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## Biotechnological approaches for rapid elicitation of artemisinin in *Artemisia annua* L. employing biotic and abiotic stresses, its isolation and evaluation of bio-efficacy against cancer cell lines, malaria and dengue vectors

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Artemisinin is a naturally occurring biomolecule in *Artemisia annua*, known for its anti-malarial as well as anti-cancerous activity. *In vitro* enhancement in artemisinin content has been achieved employing biotic (*Piriformospora indica* and *Agrobacterium rhizogenes* strain A4) and abiotic (such as heavy metals and salicylic acid) elicitors with different explants in various MS media compositions were employed. A significant enhancement in artemisinin content of 60% was achieved in shoot cultures co-cultivated with *P. indica*. Hairy root cultures raised through leaf explants of *A. annua* when exposed to different concentration of Pb, Hg, Co and SA have shown a tremendous enhancement in artemisinin, the maximum elevation reaching to 1450% in lead nitrate (100 mg/L) supplemented medium over control. For abiotic stress, nodal explants if exposed to various heavy metal (Ag, Cu, Hg, Co and Zn) salts too revealed significant increase in artemisinin production, the optimum being 50% at 100 mg/L of Cu and Zn. The crude extract of *A. annua* has been fractionated, isolated and characterized through CC, TLC, FT-IR and NMR. Bioassays conducted with crude extract of leaves against larvae of malaria (*Anopheles stephensi*) and dengue (*Aedes aegypti*) vectors have shown a strong larvicidal activity and on human oral cancer cell line causing 98.5% mortality. This is our first report of elicitation of artemisinin in *A. annua* employing *P. indica* and hairy roots coupled with abiotic stresses.

### Biography

Veena Agrawal is teaching and conducting research in the Department of Botany, University of Delhi in the area of Plant Biotechnology (Micropropagation, genetic transformation and evaluation of biomolecules in the medicinal plants) since 1990. She has developed more than 25 micropropagation protocols of economically important plant taxa. She has published over 75 research papers in international/national peer reviewed journals and immensely contributed (over 100 abstracts) her research in many international conferences, delivered invited lectures and chaired the technical sessions. She has visited many countries namely Israel, Nepal, Australia in connection with research. She is awarded with several fellowships: Indian Society of Plant Physiology (FISPP) and International Society of Plant Morphologists (FISPM) and is an elected Member of PTCA (I). For the first time, she developed sex-linked markers in Jojoba, an oil yielding dioecious crop. She has filed five Indian patents. She has been on the Editorial Board and Reviewer of various prestigious international projects and journals.

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