine). The data were analyzed using statistical methods described by (4).

Results and Discussion

The growth habits of the varieties revealed that highest plant height (7.60 m) after 13 years of planting was recorded in CHES selection (Arka Coorg excel). This was closely followed by Subhakara (7.38 m). The lowest plant height was recorded in Panniyur -1 (3.40 m). The girth of the vine including support tree at 1 meter above ground level was highest (1.40 m) in CHES selection (Arka Coorg excel). This is followed by Panniyur- 1 (1.33 m). The lowest girth was recorded in Sreekara and Choumala (0.83 m). The average length of leaves was highest (16.80 cm) in CHES selection which is significantly higher than the all released varieties namely Panniyur –1 (14.45 cm), Panniyur -2 (10.2 cm) , Panniyur -3 (12.68 cm) , Panniyur – 4 (12.10 cm), Panniyur -5 (11.41 cm), Choumala (13.78 cm), Sreekara (9.98 cm), Subhakara (10.71 cm), Panchami (11.07 cm) except Pournami (16.27 cm). The average width of leave of CHES selection (Arka Coorg excel) was 8.10 cm which was significantly lower than the Panniyur -1(10.42 cm) and Panniyur -4 (9.21 cm). It was statistically at par with other cultivars (Table 1). The leaves shape of CHES selection was heart shape with comparatively longer is tapering leaf apex (Fig. 1).

As far as the yield of green berries is concerned, the average yield of three year (2011-13) was highest (9.67 kg/vine) in CHES selection (Arka Coorg excel)was higher than average yield of all other varieties including Panniyur -1 (6.71 kg/vine) which is the leading variety of this region. The lowest yield was recorded in cultivar Choumala (3.57 kg/vine). The yield data of three years also revealed that this CHES selection produces highest yield in all the three years (Table 2a). The yield data of last 10 years revealed that that CHES selection (Arka Coorg excel) is a regular yielding variety and did not show the alternate bearing trend. Spike length is an important yield contributing trait in black pepper and amenable for selection (9,5). Reported spike length in cultivated black pepper ranges from 3.7 to 17.1 cm (7). The average spike length in CHES selection (Arka Coorg Excel) was 14.68 cm which was 15 to 35 percent higher than other varieties. The spike length was 12.43 cm in Panniyur-1 while it was lowest in cv. Choumala (8.61 cm) (Table 2a). The average number of berries per spike ranged from 63.83 per spike in Cv. Choumala to 93.93 per spike in CHES selection (Arka Coorg Excel). The number of berries per spike was highest in CHES selection (Arka Coorg Excel) in all the three years. The number of berries per spike is directly related with spike length. The higher number of berries per spike in CHES

selection is due to more spike length and the similar trend was notice in all other varieties. The weight of green berries /spike was highest (14.3 g) in CHES selection (Arka Coorg Excel) closely followed by Panniyur-1 (11.23 g) while it was lowest in Choumala (7.48 g). The weight of berries showed trend similar to number of berries (Table 2b). The weight of dry berries per spike was also highest (5.29 g) in CHES selection (Arka Coorg Excel) followed by 3.90 g in Panniyur -1, while it was lowest in Choumala (2.58 g). The weight of 100 berries was highest (5.45 g) in CHES selection (Arka Coorg Excel) .This as followed by cv. Subhakara with 4.75 g per 100 berries weight. The percent recovery was also highest (37.12 %) in CHES selection (Arka Coorg Excel). This was followed by cv. Subhakara with 36.08 percent recovery (Table 2c). The quality parameters of the CHES selection were analysed and it was found that the dried berries contains 1.6% oil , 6.88 % oleoresin and 2.14 % piperine.

