



## ***IPOMOEA DIGITATA*: A THERAPEUTIC BOON FROM NATURE TO MANKIND**

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Family Convolvulaceae consists of the largest number of species of the genus *Ipomoea* commonly known as Morning glories found in tropic and subtropic regions of our globe. From the classical times several *Ipomoea* species are used as Medicinal herbs and are consumed as raw foods showing various fascinating effects. One of such species among the morning glories is *Ipomoea digitata* Linn which can be considered as gift of nature to mankind as it has certain pharmaceutically important promising properties such as hypoglycemic, anti-inflammatory, antioxidant, aphrodisiac and anticonvulsant, etc., This review paper deals with an objective of drawing attention to morphological, phytochemical and pharmacological information along with certain important metabolites in *Ipomoea digitata*.

**Keywords-** Antidiabetic, aphrodisiac *Ipomoea digitata*, medicinal plant.

In the entire biosphere Medics are considered as God and are waged for curing us from several kinds of diseases. Though we must pay back to nature by planting trees as nature has provided us with the remedies of approximately every small to big disease from the prehistoric times as mentioned in ancient Unani manuscript, Chinese writings, Egyptian papyrus and Vedas, etc. The primitive man has always appreciated the nature in every form as the nature has provided its various kinds of resources and remedies such as Neem, Tulsi, Sadabahar, etc. against several infections and diseases. Many of the medicinal properties of different herbal plants have been observed by certain kinds of experimentation and slip-up methods before actually considering them all (Ramchara 1999). Population growth at such a drastic rate has led to inadequate supply of synthetic drugs as they are labour requiring, costly and may have many negative impacts on body such as kidney failure, cardiovascular disorders, gastric and many digestive issues.

Ayurveda has described India as a rich repository of herbal medicines due to large area of India under forest cover with rich herbal and aromatic plants. AYUSH ministry for herbal medicine has codified about 8000 remedies for curing several diseases. Recent research by WHO has made an estimate that about 80% of

the people in the world rely on the herbal medicines for their primary body care (Chandira and Jayakar 2010). About 21000 plant species have the potential to be categorized under herbs, indeed out of 25 ethical drugs allocated in the united states at least one contains bioactive ingredient derived from plant whereas considering the developing lands such as India, China, the contribution is nearly 80% (Austin 1997).

The Golden fact to be considered about the herbal medication is one of the safest source to keep the body fit with 0% side effect and is independent of age groups or sex. Herbal medicines are safe for both human beings and for environment as compared to the synthetic drugs.

Alligator yam botanically called as *Ipomoea digitata* is one of such herbal plants which have been proved to be very effective in curing many of the severe diseases, such as hyperglycaemia, inflammation, convulsion, indigestion, spermatorrhoea, aphrodisiac activity, menstrual problems, GI tract infections, stiffing etc. due to the presence of various pharmacological compounds such as  $\beta$ -sitosterol, Resin glycosides, Scopoletin, Teraxerol, etc. The present paper is focused at reviewing the important facts, pharmacological character, bioactive

compounds, ecological status of alligator yam which has been one of the Golden plants considering modern health care and lifestyle system.

**Latin name:** *Ipomoea digitata* Linn (Austin 1997).

**Synonyms:** *Ipomoea cheirophylla* O' Donell, *Ipomoea mauritiana* Jacquin. *Ipomoea paniculata* R. Br. Burm.

**Common name:** Milky yam, Alligator yam, finger leaf morning glory, palm leaf morning glory (Indian); Vrishyavardhini (Sanskrit); Palmutakku (Malayalam); Valli (Tamil); Bhuchakragadda, Chirugummudu, palamodikku (Telugu); Vidari (Kannada); Vidarikand (Marathi);

#### **Taxonomic position**

Class- Magnoliopsida  
Order- Polemoniales  
Family- Convolvulaceae  
Genus- *Ipomoea*  
Species- *digitata*

**Similar species:** The species *Ipomoea digitata* is similar to the common 'aurora' (*Ipomoea carica*), differing only in its much larger leaves and flower, Fig 1.

**Origin:** It has been recorded in Gambia, riparian forest of Benin and widely in West Africa although the origin is uncertain, also reported in Australia's Northern Territory and is enfranchised in many parts of the world, including Taiwan.

**Naturalized distribution:** The plant has been naturally distributed across the globe in the regions like Australia, Belize, Benin, Brunei, Cambodia, Cameroon, China, Colombia, Costa Rica, Côte d'Ivoire, DRC, Ecuador, Equatorial Guinea, Gabon, Ghana, Guinea, Honduras, Indonesia, Laos, Liberia, Madagascar, Mauritius, Micronesia, Federated States of Myanmar, New Caledonia, Nicaragua, Nigeria, Panama, Papua New Guinea, Peru, Senegal,



**Figure 1:** Morphological Appearance of *Ipomoea digitata*

Sudan, Tanzania, Thailand, Togo and Venezuela. In India it is found in moist temperate regions such as Bihar, Orissa, West Bengal, Assam and the western coastal regions of Konkan to Kerala.

