



Growth and economics of production of rooted black pepper (*Piper nigrum* L.) cuttings as affected by drenching cattle urine

Abstract

An experiment on survival and growth of rooted black pepper (*Piper nigrum* L.) cuttings as affected by drenching cattle urine was conducted at Department of Plantation, Spices, Medicinal and Aromatic Crops, College of Horticulture, Dapoli, Dr. Balasaheb Sawant Konkan Krushi Vidyapeeth, Dapoli during the year 2023-24. Eleven treatments and 3 replications in Randomized Block Design viz. T₁ Cattle urine 5 %, T₂ Cattle urine 7.5 %, T₃ Cattle urine 10 %, T₄ Cattle urine 12.5 %, T₅ Cattle urine 15 %, T₆ Cattle urine 17.5 %, T₇ Cattle urine 20 %, T₈ Cattle urine 22.5 %, T₉ Cattle urine 25%, T₁₀ Keradix powder and T₁₁ Control with the aim to investigate effect of drenching cattle urine on growth and economics of production of rooted black pepper cuttings. The highest length of sprout (65.17 cm), number of leaves per cutting (14.32) and leaf area (78.16 cm²) were recorded in treatment T₇ i.e. drenching cattle urine 20 %. The maximum survival percentage (90.33%), net profit (Rs. 2515.00) and B:C ratio (1.87) found in treatment T₇.

Keywords: Cattle urine, black pepper, cuttings, economics

Introduction

Black pepper is the most important commercial spice crop and popularly known as the “**King of spices**”. According to year 2021-2022, in India 2,88,270 ha area under cultivation of black pepper with 96,730 MT and 0.34 MT/ ha production and productivity respectively. Among all states, Karnataka is the leading producer of black pepper, produces 55,640 MT followed by Kerala which produces 34,420 MT black pepper. Maharashtra produces relatively less as compared to other states 440 MT. About 21862.94 T of pepper exported from India at value of Rs.75393.13 lakh out of which highest 8382.33T exported to USA followed by UK 1255.33 T (Anon., 2022). Black pepper is propagated through seeds, cuttings, layering and grafting but propagation by shoot cutting is most popular, economical and suitable method to produce true to type. Nowadays, pepper industry faces many challenges regarding quality planting material and post planting mortality. To overcome this problem, it is essential to understand and standardize optimal dose of cattle urine to enhance survival and growth of rooted black pepper cuttings.



Material and methodology

The field trial was conducted at Nursery No. 4, College of Horticulture, Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli during the year 2023-24. The experiment was laid out in Randomized Block Design (RBD) with eleven treatments replicated thrice. T₁ Cattle urine 5 %, T₂ Cattle urine 7.5 %, T₃ Cattle urine 10 %, T₄ Cattle urine 12.5 %, T₅ Cattle urine 15 %, T₆ Cattle urine 17.5 %, T₇ Cattle urine 20 %, T₈ Cattle urine 22.5 %, T₉ Cattle urine 25%, T₁₀ Keradi powder and T₁₁ control. The cuttings (100 cuttings/treatment/replication) were planted in polybags which filled with potting mixture soil and FYM in 3:1 proportion and *Trichoderma viridae* was added @ 50 g/kg of FYM. The length of sprout was measured from base of sprout to the apical tip of the sprout per treatment per replication by using measuring scale. The fully opened leaves per cutting were counted at 180 days after planting. The number of cuttings survived per treatment per replication were counted at 180 days after planting and recorded in percentage. Leaf area was computed using leaf area meter. The survival percentage was recorded by counting survived cuttings out of 100 cuttings in each treatment and each replication. The data were statistically analyzed by method suggested by Panse and Sukhatme (1995).

Result and discussion

The appraisal of data showed significant effect of drenching cattle urine on length of sprout, number of leaves per cutting and leaf area of black pepper cuttings 180 days after planting in Table 1. The maximum length of sprout found in treatment i.e. drenching of cattle urine 20 % (65.17 cm) and it was closely followed by T₉ i.e. drenching of cattle urine 25% (63.27 cm). The lowest length of sprout (38.39 cm) recorded in treatment T₁₁ i.e. control. This might be due to nutrient content present in cattle urine which stimulates cell division, elongation and differentiation process. Sakhare *et al.* (2022).

Similar trend observed by Garande (2021) in black pepper and Santoso *et al.* (2016) in chrysanthemum.

Average number of leaves per cuttings was 11.65. The highest number of leaves per cuttings was observed in treatment T₇ i.e. drenching with cattle urine 20 % (14.32) and it was at par with treatment T₉ i.e. drenching of cattle urine 25 % (13.88). The lowest number of leaves found in treatment T₁₁ i.e. control (8.84). Increase in leads to increase in photosynthetic process and makes more food available in plants which results into enhancing growth of plants which ultimately increases number of leaves per cutting.

