A pharmacognostic and pharmacological review on *Vigna aconitifolia* (Moth bean)

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**Abstract**

*Vigna aconitifolia* is generally known as mat bean, moth bean, matki, Turkish gram or dew bean. The pods, sprouts and protein rich seeds of this crop are normally consumed in India. Moth bean can be grown on many soil types, and can also act as a field legume. Due to its famine resistant merits, its capacity to fight soil erosion and its high protein content, moth bean has been identified as possibly a more significant food source in the future. It has been recommended that its correctness as a grain legume in semi-arid Africa should be further investigated. In the present study, phytochemical contents of moth bean (*Vigna aconitifolia*) seed accessions were evaluated. This includes protease inhibitors, phytic acid, radical scavenging activity, and tannins. The studies publicized important deviation in the contents of these phytochemicals. Presence of photochemical composition was linked with seed storage proteins like albumin and globulin. The seeds of *Vigna aconitifolia* is analysed for proximate composition, minerals, seed protein fractions, amino acids, fatty acids, and antinutritional factors. The pulse is found to be rich sources of proteins and minerals like Ca, Mg, Fe, Zn, and Mn. *Vigna aconitifolia* seeds exhibited quite high levels of crude lipid. The most limiting necessary amino acids in both the pulses were the sulphur-amino acids, cystine, and methionine. Threonine in *V. aconitifolia* occurred in higher quantities when compared with WHO/FAO requisite pattern. Oleic acid and palmitic acid in *V. aconitifolia* is found to be the predominant fatty acids. The other antinutritional factors like total free phenols, L-DOPA and haemagglutinating activity were also analysed/assayed.

**Keywords:** *Vigna aconitifolia*, moth bean, haemagglutinating, phytic acid

**Introduction**

Belonging to the family Fabaceae (sub-family Papilionaceae), the moth bean is an herbaceous creeping annual that creates a low-lying soil cover when fully grown [1]. The natural antioxidants, more recently, have fascinated the considerable concentration of users and researchers. In this context, medicinal plants are being viewed as an easily accessible and potent source of antioxidants as they contain a mixture of different chemical compounds [2]. Antioxidants are having a key role in the prevention of human diseases and may function as scavengers of free radicals. These are capable even in small quantities, to prevent or reduce the oxidative destruction of biologically important compounds such as lipids, proteins, and nucleic acids [3]. Herbs can be used as an alternative remedy for different neurological disorders. Different bioactive compounds isolated from herbs are being successfully used for the treatment of neurological disorders [4]. The past decade has also witnessed an intense interest in herbal medicines that have long-term health-promoting qualities [5].

Over the years and the latest, there have been numerous studies documenting the antibacterial, antifungal, antiviral, anticancer and anti-inflammatory properties of plant ingredients. Therefore, herbal derived substances stay the source for a large proportion of commercial medications used today in developing countries. When we refer to plants of medicinal value, researchers. In this context, medicinal plants are being viewed as an easily accessible and potent source of antioxidants as they contain a mixture of different chemical compounds [2]. Antioxidants are having a key role in the prevention of human diseases and may function as scavengers of free radicals. These are capable even in small quantities, to prevent or reduce the oxidative destruction of biologically important compounds such as lipids, proteins, and nucleic acids [3]. Herbs can be used as an alternative remedy for different neurological disorders. Different bioactive compounds isolated from herbs are being successfully used for the treatment of neurological disorders [4]. The past decade has also witnessed an intense interest in herbal medicines that have long-term health-promoting qualities [5].

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Moth bean (Vigna aconifolia) is a legume belonging to the family Fabaceae, commonly found in arid and semiarid regions of India. It is known for its ability to thrive in dry conditions, making it a valuable crop in regions with limited rainfall. The seeds contain high levels of protein, fiber, and essential amino acids, making it an important crop in the diet of many communities.

**Phytochemical Composition**

The seeds of *Vigna aconifolia* are rich in various phytochemicals. They contain high levels of phytic acid, polyphenols, and flavonoids. The seeds also contain significant levels of minerals such as iron, zinc, and manganese. These nutrients contribute to the health benefits of moth bean, making it a valuable crop for human consumption.

