



E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2020; 9(1): 1149-1152
Received: 16-11-2019
Accepted: 21-12-2019

Mehreen Zaheer
Department of Pharmacognosy,
Faculty of Pharmacy and
Pharmaceutical Sciences,
University of Karachi, Karachi,
Pakistan

Salman Ahmed
Department of Pharmacognosy,
Faculty of Pharmacy and
Pharmaceutical Sciences,
University of Karachi, Karachi,
Pakistan

**Muhammad Mohtasheemul
Hassan**
Department of Pharmacognosy,
Faculty of Pharmacy and
Pharmaceutical Sciences,
University of Karachi, Karachi,
Pakistan

Vigna unguiculata (L.) Walp. (Papilionaceae): A review of medicinal uses, Phytochemistry and pharmacology

Mehreen Zaheer, Salman Ahmed and Muhammad Mohtasheemul Hassan

Abstract

Vigna unguiculata (L.) Walp. (Papilionaceae) is a medicinally important plant and is used for the treatment of different diseases. Alkaloids, phenols, flavonoids and phytic acid have been reported from this plant. Antioxidant, antidiabetic and hypocholesterolemic activities are reported by *Vigna unguiculata*. The present review is an attempt to compile all the previous data on the basis of its medicinal uses, phytochemistry and pharmacology reported in the previous articles.

Keywords: *Vigna unguiculata*, medicinal uses, phytochemistry, pharmacology

Introduction

Vigna unguiculata (L.) Walp. is a leguminous plant belongs to the family Papilionaceae. It is originated from Africa and is grown widely all over the world including Nigeria, India, Central America, China and Africa. It is an edible legume. The seeds and leaves are a major source of plant proteins and vitamins for man and feed for animals [1, 2].



Fig 1: *Vigna unguiculata* seeds

Table 1: Names of *Vigna unguiculata* in different languages: [1, 3-5]

Languages	Names
Arabic	اللوبياء
Bengali	Ghangra, Kulatha, Kalaya, Barbati
English	Cowpea, Black-eye pea, Horse gram, Asparagus bean, Catjang, Catjang cowpea, Chinese long bean, Clay pea, Cream pea, Crowder pea, Pea bean, Purple-Hull pea, Southern pea, Sow pea, Yard-Long bean
French	Dolique asperge, Dolique mongette, Haricot asperge, Haricot indigène, Niébé, Pois à vaches
Ghana	Adua, Ayi, Tipielega, Tuya, Saau
Gujrati	Kalathi, Kulathi
Hindi	Lobia, Kulathi, Kurathi
Indonesian	Kacang bol, Kacang merah, Kacang toonggak, Kacang békngkok
Kannada	Alasabde, Alasund, Huruli, Hurali
Kashmiri	Kath
Malayalam	Mudiraa
Marathi	Alasunda, Chavali
Nigeria	Wake, Ezo, Nyebbe, Ngalo, Azzo, Dijok, Alev, Arebe, Lubia, Mongo, Ewa, Akedi, Akoti
Portuguese	Feijão-espargo, Feijão-fradinho
Punjabi	Lodhar
Sanskrit	Mahamasah, Rajamasah, Khalva, Vardhipatraka
Spanish	Costeño, Frijol de costa, Judía catjang, Judía espárrago, Rabiza
Swahili	Kunde
Tamil	Kaattuulundu, Karamani
Telugu	Alasandalu, Kaaramanulu
Urdu	Gawara, Gawar ka beej

Corresponding Author:
**Muhammad Mohtasheemul
Hassan**
Department of Pharmacognosy,
Faculty of Pharmacy and
Pharmaceutical Sciences,
University of Karachi, Karachi,
Pakistan

Table 2: Taxonomy [2, 6]

Kingdom	Plantae
Family	Papilionaceae
Subfamily	Faboideae
Tribe	Phaseolae
Sub tribe	Phaseolinae
Genus	<i>Vigna</i>
Species	<i>unguiculata</i>
Synonyms	<i>Dolichos biflorus</i> L.
	<i>Dolichos catjang</i> Burm.f.
	<i>Dolichos hastifolius</i> Schnizl.
	<i>Dolichos lubia</i> Forssk.
Plant	Annual herb with twining stem, 3-5m in length.
Leaves	Trifoliate, 5-25 cm long
Inflorescence	Racemes
Flower	Axillary racemes on stalks 15 to 30 cm long
Fruit	Pendulous, smooth, 10 to 23 cm long with a thick curved beak
Seeds	10- to 15-seeded, 4 to 8 mm long, 3 to 4 mm broad, reddish brown or white with a black spot

Macroscopy of seeds

V. unguiculata showed reniform shaped seed. The sculpturing pattern on seed coat surface of both wild and cultivated species of *V. unguiculata* is maculo-reticulate type. Wild seed color is black and cultivated is cream in color [7].

