



'IISR Thevam', 'IISR Malabar Excel' and 'IISR Girimunda'— three new black pepper (*Piper nigrum* L.) clones

B Sasikumar, P Haridas¹, K Johnson George, K V Saji, T John Zachariah, P N Ravindran², K Nirmal Babu, B Krishnamoorthy, P A Mathew & V A Parthasarathy

Indian Institute of Spices Research

Marikunnu P. O., Calicut – 673 012, Kerala, India

E-mail: bhaskaransasikumar@yahoo.com

Received 23 March 2004; Revised 15 May 2004; Accepted 07 June 2004

Abstract

Based on 7 years' performance at Valparai (Tamil Nadu) (3000 ft MSL), and 2 years' performance at Peruvannamuzhi (Kerala) and quality evaluation, three black pepper lines namely, Coll. 1041, HP-813 and HP-105 were superior and proposed for release as 'IISR Thevam', 'IISR Malabar Excel' and 'IISR Girimunda', respectively. These lines were superior to at least one of the controls for more than one character at one or both the locations. Trials laid out at farmers' fields in four northern districts of Kerala also indicated the superiority of these lines. Coll. 1041 besides out-yielding control, exhibited a high degree of field tolerance to foot rot disease, whereas HP-813 had oleoresin content as high as 12%.

Key words: black pepper, foot rot disease tolerance, high yielding lines, *Piper nigrum*.

Introduction

The Indian black pepper industry is on the verge of losing out its age old monopoly over production and export of the commodity to other producing countries like Vietnam due to high incidence of foot rot disease, surge in imports and high cost of production. Development of new varieties with tolerance to the disease, ability to break the yield plateau of existing lines and high quality are the viable ways for salvaging the black pepper industry in the country. The present paper is a result of the efforts in this direction, since 1986.

Materials and methods

The materials for the present study comprised of a clonal selection of cv. Thevanmudi col-

lected from Mr. Phillip Mathew, Karakkal, Attappalam, Kumuli, Idukki (Kerala), during 1986 and multiplied and evaluated through 2001–02 at Valparai (Tamil Nadu) (3000 ft MSL), a hot spot area of foot rot disease, along with two hybrids namely, HP-813 and HP-105 and controls (Panniyur-1, KS-14 and KS-27). HP-813 is a hybrid between Chulamundi × Panniyur-1 while HP-105 is a hybrid of Narayakodi × Neelamundi. The lines were evaluated in a replicated row trial (10 plants row⁻¹) and non-replicated large block trials (50 plants). These lines were also evaluated at the Research Farm of Indian Institute of Spices Research, Peruvannamuzhi (Kerala), in a replicated trial (randomized block design, five replications) during 1997–

¹ Tata Tea Ltd, R & D Department, Munnar – 685 612, Kerala

² Present address: Centre for Medicinal Plants Research, Kottakkal – 676 503, Kerala

2002 besides in farmers' fields (10 plants line⁻¹) in four northern districts of Kerala, namely, Kozhikode, Wayanad, Kannur and Kasaragod. Observations were recorded on morphological traits, yield plant⁻¹ and quality parameters, besides visually rating the plants for foot rot disease incidence. Stability of the new lines for berry yield was also worked out (Eberhart & Russell 1996).

Results and discussion

The mean yield of the new lines and controls presented in Tables 1 and 2 indicates the superiority of Coll. 1041 and HP-105 over the control at Valparai. The mean fresh yield vine⁻¹ for Coll. 1041 was 5.17 kg (row trial)

and 1.61 kg (large block trial) as compared to 3.23 kg and 1.05 kg of Panniyur-1 in row trial and large block trials, respectively. Similarly for HP-105, the mean fresh yield vine⁻¹ was 6.14 kg (row trial) and 1.42 kg (large block trial). However, HP-813 recorded a mean fresh yield of 2.78 kg (row trial) and 2.06 kg vine⁻¹ (large block). The performance of Coll. 1041 and HP-105 at Peruvannamuzhi was also at par with control, KS-27 (Subhakara) (Table 3).

The initial performance of the new lines in farmers' plots also indicated the superiority of all the three lines in one of the two locations in Kozhikode. The superiority of Coll. 1041 and HP-105 over the control Panniyur-1

Table 1. Yield of promising black pepper lines and controls at Valparai (planted during 1991)

Line/Control	Average yield (fresh) vine ⁻¹ (kg)							Mean
	1995-96	1996-97	1997-98	1998-99	1999-2000	2000-01	2001-02	
Coll. 1041*	2.29	4.10	4.20	4.71	4.77	8.45	7.70	5.17
HP-105	6.17	7.33	4.80	6.02	3.34	6.90	8.40	6.14
HP-813	3.35	1.05	2.45	2.90	1.34	5.50	2.90	2.78
Panniyur-1 (Control)	3.60	1.90	1.84	2.76	1.15	6.60	4.94	3.23
KS-14 (Control)	0.40	0.34	0.32	0.32	0.63	1.28	0.80	0.58
KS-27 (Control)	0.51	0.16	0.24	0.93	1.52	2.80	0.90	1.08
CD (P=0.05)	1.05	1.10	1.12	1.60	1.65	1.70	1.05	1.30
CV %	12.00	14.00	15.00	12.00	13.00	14.00	12.00	14.00