**Method for Determination of Condensed Tannins and Phytic Acid**

For the determination of condensed tannins and phytic acid, the procedure involves the extraction of the seeds and the measurement of the concentration of these compounds using specific methods. The results are then analyzed to determine the levels of these compounds in the moth bean seeds.

**Nutritional Value**

The seeds of *Vigna aconifolia* are a rich source of protein, with a high amino acid profile. They also contain essential fatty acids, which are important for the maintenance of healthy membranes and support cell function.

**Applications**

Moth bean is used in various applications, including food production, where it is used to make moth bean flour, which is used in bread making and other baked goods. It is also used in traditional medicine for its nutritional and therapeutic properties.
molybdate, 10% (w/v) ascorbic acid, and distilled water in 1:1:1:2 ratio). The contents were incubated for 60 min at room temperature and absorbance was taken at 650 nm using Systronics UV-Vis spectrophotometer [20].

Method for determination of trypsin inhibitor (TI) activity
The inhibitor content was measured using BAPNA as a substrate [21]. For measuring trypsin inhibitory activity 10 μg of trypsin was mixed with suitable amount of the sample (to get 50–60% inhibition) and incubated at 25°C before measuring the remaining trypsin activity. 10 μL of seed extract was mixed with 50 μL of 50 mM Tris-HCl buffer, pH 8.2, containing 20 mM CaCl₂, and 10 μL of trypsin and incubated at room temperature at 30 sec interval between two wells on a microtiter plate. The residual activity was measured by adding 125 μL of BAPNA (40 mg/mL dimethyl sulfoxide, freshly diluted 1:100 in 50 mM Tris-HCl buffer, pH 8.2, and 20 mM CaCl₂ prewarmed to 37°C) and then incubated at room temperature for 30 min. Reactions were stopped by the addition of 25 μL of 3% (v/v) acetic acid. Liberated p-nitroaniline was measured at 410 nm. 100% trypsin activity was measured from the sample minus the inhibitor extract. One unit of trypsin activity was defined as the amount of enzyme which increases the amount of inhibitor that inhibited 1 unit of trypsin activity [21].

Method for determination DPPH radical scavenging assay
Scavenging activity on DPPH free radicals by the extracts was assessed according to the method reported by Awah et al. [22] with slight modifications of Gyanfli et al. [23]. Briefly, a 2.0 mL solution of the extract, at different concentrations diluted twofold (2–125 μg/mL) in methanol, was mixed with 1.0 mL of 0.3 mM DPPH in methanol. The mixture was shaken strongly and allowed to stand at room temperature in the dark for 25 min. Blank solutions were equipped with each test sample solution (2.0 mL) and 1.0 mL of methanol while the negative control was 1.0 mL of 0.3 mM DPPH solution plus 2.0 mL of methanol. L-ascorbic acid was used as the positive control. Subsequently the absorbance of the assay mixture was measured at 518 nm against each blank with Systronics 2203 UV-Vis spectrophotometer. Lower absorbance of the reaction mixture indicated higher radical scavenging activity.

DPPH radical scavenging activity was calculated using the equation

\[
\text{DPPH\%} = \left(\frac{A_{\text{blank}} - A_{\text{sample}}}{A_{\text{blank}}}\right) \times 100
\]

Solubility
Dopamine is freely soluble in water, methanol, and hot 95% ethanol but is virtually insoluble in ether, petroleum ether, chloroform, benzene, and toluene [24].

Traditional Uses
Seed of Vigna aconitifolia is said to be a traditional source, used in healing of paralysis, for weight reduction, rheumatism, cough, fever and liver ailments [25].

