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The Analytic Aspect of Phyto-Chemicals of *Butea monosperma* Medicinal Plant of Khetri Region, Rajasthan

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Abstract: ***The area under study i.e. Khetri Region is located in South-eastern part of Jhunjhunu district, Rajasthan state with it's geographical extension in between 27º 40' 24" to 28º 17' 12" N latitude and 75º 39' 59" to 76º 12' 59" E longitude.The district consists of three rivers which are seasonal by their nature of water stream flow point of view viz; Basai river, Kantli river, and Chandravati river.***

RESEARCH AREA

All these rivers fall under the pattern of the total area under internal drainage system of the district. The area under study is facing the problem of excess of fluoride contents in the water which has average value of 7.5 ppm and suffering from the disease of Fluorosis at many places which are scattered throughout the area under study.

REVIEW OF LITERATURE

Being an applied researcher I feel my prime most duty to present here the specific interpretation of the studies who have carried out the research work of the analytic aspect of the nature, contents and details of available phyto-chemicals which are investigated or traced out within the applied parts and portion of medicinal plant species, with specific reference to my study area i.e. Khetri region of Rajasthan.

With the end of third decade of 20th century, the study on analytic aspect of phyto-chemicals of medicinal plants had already been started, during that period in 1929-30 Chopra, R.N. and Chosh, S. studied on "Medicinal Plants Used in Indigenous Medicine", Further in this context in 1984 studied in 1956-58 Chopra,R.N. on "Medicinal Plants" whereas in 1984 Basu, B.D. and Kirtikar, K.R.studied on "Indian medicinal plants", respectively.

It will be very interesting to mention here a descriptive account of certain medicinal plant species analytic aspect of available phyto-chemicals by some researchers, are being illustrated here in the following paragraph which alphabetically covers the medicinal plant.

Phytochemicals of applied parts and portion of medicinal plant - *Albizia lebbeek* (A tree species) was studied by Tripathi, S.N. et al. in 1978, Tripathi, R.M. et al. in 1979, and Das, P.K. et al. in 1983. Another medicinal shrub/ tree species i.e. *Adhatoda vasica* was studied in 1983 by Kanwal, P. et al. *Asparagus species* (Herb species was studied by Inamdar, A.C. and Mahabale, T.S. in 1980. *Azadirachta indica* (Neem tree) a multipurpose medicinal plant species was studied by several researchers but the phyto-chemicals analytic aspect studied by K.C. Sinha et al. in 1984 with specific reference to Neem Oil is worthwhile to mention here.

Boerhavia diffusa (herb species) was studied by Srivastava, K. et al. in 1980 for it's phyto-chemicals contents. In 1980 Dennis, T.J. et al. and in 1984 Pachnanda, V.K. et al. studied the phyto-chemicals of *Boswellia serrata* (Medicinal tree species). In 1981, the phyto-chemicals of *Corchorus depressus* (Medicinal herb species) was studied by Vohara, S.B., et al. in 1981. A very important multipurpose medicinal shrub species - *Commiphora mukul* was studied by some researchers from phyto-chemicals analytic aspect point of view which are as - Baldwa, V.S. et al. in 1978, Mester L. in 1978, Bordia, A. and Chuttani, S.K. in 1979 and Kotiyal J.P. in 1979. Sharma, H.K. et al. studied the phyto-chemical of *Cassia species* in 1982.

Occimum sanctum - a under shrub medicinal plant species phyto-chemically was studied by Bhargava, K.P. and Singh, N.

in 1981. Phyto-chemicals of *Solanum nigrum* in 1982 was studied by Brindha, P. et al. In very early during 1932-33 Pandse, G.P. and Dutt. S. worked out the phyto-chemicals of an important medicinal climber species - *Tinospora cordifolia*.

In earlier studies, Venkataraghavan S. et al. in 1980 traced out the phyto-chemicals which are found in applied parts and portion of two plant species namely - *Boerhavia diffusa* and *Withania somnifera* - a multi-purpose medicinal shrub species was phyto-chemically studied by some researchers which are as - Kuppurajan, S. et al. in 1980, Singh, N. et al. in 1982, Verma, V. in 1983 and Sharma, M. K. in 2007.

Although all of them as above mentioned researchers, botanists and authors contributed their valuable work from time to time but none of them upto now presented their work on exact lines of the analytic aspect of phyto-chemicals of Aloe vera medicinal plant of Khetri Region, Rajasthan.

