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PHARMACOLOGICAL ACTIVITIES OF *VIGNA UNGUICULATA*- A REVIEW

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ABSTRACT

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 since time commercial, Ayurveda and Siddha systems of medicine are the traditional heritage of India wherein diverse plants have been used. The medicinal value of these plants lies in some chemical active substances that produce a definite physiological and pharmacological action on the human body. *Vigna unguiculata* is one of the most widely distributed species of weeds in the world. It is originated from Africa. It is a major step food cropin sub-saharan Africa, mainly in dry savanna region of Africa. Nigeria is known as world prime producers of cowpea. In India, the plant is popularly called Barbarti and lobia and found abundantly in the winter season. The plant contains various phytochemicals like protein, carbohydrate, and fibers. Pharmacological studies reported that the plant consist various activities such as antifungal, antimicrobial, antioxidant, antibacterial, anti-diabetes, anti-hyperglycemic etc. The extensive survey of the literature revealed that *Vigna unguiculata*, is an important medicinal plant with diverse pharmacological spectrum.

KEYWORDS: Cowpea, Lobia, traditional uses, pharmacological properties, medicinal plant.

INTRODUCTION

Vigna unguiculata is a leguminous plant who belongs to the family Fabaceae. It is grown widely all over the world and mainly it is originated from Africa.[1] It is a major part of food crop of sub-Saharan Africa, mainly in the dry savanna regions of West Africa.[2] Nigeria is

known as the world prime producers of cowpea.[3] *Vigna unguiculata* become a part of the human diet in African countries because, high amount of protein (23%), carbohydrates (56%) and fibres (4%) are found in it that can fulfill the human essential amino acid requirements when complemented with cereals.[4]

The seeds & leaves are a major source of vitamins and proteins for humans. The little leaves and immature pods are used as vegetables. The Cowpea plant has the power of tolerating drought and atmospheric nitrogen fixing in the soil which is enhanced by the rhizome.[5] The economic uses of cowpea and some health benefits includes, toning the spleen, stomach and pancreas helps in inducing urination and relieves damp conditions like leucorrhoea, makes it an important crop for serving as food security, which is need of a society. Cowpea contains various ions but it is rich in potassium and Ca, Mg and phosphorus contains good amount. It also contains iron, zinc, sodium, manganese, copper and selenium in small amounts. Cowpea contains a rich amount of Vitamin A & C and also contains a well amount of vitamin B6, thiamin, riboflavin, niacin and pantothenic and a small amount of foliate. Cowpea shoots and leaves are rich source of Vitamin B.[6] Because of these nutrients provided by cowpea it becomes extremely important and valuable mainly for those peoples who are not able to afford proteins which are found in non-vegetarian foods like meat and fish. Cowpea (*Vigna unguiculata*), is also known as black eye pea is a legume of African origin. Its drought tolerance efficacy makes it valuable in rain fed agriculture or in un-irrigated fallow fields.[2]

Taxonomical hierarchy

Kingdom	:	*Plantae*
Sub-kingdom	:	Tracheobionta
Superdivision	:	Spermatophyta
Division	:	Magnoliophyta
Class	:	*Dicotyledonea*
Subclass	:	Rosidae
Order	:	*Fabales*
Family	:	*Fabaceae*
Genus	:	*Vigna*
Species	:	*Vigna unguiculata*

Vernacular names in India

English	:	Cowpea, Black-eye pea, Horse gram

Hindi	:	Lobia, Kulathi, Kurathi
Bengali	:	Ghangra, Kulattha, Kalaya
Sanskrit	:	Mahamasah, Rajamasah
Tamil	:	kaattuulundu, karamani
Marathi	:	Alasunda, Chavali
Telugu	:	Alasandalu, Kaaraamanulu
Kannada	:	Alasabde, Alasund, Huruli, Hurali
Sanskrit	:	Khalva, Vardhipatraka
Gujrati	:	Kalathi, Kulathi
Kashmiri	:	Kath
Urdu	:	Kulthi[7,8]

PLANT DESCRIPTION

Fig. 1:- ***Vigna unguiculata***

Morphology-Cowpea is an annual herb having various growth forms. According to their uses there are three types: grain, forage or dual-purpose. It may be trailing, bushy, climbing and erect, under favourable condition they are usually indeterminate.

