Biospectra : ISSN: 0973-7057, Vol. 16(2), September, 2021, pp. 139-144 **27(PS).**
An International Biannual Refereed Journal of Life Sciences **Plant Science**

ISSN : 0973-7057

Int. Database Index: 616 www.mjl.clarivate.com

Phytochemical screening of primary and secondary metabolites in four species of *Ipomoea* (*I.aquatica, I.batata, I.carnea, I.palmata*)- an underutilized ethnomedicinal weeds of Jharkhand

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Received : 14th June, 2021 ; Revised : 15th July, 2021

Abstract- The present study deals the screening of primary and secondary metabolites in four underutilized weed species of *Ipomoea* (*I.aquatica, I.batata, I.carnea, I.palmata*). Screening was done in aqueous extract by using standard protocol. The result shows the presence of primary metabolites (carbohydrate and protein) in all the selected weed species. For screening of secondary metabolites test for saponin, tannin, phenol, glycoside, terpenoid, steroid and flavonoid was done. The result shows the presence of steroid, tannin, phenol, alkaloid and terpenoid in all the selected species. Saponin was highest in both *I.palmata* and *I.carnea* while flavonoids are absentin *I.carnea*. In *I.batata* glycosides and saponin are absent and in *I.aquatica* all the screened phytochemicals were present. The process was doneto see the status of nutritional and therapeutic uses of these underutilized weed species.

Key words: *Ipomoea*, ethnomedicinal, underutilized, weeds, primary and secondary metabolites, screening.

INTRODUCTION

The family Convolvulaceae comprises about 1650 predominantly tropical species. The genus *Ipomoea*, comprises the largest number of species within the Convolvulaceae with approximately 500-600 species[1]. This family is dominated by twinners or climbers, woody or herbaceous plants having heart-shaped leaves and funnel-shaped flowers[2]. It occurs in the tropical as well as temperate region of the world[3]. The species of this genus are mainly distributed throughout the South and Central America countries, and Tropical Africa territories. Since time immemorial the genus *Ipomoea* have been used for nutritional, medicinal, ritual and agricultural purpuses[4].

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Medicinal properties of some species of genus *Ipomoea* are mentioned here. *I. aquatica* is used as blood purifier, roots are used for the inhibition of prostaglandin synthesis[5]. Plants are used to treat diabetes and obesity[6], blood purifier, Urinary tract infection, emetic, mild, purgative and used as antidote for opium and arsenic poisoning. It is used against liver complaints, nosebleed and high blood pressure[7]. Plant extract possesses antibacterial activity against *E.coli, P.aeruginosa* and *B.subtilis*[8]. Leaves of *I.batata* can be used as effective and eco friendly control of mosquitos causing dengue, Urinary tract infection, Malaria and filariasis. It is folk therapy for asthma bug bites, burns, fever, ciguatera, diarrhea, nausea, spleenosis, stomach distress tumors and whitlows[9]. Aqueous extract of *I.cairica* showed anti-RSV

(Respiratory syncytial virus) activity[10]. Ethanolic extract presents antinociceptive effect[11,12]. It posses antioxidant and anti-inflammatory activity[13]. It inhabited the replication of human immunodeficiency virus[14]. Medicinally it is used as an antioxidant, anti-inflammatory, antiviral and highly potent against malaria[15]. *I.campanulata* used as antidote to snake poison[16]. *I.carnea* possesses antioxidant, antifungal, antibacterial, antimicrobial, anti-diabetic, anticancer, anti-inflammatory, immune modulatory, wound healing and embryo toxic activities. Leaf paste is applied on Haja (blister between toes and fingers due to fungal infection)[17,18]. Some of the species of *Ipomoea* have been documented by me in my previous paper among which four species have been taken into consideration that was abundantly present in Ranchi and its native areas. *Ipomoea carnea* and *Ipomoea palmata* was found invasive in nature.

