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Effect of different concentrations of vermiwash on survival and root growth of black pepper cuttings (*Piper nigrum* L.)

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Abstract
The present investigation entitled "Effect of different concentrations of vermiwash on survival and root growth of black pepper cuttings (*Piper nigrum* L.)" was conducted at the Department of Horticulture, College of Agriculture Dapoli, and Dist. Ratnagiri during the year 2018-2019. The experiment was conducted in Randomized Block Design (RBD) with six treatments and four replications. The treatments were T_1-Vermiwash 10 % drenching, T_2-Vermiwash 20 % drenching, T_3-Vermiwash 30 % drenching, T_4-Vermiwash 40 % drenching, T_5-Vermiwash 50 % drenching and T_6-Control (no drenching of vermiwash).
It is observed that root growth parameters were significantly influenced by vermiwash drenching as compare to control (i.e.) no drenching. In treatment T_4 (i.e. 40% vermiwash drenching) high survival (88.50%), root length (20.37 cm), more number of primary roots (21.20), and dry root weight (2.014 g) was observed. Lowest survival (60.50 %), lowest root length (17.97 cm), lowest number of primary roots (14.15), and low dry root weight (0.710 g) was observed in control *i.e.* no vermiwash drenching. The vermiwash drenching at various concentrations improves the survival and root growth of black pepper cuttings in comparison to control *i.e.* no vermiwash drenching.

Keywords: Vermiwash, cuttings, drenching

Introduction
Black Pepper is one of the oldest spices in the world. Botanically it is *Piper nigrum* L. which is belongs to family piperaceae it is originated from Western Ghats of India. Black pepper is commonly known as Kalimirch in Hindi, Karimenasu in Kannada, Syahmirch in Urdu, Kalomirch in Gujrati, Marich in Sanskrit, and Kali miri or Golmirh in Marathi.
Black pepper was used extensively in various remedies in the traditional treatment methods like Ayurveda, Siddha and Unani in India. Besides medicinal usages, black Pepper is valued for its pungency and flavour, which is attributed by the alkaloid piperine and the volatile oil. (Ravindran *et al*., 2000) [6] The essential oil present in black pepper was used extensively in ancient times and is utilized in different ways in modern India, as well. Black pepper is used as flavour ingredient in many major food products in India. Black pepper is cultivated to a large extent in Kerala, Karnataka and Tamil Nadu where as in Maharashtra cultivated on small scale.
The growth and rooting of black pepper cuttings is very slow at nursery stage, hence, they do not attain appropriate size and good root growth at the planting and selling time and weak root growth leads to heavy mortality after planting. Hence, the present study is undertaken to achieve rapid growth of cuttings by drenching vermiwash liquid at nursery stage so that they will attain appropriate size i.e. height at the time of planting in the field as well as at the selling time.

Therefore following study was undertaken with following objectives.
1. To study the effect of different concentrations of vermiwash on the survival of black pepper vine cuttings.
2. To study the effect of different concentrations of vermiwash on the root growth of black pepper vine cuttings (i.e. to prepare sellable size rooted cuttings in planting season).

Material and Methods

An investigation was carried out to study the "Effect of different concentrations of vermiwash on survival, and root growth of black pepper cuttings (*Piper nigrum* L.)" at the Department of Horticulture, College of Agriculture Dapoli, and Dist. Ratnagiri during the period 2018-2019. The experiment was conducted at the Nursery plot NO. 4. in Department of Horticulture, College of Agriculture, Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli. With Randomized Block Design (RBD) with four replications and six treatments and number of cuttings per treatment were Fifty. Size of a polybag 4"×8" and growing media used was as soil: compost (3:1). Cuttings were pretreated with bavisine (2g/1lit). And the treatments were T_1: Vermiwash 10 % drenching, T_2: Vermiwash 20 % drenching, T_3: Vermiwash 30 % drenching, T_4: Vermiwash 40 % drenching, T_5: Vermiwash 50 % drenching, T_6: Control (no drenching).

Five Black pepper cuttings in each treatment per replication were selected randomly to record observations. Drenching of vermiwash (50 ml) was given to per cutting at monthly basis. And root observations were recorded at the end of experiment i.e. at the end of 7th month and recorded in term of percentage.

Results and Discussion

The data regarding the survival percentage and root growth of black pepper cuttings is given in table no.1.

Table 1: Effect of vermiwash drenching on survival (%) and root growth of black pepper cuttings.

