

A review on- A medicinally important climber plant *Clitoria ternatea* L. and its variants

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ABSTRACT

India is one of the largest producers of herbal products and richest country in the world in regard to genetic resources of medicinal plants. Nature around us has provided everything of necessity of mankind. Plants are natural laboratories where a great number of chemicals are biosynthesized and they may be considered the most important source of chemical compounds. Herbal medicines are prepared from variety of plant parts like leaves, stems, roots, barks, seeds and so on. They usually contain many bioactive compounds and are used primarily for treating mild or chronic ailments. Due to the increasing demand in the field of herbal medicines, it has become necessary and pertinent to know in detail about the systematic knowledge of herbal drugs.

Key words: Climber, *Clitoria ternatea* L., variants. Medicinal plants.

INTRODUCTION

India is a varietal emporium of medicinal plants and is one of the richest countries in the world in regard to genetic resources of medicinal plants. It exhibits a wide range in topography and climate, which has bearing on its vegetation and floristic composition (Martins *et al.*, 2001). The nature around us has provided everything of necessity of mankind. Plants have the ability to synthesize a wide variety of chemical compounds that are used to perform important biological functions and to defend against attack from predators such as insects, fungi and herbivorous mammals. The large resources of the vegetables, minerals, vitamins and important phytochemicals are available naturally have beneficial effects on long-term health when consumed by humans and can be used to effectively treat human diseases. Herbal medicines are prepared from variety of plant parts like leaves, stems, roots, barks, seeds and so on. They usually contain many bioactive compounds and are used primarily for treating mild or chronic ailments. Due to the increasing demand in the field of herbal medicines, it has become necessary and pertinent to probe into the area of systematic knowledge about herbal drugs. There is a need for the application of this knowledge in authentication, detailed study and practical utilization of crude drugs (Prathyusha *et al.*, 2010). Gianoli (2004) suggested that the climbing habit seems to be a key innovation within flowering plants because of the great diversity of climbing vs. non-climbing sister taxa.

Climbing habit has been accepted for the ecological feature of light capture (Darwin, 1875; Putz, 1984; Putz and Chai, 1987; Hegarty and Caballe, 1991; Niklas, 1992; Ginoli, 2002). Investigations of character displacement have clarified the understanding of several basic evolutionary patterns and processes (Pfennig and Murphy, 2009).

The chemicals are derived from the plants. Along with authentication of species identity and prediction of concentration of active phytochemicals may be required for quality control in the use of plant materials for pharmaceutical purposes (Wikipedia, 2012).

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Phytochemistry:

Phytochemistry is in the strict sense, the study of phytochemicals. These are chemicals derived from the plants. Along with authentication of species identity and prediction of concentration of active phytochemicals may be required for quality control in the use of plant materials for pharmaceutical purposes (Wikipedia, 2012).

Plants continue to be a major source of medicines, as they have been throughout human history. It is estimated that roughly 1500 plant species in Ayurveda and 1200 plant species in Siddha have been used for drug preparation (Jain, 1987; Krishnakumar and Kumar, 1995). Ethnobotany (the study of traditional human uses of plants) is recognized as an effective way to discover future medicines.

Generally quantitative estimation parameter is used to study the total amount of phytoconstituents present in different parts of the plants. The major parameters are crude fibers, proteins, total phenolics, vitamins, micro and macro minerals which in necessary and essential a major part in human nutrition and health.

***Clitoria ternatea* L. and *C. biflora* Dalz.**

The four genotypes/variants of the *Clitoria* used for study were broadly categorized and coded on the basis of well distinguishing character i.e. flower colour (first

three), except fourth one which distinguish on the basis of habit, these are

C. ternatea L. (White petaloid) coded as 'A' (Plate I), *C. ternatea* L. (Blue petaloid) coded as 'B' (Plate II), *C. ternatea* L. (Double petaloid) coded as 'C' (Plate III) and *C. biflora* Dalz. (Wild) coded as 'D' (Plate IV) though these all species are belong to the same genus and family but they also shows some other distinguishing morphological characteristics (Dhore, 2002; The wealth of India, 2004; Yeotkar *et al.*, 2011; Yeotkar and Malode, 2013).

