

# Elicitors of Disease Resistant and their Role in Plant Tissue Culture

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**Abstract:** Disease control is largely based on the use of fungicides, bactericides, and insecticides chemical compounds toxic to plant invaders, causative agents, or vectors of plant diseases. Here are some natural phenomenon of induced resistance to protect plants from various disease. Elicitors are compounds, which activate chemical defense in plants. Various biosynthetic pathways are activated in treated plants depending on the compound used. Commonly tested chemical elicitors are salicylic acid, methyl salicylate, benzothiadiazole, benzoic acid, chitosan, and so forth, which affect production of phenolic compounds and activation of various defense-related enzymes in plants. Their introduction into agricultural practice could minimize the scope of chemical control, thus contributing to the development of sustainable agriculture. Elicitors are compounds stimulating any type of plant defense. This broader definition of elicitors includes both substances of pathogen origin (exogenous elicitors and compounds released from plants by the action of the pathogen (endogenous elicitors). Also elicitors could be used as enhancers of plant-secondary-metabolite synthesis and could play an important role in biosynthetic pathways to enhanced production of commercially important compounds. The increased production, through elicitation, of the secondary metabolites from plant cell cultures has opened up a new area of research, which could have important economical benefits for bio industry.

**Keywords:** Pathogen, economic and resistance

## 1. Introduction

Plants are attacked by a variety of biotic stresses like fungal, bacterial, or viral infections. This challenge lead to a great loss to plant yield (Savitha, et al., 2006, Gundlach, et al., 1992) Various options are available for the farmers to protect their crop from the disease. Some of the options are development of resistant cultivars, biological control, crop rotation, tillage, and chemical pesticides. But their use at commercial level is uneconomical, application is unwieldy, and some are proved to be carcinogenic (Zhao, et al., 2001, Chan. et al., 2010). Therefore, considerable efforts have been accomplished to devise environmental-friendly strategies for the check of plant diseases and thus to save mankind from health hazard. In plant tissue culture studies, the plant tissues are challenged by various stresses and their combinations but the plasticity of plant genome counters remarkably to such stresses under in vitro condition (Rao and Ravishankar. 2001 and Pitta-Alvarez. 2000). The stress responses are triggered in the plant tissues for enhanced yield of secondary metabolites using Elicitors,

Precursors and Bioinformation, environmental stresses and change in media constituents. Elicitors are compounds which stimulating any type of physiological abnormality of plant. This broader definition of elicitors includes both substances of pathogen origin (exogenous elicitors) and compounds released from plants by the action of the pathogen (endogenous elicitors) (Arehzoo et al., 2015 and Sivanandhan et al., 2013). Elicitors could be used as enhance of plant secondary-metabolite synthesis and could play an important role in biosynthetic pathways to enhanced production of commercially important compounds. The secondary metabolites are released due to defense responses, which are triggered and activated by elicitors, the signal compound of plant defense responses (Avancini et al., 2003, Shabani et al., 2009 and Wang et al., 2013).

## 2. Elicitation in plant cells

A research has been dedicated to publish the mechanism of elicitation in plants. Intensive research was targeted specifically on the biotic and especially on carbohydrate elicitors, and the effects of abiotic elicitors on the advances of secondary metabolites in plants; elicitation is considered to associate the key messenger Ca<sup>2+</sup>, factors affecting cell membrane integrity, inhibition, activation of intracellular pathways and changes in osmotic pressure acting as stress agents (Savitha et al 2006., Goel et al., 2011 and Radman et al., 2011). A general mechanism for biotic elicitation in plants:

- Binding of the elicitor to a plasma membrane receptor.
- Altered ion fluxes across the plant cell membrane i.e. Cl<sup>-</sup> and K<sup>+</sup> efflux, Ca<sup>2+</sup> influx.

Elicitor signal transduction is a numerous factors with various reflection to establish a capable defense. These multiple components contain, some parallel or cross-linking signaling pathways, which are leading to different target responses. An elicitor-signaling pathway having some variation with perception of different elicitor signals or with target defense responses. There are different types of plant hormones which act as an elicitors (Pitta-Alvarez. et al., 2000 and Yan et al., 2006. The common plant hormones are Salicylic acid (SA) and Jasmonic acid (JA) are key signals for defense gene expression, In which Salicylic acid (SA) control resistance to pathogens like bacterial, fungal and viral, Whereas JA regulates the production of protiens by the octadecanoid pathway. SA and JA are both

fabricated mimics that can be applied apparently to activate and regulates resistance against pathogen. The biochemical pathways of both SA and JA are useful in the plant elicitation process (Hao et al., 2015).

#### A. Various types of elicitors

Elicitors is one of the most powerful strategy employed which increase the productivity of important alkaloids in cell and organ culture. Elicitors are classified into two groups: biogenic and abiogenic. Biogenic elicitors are classified into exogenous group which are extracted from pathogens or isolated from their culture media and endogenous group isolated from plant tissues Sonja et al., 2015., Whereas, abiogenic elicitors are heavy metal ions, inhibitors of some metabolic steps, some antibiotics and fungicides, and UV radiation. Reports and datas are showing the rapid increase in the alkaloid production by using both factors biogenic and abiogenic elicitors.

#### B. Features involved in elicitors

The product accumulation in plant cell cultures because of elicitation may be antimicrobial in nature, but confusion should be avoided with phytoalexins unless there is sufficient proof that the source plant respond to pathogens with rapid accumulation of the same product. Thus a new term has been coined named as "Elicitation product" or "Elicitation metabolite". Different features has been involved in elicitation process such as follows (Poulev et al., 2003 and Krishnamurthy. 1983).

- Elicitor specificity
- Elicitor concentration
- Duration of elicitor contact
- Elicitor of cell line (Clones)
- Time course of elicitation
- Growth stage of culture
- Growth regulation and Nutrient composition.

### 3. Conclusion

The evolutionary process made plant to produce new bioactive compounds. Naturally plant produces a various number of secondary metabolites in varying concentration in different parts of the tissue. In modern technologies development, in vitro culture plays an important role in the production of secondary metabolites from the particular tissue, organ and cells. In the past, less attention was paid to abiotic elicitor, but now the use of abiotic elicitors has emerged as one of the most effective strategy for enhancing the productivity of different commercial secondary metabolites from in vitro cultures. However, elicitation enhances secondary metabolism in in vitro culture of plant cells/organ, but the exact mechanism of elicitation is still not fully understood.

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