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Short Communication:

Rooting performance of *in vitro* microshoots of strawberry (*Fragaria x ananassa* Duch.) as influenced by plant growth regulators

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ABSTRACT

This work was done to study the rooting performance of strawberry cv sweet Charlie under in vitro conditions. Healthy microshoots were collected from in vitro plantlets (1.0-1.5 cm long) grown in hormone free basal MS medium and placed in MS media containing BAP (0-1.0 mg/l) and (IBA 0-1.0 mg/l) for shoot elongation and root proliferation. The results showed that the higher number of newly formed shoots was observed in the medium containing 0.5 mg/l BAP and 0.5 mg/l IBA. The shoot and root lengths of newly formed shoots were high (>4.5 cm) in hormone free medium and also media with 0.5-1.0 mg/l IBA than the other tested media. Further, it was noted that more than ten roots per plantlet were recorded in MS media containing 0-1.0 mg/l IBA and also there was no significant variation (P>0.05) in number of roots between them. MS media supplemented with 0-1 mg/l IBA concentrations could be used for rooting of strawberry microshoots under in vitro conditions.

Key words: BAP, IBA, in vitro culture, rooting, runner tip, strawberry

INTRODUCTION

The cultivated strawberry (*Fragaria x ananassa* Duch) is one of the most important soft fruit which is widely cultivated all around the world for its characteristic and nutritional value of fruits. In Sri Lanka, strawberry is grown in higher elevated areas and this crop is mostly cultivated in Nuwara Eliya due to the suitable climate. Strawberry is an excellent source of vitamin C and essential minerals for human being. Most of the strawberry varieties are commercially propagated by runner plants. It is difficult to propagate by seeds due to genetic variation and also rooting percentage of cuttings is relatively low (Mohan *et al*., 2005). In the horticulture, in *vitro* culture technique is widely used for rapid mass clonal propagation of virus free plants.

Meristem tip and meristem culture from runner tips usually use for the production of virus free plants (Mercado *et al.*, 2007). The runner tips are widely used explants for strawberry plant production under *in vitro* conditions. Plant growth regulators especially cytokinin and auxin are added to the culture medium to regulate the morphogenesis and organogenesis in the *in vitro* cultured explants. The cytokinin is commonly used to induce lateral buds for shoot development and auxin is incorporated into the culture medium for root formation. Hu and Wang (1983) stated that a high concentration of cytokinin decrease shoot bud formation. Among cytokinins, 6-benzylaminopurine (BAP) is generally used for shoot proliferation in clonal propagation. Sakila (2007) reported that Indole-3-butyric acid (IBA) is the most suitable auxin than

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Indole Acetic Acid (IAA). Moradi *et al.* (2011) mentioned that root formation is high in the explants cultured in MS medium containing BAP and IBA. This study was aimed to determine the performance of *in vitro* rooting of microshoots of strawberry cv sweet Charlie as influenced by the plant growth regulators.

MATERIALS AND METHODS

This experiment was done at the Tissue culture laboratory, Regional Agricultural Research and Development Centre, Bandarawela in 2018. Microshoots (1.5-2.0 cm long) were separated from *in vitro* plantlets of strawberry cv. sweet charlie grown in MS basal medium without any plant growth regulators (Murashige and Skoog, 1962). The excised microshoots were then transferred to the fresh MS media supplemented with BAP (0-1.0 mg/l) and IBA (0-1.0 mg/l) for shoot elongation and root proliferation (Table 1). The experiments were arranged in a Complete Randomized Design with four replicates.

The culture vessels containing microshoots were sealed and kept in the culture room under white fluorescent light (1000-1500 Lux, 16/8 hours photoperiod) and 25±1ºC temperature. After 8 weeks of culture, number of newly formed shoots, number of leaves, length of shoot, number of roots, length of root and fresh weight of plantlet were recorded. The collected data were analyzed using the SAS statistical software and treatment means were separated according to the Duncan's multiple range test at 5% significant level.

RESULTS AND DISCUSSION

In the present study, microshoots were cultured in MS media containing different plant growth regulators to evaluate the rooting performance of strawberry microshoots.. The results showed that plant growth regulators had remarkable effects on shoot and root growth of plantlets (Figure 1). The number of newly formed shoots was high (>4) in medium containing 0.5 mg/l BAP and 0.5 mg/l IBA among the treatments. It was low (<2) in media containing only 0.5-1.0 mg/l IBA as well as hormone free medium. The microshoots grown in hormone free medium showed the prominent result in shoot and root lengths than those in 0.5 mg/l BAP + 0.5 mg/l IBA. The result is in line with the finding of Mahmood *et al.* (1994) who reported that 0.5 mg/l BAP was more suitable for shoot response.

