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Rooting response of pomegranate cv. Bhagwa cuttings to different media and growth regulators

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Abstract

An experiment was conducted to study the influence of different media and growth regulators on the rooting and sprouting of hardwood cuttings of pomegranate cv. Bhagwa. Hardwood cuttings of diameter 0.8-1.0 cm having length 20-25 cm were taken and subjected to following treatments, *viz*., NAA-2500 ppm (T_1), NAA-5000 ppm (T_2), distilled water without growth regulator as control (T_3), Seradex rooting powder (T_4), IBA-2500 ppm (T_5) and IBA-5000 ppm (T_6) and then planted in vermiculite (M_1), cocopeat (M_2), sand (M_3) and soil (M_4) as rooting media. The results clearly demonstrate that cocopeat showed significantly higher bud sprout (5.54), shoot length (21.35 cm), root length (17.48 cm) and survival per cent (74.17) of hardwood cuttings. Among the different growth regulator maximum number of sprouts (4.88), shoot length (22.93 cm), root length (19.54 cm) and per cent survivability (73.0%) were registered with IBA 5000 ppm treatment. The interaction of cocopeat + IBA 5000 ppm was found to be most effective for encouraging the number of shoots (7.60), shoot length (26.70 cm), root length (25.60 cm), survivability of cuttings (85%) and root density.

Key Words: *Auxin, hardwood cutting, pomegranate, potting media.*

Introduction

The Punicaceae family has only two members, one of which is cultivated pomegranate (*Punica granatum* L.). Pomegranate is a high value fruit crop due to high return and export demand at the world level. It is a very suitable fruit, which can be grown in arid and semi-arid areas successfully. Air-layering and hardwood cuttings are employed for its commercial propagation. Though air-layering is successful in pomegranate but it is expensive, cumbersome and it adversely affects the growth of the mother trees (Purohit, 1981) and limited number of plants can be obtained. Hence, propagation by means of stem cuttings is convenient and a cheap method. Cutting is a commercial method of propagation in pomegranate and its propagation by means of hardwood cuttings is generally practiced but the rooting is hard (Singh *et al*., 2011). A bound cardinal of attempts are made to improve the rooting in pomegranate through different potting media (Muhammed *et al*., 2005; Alikhani *et al*., 2011; Gurjar and Patel 2007; Saroj *et al*., 2008; Hussain *et al*., 2012) and growth regulators (Polat and Caliskan, 2009; Sandhu *et al*., 1991; Ghosh *et al*., 1998; Hore and Sen, 1993; Jain and Parmar, 1996; Navjot and Kahlon, 2002; Ram *et al*., 2005; Tripathi, and Shukla, 2004; Singh *et al*., 2011; Owis, 2010). In order to abate the high mortality of rooted cuttings in field, it is highly desirable to build a healthy and well developed root system in the hardwood cuttings. However, there is limited information on combined application of rooting media and growth regulators. Therefore, in this study different media and growth regulators were used to improve the rooting in Bhagwa cultivar.

Materials and Methods

The experiment was carried out to examine the effect of different media and growth regulators on the rooting and sprouting of pomegranate cuttings of cv. Bhagwa. This study was carried out in the Horticultural Farm, Rajasthan College of Agriculture, Udaipur during the year 2010-2011. Hardwood cuttings of diameter about 0.8-1.0 cm having length 20-25 cm were taken in the month of February. The cuttings were subjected to following treatments: NAA-2500 ppm (T_1), NAA-5000 ppm (T_2), distilled water without growth regulator as control (T_3), Seradex rooting powder (T_4), IBA-2500 ppm (T_5) and IBA-5000 ppm (T_6). The 1-2 cm basal part of the cuttings were dipped with plant growth regulators by quick dip method for 10 sec. and then planted in beds of vermiculite (M_1),

cocopeat (M_2), sand (M_3) and clay loam soil (M_4) rooting media in mist house. Cuttings were planted in 10 cm between rows and 5 cm within row spacing. There were three replications and each replicate had 100 cuttings. In this study, number of sprouts/cutting, shoot length from emerging point (cm), per cent survival of cutting (%), root length (cm) and root density parameters were determined. Number of sprouts/cutting was counted one month after planting (MAP). Shoot length, root length (measured with measuring tape) and per cent survival of cutting were measured three months after planting, whereas, root density was categorized as low (less than 20 roots / cutting), medium (less than 40 but more than 20 roots / cutting) and high (more than 40 roots / cutting) measured two months after planting. Statistical analysis was carried out using SAS software. The experiment was laid out in factorial completely randomized blocks design and the differences between the means were compared using least significant difference at 5%.