The performance of CHES selection (Arka Coorg Excel) was compared with Panniyur-1 at the second location in Krishi Vigyan Kendra, Gonikoppal, Karnataka for 12 years. The average of growth and yield parameters showed that spike length (cm), number of berries per spike, weight of green berries per spike , weight of dry berries per spike , per cent recovery, weight of hundred berries, green yield, dry yield were higher in CHES selection (Arka Coorg Excel) than Panniyur one all three years (Table 3) The performance of this variety at both the station was better than other varieties including Panniyur -1 which is leading variety in Coorg region. Moreover Panniyur – 1 is known for its alternate bearing in nature. Considering the performance of this selection, it was proposed to release as the variety for Karnataka state and subsequently identified and named Arka Coorg Excel(IC599082) for the growing in the Coorg region of Karnataka(12).

Conclusion

Based on the present study, it can be concluded that the performance of CHES Selection was found better than all the released cultivars during the years of initial yielding period under coorg conditions and it was released with a name Arka Coorg Excel.

Application of research: This newly identified variety will be helpful for increasing production of black pepper in the mountainous regions of Western Ghats.

Research Category: Spices research

Abbreviations:
Central Horticultural Experiment Station(CHES), Krishi Vigyan Kendra (KVK), Indian Institute of Horticultural Research (IIHR), Cardamom Research Centre (CRC), Indian Institute of Spice Research (IISR)

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Table 1. Growth and leaf characteristics of CHES Selection and other pepper varieties after 12 years of planting

Variety	**Height(m)**	**Diameter at bottom (m)**	**Leaf length (cm)**	**Leaf width (cm)**
Panniyur 1	3.40	1.33	14.45	10.42
Panniyur 2	3.85	1.25	10.20	7.25
Panniyur 3	5.37	1.32	12.68	7.53
Panniyur 4	5.37	1.30	12.10	9.11
Panniyur 5	6.67	0.92	11.41	7.95
Choumala	5.65	0.83	13.78	8.29
Sreekara	5.65	0.83	9.98	7.76
Subhakara	7.38	1.21	10.71	7.87
Panchami	6.27	1.12	11.07	8.93
Pournami	6.10	1.08	16.29	7.74
CHES Selection	7.60	1.40	16.80	8.10
Average	**5.76**	**1.14**	**12.68**	**8.27**
CD (0.05)	**1.73**	**0.26**	**2.43**	**0.87**

Table 2a. Yield and yield contributing characters of CHES Selection and other pepper

Variety	Green Yield (kg/vine)				Spike length(cm)			
	2011	2012	2013	Mean	2011	2012	2013	Mean
Panniyur 1	10.2	2.97	6.97	6.71	14.67	10.63	12	12.43
Panniyur 2	7.1	0.68	5.68	4.49	14.13	10.7	10.1	11.64
Panniyur 3	9.5	3.95	5.95	6.47	13.8	8.83	10.5	11.04
Panniyur 4	9.1	3.57	7.81	6.83	13.8	8.97	10.5	11.09
Panniyur 5	7.2	4.03	5.57	5.60	16.2	6.93	6.6	9.91
Choumala	4.5	1.11	5.11	3.57	12.47	5.57	7.8	8.61
Sreekara	7.5	1.48	6.48	5.15	15.5	7.83	9.9	11.08
Subhakara	8.1	4.04	7.04	6.39	13.67	6.87	9.2	9.91
Panchami	9.1	1.04	6.04	5.39	13.2	8.83	11	11.01
Pournami	9	3.95	7.95	6.97	13.23	10.2	12.2	11.88
CHES, selection	10.4	4.31	14.31	9.67	16.6	11.83	15.6	14.68
Average	**8.34**	**2.83**	7.17	6.11	**14.3**	**8.84**	10.49	11.21

CD (0.05)	**1.87**	**1.61**	2.43	1.79	**1.40**	**1.85**	2.47	1.78

Table 2b. Yield and yield contributing characters of CHES Selection and other pepper