The present findings were analogous to the research findings recorded by Yadav (2023) with cattle urine 10 % in black pepper. Other such as Juvekar (2006) in chilli and Venugopal *et al.* (2019) in madhunashini.

It is evident from the data that maximum leaf area was recorded in treatment T₇ i.e. drenching cattle urine 20 % (78.16 cm²) and it was closely followed treatment T₉ (cattle urine 25 %) i.e. 76.17 cm² and T₈ (cattle urine 22.5 %) i.e. 74.69 cm². Cattle urine contains auxin like IAA which is responsible expansion of meristematic cells which eventually increase in leaf tissue, this might be the reason for highest leaf area when treated with cattle urine 20%.

The similar findings reported by Adsure (2021) in black pepper and Kumari *et al.* (2018) in mulberry.

Table 1: Effect of drenching cattle urine on length of sprout, number of leaves per cutting and leaf area of black pepper cuttings at 180 days after planting

Treatments	Length of sprout (cm)	Number of leaves per cutting	Leaf area (cm ²)
T ₁ - Cattle urine 5%	53.50	12.21	66.30
T ₂ - Cattle urine 7.5%	47.46	11.26	72.67
T ₃ - Cattle urine 10%	55.95	12.84	63.18
T ₄ - Cattle urine 12.5%	43.14	10.04	58.15
T ₅ - Cattle urine 15%	50.36	11.01	60.97
T ₆ - Cattle urine 17.5%	45.25	10.54	70.08
T ₇ - Cattle urine 20%	65.17	14.32	78.16
T ₈ - Cattle urine 22.5%	57.75	13.36	74.69
T ₉ - Cattle urine 25%	63.27	13.88	76.17
T ₁₀ - Keradix Powder	41.67	9.82	56.90
T ₁₁ - Control	38.89	8.84	53.29
Mean	51.13	11.65	66.41
Range	38.89-65.17	8.84-14.32	53.29-78.16
SEm±	1.009	0.246	1.191
CD at 5 %	2.978	0.727	3.512
Result	SIG	SIG	SIG

Drenching various concentrations of cattle urine showed significant effect on survival percentage of black pepper cuttings. Results from present investigation revealed that the highest survival (90.33 %) was observed in treatment T₇ (cattle urine 20 %) which was par with treatment T₈ (cattle urine 22.5 %) i.e. 89.33 %. Significantly lowest survival percentage was noted in treatment T₁₁ i.e. control 66.33 %. Development of effective root system and enhancing the vegetative growth which might have increased due to uptake of nutrients and water from cattle urine. The overall

performance in relation to growth parameters of root and shoot were comparatively better in treatment T₇ i.e. drenching cattle urine 20 % which ultimately increased survival percentage.

The results are in accordance with the research findings recorded by Jalgaonkar (2022) in black pepper, Dorigol *et al.* (1996) in mulberry and Smitha and Umesha (2012) in stevia cuttings.

The benefit cost ratio (B:C) for black pepper plants raised in nursery was shown in Table 2. Net profit was calculated on the basis of expenditure incurred and income received from total number of black pepper plants survived and sold at the end of experiment. The highest net profit (Rs. 2515.00) recorded in treatment T₇ i.e. drenching cattle urine 20 % and the lowest net profit (Rs. 1255.00) was noticed in treatment T₁₁ i.e. Control. While the maximum B:C ratio recorded in treatment T₇ i.e. cattle urine 20% (1.87) this might be due to highest survival percentage and gross return and it was par with treatment T₈ i.e. cattle urine 22.5% (1.83).


Similar outcomes were reported by Jalgaonkar (2022) and Yadav (2023). They recorded highest B:C ratio (1.43) and (2.87) when treated with cattle urine 20 % and 10 % respectively.

Similarly, Pawar (2020) in bush pepper found maximum B:C ratio (1.81) due to application of 10 % cattle urine.




Table 2: Effect of drenching cattle urine on economics of production of black pepper cutting

Treatments	Survival (%)	Net Profit (Rs.)	B:C Ratio
T ₁ - Cattle urine 5 %	82.33 (65.31) *	2170.00	1.78
T ₂ - Cattle urine 7.5 %	79.33 (63.08)	1967.50	1.70
T ₃ - Cattle urine 10 %	85.00 (67.38)	2285.00	1.81
T ₄ - Cattle urine 12.5 %	75.67 (60.53)	1702.50	1.60
T ₅ - Cattle urine 15 %	81.33 (64.55)	2020.00	1.71
T ₆ - Cattle urine 17.5 %	78.33 (62.37)	1817.50	1.63
T ₇ - Cattle urine 20 %	90.33 (72.06)	2515.00	1.87
T ₈ - Cattle urine 22.5 %	89.33 (71.09)	2430.00	1.83
T ₉ - Cattle urine 25 %	88.00 (69.88)	2330.00	1.79
T ₁₀ - Keradix Powder	70.00 (56.84)	1459.00	1.53
T ₁₁ - Control	66.33 (54.56)	1255.00	1.46
Mean	80.64	-	1.70

SEm±	0.413	-	0.015
CD at 5 %	1.219	-	0.044
Result	SIG	-	SIG


*Figures in parenthesis are arc  transformed values.

