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In vitro Callus Production from Lantana Camara: A Step towards Biotransformation Studies

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Abstract : Plant tissue culture practices are presented nowadays as the most promising substitute to a whole plant in the terms of secondary metabolites production. They offer the advantages of high production, tunability and they have less effect on plant ecosystems. Lantana camara is a weed, which is common all over the world as an ornamental plant. Weeds can adapt to any type of soil and climate due to their rich cellular machinery for secondary metabolites' production. This characteristic is found in Lantana camara as a plant of very rich diversity of secondary metabolites with no dominant class of compounds. Aim: This trait has encouraged the author to develop tissue culture experiments for Lantana camara to be a platform for production and manipulation of secondary metabolites through biotransformation. Methodology: The plant was collected in its flowering stage in September 2014, from which explants were prepared from shoot tip, auxiliary bud and leaf. Different types of culture media were tried as well as four phytohormones and their combinations; NAA, 2,4-D, BAP and kinetin. Explants were grown in dark or in 12 hours dark and light cycles at 25°C. A metabolic profile for the produced callus was made and then compared to the whole plant profile. The metabolic profile was made using GC-MS for volatile constituents (extracted by n-hexane) and by HPLC-MS and capillary electrophoresis-mass spectrometry (CE-MS) for non-volatile constituents (extracted by ethanol and water). Results: The best conditions for the callus induction was achieved using MS media supplied with 30 gm sucrose and NAA/BAP (1:0.2 mg/L). Initiation of callus was favoured by incubation in dark for 20 day. The callus produced under these conditions showed yellow colour, which changed to brownish after 30 days. The rate of callus growth was high, expressed in the callus diameter, which reached to 1.15±0.2 cm in 30 days; however, the induction of callus delayed for 15 days. The metabolic profile for both volatile and non-volatile constituents of callus showed more simple background metabolites than the whole plant with two new (unresolved) peaks in the callus' nonvolatile constituents' chromatogram. Conclusion: Lantana camara callus production can be itself a source of new secondary metabolites and could be used for biotransformation studies due to its simple metabolic background, which allow easy identification of newly formed metabolites. The callus production gathered the simple metabolic background with the rich cellular secondary metabolite machinery of the plant, which could be elicited to produce valuable medicinally active products.

Keywords : capillary electrophoresis-mass spectrometry, gas chromatography, metabolic profile, plant tissue culture
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