An overview on phytochemical and pharmacological profile of upodika [Basella rubra Linn]

SHINDE GIRISH GULABRAO

ABSTRACT

India is virtually a herbarium of the world. Research on medicinal plants is one of the leading areas of research globally. Although there is require to pay attention in regard of safety evaluation of bioactivities of medicinal plants. Medicinal plants are containing inherent active ingredients used to cure disease and relieve pain. The use of medicinal plants as raw materials in the production of new drugs is increasing day by day because of their potentials in combating the problem of drug resistance in micro-organisms. The traditional medicines and medicinal plants have been widely in most developing countries as therapeutic agents for the maintenance of good health. The World Health Organization (WHO) estimates that about 80% of people living in developing countries rely almost exclusively on traditional medicines for their primary health care needs. The present review summarizes the scientific information of various aspects of Upodika [Basella rubra Linn.] plant used in traditional system of medicine for a variety of purpose. Upodika [Basella rubra Linn.] is well known medicinal plant commonly found in India and other tropical countries.

Keywords: Basella rubra Linn., WECT (water extract of Basella rubra), traditional use, pharmacognostic study, pharmacological activity

Introduction:

The nature has provided the storehouse of remedies to cure all ailments of mankind. The traditional herbal medicines are still practiced in large part of our country mostly in tribal and rural areas. In many developing countries large section of population relies on traditional practitioner, who are depend on herbal folk medicine for their primary health care and has deep faith in it. Medicinal plants are containing inherent active ingredients used to cure disease and relieve pain. The traditional medicines and medicinal plants have been widely in most developing countries as therapeutic agents for the maintenance of good health. The World Health Organization (WHO) estimates that about 80% of people living in developing countries rely almost exclusively on traditional medicines for their primary health care needs. Research on medicinal plants is one of the leading areas of research globally. Although there is need to pay attention in regard the bioactivity-safety evaluation and conservation of medicinal plants. Some of the screening tests on medicinal plants are performed in vitro. The ultimate aim of the researcher is to use the medicinal plants to treat diseases in humans and animals. Traditionally, herbs have been considered to be nontoxic and used for treating various diseases. In India, we are using plants and herbs as the basic source of medicine because we are rich in them. Basella rubra Linn. is well known medicinal plant commonly found in India and other tropical countries. The use of medicinal plants as raw materials in the production of new drugs is increasing day by day because of their potentials in combating the problem of drug resistance in micro-organisms. Various medicinal properties of this plant have been mentioned in the Indian traditional system of medicine.

1.1 Introduction to Plant

1.1.1 Botanical Description

Source, habitat and distribution

The plant prefers light (sandy), medium (loamy) and heavy (clay) soils and requires well-drained soil. The plant prefers acid, neutral and basic (alkaline) soils and can grow in very acid soil. It cannot grow in the shade. It requires moist soil. Basella rubra grows well under full sunlight in hot, humid climates and in areas lower than 500 m above sea level. Growth is slow in low temperatures resulting in low yields. Flowering is induced during the short-day months of November to February. Basella rubra Linn. grows best in sandy loam soils rich in organic matter with pH ranging from 5.5 to 8.0.
1.1.2 Morphology:

- A perennial herb, stem very long, slender, twinning to the right, succulent, glabrous, much branched
- Leaves 5-12 by 2.5 to 7.5 cm (often larger than cultivation), broadly ovate, acute or acuminate, thick, apiculate, entire, base often cordate, narrowed into the petiole
- Petioles 1.2-2.5cm long.
- Flowers white or red, sessile, few, in lax pedunculate spikes 2.5-15 cm. long; bracts small, apiculate, bracteoles rather longer than the perianth, oblong, obtuse

1.1.3 Chemical structures of some phytoconstituents of B. rubra:

**Major constituents:**
- Lupeol, β-carotene

**Other Constituents:**
- α-carotene, neo-β-carotene, phytofluene, cis- cryptoxanthin, neoxanthin, cis-lutein, cis-xanthoflavine, vitamin A, B, C, B2, K, quercetin, glucan, polysaccharide containing L-arabinose, D-galactose, L-rhamnose, Monogalactosyldiglyceride, Triglycerides, Digalactosyldiglycerides, Trigalactosyldiglycerides acids - α-ketoglutaric, levulinic, pyruvic, oxalacetic, succinic, lactic, malonic, glycolic, oxalic, malic, citric, propionic, acetic, formic, pyroglutamic, uronic