Results and Discussion

Results revealed that growing media, plant growth regulators and its interaction significantly influenced the number of sprouts from the cuttings and its length along with root length, per cent survival and root density (Table 1&2; Fig. 1).

Effect of growing media: It is clear from the data (Table 1) that the significantly higher sprout numbers (5.54), shoot length (21.35 cm), root length (17.48 cm) and survival (74.17%) of hardwood cuttings were recorded in cocopeat based growing media (M_2), while these attributes were minimum under soil media (M_4). However, M_1 and M_3 treatments found at par. Rooting performance of hardwood cuttings depends on the type of medium used in the propagating structure. This is so because the various materials and mixes of materials that can be used in rooting of cuttings provide physical support, oxygen, nutrients and water. Cocopeat is considered an ideal growing media component with acceptable pH, electrical conductivity (EC) and other chemical attributes. Cocopeat being inert with qualities like water retention and substrate aeration might have helped cuttings to establish. Soil alone showed a very poor rooting due to algae and fungal contamination coupled with water logging. Alikhani *et al.* (2011) observed highest roots length on sand + peat medium with three bud cuttings in pomegranate. Albouyeh (2007) for citrus cuttings recommends only peat or mixture of peat, perlite and cocopeat with 2:2:1 ratio for plant height and the increase in leaf number. When *in vitro* rooted plantlets of *Garcinia indica* were transferred to different media for acclimatization then plants grown in cocopeat showed maximum survival (Chabukswar and Deodhar, 2005).

Effect of growth regulators: Different growth regulator treatments significantly influenced the performance of cuttings over control (Table 1). Rooting hormone IBA exhibited better results over NAA and other treatments. After one month the maximum number of sprouts (4.88) were recorded under treatment T_6, i.e., IBA 5000 ppm followed by T_5 (4.15), T_2 (4.20) and minimum in T_3 (1.53) treatment. After three months of planting maximum shoot length (22.93 cm), root (19.54 cm) and per cent survivability (73.0) was registered with IBA 5000 ppm treatment followed by IBA 2500 ppm and NAA 5000 ppm and least under control. The higher concentration of IBA gave better results as it helps in initiation of cell division and early root formation (Hartman *et al*., 2002). Presented results are also in the line of Tripathi and Shukla (2004) and Ram *et al.* (2005) who used IBA-5000 ppm along with p-hydroxybenzoic acid (PHB) in pomegranate. Ghosh *et al.* (1988) also found that IBA was more effective than NAA in rooting on pomegranate stem cutting.

Combined response of growing media and growth regulators: The combination of media and PGRs significantly influenced different attributes of cuttings *viz*., number of sprouts, lengths of shoot and root, per cent survivability and root density. Combination of cocopeat + IBA 5000 ppm showed the maximum number of shoots (7.60), shoot length (26.70 cm), root length (25.60 cm) and survivability of cuttings (85 %) closely followed by cocopeat + IBA 2500 ppm and least under soil + no treatment (Fig. 2). Earlier, Gurjar and Patel (2007) studied all the root and shoot characters of pomegranate cv. Ganesh found that these were significantly increased with hardwood cutting planted in soil + sand + leaf mold medium and treated with IBA 4000 ppm. Torkashvand and Shadparvar (2012) found 4000 ppm IBA and coco peat-perlite substrate most effective for *Hibiscus rosa-sinensis* cuttings.

Thus, hardwood cuttings of pomegranate cv. Bhagwa treated with IBA-5000 ppm and then planted in cocopeat based growing media showed better response (higher number of sprouts, lengths of shoot and root) and maximum establishment rate in terms of per cent survivability and root density.

Table 1. Response of different growing media and plant growth regulators on hardwood cuttings of pomegranate cv. Bhagwa.

Treatment	No. of Sprouts/cutting (1MAP)	Shoot length (cm) (3MAP)	Survivability of cutting (%) (3MAP)	Root length (cm) (3MAP)
Media				
M1	2.99[b]	19.64[b]	61.00[b]	16.07[b]

M2	5.54[a]	21.35[a]	74.17[a]	19.48[a]
M3	2.80[b]	18.90[b]	59.33[b]	16.33[b]
M4	2.45[c]	14.28[c]	51.17[c]	9.67[c]
Plant growth regulator				
T1	2.46[d]	16.03[d]	56.75[d]	13.35[d]
T2	4.20[b]	18.18[c]	65.25[c]	14.78[c]
T3	1.53[e]	14.98[d]	46.00[d]	11.68[e]
T4	3.46[c]	18.05[c]	58.50[c]	14.88[c]
T5	4.15[b]	21.12[b]	69.00[ab]	18.13[b]
T6	4.88[a]	22.93[a]	73.00[a]	19.54[a]

