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Evaluation of Local Black Pepper (*Piper nigrum* L.) Genotypes for Yield and Quality under Arecanut Based Cropping System

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ABSTRACT

Twenty two black pepper genotypes were evaluated for yield and quality parameters under arecanut based cropping system during 2015-16 in Uttara Kannada (Dist.), Karnataka. Among them, The var. Panniyur-1(control), recorded significantly highest fresh spike yield (24.23kg/vine), fresh berry yield (22.84kg/vine) dry berry yield (8.22kg/vine)whereas, maximum black pepper (39.61%) and white pepper (31.04%)recovery seen in the genotype SV-21 and var. Panniyur-1.However, yield components viz., number of spikes per unit area, number of spikes per 100 leaves, individual spike weight differed statistically. Among the quality attributes, the bulk density was recorded maximum (650g/l) in the genotype SV-15 followed by SV-14 (627.67g/l). The essential oil content was found highest in var. Panniyur-1, SV-7, 12 and SV-16 (2.80% each).Whereas oleoresin was maximum (10.74%) in SV-7. However, the highest piperine content (5.50%) was recorded in genotype SV-15 and next best in SV-7 (5.49%).

Key words: *Genotypes, evaluation, spikes, Piper nigrum L.*

INTRODUCTION

Black pepper (*Piper nigrum* L.), (Family-Piperaceae) christened as the 'King of Spices' and 'Black Gold' is an important commodity of commerce since time immemorial. It is one of the oldest and most important spices known to mankind. Black pepper of commerce is the matured dried berry and is valued for its aroma due to the essential oil, present in the berries and the pungency due to its alkaloid piperine. It is mainly used as culinary item in processing food industries, perfumery, allied industries and in traditional medicines. Black pepper is also very important in traditional medicine[11]. It is a climbing herbaceous perennial vine, native to humid tropical evergreen forests of Western Ghats of India. Black pepper is either grown as pure crop and largely as a mixed crop with arecanut, coffee and tea. Other tree species like Silver oak and *Erythrina indica* are also used as live standards in hill zone of Karnataka. The performance of black pepper varieties vary significantly between plains and higher altitudes owing to difference in environmental conditions in addition to genetic differences[5].

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Indian pepper fetches a premium price in major international markets because of its intrinsic quality[14]. But the continuous use of low yielding cultivars, non availability planting materials, losses due to severe incidence of biotic and abiotic stress and also non adoption of appropriate agronomic practices are some of the prominent factors contributing to low productivity of black pepper in India. There is no information on the availability of improved genotypes other than var. Panniyur-1 and local cultivars like Karimalligesara, Bilimalligesara, Uddakare, Doddiga for the arecanut mixed system of cultivation in Karnataka. However, some of the superior genotypes believed to be high yielders with superior in quality and tolerant to drought situation, pest and diseases, that may available in the farmers fields. Hence, the present study was undertaken on morphological characterization and evaluation of local black pepper genotypes for growth, yield and quality under arecanut based cropping system.

MATERIAL AND METHODS

The experiment was conducted during 2015-16 at Chavatti, Hosmane, Yellapur Tq. Uttara Kannada (Dist.), Hill Zone of Karnataka (Zone-9) situated at an altitude of 590 m above MSL. This zone receives an annual average rainfall of 1687.48 mm, the mean maximum temperature was 37.11°C during April and mean minimum temperature was 18.41°C during January and the relative humidity ranged from 47.98 to 90.40 per cent. Twenty two genotypes were evaluated in Randomized Complete Block Design with three replications and treatments includes the SV-2 to 22 genotypes and the var. Panniyur-1 as control. Genotypes were planted and trained on arecanut plant as a standard with a spacing of 2.7 x 2.7m and the vines are about 15 years age. Observations were recorded on morphological, growth, yield and quality attributes.