#### **Distinguishing Feature:**

- Lushful Climber or creeper.
- The heart shaped base and round outline of the leaves which are Palmately arranged in 5-7 segments make it distinctive from other species.
- August-September is the flowering season with Pink to reddish purple flower.
- 4 black colored flattened seeds (8\*6mm) are present in each fruit with cottony brown hairs and shows epigeal germination.
- Milky latex is found.

**Morphological appearance:** Reaching up to a height of 7-10m height, it is a long-lived perennial climber, large glabrous liana with tuberous roots, stems twinning, leaf blade orbicular in outline, entire or palmately 3-9 lobed; 6-24cm in length and 6-18cm wide, the base being cordate or truncate, lanceolate or ovate lobe, acuminate apex, petioles 3-11cm long, Inflorescence few to many flowered, peduncles 2.5-20cm long; pedicels 0.9-2.5cm long; flower buds globular, markedly the sepals are convex clasping the corolla tubes

narrow below 5-6cm long, capsule void obtuse, 1.2-1.4cm long, seeds 6-7mm long black covered with approx. 7mm long silky hairs (Sonia *et al.* 2017) Fig 1

T.S. of tuberous root of *Ipomoea digitata* shows the presence of starch grain and resin ducts, the starch grains are known to be the storage site of sugar units namely glucose. The Resin duct is basically known to have antifungal property and protect the plant from various infections Fig 2.

**Medicinal components of the plant:** Tuberous root (used in powdered form) (Matin *et al.* 1969). The dosage of tuberous roots utilized usually 3-6gram powdered form is effective in treating various diseases (Nelkamal 2009).

**Pharmacopoeia Aspects of *Ipomoea digitata* described in Ayurveda:**

- Rasa (Juice)- Tikta/ Bitter, Kashaya/ Astringent, madhura/sweet.
- Guna (Characteristics)- guru/heavy/ unctuous/sharp.
- Virya (Potency)- Sheet/cool.
- Vipaka (Post digestive effect)- Madhura/Sweet

**Bioactive component and structure-** Survey of various literary source reveals the presence of various Phytochemical/ bioactive compound described in list. (Table: 1)

The major phytochemicals known till date are

**Table 1: Bioactive compounds in *Ipomoea*** (Chandira & Jayakar, 2010).

Name of Extract	Acetone extract	Chloroform extract	Ethanol extract	Hydro-ethanolic extract
Alkaloids	+	-	+	+
Carbohydrates	-	-	+	+
Fat and oils	-	-	-	-
Flavonoids	-	-	+	+
Glycosides	-	-	-	+
Phytosterols	-	+	+	+
Proteins	-	-	+	+
Resins	-	-	+	+
Saponins	-	-	-	+
Tannins	-	-	-	+

