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"CHEMOTAXONOMICAL STUDIES ON FAMILY LEGUMINOSEAE IN PUNE UNIVERSITY CAMPUS GANESHKHIND PUNE."

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Chemotaxonomic

ABSTRACT:

"Na kinchit vidyate jagatyena vanaushedam"

No any one plant on the earth without any medicinal value/s. The universal role of plants in the treatment of disease is shown by the example of their employment in all the systems of medicine irrespective of the underlying philosophical premise. The plants are indispensable to man for his life. In the past, almost all the medicines were used from the plants. Today, a vast store of knowledge concerning therapeutic properties of different plants has accumulated. All phyla of plants contain species that yield official and unofficial products of medicinal importance. The history of herbal medicines is as old as human civilization. A popular ancient herbal medicine system was the Unani medicine discussed in Kitabi-Al-Shifa, the Magnum Opus of Avicenna, 980-1037 A.D. (Islamic) (C.F. Trease & Evans, 2002) and Ayurvedic medicine (Ayurveda 2500-600 BC (Hindu) systems centred in Western Asia and the Indian subcontinent and those of the orient (China, Japan, Tibet, etc.).

KEYWORDS

Chemotaxonomical Studies , Family Leguminoseae , human civilization.

INTRODUCTION:-

Chemotaxonomy is attempt to classify and identify plants, according to demonstrable and similarities in their biochemical compositions. Plant Chemotaxonomy is one of the rapidly expanding areas of Plant taxonomy. Chemical data on a plant has provided much information on the status of the taxon. Large number of studies on the biosynthesis and adaptative values of secondary metabolites have been done, which proved to be useful in the study of chemotaxonomy. These chemicals have been further used by plants to combact with the herbivores, microbes and the nearby plants, which give an account of the evolution of chemical characters and leads to the usage of chemical as a character in plant taxonomy. The chief chemical constituents are present in plants, Plants having medicinal value due to presence of such chemical constituents. These therapeutic agents or active principles in the drugs are mainly different types of secondary metabolites. Namely; Starch, Protein, Saponin, Alkaloids, Flavonoids, Glycosides and Tannins. They are structurally and chemically different in different plants. They are found in specific orders, families, genera it can be used as taxonomical characters for classification of plants. Their nomenclature is given according to that plant, mostly Alkaloids eg. Abrin is active principle in Abrus precatorius, Melanin in Dalbergia melanoxylon etc. Chemotaxonomy establishes a relationship between position of the plant and attempts to utilise chemical facts for more exact understanding of the biological evolution and relationships. The knowledge of chemotaxonomy used for the classification of crude drugs on the basis of presented chemical constituent. (Kokate, C.K., Purohit A.P. and S.B.Gokhale 2007)

The Fabaceae (Leguminosae or bean and pea family) is the second largest family of angiosperms and contains 600 genera and about 16,000 species in nearly all of the world's habitats. This is a dominant family for medicinal use. It includes more important drugs than any other family. (Trease and Evans, 1972). For the identification of that property chemotaxonomical study needed which include chemical analysis of that plant. Medicinal plants obviously are not to be found growing at any one place or in particular season, hence, it is decided to carry out the detailed work on, "Chemotaxonomical studies on some plant genera of family Leguminosae." Chemotaxonomic relevance of seed polysaccharides and flavonoids in this family. (Hegnauer and R.J. Grayer 1993). Which helpful for the taxonomical arrangement of plants. Taxonomically, Fabaceae has been traditionally divided into three subfamilies, the Caesalpinioideae, Mimosoideae, and Papilionoideae (although sometimes these have been ranked as separate families, as in Caesalpiniaceae, Mimosaceae, and Papilionaceae). (Wojciechowski M. F.) The study of family Leguminosae with respect to above aspect from Pune University campus is scanty. Therefore, present investigation will help in documentation and addition of new scientific information regarding chemotaxonomical study of selected area. Efforts were made to collect the plants from different locations of Pune University campus. The plants which have been selected for study of chemotaxonomic tests reported in the present project work. The review of literature is revealed second chapter and it follows material and methods in third chapter for obtaining the results of present investigation.

