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Meta-topolin conciliated ameliorating effect on micropropagation, net photosynthetic rate, antioxidant activity, improved rhizogenesis and acclimatization in *Syzygium cumini* L. Skeels, a recalcitrant medicinal tree species

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In the present study an efficient, rapid and improved shoot regeneration protocol was successfully developed for a recalcitrant aromatic, medicinal woody tree (*Syzygium cumini* L.) by the use of meta-topolin (mT) for the first time. Amongst the various cytokinins (BA, KN, mT and 2ip) and auxins (NAA, IBA) combinations evaluated as supplement to Murashige and Skoog (MS) medium, mT mediated cultures were most effective, inducing maximum multiple shoots with good vigor. A high multiplication rate and good elongation was achieved when mT exposed cultures were sub-cultured in a secondary MS medium containing a combination of 5.0 µM 6-benzyladenine (BA) and 0.2 µM α-naphthalene acetic acid (NAA), producing nearly 50 microshoots attaining mean length of 5.7 cm. These mT exposed cultures appeared healthy and without any discrepancy like hyperhydricity or leaf fall (quite common during culture) that aggravate the improper growth and development of cultures. Beside increased growth parameters (shoot numbers and length) and decreased discrepancy in the mT raised cultures, the mT raised cultures were shown to have increased pigment content with better rhizogenic competency and acclimatization. The mT raised regenerants showed better rooting (80%) than BA raised regenerants (65 %). Healthy growing in vitro microshoots (80%) rooted efficiently on ½ MS medium supplemented with NAA (0.5 mM), which induced (5.7±0.12) roots with root length (0.13 4.30 cm) after 6 weeks. Simultaneously, percent acclimatization of mT raised regenerants was much better (80%) than BA raised regenerants (65%). The assessment of net photosynthetic rate (P_N) and pigment content during acclimatization and antioxidant enzymes activity (SOD, CAT, GR, APX, H_2O_2 and MDA) under controlled culture conditions indicated that the mT regenerants, substantially acquired to control the stress condition of the prevailing external environment well in a span of two and half months. These antioxidant enzyme systems eventually expressed to protect the micropropagated regenerants from oxidative damage due to extreme heat and humid condition of external environmental.

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