"Phytochemical Analysis and Ethnobotanical Study of Wild Medicinal Plants"

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Abstract:

The aim of present investigation is phytochemical analysis of wild medicinal plants such as *Withania somnifera* L. (Dunal), *Cordia dichotoma* G. Forst and *Butea monosperma (*Lam.)Taub. These medicinal plants were screened for various active constituents like alkaloids, tannins, glycosides, starch/ carbohydrates, saponin, phytosterols, phenols, flavonoids, diterpens, proteins and amino acids with the help of preliminary test. The result of phytochemical analysis of *Withania somnifera* roots revealed the presence of alkaloid, glycoside, starch, saponin, phytosteriales, flavenoides, and absence of diterpens, proteins, amino acid, tannin and phenols. *Cordia dichotoma* showed presence of all phytochemical constituents such as alkaloids, tannins, glycosides, starch, saponin, phenols, flavonoids', diterpens, proteins and amino acid. *Butea monosperma* leaves revealed the presence of alkaloid, tannins, glycoside, starch, saponin, phytosteriales, phenols, diterpens, proteins and amino acid. The obtained result in present study suggested that the identified phytochemical compounds may be bio-active constituent and these plants are proving to be valuable reservoir of active compounds so used for medicinal and ethano-botanical aspect.

Keywords: *Withania somnifera, Cordia dichotoma, Butea monosperma,* phytochemical.

INTRODUCTION

Plants are composed entirely of chemicals of various kinds (Breslin, 2017). Phytochemicals (in Greek phyto Means "Plant") are chemical produced by plants through primary or secondary metabolism (Molyneux, *et. al*., 2007). Also called phytonutrient any of various bioactive chemical compounds found in plants, as antioxidants, considered to be beneficial to human health.

The medicinal plants are useful for healing as well as for curing of human diseases due to presence of phytochemical constituents (Nostro, *et. al*., 2000). Currently medicinal plants are of considerable significance due to their special attributes as a large source of therapeutic phytochemical that may lead to the development of novel drugs. Phytochemicals are naturally occurring in the parts of medicinal plants viz. Leaves, stem and roots that have defense mechanism to protect from various diseases. Phytochemical are primary and secondary compounds like chlorophyll proteins and common sugars are included in primary constituents and secondary compounds having terpenoid, alkaloids and phenolic compounds (Krishnaiah, *et. al*., 2007). Most of the phytochemicals from

plant sources such as phenolics and flavonoids have been reported to have positive impact on health and cancer prevention (Venugopal, *et. al*., 2012).

Now-a-days these Phytochemicals become more popular due to their countless medicinal uses. Phytochemicals play a vital role against number of diseases such as asthma, arthritis, cancer etc. unlike pharmaceutical chemicals these Phytochemicals do not have any side effects since the Phytochemicals cure diseases without causing any harm to human beings these can also be considered as "man-friendly medicines".

Medicinal plants and human beings have unique relationship since time immemorial. Man's vital interest in plants, primarily as a source of food, shelter and clothing, dates back to the very origin of human civilization plants are nature's "chemical factories" providing the richest source of organic chemicals on earth. Phytoconstituents are the natural bio-active compounds found in plants and phytochemistry is a distinct discipline somewhere in between organic chemistry, plant biochemistry and closely related to natural products. It deals with a variety of organic substances accumulated in plants. The plants may be considered as a biosynthetic laboratory. Not only their chemical compounds such as carbohydrates protein, and lipids that are used as food by men, but also a multitude of compounds like glycosides, alkaloids, Flavonoids, etc.

The most important of these bioactive constituents of plants are alkaloids, tannins, flavonoids and phenolic compounds (Doss, 2009) correlation between the phytoconstituents and the bio-activity of plant is desirable to know for the synthesis of compounds with specific activities to treat various health ailments and chronic diseases as well (Pandey, *et. al*., 2013).