Butterfly pea commonly known as Shakupushpam is widely used in traditional Indian systems of medicine as a brain tonic and is believed to promote memory and intelligence. The study conducted on rat revealed that *C. ternatea* root extract increase rat brain acetylcholine content and acetylcholine esterase activity in a similar fashion to the standard cerebro drug pyritinol (Taranalli and Cheeramkuzhy, 2000). This plant is also used as laxative, diuretic, antiulcer, in the treatment of headache and snakebite (Anonymous, 2005). It is also useful in the treatment of severe bronchitis, asthma and hectic fever and is used by the local tribal people to cause abortion; paste is applied for curing abdominal swellings (Dominguez and Alcorn, 1985).

Uses:

In 2001 to 2010, researchers identified near about 198 compounds used in modern medicine which were derived from "ethnomedical" plant sources; 80% of these have an "ethnomedical" use identical or related to the current use of the active elements of the plant (Fabricant and Farnsworth, 2001). At least 12,000 such compounds have been isolated so far; a number estimated to be less than 10% of the total. Chemical compounds in plants mediate their effects on the human body through processes identical to those already well understood for the chemical compounds in conventional drugs; thus herbal medicines do not differ greatly from conventional drugs in term of how they work. This enables herbal medicines to be as effective as conventional medicines but also give them the same potential to cause harmful side effects (Lai and Roy, 2004; Tapsell *et al.*, 2006)

The climber yields green fodder throughout the year, particularly during dry period. It can be grown as a forage legume either alone or with perennial fodder grasses in Punjab, Rajasthan Uttar Pradesh, Gujarat,

Maharashtra and Madhya Pradesh. The plant is also suitable as green manure and cover crop. It enriches soil by fixing nitrogen (Idnani and Chibber, 1953; Ratan *et al.*, 1982; The wealth of India, 2004).

C. ternatea is reported to possess antimicrobial and insecticidal (Kelemuet *al.*, 2004), nootropic, anxiolytic, antidepressant, antistress and anticonvulsant activities (Jain *et al.*, 2003), hepatoprotective activity, antidiabetic, sedative and blood platelet aggregation-inhibiting properties. In Ayurveda, the roots, seeds and leaves of *C. ternatea* have long been widely used as a brain tonic and is believed to promote memory and intelligence. *C. ternatea* has been traditionally used as an anthelmintic (Mukherjee *et al.*, 2008, Gomez and Kalamani, 2003).

The roots of *Clitoria* have an acrid and bitter taste and are credited with purgative, laxative and diuretic properties. They are administered with honey and ghee as a general tonic to children for improving

mental ability, muscular strength, complexion, in epilepsy and insanity. The root-juice of white-flowered variety is blown up the nostrils as a remedy for hemicranias. A decoction or powder of the root is given in rheumatism and ear diseases. The roots are also demulcent and given in chronic bronchitis and fevers they cause gripe and tenesmus and hence are not recommended as purgative (Banerji and Chakravarti, 1963; Nair *et al.*, 1982).

2.3.2 Chemical constituents

The young shoots, leaves, flowers and tender pods of *Clitoria* are eaten as vegetable in Kerala and Philippines. Analysis of young shoots and tender pods from Philippines is as follows- Moisture- 80.0; protein-3.75; ether extract-0.40; crude fiber-4.80 and ash-0.80g/100g; Ca- 40.30; P-24.20; Fe-0.45; carotene-0.67; thiamine-0.04; riboflavin-0.18 and ascorbic acid-247.7mg/100g. Due to the high calcium concentration the plant showed that it can be exploited as a significant source of calcium brewed as herbal drink (The wealth of India, 2004).