OBJECTIVES

Being a field of applied phyto-researcher with specific reference to the study of medicinal plants, naturally it become a significant aim to illustrate the applied parts and portion of medicinal plants which are being used to cure certain disease. Further in this context, the research study objective also covers the illustration of analytic aspect of phyto-chemicals of the applied parts and portion of medicinal plants i.e. in other words to say phyto-chemistry descriptive interpretation due to which the particular medicinal plant has applied values as drug to cure certain kind of diseases for the welfare of healthy environment of human beings.

HYPOTHESIS

1. I also hope that there may be a marked variation in the percentage of vegetational group of medicinal plants and their families. Naturally, the author presume that all parts of every medicinal plant should not be useful as drug but some specific parts and portion should be useful, it may be traced out during the course of study of research work details of analytic aspect of phyto-chemicals in this concerned.

2. The author may find or trace out that the region may include many medicinal plant species which may be useful according available phyto-chemicals one side for the cure of one disease particular, and another side many single medicinal plant species which may be useful as drug in the cure of many different kind of diseases.

METHODOLOGY

Phytochemical study of the crude medicinal plant parts, several of these medicinal herbs will be chemically analysed and their biologically active chemical compounds recorded Literatures will be searched to know those chemicals which give them their medicinal properties.The chemicals searched for would mainly their Alkaloid, Steroid, Glycoside, Saponin, and Tannin contents for the area under investigation i.e. the Khetri region of Rajasthan.

INTRODUCTION AND MORPHOLOGY

It the world of forest, it is popular by name ‘flame of the forest’. The plant belongs to the family - Leguminosae. Mostly, it is observed as suitable ecoclimatic conditions and nature of habit, it may be observed as a tall as well as large tree. From life - forms classification point of view, it belongs, to the ‘micro-phanerophyte’ group i.e. under the group of ‘trees’ from vegetational group point of view. It is deciduous by nature, untidy in growth and ragged in shape, with twisted trunk. Leaves are rough in texture and 10 to 15 cm. long and broad, by thus, from leaf - class classification point of view, the tree falls in the class of ‘macrophylls’. In February - May the tree becomes leafless and in blooming stage, flowers are bright flaming scarlet orange with black calyces. It’s fruit’s are in the form of pods, ripe pods are light and found scattered far and wide by hot winds in the month of June. It’s pods have deep red, thin button shaped seeds, generally of the size 2 cm. in diameter (Plate).

Plate : Butea monosperma Tree

Although the tree can be grown in types of soil and also in low rainfall area, it's plants and hardy and frost resistant but in nature for the area under study, the trees are generally observed in stony and rocky areas i.e. hilly Habitat, respectively. The tree is reported with stands in frost and drought very well and also does well in saline soils (Sharma, 2007) but neither I have observed any tree of Butea monosperma in saline soil areas of Khetri Region nor in any other Habitat except stony and rocky, respectively. It is also not observed in the drought prone areas of arid climate of Khetri Region. It requires good rainfall conditions i.e. atleast more than 40 cm. annual average to 150 cm., respectively. The plants propagated by seeds and also by roof suckers. Viability of the seed is poor. The trees are observed in aquatic and riverine areas such places are located within stony and rocky Habitat e.g. Ajit Sagar Dam locality in Khetri Region. The association of Butea spp. requires at least 30 percent relative humidity in the atmosphere.

The tree community has no occurrence at two Habitats i.e. sand dunes and sandy plains, respectively. The tree community shows specific pattern of phytogeographic distribution at two Habitats, specially stony and rocky Habitat, it has frequent at Mansamata locality and also frequent at Ajit Sagar Dam locality (riverine and aquatic Habitat). At Dadafatehpura locality it shows rare distribution whereas it shows no occurrence at the locality of Basai river of distribution specially on the slopes of hilly areas of Khetri Region.

PHYTO-CHEMICAL (MEDICINAL) USES

The tree has good Phyto-chemical uses for the cure of some diseases. This is another herbal drug of choice for them for the eradication of intestinal worms and which also improve the function of stomach and intestine. They also use it in other combination to treat sexual impotency. Some of them indicated that it can restore the proper menstrual cycle in women and also prevent pregnancy if taken regularly.

The flowers (popularly called as 'kesula') and leaves this tree species are used against boils and pimples, and are also prescribed to take internally in flatulent colic, worms and piles. Red coloured gum, root, bark and seeds of the tree also possess Phyto-chemical properties. Gum is contains tannins. The flowers and seeds are mixed in a diarrhoea and used as wormicide against tapeworms and ring worms. When several leaves are stiched together, it sorves as dinning plates and the leaves are also used in beedi factories. Lack- insects can be reared on the twings. Bark flowers yield a yellow die and are used in textiles. Bark is used for tanning.

