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ANALGESIC POTENTIAL AND PHYTOCHEMICAL SCREENING OF *LABLAB PURPUREUS* AERIAL PARTS

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ABSTRACT

Background. *Lablab purpureus*, also known as the hyacinth bean is cultivated throughout Bangladesh for its edible beans. It was of interest to phytochemically screen and evaluate the analgesic properties of the aerial parts. **Methods**. Analgesic activity was determined by observed decreases in abdominal constrictions (writhings) in intraperitoneally administered acetic acid-induced pain model in mice. Phytochemical screening was done through standard methods. **Results.** In analgesic activity tests, the extract at doses of 50, 100, 200 and 400 mg per kg body weight reduced the number of abdominal constrictions by 23.1, 34.6, 42.3, and 61.5%, respectively. A standard pain relieving (analgesic) drug, aspirin, reduced the number of writhings by 38.5%, when administered at a dose of 200 mg per kg body weight. **Conclusion**. Analgesic activity has not previously been reported for *Lablab purpureus* aerial parts. The aerial parts can be beneficial for alleviating pain.

KEY WORDS: *Lablab purpureus*, analgesic, Fabaceae, hyacinth bean.

INTRODUCTION

Lablab purpureus (L.) Sweet, known as hyacinth bean in English, and seim in Bangladesh belongs to the Fabaceae family and is cultivated in many countries of the world including Bangladesh for its beans, which are cooked and eaten as vegetable. The plant is vinous and is

usually grown as a winter crop in Bangladesh. Various parts of the plant are considered to have medicinal properties in Bangladesh and in other countries.

Rural communities of Pudukkottai district in South India use the plant for inflammation, colic and urinary retention. [1] The Santal tribe residing in Thakurgaon district, Bangladesh wraps crushed leaves around the throat for tonsillitis. [2] Paste of leaves is applied in skin diseases by folk medicinal practitioners of Vasu Bihar village in Bogra district, Bangladesh. [3] The garo tribal community residing in Netrakona district of Bangladesh orally partake the seeds for low sperm count. [4]

People of Bargarh district in Odisha, India apply seed paste to scorpion stings. [5] The aboriginal and rural folks of Jalgaon district, Maharashtra, India orally take leaf juice mixed with milk to cure arthritis. [6] Leaf juice is applied to treat ringworm by the Irular tribe in Palamalai Hills, Coimbatore, Tamil Nadu, India. [7] Leaf juice is used to treat various skin diseases and seeds to relieve stomachic by the indigenous communities of Kavrepalanchowk district in Nepal. [8] The tribal people and village medicine-men of Chatara Block of Sonebhadra district in Uttar Pradesh, India use roots of the plant as antihelminthic and leaves for coughs and skin diseases. [9] Leaves of the plant are used as emmenagogue, diuretic, aphrodisiac, stomachic, and antispasmodic by village people of Vellore district, Tamil Nadu, India. [10]

We had been systematically screening various common and endangered plants of Bangladesh for their antihyperglycemic and analgesic potential. [11-22] Pain is a common affliction in Bangladesh. Besides diseases like arthritis or cancer, where people suffer from chronic pain, pain is experienced on a daily basis by particularly the agricultural workers (rural people) and urban slum dwellers of Bangladesh for their work involve heavy physical labor. On the other hand, most of these people lack access to or cannot afford pain-relieving medicines. *L. purpureus* can be commonly found in Bangladesh and its aerial parts mainly used as fodder for cattle. Considering that the plant is used to treat problems like arthritis and scorpion stings where pain is involved, it was of interest to evaluate the analgesic potential of aerial parts of the plant, for if found to be active the aerial parts can form a cheap and alternative medicine for treatment of pain.

METHODS

Plant material collection

Aerial parts of *L. purpureus* were collected during September 2013 from Dinajpur district, Bangladesh, and taxonomically identified at the Bangladesh National Herbarium (Accession Number 38,714).

Preparation of methanolic extract of aerial parts

Aerial parts were washed thoroughly with distilled water to remove dust and other particulate matter, cut into small pieces, air-dried in the shade, and 150g of dried and powdered aerial parts were extracted with methanol (w:v ratio of 1:5, final weight of the extract 9.31g).

Chemicals and Drugs

Aspirin was obtained from Square Pharmaceuticals Ltd., Bangladesh. All other chemicals were of analytical grade.

Animals

Swiss albino mice, which weighed between 15-18g were used in the present study. The animals were obtained from International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B). The animals were acclimatized for three days prior to actual experiments. The study was conducted following approval by the Institutional Animal Ethical Committee of University of Development Alternative, Dhaka, Bangladesh.

Analgesic activity evaluation through abdominal writhing test

Analgesic activity of the extract (MELP) was examined as previously described. [23] Mice were divided into six groups of five mice each. Group 1 served as control and was administered vehicle only. Group 2 was orally administered the standard analgesic drug aspirin at a dose of 200 mg per kg body weight. Groups 3-6 were administered MELP at doses of 50, 100, 200 and 400 mg per kg body weight, respectively. Following a period of 60 minutes after oral administration of standard drug or MELP, all mice were intraperitoneally injected with 1% acetic acid at a dose of 10 ml per kg body weight. A period of 5 minutes was given to each animal to ensure bioavailability and onset of chemically induced irritation of acetic acid [24], following which period, the number of abdominal constrictions (writhings) was counted for 10 min. The percent inhibitions of abdominal constrictions were calculated according to the formula given below.