MATERIAL AND METHODS

A detailed survey through inventorying of plants in Pune University campus was under taken. The secondary information on existence of plants was gathered with the help of The Flora of Presidency of Bombay (Cooke, 1958) as well as personal visits in the botanical garden of the department of Botany and whole area of Pune University campus. The primary information about existence of family plant

members was recorded by personal visits, with the help of The Flora of Presidency of Bombay (Cooke, 1958). The present research involves the study of geographic distribution, habit, macroscopic (organoleptic) characters, their medicinal uses and chemotaxonomy of that plants following the standard methods used by many pharmacopoeia especially, Indian pharmacopoeia (Anonymous, 1955). Season wise available plant part was collected in flowering and fruiting conditions personally. Collected medicinal plants species were identified referring to The Flora of Presidency of Bombay (Cooke, 1958), Flora of Kolhapur District (Yadav and Sardesai, 2002), The Flora of Ganeshkhind, Poona (Varadpande, 1972) and from Botanical Survey of India (BSI), Western Circle, Pune. Phototgraphs of plants on field and their most medicinally important parts as well as evidences of various chemotaxonomic tests were collected during the course of work. List of medicinal plant along with therapeutic uses and their local names were recorded.

RESULTS AND DISCUSSION

The present investigation is pertaining to the results of Chemotaxonomical studies on selected thirty generas of Family Leguminosae Pune university campus In chemotaxonomical tests, plants were analysed by qualitative tests for the presence of various chemical constituents, such as starch, protein, saponin, alkaloids, flavonoids, glycosides and tannin. These are the following chemotaxonomical test on plants from family Leguminosae : -

PAPILIONACEAE

1) Abrus precatorius Linn.: Showing the +ve test for starch, protein, saponin, alkaloids, glycosides and –ve test for flavonoid.
2) Clitoria ternatea Linn. Showing the +ve test for starch, protein, saponin, alkaloids, glycosides and –ve test for flavonoid.
3) Dalbergia lanceolaria Linn. Showing the +ve test for all starch, protein, saponin, alkaloids, flavonoid, glycosides.
4) Dalbergia melanoxylon Guill. Showing the +ve test for starch, protein, saponin, alkaloids (in Mayer's, Wagner's, Dragendorff's test), glycosides and –ve test for alkaloid (in Hager's tesst) and flavonoid.
5) Erythrina variegata Merr. Showing the +ve test for starch, protein, saponin, alkaloids, glycosides and –ve test for flavonoid.
6) Gliricidia sepium Steud.Showing the +ve test for all tests starch, protein, saponin, alkaloids, flavonoid,glycosides.
7) Milletia ovalifolia Kurz.Showing the +ve test for all tests starch, protein, saponin, alkaloids, flavonoid, glycosides.
8) Mucuna monosperma Linn. Showing the +ve test for starch, protein, saponin, alkaloids, glycosides and –ve test for flavonoid.
9) Pongamia pinnata Pierre.Showing the +ve test for starch, protein, saponin, alkaloids, glycosides and –ve test for flavonoid.
10) Pterocarpus marsupium Roxb. Showing the +ve test for all tests starch, protein, saponin, alkaloids, flavonoid and glycosides.

CAESALPINIACEAE:

11) Acrocarpus fraxinifolius Linn. Showing the +ve test for starch, protein, saponin, alkaloids, glycosides

and –ve test for flavonoid.

12) Bauhinia purpurea Linn. Showing the +ve test for starch, protein, saponin, alkaloids (in Wagner's, Dragendorff's and Hager's test), glycosides and –ve test for Alkaloid (in Mayer's test), and flavonoid.

13) Bauhinia racemosa Lumk. Showing the +ve test for starch, protein, saponin, alkaloids, glycosides, and –ve test for flavonoid.

14) Bauhinia variegata Linn. Showing the +ve test for all tests starch, protein, saponin, alkaloids, flavonoid and glycosides.

15) Caesalpinia coriaria Willd. Showing the +ve test for all tests starch, protein, saponin, alkaloids, flavonoid, and glycosides.

16) Caesalpinia pulcherrima SW. Showing the +ve test for starch, protein, saponin, alkaloids, glycosides. and –ve test for flavonoid.

17) Cassia fistula Linn. Showing the +ve test for all tests starch, protein, saponin, alkaloids, flavonoid and glycosides.