Table 2. Combined response of different growing media and plant growth regulators on root density*

Combination	Root density	Combination	Root density	Combination.	Root density	Combination	Root density
Vermiculite + NAA -2500	M	Cocopeat + NAA - 2500	M	Sand + NAA - 2500	M	Soil + NAA - 2500	L
Vermiculite + NAA - 5000	M	Cocopeat + NAA - 5000	H	Sand + NAA - 5000	M	Soil + NAA - 5000	L
Vermiculite + Control	L	Cocopeat + Control	L	Sand + Control	L	Soil + Control	L
Vermiculite + Saredex	M	Cocopeat + Saredex	H	Sand + Saredex	M	Soil + Saredex	L
Vermiculite + IBA - 2500	H	Cocopeat + IBA - 2500	H	Sand + IBA - 2500	H	Soil + IBA - 2500	M
Vermiculite + IBA - 5000	H	Cocopeat + IBA - 5000	H	Sand + IBA - 5000	H	Soil + IBA - 5000	M

L- Low, M- Medium and H- High *Two months after planting.
MAP= Month after planting Means with the same letter are not significantly differen

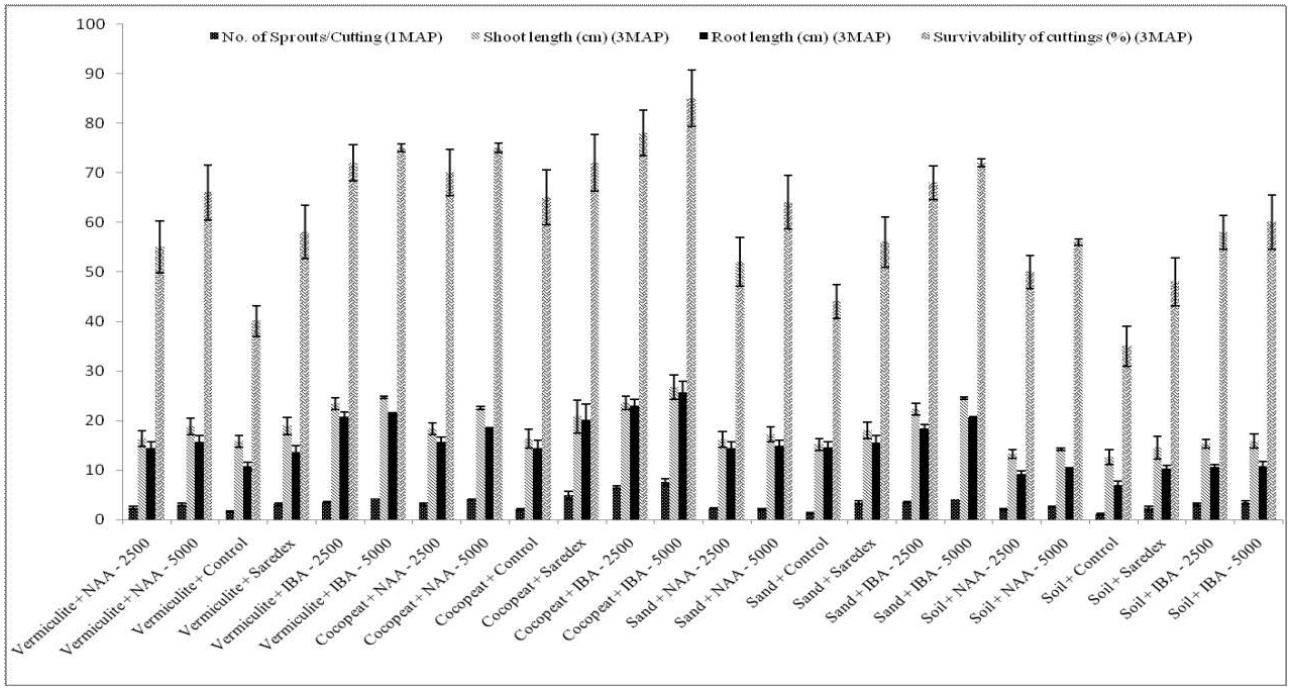

Fig. 1. Combined response of different growing media and plant growth regulators on hardwood cuttings of pomegranate cv. Bhagwa

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