Percent inhibition = $(1 – W_e/W_c) X 100$

where W_e and W_c represents the number of writhings in aspirin or MELP administered mice (Groups 2-6), and control mice (Group 1), respectively.

Acute toxicity test

Acute toxicity test was conducted as previously described. [25] Mice were divided into nine groups, each group consisting of six animals. Group 1 was given 1% Tween 80 in normal saline (2 ml per kg body weight). The other eight groups (Groups 2-9) were administered, respectively, 100, 200, 300, 600, 800, 1000, 2000 and 3000 mg of MELP per kg body weight. All animals were closely observed for the next 8 hours to notice any behavioral changes or mortality and were kept under close observation for the next two weeks.

Statistical analysis

Experimental values are expressed as mean ± SEM. Independent Sample t-test was carried out for statistical comparison. Statistical significance was considered to be indicated by a p value < 0.05 in all cases. [18]

Preliminary phytochemical screening

Preliminary phytochemical analysis of MELP for presence of saponins, tannins, alkaloids, and flavonoids were conducted as described before. [26]

RESULTS

Toxicity evaluation

The crude extract (MELP) did not show any toxicity in mice even at the highest dose tested. There were no changes in behavioral pattern and mortality was not observed.

Preliminary screening of phytochemicals

Various tests conducted for presence of phytochemicals in MELP indicated the presence of alkaloids, saponins, and tannins.

Analgesic activity evaluation results

Dose-dependent and significant reductions in the number of abdominal constrictions induced by intraperitoneal administration of acetic acid were observed with MELP. At doses of 50, 100, 200 and 400 mg per kg body weight, MELP was observed to reduce the number of constrictions, respectively, by 23.1, 34.6, 42.3, and 61.5%. A standard analgesic drug, aspirin, when administered to experimental animals at a dose of 200 mg per kg body weight, reduced

the number of constrictions by 38.5%. Thus, a dose of 200 mg/kg MELP was better than that of 200 mg/kg aspirin in reducing the number of abdominal constrictions, and a dose of 400 mg MELP demonstrated far better analgesic activity than 200 mg aspirin per kg. The results are shown in Table 1 and suggest that the extract possesses significant analgesic properties. Since analgesic activity has previously not been reported from the aerial parts to our knowledge, the results suggest possible presence of potentially new analgesic phytoconstituents in aerial parts.

Table 2: Analgesic effect of crude methanol extract of *L. purpureus* aerial parts (MELP) in acetic acid-induced pain model mice.

Treatment	Dose (mg/kg body weight)	Mean number of abdominal constrictions	% inhibition
Control	10 ml	5.2 ± 0.20	-
Aspirin	200 mg	3.2 ± 0.58	38.5*
(MELP)	50 mg	4.0 ± 0.45	23.1*
(MELP)	100 mg	3.4 ± 0.51	34.6*
(MELP)	200 mg	3.0 ± 0.71	42.3*
(MELP)	400 mg	2.0 ± 0.55	61.5*

All administrations (aspirin and extract) were made orally. Values represented as mean ± SEM, (n=5); *$P < 0.05$; significant compared to control.

DISCUSSION

L. purpureus is a common plant cultivated in many part of the world for its edible beans. Even though it has multiple ethnomedicinal uses, and some of these uses appear to be against pain arising from scorpion stings, arthritis or tonsillitis, the analgesic properties of its aerial parts, roots or beans are yet to be studied. To our knowledge, this is the first study of analgesic properties of its aerial parts.

Analgesic activity in this study has been determined with intraperitoneally acetic acid-induced pain model in mice. Intraperitoneal injection of acetic acid to mice results in pain of peripheral origin and is manifested by abdominal constrictions. [27] Such pain can be caused by increases in prostaglandin synthesis; as such alleviation of pain may result from decrease of prostaglandin synthesis mediated through inhibition of cyclooxygenase pathways. However, the exact mechanism of pain reduction by MELP was not determined in the present study and is currently being conducted in our laboratory.

Preliminary phytochemical screening indicated the presence of alkaloids, saponins, and tannins in MELP. These groups of compounds have been demonstrated to exhibit analgesic activity in extracts of other plants. Antinociceptive activity has been reported for various solvent extracts of *Vernonia condensata leaves*. Phytochemical screening showed that all the extracts contained alkaloids, phenolic compounds, flavonoids, tannins and saponins. [28] Analgesic and anti-inflammatory activities have been noted with *Anacardium occidentalis* leaf extract in laboratory rodents. Preliminary phytochemical screening of the extract showed presence of alkaloids, tannins, saponins and cardenolides. [29] Ethanol extract of *Sida cordifolia* roots showed analgesic activity in acetic acid induced writhing tests; phytochemical screening showed presence of reducing sugar, alkaloids, steroids and saponins. [30] The exact nature of the phytochemical constituent responsible for the observed analgesic effect is also currently under investigation by us.

The absence of toxicity of the methanol extract combined with the ready availability of aerial parts of the plant make *L. purpureus* an attractive plant towards using it as a crude medicine or isolating possibly newer and more efficacious pain relieving drug(s) from the plant. If this can happen, it will certainly provide relief to the millions of people of Bangladesh and the world who suffer from acute or chronic pain.

CONCLUSION

The results suggest that methanolic extract of *L. purpureus* aerial parts can be used for alleviating pain.

CONFLICTS OF INTEREST

The author(s) declare that they have no competing interests.

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