18) Cassia grandis Linn. Showing the +ve test for starch, protein, saponin, alkaloids, glycosides and –ve test for flavonoid.

19) Cassia mimosoides Linn.Showing the +ve test for starch, protein, saponin, alkaloids (in Wagner's, Dragendorff's, Hager's test) and glycosides and –ve test for alkaloid (in Mayer's test) and flavonoid.

20) Cassia roxburghii DC. Showing the +ve test for starch, protein, saponin, alkaloids (Wagner's, Dragendorff's, Hager's test) and glycosides and –ve test for alkaloid (in Mayer's test) flavonoid.

21) Colvillea racemosa Boj. Showing the +ve test for starch, protein, saponin, alkaloids, glycosides and –ve test for flavonoid.

22) Delonix regia Raf. Showing the +ve test for starch, protein, saponin, alkaloids (in Wagner's, Dragendorff's, Hager's test) and glycosides and –ve test for alkaloid (in Mayer's test) and flavonoid.

23) Peltophorum pterocarpum Linn.Showing the +ve test for protein, saponin, alkaloids, flavomoid, glycosides and –ve test for starch.

24) Saraca asoca Linn. Showing the +ve test for starch, saponin, alkaloids (in Wagner's, Dragendorff's, Hager's test) and glycosides and –ve test for protein, alkaloid (in Mayer's test) and flavonoid.

25) Tamarindus indica Linn.Showing the +ve test for starch, protein, saponin, alkaloids (in Wagner's, Dragendorff's, Hager's test) and glycosides and –ve test for alkaloid (in Mayer's test) and flavonoid.

MIMOSACEAE:

26) Acacia chundra Willd.Showing the +ve test for starch, protein, saponin, alkaloids (in Wagner's, Dragendorff's, Hager's test) glycosides and tannin and –ve test for alkaloid (in Mayer's test) and flavonoid.

27) Acacia feruligina Arn.Showing the +ve test for starch, protein, saponin, alkaloids, glycosides, tannin and –ve test for flavonoid.

28) Albizzia lebbeck Benth.Showing the +ve test for all tests starch, protein, saponin, alkaloids, flavonoid, glycosides, tannin.

29) Mimosa pudica Linn. Showing the +ve test for all tests starch, protein, saponin, alkaloids, flavonoid, glycosides, tannin.

30) Parkia biglandulosa Wt. & Arn.Showing the +ve test for starch, protein, saponin, alkaloids, glycosides and –ve test for flavonoid.

SUMMARY AND CONCLUSIONS

The whole dissertation gives the detailed account of the chemotaxonomical studies of thirty genera of the family Leguminosae having importance in the indigenous systems of medicine. It is observed that, this area is very rich with biodiversity.

The dissertation is incorporated in seven parts i.e. introduction, review of literature, material and methods, descriptive, results and discussion, summary and conclusions and ended with references. This chapter presents the summary and conclusions of the present investigation.

Chapter- I give an introduction of the study. It gives an outline of the history and the basic principles of indigenous system of medicine such as Ayurveda, Unani, Siddha and Chinease systems. It also deals with the study of Pharmacognosy definition, history, scope of Pharmacognosy, about family and their classification, chemotaxonomical evaluation and the study of different chemical constituents.

Chapter-II deals with the previous literature on the plants from family leguminosae. Since the important properties of a medicinal plant is due to the secondary metabolites present in it, the properties and the relationship of secondary metabolites such as alkaloids, saponins, and tannins to various diseases have been discussed in the review of literature. The aspects like classification of medicinal plants, their medical uses and reports on phytochemical of the plants of study are also given in this section.

Chapter-III includes a detailed account of the material and methods used in the research for macroscopic evaluation and chemotaxonomical studies.

Chapter-IV gave an account of the descriptive. Illustration on macroscopically i.e on organoleptic evaluation of different drug parts of the Leguminous plants, and gives the identification of different chemical constituents

Chapter-V gave the results and discussions of the study on chemotaxonomical studies of the selected plants of study.

Chapter- VI which is present chapter gives the summary and conclusion of the present investigation.

Chapter- VIII incorporates the reference used for carrying out the study.

