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REVIEW ARTICLE ON SECONDARY METABOLITES

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ABSTRACT

Plants are an important source for the discovery of new products of medicinal value for drug development and plants secondary metabolites are unique sources for pharmaceuticals food additives, flavours, and other industrial values. The trading importance of these secondary metabolites has resulted in a great interest in its production and in survey possibilities of enhancing its production using tissue culture technology in recent years. A good number of abstracts and research articles announced, so far, for estimating antioxidant, the anti-microbial and anti-diabetic activity of individual secondary metabolites which have been extracted from various plants. In this article, we evaluate bioactivity of flavonoids, alkaloids, and phytosterols of total 18specific plants. Out of which, total of 10 plants were found to show antioxidant possible, 9 plants were found to show anti-microbial possible, and 9 plants were found to show the anti-diabetic possible of secondary metabolites. Root, stem, leaves, fruits, and flowers of numerous plants were established to hold secondary metabolites to layout bioactivity. So, this article will be a total organized reference for those who are involved in antioxidant, anti-diabetic and antimicrobial of secondary metabolites.

KEYWORDS: Gossypol, Cyanogenic Glycoside, Phytoestrogens, Carotenoids, Atropine.

INTRODUCTION

Secondary metabolites are routinely produced at highest levels during a conversion from active growth to stationary phase. The producer organism can grow in the absence of their synthesis; intimate that secondary metabolism is not necessary, at least for short term durability. A second view suggests that the genes involved in secondary metabolism supply a "genetic playing field" that permits mutation and natural choice to fix new favourable traits via evolution. A third view specify secondary metabolism as an essential part of cellular metabolism and biology; it depend on primary metabolism to deliver the recommended enzymes, energy, substrates and cellular machinery and donate to the long-term duration of the producer (Roze et al, 2011). A number of traditional division techniques with different solvent systems and spray reagents, have been categorized as having the ability to divide and identify secondary Metabolites. Secondary metabolites are organic molecules that are not participating in the normal growth and improvement of an organism. While primary metabolites have a key role in live of the species, playing an energetic function in the photosynthesis and respiration, absence of secondary metabolites does not result in immediate death, but rather in long-term injury of the organism's sustainable, often sport a significant role in plant defence.

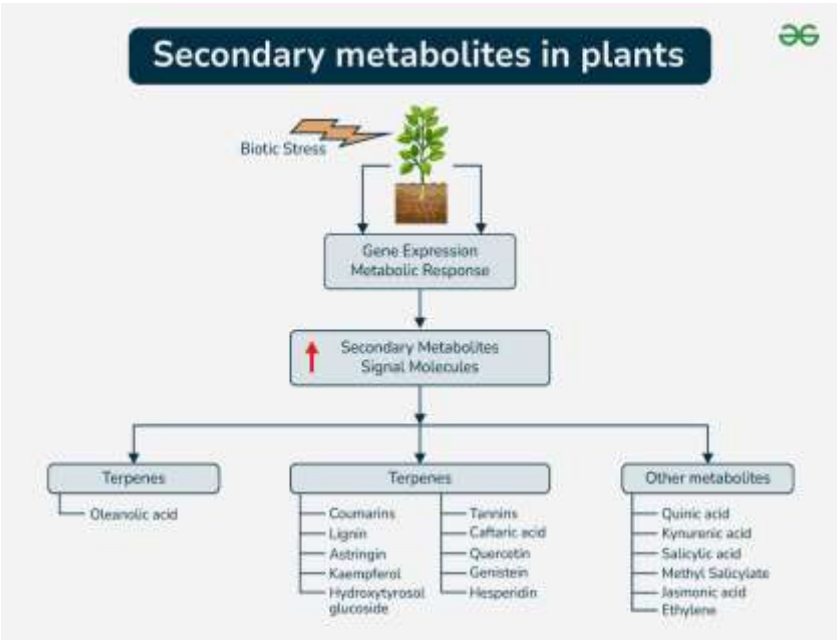

Fig. 01: Secondary metabolites in plants.

The seed of the plant are metabolized through germination to free nitrogen for seedling to grow. With this, it can be conclude that cyanogenic glycosides play different roles in plant metabolism. Though subject to change with following research, there is no validation showing that cyanogenic glycosides are accountable for infections in plants.