PHYTO-CHEMICAL ANALYSIS OF APPLIED PARTS AND PORTION

The tree has it's seeds and secretion products at the name of applied parts and portion. The biologically active chemicals reported, they are - Glycosides, Butrin, Isobutrin, Coreoposin, Isocoreoposin, Sulphurein; besides this all, the tree has property of contents of monospermoside and Isomonospermoside. The flowers and leaves of *Butea monosperma* have characteristic values due to it's nature of phyto-chemicals which are astringent.

Flower - Triterpene, several flavonoids butein, glucose, fructose, histidine, aspartic acid, alanine and phenylalanine, Gum -Tannins, mucilaginous material, pyrocatechin.

Plate : Butea monosperma Flower

Seed - Oil (yellow, tasteless), proteolytic and lypolytic enzymes, plant proteinase and polypeptidase. (Similar to yeast tripsin). A nitrogenous acidic compound, along with palasonin is present in seeds . It also contains monospermoside (butein3-e-D-glucoside) and somonospermoside. Allophanic acid, several flavonoids (5, 6, 7, 4'-tetrahydroxy-8-methoxyisoflavone 6-O-rhamnopyranoside. Butin a-Amyrin, (3-sitosterol, (3-sitosterol-p-D-glucoside, sucrose, Fatty acids such as myristic, palmitic, stearic, arachidic, behenic, lignoceric, oleic, linoleic and linolenic, Monospermin. And an acid imide. 15-Hydroxypentacosanoic acid nheneicosanoic acid **5**-lactone. 16-dihydroxyhexadecanoic acid Phosphatidylcholine, phosphatidylethanolamine and phosphatidylinositol.

Plate : Butea monosperma Seeds

Root- The root of *Butea monosperma* contains glucose, glycine, a glycoside and an aromatic hydroxy compound. Stem- 3-Z-hydroxyeuph-25-ene and 2,14-dihydroxy-1 1,12-dimethyl-8-oxo-octadec-11-enylcyclohexane Stigmasterol-e-D-glucopyranoside and nonacosanoic acid Flavonoid 8-C-prenylquercetin 7,4'-di- O- methyl-3-O-a-L-rhamnopyranosyl(1-4)-a-L- rhamnopyranoside. 3-hydroxy-9 methoxypterocarpan(-)-medicarpin. Lupenone, lupeol and sitosterol. Two iso-flavones 5-methoxygenistein and prunetin. In addition to stigmasterol-3-a-L- arabinopyranoside, four compounds isolated from the stem of Butea monosperma have been characterized as 3-methoxy-8,9-methylenedioxypterocarp-6-ene, 21-methylene-22-hydroxy-24-oxooctacosanoic acid Me ester, 4-pentacosanylphenol and pentacosanyl-(3-D-glucopyranoside.

Bark - Kino-tannic acid, Gallic acid, pyrocatechin. Also contains palasitrin, and major glycosides as butrin, alanind, allophanic acid, butolic acid, cyanidin, histidine, lupenone, lupeol, (-)-medicarpin, miroestrol, palasimide and shellolic acid. Two compounds, 3, 9-dimethoxypterocarpan, and triterpenoid ester, 3a- hydroxyeuph-25-enyl heptacosanoate.

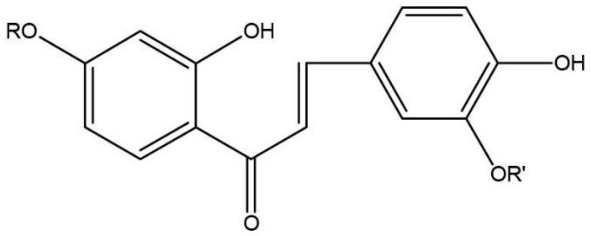
Leaves - Glucoside, Kino-oil containing oleic and linoleic acid, palmitic and lignoceric acid.

Resin - Jalaric esters I, II and laccijalaric esters III, IV.; Z-amyrin, e-sitosterone and its glucoside, sucrose, lactone-nheneicosanoic acid-lactone Sap - Chalcones, butein , butin, colourless isomeric flavanone and its glucosides, butrin.