* Tolerant to foot rot disease

Table 2. Mean yield of promising black pepper lines in large block trials at Valparai (planted during 1995-97)

Line/Control	Average yield (fresh) vine ⁻¹ (kg)			Mean
	1999-2000	2000-01	2001-02	
Coll. 1041*	0.300	1.68	2.85	1.61
HP-105	0.445	1.24	2.57	1.42
HP-813	0.730	2.10	3.19	2.06
Panniyur-1 (Control)	0.095	1.30	2.94	1.05

* Tolerant to foot rot disease

Table 3. Mean yield of promising black pepper lines at Peruvannamuzhi (planted during 1997)

Line/Control	Average yield (fresh) vine ⁻¹ (kg)			Mean
	2000-01	2001-02	2002-03	
Coll. 1041*	2.12	3.15	2.32	2.53
HP-105	5.06	1.80	0.50	2.45
HP-813	-	2.20	1.32	1.76
KS-27 (Control)	2.27	2.20	2.70	2.39
CD (P=0.05)	0.70	0.60	0.48	0.50
CV%	12.50	13.00	12.00	14.00

* Tolerant to foot rot disease

Table 4. Performance of promising black pepper lines in farmers' fields

Name of farmer/Locality	Line/Variety	Fresh yield vine ⁻¹ *(kg)	Dry recovery (%)
Mr. Jose Austin Kodencherry Kozhikode District	Coll. 1041**	2.5	32.0
	HP-105	3.2	31.0
	HP-813	2.5	34.0
	Karimunda	2.0	33.0
	Panniyur-1	2.2	32.0
Mr. Cherian Koombara Kozhikode District	Coll. 1041**	3.2	33.0
	HP-105	3.0	30.0
	Panniyur-1	2.8	31.0
	Panniyur-5	3.0	30.0
Mr. Sunny Wayanad District	Coll. 1041**	1.8	32.0
	HP-105	2.3	29.5
	Karimunda	1.0	32.0
	Panniyur-1	2.2	32.0
Mr. Joy George Kannur District	Coll. 1041**	3.2	32.0
	HP-105	2.9	30.5
	Karimunda	2.4	32.0
	Panniyur-1	3.0	33.0
Mr. Haridran Nair Parappa Kasaragod District	HP-105	4.0	30.5
	HP-813	2.8	33.0
	Sreekara	3.0	32.0
	Panniyur-1	3.8	33.0

* 2nd-3rd year of yielding

** Tolerant to foot rot disease

Table 5. Stability parameters of promising black pepper lines and control

Line/Control	Mean yield (fresh) vine ⁻¹ (kg)	bi	S ² di
Coll. 1041	5.17	1.39	1.30**
HP-105	6.42	0.92	1.96**
HP-813	2.78	1.05	0.76**
Panniyur-1	3.23	1.61	0.26**

** Significant at 1% level

in the second location in Kozhikode District and over the control Karimunda in Wayanad District was also observed besides in Kannur District wherein Coll. 1041 out-yielded Panniyur-1 and HP-105 out-yielded Karimunda. HP-105's performance was superior to both the controls (Sreekara and Panniyur-1) at Kasaragod District too (Table 4).

Coll. 1041 exhibited high degree of field tolerance to foot rot disease at Valparai and Peruvannamuzhi. Stability analysis for berry

Table 6. Quality attributes of promising lines of black pepper and controls at Valparai and Peruvannamuzhi

Line/Control	Valparai					Peruvannamuzhi				
	Dry recovery (%)	Bulk density (g/l)	Piperine (%)	Oleoresin (%)	EO (%)	Dry recovery (%)	Bulk density (g/l)	Piperine (%)	Oleoresin (%)	EO (%)
Coll. 1041	35.0	582	1.4	8.5	3.2	30.5	569.0	1.9	7.8	3.0
HP-105	32.0	582	1.4	8.5	3.2	32.0	454.0	2.8	10.8	3.6
HP-813	34.0	612	2.4	11.7	2.8	30.6	452.2	3.5	14.6	5.4
Panniyur-1 (Control)	30.0	512	3.0	9.4	2.0	-	-	-	-	-
KS-27 (Control)	-	-	-	-	-	34.0	565.2	3.0	10.6	3.6

EO=essential oil

yield revealed better stability of the new lines compared to Panniyur-1 as they recorded high mean yield and regression coefficients near to 1 (Table 5). Panniyur-1 is known for

its alternate bearing nature (Kumar *et al.* 1999).

