

Dudhikalmi (*Ipomoea alba*) A Less Exploited Nutritive Plant- A Reassessment

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Abstract

The largest species of genus *Ipomoea* normally known as morning glories predominates in family Convolvulaceae which is known to occupy major tropical and subtropical regions of the world. The consumption of different species of *Ipomoea* has been reported since the traditional times and their use as medicine is also an orthodox. *Ipomoea alba* being highly rich in nutrients is widely used as raw or cooked vegetables in different regions of biosphere as it helps to heal certain unreliable happenings such as snake bites, filariasis, constipation, boils and wounds, also it overcomes obesity, used as antioxidant etc. Highlighting the essential feature of *Ipomoea alba* along with how its use is practised all over the world and focus on its medicinal importance is main aim of this review paper.

Keywords

Ipomoea alba, nutrition, filariasis, chloroform.

INTRODUCTION

World food trade deals largely with important food crops such as vegetables and due to diverse climatic condition of different places in world it ensures the consumption of vegetables across the year with great variations in it. Hominoid diet has a special role played by the vegetables as they are highly rich in minerals like phosphorus, iron, proteins, various vitamins like A, B, C, K and are part of human population since several years. Vegetables serves as a source to prevent several diseases and maintain good human health by repairing body with the help of several ingredient present in it. Several illnesses such as gastrointestinal health, weak eyesight, chances of heart disease, strokes, chronic diseases such as some form of cancer and diabetes can be easily cured by consuming the vegetables which are highly nutritious and has high fibrous content. Some photochemicals of the vegetables are strong antioxidant which are thought to eliminate the risk of chronic illness by increasing resistance against the free radical impairment by changing metabolic

activation and detoxification of carcinogens or even by controlling the processes that changes the course of tumor cells. All vegetables offer shield to humans from chronic diseases (Dias, 2012). The vegetables being source of biomolecules and nutraceuticals contributes a lot in combating the problem of malnutrition all across the globe.

Vegetables serves as the source of nutritional fuel for the body as 'Eat veggies' is the mantra we regularly listen from doctors this can be forsured as the doctors of the future will no longer cure the people frame with drugs, but rather will treat and prevent diseases with nutrition is truly said by Thomas Edison. The exact nutrition in humans could be accomplished either by raw or cooked vegetables which provides with amount of essentials that are required by the human body. Dieticians always suggest to supplement body with good amount of veggies one of the such veggie is *Ipomoea alba* which is consumed all over the world in form of vegetable is known to be source of various minerals and biomolecules such as Ipalbine and Ipalbidine,

alkaloids, flavonoids which are considered to play essential role in maintaining human health.

Ipomoea alba L (moon vine) native to tropical America member of family Convolvulaceae is a night blooming morning glory. (McDonald, 1994). In Mexico, treatment of paralysis as well as swollen tissue treatment is done by the decoction of the leaves of *Ipomoea alba* (Lim, 2014).

Latin name- *Ipomoea alba* L.



Synonyms

Calonyction aculeatum (L.) House,
Calonyction aculeatum var. *lobatum* (Hallier f.),
C.Y. Wu,
Calonyction album (L.) House,
Calonyction bona-nox (L.) Bojer,
Calonyction bona-nox var. *lobatum* Hallier f.,
Calonyction pulcherrimum Parodi,
Calonyction speciosum Choisy,
Convolvulus aculeatus L.,
Convolvulus bonanox (L.) Kuntze,
Convolvulus bonanox (L.) Spreng.,
Convolvulus pulcherrimus vell.,
Ipomoea aculeata (L.) Kuntze,
Ipomoea aculeata var. *bona-nox* (L.) Kuntze,
Ipomoea bona-nox L.

Family

Convolvulaceae

Local name

Dudhikalmi, Chandra pushpa, Munda-Valli, Gulchandi, Naganamukkorai, Naagaramukkattie.

English name

Evening glory, Giant moonflower, Good night flower, Moon flower vine, Moonvine, Prickly Ipomoea, Tropical white morning glory, White morning glory, White flowered morning glory.

Vernacular name

Maanblom (Africa), Boa-Noite, Flor-Da-Lua, Jetirana-Branca (Brazil), Kran-Hing (Burma), Yue Guang Hua, Yuck Kuang Hua (China), Liane Bla (French), Mondblute WeiBe Prunkwinde (Germany), Koali Pehu (Hawaiian), Yukai-So, Yoru-Gao (Japan), Camotillo, Haapolin, Nicua, Oracion (Spain/Mexico), Manvinda (Sweden), Ban Duek, Dok Phra Chan (Thai), Bim Trang (Vietnam).

