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A Review on the Effects of Auxin and Cytokinin on the Growth of *Momordica Charantia* Using in Vitro Propagation Technique

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Abstract

Momordica charantia, also known as bitter gourd is a member of the Cucurbitaceae family which grows in tropical and subtropical regions. This review was conducted to investigate the effects of auxin and cytokinin on the growth of *Momordica charantia* using in vitro propagation technique. The greatest percentage of shoot regeneration (75%) was observed with the treatment of 1.0 mg/L Benzylaminopurine (BAP) and 1.0 mg/L 2,4-Dichlorophenoxyacetic acid (2,4- D). It also showed that 0.6 mg/L 1-Naphtalene acetic acid (NAA) and 2.5 mg/L BAP promoted higher formation of callus (86.25%) from nodal segments within 7 days. Other findings indicated that the best response towards shoot regeneration obtained from the callus by nodal segments as explants of *Momordica charantia* on MS media supplemented with 2.0 mg/L BAP and 0.2 mg/L NAA. The highest number of root formation derived from root segments was found when treated with 1.0 mg/L 2,4- D and 1.0 mg/L BAP after 3 days. For the effect of auxin and cytokinin on callus formation, it was observed that all three calluses exhibited the best callogenic response when treated with 1.5 mg/L BAP, 1.5 mg/L NAA and 1.0 mg/L 2,4-D (leaf, stem, and cotyledon). Overall, this approach of in vitro propagation technique using auxin and cytokinin offers the benefits and good results on the growth of M. charantia.

Keyword: in vitro propagation; auxin; cytokinin; *Momordica charantia*.

INTRODUCTION

Momordica charantia, also known as bitter melon, bitter apple, bitter gourd, bitter squash, balsam-pear, and a variety of other names, is a tropical and subtropical vine that is a member of the Cucurbitaceae family and grows in tropical and subtropical regions. Malays often refer the bitter melon as Peria Katak.

Figure 1 *Momordica charantia*

The increasing number of successful in vitro propagation have been established and reported in many medicinal plant species including this indigenous crop of *M. charantia.* As a result, in vitro propagation may be a viable alternative solution to encounter this problem for large-scale field cultivation applications [1].

RESULTS AND DISCUSSION

In vitro Propagation of *Momordica charantia*

The initial in vitro research on *Momordica charantia* had been done in which revealed the potential of *Momordica charantia* for in vitro propagation research. The highest rate of seed germination was seen in basal MS media, which led to plant proliferation of the shoot, callus production, and rooting of the shoot. It was discovered that a basic medium supplemented with various concentrations of BAP (1mg/L, 2mg/L, and 4mg/L) had produced a great number of shoots [2].

In vitro shoot and root regeneration of *Momordica charantia* from different segments.

Among the treatments, 1.0 mg/L BAP with 1.0 mg/L 2,4- D had produced the highest percentage (75%) of shoot regeneration. It showed that the combination of 2.5 mg/L BAP and 0.6 mg/L NAA promoted higher percentage of callus (86.25%) from nodal segments within 7 days [3]. The maximum percentage of shoot regeneration (75%) was observed when BAP and 2,4- D were used at the concentration of 1.0 mg/L BAP with 1.0 mg/L 2,4- D (Figure 2a &b).

Figure 2 Shoot regeneration formed from callus by nodal segments on MS media containing at (a) 1.0 mg/L BAP (b) 1.0 mg/L 2,4- D after 45 days of culture.[3]

The best response towards shoot regeneration obtained from the callus by nodal segments as explants of *Momordica charantia*. on Murashige and Skoo media (MS media) supplemented with 2.0 mg/L BAP and 0.2 mg/L NAA [4]. This is because a higher concentration of BAP and lower concentration of NAA influences the shoot formation. The callus was initially soft and completely off-white in colour but afterwards some areas on the surface of the callus appeared greenish in colour which resulted in organization of shoots. The highest number of root formation derived from root segments (7.50) was found in MS media supplemented with 1.0 mg/L 2,4- D and 1.0 mg/L BAP after 3 days (Figure 3a) [5].