Some important phytochemicals:

Alkaloids are the natural product that contains heterocyclic nitrogen atoms, are basic in character. Alkaloids are naturally synthesed by organisms, including animals, plants, bacteria and fungi. Alkaloids are significant for the protecting and survival of plant because they ensure their survival against micro-organisms, insects and herbivores and also against other plants by means of allelopathically active chemicals (Molyneux, *et. al*., 1996). The use of alkaloids containing plants as dyes, spices, drugs or poisons. Some alkaloids have stimulant property as caffeine and nicotine, morphine are used as the analgesic and quinine as the antimalarial drug (Rao, 1978).

Tannins are a heterogeneous group of high molecular weight polyphenolic compounds with the capacity to form reversible and irreversible complexes with proteins, polysaccharides, alkaloids, nucleic acids and minerals, etc. (Schofield, *et. al*., 2001 and Vansoest, 1994). Tannins are found commonly in fruits such as grapes, persimmon, blueberry, tea, chocolate, legume forages, legume trees like *Acacia* spp., *Sesbania* spp., in grasses, *Sorghum*, corn, etc (Giner-Chavez, 1996). Tannin containing plant extracts are used as astringents, against diarrhoea, as diuretics, anti-inflammatory, antiseptic, antioxidant and some pharmaceuticals (Dolara, *et. al*., 2005).

Saponins are a group of secondary metabolites found widely distributed in the plant kingdom. They form a stable foam in aqueous solutions such as soap, hence the name “saponin”. Saponins may be considered a part of plants’ defense systems, and as such have been included in a large group of protective molecules found in plants called as phyto-protectants (Lacaille-Dubois and Wagner, 2000). Many saponins are known to be antimicrobial, to inhibit mould, and to protect plants from insect attack.

Phenolic compounds are a large and complex group of chemical constituents found in plants (Walton, *et. al*., 2003). Phenolic compound exhibit several beneficial properties to humans and its antioxidant properties are important in determining their role as protecting agents against free radical-mediated disease processes. Phenolic acids helps in increase of bile secretion, reduces blood cholesterol and lipid levels and antimicrobial activity against some strains of bacteria such as *Staphylococcus aureus* (Gryglewski, *et. al*., 1987). Phenolics acid possesses different biological activities, for instance, antiulcer, anti- inflammatory, antioxidant (Silva, *et. al*., 2007), cytotoxic and antitumor, antispasmodic, and antidepressant activities (Ghasemzadeh, *et. al*., 2010).

Flavonoids are polyphenolic compounds that are ubiquitous in nature. Flavonoids occur in some vegetables, fruits and beverages like tea, coffee and fruit drinks (Pridham, 1960). Flavonoids have been reported multiple biological properties including antimicrobial, cytotoxicity, anti-inflammatory as well as antitumor activities but the best described property is their capacity to act as powerful antioxidants which can protect the human body from free radicals and reactive oxygen species. Flavonoids contain anti-inflammatory activity, enzyme inhibition, antimicrobial activity, estrogenic activity, anti-allergic activity, antioxidant activity and cytotoxic antitumor activity (Tapas, *et. al*., 2008).

The terpenoids are a class of natural products which have been derived from five-carbon isoprene units. Many of the terpenoids are commercially interesting because of their use as flavors' and fragrances in foods and cosmetics or quality of agricultural products, such as the flavor of fruits and the fragrance of flowers (Harborne and Tomas-Barberan, 1991). Many plants produce volatile terpenes in order to attract specific insects for pollination or otherwise to expel certain animal predators. Less volatile but strongly bitter-tasting or toxic terpenes also protect some plants from being eaten by animals called antifeedants (Degenhardt, *et. al*, 2003). In addition, terpenoids can have medicinal properties such as anti- carcinogenic, antimalarial, anti-ulcer, hepaticidal, antimicrobial or diuretic activity and the sesquiterpenoid antimalarial drug artimisinin and the diterpenoid anticancer drug taxol (Dudareva, 2004).

The present study was undertaken-

i. To know the active constituents of plants
   1) *Withania somnifera L. (Dunal)*
   2) *Cordia dichotoma G. forst*
   3) *Butea monosperma (Lam.) Taub.*

ii. To take confirmation test of various active constituents of given plant material.

iii. To study ethno botanical aspects of selected plants.