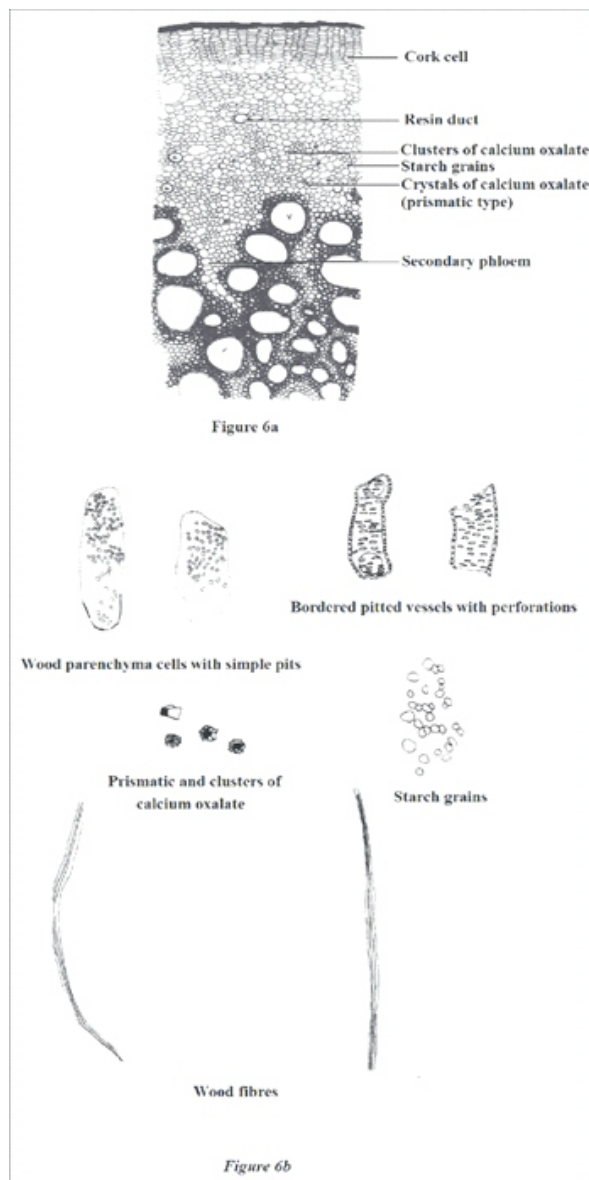


Figure 2- (Chinmay & Kumari S. 2020). 6a: T.S. of root tuber of *Ipomoea digitata* L. (Cellular details) 6b: Powder characteristics of *Ipomoea digitata* L

**Table 2:** The major phytochemicals known till date are Resin glycosides, Scoperon, β-sitosterol, taraxerol (.Mofiz & Sagar, 2015).

Major phytochemical	Colour	Detected by
B-sitosterol	Whitish pink	<sup>1</sup> H NMR & Mass spectrum
Trans-cinnamic acid(C <sub>20</sub> H <sub>30</sub> O <sub>3</sub> )	White powder	<sup>13</sup> C NMR
5-Hydroxy-7 Methoxy Coumarin	Pale yellow colour	<sup>1</sup> H NMR
Resin glycoside	Brown colour	<sup>1</sup> H NMR

Resin glycosides, Scoperon,  $\beta$ -sitosterol, taraxerol. (Table 2)

The leaves and stems of *Ipomoea digitata* are a rich source of Resin glycosides namely **digitata jalapin I** (Ojha & Mishra 2016).

***Ipomoea digitata* aids in human body make up** (Hesham *et al.* 2002).

Helps in:

- Stimulating Myometrium contraction during Labour pain.
- Gaining weight.
- Vasoconstriction and Bronchoconstriction.
- Reducing the level of Lipoproteins and Lipids.
- Protecting from Liver infections.

**Table 3:** Other species of genus *Ipomoea* with rich medicinal aspects (Mofiz & Sagar 2015).

<i>Ipomoea</i> Species	Curing disease
<i>Ipomoea alba</i>	Filariasis
<i>Ipomoea aquatica</i>	Diarrhoea, diuretic, diabetic
<i>Ipomoea asarifolia</i>	Abortifacient, oxytocic
<i>Ipomoea batatas</i>	Anticancerous, Tumor of mouth & throat
<i>Ipomoea cairica</i>	Antioxidant, Larvicidal, Rheumatism
<i>Ipomoea carnea</i>	Antibacterial, antifungal, hepatoprotective, antioxidant, anticancer, anticonvulsant, anxiolytic, sedative, wound healing
<i>Ipomoea dissecta</i>	Intoxicant in snake bites.
<i>Ipomoea eriocarpa</i>	Rheumatism, Leprosy, Epilepsy, Ulcer, Fever
<i>Ipomoea hereracea</i> Jacq	Abortifacient, antihelminthic, deobstruent, diuretic.
<i>Ipomoea imperti</i>	To treat postdelivery (child birth)
<i>Ipomoea involucrate</i> P.	Oedema, gout, Menstrual problems
<i>Ipomoea oblongata</i>	Cardiovascular disease, Impotence
<i>Ipomoea pes caprae</i> (L.)	Treats gastrointestinal disorder
<i>Ipomoea purpurea</i>	Fungal infection, Liver protection, syphilis
<i>Ipomoea quamoclit</i> L.	Piles
<i>Ipomoea tuberosa</i>	Swollen bellies
<i>Ipomoea violaceae</i>	Expectorant, cough, Indigestion.

- Vitalizes body by reducing Blood sugar level.
- Promotes Respiration.
- Treating Constipation.
- Regulating Menstruation.
- Rejuvenating Old age.

**Pharmacological activity** (Maurya *et al.* 2004)

- .Antidiabetic activity.
- Antioxidant potential.
- Galactagogue activity (Breast feeding/ Lactation)
- Hepatoprotective activity.
- Hypertension, Blood pressure and other Cardiovascular risk
- Indigestion.
- Infertility.
- Revitalizing effect.
- Spasmogenic effect.
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**Other species of genus *Ipomoea* with rich medicinal aspects:** (Table: 3)  
**Important medicinal properties**

**1-Anti-diabetic Property:** In a survey a report has been presented on the basis of evaluation of in-vivo and in-vitro antidiabetic activity of *Ipomoea digitata's* tuberous root in streptozotocin induced diabetic rat in which the activity of  $\alpha$ -amylase Inhibition is shown since high concentration of amylase digests starch (Shirwaikar 2006). (Annie *et al.* 2005). (Nagappa 2003). In in-vitro studies as the concentration of  $\alpha$ -amylase increases the rate of reaction also increases up to a particular time and then decreases thereafter. In *in-vivo* studies the tablets of aqueous extract (Carbopol) of *Ipomoea digitata* are used to study the role in diabetic patients which revealed that the plant has important potential in inhibiting the glucose level and inflammation to protecting from Hyperglycemia (Kokate 2007), (Mali *et al.* 2011)

**2-Antioxidant property:** New scientific research has reported the antioxidant potential of *Ipomoea digitata* both in-vivo and *in-vitro*.