TYPES OF SECONDARY METABOLITES IN PLANTS

Atropine

Atropine is a type of secondary metabolite known as tropane alkaloid. Alkaloids carry nitrogen's, usually in a ring structure, and are obtain from amino acids. Tropane is an organic compound carry nitrogen and it is from tropane that atropine is derived. Atropine is integrated by a reaction between tropane and tropane, affected by atropines. Both of the support involved in this reaction is earn from amino acids, tropine from pyridine (through several steps) and tropane straight from phenylalanine. Within Atropa belladonna atropine synthesis has been found to appear primarily in the root of the plant. The absorption of synthetic sites within the plant is symptomatic of the nature of secondary metabolites. Primarily, secondary metabolites are not need for normal functioning of cells inside the organism meaning the synthetic sites are not need throughout the organism. As atropine is not a primary metabolite, it does not cooperate accurately with any part of the organism, approving it to travel throughout the plant.

Flavonoids

Flavonoids are one class of secondary plant metabolites that are also called as Vitamin P or citron. These metabolites are mainly used in plants to produce yellow and more pigments which play a big role in shade the plants. In addition, Flavonoids are gladly ingested by humans and they seem to exhibit influential anti-inflammatory, anti-allergic and anti-cancer activities. Flavonoids are also built to be powerful anti-oxidants and researchers are noticing into their capability to prevent cancer and cardiovascular diseases. Flavonoids help prevent cancer by prompt certain mechanisms that may help to kill cancer cells, and observer believe that when the body processes extra flavonoids compounds, it activate specific enzymes that fight carcinogens. Good dietary sources of Flavonoids are all citrus fruits, which carry the special flavonoidshesperidin's, quercitrin, and rutin, berries, tea, dark chocolate and red wine and many of the health advantages attributed to these foods come from the Flavonoids they carry. Flavonoids are integrated by the phenylpropanoid metabolic pathway where the amino acid phenylalanine is used to produce 4-coumaryol-CoA, and this is then merged with malonyl-CoA to produce chalcones which are pillars of Flavonoids Chalcones are aromatic ketones with two phenyl rings that are essential in many biological compounds. The stoppage of chalcones causes the formation of the flavonoid structure. Flavonoids are also closely connected to flavones which are literally a sub class of flavonoids, and are the yellow pigments in plants. In addition to flavones, 11 other subdivisions of Flavonoids along with, isoflavones, flavones, flavanones, flavanols, flavanonols, anthocyanidins, catechins (including proanthocyanidins), leucoanthocyanidins, dihydrochalcones, and aurones.

Cyanogenic Glycoside

Many plants have adapted to iodine-deficient temporally environment by removing iodine from their metabolism, in fact iodine is requirement only for animal cells. An essential antiphrastic action is induced by the block of the transport of iodide of animal cells restrict sodium-iodide symporter (NIS). Many plant pesticides are cyanogenic glycoside which releases cyanide, which, blocking cytochrome c oxidase and NIS, is poisonous only for a large part of parasites and herbivores and not for the plant cells in which it seems convenient in seed dormancy phase. To get a good understanding of how secondary metabolites play a big role in plant security mechanisms we can concentrate on the recognizable defence-related secondary metabolites, cyanogenic glycosides. Its structure allows the detach of cyanide, a poison produced by certain bacteria, fungi, and algae that is found in many plants. Animals and humans possess the capacity to detoxify cyanide from their systems biologically. Therefore, cyanogenic glycosides can be used for positive profits in animal systems always. For example, the larvae of the southern armyworm eat up plants that contain this certain metabolite and have shown a good growth rate with this metabolite in their meals, as against to other secondary metabolite-containing plants. Although this example display cyanogenic glycosides being favourable to the larvae many still debate that this metabolite can do spoil. To help in deciding whether cyanogenic glycosides are harmful or helpful observers look closer at its biosynthetic pathway.

Phytic acid

Phytic acid is the main method of phosphorus storage in plant seeds, but is not quickly absorbed by many animals (only absorbed by ruminant animals). Not only is phytic acid a phosphorus storage unit, but it also is a source of energy and cations, a simple antioxidant for plants, and can be an origin of myoinositol which is one of the preliminary slice for cell walls. Phytic acid is also known to bond with many distinctive minerals, and by doing so prohibit those minerals from being absorbed; creating Phytic acid an anti-nutrient. In arranging foods with high phytic acid concentrations, it is supported they be soaked in after being ground to expand the surface area. Soaking allows the seed to undergo germination which expand the availability of vitamins and nutrient, while decreasing Phytic acid and protease inhibitors, finally increasing the nutritional value. Cooking can also decrease the quantity of Phytic acid in food but soaking is much more effective. Phytic acid is an antioxidant establishes in plant cells that most likely serves the purpose of preservation. This preservation is separated when soaked, decreasing the Phytic acid and admitting the germination and growth of the seed. When added to foods it can help stop discoloration by inhibiting lipid peroxidation. There is also some faith that the chelating of phytic acid may have potential use in the therapy of cancer.

