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RESEARCH ARTICLE

EFFECT OF ROOTING HORMONE AND GROWING MEDIA ON SAPLING PRODUCTION OF BLACK PEPPER

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ABSTRACT

An experiment was conducted in the nursery of Regional Agricultural Research Station, Akbarpur, Moulvibazar; where IBA, NAA, and IAA were used for rooting of black pepper (BARI Black Pepper1: Jainta Gulmorich) on three growing media (soil:cowdung: coco dust, loamy soil, and wet sand). From this experiment, it is evident that growing media has less effect on proliferation of black pepper cuttings where Indole-3-butyric acid (IBA) and Indole-3-acetic acid (IAA) was found effective for providing conditions for rooting as well as survivability in the long run.

INTRODUCTION

In nature, the plant roots interact with a large number of different microorganisms. These interactions, together with soil and climatic condition, are major determinants of the extent to which plants grow and spread. Plant producer largely depend on the propagation success rate. Vegetative propagation is more preferable than seeding propagation because of standardized and shortens once in the field (Nicola *et al.,* 2013). Increasing demand for farming techniques also requires further research to match the needs for nursery material. Cuttings are still the most important means of plant propagation: cutting propagation is fast, simple and does not require the special techniques necessary in grafting, budding, or micropropagation. Greater uniformity is obtained and the parent plant is usually reproduced exactly, with virtually no genetic change (Hartmann *et al.,* 1997). This technique has been applied to some Labiatae plants such as rosemary (*Rosmarinus officinalisL.*), sage (*Salvia officinalisL.*), thyme (*Thymus vulgaris L.*), lavender (*Lavandula angustifolia Miller*) and peppermint (*Menthapiperita* (*L.*) Hudson). Seeds are difficult to germinate, very slow to grow, and give rise to plants with a minor development. The best way to propagate blackberry is by cuttings (Milesi Ferretti, 1991). Propagation by cutting is preferable than by seed even if more expensive because plants are genetically more homogeneous and can give a good yield since from the first year of cultivation. Plantations are realized using cuttings more than seeds because seeds present a high genetic variability and their small size does not permit a regular cultural density (Catizone *et al.,* 1986). The black pepper could be propagated either vegetatively or by seed; however, seeding is not largely diffused because the seed is characterized by a high degree of non-ideality. Besides, stocks of seeds are not always genetically homogeneous, the germination is slow and the yield of plants originated by seeds is lower than the yield of vegetatively propagated plants (Ray *et al.,* 1955). The use of herbaceous cuttings is recommended to avoid these problems; rooting products are used to make easier root development (Catizone *et al.,* 1986). A group of plant root-promoting hormones involved in the control of different physiological processes by stimulating cell division and elongation and by stimulation of enzyme production (Ray *et al.,* 1955). Originating in Europe and Asia, black pepper is the most cultivated among a large number of spices. The experiments reported here were performed to determine the effect of IBA, NAA, and IAA on the rooting of black pepper on different growing media, and to identify the suitable rooting hormone and growing media on sapling production of black pepper.

MATERIALS AND METHODS

Trials were carried out in the nursery of Regional Agricultural Research Station, Akbarpur, Moulvibazar; where cuttings (BARI Black Pepper1: Jainta Gulmorich) were collected on April'2018.Portions of stem about 10-12 inches long with lateral buds were cut from disease-free stock plants, treated and immediately planted in the substrate. Treatments considered were 3 commercial rooting products (Factor A: Rooting hormone. Three rooting hormones were used i.e. A1: Indole-3-butyric acid (IBA), A2: Indole-3-acetic acid (IAA), A3: 1-napthalene acetic acid (NAA) and A0: Untreated cuttings (control). IBA, IAA and NAA solutions were prepared by dissolving the powders 1g each of the rooting promoting substances of 0.1M NaOH (p^h7) and diluted to 1000 ml of

distilled water.) According to the different application procedures, cuttings were soaked in the solution for the one minute of time. And the other factor namely B1: Soil:cowdung:cocodust (1:1:1), B2: loamy soil and B3: sand (wet) were used as growing media for the proliferation of the stem cuttings. All cuttings were planted in 3Kg polyethylene pots filled with growing media.15 days took place to evaluate the emergence of plantlets (rooting): five cuttings for each treatment for each growing media. The experimental design was a complete randomized design with rooting products as factor A (3 levels, plus control) and growing media as factor B (3 levels) with 3 repetitions. Data were submitted to the analysis of variance. Results regarding the emergence of plantlets (rooting) and survival rate (%) of the cuttings are reported in the present work.

RESULTS AND DISCUSSION

From table 1, it is evident that rooting hormones has a significant influence on rooting and survivability of vine cuttings of black pepper. The initial observation taken on 15 days after planting, showed the maximum emergence and survivability compared to the subsequent observations taken on 30 and 45 days after planting, respectively. Considering the individual effect of rooting hormone, the highest emergence of plantlets was recorded in the treatment A2: Indole-3-acetic acid (IAA) which was significantly varied with the treatment A1: Indole-3-butyric acid (IBA). Thereafter, a reduction in the percentage of survivability was marked with time. Untreated cuttings showed the lowest emergence of plantlets. All three rooting hormones showed better emergence than that of untreated cuttings.