Seeds shape reniform, 5–6 mm long, 3–4 mm broad and 2–3 mm in thickness, compressed with a polished or shiny and hard brown coloured testa. The micropyle is situated near the

hilum. The hilum is 1–1.5 mm in length. The seed are exalbuminous. The testa is tough but comparatively thin except at the region of the hilum. The embryo which was exposed after removing the testa, by softening it through emersion of the seed in water, consists of two fleshy cotyledons, 5–6 mm long and 4–5 mm wide and an incurved radical which was 4 mm long [8].

Table 3: Nutritional value of seeds [1, 9]

Essential minerals (mg / 100 g)		Amino acid (%)	
Macro-minerals		Alanine	18.7
Calcium	126	Arginine	14.3
Magnesium	51	Aspartic acid	27.8
Phosphorus	53	Cysteine	3.6
Potassium	431	Glutamic acid	43.5
Sodium	4	Glycine	9.5
Micro-minerals		Histidine	4.5
Iron	1.10	Isoleucine	5.3
Zinc	1.01	Leucine	5.4
Vitamins (mg / 100 g)		Lysine	0.5
Ascorbic acid (C)	2.5	Methionine	3.2
Thiamin (B ₁)	0.110	Phenylalanine	5.5
Riboflavin (B ₂)	0.145	Proline	17.6
Niacin (B ₃)	1.450	Serine	2.6
Pyridoxine (B ₆)	0.067	Threonine	3.3
Vitamin A, IU	817 IU/100g	Tryptophan	0.5
-----	-----	Tyrosine	0.5
		Valine	0.8

Traditional medicinal uses

Roasted seeds are used to treat neuritis, insomnia, weakness of memory, dyspepsia, indigestion, needles in limbs and sensation of pins. It is an admirable medicine for stomatitis, corneal ulcers and coeliac disease. *V. unguiculata* is a rich source of amino acid and protein and some of the amino acids play an important role in the management of sickle cell disease. Seeds have cardioprotective potency and also preventing cardiovascular diseases. Decoction of leaves is used to treat as hyperacidity, nausea and vomiting [3]. The

seeds are used medicinally to treat burns, chest pains, epilepsy, fever, headaches and menstruation and in childbirth [10]. The plant is used in measles, smallpox, adenitis and sores. Decoction or soup is used in affection of the liver and spleen, intestinal colic, in leucorrhoea and urinary discharges. The seeds are used as astringent, antipyretic, diuretic and also used in cardiovascular diseases. Green leaves may be used in vitamin C deficiency syndrome [1]. 100 ml decoction of *V. unguiculata* seeds taken orally twice a day for 30 days to dissolve kidney stones [11].

Table 4: Phytochemistry and Pharmacology

Part (Extract)	Compounds	Activity
Seeds (aqueous)	-----	Antibacterial ^[12] , hepatoprotective ^[13]
Seeds (ethanol)	-----	Anthelmintic ^[14] , anti-atherosclerotic ^[15] , antisickling activity ^[16] , hypolipidemic ^[17]
Seeds (methanol)	Phenolic compounds (chlorogenic acid, caffeic acids and condensed tannins)	Anti oxidant ^[18]
	-----	Antibacterial ^[19] , anti nociceptive, antidiabetic ^[20] , thrombolytic ^[21]
Seeds	Total phenolics, tannins	Anti oxidant ^[22]
Seeds powder (20 % incorporated in diet)	-----	Hypocholesterolemic, hypoglycemic ^[23]
Seeds	α - and β -antifungal proteins	HIV-1 reverse transcriptase and α -glucosidase inhibitor ^[24]
	Antimicrobial peptides	Antiparasitic ^[25]
Seed oil	-----	Antimicrobial ^[26]
Leaves (ethanol)	-----	Antimicrobial ^[27]
	-----	Diuretic ^[28]
	Anthocyanins	Antisickling activity ^[29]
Leaves	Flavonoids	Antihyperlipidemic, cardioprotective ^[30]
Whole plant (methanol)	-----	Antiobesity ^[31]
Whole plant	Peptide	Antidiabetic ^[32]

Conclusion

The traditional uses, pharmacology and phytochemistry of *V. unguiculata* presented in this review could be helpful for future studies and research. The plant has good future prospective for discovery of new molecules and pharmacological activities.

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