The singlet (reactiv) oxygen species (ROS) which is known to destroy several cellular structures resulting in various pathological and physiological disorders such as Atherosclerosis, disorders of nervous system, certain viral infections and many cardiovascular disorders. The antioxidant potential *in-vitro* has been significantly demonstrated by free radical scavenging activity of the methanolic extract of tuberous roots of *Ipomoea digitata* Linn. using hydroxy radical method i.e., FRAP method (Ferric reducing antioxidant power). The increase in different antioxidant enzymes like SoD (superoxide dismutase), Catalase (CAT), Glutathione reductase and TBARS (thiobarbituric acid reactive substances) has significantly led to the study of antioxidant property *in-vivo* (Sonia *et al.* 2017)

**3. Increased Lactation:** Traditionally lactation could be increased by the juice of tuberous roots. In mothers the breast milk production was stimulated by using stimulators of lactogenic hormones (Galactogogue). The consumption of powdered tuberous roots of *Ipomoea digitata* has revealed increase in serum Prolactin, glycogen of mammary gland along with mil secretion in ducts.

**4. Control High blood pressure:** A teaspoon full powdered tuberous roots of *Ipomoea digitata* have been known to be remarkably effective in controlling high Blood pressure, hence reduces the stress level by reducing the lipid profile and lipoproteins accumulation in body. It provides with the feeling of calmness and connectedness.

Powdered tuberous extract study on males of certain different age groups between 40-50 resulted in decrease of systolic/diastolic mean Blood pressure, Thus it is called rejuvenating agent or tonic for old age, it also led to the analysis of increased fibrinolytic activity. Serum antioxidant status was favourable exhibiting decrease in serum, total cholesterol, triglycerides, VLDL-c, LDL-c proving its Antihypertensive effect (Sapakal *et al.* 2008).

**5. Anti-Obesity property:** When a dose of 300mg/kg of methanolic extract of tuberous roots was used it worked as a substitute for reducing weight hence proved its Antiobesitic effect, which in turn promotes strength by making body fit and healthy (Mishra *et al.* 1965).

**6. Increases Fertility:** In Spermatorrhoea (involuntary flow of semen without orgasm) the fluid of fresh tuberous roots of *Ipomoea digitata* along with cumin (jeera) and sugar is proved to be effective. The juice has been proved to be operative in increasing sperm density, sperm motiity, serum levels of testosterone, FSH, LH. The presence of Ergonovinea, a powerful alkaloid in *Ipomoea digitata* is extremely helpful in regulating menstrual bleedings also the mixture of ghee, sugar and milk boiled dried roots have proved to be effective in improving weight and moderate menstrual discharge.

**7. Other Activities:** Powdered form of tuberous root, wheat flour, barley, milk, ghee, sugar and honey in equal parts is consumed as a restorative for emaciated and debilitated children.

Gums of seeds and its graft copolymer with polyacrylamide have the capability to be used as pharmaceutical gums and its structure and properties are similar to guar gum and locust bean gums. Thus, pharmaceutically it is important.

Ulcers, Hemorrhoids, GI tract disorders and nagging coughs can be cured using the powder of tuberous roots of *Ipomoea digitata*. It is a good anti-inflammatory agent thus helping in pain and stiffness. *Ipomoea digitata* is regarded as good stimulant thus helpful in increasing vitality and energy and also helpful in treatment of enlarged liver and spleen.

## CONCLUSION

Herb and herbal products are consumed since time immemorial as they are very effective and least toxic and less costly. As shown in

Ayurveda, its significance and importance has been established by various research and experiments by great vaidas, maharishis and scientists. Various trial and error methods are always performed on one or more plants to know the important constituents of the plant and how effective are they in curing several diseases (Chandira & Jayakar 2010). The review of *Ipomoea digitata* helped us to know the importance of this plant in treating various disorders and diseases. Its significance has been studied by various researchers and the studies are still continuing to further explore the importance of the plant specially its tuberous roots, so it could be considered as a nature's gift to mankind. In the present scenario of the biosphere, 95% of people depend on medicine for either of the reasons, but the allopathic medicine is so harmful that it causes brain hemorrhage, kidney failure and sometimes strokes so if we replace these allopathic medicine with the herbal medicines obtained from various plants such as *Ipomoea digitata* could be helpful to mankind as well as nature.

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