MATERIALS AND METHODS

Plant selected	Plant part used
Withania somnifera	Roots
Cordia dichotoma	Leaves
Butea monosperma	Leaves

Collection of plant material

These three medicinal plants *Withania somnifera, Cordia dichotoma* and *Buatea monosperma* were collected from Botanical garden of R.B.N.B. College, Shrirampur. These plants were identified with the help of flora and expert. After collection required parts were separated, washed and cleaned by muslin cloth and kept for drying for 7 days. They have to be processed for cleaning in order to prevent the deterioration of phytochemicals present in plant.

Powdering of plant material

After complete drying of plant material crushed in mortar and pestle and sieved with muslin cloth to make fine powder these powders were used for further analysis.

Preparation of aqueous extract

Aqueous extraction was carried out by decoction process (Davis, 1956). This was carried out by boiling powdered plant material in hot water, in this process one part of dried powder plant and 5 parts of sterilized water were taken in a boiling water flask and boiled for 15 min. after boiling the extract was filtered through a Whatmann filter paper no.1, autoclaved at 121˚c for 15 min. and kept in clean and sterilized test tubes and stored at 4˚c till further use.

Qualitative Detection of Phytochemical Constituents

Detection of active phytochemical constituents was carried out for all the extracts using the standard procedures (Kokate, 2005).

RESULTS AND DISCUSSION

Observation Table

Withania somnifera

Sr.No.	Test		Reagent	Root
I	Alkaloids	a) Mayer's Test	Mayer's reagent	-
		b) Wagner's Test	Wagner's reagent	+
		c) Marme's Test	Dilute H_2So_4	+
II	Tannins	a) Iodine Test	I_2	-
		b) Acetic acid Test	CH_3CooH	-
		c) Dilute HNo_3 Test	$dil.HNo_3$	-
III	Glycosides	a) Liebermann's Test	$CHcl_3$, CH_3CooH	-
		b) Coumarins Test	10% NaoH	+
		c) Borntrager's Test	Hcl, NH_3	-
IV	Starch / Carbohydrates	a) Molish's Test	a napthol, conc. H_2So_4	-
		b) Benedict Test	Benedict's reagent	-
		c) Barfoed's Test	Barfoed's reagent	-
V	Saponin	Foam Test	Olive oil	+
VI	Phytosterols	Salkowski's Test	$CHcl_3$, H_2So_4	+
VII	Phenols	Ferric Chloride Test	$Fecl_3$	-
VIII	Flavonoids	Alkaline Test	NaoH	-
IX	Protein & Amino acids	a) Xanthoproteic Test	HNo_3	-
		b) Ninhydrin Test	Ninhydrin reagent	-
X	Diterpenes	Copper acetate Test	$Cu(CH_3CooH)_2$	-

Cordia dichotoma

Sr.No.	Test		Reagent	Leaves
I	Alkaloids	a) Mayer's Test	Mayer's reagent	-
		b) Wagner's Test	Wagner's reagent	+
		c) Marme's Test	Dilute H_2So_4	+
II	Tannins	a) Iodine Test	I_2	-
		b) Acetic acid Test	CH_3CooH	+
		c) Dilute HNo_3 Test	dil.HNo_3	-
III	Glycosides	a) Liebermann's Test	$CHcl_3$, CH_3CooH	-
		b) Coumarins Test	10% NaoH	+
		c) Borntrager's Test	Hcl, NH_3	+
IV	Starch / Carbohydrates	a) Molish's Test	a napthol, conc. H_2So_4	-
		b) Benedict Test	Benedict's reagent	-
		c) Barfoed's Test	Barfoed's reagent	+
V	Saponin	a) Foam Test	Olive oil	+
VI	Phytosterols	Salkowski's Test	$CHcl_3$, H_2So_4	+
VII	Phenols	Ferric Chloride Test	$Fecl_3$	+
VIII	Flavonoids	Alkaline Reagent Test	NaoH	+
IX	Protein & Amino acids	a) Xanthoproteic Test	HNo_3	+
		b) Ninhydrin Test	Ninhydrin reagent	-
X	Diterpenes	Copper acetate Test	$Cu(CH_3CooH)_2$	+

