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Short Communication

Effect of different media on the *in vitro* growth of cactus (*Opuntia ficus-indica*) explants

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The effect of media composition on the growth of cactus explants was investigated. Two media designated A and B were used in this study. Medium A contained basal Murashige Skoog salt (MS salt) and vitamins supplemented with 5% sucrose and 1% BAP (benzyl amino purines) and media B containing vitamins and MS salt supplemented with 3% sucrose, 1.25 mg/l BAP, and 0.25 mg/l IAA (indole acetic acid). These media were used to culture cactus explants over a period of 30 days, with a view to determine the effect of difference in the supplements on days to shoot emergence, shoot height, percentage survival and percentage oxidation (secretion of phenolic compounds) of the explants in. Analysis of the results indicated that there was no significant difference between the two media used in terms of the shoot height and days to shoot emergence.

Key words: Media, explants and growth.

INTRODUCTION

The utilization by man of cactus (*Opuntia ficus–indica*) was recorded in the agricultural economy of the Aztec empire (Bravo, 1978). It is now part of the agricultural systems of many regions of the world where it has adapted to dry areas with droughty conditions, scarce rainfall and poor, erosion prone soils. Cactus is rich in carbohydrates and calcium, it is attractive as an animal feed because of its efficiency in converting water to dry matter and thus to digestible energy (Nobel, 1995). The conversion efficiency of cactus is greater than C_3 grasses and C_4 broad leaves. It provides digestible energy, water and vitamins to livestock during periods of drought. Cactus is also used to combat desertification because of its ability to grow in severely degraded soils.

The Jigawa state government of Nigeria introduced *O. ficusindica* as a new alternative to animal feeds for livestock farmers. However, conventional propagation methods cannot adequately meet the needs of mass release of this newly introduced crop, thus the need for mass propagation through tissue culture. The aim of this research was to determine the effect of two different supplementations of Murashige and Skoog (1962) basal nutrient medium (used frequently for cactus micropropagation) on the growth and survival of cactus explants *in vitro*.

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MATERIALS AND METHODS

Media preparation

Two different media were prepared, media A was composed of basic Murashige and Skoog (MS) salt, plant vitamins, 0.8% agar supplemented with 5% sucrose and 1.25 mg/l benzyl amino purine (BAP), while media B was composed of basic MS salt, plant vitamins, 0.8% agar supplemented with 3% sucrose and 1.0 mg/l benzyl amino purine (BAP) and 0.25 mg/l indole acetic acid (IAA). 400 ml each of the MS salts were prepared as per Murashige and Skoog (1962) and to these the supplements were added to make-up the two media (A and B). Two measures of 2.4 g of agar were added to two 500 ml conical flasks containing the 400 ml each of media A and B; the volume of the media was made-up to the 500 ml mark. These were heated in a microwave oven until the media was homogenous. Ten milliliters each of media A and B were dispensed into 30 labelled culture tubes each and autoclaved at 121^{o}C for 15 min.

Table 1. Mean number of days to shoot emergence, shoot height (cm), shoot survival (%) and oxidation (%) of cactus explants grown on two different media A and B.

Replicates	Mean no. of days to shoot emergence		Mean shoot height (cm)		Shoot survival (%)		Oxidation (%)	
	A	B	A	B	A	B	A	B
1	10.6	8.5	1.32	1.08	70	80	20	0
2	11.7	9.3	1.38	1.44	80	90	10	10
3	10.1	11.2	0.99	1.16	80	70	20	20
Grand means	10.8	9.66	1.23	1.22	76	80	17	10
Calculated means	1.051		0.303					

Isolation of explants

Young cactus cladodes were obtained from the cactus plantations of the Jigawa state Research Institute and surface sterilized by washing under running tap water, detergent and rinsing with distilled water. These were cut into pieces. The cut pieces were surface disinfected under a laminar flow using the double sterilization procedure (Ibrahim et al., 2004). The cladodes were immersed in 500 ml sterilized beaker containing 70% alcohol for 5 min, the alcohol was drained and the cladodes were immersed in 10% sodium hypochlorite for 10 min, rinsed in deionised sterile distilled water and transferred into Petri dishes ready for inoculation.

Inoculation

The pieces of the cladodes were sprayed with 70% ethanol, cleaned with a clean towel and transferred to a lamina flow. Using sterile surgical blade and forceps the cladodes were cut-off and transferred into culture tubes, these were sealed with parafilm. The culture tubes were transferred to a growth chamber with a photoperiod of 16 h light and 8 h of dark at 27 ± 2ºC. Over a period of 30 days after inoculation data on the number of days to shoot emergence, shoot height, percentage survival and percentage oxidation (secretion of phenolic compounds) were recorded for explants in the two media. Student's t-test was used for the statistical analysis. One explant per test tube in a group of ten was laid out in replicates of 3 for each of the media.

RESULTS AND DISCUSSION

Table 1 shows the results of 30 days mean shoot growth (emergence and height), percentage survival and percentage oxidation of the cactus explants in the different growth media A and B. Statistical analysis using Student's t-test indicated hat there is no significant difference between explants in media A and B in terms of number of days to shoot emergence and shoot height at 1 and 5% levels of significance. The lack of a significant difference between the two media could be attributed to the fact that the supplements to the MS salts, that is, benzyl amino purine (BAP) and indole acetic acid (IAA) are both growth promoters. Also the difference in the concentration of BAP in media A and B may have played a role in neutrallizing whatever effect the two different media may exert on the shoot length and emergence, because BAP, a cytokinin, is in media B, however, the presence of 0.25 mg/l of IAA (an auxin) in media B may have made up for the absence of 0.25 mg/l of BAP. Johnson and Emino (1979a,b) suggested that the growth regulator combinations required for axillary shoot proliferation are unique to each species; Clayton et al. (1990) also confirmed that the sources of auxin and cytokinin needed for optimal production of axillary shoots interact strongly with species. In general, low levels, or no auxin are required in combination with moderate to high levels of cytokinin for cactus axillary shoot proliferation.

These results indicate that both media compositions have similar effect on shoot formation of cactus *in vitro* and are effective for the micro-propagation of cactus in general.

The study has shown that the different media used in the investigation have similar effect on *in vitro* growth of cactus. This may, however, be attributed to the fact that the investigation spanned a period of 30 days which may not necessarily be long enough for an exhaustive evaluation of the response of the explants to the two media.

REFERENCES

Bravo HE (1978). L'as cactaceae de Mexico 2a. ed. Vol. 1. Universal nacional autonoma de Mexico. Mexico, D.F.

Clayton PW, Ubstenber HJF, Philip GC, Butler-Nance SA (1990). Micropropagation of members of the cactaceae subtribe cactinae. J. Am. Soc. Hort. Sci. 115: 337-343.

Johnson JL, Emino ER (1979a). *In vitro* propagation of mammilaria elongate. Hort science 14: 605-606.

Johnson JL, Emino ER (1979b). Tissue culture in the cactacea. Cact. Succ. J. (U.S.) 51: 272-275.

Murashige T, Skoog F (1962). A revised medium for rapid growth and bioassays with tobacco tissue cultures. Physiol. Plant 15: 473-497.

Nobel JL (1995). Changes in water potential and its component during shoot formation in cacti callus. Physiol. Plant 45: 92-97.