INTERNATIONAL JOURNAL OF SCIENCE AND NATURE

www.scienceandnature.org

ROOTING AND ACCLIMATIZATION OF TISSUE CULTURED RAISED SEEDLING OF BANANA CV. GRAND NAINE

Rinku Rani, S.K. Sehrawat, Minakshi Pal
Department of Horticulture, COA, CCSHAU, Hissar, Haryana, India
*Corresponding author email: rinkusthr49@gmail.com

ABSTRACT
The present investigation was undertaken to develop *in vitro* protocol for rooting and acclimatization in banana cv. Grand Naine. The results showed that the All rooting media containing auxins produced 100 per cent rooting, whereas MS Media containing 2mg/l IBA took minimum number of days (10.5) for root initiation with significantly maximum root length (8.3cm) and significantly maximum number of roots (18.7). The higher survival per cent (100%) was recorded in potting media containing Coco peat + vermicompost + perlite (3:1:1) and sand + clay + vermicompost (1:1:1).

KEY WORDS: *in vitro*, rooting, acclimatization, banana, MS Media, Coco peat, vermicompost, perlite, clay, sand.

INTRODUCTION

The cultivated banana (*Musa* spp.) provides nourishment and a well balanced diet to millions of people of globe and contributes to livelihood through crop production, processing, and marketing. To cope with the increasing demand of food, the area and production of this crop needs to be enhanced. Banana is conventionally propagated through sword suckers. Although propagation by sucker retains all the characters of the mother plant but viral diseases are also transmitted through suckers especially when parent material is infected with viral disease. *Musa* crop suffers from several devasting diseases. Besides, sufficient number of suckers is not available at a time for propagated on a large scale area. Hence, non availability of disease free planting material is barrier in its cultivation. The extensive works on *in vitro* propagation of banana provided opportunity for improvement in supply of healthy and good quality planting material (Suprasanna *et al*., 2008). The regeneration through *in vitro* culture has now become a viable and alternate method to conventional one. *In vitro* shoot multiplication, rooting and acclimatization process in banana are required to be optimized for commercial application of micropropagation in banana (Choudhary *et al.*, 2014).

MATERIALS & METHODS

The present study was conducted at Centre for Plant Biotechnology, Government of Haryana, CCS HAU Campus, Hisar during 2015-2016. To induce *in vitro* rooting, the regenerated plantlets were transferred on different rooting media containing 0.5-2.5 mg/l IAA, IBA. Rooted plantlets were removed from media and the agar was washed gently with sterile water. The plantlets were transferred to poly bags containing different potting media and kept in green house. The data of all the experiment recorded during the present investigation were subjected to statistical analysis using "Completely Randomized Design" by using software OP STAT.

RESULTS & DISCUSSION

Root development

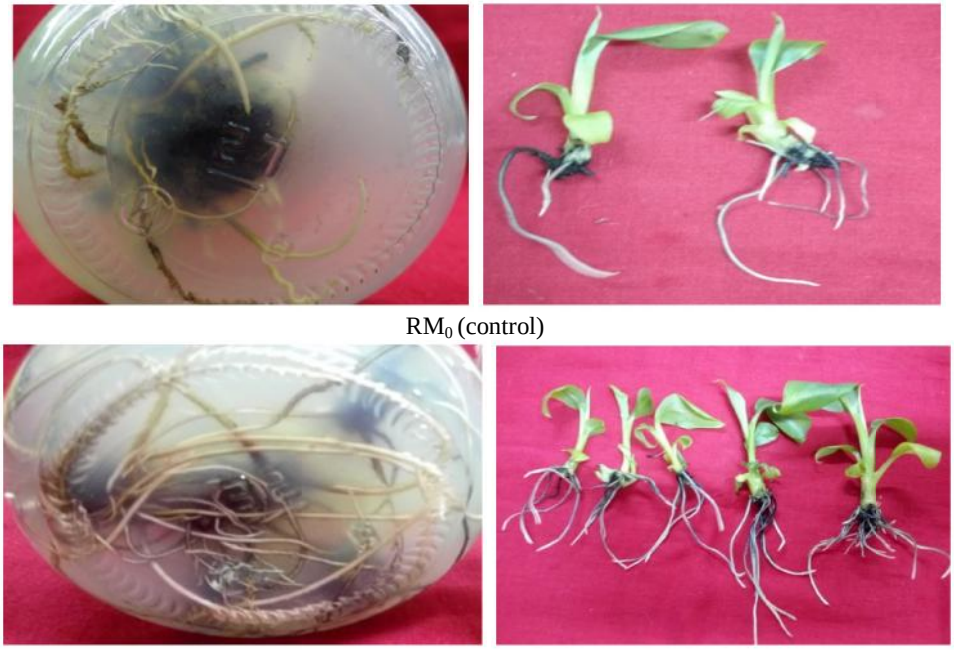
The data presented in Table 1 reveals that MS media supplemented with 2.0 mg/l IBA was best for *in vitro* rooting as it required minimum number of days (10.53) for root initiation with significantly maximum root length (8.28 cm) and number of roots (18.69).

