Plant Archives Vol. 26, No. 1, 2026 pp. 2183-2186 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org

DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2026.v26.no.1.300

EVALUATION OF BLACK PEPPER (*PIPER NIGRUM* L.) VARIETIES FOR PROPAGATION EFFICIENCY USING MODIFIED SERPENTINE LAYERING UNDER THE TERAI ZONE OF WEST BENGAL INDIA

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(Date of Receiving-18-12-2025; Date of Revision-25-02-2026; Date of Acceptance-05-03-2026)

ABSTRACT

Quality planting material is one of the most important factors and the key to success in black pepper production and area extension of pepper gardens in India. Conventional methods practiced for the establishment of black pepper have the disadvantage of false sprouting and poor root growth, coupled with high disease incidence which eventually leads to poor establishment. With this in view, the present experiment has been laid to study the response of different black pepper varieties for propagation through modified serpentine layering. The present investigations were carried out in the polyhouse situated at the Instructional Farm of Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, West Bengal during the year 2016-17 and 2017-18. The experiment was laid out in Complete Randomized Design (CRD) with three replications. Eight black pepper varieties (viz. Panniyur-1, Panniyur-2, Panniyur-3, Panniyur-6, Panniyur-7, Pournami, Panchami and Subhakara) layered in a media comprising of soil + sand + FYM @1:1:1 were undertaken to evaluate. Results revealed that different varieties of black pepper had significant variations with respect to shoot and root parameters, survivability and number of layers per year. Maximum survivability (94.50 % and 91.83 %) at 30 and 90 days after cutting of layers was found in Panniyur-1. Maximum planting material per year was produced by Panniyur-1 (52.17) which was higher than the rest of the varieties but was statically at par with Panniyur-2 (50.83) and Pournami (49.83). So, these three varieties may be considered for a modified serpentine layer for the production of more numbers of quality planting materials with higher root and shoot growth.

***Key words*:** Planting materials, Propagation, Modified serpentine layering, Varieties.

Introduction

Black pepper (*Piper nigrum* L.) is one of the most popular spices in the World. It has a vast history back to the times of King Solomon (BC 1015-BC 66). Black pepper has influenced the destiny of nations and their people both economically and culturally. Black pepper is one of the oldest and most important spices and hence it is called “King of spices”. It belongs to the family Piperaceae. It is grown in 26 countries including India, Indonesia, Srilanka, Thailand, China, Vietnam, Cambodia, Brazil, Mexico and Guatemala and occupies an area of 6,08,964 hectares with production and productivity of 6,20,871 tonnes and 1,020 kg/ha (Directorate of Arecanut and Spices Development 2019-20). Among the different black pepper growing countries, India is the major producer, exporter and consumer in the World with a total cultivated area of 278050 hectares with production of 64000 tonnes and productivity of 230.17 kg/ha (Directorate of Arecanut and Spices Development 2022-23). In India, Black pepper is usually cultivated as a mixed crop in the coconut and coffee-based multilayer cropping system and also in the farmstead gardens to a large extent

Table 1: Response of different varieties on growth parameters of layers.

Varieties	Shoot length of layer (cm)			Number of leaves			Root length of layer (cm)			Number of roots		
	30 DAC	60 DAC	90 DAC	30 DAC	60 DAC	90 DAC	30 DAC	60 DAC	90 DAC	30 DAC	60 DAC	90 DAC
Panniyur-1	13.00	22.67	30.66	6.01	7.78	8.98	13.44	18.97	25.48	6.85	7.83	8.96
Panniyur-2	11.71	20.32	29.72	5.33	6.97	8.54	12.65	18.30	24.23	6.10	7.26	8.34
Panniyur-3	9.52	15.99	23.34	4.63	5.58	7.68	10.31	14.34	19.36	4.67	5.08	6.14
Panniyur-6	10.32	17.25	25.27	4.75	6.01	7.87	10.68	14.91	20.13	4.83	5.6	6.77
Panniyur-7	8.65	14.29	20.08	3.78	4.88	6.54	9.17	12.75	17.47	3.63	4.27	5.25
Pournami	11.21	19.27	27.9	4.97	6.73	8.29	11.57	16.98	22.67	5.55	6.42	7.73
Panchami	10.61	18.24	26.49	4.67	6.35	8.18	11.25	15.96	21.48	5.22	5.71	7.1
Subhakara	9.52	15.78	22.21	3.92	5.08	6.74	9.9	13.62	18.41	4.54	4.91	5.95
SE(m) ±	**0.72**	**0.82**	**0.7**	**0.44**	**0.5**	**0.36**	**0.62**	**0.84**	**0.76**	**0.24**	**0.38**	**0.62**
C.D. (P=0.05)	**2.1**	**2.38**	**2.02**	**1.28**	**1.46**	**1.04**	**1.79**	**2.43**	**2.19**	**0.69**	**1.1**	**1.78**
* DAC - Days after cutting												