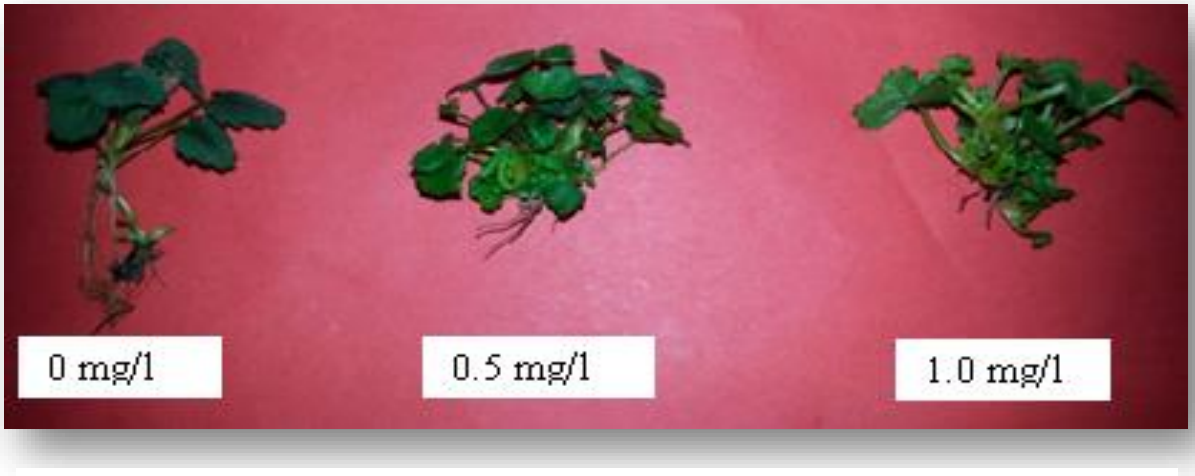

Figure 1: Plantlets grown in different BAP levels (0-1.0 mg/l) with 0.5 mg/l IBA.

A remarkable difference (P<0.01) in the number of leaves per plantlet was noted and it was significantly high in medium containing 0.5 mg/l BAP plus 0.5mg/l IBA among the treatments except medium with 0.5 mg/l BAP and 1.0 mg/l IBA (Table 1). In this study, the number of roots per plantlet was high in hormone free medium (control) than the other media. It was also noted that there were no remarkable differences in number of roots per plantlet between the media containing 0-1 mg/l IBA. Madhavrai *et al*. (2014) stated that IBA at 1 mg/L was best for rooting.

Table 1: Response to BAP and IBA on numbers of leaves and roots per plantlet.

MS medium with BAP and IBA (mg/l)		**Number of leaves**	**Number of roots**
BAP	**IBA**	**per plantlet**	**per plantlet**
0	0	10.3cd	15.3a
0	0.5	09.5d	12.0ab
0.5	0.5	31.5a	06.8bc
1.0	0.5	12.5cd	05.3c
0	1.0	07.8d	10.8ab
0.5	1.0	23.0ab	08.0bc
1.0	1.0	18.3bc	05.0c
F test		P<0.01	P<0.01

Hormone free medium as a control. Means with the same letter are not significantly different according to the DMRT at P=0.05.

Significant differences (P<0.01) in shoot and root lengths were observed among the treatments (Table 2). The longest shoot and root were observed in hormone free medium. Medium length of roots was recorded in medium containing 0.5 mg/l BAP + 0.5 mg/l IBA concentration. There was a significant difference (P<0.05) in the fresh weight of plantlet among the treatments. It was high (1.2 g) in 0.5 mg/l BAP and 0.5 mg/l IBA where the number of leaves was higher than other treatments. Healthy plantlets (Figure 2) were collected and they (Figure 3) were grown well in 50% soil and 50 % husk biochar than in 100% soil.

Table 2: Response to different concentrations of BAP and IBA on shoot length, root length and fresh weight of strawberry *in vitro* plantlet.

BAP (mg/l)	IBA (mg/l)	Shoot length (cm)	Root length (cm)	Fresh weight of plantlet (g)
0	0	4.8a	5.0a	0.3c
0	0.5	3.7bc	3.3b	0.3c
0.5	0.5	4.0ab	1.6bc	1.2a
1.0	0.5	2.5e	0.9c	0.3c
0	1.0	4.6a	5.4a	0.4bc
0.5	1.0	3.2cde	1.0c	0.7abc
1.0	1.0	2.6de	1.8bc	0.6bc
F test		P<0.01	P<0.01	P<0.05

Means with the same letters are not significantly different according to the DMRT at P=0.05.

Figure 2: *In vitro* plantlets in hormone free medium.

Figure 3: Strawberry plant in 50% soil and 50% husk biochar

CONCLUSION

The concentrations of plant growth regulators added to the culture medium play a major role in plant propagation of strawberry under *in vitro* conditions. In the present study, MS basal media supplemented with 0-1.0 mg/l IBA showed better rooting performance in microshoots of strawberry under *in vitro* conditions.

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