Variety	No. of berries/spike				Wt.(g) of green berries/spike			
	2011	2012	2013	Mean	2011	2012	2013	Mean
Panniyur 1	120	55	66.6	80.53	15.4	8.08	10.2	11.23
Panniyur 2	125.3	55.2	60.7	80.40	16.13	9.33	8.1	11.19
Panniyur 3	122	49	77.1	82.70	13.3	7.27	9.5	10.02
Panniyur 4	118.7	52.3	66.1	79.03	14.63	6.57	10.4	10.53
Panniyur 5	123	56	57.5	78.83	15.97	7.5	6.8	10.09
Choumala	112	26	53.5	63.83	11.83	3.1	7.5	7.48
Sreekara	124.3	54.3	70.4	83.00	15.13	5.67	8.3	9.70
Subhakara	118.7	40.7	70.8	76.73	15.43	5.83	10.1	10.45
Panchami	123.3	49.7	66.1	79.70	14.97	4.33	9.3	9.53
Pournami	118.3	67.7	77.7	87.90	15.2	6.13	10.1	10.48
CHES, selection	127.2	70.3	84.3	93.93	17.8	11.5	13.6	14.30
Average	**121.16**	**52.38**	68.25	80.60	**15.07**	**6.85**	9.45	10.46
CD (0.05)	**4.32**	**10.17**	9.43	8.21	**1.47**	**2.11**	1.87	1.91

Table 2c. Yield and yield contributing characters of CHES Selection and other pepper

Variety	Wt. (g) of dry berries/ spike				Wt. of 100 berries				Per cent recovery			
	2011	2012	2013	Mean	2011	2012	2013	Mean	2011	2012	2013	Mean
Panniyur 1	5.4	2.89	3.41	3.90	4.5	5.25	3.15	4.30	35.06	35.77	33.47	34.77
Panniyur 2	5.83	2.92	2.44	3.73	4.65	5.29	3.29	4.41	36.14	31.3	30.16	32.53
Panniyur 3	4.13	2.33	3.09	3.18	3.39	4.76	2.98	3.71	31.05	32.05	32.52	31.87
Panniyur 4	4.72	2.1	3.3	3.37	3.98	4.02	4.24	4.08	32.26	31.96	31.73	31.98
Panniyur 5	5.47	2.5	2.2	3.39	4.45	4.46	3.65	4.19	34.25	33.33	32.35	33.31
Choumala	4	1.03	2.7	2.58	3.57	3.96	3.18	3.57	33.81	33.23	36	34.35
Sreekara	5.27	1.82	2.81	3.30	4.24	3.35	3.84	3.81	34.83	32.1	33.82	33.58
Subhakara	5.67	2.13	3.53	3.78	4.78	5.23	4.24	4.75	36.75	36.54	34.94	36.08
Panchami	5.23	1.6	3.04	3.29	4.24	3.22	4.08	3.85	34.94	36.95	32.67	34.85
Pournami	5.1	2.11	3.37	3.53	4.31	3.12	3.6	3.68	33.55	34.42	33.33	33.77
CHES, selection	6.58	4.45	4.85	5.29	5.17	6.33	4.86	5.45	36.97	38.7	35.68	37.12
Average	**5.22**	**2.35**	**3.16**	**3.58**	**4.3**	**4.45**	**3.74**	**4.16**	**34.51**	**34.21**	**33.33**	**34.02**

CD (0.05)	**0.74**	**0.88**	**0.7**	**0.77**	**0.52**	**1.03**	**0.58**	**0.71**	**1.81**	**2.45**	**1.74**	**2.00**

Table 3. Comparison of growth and yield characteristics of Panniyur-1 and CHES Selection at KVK, Gonikoppal

Parameters	CHES Selection	Panniyur -1
Leaf Length (cm)	16.58	12.68
Leaf Width(cm)	8.17	8.39
Spike Length(cm)	19.56	14.52
No. of berries/spike	103.0	81.0
Wt.(g) of green berries/spike	14.31	11.78
Wt. (g) of dry berries/ spike	5.61	4.30
Per cent recovery	38.2	36.50
Wt. of 100 berries	6.02	5.11
Green Yield (kg/vine)	8.23	6.58
Dry Yield (kg/vine)	3.23	2.41