Treatments	Survival (%)	Root length (cm)	Number of primary roots	Dry weight of roots (g)
T_1 - VW 10 % DR	71.00(57.43)	18.36	14.25	0.910
T_2 -VW % 20 DR	74.50(59.68)	18.68	18.05	1.615
T_3 - VW % 30 DR	78.50(62.39)	18.75	18.35	1.120
T_4 - VW % 40 DR	88.50(70.22)	20.37	21.20	2.014
T_5 - VW % 50 DR	81.50(64.55)	18.44	17.70	1.022
T_6 – Control	60.50(51.06)	17.97	14.15	0.710
Mean	75.75	18.76	17.28	1.232
S. Em ±	0.99	0.31	1.14	0.07
CD at 5 %	2.98	0.94	3.45	0.21

(Figures in the parentheses are arcsine transformed values)

Survival of black pepper cuttings

It is seen from table no-1 that at the end of experiment highest (88.50 %) survival was in T_4 (i.e. 40 % vermiwash drenching) which was significantly superior over rest of the treatments. And the lowest survival (60.50 %) was observed in treatment T_6 (i.e. control).

Plate 1: Effect of different concentrations of vermiwash on black pepper cuttings (*Piper nigrum* L.)

Root length (cm)

Roots are important plant part which absorbs water and nutrients from soil and supplies to other parts. The data regarding root length of black pepper cuttings as influenced by application of vermiwash are presented in Table-1

It is seen from the data that after seven months (i.e. at the end of experiment), all treatments showed significant effect on root length of black pepper cuttings. Treatment T_4 (40 % vermiwash drenching) recorded highest root length (20.37 cm) which was significantly superior over all rest of the treatments and T_6 (i.e. Control) recorded lowest root length (17.97 cm).

Similar results were obtained by Jadhav *et al*., (2014) [3] in Fenugreek CV. Local, also obtained by Kamalakar (2013) [4] in Jamun Cv. Konkan Bahadoli and Gite (2015) [1] in Jamun grafts; Gunasundari and Kumar (2009) [2] same results found in Tea; Radhakrishnan and Mahendran (2010) [5] in Tea.

Number of primary roots

It is seen from the data at the end of experiment, all treatments showed significant effect on number of primary roots. Treatment T_4 produced maximum number of primary roots (21.20) which was at par with treatments T_3 (18.35) and T_2 (18.05). It was followed by treatments T_5 (17.70) and T_1 (14.25) and lowest (14.15) number of primary roots were found in T6 (control).

Dry weight of roots (g)

Treatment T_4 recorded the highest dry root weight (2.014 g) which was significantly superior over rest of the treatments

and followed by T_2 (1.615 g). The lowest dry root weight (0.710 g) was found in control T_6 (control).

Vermiwash contains enzyme cocktail of proteases, amylases, urease and phosphatase. Microbiological study of vermiwash revealed that it contains nitrogen-fixing bacteria like *Azotobacter* sp., *Agrobacteeium* sp. and *Rhizobium* sp. and some phosphate solubilizing bacteria (Zambare *et al.*, 2008) [7]. Due to presence of such beneficial microflora plant gets Nitrogen and Phosphorous which may influenced root length in black pepper cuttings.

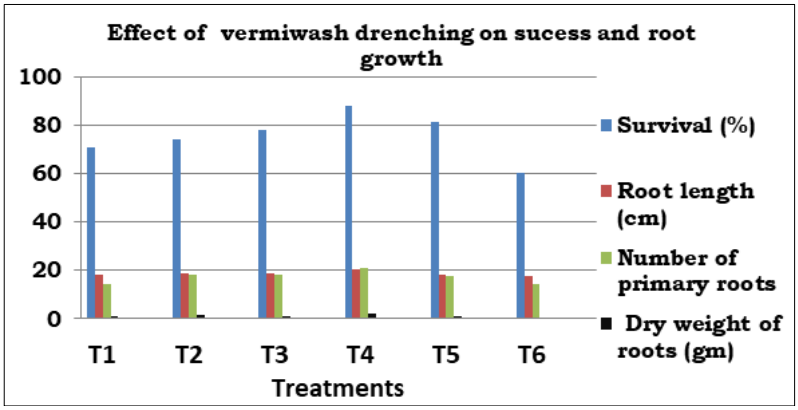

Fig 1: Effect of different concentrations of vermiwash on survival (%) and root growth of black pepper cuttings.

Conclusion

Thus, from the present investigation, it could be concluded that drenching of vermiwash at monthly interval from planting of cuttings showed good results on survival, and root growth of black pepper cuttings. But vermiwash T_4 (40 % vermwash drenching) showed the best performance in regards to all growth parameters on roots of black pepper cuttings.

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