Figure 3 (a) Root formation from root segments derived from callus in MS medium supplemented with 1.0 mg/L 2,4- D and 1.0 mg/L BAP. [3]

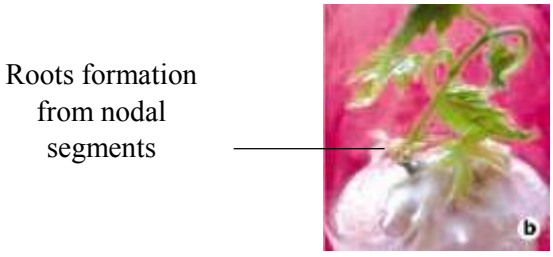

Figure 3 (b) Roots formation from nodal segments derived from callus in MS media supplemented with 2.0 mg/L BAP and 0.20 mg/L IAA 80 days after culture. [3]

Auxins induced root formation and establish hormonal signals that control root development. 0.3 mg/L was shown to be the optimal concentration for improving rooting ability, while greater doses of NAA resulted in a significant decrease in root development. As long as hormone levels are not too high, rooting is most likely to occur.

Effect of different concentrations of growth regulators on rooting of shoot.

Leaf segments showed the greatest percentage of roots initiation (65.0%) when treated with 2.5 mg/L BAP and 0.60 mg/L NAA. Also, by using 3.0 mg/L BAP and 0.1 mg/L NAA, the largest number of root (6.75) and length of root was discovered. Treatment with moderate concentration of NAA increased rooting parameters, whereas overly high concentration NAA suppressed the growth of root formation. Root differentiation of M. charantia was found on MS medium containing BAP and NAA. M. charantia was successfully rooted in half-strength MS media and with either 0.1 mg/L of NAA, 0.1 mg/L IAA, or 0.1 mg/L kinetin. Highest percentage of root (70%) was found in 2.5 mg/L BAP and 0.5 mg/L IBA. 2.0 mg/L BAP and 0.5 mg/L IBA produced the maximum number of roots.

The effect of auxin and cytokinin on callus formation of *Momordica charantia* from various explants.

There was callus development from leaf, stem, and cotyledonary explants of *Momordica charantia* in various combinations of auxin and cytokinin supplemented on MS media. After applying MS medium supplemented with 1.0 and 1.5 mg/L BAP with 1.5 mg/L NAA and 1.0 mg/L 2,4-D, it was found that the best callogenic response were from all three explants (leaf, stem, and cotyledon). However, at low levels, no callus was obtained (0.1 and 1.0 mg/L).

The leaf explants produced the highest percentage of callus formation on MS medium supplemented with BAP, NAA, and Kinetin. Good shooting was seen at 0.1 mg/L BAP and

0.2 mg/L NAA from shoot tip and cotyledonary node explants. BAP has been the only plant growth regulator that was effectively preferred for the formation of excellent texture callus. Callus cultures are commonly characterized as being either compact or friable.

To compare from different studies of different plant, the use of BAP as plant growth regulator is essential for the growth of shoot or shoot regeneration. The in vitro propagation of Ocimum sanctum L. for mass propagation, both in vitro and in vivo and the regeneration procedure showed a significant improvement according to this research. Having a well-developed roots system for effective acclimatisation enables rapid shoot growth and once established in the field, it facilitates successful shoot proliferation. MS basal medium has mostly included NAA and IAA in full and 1/2 strength. During the first two weeks of cultivation, roots had already developed even with a concentration of 1.0 mg/L NAA. The evidence presented above shows that outliving of seasonal plant may be 85% when compared to prior findings.

CONCLUSION

It can be concluded that this approach of in vitro propagation technique offers the benefits and good results on the growth of M. charantia. The effect of media formulations supplemented with auxin and cytokinin on the growth of M. charantia was achieved. Based on the findings of previous study, the best response towards shoot regeneration obtained from the callus by nodal segments of M. charantia on MS media supplemented with 2.0 mg/L BAP & 0.2 mg/L NAA. For the effect of auxin on root formation, it was seen that root regeneration was obtained from callus by root segments on MS medium supplemented with 1.0 mg/L BAP & 1.0 mg/L 2,4-D. This means 2,4-D gave the best response and the highest number of root formation compared to other auxins. Best callus formation was seen at 0.2 mg/L NAA and 0.1 mg/L BAP from cotyledonary node explants.

Plant propagation techniques are clearly required in agriculture. Consequently, high-breed-value genotypes tend to multiply quickly in tissue culture. Quality plant material ensures disease-free plants. These findings are significant because they may improve shoot and root regeneration in tissue culture systems, thereby improving plant micropropagation. Hence, M. charantia has been used for hundreds of years to assist with diabetic symptoms and diseases.

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