Biosynthesis of Tumor Inhibitory Podophyllotoxin, Quercetin and Kaempferol from Callogenesis of Dysosma Pleiantha (Hance) Woodson

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Abstract : Medicinal herbs do represent a huge and noteworthy reservoir for novel anticancer drugs discovery. Dysosma pleiantha (Hance) Woodson (Berberidaceae), one of the oldest traditional Chinese medicinal herb, highly prized by the mountain tribes of Taiwan and China for its medicinal properties contained pharmaceutically important antitumor compounds podophyllotoxin, quercetin and kaempferol. Among lignans, podophyllotoxin is an active antitumor compound and has now been modified to produce clinically useful drugs etoposide and teniposide. In recent years, natural populations of D. peliantha have declined considerably due to anthropogenic activities such as habitat destruction and commercial exploitation for medicinal applications. As to its overall conservation status, D. pleiantha has been ranked as threatened on the China Species Red List. In the present study, an efficient in vitro callus culture system of D. pleiantha was established on Gamborg's medium with various combinations and concentrations of different auxins and cytokinins under dark condition. Best callus induction was recorded in 2 mg/L 2, 4 - Dichlorophenoxyacetic acid (2,4-D) along with 0.2 mg/L kinetin and the maximum callus proliferation was achieved at 1 mg/L 2,4-D. Among the explants tested, maximum callus induction (86 %) was achieved from tender leaves. Hence, in subsequent experiments, leaf callus was further investigated for suitable callus biomass and production level of anticancer compounds under the influence of different additives. A maximum fresh callus biomass (8.765 g) was recorded in callus proliferation medium contained 500 mg/L casein hydrolysate. High performance liquid chromatography results revealed that the addition of different concentrations of peptone (1, 2 and 4 g/L) in callus proliferation medium enhanced podophyllotoxin (16 fold), quercetin (12 fold) and kaempferol (5 fold) accumulation than control. Thus, the established in vitro callus culture under the influence of different additives may offer an alternative source of enhanced production of podophyllotoxin, kaempferol and quecertin without harming natural plant population.

Keywords : dysosma pleiantha, kaempferol, podophyllotoxin, quercetin
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