

## Elicitors for plant secondary metabolites production

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Plants are the tremendous source of various compounds that are not strictly necessary for growth and development but which play a crucial role in defence and adaptation of plants. These compounds are referred to as secondary metabolites, which include terpenes, steroids, phenolics and alkaloids that exhibit a wide range of biological activities and have immense potential application in pharmaceutical, food, agricultural, cosmetic, and textile industries. The evolving commercial importance of secondary metabolites has in recent years resulted in a great interest in research focusing on secondary metabolism and finding alternative ways for secondary metabolite production. Plant cell and tissue cultures have led the ways for the production of valuable secondary metabolites but they have limited commercial success as they do not produce sufficient amounts of the required secondary metabolites. The production of these valuable compounds could be enhanced by elicitors. Elicitors help in stimulating the plant defence, promoting secondary metabolism to protect the cell and whole plant. Their addition triggers physiological and morphological responses and phytoalexin accumulation in plants. Elicitors can be divided into two types, namely abiotic and biotic elicitors. Abiotic elicitors comprise physical (UV radiation, osmotic stress, thermal stress), chemical (heavy metal, mineral salt) and synthesised hormonal substances. These factors help in stimulating the activity of various secondary metabolic pathways leading to increased production of secondary metabolites. Biotic elicitors comprise polysaccharides obtained from various plants, bacterial, fungal and yeast extracts, which are usually added in plant cell suspension culture to enhance the secondary metabolites production. Therefore, with the addition of elicitor-specific receptors to plant cells in vitro, defence responses could be stimulated resulting in increased synthesis and accumulation of secondary metabolites. For an effective elicitation, elicitor type, concentration, duration of exposure, and treatment schedule are taken into consideration to scale up the industrial production of secondary metabolites for various purposes.

*Keywords: Secondary metabolites, Plants defence, Elicitors, Plant cell culture, Elicitation*

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