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Short Communication

QUANTIFICATION OF LEAF AND ROOT PLUMBAGIN IN *PLUMBAGO ZEYLANICA* FOLLOWED BY A COMPARATIVE STUDY WITH CALLUS AND COMMERCIAL SOURCE

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ABSTRACT

Plumbago zeylanica shows the presence of many phytochemical constituents of which plumbagin, a type of naphthoquinone, is vital and has major biological effects. Plumbagin is majorly present in the root of the plants, with a minimal concentration in other parts of the plant. However, extracting plumbagin from the roots is destructive harvesting. Thus, micropropagation could be a viable alternative to reduce the collection of plant from wild. Study from micropropagated leaf calli was considered as a steady and sustainable source of phytochemical. *P. zeyalnica* callus was subcultured in an appropriate medium with plant growth regulators to initiate root cultures. A comparative study was performed to estimate the quantities of plumbagin obtain from the wild plant root part and root created by callus culture differentiation.

Keywords: Micropropagation, *Plumbago zeylanica*, Plumbagin, TLC.

1. INTRODUCTION

Metabolites are plant products which comprise of large as well as small molecules. Fundamentally metabolites are of two types: Primary metabolite and Secondary metabolite. Metabolites which are directly involved in normal growth, development, and reproduction are the primary ones. They usually perform a typical function in the organism and are produced by all species. Some metabolites are organic in nature and not directly involved in the normal growth, development, or reproduction of an organism, are termed as secondary. They are produced in a phase of subsequent growth and may have no function in the growth (although they may have survival function). Secondary metabolite can also be produced by certain limited taxonomic group of microorganisms. These types of secondary metabolites have unusual chemical structures and are often formed as mixtures of closely associated components of a chemical family. Secondary metabolites have various uses and applications, such as, they are used as fuel, in structure integrity, signalling, stimulatory and inhibitory effects on enzymes, catalytic activity of their own (usually as a cofactor to an enzyme), defence, and interactions with the other organisms [1].

Unlike primary metabolites, absence of secondary metabolites does not result in immediate death, but rather creates a long-term impairment during the organism's survivability, fecundity, or aesthetics or perhaps no significant change at all. These are often restricted to a narrow set of species within a phylogenetic group. And these also play an important role in plant defence against herbivory and other interspecies interaction. Humans have been using secondary metabolites as medicines, flavourings, and recreational drugs in the recent past. Kossel was the first to define these metabolites as opposed to primary ones. It has been clearly demonstrated that secondary products play a major role in the adaptation of plants to their environment. The compounds which have antibiotic, antifungal, and antiviral activities are prepared owing to the plant's defence mechanism against pathogens [1-3].

Plumbago zeylanica contains various phytochemicals like alkaloids, flavonoids, naphthaquinones, glycosides, steroids, saponins, triterpenoids, tannins, phenolic compounds and coumarins. The most well-known secondary metabolite from *Plumbago zeylanica* is Plumbagin (5-hydroxy-2-methyl-1, 4- naphthoquinone) which is largely present in the roots of *Plumbago* species.

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A comprehensive evaluation of pectinase, pectinmethylesterase and pectolyase activity

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ABSTRACT

Pectin polysaccharide has galacturonic acid with linear chains of α-(1–4)-linked D- galacturonic acid. Rhamnogalacturonan I pectins (RG-I) shows the existence of the repeating disaccharide 4-α-D-galacturonic acid-(1,2)-α-L- rhamnose, which acts as a backbone. Chiefly, D-galactose, L-arabinose, and D-xylose are the sugars types and their proportions of neutral sugars are varied according to the origin of pectin. Pectinase, pectinmethylesterase, and pectolyase enzymes have important applications in food, textile and agricultural industries. These enzymes play an important role in the breakdown of the central part of the plant cell wall. Pectin forms the center part of the plant cell wall. Pectins are termed as a structural polysaccharide that has integrity for the steadiness of the plant cell wall. Citrate buffer of molarity 0.1 utilized to verify optimal pH along with temperature, for standardising enzyme activity of pectinase, pectolyase, and pectinmethylesterase by the dinitrosalicylic acid reagent method. A confirmatory check of enzyme's activity was performed on plant leaves dried particles. The impact of catechin presence in enzyme reaction was too studied. Results delve into the degradation of the plant polysaccharide by applying these enzymes. An increase in the monosaccharide galacturonic acid quantity was also significant. The highest release of the polyphenols was found due to pectolyase followed by pectinmethylesterase and pectinase. Pectinmethylesterase effect showed the maximum release of the flavonoids followed by pectinase and pectolyase which was remarkable.

KEYWORDS: Plant Cell-wall, Pectin, Catechin, DNSA Method, Monosaccharides.

INTRODUCTION

Pectin, a biopolymer of D-galacturonic acid and primary structural heteropolysaccharide in plant cell wall. Pectins polysaccharide holds numerous galacturonic acids which are straight chains of α-(1–4)-linked D-galacturonic acid. Rhamnogalacturonan I pectins (RG-I) backbone is made of numerous repeating disaccharide 4-α-D-galacturonic acid-(1,2)-α-L- rhamnose. Rhamnogalacturonan I another structure have highly branched but a few numbers of complex polysaccharide of pectin is of rhamnogalacturonan II (RG-II). Its backbone is completely made of many D-galacturonic acid units (Caffall & Mohnen, 2009; Voragen *et al.*, 2009). Plant pectin differs in its structure, quantity, and chemical structure in each and every cell part. Studies have revealed that primary cellwall extension and plant development are greatly influenced by pectins. In middle lamellae, major components is constructed of pectin; as they facilitate cell binding together. Pectin is broken-down or degraded by the set of enzymes, throughout the progression of fruit ripening, in which the fruits turn out to be softer after the broken down of middle lamellae leading to the detachment of cells from each other. A similar progression of the cell separation is observed during the breakdown of the pectin, which appears in the abscission region of petioles of the deciduous plant at the time of leaf fall (Voragen *et al.*, 2009; Mollet *et al.*, 2013). Pectin forms the center of the plant cell wall. Hence, pectinase, pectinmethylesterase, and pectolyase enzymes have key applications in commercial and non- commercial food, textile and fabrics, and major in pre and post harvest agricultural products industries. Other molecules like cellulose are embedded in it. Plant cell wall stability is integral due to pectin structural polysaccharide. Pectinase, pectinmethylesterase, and pectolyase are a cluster of enzymes that break down vital central parts of the plant cell walls. Glycosidic bonds of the long carbon chains were broken-down by pectolyase. They proceed towards the substrate in a random way and also catalyze the substrate cleavage from non-reducing end. Cell-wall extension and softening of some plant tissues occur due to these enzymes, thus they are termed as prime importance for plants during maturation and storage. The random cleaving of pectin is chiefly seen near the high esterified areas of pectin which produces unsaturated