Pharmacological activities
Antioxidant activity
The human body has a complex system of natural enzymatic and non-enzymatic antioxidant defenses which counteract the harmful effects of free radicals and other oxidants. Free radicals are responsible for causing a large number of diseases including cancer [26] cardiovascular disease [27] neural disorders [28] Alzheimer’s disease [29], mild cognitive impairment [30] Parkinson’s disease [31] alcohol induced liver disease [32], ulcerative colitis [33] aging [34] and atherosclerosis [35]. The antioxidant activity and free radical-scavenging potential of phenolics of raw and dry heated moth bean (Vigna aconitifolia) (Jacq.) Marechal seed extracts. The antioxidant characteristics and total phenolic contents of Vigna aconitifolia were evaluated. The raw and dry heated seeds samples were separated with 70% acetone and the extracts were freeze-dried. The raw seeds consists maximum levels of total phenolics (6.54%) and tannins (1.91%) than the dry heated seeds. The extracts were screened for their potential antioxidant activities using, OH·, ±, ± diphenyl-2-picyrylhydrazyl (DPPH), 2,2,2-azinobis(3-ethylbenzothiazoline-6-sulfonic acid) (ABTS+). Ferric reducing/antioxidant power (FRAP), linoleic acid emulsion and Fe2+ chelating systems. At mg of extract in the reaction mixture, the superoxide anion radical-scavenging activity in raw and dry heated seed extracts. The DPPH radical and ABTS cation radical scavenging activities were well proved and concurrent with the ferric reducing antioxidant capability of the extracts [30] conducted by Perumal et al 1988.

Anti inflammatory
Inflammation is a defense response of our body to hazardous stimuli such as allergens and/or injury to the tissues; on the other hand, uncontrolled inflammatory response is the main cause of a vast continuum of disorders including allergies, cardiovascular dysfunctions, metabolic syndrome, cancer, and autoimmune diseases imposing a huge economic burden on individuals and consequently on the society [37]. Thus, we need to apply natural anti-inflammatory factors within medication therapy to achieve increased pharmacological response and the lowest degree of unwanted side effects [37,38]. Trypsin inhibitors were acceptable for reducing the incidence of certain cancers and potent anti-inflammatory properties [39] conducted by F. Roy, J. I. Boye et al 2010. Concentration of trypsin inhibitor in the seeds of moth bean is quantified. The maximum concentration of trypsin inhibitor that was found in Jwala is 0.078 TII/mg and the lowest concentration that was found in I.C. #39756 is 0.041 TIU/mg. Differences in the concentration of inhibitor and their activity exist between pulse crop species and may be accredited to varietal differences [40] conducted by P.W. Franks, M.-Y. Wong et al 2002.

Neurodegenerative diseases
Several common themes have driven prevailing notions about neurodegenerative diseases and their underlying etiology. Pathologically, a fre-quent characteristic of these diseases is the accumulation and aggregation of abnormal or misfolded proteins, as with amyloid-β (Aβ) in Alzheimer’s disease (AD) [41, 42], α-synuclein in Parkinson’s disease (PD) [43], huntingtin protein in Huntington’s disease (HD) [44], and trans-act-response DNA-binding protein 43 (TDP-43) in frontotemporal dementia (FTD) and amy-o-trophic lateral sclerosis (ALS) [45]. The discovery of genetic mutations causing rare, early onset, familial forms of these diseases, as with APP (amyloid precursor protein) gene in AD [46] and the SNCA (α-synuclein) gene in PD [47], fur-ther focused attention on mechanisms directly connected to disease pathology.
However, most cases of AD, PD, and other neurodegenerative diseases cannot be explained by simple Mendelian inheritance of genetic mutations in isolated disease-specific pathways. These late onset, sporadic forms of disease are thought instead to have a complex etiology, with susceptibility influenced by lifestyle and environmental factors in addition to as-yet-uncharacterized variants in numerous genes [48-52]. Protease inhibitors are recommended as potential drugs for treating various diseases such as human immunodeficiency virus (HIV), hypertension, and neurodegenerative disease, along with various infectious diseases [39] by F. Roy, J. J. Boye et al 2010. Most of the research on health benefits of protease inhibitors has been performed [53, 54] by A. R. Kennedy et al 1993, B. J. Xu et al 2007. However, research in this direction is in progress.

Conclusion

Vigna aconitifolia is very useful habit for treating various types of diseases. Various studies have demonstrated that V.acconitifolia possess antioxidant, antiinflammatory, neurodegenerative activity. The chemical constituents such as phenolics, trypsin inhibitors, protease inhibitors are responsible for these activities. Review of the literature concluded that Vigna aconitifolia is considered to be a useful herbal medicinal plant.

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Conflicts of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

Authors contribution

We declare that this work done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be done by the authors. Miss Sushmita Singh collected the data, and analysed the data. Prof. Imtiyaz Ansari proof read the whole manuscript, and suggested the necessary changes, and helps in designing manuscript.

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