

ALKALOIDS AND PHENOLS ACCUMULATION IN GROWING LEAF CELLS OF *GYMNOSPORIA MONTANA* (ROTH) BENTH.

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ABSTRACT : Accumulation of phenols and alkaloids in developing leaf cells of *Gymnosporia montana* were studied with an aim to know at which development stage this bioactive compounds are synthesized in cells. To observe this phenomenon alkaloids and phenols were localized in each developing leaf of *Gymnosporia montana*. Further, total alkaloids and phenols content were estimated from each developing leaf of *Gymnosporia montana*. Finally, characterization of compounds from chloroform extract of mature leaves was done using GC-MS analysis which suggested presence of Phenol (Phenol, 2,4-bis(1,1-dimethylethyl)-) and alkaloid (4,8,12,16-Tetramethylheptadecan-4-olide) in leaf tissue. Microscopic analysis suggested that alkaloids accumulate in phloem cells of vascular tissue and phenol accumulate in mesophyll palisade cells of leaf tissue. Both metabolites start accumulation from its meristematic stage and ends after differentiation of cells into specialized cells.

Alkaloid and phenol content estimation suggested that both compounds accumulate exponentially with leaf growth and stabilizes at maturation. The bioactive compounds identified through GC-MS analysis belonged to secondary metabolites such as phytosterols, alkaloid, flavanoid, terpenoid, saponins, phenol and coumarin.

Key words : *Gymnosporia montana*, alkaloids, phenols, cell differentiation, accumulation, palisade cells, phloem cells.

INTRODUCTION

Plants produce wide varieties of chemical compounds during their growth and development. These compounds are used for growth, wound healing and for defense mechanism to survive against harsh conditions. These chemical compounds are of two types: 1) primary metabolites and 2) secondary metabolites. Primary metabolites include biomolecules such as amino acids, lipids, carbohydrates and nucleic acids. They play major role in regulation of cellular metabolism, photosynthesis, respiration and nutrients assimilation. These primary metabolites are used as food additives as well as raw material for synthesis of secondary metabolites (Balandrin *et al*, 1985). Secondary metabolites include alkaloids, phenols, anthocyanin, saponins, flavonoids, sterols, etc. They help plants in signalling and regulation of cellular metabolic pathways. They take part in giving specific odors, tastes and colors to plants (Bennett and Wallsgrove, 1994). They are unique sources for food additives, flavors and pharmaceuticals (Agrawal and Rawal, 2012). They are needed in plant defense against herbivores and pathogens (War *et al*, 2012). These pharmaceutical compounds include calcium,

abscisic acid (ABA), salicylic acid (SA), polyamines Jasmonates (JA) and nitric oxide which are involved in stress responses in plants. They are important for the plant to interact with its environment for adaptation and defense (Tuteja and Sopory, 2008). They are organic compounds which are important for the growth and development of plants. Secondary metabolism facilitates the primary metabolism in plants. This primary metabolism includes chemical reactions so that plant can live, stay healthy and its metabolic systems work appropriately. Also, it is used to fight off herbivores, pests and pathogens. Anti-feeding activity and toxicity which acts as precursors to physical defense systems also serve as attractants for pollinators and seed-dispersing animals that in turn help plants to function as agents for plant to plant competition and plant to microbe symbioses. They are very defensive compounds that increase the reproductive fitness of plants by warding off fungi, bacteria, and herbivores.

It is believed that the production and concentration of these compounds is strongly dependent on the physiological and developmental stage of the plants. These secondary metabolites are synthesized in different organs or tissues of plants at particular developmental stage. For eg. In cotton, the phytoalexin gossypol accumulates largely

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