- **Leaves-** The first pair of leaf is basic and opposite while other leaves are trifoliate, alternate with petioles 5-25 cm long. The leaves are dark green with variation in size (6 to 16x4 to 11 cm), while the leaflets which are central has found symmetrical and ovate.
- **Inflorescence**- The inflorescence at the distal ends of 5 to 60 cm long peduncles found to be racemose or intermediate. Flowers are self-pollinating, conspicuous, short pedicels or borne and the petals of flower may be white, pink, dirty yellow, purple or pale blue in colour.

- **Fruit and seeds-** Pods are different in size, colour, shape and texture. They may be crescent-shaped, erect or coiled. Usually, yellow when ripe, but sometimes purple or brown in colour. Seeds are also different in shape, colour and size. Usually per pod vary in number of seeds 8 to 20. The seeds are generally large (2 to 12 mm long) and weight 5 to 30 g/100 seeds.
- **Root-** Cowpea has various spreading roots which are lateral and a strong taproot in surface soil.
- **Stems-**Cowpea has smooth or slightly hairy and striate stems with some purple shades.[9]

Distribution- This plant is considered to be a native to West Africa, Asia where the highest genetic diversity. Cowpea is an important crop in many countries of tropical Africa, Asia and South America. Africa is the origin of cowpea where domestication took place as well.[10]

Cultivation- Cowpeas are mostly grown for their edible beans, although the green peas, green pea pods and leaves can also be consumed, meaning before the dried peas are harvested it can be used as a food source.[11] Cowpeas develop well in poor dry conditions, growing well in soils up to 85% sand. These properties of cowpea make it a particularly important crop in arid and semi-desert regions where many other crops will not grow.[12]

CHEMICAL CONSTITUENTS

The chemical constituents are mainly found in the seeds and leaves. The seed contains crude protein 20.8, pentosan 10.8, water soluble gum 2.8%, globulin and several common phytosterol. There are some anti-nutritional components also present such as haemagglutinin and a protease inhibitor has been reported. The mean protein value of the seeds is 25.47%. The horsegram seeds are rich in lysine content. Green pod of the plant contains vitamin A and green leaf contains ascorbic acid and calcium. Alectin like glycoprotein found in the stems and leaves of the plants. It is a rich source of protein and amino acid & some of them play an important role in the management of sickle cell disease.[13] The plant also contains a higher content of three flavonoid aglycons: quercetin, kaempferol, and isorhamnetin.[14]

Table 1: Amino acid content of the seed extract of *Vigna unguiculata*

Amino acid	% Composition
Aspartate	27.8
Threonine	3.3
Serine	2.6
Glutamine	43.5

Proline	17.6
Glycine	9.5
Alanine	18.7
Cysteine	3.6
Valine	0.8
Methionine	3.2
Isoleucine	5.3
Leucine	5.4
Tyrosine	0.5
Phenylalanine	5.5
Histidine	4.5
Lysine	0.5
Arginine	14.3
Tryptophan	0.5

Table 2: Proximate content of the seed extract of *Vigna unguiculata*

Components	% Composition
Protein	23.65
Ash	3.4
Fiber	4.8
Fats and oil	4.5
Moisture	12.85

The seed extract of *Vigna unguiculata* contains various proteins and amino acids, fiber, ash, fats and oils, and varying amount of moisture as represented in table 1 & 2 above.[15]

MEDICINAL USES

The leaves, stems and seeds of *Vigna unguiculata*are used in many countries. The plant is used in measles, smallpox, adenitis, burns and sores. Decoction or soup is used in affection of the liver and spleen, intestinal colic, in leucorrhoea and menstrual disorder, urinary discharges. The seeds are used as astringent, antipyretic, diuretic and also used in cardiovascular diseases. Globulin fraction of the seed showed hypolipidaemic effects in rats. Ayurvedic pharmacopoeia of India recommends the decoction of dry seeds in calculus and amenorrhoea. Presence of vitamin A in the green pods makes them a valuable diet for children. Green leaves may be used in vitamin C deficiency syndrome.[13]

Roasted seeds are used to treat neuritis, insomnia, weakness of memory, dyspepsia, indigestion, needles in limbs and sensation of pins, periodic palpitation, congestive cardiac failure etc. It is an admirable medicine for stomatitis, corneal ulcers, coleic diseases, kwasiorkar, marasmus.[8]