in Kerala, Karnataka and Tamil Nadu (Muthumanikam, 2003, Kumar and Swarupa, 2017). To establish a good black pepper garden requires good quality planting materials, quality planting material is one of the most important factors and the key to success in black pepper production and area extension of pepper gardens in India. But the continuous use of low-yielding cultivars, nonavailability of quality planting materials and losses of plants due to rigorous incidence of biotic and abiotic stress and also non-adoption of advance agronomic practices by the growers are some of the major problems for contributing low productivity in India. The availability of an adequate quantity of quality planting material of black pepper on a large scale is one of the major constraints faced by black pepper growers for increasing the production of pepper in India. The use of quality planting material is always a vital aspect of black pepper production. Recent advancements like, the use of growth regulators, growing media, and advanced propagation techniques are found helpful in solving this problem to an extent. For the production of quality planting materials modified serpentine layering method has greater advantages over traditional methods because this method is a modified form of serpentine layering and it is simple, cheap and produces more planting materials. With keeping this in view, the present investigation has been outlined to study the response of different black pepper varieties for propagation through modified serpentine layering.

Materials and Methods

The present investigations were carried out at Instructional Farm, Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, West Bengal during the year 2018 and 2019. The experiment was carried out to study the response of different black pepper varieties on the production of planting material through modified serpentine layering under the terai zone of West Bengal. The experiment was carried out in a Complete Randomized Design (CRD) with three replications. Eight black pepper varieties (viz, Panniyur-1, Panniyur-2, Panniyur-3, Panniyur-6, Panniyur-7, Pournami, Panchami and Subhakara) layered in a media comprising of soil + sand + FYM @1:1:1 were undertaken to evaluate through modified serpentine layering. This method is a modified form of serpentine method of plant propagation. In this method long vines are allowed to creep on the bed made up of suitable potting media. In this method vines are allowed to strike root on the bed and when it reaches the end of the bed, entire strips is harvested and each rooted nodes are separated individually in poly bags filled with potting media for further establishment. The separation of nodes can also be done when the entire vines is trailing on the bed. After activation of buds it can be separated and planted in poly bags for further establishment (Nybe *et al.*, 2016; Anandraj *et al.*, 2014). Semi-hardwood cutting of 3 years old black pepper var. Panniyur-1, Panniyur-2, Panniyur-3, Panniyur-6, Panniyur-7, Pournami, Panchami and Subhakara were prepared as a mother plant and kept at the bottom of well-prepared seed bed sized 10 m × 1.5 m as the vine elongated each node are clipped in a bed with the help of bamboo pegs. When the plant consists of 10-15 rooted nodes then single node cuttings are taken and planted in a poly bag comprising a mixture of topsoil + sand + FYM (1:1:1). This process was repeated continuously as the vine elongates. Mean data on all the recorded parameters were statistically analysed and result were presented on the basis of pooled data for all the measured traits. Data were analysed statistically using the procedure of Gomez and Gomez (1984).

Table 2: Response of different varieties on plant biomass, survival percentage and number of planting materials production.

Varieties	Fresh weight of layers (g)			Dry weight of layers (g)			Survival Percentage	Total planting materials production
	30 DAC	60 DAC	90 DAC	30 DAC	60 DAC	90 DAC		
Panniyur-1	14.58	20.71	27.62	2.52	3.73	5.94	91.83 (9.58)	52.17
Panniyur-2	13.58	18.83	24.85	2.35	3.38	5.45	89.33 (9.45)	50.83
Panniyur-3	10.39	13.88	17.91	1.82	2.54	4.20	85.00 (9.22)	47.67
Panniyur-6	11.30	15.18	19.70	1.97	2.77	4.52	86.00 (9.27)	48.83
Panniyur-7	8.86	11.27	14.30	1.56	2.18	3.76	82.33 (9.07)	46.00
Pournami	12.52	17.10	22.37	2.17	3.10	5.00	87.83 (9.37)	49.83
Panchami	11.91	16.15	21.05	2.07	2.93	4.76	86.83 (9.32)	48.33
Subhakara	9.80	12.92	16.55	1.72	2.37	3.96	83.33 (9.13)	47.17
SE(m) ±	0.50	0.63	0.83	0.08	0.19	0.21	0.02	1.10
C.D. (P=0.05)	1.45	1.82	2.42	0.24	0.54	0.61	0.04	3.19