Analysis of quality of the new lines revealed that in terms of dry recovery, bulk density

Table 7. Distinguishing morphological characters of promising black pepper lines

Character	IISR Thevam (Coll. 1041)	IISR Girimunda (HP-105)	IISR Malabar Excel (HP-813)
Berries spike ⁻¹	57	47	70
Vine column circumference (m)	6.0	3.5	6.0
Vine height (cm)	224	460	310
Support	Living	Living	Living
Branching habit	Dimorphic	Dimorphic	Dimorphic
Shoot tip colour	Light purple	Light purple	Light purple
Runner shoot production	Many	Many	Many
Holding capacity	Strong	Strong	Strong
Adventitious root production	Many	Many	Many
Pubescence on stem	Absent	Absent	Absent
Lateral branch habit	Erect	Erect	Hanging
Lateral branch length (cm)	33.4	55.6	60.4
No. of nodes lateral branch ⁻¹	29	44	29
Juvenile leaf length	Short	Short	Intermediate
Leaf petiole length (cm)	1.2	1.4	1.2
Leaf length (cm)	14.2	12.9	17.0
Leaf width (cm)	7.0	8.6	8.0
Leaf lamina shape	Ovate-elliptic	Ovate-elliptic	Elliptic-lanceolate
Leaf base shape	Round	Round	Acute
Leaf margin	Even	Even	Even
Vein type	Campylodromous	Campylodromous	Campylodromous
Leaf texture	Glabrous/scoriaceous	Glabrous/scoriaceous	Glabrous/scoriaceous
Leaf hairiness	Absent	Absent	Absent
Leaf scales	Absent	Absent	Absent
Presence of pearl glands	Sparse	Sparse	Sparse
Spike orientation	Pendant	Pendant	Pendant
Spike shape	Filiform	Filiform	Filiform
Spike colour	Green	Green	Green
Spike fragrance	Not fragrant	Not fragrant	Not fragrant
Spike length (cm)	8.2	9.2	8.8
Sex of spike	Predominantly bisexual	Predominantly bisexual	Predominantly bisexual
Peduncle length (cm)	1.1	1.1	1.0
No. of spikes lateral branch ⁻¹	10.6	15.5	13.4
Spikes vine ⁻¹	142	142	355
Flower arrangement	Free	Free	Free
No. of stamens	2	2	2
Anther length	Short	Short	Long
Spike texture	Glabrous	Glabrous	Glabrous
Bract type	Deeply cupular with decurrent base	Deeply cupular with decurrent base	Deeply cupular with decurrent base
Flower nature	Sessile	Sessile	Sessile
Fruit setting (%)	80	90	70
No. of berries 10 spikes ⁻¹	392	515	545
100 fruit wt. (g)	15.5	11.2	10.3
100 fruit volume (ml)	12.0	11.5	10.0
Fruit shape	Round	Round	Round
Dry wt. of 100 berries (g)	5	4	4

and essential oil content, the new lines are superior to Panniyur-1 at Valparai (Table 6). At Peruvannamuzhi, the bulk density of Coll. 1041 (569.0 gl^{-1}) was better than that of the control KS-27 (565.2 gl^{-1}).

A striking quality aspect of HP-813 is its very high oleoresin content both at Valparai (11.7%) and Peruvannamuzhi (14.6%) as against 9.4% (Panniyur-1) and 10.6% (Sreekara) of the controls at Valparai and Peruvannamuzhi, respectively. Based on its high yield, yield stability and tolerance to foot rot disease, Coll.1041 was recommended for release as 'IISR Thevam', while HP-813 was recommended for release as 'IISR Malabar Excel' owing to its high oleoresin levels and stable performance and HP-105 as 'IISR Girimunda' due to its high yield, by the Staff Research Council of Indian Institute of Spices Research, Calicut, and the XVII Workshop of All India Coordinated Research Project (Spices) held at Calicut during 3–5 February 2004. All the three lines are proposed to the State Variety Release Committee.

The distinguishing morphological traits of the new lines are presented in Table 7. Coll. 1041, registered as a unique germplasm having tol-

erance to foot rot disease with National Bureau of Plant Genetic Resources, New Delhi (Registration No. 03091), was collected from a farmer's plot in Idukki District, Kerala. Thevanmundi, the mother clone of Coll. 1041, is known for its high degree of field tolerance to foot rot disease among the farmers of Kerala, especially Idukki District.

Acknowledgements

We are thankful to Mr. Phillip Mathew, Karakkat, Attappalam, Kumuli, Idukki District, Kerala, for the original specimen of Coll. 1041. We are also thankful to Mr. Premachandran, Technical Assistant, Research Farm, Indian Institute of Spices Research, Peruvannamuzhi and Mr. K. N. Radhakrishnan, Assistant Manager, Tata Tea Ltd., R & D Department, Munnar, Idukki District, for their help in recording the yield data.

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