PHARMACOLOGICAL ACTIVITIES

Antioxidant

The study determined the antioxidant activity of methanolic extract of seeds of *Vigna unguiculata*. The results concluded that the phenoloic compounds present in the extract showed the antioxidant and antiradical properties using different models like linoleic acid peroxidation model, FRAP, ORAC, TRAP, etc.[16] The raw, dry heated and hydrothermal treated samples of *vigna unguiculata* were investigated for its antioxidative properties and total phenolic content. The raw, dry heated and hydrothermal treated samples were extracted with 70% acetone and the extracts were freeze-dried. The study reported that all extracts exhibited good antioxidant activity (74.3–84.6%) against the linoleic acid emulsion system.[17]

Antihyperglycemic and antinociceptive activity

The effects of methanolic extract of *Vigna unguiculata* beans were evaluated for antihyperglycemic activity. For determination of antihyperglycemic activity, Oral glucose tolerance test (OGTT) was used and Antinociceptive activity was examined through the observation of decrease in abdominal constrictions in intraperitoneally administered acetic acid-induced pain model in mice. Administration of methanol extract of beans results in dose-dependent and significant decreases in blood glucose levels in glucose-loaded mice. The tests for antinociceptive activity results, that the methanolic extract decreases the number of abdominal constrictions by 30.0, 33.3, 36.7, and 43.3%, respectively in all above four doses. This study concluded that the beans can be a good source for alleviating pain and for lowering blood sugar in diabetic patients.[18]

Antidiabetic activity

The seed oil of *vigna unguiculata* was investigated for its anti-diabetic activity against alloxan monohydrate induced diabetes in rats. Levels of blood glucose, TC, TGs, LDL, ALT, AST and ALP decreased and HDL increased in alloxan induced diabetic rats after treatment with 200 mg/kg barbati seed oil for 21 days. The study reported that the seed oil of barbati may be very useful for the improvement of the complications of diabetes.[19]

Antibacterial activity

The aqueous and ethanolic extracts of seeds of *Vigna unguiculata* were evaluated for its antibacterial activity against Gram positive bacteria, Bacillus subtilis and Gram negative bacteria, Escherichia coli by agar well diffusion method. The study showed that the aqueous

extract exhibited more antibacterial activity against both the Gram positive and Gram negative organisms than that of the ethanolic extract.[20]

Antimicrobial activity

The effect of acetone and ethanol extracts of leaves of *Vigna unguiculata* was examined for their antimicrobial activity against bacterial (*Staphylococcus aureus* and *Enterococcus faecalis*) and fungal (*Fusarium proliferatum*) pathogens. The result showed that the acetone extract from Kpod significantly inhibited the growth of *A. alternata* at 2.5mg ml^{-1}. The acetone and ethanol extracts showed no inhibitory activity at 1.0mg ml^{-1}. BW acetone extracts inhibited growth of the Gram-positive bacteria, *Enterococcus faecalis* and *Staphylococcus aureus*, at 2.5mg ml^{-1} and *Bacillus cereus*, *B. subtilis* and *Enterobacter cloacae* at 5.0mg ml^{-1}. Ethanol extracts of the same cultivar only showed antibacterial activity against *Enterococcus faecalis* and *Enterobacter cloacae* at 5.0mg/ml.[21]

Antifungal and antiviral activity

The *vigna unguiculata* seeds were examined for the presence of various proteins and amino acids with antiviral and antifungal potency. The two proteins, designated α- and β-antifungal proteins according to their elution order from the CM-Sepharose column, were capable of inhibiting human immunodeficiency virus (HIV) reverse transcriptase and one of the glycohydrolases associated with HIV infection, α-glucosidase, but β-glucuronidase was not repressed. The ability of the proteins was also demonstrated in order to retarding mycelial growth of a variety of fungi, and α-antifungal protein being proved more potent in most cases. β-Antifungal protein was highly active in only one instance. Both antifungal proteins had low cell-free translation-inhibitory activity.[22]

CONCLUSION

Medicinal plants have the ability to synthesize a wide variety of chemical compounds that are used to perform important biological functions. The above plant contains enormous phytochemical constituents. The extensive survey of literature revealed that *Vigna Unguiculata*, is an important medicinal plant with diverse pharmacological spectrum. The pharmacological studies reported in this review confirm the therapeutic value of *Vigna Unguiculata*. The plant possesses various activities such as antioxidant, antibacterial, antimicrobial, antihyperglycemic, antinociceptive, antifungal and antiviral. Hence, this plant provides a significant role in the prevention and treatment of a disease.

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