Origin

This species is Indigenous to Tropical and Subtropical locations of the New World.

Naturalized Circulation

India, Myanmar, Bangladesh (Bandarban, Chittagong, Cox's bazar, Manikganj, Pabna and Rajshahi district etc). Moon Vine is native to American tropics, but it was naturalized in many places where it was introduced.

Habit- Herb, annual vine.

Habitat- Waste places, along roadsides and Jungles.

Ripening and Blossoming – Throughout the year it flourishes well.

Chromosome number- $2n=30$

Similar species: *Ipomoea grandiflora* Roxb., *Ipomoea longiflora*, *Ipomoea noctiflora*.

Morphological appearance

The flowers unwrap at night and are up to 6 inches (15 cm) across with a slender, equally long floral tube. The flowers made of 5 sepals, corolla lobes being 5 in number and are rounded, and a pale greenish yellow 5-pointed "star" radiating from the centre of the floral tube. Although they are night-blooming, the hefty, magnificent white flowers are easy to advert if any moonlight is available. They have greenish leaf which are heart shaped, sometimes 3-lobed and alternate. The stems of the plant are green and twining.

Physiognomies:

- The flowers shine in the moonlight and have a delightful evening fragrance.
- The name moonflower derives from their blooming in the evening and their being round in shape like a full moon.

Bioactive compounds known

Alkaloids, Anthraquinones, Anthracene glycosides, Cardenolides Leucoanthocyanin, flavonoids, polyoses Simple phenolics and saponin. Indolizidine alkaloids were attained from the seeds of *I. alba* such as ipalbline ipalbidine, isoipomine, ipalbidinium, dimethoxyipomine E-ipomine, Z-ipomine, methoxyipomine, and ipohardine (Ikhiri et al., 1987; Gourley et al., 1969). Ipalbidine owns nonaddictive pain-relieving properties (Honda et al., 2003; Wang & Chu, 1996). Moreover, it showed hindrance on respiratory burst of leukocytes and foraged oxygen-free radicals (Chen & Chu, 1998). Calystegines A5, B1 and B2 were attained from the herbal material and roots of *Ipomoea alba* (Schimming et al., 1998; 2005). Calystegines B1 and B2 are known to be powerful inhibitors of rat lysosomal β -glucosidase (Haraguchi et al., 2003).

The presence of resin glycosides is one of the characteristic Property of *Ipomoea alba*, the amalgam of oligosaccharides of monohydroxy and

dihydroxy C-14 and C-16 fatty acid is known as Resin Glycosides and there are 11 kind of resin glycosides reported in this species which was detected by reverse phase HPLC-RI method. HPLC along with mass spectroscopy helps in detection and identification of known and novel multidrugs resistant glycolipid constraints from the complex resin glycosides.

The 11 kind of resin glycosides are as follows stated in figure 1 as (1,2,3,4,5,6,7,8,9,10,11) [20]

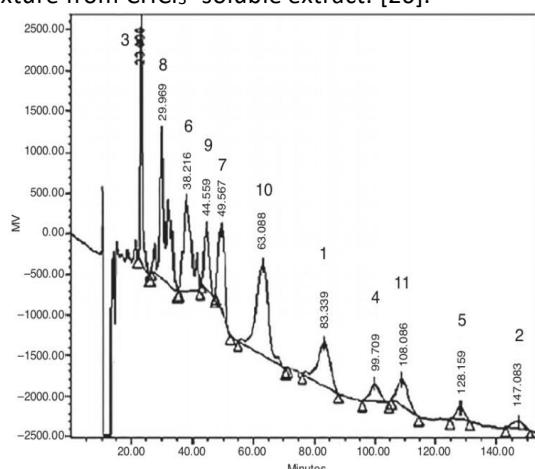
Albinoside X	Non cytotoxic with moderate activity.
Albinoside XI	Moderate activity with various Carcinoma cell lines including MCF-7/vin+ cells.
Albinoside I	Non cytotoxic with moderate activity.
Albinoside II	Non cytotoxic with moderate activity.
Albinoside III	-
Albinoside IV	-
Albinoside V	Non cytotoxic with moderate activity.
Albinoside VI	Non cytotoxic with moderate activity.
Albinoside VII	-
Albinoside VIII	-
Albinoside IX	-

HPLC-MS profiling helped-

: To record the fragmentation pattern of each eluted fraction and pure compound.

: In identification of novel compound as I and II as well as known compound III- XI.

Fig 1: HPLC Chromatogram for the resin glycosides mixture from CHCl_3 - soluble extract. [20].



Palatable Uses:

This species of *Ipomoea* is mainly used as vegetable in many locations of the biosphere. Fresh leaves and

fleshy calyces – cooked, Steamed and consumed as a vegetable or used in curries, soups, stews etc. They can also be dried for later use. Seed - eaten when young.

Nutritional Evaluation:

Nutrient per 100gm of fresh tissue: [5]

Sr.No	Nutrients	Per 100gm
1	Moisture content	66.45%
2	Crude Protein	2.25gm
3	Ascorbic acid	2.44gm
4	Lycoprene	10.67gm
5	Chlorophyll	
	Chlorophyll a	9.65mg
	Chlorophyll b	12.54mg
	Total chlorophyll	22.19mg
6	Reducing sugar	3.9gm
7	Non reducing sugar	8.4gm
8	Total phenol	3.9gm
9	Starch	0.43gm

Per Nutrients 100gm of dry tissue. [5]

Sr. No	Nutrients	Per 100gm
1	Ascorbic acid	1.36mg
2	Crude fat.	0.64%
3	Crude protein.	3.54gm
4	Non reducing sugar	10.2gm
5	Reducing sugar	4.2gm
6	Starch	0.623gm
7	Total Phenol	4.6gm

Remedial uses:

- The whole herb is used in treating snakebite.
- Root bark of *I.alba* purgative and leaves used in filariasis . The plant contains pentasaccharide glucoside of ethyl-11-hydroxyhexadecanoate. The seeds contain ipomine and dimethoxyipomine.
- The occurrence of alkaloids and flavonoids make *I.alba* an antitoxic and antioxidant aliment.
- Hypoglycemic activity of *I.alba* is due to occurrence of anthracene glycosides.
- This species of *Ipomoea* is also known to cure constipation, boils, wounds.
- Resin glycosides are potential constraints of multidrug efflux pumps in mammalian cancer cells.
- In Cameroonian tradition *Ipomoea alba* is used as an antidiabetic agent, Laxative and also Improves breast milk quality and helps in losing weight.
- Antibacterial and antifungal activity along with chloroform.

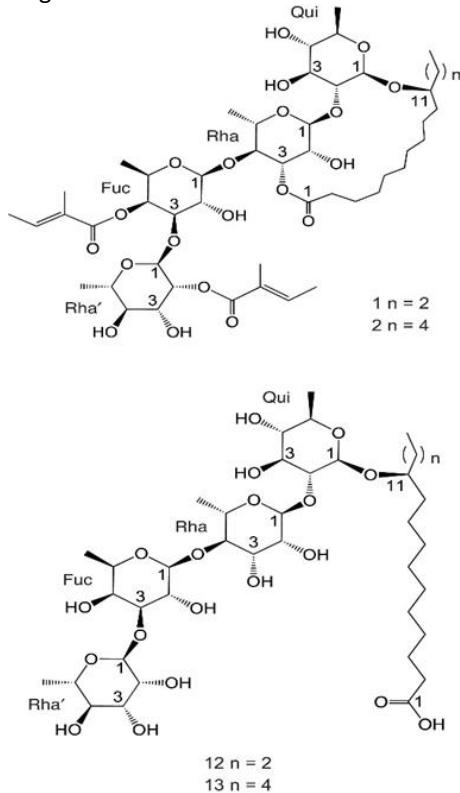
Place	Used as
Cameroon	Antidiabetic, Improves breast milk quality, weight loss.
China	Remedy for snakebites
India	Headache
Nigeria	Vegetables
Sierra Leone	Soups and Curries

Additional uses:

The Mesoamerican civilizations procedure *Ipomoea alba* to transform the latex from the *Castilla elastica* tree to yield bouncing rubber balls. The sulphur in this morning glory assisted in cross-linking the rubber, a process pre-existing Charles Goodyear's finding of vulcanization by at least 3,000 years.

Recent Research:

From Seeds of *I.alba*, albinosides X and XI were disinfected by salvaging liquid chromatography and their structural clarification was undertaken by nuclear magnetic resonance. Albinoside XI exerted a resilient potentiation of vinblastine liability in multidrug-resistant human breast carcinoma cells.