Butea monosperma

Sr.No.	Test		Reagent	Leaves
I	Alkaloids	a) Mayer's Test	Mayer's reagent	-
		b) Wagner's Test	Wagner's reagent	+
		c) Marme's Test	Dilute H_2So_4	+
II	Tannins	a) Iodine Test	I_2	-
		b) Acetic acid Test	CH_3CooH	-
		c) Dilute HNo_3 Test	dil.HNo_3	-
III	Glycosides	a) Liebermann's Test	$CHcl_3$, CH_3CooH	+
		b) Coumarins Test	10% NaoH	+
		c) Borntrager's Test	Hcl, NH_3	+
IV	Starch / Carbohydrates	a) Molish's Test	a napthol, conc. H_2So_4	-
		b) Benedict Test	Benedict's reagent	+
		c) Barfoed's Test	Barfoed's reagent	-
V	Saponin	Foam Test	Olive oil	+
VI	Phytosterols	Salkowski's Test	$CHcl_3$, H_2So_4	+
VII	Phenols	Ferric Chloride Test	$Fecl_3$	+
VIII	Flavonoids	Alkaline Reagent Test	NaoH	+
IX	Protein & Amino acids	a) Xanthoproteic Test	HNo_3	+
		b) Ninhydrin Test	Ninhydrin reagent	-
X	Diterpenes	Copper acetate Test	$Cu(CH_3CooH)_2$	+

The result of the phytochemical analysis shows that these plants are rich in alkaloids, glycosides, reducing sugar, saponin, protein and amino acids, phytosterols.

Withania somnifera roots, shows the presence of alkaloids, glycosides, reducing sugar, saponins, protein and amino acids, phytosterols and absence of tannins, phenols, diterpenes. It helps to reduce stress and build immune system.(Umadevi *et. al*., 2012).

Leaves of *Cordia dichotoma,* shows the presence of alkaloids, tannins, reducing sugars, glycosides, saponins, phytosterols, phenols, flavonoids, proteins and amino acids. i. e. all chemical constituents are present. This result was similar to (Parmar *et. al.,* 1998). Chemical screening of leaves showed the presence of pyrrolizidine alkaloids, cumarins, flavonoids, saponins, terpenes, sterols (Alarcon *et.al*., 1994).

Butea monosperma leaves, showed presence of all phytochemical constituents like alkaloids, tannins, glycosides, saponins, reducing sugars phytosterols. According to (Mazumdar *et. al.,* 2011), leaves of *Butea monosperma* used as an anti-inflammatory, anti-tumour, diuretic, antileprotic, antimicrobial, astringent, sore throat, cough and cold.

The present study may be useful to supplement the information with regards to standardization, identification of drug obtained from the selected three plants and helpful for further researches.

CONCLUSION

All these plants *Withania somnifera, Cordia dichotoma, Butea monosperma* are ethnobotanically important plants with many reported biological activities. This study reported that these selected three medicinal plants are the source of the secondary metabolites i.e. alkaloids, flavonoids, tannins, reducing sugars etc.These plants play a vital role in preventing various diseases. The anti-inflammatory, anti-cancer, anti-viral, anti-malarial, antibacterial activity due to presence of above chemical constituents.

REFERENCES

Alarcon D. L. Martin M. J. and Motilva V. J. Ethnopharmacol. 1994; 42:161-170.

Breslin, A. The chemical composition of Green plants - silencing, Leaf group Ltd. 2017.

Davis H. Bentley's text book of pharmaceutics (6th edition). 1956:272-30.

Degenhardt J. Gershenzon J. Baldwin I.T. Kessler A. Attracting friends to feast on foes: Engineering terpene emission to make crop plants more attractive to herbivore enemies. Current Opinion Biotechnology, 2003; 14: 169–176.

Dolara P. Luceri C. De Filippo C. Femia A. P. Giovannelli L. Carderni G. Cecchini C. Silvi S. Orpianesi C. Cresci A. Red wine polyphenols influence carcinogenesis, intestinal microflora, oxidative damage and gene expression profiles of colonic mucosa in F344 rats. Mutation Research, 2005; 591: 237–46.

