Research Application Summary

Mass propagation of selected papaya planting materials through shoot tip culture in Kenya

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Abstract

The objective of this study was to optimise media conditions in order to develop an efficient plantlet regeneration system of papaya planting materials. Twelve combinations of different levels of BAP (0.1, 0.3, 0.5 & 0.7mg/L) and NAA (0.05, 0.1 & 0.2mg/L) were used for shoot regeneration. The highest rate of shoot multiplication was recorded in 0.5mg/L BAP combined with 0.1 mg/L NAA. On the other hand, 0.1mg/L BAP combined with 0.05mg/L NAA produced the longest shoots in the three local papaya varieties. 2.5mg/l IBA induced about 85% of the shoots to root. Thus, an efficient plantlet regeneration system for Kenyan papaya through shoot tip culture was successfully developed.

Key words: *Carica papaya*, micropropagation, plantlet regeneration, shoot multiplication

Résumé

L'objectif de cette étude était d'optimiser les conditions du milieu afin de développer un système efficace de régénération des plantules de matériel de plantage de papaye. Douze combinaisons de différents niveaux de BAP (0,1 ; 0,3 ; 0,5 et 0,7 mg / L) et NAA (0,05 ; 0,1 et 0,2 mg / L) ont été utilisées pour la régénération des pousses. Le plus haut taux de multiplication des pousses a été enregistré en 0,5 mg / L de BAP associé avec 0,1 mg / L d'ANA. D'autre part, 0,1 mg / L de BAP associé à 0,05 mg / L d'ANA a produit les plus longues pousses dans les trois variétés locales de papaye. 2.5mg / l de IBA ont induit environ 85% des pousses à la racine. Ainsi, un système efficace de régénération des plantules de la papaye kenyane par la culture des bouts de pousse a été développé avec succès.

Mots clés: *Caricapapaya*, micro-propagation, régénération des plantules, multiplication des pousses

Background

Papaya is an important horticultural crop in Kenya grown for local fresh consumption and processing both by small and large scale farmers (Imungi and Wabule, 1990). Papaya production has been declining over the years due to several constraints such as unreliable methods of picking the required sex of seedlings at planting time, shortage of clean and disease-free planting materials and devastating diseases that are difficult to control. Solutions need to be sought to improve papaya production in Kenya.

Literature Summary

Tissue culture techniques offer reliable procedure for mass propagation of clean, disease free and uniform plants for both commercial and research purposes. Several protocols for *in vitro* plantlet regeneration from shoot meristems of papaya have been developed in other regions of the world. However, most of the protocols are genotype dependent and therefore cannot be reproduced (Mishra *et al.,* 2007). However, no protocol for micro-propagation of papaya has been developed for any papaya genotypes in East Africa.

Study Description

Seeds of three local papaya varieties were used in this study and were established in a greenhouse. Shoot tips were cut out of three months old seedlings, , sterilised and cultured on Murashige and Skoog (MS) basal medium supplemented with 16 combinations of BAP (0, 0.1, 0.5 & 1.0mg/L) and NAA) (0, 0.05, 0.1 & 0.5mg/L. After 4 weeks of growth, shoot number and appearance for each combination was recorded. The combinations with largest number and well developed shoots were selected for use in the second stage of the experiment. The treatment selected were 0.1, 0.3, 0.5 and 0.7mg/L levels of BAP each combined with 0.05, 0.1 and 0.2mg/L levels of NAA. Mean number of shoots produced per shoot tip and average shoot length were recorded every three weeks. Proliferated shoots were separated into single shoots and rooted in MS basal medium supplemented with 2.5 mg/l for one week, and transferred into half strength MS liquid medium with vermiculite for further root development.

Research Application

The highest rate of shoot multiplication was recorded in 0.5mg/L BAP combined with 0.1 mg/L NAA (Table 1). On the other hand, 0.1mg/L BAP combined with 0.05mg/L NAA produced the longest plantlets. 2.5mg/l IBA stimulated more than 50% of the shoots to produce roots (Fig. 1). This implies that the most optimum media for regenerating papaya from shoot tips is MS medium supplemented with 0.5mg/l BAP +0.1 mg/l NAA, with

Table 1. The effects of different combinations of BAP and NAA on average papaya shoot number and length.

Treatment		NAA (mg/l)	Average number of shoots
BAP(mg/l)	Shoot length (cm)		
0.1	0.05	17bc	2.1c
0.3	0.05	14ab	1.9bc
0.5	0.05	15ab	1.5 ab
0.7	0.05	12ab	1.4ab
0.1	0.1	10a	1.3a
0.3	0.1	10a	1.5ab
0.5	0.1	23c	1.4ab
0.7	0.1	13ab	1.5ab
0.1	0.2	13ab	1.4ab
0.3	0.2	12ab	1.3a
0.5	0.2	13ab	1.4ab
0.7	0.2	13ab	1.8bc
CV		35.3	20.8
P value		<0.001	<0.001

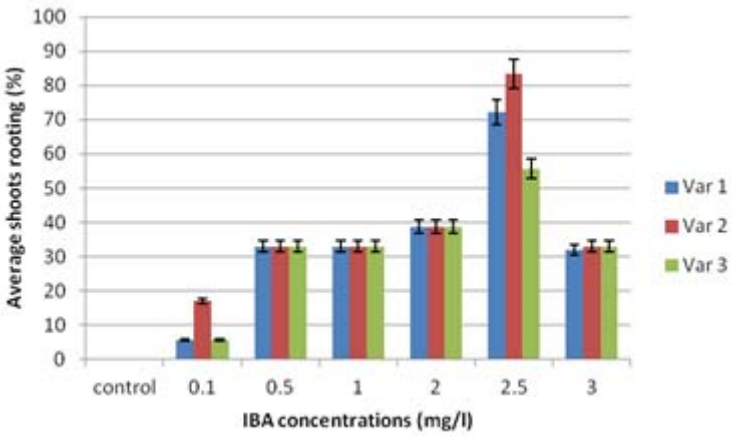

Figure 1. Average number of shoots in three varieties in response to different IBA concentrations.

subcultures in MS medium containing 0.1 mg/l BAP +0.05mg/l NAA for elongation prior to rooting. To obtain high number of shoots producing roots, we recommend that the elongated shoots to be rooted in MS media supplemented with 2.5mg/l IBA in darkness before transferring them to half strength liquid MS plus vermiculite for further root development.

Acknowledgement

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References

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