TABLE 1. Effect of different concentrations of auxins on root development from regenerated shoots of banana cultivar Grand Naine

Media composition (mg/l)	Days taken for root initiation	Root length (cm)	Number of roots/shoot	Rooting percentage %
RM_0 (MS, no growth regulators)	21.0 ± 0.29	3.6 ± 0.13	5.5 ± 0.29	30.5 ± 2.78
RM_1 (MS + 0.5 IBA)	18.7 ± 0.89	4.9 ± 0.19	8.7 ± 0.78	100.0 ± 0.00
RM_2 (MS + 1.0 IBA)	17.3 ± 0.55	5.2 ± 0..25	9.2 ± 0.93	100.0 ± 0.00
RM_3 (MS + 1.5 IBA)	14.7 ± 1.01	5.2 ± 0.31	12.2 ± 0.54	100.0 ± 0.00
RM_4 (MS + 2.0 IBA)	10.5 ± 0.37	8.3 ± 0.09	18.7 ± 0.54	100.0 ± 0.00
RM_5 (MS + 2.5 IBA)	16.8 ± 1.07	5.6 ± 0.13	10.3 ± 0.31	100.0 ± 0.00
RM_6 (MS + 0.5 NAA)	19.9 ± 0.65	4.3 ± 0.38	7.1 ± 0.11	100.0 ± 0.00
RM_7 (MS + 1.0 NAA)	18.7 ± 0.48	5.6 ± 0.06	10.7 ± 0.38	100.0 ± 0.00
RM_8 (MS + 1.5 NAA)	15.3 ± 1.01	5.9 ± 0.21	11.8 ± 0.95	100.0 ± 0.00
RM_9 (MS + 2.0 NAA)	14.8 ± 0.90	6.3 ± 0.19	12.8 ± 0.90	100.0 ± 0.00
RM_{10} (MS + 2.5 NAA)	18.9 ± 0.57	5.8 ± 0.25	9.4 ± 0.44	100.0 ± 0.00

RM= Rooting media

All media containing auxins induced 100 per cent rooting. IBA at 2.0 mg/l concentration produced the best result for induction of root in banana cultivar Grand Naine where as MS media without IBA produce poor root system as shown in Fig.1. Similar result was observed by Rai *et al*. (2012). In present investigation, it was observed that IBA was more effective for rooting in banana as compared to NAA. The present findings are in conformity with those of Rai *et.al*. (2012) and Senthilkumar and Ramsundar (2009) who found that IBA was more effective than NAA in induction of rooting in Grand Naine cultivar of banana. Klerk *et al*. (1997) hypothesized that NAA has more inhibitory side-effects than other auxins. Perhaps because of this, NAA induces fewer roots. The lower efficiency of NAA in rooting could be explained by the connection between levels of endogenous IAA and adventitious root formation. It might be due to the exogenously applied synthetic auxin (NAA) that has not been efficiently oxidized to IAA for plant cell utilization. Hence, due to inadequate supply of IAA, the explants showed lower ability in root initiation (Ling *et al*., 2013).



RM_0 (control)

RM_4 (MS + 2.0 mg/l IBA)

FIGURE 1. Effect of growth regulators on rooting

Acclimatization of plantlets

The acclimatization of *in vitro* plants is one of the least explored avenues of tissue culture. It remains one the obstacles in commercial exploitation of large number of plant species. Micropropagated plantlets have divergent leaf anatomy from normal grown plants such as poor development of cuticular wax, malfunctional stomata, and low efficiency photosynthesis mainly due to high humidity and sugar containing media under *in vitro* condition. The *in vitro* derived plantlets have to be acclimatized to the external environment prevailing under *in vivo* as they are poorly adapted to resist the low relative humidity, higher light intensity and highly variable temperature situation etc. The rooted plantlets were transferred to plastic bags containing different types of potting media and placed in greenhouse for two to five weeks. The higher survival per cent (100%) was recorded in potting media containing coco peat + vermicompost + perlite (3:1:1) and sand + clay + vermicompost (1:1:1) followed by coco peat + vermicompost + perlite (2:1:1) potting mixture (96.67%) as shown in Fig. 2 whereas minimum survival percentage (60.00) was recorded in potting media containing sand followed by potting mixture containg sand + clay (1:1) as shown in Table 2.

TABLE 2. Effect of different potting mixture

Treatment	Potting mixture	Survival %
PM_1	Sand	60.0
PM_2	Sand + Vermicompost (1:1)	76.7
PM_3	Sand + Clay (1:1)	63.3
PM_4	Sand + Clay + Vermicompost (1:1:1)	100.0
PM_5	Coco peat + Vermiculite + Perlite (1:1:1)	86.7
PM_6	Coco peat + Vermiculite + Perlite (2:1:1)	96.7
PM_7	Coco peat + Vermiculite + Perlite (3:1:1)	100.0

PM = Potting media

Sand | Sand + Clay + Vermicompost (1:1:1) | Coco peat + Vermiculite + Perlite (3:1:1)

FIGURE 2. Effect of different potting media on acclimatization of *in vitro* propagated plants of banana

The higher survival percentage of plantlets in potting media containing coco peat, vermiculite and perlite etc may be due to ability of these components to provide nutrients and aeration required for quick acclimatization. Results are in agreement with findings of Choudhary *et al*. (2014) who also observed 100 per cent survival in plants transferred to plastic bag containing sand, soil and vermicompost in ratio of 1:1:1. Later on, these hardened plantlets were placed in naturally ventilated polyhouse.

CONCLUSION

Salient features of the results obtained in the present study are as given below.

1. All rooting media containing auxins produced 100 per cent rooting, whereas MS Media containing 2.0 mg/l IBA took minimum number of days (10.5) for root initiation with significantly maximum root length (8.3cm) and number of roots (18.7).
2. The highest survival (100%) was recorded on potting media containing coco peat + vermicompost + perlite (3:1:1) and sand + clay + vermicompost (1:1:1) followed by coco peat + vermicompost + perlite (2:1:1) potting mixture (96.67%).

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