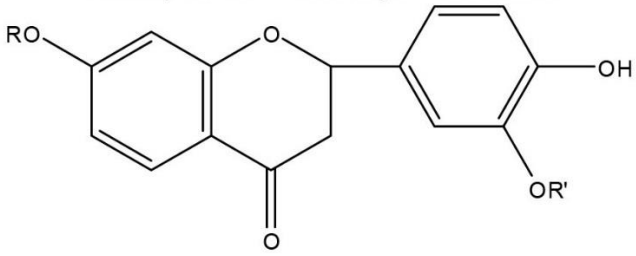
Plate : Butea monosperma Resin

The anti-inflammatory activity of methanolic extract of *Butea monosperma* evaluated by carrageenin induced paw edema and cotten pellet granuloma. In carrageenin induced paw edema at 600 and 800 mg/kg inhibition of paw edema.

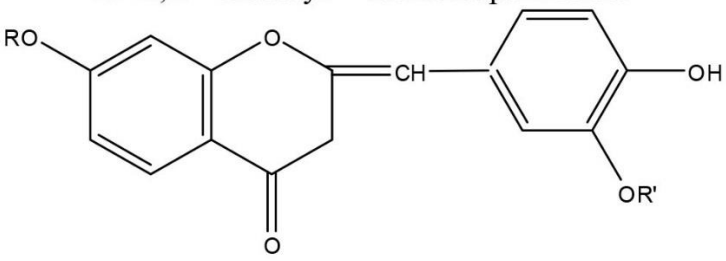
SOD, GPx, and xanthine oxidase, which are important phase II enzymes Anticonvulsive activity.



R = H, R' = Glucosyl - Monospermoside , R=R'=H - Butein, R=R' = Glucosyl - Isobutrin



R =R' = H - Butein, R = R'= Glucosyl - Butrin, R=H,R'=Glucosyl - Isomonospermoside.



R= R' = Glucosyl

It shows anticonvulsive activity, due to the presence of a triterpene. The acetone soluble part of petroleum ether extract of *Butea monosperma* flowers showed anticonvulsant activity. The stem bark of *Butea monosperma*, led to the isolation and identification of three new compounds named buteaspermin-A, buteaspermin-B and buteaspermanol, along with 19 known compounds. Hemagglutinating activitySeeds of *Butea monosperma* showing specificity towards human erythrocytes. The lectins such as Butea monosperma agglutinin isolated from the seeds of *Butea monosperma* are responsible for agglutinating property this property was only shown by seeds not by flowers, leaves, roots and stems. Human blood group-A-specific agglutinins have been demonstrated in some of the N-acetyl galactosamine/galactose –binding lectins, such as the lectins. Hemagglutination test showed that N-acetyl galactosamine is the strongest inhibitor of agglutination.

The granulation tissue formed on days 4, 8, 12 and 16 (post-wound) was used to estimate total collagen, hexosamine, protein, DNA and uronic acid. The extract increased cellular proliferation and collagen synthesis at the wound site.

Ayurvedic herbal medicine, prepared from *Piper longum* and *Butea monosperma* in which ash of stem, root, flower and leaves of *Butea monosperma* is used, It induced significant activation of macrophages as evidenced by increased macrophage migration index and phagocytic activity.

RESULTS AND DISCUSSION

The plants of this genus are well known for their colouring matters. Commonly *Butea monosperma* is used as tonic, astringent, aphrodisiac and diuretics. Roots are useful in filariasis, night blindness, helminthiasis, piles, ulcer and tumours. It is reported to possess antifertility, aphrodisiac and analgesic activities. Flowers are useful in diarrhoea, astringent, diuretic, depurative and tonic. The stem bark is useful in indigenous medicine for the treatment of dyspepsia. *Butea monosperma* is also a host to the Lac insect, which produces natural lacquer.

*Butea monosperma*is a native herb, the long shape tuberous were annually enlarged and accumulated at least 15 chemicals in the group of direct chain organic acid especially flavonoids and flavonoid glycosides with c-AMP Phosphodiesterase potent inhibitor directly at the corpus cavernosum of the penis and resulted in enhancing blood flow to that area. In addition, it supports normal sexual function, erectile capacity, enhance sensitivity and better performance. The preparation of *Butea monosperma*tubers has been used as an alternative herbal treatment for erectile dysfunction in males. The tubers of *Butea monosperma*have been found to contain estrogenic substances similar to follicle hormones. Roots of *Butea monosperma*show rejuvenating activity. The root barks of *Butea monosperma*shows 65 percent inhibitory activity on acetylcholinesterase.

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