A. Habit



B. Leaf



C. Flower



D. Pod



E. Seeds

Plate I: *Clitoria ternatea* L. (variant A).



A. Habit



B. Leaf



C. Flower



D. Pods



E. Seeds

Plate II: *Clitoria ternatea* L. (variant B).



A. Habit



B. Leaf



C. Flower



D. Pod



E. Seeds

Plate III: *Clitoria ternatea* L. (variant C).

A. Habit



B. Leaf



C. Single flower



D. Flowers in pair



E. Pod



F. Seeds

Plate IV: *Clitoria biflora* Dalz. (variant D).

Butterfly pea commonly known as Shakupushpam is widely used in traditional Indian systems of medicine as a brain tonic and is believed to promote memory and intelligence. Taranalli and Cheeramkuzhy (2000) conducted study on rat showed that *C. ternatea* root extract increase rat brain acetylcholine content and acetylcholine esterase activity in a similar fashion to the standard cerebro drug pyritinol. Flavonoids in the petals of several *C. ternatea* lines with different petals were investigated. Delphinidine 3-O (2''-O-alpha-rhamnosy 1-6''-O-malonyl)- beta-glucoside was newly isolated from the petals of mauve line together with three known anthocyanins. Ternatins, a group of 15 (poly) acierated delphinidine glucosides, were identified in all blue petal lines. White petal line did not contain anthocyanins.

Analysis of fodder of *Clitoria* from Jhansi and Rajasthan by Katiyar *et al.*, 1970; Ratan *et al.*, 1982; Barro and Ribeiro, 1983 gave the following values, dry matter- 97.64, 94.01%, crude protein- 13.0, 15.34; ether extract-2.45, 2.35; crude fiber-23.63, 32.21 and ash- 6.05, 7.36%; Ca-10.4 and P-22mg/100g respectively. The values for digestible crude protein and total digestible nutrients were 8.29, 11.14 and 57.66, 59.67%, respectively.

Kazuma *et al.* (2003) worked on the colour of petals of *Clitoria*. They further stated that total anthocyanine contents in blue petals and double blue were high, while all the lines contained the same set of 15 flavonol and glycosides in similar relative ratios. The change in flower colour from blue to mauve was not due to the change in structure of anthocynidin from delphinidin but due to the lack of (polyacylated) glucosyl group substitutions at both the 3'and 5' positions. This implies that glucosylation of the 3' and 5' positions of anthocyanins cause blue petals in *C. ternatea*.

CONCLUSION

There is a need for the applications of this knowledge in authentication, detailed study and practical utilization of crude drugs. Today, many traditional medicinal practitioner, tribal people uses different plant parts to cure different human diseases without knowing bioactive constitutes or chemical quantity present in it, in such case considerable risk is there as far as human health is consider. Besides these many plants variants looks similar but they differ in their phytochemicals. The present work was carried out to

comparative study of eight different genotypes, of which A, B, C, represent *Clitoria ternatea*, D- *Clitoria biflora*.

Since ancient times, people have been discovering the nature particularly plants in search of drugs. This has resulted in the use of large number of medicinal plants with curative properties to treat various diseases (Verpoorte, 1998). Nearly 80% of world's population relies on traditional medicines. Plant-derived substances have recently become of great interest owing to their versatile applications. Medicinal plants are the richest bio-resource of drugs of traditional systems of medicine, modern medicines, nutraceuticals, food supplements,

Considering the future drug formulations for herbal drug preparations and authentication of plants some of the genotypes with different phytochemicals (qualitatively and quantitatively) obtained in this study hold promise. Since, this study has been successfully achieving the objectives of identification of genotypes morphological, phytochemical and molecular level are now authentically available for the use in pharmaceutical industry for the preparation of new drugs or formulations. Knowledge of the chemical constituents of plants is desirable because such information will be valuable for synthesis of complex chemical substances.

Conflicts of interest: The authors stated that no conflicts of interest.

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