Gossypol

Gossypol is established in cotton plants. It occurs mostly in the root and/or seeds of dissimilar species of cotton plants. Gossypol can have numerous chemical structures. All of these forms have very parallel biological properties. Gossypol is a category of aldehyde; sense that it has a formyl category. The formation of gossypol takes place through an isoprenoid pathway. Isoprenoid pathways are routine among secondary metabolites. Gossypol's major function in the cotton plant is to move as an enzyme inhibitor. An example of gossypol's enzyme inhibition is its capacity to inhibit nicotinamide adenine dinucleotide-linked enzymes of Trypanosoma cruzi. Trypanosoma cruzi is a parasite which results in Chaga's disease. For some time; it was assumed that gossypol was merely a dust product produced during the processing of cottonseed products. Extensive studies have proven that gossypol has more functions. Many of the more popular studies on gossypol talk over how it can react as a male contraceptive. Gossypol has also been linked to producing hypocalcaemia paralysis. Hypokalaemia paralysis is diseases point out by muscle weakness or paralysis with measure up to decreases in potassium levels in the blood. Hypocalcaemia paralysis connected with gossypol in-take mostly occurs in March, when vegetables are in short deal, and in September, when people are secrete a lot. This side complication of gossypol in-take is very rare however. Gossypol influenced hypocalcaemia paralysis is freely treatable with potassium repletion.

Phytoestrogens

Plants synthesize definite compounds called secondary metabolites which are not biologically produced by humans but can play key role in protection or destruction of human strength. One such group of metabolites is phytoestrogens, establish in nuts, oilseeds, soy, and other foods. Phytoestrogens are chemicals which react like the hormone oestrogen. Oestrogen is important for women's bone and heart health, but high quantity of it has been joined to breast cancer. In the plant, the phytoestrogens are interested in the defence system against fungi.

Phytoestrogens can do two dissimilar things in a human body. At short doses it mimics oestrogen, but at long doses it literally blocks the body's natural oestrogen. The oestrogen receptors in the body which are stimulated by oestrogen will admit the phytoestrogens, thus the body may decreases its own production of the hormone. This has a negative result, because there are different abilities of the phytoestrogen which oestrogen does not do. Its effects the conversation pathways between cells and has effects on other parts of the body where oestrogen usually does not play a role.

Carotenoids

Carotenoids are natural pigments establish in the chloroplasts and chromoplasts of plants. They are also establishing in some organisms like algae, fungi, some bacteria, and certain species of aphids. There are over 600 familiar carotenoids. They are dividing into two classes, xanthophylls and carotenes. Carotenoids have two significant functions in plants. First, they can put up to photosynthesis. They do this by transmitting some of the light energy they absorb to chlorophylls, which then applies this energy for photosynthesis. Second, they can preserve plants which are over-exposed to sunlight. They do this by powerlessly dissipating excess light energy which they occupy as heat. In the absence of carotenoids, this extra light energy could demolish proteins, membranes, and other molecules. Some plant physiologists accept that carotenoids may have an accessory function as regulators of certain developmental reaction in plants. [Citation needed] Tetraterpenes are integrated from DOXP precursors in plants and some bacteria. Carotenoids immersed in photosynthesis are formed in chloroplasts; others are formed in plastids. Carotenoids found in fungi are apparently formed from melonic acid precursors. Carotenoids are formed by a head-to-head condensation of geranylgeranyl pyrophosphate or diphosphate (GGPP) and there is no NADPH condition.

IMPORTANCE OF SECONDARY METABOLITES

Secondary metabolites (PSMs) are important for plants because they help plants survive and protect themselves from a variety of threats:

- **Defence:** PSMs protect plants from pathogens and herbivores, including viruses, bacteria, fungi, arthropods, and vertebrates.
- **Attraction:** PSMs attract pollinators and animals that disperse seeds.
- **Environmental stress**: PSMs help plants respond to environmental stresses.

- **Growth and development**: PSMs play a role in plant growth and developmental processes.

CONCLUSION

Secondary metabolites are molecules that are not requirement for the growth and life of an organism, but the play a crucial role in the organism's connecting with its environment. Major part of these compounds our awareness about the details of their biosynthesis and donation to plant immunity scarce.

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