RAPID MULTIPLICATION OF SUGARCANE THROUGH MICROPROPAGATION

Shamim H. Siddiqui, Imtiaz Ahmad Khan, Abdullah Khatri
and Ghulam Shah Nizamani*

ABSTRACT: Micropropagation provides rapid multiplication of plants and has potential for diseases elimination in vegetatively propagated crop plants like sugarcane. The procedure has been stream-lined to multiply sugarcane clones by using apical meristem as an explant source. Basic MS (Murashige and Skoog) medium supplemented with 0.2mg/l BAP and 0.1mg/l kinetin was used for shoot multiplication while MS supplemented with 6% sucrose for root induction.

Key Words: Sugarcane; Plant Propagation; MS medium; Pakistan.

INTRODUCTION

The lack of multiplication procedure has long been a serious problem in sugarcane breeding programmes. This problem has been solved to the maximum extent by in vitro propagation. The micropropagation provides many benefits such as rapid initial propagation of new cane varieties, reduction of seed yield area because of small amount of plant tissue needed to initiate culture, elimination of pathogen and provides material for basic studies on physiology and biotechnology.

Barba et al. (1978) reported that within nine and half months callus culture of apical meristem produced planting material from a single spindle which was sufficient to plant a hectare of land, Sauvaire and Glazy (1978) described a method using axillary buds for micropropagation of sugarcane. Shoot tip culture has also been reported for sugarcane mass propagation by other researchers (Hendre et al., 1983; Lee, 1986; Lee, 1987; Hu and Wange, 1993; Nagai, 1987; Nagai, 1988).

Studies on micropropagation were initiated with the objectives to multiply the specific clones, to develop disease free clones and to create variability by using the mutagen treated explants.

MATERIALS AND METHODS

Two sugarcane clones BL4 and AEC81-8415 were used for micropropagation. Stem segments of about 4cm, together with meristem tips were excised. They were sterilized for one minute in 95% alcohol and for 10 minutes in 4% sodium hypochlorite solution. The segments were then washed 3 times with sterilized distilled water under sterile conditions and shoot tips were dissected. The apical meristem was explanted on MS media (Murashige and Skoog, 1962) supplemented with 9 different combinations of auxins and cytokinins to identify the most appropriate combination of nutrients for micropropagation. Under our conditions the cultures were incubated with a 16 hours photoperiod at 25±1°C. Polyvinyl polypropilidone (PVP) was used to avoid phenolic compounds in the culture. When the plantlets attained a suitable height (5.8cm), they were sepa-
rated and transferred to the rooting media consisting of MS+6% sucrose.

RESULTS AND DISCUSSION

Three stages are involved in micro-propagation i) Culture establishment ii) Shoot multiplication and iii) Rooting.

Culture Establishment

The source and size of explants and sterilization procedure and chemical composition of media play a vital role in obtaining clean culture and high efficiency. The optimum size of the shoot tips was approximately 1cm x 0.5cm including the apical meristem and 4 to 5 young leaves (Figure 1). The small explants (0.3 cm x 0.3 cm) produced more polyphenolics because of the tissue injury close to the meristem and thus could not be cultured.

Shoot Multiplication

Of 9 different combinations of auxins and cytokinin used for shoot multiplication, two showed bud formation but healthy shoot multiplication was observed (Figure 2, 3) in media containing MS+0.2mg/l BAP+0.1mg/l KIN. Media containing high concentration of hormones did not show positive response for

Figure 2. Shoot initiation and multiplication

shoot multiplication while low concentration of hormone (i.e. 0.2 mg/l BAP+0.1mg/l KIN) showed positive response for the same. This indicates that the higher concentration of hormone inhibits cell division while low concentration of hormone is suitable for cell division and elongation. Besides the concentration of hormone, sugar concentration also plays very vital role. Media containing 2%, 3%, 4% and 5% sucrose were found ineffective for shoot multiplication.
while the media containing 6% sucrose along 0.2mg BAP and 0.1mg Kinetin proved suitable for shoot multiplication.

**Rooting**

Induction of rooting was achieved when the plantlets were transferred to the media containing 6% sucrose. After 2 weeks, vigorous rooting was observed. Plantlets were then transferred to jiffy pots for acclimatization. After 2-4 weeks, they were transplanted in the soil.

**LITERATURE CITED**