Doss A. Preliminary phytochemical screening of some Indian medicinal plants. Anc Sci. Life. 2009.

Dudareva N. Pichersky E. Gershenzon J. Biochemistry of plant volatiles. Plant Physiology, 2004; 135: 1893–1902.

Ghasemzadeh.A. Jaafar H. Z. E. Rahmat A. Antioxidant activities, total Phenolics and flavonoids content in two varieties of Malaysia Young Ginger (Zingiber officinale Roscoe). Molecules, 2010; 15: 4324-4333.

Giner-Chavez BI. Condensed tannins in tropical forages. Doctoral Thesis. Cornell University. Ithaca, NY, 1996.

Gryglewski R. J. Korbut R. Robak J. On the mechanism of antithrombotic action of flavonoids. Biochemical Pharmacology, 1987; 36: 317-321.

Harborne J. B. and Tomas-Barberan F. A. Ecological Chemistry and Biochemistry of Plant Terpenoids, Clarendon, Oxford, 1991.

Kokate C K. A textbook of practical pharmacognosy. Vallabh Prakashan. 2005; 05:105-111.

Krishnaiah D. Sarbatly R. and Bono A. Phytochemical antioxidant for health and medicine, a move towards nature. Biotechnol Mol. Bio. Rev. 2007: 97-104.

Lacaille-Dubois M.A. and Wagner H. Bioactive saponins from plants: An update. In Studies in Natural Products Chemistry; Atta-Ur-Rahman, ed. Elsevier Science. Amsterdam, 2000; 21: 633-687.

Molyneux R. J. Lee S.T. Gardner D. R. panter K. E. James L. F. Phytochemicals: the good, the bad and the ugly? Phytochemistry. 2007; 68 (22–24): 2973–85.

Molyneux RJ, Nash RJ, Asano N. Alkaloids: Chemical and Biological Perspectives, Vol. 11, Pelletier SW, ed. Pergamon, Oxford, 1996; 303.

Muzumder P.M. and Das M.K. *Butea monosperma* (LAM) Kuntze- comprehensive Review MSID, IJPSN. 2011.

Nastro A. Germano M. P. D'angelo V. Morino A. Canntelli M. A. Extraction methods and bioautography for evaluation of medicinal plant antimicrobial activity. 2000.

Pandey P. Mehtra R. Upadhyay R. Physico chemical & preliminary phytochemical screening of *Psoraled corylifolia*. Arch Appl sci Re 2013; 5:261-265.

Parmar N. S. and Parmar S. Anti-ulcer potencial of flavonoids. Indian J. Physiol. Pharmacol. 1998.

Pridham J. B. Phenolics in Plants in Health and Disease, Pergamon Press, New York, 1960; 34-35.

Rao R. V. K. Ali N. Reddy M. N. Occurrence of both sapogenins and alkaloid lycorine in *Curculigo orchioides*. Indian Journal Pharma Science, 1978; 40: 104-105.

Schofield P. Mbugua D. M. Pell A. N. Analysis of condensed tannins: a review. Animal Feed Science Technology, 2001; 91: 21-40.

Silva E. M. Souza J. N. S. Rogez H. Rees J. F. Larondelle Y. Antioxidant activities and polyphenolic contents of fifteen selected plant species from the Amazonian region. Food Chemistry, 2007; 101: 1012-18.

Tapas A. R. Sakarkar D. M. Kakde R. B. Flavonoids as Nutraceuticals: A Review. Tropical Journal of Pharmaceutical Research, 2008; 7: 1089-1099.

Umadevi M. and Rajeswari R. Traditional And medicinal uses of *Withania somnifera*. The pharma innovation. 2012; 7725: 1.

Vansoest P. J. Nutritional ecology of the ruminant, 2nd ed. Cornell Univ. Press. Ithaca, NY, 1994; 476.

Venugopal R. liu R. H. phytochemical in diets for breast cancer prevention. The importance of resveratrol & ursolic acid. Food Sci. Hum. wellness. 2012; 1: 1-13.

Walton N. J. Mayer M. J. Narbad A. Molecules of Interest: Vanillin. Phytochemistry, 2003; 63: 505- 515.