RESULTS AND DISCUSSION

Among the evaluated genotypes for yield and yield attributing characters, the number of spikes per 100 leaves at 2m was found to be maximum in SV-11 (70.33) followed by SV-12 (58.33) and SV-6 (58). The mean number of spikes per column at different heights up to 3m was recorded. At one meter height, the mean no. of spikes was found to be highest in SV-17 (187.66) followed by SV-4 (156) and it was lowest in SV-16 (56.26). Similarly, at 2m height the genotype SV-11 shown maximum spikes (263.67), which was on par with SV-17 (256.55) and SV-20 (256.46) while, it was lowest in SV-16 (84.70) and at 3m height SV-14 recorded maximum number of spikes (321.40), it was statistically on par with SV-20 (308.33) whereas, lowest spikes were noticed in SV-13 (105). Maheswarappa *et al*.[8] observed, Panniyur-5 having significantly higher number of spikes (238 in one metre column height) which was on par with IISR Thevam (202.5) and OPKM (186.6) while, lowest was in HP-780 (21.5). The upper part of the canopy with a relatively high leaf area during the spike development period and higher photosynthetic rate promote the development of productive laterals and sustains relatively large number of spikes[7]. The fresh spike yield per vine was maximum in var.Panniyur-1 (24.23kg) and lowest was recorded in SV-15 (1.27kg).Significantly highest fresh weight of berries per vine was recorded in var.Panniyur-1 (22.84kg/vine) followed by SV-7 (16.89kg/vine) whereas, lowest was obtained in SV-15 (0.444kg/vine).Ibrahim *et al*.[3] reported spike yield and spike number in black pepper as important traits contributing for yield. The quantitative traits, green berry yield per vine, spike number, spike length are known to influence the yield of black pepper[13]. Different varieties perform based on its genotypic character and its exposure to environment, distribution of pre-monsoon showers, incidence of anthracnose disease and spike shedding[1]. Similarly, in the present study higher yield in var. Panniyur-1 was due to longer (20.60cm) and heavier spikes (17.92g/spike) with more number of berries per spike (91.33) and in SV-7 higher spike weight, more number of berries per spike, bigger size of dry berries resulted in higher

yield. However, the fresh weight of berries per vine was recorded significantly highest in var. Panniyur-1 (22.84kg/vine) followed by SV-7 (16.89kg/vine) and lowest was in SV-15 (0.444kg/vine). The variation in fresh berry weight was recorded in black pepper cultivars studied by Bhagavantagoudra *et al.*[1]as the performance of five varieties of under coffee based cropping system on *Erythrina indica* as the standard. Among the varieties tested, the cumulative yield of green pepper was found highest in var. Panniyur-3 (19.06kg/vine) followed by var. Panniyur-5 whereas, lowest was in Karimunda (8.63kg/vine).Hence, the contributing characters like increased number of spikes, length of spike, number of berries per spike, etc. have direct effect on fresh berry yield in black pepper.In terms of quality parameters, the maximum essential oil content (2.80%) were recorded in the genotypes (var. Panniyur-1, SV-7, 12, and SV-16) while it was lowest (1.60%) in the genotypes (SV-6, 8, 11 and SV-19).This can be attributed to the effect of cultivar, agro climatic conditions, differences in the maturity of spikes and method of oil extraction[12,15]. The oleoresin content were obtained maximum in genotype SV-7 (10.74%) followed by SV-4 (9.39%) and SV-21 (9.31%), while lowest was in genotype SV-9 (4.27%).The maximum piperine content was recorded in the genotype SV-15 (5.50%). The genotype SV-15 recorded highest bulk density of (650g /l) followed by SV-14 (627.67g /l) and lowest was found in SV-5 (480.33g /l). For export purpose, the minimum bulk density should be (>500g/l). Bulk density is the major physical property of biomass and it influences directly the cost of the substances[6]. In the present study out of 22 evaluated genotypes, nine genotypes (SV-2, 6, 10, 12, 13, 14, 15, 19 and SV-20) had more than 600g per liter bulk density, whereas thirteen genotypes (var. Panniyur-1, SV-3, 4, 5, 7, 8, 11, 16, 17, 18, 21 and SV-22) recorded more than 500g per liter only the genotype SV-5 showed lower bulk density (480.33g/l). Hence, the local genotypes available at the farmers' field are having potential to perform for better yield with higher quality characters.

Table 1: Yield characters in different genotypes of black pepper (*Piper nigrum* L.)