***** Values in parenthesis indicate the square root transformed value (Gomez and Gomez 1984)

Results and Discussion

The data presented in Table 1 showed a significant variation among the black paper varieties propagated through modified serpentine layering at different stages. After perusal of data maximum shoot length (13.00 cm, 22.67 cm and 30.66 cm), number of leaves (6.01, 7.78 and 8.98), root length (13.44 cm, 18.97 cm and 25.48 cm) and number of roots (6.85, 7.83 and 8.96) was recorded in Panniyur-1 which was followed by Panniyur-2 with a shoot length (11.71 cm, 20.32 cm and 29.72 cm), number of leaves (5.33, 6.97 and 8.54), root length (12.65 cm, 18.30 cm and 24.23 cm) and number of roots (6.10, 7.26 and 8.34) at 30, 60 and 90 days after cutting of layers respectively. fresh weight of layers (14.58 g and 27.62 g) and dry weight of layer (2.52 g and 5.94 g), fresh weight and dry weight (g). Meanwhile the lowest shoot length (8.65 cm and 20.08 cm), number of leaves (3.78 and 6.54), root length (9.17 cm and 17.47 cm), fresh weight of layer (8.86g and 14.30g), dry weight of layer (1.56 g and 3.76 g) was observed in Panniyur-7 at 30 and 90 days after cutting of layers. Panniyur-1 outperform all the varieties evaluated in the experimentation on growth parameters might be due to the genetic characteristic of the individual varieties of black pepper. Similar findings were confined by Akshay *et al.*, (2018) and Waman *et al*., (2019). After perusal of data presented in Table 2 reveals a significant response among the varieties propagated through modified serpentine layering. The highest survival percentage of layers (91.83) was observed in Panniyur-1, followed by Panniyur-2 (89.33) and Pournami (87.83), meanwhile the lowest survivability rate was recorded in Paniyur-7 (82.33). Similarly, Panniyur-1 also produced a highest number of layers (52.17), followed by Paniyur-2 (50.83) and Pournami (49.83). Similar findings were also reported by Thapa *et al*., (2021), where they observed highest survival percentage and layer production in Panniyur-1. Khatke *et al*., (2024) also highlights that Panniyur-1 showed excellent survival rates under several rapid propagation methods. Data presented on residual nutrient status in media of different varieties of black pepper showed a significant variation (Table 3). The lowest residual nitrogen (66.60 kg/ha), phosphorous (51.49 kg/ha) and potassium (74.51 kg/ha) was recorded in media of Panniyur-2, whereas the highest residual nitrogen (87.42 kg/ha), phosphorous (65.31 kg/ha) and potassium (81.26 kg/ha) was recorded in media of Panniyur-7. Panniyur-1 exhibited lowest residual available nutrient as Panniyur-1 showed better growth, root development and sucker development due to better absorption and utilization of nutrient by the plant resulting in least residual nutrient.

Table 3: Available residual nutrients in media of different varieties of black pepper layers.

Varieties	Nitrogen at 90 days after cutting	Phosphorous at 90 days after cutting	Potassium at 90 days after cutting
Panniyur-1	66.6	51.49	74.51
Panniyur-2	70.62	53.06	76.31
Panniyur-3	83.41	61.51	82.9
Panniyur-6	80.59	60.01	81.26
Panniyur-7	87.42	65.31	85.99
Pournami	74.43	56.06	77.76
Panchami	77.71	58.81	79.67
Subhakara	84.89	63.57	84.25
SE(m) ±	**0.64**	**0.63**	**0.89**
C.D. (P=0.05)	**1.85**	**1.82**	**2.57**
Initial	157.31	92.41	122.95

Conclusion

Based on the above study, we found that Punniyur-1, Panniyur-2 and Pournami performed well and recorded the maximum results on the basis of the above findings it could be concluded that among the different varieties of

black pepper observed during this study Panniyur-1, Panniyur-2 and Pournami are best suited as a mother plant for the production of quality planting material of black pepper through the modified serpentine layering method of propagation for production of more number of quality planting material with higher root and shoot growth to establish a good black pepper garden and to increase pepper production in India.

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