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Study of Chemotaxonomy: Meaning, Stages and Significance

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Introduction : The occurrence and distribution of the various types of chemical substances present in plants prove to be of taxonomic significance. However, it should be noted that, all kinds of chemical substances present in plants do not reveal information useful to the taxonomist. Phytochemical characters of taxonomic significance have been classified into three types.

Key Words : Chemotaxonomy , taxonomic, nitrogen

a. Primary constituents:

These include the macromolecular compounds directly taking part in metabolism and include proteins, nucleic acids, chlorophyll and polysaccharides. All chemical materials synthesized by an organism reflect the information in DNA, RNA and proteins. These latter molecules have been termed as semantides. Semantides, thus contain useful information of taxonomy and phylogeny.

b. Secondary constituents :

They include compounds lacking nitrogen and not involved directly in plant metabolism i.e., simple phenolic compounds like caffeic, benzoic and nicotinic acids and polyphenolic compounds like flavonoids, terpenes, coumarines, alkaloids and pigments of which flavonoids are most widely ***studied with respect to plant systematics.***

c. Miscellaneous substances:

However, no suitable classification of the chemical characters and their use in taxonomy is developed so far. On the basis of their molecular weight, Jones and Luchsinger (1987) has divided the natural chemical plant products useful in taxonomy, into two major groups.

d. Micro-molecules :

They are low molecular weight compounds with a molecular weight of 1000 or less, e.g. amino acids, alkaloids, fatty acids, terpenoids, flavonoids, etc.

e. Macromolecules :

They include the high molecular weight compounds with a molecular weight of over 1,000, e.g. proteins, DNA, RNA, complex polysaccharides, etc.

Comparison of the protein banding patterns :

In recent times protein banding patterns obtained by gel electrophoresis, have been focused on the problem of identification of critical taxa, their relationship and taxonomic status. Taxonomic interpretations should be based on comparison of proteins from homologous organs of the same age in order to avoid any confusion due to variability of proteins.

Considerable variation in protein complements has been recorded at the level of species and genus, and even between the same plants in different populations. These form evidence upon which taxonomic systems may be founded, tested or demolished.

Electrophoresis is one of the most extensively used techniques in protein investigations. Because of the presence of ionizable molecules on the surface of proteins, they will migrate when subjected to an electrical field in a solution of suitable pH. Soluble proteins thus migrate within an electric gradient at a rate that depends on their net electric charge and on their molecular size and shape.

The rate of migration of each protein is constant under identical conditions and hence can be used as a reliable character for the detection of homologous proteins. Separation of proteins can be done either on paper (paper-electrophoresis) or on a gel medium (gel-electrophoresis).

The commonly employed gel media include starch, polyacrylamide and cellulose acetate. It has been possible to obtain useful systematic information from electrophoretic analysis of crude biological protein samples.

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