Conclusion

Among different treatments, drenching cattle urine 20 % (T₇) at monthly interval was recorded the maximum length of sprout, number of leaves per cutting, leaf area and survival percentage. Thus, on the basis of results revealed from above investigation, it can be concluded that treatment T₇ (cattle urine 20 %) gives  excellent results for better growth performance of cuttings in black pepper and was also economically  beneficial over rest of treatments under  study.

Reference

- Adsure, P. R. (2021). “Assessment of different bioregulators on survival and growth of black pepper cuttings (*Piper nigrum* L.)” *M.Sc. (Horti.) thesis* submitted to Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra.
- Anonymous. (2022). *Selected State-wise Area, Production and Productivity of Black Pepper in India (2023-2024 2nd Advance Estimates)* Ministry of Agriculture & Farmers Welfare, Govt. of India.
- Dorigol, S. B. and Rajashekhargouda, R. (1996). Effect of growth substances on rooting of mulberry cuttings. *Karnataka J. Agric. Sci.*, **10**(2): 346-354.
- Garande, S. T. (2021). “Studies on application of organic nutrients on survival and growth of black pepper cuttings (*Piper nigrum* L.)” *M.Sc. (Horti.) thesis* submitted to Dr. Balasaheb Sawant konkan Krishi Vidyapeeth, Dapoli, Maharashtra.
- Jalgaonkar, M. R. (2022). “Effect of drenching with vermiwash, humic acid and cattle urine on survival and subsequent growth of black pepper (*Piper nigrum* L.) in nursery stage” *M.Sc. (Horti.) thesis* submitted to Dr. Balasaheb Sawant konkan Krishi Vidyapeeth, Dapoli, Maharashtra.
- Juvekar, P. M. (2006). “Effect of cattle urine, vermiwash and triacontanol on the growth, yield and quality of green chilli (*Capsicum annum* L.) var. Konkan Kirti” *M.Sc. (Horti.) thesis* submitted to Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra.

- Kumari, Anita, Bharti, Devi, Sunita, Thakur, I. K., Suman, Kritika and Sankhayan, N. (2018). Effect of organic formulations on growth of mulberry (*Morus alba* L.) at nursery stage. *Int. J. Chemical Studies*, **6**(6): 974-978.
- Panse, V. G. and Sukhatme, P. V (1995). *Statistical Methods for Agricultural Workers*. Indian Council of Agricultural Research, New Delhi.
- Pawar, J. T. (2020). "Effect of different plant growth promoters on survival and growth of bush pepper (*Piper nigrum* L.)" M.Sc. (*Horti.*) thesis submitted to Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra.
- Rajpu  Keerti and Sharma, T. R. (2020). Effect of organic and inorganic sources on seed germination, growth and survival of Custard apple (*Annona squamosa* L.) seedlings. *J. Pharmacognosy and Phytochemistry*, **9**(6): 552-556.
- Sakhare, V. S., Jadhav, A.B., Patil, G. D. and Patange, D. D. (2022). Effect of cattle urine application on soil properties of lateritic soils under spinach cultivation. *Intl. J. Plant and Soil Sci.*, **34**(20):117-124.
- Santoso, M., Aprilia, S. and Aprilia, L. (2016). Test of various PGR and concentrations to shoot cuttings on chrysanthemum plant (*Dendranthema grandiflora* T.). *PLANTROPICA J. Agri. Sci.*, **1**(1): 13-18.
- Smitha, G. R. and Umesha, K. (2012). Vegetative propagation of stevia (*Stevia rebaudiana* (Bertoni) Hemsl) through stem cuttings. *J. Trop. Agri.*, **50** (1-2): 72-75.
- Venugopal, C. K., Sajjan, R. M. and Yashswini, S. (2019). Propagation studies in Madhunashini (*Gymnema sylvestre* R. Br.) under shade house and shaded poly tunnel condition. *Intl J. Chemical Studies*. **7**(1): 1448-1453.
- Yadav, V. R. (2022). "Studies on survival and growth of black pepper (*Piper nigrum* L.) cuttings by drenching cattle urine and vermiwash" M.Sc. (*Horti.*) thesis submitted to Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra.