In this issue

Production of andrographolide

Higher plants produce a great variety of secondary products which often have an ecological role, such as attractant of pollinators and chemical defense against microorganisms, insects and higher predators. Many of these natural products have been used as sources of large number of industrial products, including agricultural chemicals, pharmaceuticals and food additives. During the last 50 years there has been an increasing interest among scientists to produce high value natural plant products by cell and organ culture to overcome many problems associated with industrial production of these phytochemicals by extraction from field grown plants. Different strategies, using *in vitro* systems, have been extensively studied with the objectives of improving the production of valuable secondary metabolites. Undifferentiated cell cultures have been mainly studied, but a large interest has been also shown in hairy roots and other organ cultures. Recently, adventitious root cultures have become focus of research for the production of secondary products. Adventitious roots have merit as production system with stable productivity, being in a differentiated state, and being genetically more stable than callus cells.

Andrographis paniculata Nees (Acanthaceae), commonly known as 'Kalmegh' has been widely used in India for the treatment of hepatitis. The plants possess protective activity against various liver disorders. The major chemical constituent is andrographolide and related compounds which are diterpenoid compounds and show antipyretic, antimalarial, anti-inflammatory, immunostimulatory and anticancerous activities. Praveen *et al.* (**page 694**) have induced adventitious roots from leaf explants of *Androgrpahis paniculata* and developed the methodology for multiplication of adventitious root biomass in suspension cultures. Root biomass produced from suspension cultures contained 3.5-fold higher andrographolide content compared to natural plants. The study focuses great potentiality of adventitious root cultures for the production of andrographolide.

Worries of carbon nanotube community

Nanotoxicology of carbon nanotubes remains a major concern among scientific community despite a great promise of carbon nanotubes application wise in areas spanning from structural to electromagnetic including clothes, combat jackets, concrete, sports equipments, space elevators, artificial muscles, bucky papers, computer circuits, conductive films, light bulb filaments, solar cells, displays and transistors to name a few. This growing list of potential applications does not stop here as even more importantly, the use of carbon nanotubes extends vehemently to chemical and biotechnological fields. These promising applications include air pollution filter, biotech container, hydrogen storage, water filter, cancer therapy, drug delivery, sensory and diagnostic tools, biomaterials nanocomposites, military applications, tissue scaffoldings, etc. Because of their excellent physical properties, carbon nanotubes currently are being developed for the above-mentioned multiple commercial applications. Nevertheless, the potential hazard of inhaled carbon nanotubes well before their mass production leading to greater possibilities of its exposure to humans and the environment is of utter importance. Hazard studies in rats indicates that inhaled, nano-sized (i.e. <100 nm) carbon black particles may produce significant lung toxicity in rats and the toxicity potential appears to be inversely related to particle size. Studies on human keratinocyte cell culture show that dermal exposure to unrefined single-walled carbon nanotube (SWCNT) may lead to dermal toxicity due to accelerated oxidative stress in the skin of exposed workers. Interactions of multi-walled carbon nanotube (MWCNT) with human epidermal keratinocytes show that its exposure can localize within cells and initiate an irritation response. But in many cases observed toxicity may arise from byproducts of carbon nanotube synthesis rather than from carbon nanotubes itself. So carbon nanotubes can be considered non-toxic if used pure. For such detailed discrepancies on the cytotoxicity issues of carbon nanotubes, see **page 664**.

Climate change and Himalayan glaciers

R. K. Chaujar report (**page 703**) climatic changes and its impact on the Himalayan glaciers based on the dating of lichens, developed on loops of moraines formed due to various stages of advance and retreat of the glacier. The date of largest lichen on the loop of moraine that indicates the

position of maximum advance of the glacier is 258 years. It shows the period when the Chorabari glacier started receding from the point of its maximum advancement in this part of the Himalaya. Earlier work in the Dokriani Bamak (glacier) had shown that the period of retreat in the respective part of the Himalaya is around 314 years. There is every possibility that the effect of climate change was sensed first in the equatorial zone by the north-facing Himalayan glaciers such as the Dokriani Bamak (glacier).