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Clonally Propagated Elephant-Foot Yam (*Amorphophallus Konjac*) and its Potential Utility for Sustainable Production of Konjac Glucomannan

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Abstract

Amorphophallus konjac is an herbaceous evergreen perennial plant with edible corms that contain two important reserve polysaccharides, starch and glucomannan, in its underground tubers, which is native to forest margins and open thickets in most Asian countries. It is an economically important crop that is commonly used in China, Japan and several Southeast Asian countries as a food source and in the production of bio-polymers and pharmaceutical merchandise with many health benefits. The flour derived from the corm is widely used in Oriental cuisine for preparation of noodles, tofu, snacks and as an emulsifier in foods and drinks. A gel prepared from the flour has been used for detoxification, tumor-suppression, blood stasis alleviation and phlegm liquefaction in traditional Chinese medicine (TCM). For more than 2000 years, it has equally been consumed for the treatment of asthma, cough, hernia, breast pain, burns as well as hematological and skin disorders in China. Recently, purified konjac flour, commonly known as konjac glucomannan (KGM) has become available on a relatively small scale both as a food additive and a dietary supplement, which significantly helps to reduce plasma cholesterol, improves carbohydrate metabolism, bowel movement and colonic ecology, a development that is increasingly correlated with the natural abundance of nutritious compounds in the corm. Thus far, the available scientific data strongly support plantation-scale production of the crop, given the enormous economic potential of KGM. To meet this huge demand for konjac flour as a non-vitamin, non-mineral dietary fiber mainly composed of hydro-colloidal polysaccharides, an efficient and alternative propagation system where multiple shoots are induced *in vitro* with 2mg/l of BAP and adapted to field conditions is described as a valuable resource for further study of the genetics and breeding of this economically important crop.

Keywords: Amorphophallus konjac; Elephant-foot yam; Konjac glucomannan; Clonal propagation; Tissue culture; Murashige and Skoog (MS) medium; Benzyl Amino Purine (BAP); Bulbil; Shoot initiation; Rooting; Callus formation Plantlet

Abbreviations: TCM: Traditional Chinese Medicine; KGM: Konjac Gluco Mannan; MS: Murashige and Skoog; BAP: Benzyl Amino Purine

Introduction

Amorphophallus is included in the Araceae family. It is easy to propagate it in tissue culture. In Japan and Indonesia, the Amorphophallus is famous of rice Amorphophallus. In Japan, we call it konyak. In Indonesia, we named it porang. In English, it is called elephant foot yam. Tissue culture of porang is being performed in many countries, for instance in Indonesia [1]. In the School of Life Sciences and Technology, Bandung Institute of Technology, we performed tissue culture of porang. We have successfully obtained plantlets of porang.

Material and Method

Initiation

Bulbil of elephant foot yam (porang) was used as the explant. For surface sterilization, the bulbil was washed by running water for 30 minutes. Then, it was sterilized by 70% alcohol for 5 minutes. Subsequently, it was sterilized by 20% chlorox for 10 min and 10% chlorox for 5 min. Thereafter, it was washed by sterile water. Medium for initiation was Murashige and Skoog (MS) supplemented by 2 mg/l BAP (Benzyl Amino Purine).

Multiplication and rooting

Medium for multiplication was MS medium supplemented with 2 mg/l BAP.

Medium for rooting was MS medium without plant growth regulator.

Result and Discussion

Shoot initiation

Explant of the porang is called katak (bulbil).

[Figure 1]

Figure 1: Initiation of porang shoot from the bulbil.

When the bulbil was cultured, it could develop into shoot on MS medium supplemented with 2 mg/l BAP. Fig 1 shows initiation of culture. Ferziana et al. [2] reported that the addition of BAP could induce callus formation. In contrast, we observed that shoots were directly induced.

Multiplication and rooting

As for shoot multiplication, the medium is the same as for the initiation.

Figure 2 shows multiplication of porang shoots.

[Figure 2]

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Figure 2: shows multiplication of porang shoots.

(figure 2) indicated that multiplication of porang shoot occurred. For multiplication, the shoot was sub cultured into multiplication medium (2 mg/l BAP), which is the same as initiation medium. Likewise, the shoots of porang were multiplying in MS medium with 0.2 mg/l TDZ and 0.5 mg/l BAP (Imelda, 2007).

Figure 3: Plantlet of porang on MS medium without plant growth regulator

In medium for rooting, roots develop on medium MS without plant growth regulator. Fig 3 shows the rooting and plantlet. Likewise, Imelda (2007) reported that for rooting and plantlet formation, no need plant growth regulator.

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Conclusion

Based on the result of experiment, we concluded that plantlet of porang can be obtained on MS medium supplemented without plant growth regulator. This potential could be used for sustainable production of Konjac glucomannan through its bulb.

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