Structure of albinosides X and XI [20]

Antifungal and Antibacterial activity of *Ipomoea alba*.

On the cold extraction of grounded seeds of *Ipomoea alba* along with chloroform three fungus and several bacteria were known to culture for several generation to determine their mimimal inhibitory concentration (MIC) using broth microdilution

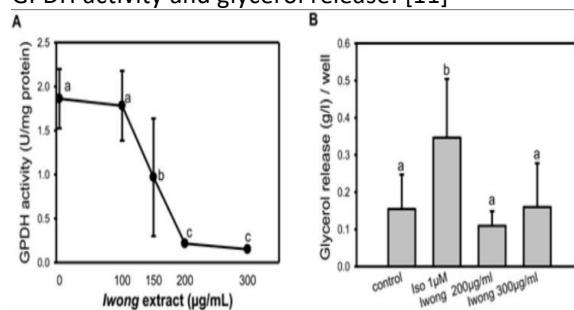
technique in a 96well microplate and for the cancerous cell IC50 were determined. It was witnessed that according to the MIC strong anibacterial and antifungal activity of *Ipomoea alba* against *E.faecalis* and *B.cereus* and also strong cytotoxic activity against MDA-MB-231 (breast tumor cell) was observed.

Bioactivity assay [7]	<i>Ipomoea alba</i>
Antibacterial activity	
<i>Bacillus cereus</i>	19.5
<i>Enterococcus faecalis</i>	19.5
<i>Staphylococcus aureus</i>	625
<i>E. coli</i>	1250
<i>Pseudomonas aeruginosa</i>	1250
<i>Salmonella typhimurium</i>	1250
<i>Serratia marescens</i>	1250
Antifungal	
<i>Aspergillus niger</i>	312
<i>Candida albicans</i>	1250
<i>Cryptococcus neoformans</i>	156
Cytotoxicity	
Hs578T	-
MDA-MB-231	35.72 (±1.86)

Role of *Ipomoea alba* in Adipogenesis.

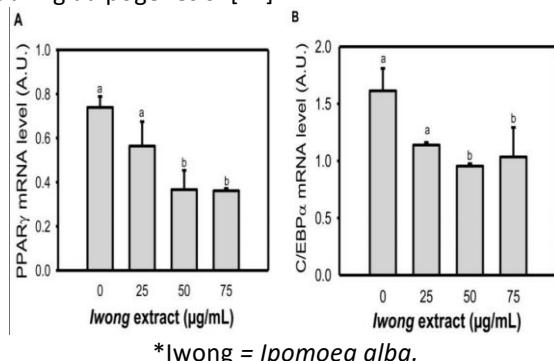
The role of Adipogenesis in *I.alba* could be significantly studied by the action of inhibiting triglycerides accumulation in the early phase of adipogenesis. The reduction in the activity of glycerol-3-phosphate significantly and PPAR γ and C/EBP α mRNA level helps greatly in reducing the accumulation of Lipids as this species of *Ipomoea* contains the natural substance which is potentially suitable for reducing obesity via helping in reduction in Lipid gathering in body.

Fig 2. Effect of ethanolic extract of *Ipomoea alba* on GPDH activity and glycerol release. [11]



2.(A) GPDH activity was measured after 9 days of treatment with different doses of *Ipomoea alba* extract. 2.(B) Effect of *Ipomoea alba* extract on lipolysis, post confluent Preadipocytes were differentiated for 14days then treated for 24h with 200 and 300 μ g/ml of *Ipomoea alba*. [11]

Fig 3. Effect of ethanolic extract of *Ipomoea alba* on the mRNA level of two key transcription factors during adipogenesis. [11]



CONCLUSION AND DISCUSSION

The richness of nutrition and phytochemicals among the plant vegetable is least discovered and less known to the people all around the globe. There is essentiality to spread the knowledge of these vegetables, their essential properties and beneficial effects on ones body. The greatness and variability in nutrition provides human with good health and their phytochemical helps people to fight against several pathogenic organism. Hence there must be great concern among the humans to conserve these plants which are important from both point of view that its phytochemistry and nutritional value. Keeping in mind the scenario of the present world and the evolution of new pathogenic virus like Covid-19, hominids needs the involvement of some extra natural immunity boosters in their diet which will help them in staying safe and healthy by protecting their body from these pathogens, seeing the potentiality of *Ipomoea alba* it could be considered as one of the natural idoliser of immunity and could help in prevention of many ailment naturally if used in a proper way with proper concerned knowledge of its benefits.

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