The highest survivability rate was recorded when the cuttings were treated with Indole-3-acetic acid (IAA) on both 30 DAP (days after planting) and 45 DAP which was significantly varied with treatment A1: Indole-3-butyric acid (IBA) on both 30 and 45 DAP; and the lowest was recorded in untreated cuttings (Fontana *et al.,* 2002). Three growing media were used for observing the emergence of plantlets (Table2). Of them, Soil+Cowdung+Cocodust (1:1:1) showed maximum emergence which significantly varied with one other growing media i.e. loamy soil. In case of wet sand, the emergence percentage was lowest and it was only 46.67%. Considering the percentage of survivability, Soil+Cowdung+ Cocodust (1:1:1) and loamy soil showed much better performance than that of wet sand. Percentage of survivability had also decreased along with the increase of planting days (Nicola *et al.,* 2002A).

The higher CV value of the experimental population indicates the higher deviation among the treatment means. Considering the combined effect of rooting hormone and growing media (Table 3), the highest incidence of plantlets emergence was recorded in A1B1 which was significantly varied with A1B2, A2B1, A2B2, A2B3, and A3B1. The lowest incidence of plantlets emergence was recorded in A3B3 which was significantly varied with A1B3 and A0B1. When wet sand was used as a growing media Indole-3-butyric acid (IBA) and 1-naphthalene acetic acid (NAA) showed minimum rooting but in case of untreated control, it showed better performance than that of two others. Indole-3-butyric acid (IBA) showed better performance in soil:cowdung:cocodust (1:1:1) and loamy soil but poor performance in wet sand. When the Indole-3-acetic acid (IAA) was used as rooting hormone it showed better performance in all three cases of growing media. When the 1-naphthalene acetic acid (NAA) used as rooting hormone it

Table1. Effect of rooting hormone

Factor A (Rooting hormone)	Emergence of Plantlets (Rooting percentage) 15 DAP	Survival rate (%) 30 DAP	Survival rate (%) 45 DAP
A1: Indole-3-butyric acid (IBA)	64.44	57.78	53.33
A2: Indole-3-acetic acid (IAA)	75.56	68.89	60.00
A3:1-napthalene acetic acid (NAA)	46.67	46.67	44.44
A0: Untreated cuttings (control)	44.44	44.44	44.44
CV(%)	32.63	29.95	30.92
LSD(0.05)	15.88	15.88	15.21

Table 2. Effect of growing media

Factor B (Growing media)	Emergence of Plantlets (Rooting percentage) 15 DAP	Survival rate (%) 30 DAP	Survival rate (%) 45 DAP
Soil+Cowdung+Cocodust (1:1:1)	66.67	61.67	55.00
Loamy Soil	60	55.00	55.00
Sand (Wet)	46.67	46.67	41.67
CV(%)	32.63	29.95	30.92
LSD(0.05)	31.77	13.75	13.17

Table 3. Combined effect of rooting hormone and growing media

Combined Effect	Emergence of Plantlets (Rooting percentage) 15 DAP	Survival rate (%) 30 DAP	Survival rate (%) 45 DAP
A1B1	80.00	73.33	60.00
A1B2	73.33	60.00	60.00
A1B3	40.00	40.00	40.00
A2B1	80.00	66.67	60.00
A2B2	73.33	73.33	66.67
A2B3	73.33	66.66	53.33
A3B1	73.33	73.33	66.67
A3B2	46.66	46.66	46.67
A3B3	20.00	20.00	20.00
A0B1	33.33	33.33	33.33
A0B2	46.67	46.67	46.67
A0B3	53.33	46.67	33.33
CV(%)	32.63	29.95	30.92
LSD(0.05)	18.34	26.14	25.02

showed better performance in only soil:cowdung:cocodust (1:1:1) growing media (Nicola *et al.,* 2002B). From the table it is also evident that, almost in all cases survival rate was decreased along with increasing of planting days. Survivality was highest in A1B1, A2B1 and A3B1 at 30 DAP and A2B2 and A3B1 at 45 DAP.

Conclusion

Evidencing the outcomes, it can be assumed that growing media has less effect on proliferation of black pepper cuttings but rooting hormone has a notable effect on it. Indole-3-butyric acid (IBA) and Indole-3-acetic acid (IAA) was found effective for providing conditions for rooting as well as survivability in the long run.

Application of research: Application of study of rooting hormone and growing media for sapling production had a great impact on the yield and improved sapling production of black pepper.

Research Category: Black pepper production.

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Abbreviations: IBA- Indole-3-butyric acid
IAA- Indole-3-acetic acid
NAA-1-napthalene acetic acid
DAP- Days after planting

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