

Varietal evaluation of black pepper (*Piper nigrum* L.) for yield, quality and anthracnose disease resistance in Idukki District, Kerala

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Abstract

Fourteen accessions of black pepper were evaluated at the Cardamom Research Station, Pampadumpara for yield, quality and disease resistance. Out of the fourteen cultivars, Cul. 239 (Panniyur-5) recorded the highest wet (906.5 g) and dry (310.1 g) yield of berries per plant. The maximum volatile oil (5.06%) and oleoresin (9.4%) contents in dry berries were observed in Cul. 5128 and Panniyur-1, respectively. A positive correlation existed between the number of spikes and berries per plant and yield. However, yield and quality characters are negatively correlated, though not significant. The results showed that Panniyur-5 is the most suitable black pepper variety for high range conditions of Idukki District.

Key words: anthracnose, black pepper, correlation, crop quality, *Piper nigrum*, yield factors.

The performance of black pepper varieties vary significantly in plains and high ranges owing to the difference in environmental conditions of these two regions. Therefore, the present study was initiated with the objective of evaluating the performance of the released varieties as well as promising selections of black pepper in the high ranges. The experiment was conducted as a part of All India Coordinated Research Project on Spices at Cardamom Research Station, Pampadumpara, Idukki during 1992 to 2000. Fourteen accessions of black pepper were evaluated for yield, biometric characters, reaction to diseases and quality parameters such as volatile oil and oleoresin contents in dry berries.

Fourteen accessions including the local cultivar Vellanamban were planted in RBD in three replications with six plants per plot. *Erythrina indica* was used as the standard. Yield, volatile

oil and oleoresin contents of dried berries were analyzed as per standard methods (ASTA 1985). The number of leaves affected by anthracnose disease was recorded. The data for three years from 1998 to 2000 were pooled and analysed. Correlation analysis of yield and other characters was done using the method suggested by Al-Jibouri *et al.* (1958).

The results are presented in Table 1. All varieties of black pepper under test, differed significantly in fresh yield, dry yield and volatile oil content. Among the fourteen varieties studied, Panniyur-5 registered maximum fresh as well as dry yield (906.5 g plant⁻¹ and 310.1 g plant⁻¹, respectively) and was found to be significantly superior to all other varieties. This corroborates with the findings of Rajagopalan *et al.* (1996) in which Panniyur-5 registered the highest fresh and

dry yield in a comparative yield trial conducted at Pepper Research Station, Panniyur, Kerala. Acc. 2445 (Kottanadan) recorded the second highest yield of 676.8 g plant⁻¹ and 273.1 g plant⁻¹ of fresh and dry berries, respectively. Subhakara recorded the lowest yield of fresh (88.5 g plant⁻¹) and dry (39.9 g plant⁻¹) berries. Regarding the response to leaf spot caused by *Colletotrichum gloeosporioides*, all the varieties were found to be susceptible and did not differ significantly. But the percentage of infected leaves was highest in Acc. 2426 (Kottanadan) and lowest in Subhakara. The quality parameters of the varieties showed a marked difference. Cul. 5128 has the highest volatile oil content of 5.06% (v/w), which was significantly higher than all other varieties followed by Acc. 2426 (Kottanadan) and it was lowest in Panniyur-3. The oleoresin content was the highest (9.4% w/w) in Panniyur-1 and minimum (7.6% w/w) in Panniyur-2. However, differences among the varieties were not significant.

The correlation studies revealed that, fresh and dry yields were positively and significantly correlated with number of spikes and

berries. Length of spike, however, had no relationship with number of berries per spike and yield (Table 2). Sujatha & Namboothiri (1995) reported positive and significant influence on yield with the spike length. However, the present investigation suggested that number of bisexual/female flowers in the spike and setting percentage are the important traits along with the spike length contributing towards yield.

In general, a negative correlation was observed between yield attributing traits and volatile oil content. But the negative relationship between the length of spike and volatile oil was highly significant. This confirmed that the conversion of photosynthates into volatile oil in berries was reduced by elongation of spike. This is attributed to the enhanced utilization of photosynthates for growth of spikes and berries.

The volatile oil content is positively correlated with oleoresin content, confirming the fact that oleoresin is one of the components of the volatile oil. Simultaneous improvement of these traits through simple selection programme

Table 1. Yield, quality and reaction to anthracnose of 14 black pepper accessions at high ranges in Idukki District (Pooled data - 1998 to 2000).

Treatment	Fresh weight of berries plant ⁻¹ (g)	Dry weight of berries plant ⁻¹ (g)	Leaves affected by anthracnose (%)	Volatile oil (v/w%)	Oleoresin content (w/w%)
Sreekara	143.2	59.3	10.0	3.46	7.8
Subhakara	88.5	39.9	8.2	3.46	8.0
Panchami	419.4	150.6	12.1	3.99	8.9
Ottaplackal	411.7	162.0	15.4	4.26	9.0
Kottanadan (Acc. 2426)	457.1	151.2	20.1	4.52	8.8
Kottanadan (Acc. 2445)	676.8	237.1	15.8	3.46	8.0
Panniyur-1	371.9	142.1	14.2	3.06	9.4
Panniyur-2	157.6	57.9	17.6	3.72	7.6
Panniyur-3	229.8	127.0	19.6	2.66	8.1
Panniyur-4	326.8	99.6	15.9	4.66	8.0
Panniyur-7 (Cul. 1558)	233.3	96.0	8.4	3.59	7.8
Cul. 5128	132.5	46.9	13.3	5.06	8.9
Panniyur-5 (Cul. 239)	906.5	310.1	18.7	3.19	8.3
Vellanamban (local check)	190.4	87.7	19.3	2.92	7.8
CD at 0.05	201.5	138.1	N.S.	0.75	N.S.

Table 2. Correlation coefficients between yield, yield related characters and quality parameters

Character	No. of spikes plant ⁻¹	Length of spike	No. of berries spike ⁻¹	Volatile oil (%)	Oleoresin (%)	Fresh weight of berries	Dry weight of berries
No. of spikes plant ⁻¹	1.0000	0.0626	0.5001'	-0.0447	-0.0892	0.9829**	0.9831**
Length of spike		1.0000	0.2789	-0.6039'	-0.0276	0.1198	0.1069
No of berries spike ⁻¹			1.0000	-0.2790	0.0676	0.4914	0.4892
Volatile oil (%)				1.0000	0.3277	-0.0473	-0.0699
Oleoresin (%)					1.0000	-0.5280	-0.0777
Fresh weight of berries						1.0000	0.9959**
Dry weight of berries							1.0000

** Significant at 1% level; * Significant at 5 % level

is an ideal tool for quality improvement of black pepper. Therefore, selection programme based on number of spikes and number of berries per spike would lead to significant improvement in fresh/dry yield of black pepper. Productivity of black pepper depends on elevation, temperature, rainfall, soil fertility, cultural practices, age of the crop, and climatic conditions during flowering, fruit set and development (Sivaraman *et al.* 1999). Apart from these, plant characters like green berry yield, number of spikes, spike length and angle of insertion of plagiotrophs had direct positive influence on yield (Sujatha & Namboothiri 1995). In general, yield of black pepper is very low at an elevation of 1100 m above MSL even with local popular variety (Vellanamban). The present study therefore indicated Panniyur-5 as the best high yielding accession among the fourteen entries evaluated under high ranges of Idukki District.

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