1.2 Pharmacological Profile

1.2.1 Antifungal Activities:

Two novel antifungal peptides, designated α- and β-basrubrins, respectively, isolated from seeds of the Basella rubra Linn. α- and β-basrubrins exhibited a molecular weight of 4.3 and 5 kDa, respectively. They inhibited translation in a rabbit reticulocyte system with an IC50 value of 400 and 100 nM, respectively. α- and β-basrubrin inhibited HIV-1 reverse transcriptase by (79.4 ± 7.8)% and (54.6 ± 3.6)%, respectively, at a concentration of 40μM, and (10.56 ± 0.92)% and (2.12 ± 0.81)%, respectively, at a concentration of 40μM. Both α- and β- basrubrins exerted potent antifungal activity toward Botrytis cinerea, Mycosphaerella arachidicola, and Fusarium oxysporum. Neither α-basrubrin nor β-basrubrins exhibited DNase, RNase, Lectin protease activity, indicating that their antifungal action is not due to these activities.

1.2.2 Antioxidant activity:

The antioxidant activity of two species of leafy vegetable Basella rubra was investigated. The leaves of Basella spp. are very low in calories (95–110/100 g) and fats, but hold a good amount of vitamins, minerals, and antioxidants. The EC50 values were found high in BAW extract (3.4 mg/mL) for DPPH radical scavenging activity. BAW extract (1.04) at 50mg/mL showed high ferric reducing antioxidant power and least in BAM extract. Various extracts from leaves with different constituents were shown dose dependent antioxidant and high scavenging abilities which play a key role in combating the reactive oxygen species. Methanolic extracts of all leafy vegetables tested exhibited antioxidant activity. A better oxidative activity was observed at 200μg/ml concentration at all temperature for tested leafy vegetable. To conclude leafy vegetables infers a protective radical scavenging activity which exhibit dose dependant stability irrespective of temperature and it shows substrate specificity.

1.2.3 Antiviral activity:

In vivo-two pectin-type polysaccharides BRP-2 and BRP-4 obtained from Basella rubra linn. were found to exert potential antiHSV-2 effects in vitro mainly by interfering with the absorption of virus to host cells. Furthermore, the most abundant pectin-type polysaccharide BRP-4 showed a high therapeutic efficacy in the mouse model intravaginally infected with HSV-2, as judged from the severity of herpetic lesions, the survival rate of mice at concentrations up to 50 μM nor HIV-1 reverse transcriptase activity at concentrations up to 400 μM.21
and virus shedding. On the other hand, orally administered BRP-4 resulted in moderate therapeutic efficacy against IFV based on virus yields in the mice. Moreover, BRP-4 stimulated the production of neutralizing antibody and the secretion of mucosal IgA in IFV-infected mice in spite of less antigens (viruses), implicating an attribution to the protective effect of oral administration of BRP-4 on IFV.

1.2.4 Anti-inflammatory:

EtAc extract of Basella rubra which is endowed with a moderate effect as an NF-κB inhibitor. The crushed leaves and the flowers juice of both species have been used against skin inflammations. The anti-inflammatory function was tested at concentrations of 25, 50, and 100 μM in murine macrophages stimulated with lipopolysaccharide (LPS). The results revealed that gomphrenin I suppressed LPS induced nitric oxide (NO) production in a dose-dependent manner and decreased PGE2 and IL-1β secretions at the highest concentration tested. The transcriptional inhibitory activities of gomphrenin I on the expression of inflammatory genes encoding iNOS, COX-2, IL-1β, TNF-α, and IL-6 were also observed.

1.2.5 Anti-ulcer:

The aqueous extract of Basella rubra linn. possesses significant and dose dependent anti-ulcer and cytoprotective effect. The aqueous extract of Basella rubra linn. has demonstrated antiulcer activity and leaves masticated kept in mouth helped relief aphthae.

1.2.6 Anti-cholesterol effect:

In vivo study was designed to investigate the hypocholesterolemic and antiatherosclerotic effects of Basella rubra using hypercholesterolemia-induced rabbits. Twenty New Zealand white rabbits were divided into 5 groups and fed with varying diets: normal diet, 2% high cholesterol diet (HCD), 2% HCD + 10 mg/kg simvastatin, 2% HCD + 100 mg/kg Basella rubra extract, and 2% HCD + 200 mg/kg B. rubra extract, respectively. The treatment with B.alba extract significantly lowered the levels of total cholesterol, LDL, and triglycerides and increased HDL and antioxidant enzymes (SOD and GPx) levels. The elevated levels of liver enzymes (AST and ALT) and creatine kinase were noted in hyper-cholesterolemic and statin treated groups indicating liver and muscle injuries. Treatment with B. rubra extract also significantly suppressed the aortic plaque formation and reduced the intima: media ratio as observed in simvastatin-treated group.