Pharmacognosy forms the backbone of indigenous systems of medicines and pharmaceuticals. It deals mainly with naturally occurring phytochemical having medicinal activities. Pharmacognostic investigations help in correct botanical identification, detection of adulteration, identification and quantitative analysis of the active phytochemical of drugs thereby, increasing the efficacy of the drugs in indigenous medical systems and the pharmaceuticals. Present study includes the chemotaxonomical evaluation which is basically used for identification of chemical constituents. After the identification of secondary metabolite only we can further do the quantitative studies for knowing exact amount of active principle present. Due to lack of time we only did the identification of different secondary metabolite which is either present or absent. Moreover combination of Pharmacognosy techniques in the study of medicinal plants has many benefits.

Ayurveda, the Science of Life is the oldest, ancient and yet very systematic and very scientific system of medicine for humans but also for animals and plants. There is the globalization of Ayurveda and the world scenario is changing very fast in using the traditional systems of medicine in health care which are all plant based. Pharmacognosy is concerned mainly with naturally occurring substances in plants having a medicinal action. The medicinal value of drug plants is due to the presence some chemical substances in the plant tissues which produce a definite physiological action on the human body.

Traditional system of medicine derives more than 85% of the drugs from plant source. The utility of the drugs to overcome body disorders has given them an important role to play in traditional system of medicine. The identification of drugs is of paramount importance for survival of these systems of medicine. Due to lack of scientific names in the original texts different plants are known in the different parts of the world with the same names. The correct identity of a drug is done based on macroscopic and microscopic characteristics, where it is not common to all the plant drugs to be taxonomically related, possessing very different therapeutic characteristics may share the same name.

I)Morphological studies (Macroscopic evaluation)

Macroscopic studies of the habit, leaves, roots, stems, flowers and fruits of the plants of study showed their characteristics to be similar to earlier descriptions given in the literature.

Colvillea racemosa plant shows characteristic feature of stem its shows bristles like outgrowth on smooth and shiny stem.

Abrus precatorius shows distinctive seeds (5-7 mm long and 4-5 mm wide) are bright scarlet-red in colour with a large black spot. They are smooth in texture; generally remain on the plant for some time (i.e. several months).

Dalbergia melanoxylon plant show melanin; due to melanin whole heartwood is black in colour.

Mucuna monosperma plant is used in crime as a irritons. Plant to be taken as indicator of time and corroborative evidence in solving a problem of crime and accident. Trichomes of Mucuna pods are injectant allergents due to presence of chemical constituents.

Pterocarpus marsupium Pods nearly circular wing veined.

Papilionaceae subfamily characterized by 3 upper petals and 2 lower fused petals, and 9 of the 10 filaments are fused with the 10th being separate. It includes many herbaceous as well as woody species. The Caesalpiniaceae subfamily members are probably showing the basic pattern from which the other 2 subfamilies evolved. The flowers have 5 separate, conspicuous petals, 1 of which (the banner) is always a different size, shape, or color from the other 4. There are 10 stamens. All the members show the woody species. Mimosaceae subfamily shows the main characteristic feature i.e. the powder puff of stamens. The petals are fused in this group, but they're so tiny that they are not noticeable.

Chemotaxonomy involved identification of chemical constituents present in different leguminous plants.

II)CHEMOTAXONOMICAL STUDIES:

Qualitative Analysis by chemotaxonomy:

Qualitative analysis of the leguminous plants gave positive results for starch, tannin, proteins, saponin, alkaloids, flavonoid, and glycosides.

•In almost all the studied leguminous plants we can determine the chemical constituents like starch, proteins, alkaloids, glycosides and flavonoid. Further from the literature we concluded the different active principles present in the studied plants such as Abrus precatorius seeds from subfamily Papilionaceae contains abrin; Saraca ashoka bark from subfamily caesalpinnaceae contain condensed tannin; Mimosa pudica from subfamily mimosaceae contain mimosine but due to lack of time we only did the identification of different secondary metabolite.

- In almost all the Mimosaceae members are rich in tannin.

The present investigation will be helpful to government bodies proper conservation of plant diversity present in the Pune University campus, Pune. This data is also helpful for Pharmaceutical industries, Bush Doctors and Researchers.

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