Genotype	Fresh wt. of spike/ vine(kg)	Fresh wt. of berries / vine(kg)	Dry yield of berries/vine (kg)	Black pepper recovery (%)	White pepper recovery (%)	Bulk density (g/l)
Panniyur-1	24.23	22.84	8.22	36.00	31.04	528.67
SV-2	18.00	15.33	5.59	36.49	17.37	618.00
SV-3	11.00	8.63	3.20	37.11	27.05	555.33
SV-4	12.00	10.07	3.42	34.21	19.25	547.67
SV-5	7.92	5.45	1.80	33.08	15.67	480.33
SV-6	7.59	6.06	2.21	34.32	28.25	616.33
SV-7	20.27	16.89	5.29	31.30	21.10	574.00
SV-8	5.99	3.71	1.37	37.00	20.84	521.67
SV-9	11.99	10.46	3.66	34.99	14.19	560.67
SV-10	12.85	10.48	3.94	37.57	27.00	622.67
SV-11	15.44	13.06	4.78	36.57	29.14	585.33
SV-12	11.14	8.78	3.32	37.82	25.12	616.33
SV-13	8.12	8.27	2.61	31.59	27.94	601.67
SV-14	11.01	9.61	3.81	38.52	17.25	627.67
SV-15	1.27	0.44	0.17	38.27	27.25	650.33
SV-16	3.00	2.75	0.99	35.99	31.00	520.33
SV-17	18.34	14.84	4.73	31.88	29.25	550.00
SV-18	12.82	10.84	3.81	35.17	18.32	551.67
SV-19	10.73	8.67	3.31	38.17	28.70	600.67
SV-20	17.70	14.59	4.18	28.65	18.17	601.67
SV-21	9.79	8.01	3.17	39.61	30.33	589.67
SV-22	10.34	9.12	3.30	36.17	30.25	534.67
Grand mean	11.89	0.27	3.54	35.85	24.29	575.24
S. Em±	0.23	0.77	0.13	0.85	0.28	5.70
CD (5%)	0.64	4.59	0.36	2.44	0.81	16.27
CV (%)	3.28	10.13	6.14	4.13	2.01	1.72

Table 2: Spike yielding characters of black pepper genotypes

Genotype	Individual fresh spike weight (g)	No. of spikes/ 100-leaves	No. of spikes/column at different height		
			1m	2m	3m
Panniyur-1	17.92	43.33	128.43	211.22 (39.0)	236.72 (10.7)
SV-2	11.12	44.00	65.67	105.00 (37.5)	126.06 (16.7)
SV-3	12.12	41.66	70.00	90.00 (22.2)	126.33 (28.75)
SV-4	12.56	57.33	156.33	150.87 (-3.6)	188.77 (20.0)
SV-5	8.68	46.00	109.33	208.10 (47.5)	235.71 (11.71)
SV-6	17.17	58.00	59.22	177.89 (66.7)	189.22 (5.98)
SV-7	11.74	55.00	105.22	193.44 (45.6)	271.75 (28.81)
SV-8	7.90	56.33	61.63	88.33 (30.2)	121.67 (27.40)
SV-9	10.64	51.30	72.36	145.78 (50.4)	230.19 (36.70)
SV-10	13.02	47.33	73.29	206.75 (64.6)	254.78 (18.85)
SV-11	14.30	70.33	117.42	263.67 (55.5)	285.33 (7.60)
SV-12	15.42	58.33	114.52	165.22 (30.7)	201.44 (17.98)
SV-13	22.33	48.00	63.00	96.37 (34.6)	105.00 (34.50)
SV-14	9.57	46.00	105.00	233.33 (55.0)	321.40 (27.40)
SV-15	8.61	31.00	71.00	109.55 (35.2)	148.67 (26.31)
SV-16	17.25	30.11	56.26	84.70 (33.6)	120.67 (29.80)
SV-17	8.01	35.00	187.66	256.55 (26.9)	277.43 (7.52)
SV-18	8.58	37.33	100.40	170.33 (41.0)	219.59 (22.43)
SV-19	8.76	46.00	113.37	197.67 (42.6)	246.33 (19.75)
SV-20	13.93	44.83	134.29	256.46 (47.6)	308.33 (16.82)
SV-21	10.46	48.00	61.67	85.67 (28.0)	113.70 (24.65)
SV-22	12.52	44.00	146.00	256.00 (43.0)	275.67 (7.13)
Grand mean	12.39	46.87	98.73	170.58	209.30
S. Em±	0.78	2.31	2.26	2.61	4.66
CD (5%)	2.21	6.59	6.46	7.44	13.31
CV (%)	10.85	8.53	3.97	2.65	3.86

* Values in the parenthesis are percentage increment over the previous height

Table 3: Quality attributes in different genotypes of black pepper (*Piper nigrum* L.)

