Research Note

RAPID IN VITRO PROPAGATION OF MANGOSTEEN THROUGH SHOOT DIVISION[1,2]

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Mangosteen (*Garcinia mangostana*) is a highly praised and economically important tropical fruit within the Clusiaseae family. The origin of mangosteen is unknown. It is a slow growing tropical tree propagated by apomictic seeds; however, this natural propagation is insufficient because of low seed yield (Te-Chato and Lim, 2000). The seeds are apomictic with adventitious embryos or hypocotyl tubercules. Seeds are recalcitrant and lose their viability approximately five days after removal from the fruit (Morton, 1987). Because of the low number of seeds produced per fruit (two at most), it is necessary to find alternative propagation methods. Most vegetative propagation methods are unsuccessful since the cuttings do not root and the grafted buds die because of fermentation of a yellow resinous latex that is exuded when the cortex is split during grafting (Almeyda and Martin, 1976).

Tissue culture of mangosteen has been established by using seeds (Goh et al., 1988; Te-Chato and Aengyong, 1988), young leaves from tissue culture (Te-Chato et al., 1992a, 1992b), field grown seedlings and mature trees (Goh et al., 1990). Te-Chato and Lim (2000) have obtained meristematic nodular callus formation from in vitro-derived leaf explants. The objective of this research was to obtain a simple, efficient and fast propagation method of mangosteen by using tissue culture.

Fruits of mangosteen were collected from a tree growing at the Tropical Agriculture Research Station in Mayagüez, Puerto Rico, accession number NS-299, plot 15. Fruits were washed with a 2% antibacterial soap and rinsed under running tap water for 30 minutes, dipped in 70% ethanol for one minute and rinsed three times with sterile distilled water. Fruits were surface sterilized in a 10% sodium hypochlorite solution for 30 minutes and rinsed twice in sterile distilled water. The seeds were aseptically dissected from the fruits and cultured in tubes containing 1.8 g of vermiculite (used as a solid substrate) and 10.2 ml liquid woody plant medium (WPM) (Lloyd and McCown, 1981) for germination. This volume of media was ideal to keep the vermiculite substrate moist without being excessively wet. The cultures were maintained under fluorescent light (25 $\mu m/m^2/s$) at 24 to 26°C, 16/8 h.

Seedlings were cut in two segments, one containing the apical bud and a portion of the stem, the other containing the remaining stem and the root system. The cut surface of the shoot section was dipped for 10 seconds in a 30 mg/kg solution of BAP, NAA or 2,4-D. Both segments were subsequently transferred to one-fourth strength liquid WPM sup-

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plemented with 7% sucrose with vermiculite as a substrate. The cultures were maintained as previously described.

Seeds planted in liquid medium germinated after three weeks and continued to develop. Plantlets were obtained from seeds after four weeks by using one fourth strength WPM liquid media in a vermiculite substrate from plants derived from seeds. Shoot and root induction occurred within 3 to 4 wk of transplanting. From a total of 114 plantlets cut in two sections, and whose top sections were dipped in 30 mg/kg BAP, 113 top sections resulted in new plants (99%). From a total of 114 plantlets cut in two sections and dipped in 30 mg/kg NAA, 32 top sections resulted in new plants (28%). From a total of 37 plants cut in two and dipped in 2,4-D no new plantlets were obtained, but some callus tissue was evident in the area exposed to 2,4-D.

In mangosteen, there is no sexual variation in the seedlings from seeds of the same tree, because of apomixes (Almeyda and Martin, 1976). Thus, using seedlings for micropropagation to clonally propagate this tropical tree is justified (Goh et al., 1988). The tissues used for propagation are of critical importance. This research provides a new short and simplified method to increase the number of mangosteen plantlets starting from seeds. This two-step culture system allows for rapid clonal propagation during times when seeds are scarce or unavailable. The obtained propagules are aseptically produced and may be transported free of insects and pathogens. Although only one genotype was used to develop the technique, using other genotypes should be successful with minor modifications of the growth regulator concentrations.

LITERATURE CITED

Almeyda, N. and F. W. Martin, 1976. Cultivation of neglected tropical fruits with promise. 1. The mangosteen (*Garcinia mangostana* L.) US Agricultural Research Service South Region 155, 18 pp.

Goh, H. K. L., A. N. Rao and S. Loh, 1988. In vitro plantlet formation in mangosteen (*Garcinia mangostana* L.) *Ann. Bot.* 62:87-93.

Goh, H. K. L., A. N. Rao and C. S. Loh, 1990. Direct shoot bud formation from leaf explant of seedlings and mature mangosteen (*Garcinia mangostana* L.) trees. *Plant Sci.* 68:113-121.

Goh, C. J., P. Lakshamanan and C. S. Loh, 1994. High frequency direct shoot bud regeneration from excised leaves of mangosteen (*Garcinia mangostana* L.). *Plant Sci.* 101:173-180.

Lloyd, G. and B. McCown, 1981. Commercially feasible micropropagation of mountain laurel, *Kalmia latifolia*, by use of shoot tip culture. Combined Proceedings of the International Plant Propagation Society 30:421-426.

Morton, J., 1987. Fruits of warm climates. Ed., C. F. Cowling, Jr. Creative resource systems, Inc., Winterville, NC. 505 pp.

Te-Chato, S. and W. Aengyong, 1988. Microplant propagation of mangosteen (*Garcinia mangostana* L.). *Sonklanakarin J. Sci. Technol.* 10:1-7.

Te-Chato, S., M. Lim and A. Muangkeawngam, 1992a. Enhanced efficiency micropropagation of mangosteen through young leaf culture. *Sonklanakarin J. Sci. Technol.* 14:1-7.

Te-Chato, S., M. Lim and A. Muangkeawngam, 1992b. Tissue culture of mangosteen: root induction and establishment of in vitro plants to soil. *Sonklanakarin J. Sci. Technol.* 16:1-5.

Te-Chato, S. and M. Lim, 2000. Improvement of mangosteen micropropagation through meristematic nodular callus formation from in vitro derived leaf explants. *Scientia Horticulturiae* 86:291-298.