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Response of black pepper cuttings to drenching with vermiwash, humic acid and cattle urine in relation to root growth

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Abstract

The experiment was conducted under polytunnel at the Nursery No. 4, Department of Plantation, Spices, Medicinal and Aromatic Crops, College of Horticulture, Dapoli, Dr. Balasaheb Sawant Konkan Krushi Vidyapeeth, Dapoli during the year 2021-22 to assess the effect of effect of vermiwash, humic acid and cattle urine on root growth of black pepper cuttings. The experiment was laid in RBD design with three replications and 10 treatments viz; T₁: Control, T₂: Vermiwash (10%), T₃: Vermiwash (15%), T₄: Vermiwash (20%) T₅: Humic acid (0.2%), T₆: Humic acid (0.3%), T₇: Humic acid (0.4%), T₈: Cattle urine (10%), T₉: Cattle urine (15%) and T₁₀: Cattle urine (20%). Significantly highest fresh weight of root was observed in the treatment of drenching with 0.4% humic acid (6.57 g). The lowest fresh weight of root was found in control (3.08 g). The maximum dry weight of root was found with drenching with 20% cattle urine (1.2 g) which was followed drenching with 0.4% humic acid (1.07 g). The lowest dry weight of root was found in control (0.51 g). The root length was found highest in treatment drenching with 0.4% humic acid (15.97 cm) while minimum length of root was observed control (5.1 cm).

Keywords: Black pepper, cuttings humic acid, root

Introduction

Black pepper (*Piper nigrum* L.) is one of the most economically important spice crop of the world belongs to family piperaceae. Black pepper vines exhibit dimorphic branches, sympodial and laterally growing fruiting branches known as plagiotropic branches. The primary orthotropic shoot continues to grow and produces lateral fruiting branches from the leaf axils. The orthotropic shoot develops a normal pepper plant which is climbing on support and produces lateral branches and these plagiotropic shoot produces a bushy plant producing further plagiotropics and spikes. It can be grown well in wide range of soil such as red loam, clay loam, or sandy loam with a pH of about 4.5 to 6.0, but it thrives best on soils having rich organic matter. Pepper does not tolerate extreme heat and dryness.

Pepper can be propagated through seeds, cuttings, layering and grafting. Seed propagation often results in genetic variation while other methods are slow and time consuming. Pepper is mainly propagated through cuttings raised from the runner shoots. Cuttings are usually taken from secondary runners of the plant should possess one or two leaves.

The rooting of black pepper cuttings can be initiated with use of different concentration of growth promoter's viz., vermiwash, humic acid and cattle urine. To increase sprouting, survival, subsequent root growth and further healthy and vigorous growth of black pepper cuttings, the repeated application of these growth promoters is necessary. The improvement of black pepper cuttings is exceptionally very slow at nursery stage: therefore, they do not reach to the proper size at the time of establishing and marketing, this may also lead to hefty mortality after planting. The success of propagation and growth of such plants are comparatively less. Therefore to improve establishment and rapid growth of the cuttings, the application of growth promoter is necessary. Hence, the present investigation was "Effect of drenching with vermiwash, humic acid and cattle urine on survival and subsequent growth of black pepper (*Piper nigrum* L.) in nursery stage" was conducted for commencing to derive rapid growth.

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Material and Methods

The experiment was conducted under polytunnel at the Nursery No. 4, Department of Plantation, Spices, Medicinal and Aromatic Crops, College of Horticulture, Dapoli, Dr. Balasaheb Sawant Konkan Krushi Vidyapeeth, Dapoli during the year 2021-22. The experiment was laid in RBD design with three replications and 10 treatments *viz*; T₁: Control, T₂: Vermiwash (10%), T₃: Vermiwash (15%), T₄: Vermiwash (20%) T₅: Humic acid (0.2%), T₆: Humic acid (0.3%), T₇: Humic acid (0.4%), T₈: Cattle urine (10%), T₉: Cattle urine (15%) and T₁₀: Cattle urine (20%). The cuttings (50 cuttings/treatment/replication) were planted in polybags of 10 cm X 17.5 cm. Potting mixture was prepared with soil, FYM, compost at 2:1:1 proportion and *Trichoderma viridaewas* applied @ of 1.9/1 kg of soil of potting mixture. The cuttings of approximately 15 cm height of pencil size thickness with girth of about 1.15- 2.50 mm were planted in the synthetic resin bags of size 10 cm ×17.5 cm. The treatments i.e. drenching of vermiwash, humic acid and cattle urine at different concentrations were applied at 15 days interval starts from sprouting of cuttings up to six months. In each drenching 50 ml solution of each treatment was used for each cutting. The aftercare was taken uniformly to all the experimental cuttings. To record observations, ten black pepper cuttings in each treatment per replication were randomly selected. The observations on root length, fresh weight of root, dry weight of root were recorded. The data were statistical analyzed by standard method of analysis of variance as given by Panse and Sukhatme (1985) [6].