1.2.7 Antimicrobial:

In vitro antimicrobial activity of methanolic extract of Basella rubra leaves and Muntingia calabura was investigated. The extracts exhibited marked antimicrobial activity against gram positive and gram negative bacteria and fungi. Basella rubra showed mild inhibitory activity against Staphylococcus aureus, Basella rubra showed good inhibitory activity against Aspergillus niger.

1.2.8 Anti-hypoglycemic:

Study evaluated an aqueous extract of B. rubra for antihyperglycemic activity in STZ-induced diabetic rats. Phytochemical screening showed a rich source of phytonutrients, including enzymic and nonenzymic antioxidants. Results concluded the aqueous extract exhibited significant antihyperglycemic activity. A study of STZ-induced diabetic rats fed with Basella rubra showed the leaf pulp of B. rubra possesses a strong hypoglycemic effect.

1.2.9 Androgenic effect:

Basella rubra leaves were extracted with water, ethanol, methanol, dichloromethane, hexane and successive methanol and and mixed sex juveniles of Nile tilapia were subjected to dietary treatment with the extracts at the concentration of 0.5, 1.0 and 1.5 gm/kg feed. For dietary administration of Basella rubra leaves, the highest percentage of males (83.2±0.7) was obtained by treatment with ethanol extract at the concentration of 1.0 gm/kg feed. For all the solvents, the highest percentage of males was observed at the concentration of 1.0 gm/kg. Basella rubra has been reported to be used in traditional medicine to treat sexual asthenia and infertility in man. The methanol extract of its leaves was found to stimulate testosterone production in testicular fractions and Leydig cell cultures, and in normal adult albino male rats. Basella rubra induce the required hormonal imbalance needed to observe an effect on sex differentiation in guppy.

1.2.10 Immunomodulatory activity:

BRP-4, polysaccharide isolated from Basella rubra, is suggested to activate macrophage function and stimulate splenocyte proliferation. The strong immunomodulatory activity of BRP-4 confirmed its good potential as an immunotherapeutic adjuvant. The effects of the isoflavone genistein and methanol extract of Basella rubra leaves were evaluated in Nile tilapia, Oreochromis niloticus on growth and immunostimulation. Adult tilapia (mean weight 39.55 g) was fed diets containing genistein (1 gm/kg) and methanol extract of Basella rubra (1 g/kg) for 35 days.
Basella rubra extract treated tilapia showed significantly higher.

1.2.11 Urticaria:
The extracted juice is applied directly on the infected skin. The crushed leaves are mixed with cheese and it is then applied on the burnt places.

1.3.1 Qualitative examination of organic matter:

<table>
<thead>
<tr>
<th>Name of extract</th>
<th>Ethanol</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkaloid</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Glycosoids</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Proteins</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Starch</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td>Tannin</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Phenol</td>
<td>+</td>
<td>_</td>
</tr>
<tr>
<td>Saponin</td>
<td>_</td>
<td>_</td>
</tr>
</tbody>
</table>

1.3.2 Qualitative examination of inorganic matter:

<table>
<thead>
<tr>
<th>Contents</th>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium</td>
<td>_</td>
</tr>
<tr>
<td>Iron</td>
<td>+</td>
</tr>
<tr>
<td>Manganese</td>
<td>+</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>_</td>
</tr>
<tr>
<td>Potassium</td>
<td>+</td>
</tr>
<tr>
<td>Sulphur</td>
<td>+</td>
</tr>
</tbody>
</table>

Conclusion
It is strongly believed that above detailed information from extensive literature survey, on various activity of of B. rubra might provide detailed evidence for the varied pharmacological and medicinal spectrum. Toxicity of plant leaves also was investigated so there is need of further research in regard; how to expel the toxicity of plant leaf. However, evaluation needs to be carried out on of B. rubra in order to explore the concealed areas & their practical clinical application, which can be used for the welfare of the mankind.

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REFERENCES
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