Genotype	Essential oil (%)	Oleoresin (%)	Piperine content (%)
Panniyur-1	2.8	8.88	3.39
SV-2	2.40	7.36	2.90
SV-3	2.00	7.34	2.79
SV-4	2.40	9.39	4.30
SV-5	2.00	7.35	3.07
SV-6	1.60	6.75	2.62
SV-7	2.80	10.74	5.49
SV-8	1.60	6.68	2.87
SV-9	2.40	4.27	3.29
SV-10	2.40	8.06	3.49
SV-11	1.60	7.17	2.69
SV-12	2.80	8.79	2.93
SV-13	1.80	6.08	2.85
SV-14	1.80	7.62	3.01
SV-15	2.00	8.00	5.50
SV-16	2.80	8.79	4.08
SV-17	1.80	7.46	3.20
SV-18	2.00	7.55	3.75
SV-19	1.60	8.10	3.39
SV-20	2.00	8.44	3.33
SV-21	2.40	9.31	3.99
SV-22	2.00	7.52	3.94

REFERENCES

1. Bhagavantagoudra, K. H., Sheshagiri, K. S., Venkateshmurthy, P. and Dinesh, M., Performance of black pepper varieties in coffee based cropping system. *Karnataka J. Agri. Sci*., **21 (2):** 256-258 (2008).
2. Fife, T. E., Szasz, J. I., Hunt. C. V., Pas. and Ahola, J. A., Relationship between quality characteristics of barley grain and digestibility in feedlot Steers. *The Professional Animal Scientist*, **24 (6):** 560-565 (2008).
3. Ibrahim, K. K., Pillay, V, S. and Sasikumaran, S., Correlated response in yield and component characters in pepper (*Pipernigrum* L.). *Agric. Res. J. Kerala*, **25:** 263-264 (1987).
4. Krishnamurthy, K. S., Parthasarathy, V. A., Saji, K. V. and Krishnamoorthy, B., Ideotype concept in black pepper (*Piper nigrum* L.). *J. Spices and Aromatic Crops*, **19:** 1–13 (2010).
5. Kurian, P. S., Backiyarani, S., Josephrajkumar, A. and Murugan, M., Varietal evaluation of black pepper (*Piper nigrum* L.) for yield, quality and anthracnose disease resistance in Idukki District, Kerala. *J. Spices and Aromatic Crops*, **11(2):** 122-124 (2002).
6. Lam, P. S., Sokhansanj, S., Lim, C. J., Naimi, L. J., Hoque, M., Mani, S., Womac, A. R. and Narayan, S., Bulk density of wet and dry wheat straw and switch grass particles. *Appl. Eng. Agric*., **24(3):** 351-358 (2008).
7. Mathai, C. K., Growth and yield analysis in black pepper (*Piper nigrum* L.) under different light conditions. *Ph. D (Agri.) Thesis*, Univ. Agri. Sci., Bangalore, India (1983).
8. Maheswarappa, H. P., Krishnakumar, V., Srinivasa. Reddy, D. V., Dhanapal, R. and Zachariah, T. J., Performance of different varieties/hybrids of black pepper (*Piper nigrum* L.) as mixed crop in coconut garden. *J. Plantation Crops*, **40 (2):** 82-87 (2012).
9. Prasannakumari, A, S., Nybe, E. V., Sujatha, V. S. and Prabhakaran, P. V., Survey, evaluation and identification of black pepper cultivars. *J. Tropical Agri.*, **39:** 9-12 (2001).
10. Ravindran, P. N., Studies on black pepper and some of its wild relatives. Ph. D. Thesis, Univ. Calicut, Kerala (1991).
11. Ravindran, P. N., Balachandran, I. and Chempakam, B., End uses of pepper. In: Ravindran P N (ed.) Black pepper (*Piper nigrum* L.) *Harwood Academic Publications*, Amsterdam 467-479 (2000).
12. Sasikumar, B., Johnson, K., George, K. V., Saji, S. J., Gowda, A. and Zachariah, T. J., Two unique black pepper accessions with very long spikes from the centre of origin. *Plant Genet., Res*., **4 (9):** 1-3 (2014).
13. Sujatha, R. and Namboodiri, K. M., Influenceof plant characters on yield in blackpepper (*Piper nigrum* L.). *J. Trop. Agric.*, **33:** 11-15 (1995).
14. Thomas, K.V. Awards for excellence in exports and productivity ASEAN pact opening markets for India (2010).
15. Zachariah, T. J. and Parthasarathy, V. A., Black pepper. In: Parthasarathy *et al*. (eds) Chemistry of Spices: CABI, UK, 21–40 (2008).