Results and Discussion

Data showing effect of drenching with organic nutrients on fresh and dry weight of root of black pepper in nursery stage have been presented in Table 1. The present data expressed that the different organic nutrients showed significant difference fresh and dry weight of fresh root.

Present investigation showed that the average of fresh weight of root was 4.43 g. Significantly highest fresh weight of root was observed in T₇ i.e. drenching with 0.4% humic acid (6.57 g). While lowest fresh weight of root was found in T₁ i. e. control (3.08 g) which was at par with T₃ i. e. drenching with 15% vermiwash (3.53 g), T₅ i.e. drenching with 0.2% humic acid (3.68 g) and T₉ i.e. drenching with 15% cattle urine (3.82 g). Humic acid contains natural auxin (Indole-3-acetic acid) which is originating internally in the apical meristem of the shoot and can be transfer to the roots via the phloem. It also increases cell elongation in roots and ultimately increases fresh weight of root. This is might be the reason for maximum fresh weight of roots.

The average of dry weight of root was 0.75 g. The significantly maximum dry weight of root was observed in T₁₀ i.e. drenching with 20% cattle urine (1.2 g) which was followed by T₇ i.e. drenching with 0.4% humic acid (1.07 g). The lowest dry weight of root was found in T₁ i. e. control (0.51 g) which was at par with T₃ i. e. drenching with 15% vermiwash (0.56 g), T₅ i.e. drenching with 0.2% humic acid (0.57 g), T₉ i.e. drenching with 15% cattle urine (0.62 g) and T₂ i. e. drenching with 10% vermiwash (0.64 g).

Application of cow urine increases root weight of black pepper cuttings by increasing the carbohydrate and protein content and this might be possible reason for increasing weight of root in black pepper cuttings (Chandramouli, 2001) [3]. In present investigation, maximum fresh weight of roots

was observed in treatment with 20% cattle urine so it might be due to accumulation of more dry matter. Similar observation was also noted by Garande (2021) [4] with 7.5% cow urine drenching in black pepper and Pal *et al.* (2019) [5] with 25% cow urine in karonda.

Data pertaining effect of drenching with organic nutrients on root length of black pepper cutting in nursery stage have presented in Table 2. The present data revealed that the different organic nutrients caused significant difference in root length of black pepper cutting.

Table 1: Effect of drenching with vermiwash, humic acid and cattle urine on fresh and dry weight of root in black pepper rooted cuttings

Treatments	Fresh weight of root (g)	Dry weight of root (g)
T ₁ – Control	3.08	0.51
T ₂ – Vermiwash (10%)	4.64	0.64
T ₃ – Vermiwash (15%)	3.53	0.56
T ₄ – Vermiwash (20%)	4.59	0.78
T ₅ – Humic acid (0.2%)	3.68	0.57
T ₆ – Humic acid (0.3%)	4.83	0.85
T ₇ – Humic acid (0.4%)	6.57	1.07
T ₈ – Cattle urine (10%)	4.37	0.68
T ₉ – Cattle urine (15%)	3.82	0.62
T ₁₀ – Cattle urine (20%)	5.20	1.20
Mean	4.43	0.75
S.Em±	0.28	0.04
CD at 5%	0.84	0.13

Table 2: Effect of drenching with vermiwash, humic acid and cattle urine on length of root and Dry: Fresh root weight ratio in black pepper rooted cuttings

Treatments	Length of root (cm)	Dry : Fresh root weight ratio
T ₁ – Control	5.10	0.16
T ₂ – Vermiwash (10%)	9.63	0.14
T ₃ – Vermiwash (15%)	5.70	0.16
T ₄ – Vermiwash (20%)	10.73	0.17
T ₅ – Humic acid (0.2%)	8.57	0.16
T ₆ – Humic acid (0.3%)	13.60	0.18
T ₇ – Humic acid (0.4%)	15.97	0.17
T ₈ – Cattle urine (10%)	10.23	0.16
T ₉ – Cattle urine (15%)	8.73	0.16
T ₁₀ – Cattle urine (20%)	9.37	0.23
Mean	9.76	0.17
S. Em±	0.66	0.0181
CD at 5%	1.90	NS

It was observed that the average of root length of black pepper cuttings recorded at end of experiment (180 DAP) was 9.76 cm. The root length was found highest in treatment T₇ i.e. drenching with 0.4% humic acid (15.97 cm). While minimum length of root was observed in T₁ i. e. control (5.1 cm) which was at par with T₃ i. e. drenching with 15% vermiwash (5.7 cm). It is inferred from the present investigation that the source of organic nutrients helps in improving root length.

Humic acid increases permeability of cell membrane and has beneficial effects on oxygen and phosphorous uptake, respiration, photosynthesis and root elongation and hence resulted in enhancement of root length of plants (Adil and Turan, 2012) [1]. Similar findings were observed by Bendre (2019) [2] and Pawar (2020) [7].

It was reported that effect of drenching with organic nutrients showed non-significant effect on dry: fresh root weight ratio (Table 2).

From the present investigation it is cleared that the drenching with 0.4% humic acid was beneficial for better growth of black pepper cuttings in nursery stage.

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