Jharkhand is one of the biodiversity rich regions of India because of its diverse physiographic and climatic condition. The state is known for the forest tracts of Chotanagpur plateau and Santhal Pargana with different types of culture and tradition. Many weeds, herbs, fruits, vegetables and seeds are consumed by the tribals as an alternative staple food. In Jharkhand, many species of *Ipomoea* (*I.carnea, I.cairica, I.alba, I.digitata, I.aquatica, I.quamoclit* etc.) are found growing on waste area generally disturbed soil, forest margin, open road lands, fences and growing near water waste as weed. In Jharkhand this plant species shows a luxuriant growth and is also used as a conventional nutritional supplement. But most of the species are still underutilized and are being destroyed rapidly from various places. Reason may be treating the plant as weed, changing climate and its less economic exploitation, due to urbanization, industrialization and lack of knowledge about its utility. Phytochemical screening is the first essential step taken to see the status of nutritive and therapeutic uses of these plants.

METHODOLOGY

Plants were collected from Ranchi and its native area and authenticated in university Department of Botany, Ranchi University, Ranchi. The fresh leaves were plucked, washed with tap water followed by distilled water and then air dried. The dried leaves were powdered and stored in a air tight container.

Plant extract preparation: 5gm leaves were added to 200ml distilled water and kept in magnetic stirrer at 50-60^{o}C for an hour in reflux condition. The extract was filtered using Whatsmann no. 1 filter paper. The extract was kept in refrigerator for further process.

i. **Test for Carbohydrate: Molish test:** 2ml extract mixed with few drops of Molish reagent. 2ml sulphuric acid poured carefully along side of test tube, appearance of violet ring interphase indicates the presence of carbohydrate.

ii. **Protein test; Ninhydrin's test:** 2 drops of 2%Ninhydrin solutionis added to 1ml of extract andheat and observed for blue or violet colour.

iii. **Test for Tannins:** To 1 ml of the extract is taken in a test tube and 2ml of 5% $FeCl_3$ is added to it. Formation of dark blue or greenish black colour indicate the presence of tannin .

iv. **Test for phenols:** 1ml of plant extract is taken in a test tube and few drops of of $FeCl_3$ solution is added to it. Formation of blue green colour and indicate the presence of phenols.

v. **Test for Glycosides: (Salkowski test)** To 1 ml of plant extract, 1 ml FeCl3 (5%), and equal amount of acetic acid is added in a test tube, then few drops of H_2SO_4 is added to the mixture. Greenish blue colour indicates the presence of glycosides.

Keller-kilani test- 5ml extract taken in a test tube 2ml glacial acetic acid and 1-2 drops of 2% $FeCl_3$ added to it. Mixture poured in other test tube containing 2ml H_2SO_4. Brown ring in interphase indicate the presence of glycoside.

vi. **Test of Saponin:** Foam test: A small amount of extract was added to distilled water and shaken vigorously formation of persistent froth indicates the presence of saponin.

vii. **Test for Steroids: Salkowski test:** 1 ml of extract was added to 1 ml of chloroform and 1ml of concentrated H_2SO_4. Formation of cherry or bluish red colour in chloroform layer shows the presence of steroid.

viii. **Test for flavonoid:** 1ml extract mixed with 2ml 2%NaOH. Intense yellow colour indicates the presence of flavonoid.

ix. **Test of alkaloid:** 1ml extract added to 5ml 1% HCl on steam bath few drops of Dragondroffs reagent added to it. Formation of reddish brown ppt indicates the presence of alkaloid.

RESULT & DISCUSSION

Table 1 : Showing the presence of phytochemicals in different species of *Ipomoea*

Sp. of *Ipomoea*	Steroid	Glycoside	Saponin	Tannin & phenol	Flavonoid	Terpenoid	Carbohydrate	Protein	Alkaloid
I.aquatica	+	+	+	+	+	+	+	+	+
I.batata	+	-	-	+	+	+	+	+	+
I.carnea	++	++	++	++	-	++	+	+	+
I.palmata	++	+	++	+	+	+	+	+	+

The study showed that the aqueous extract of the leaves of *Ipomoea* of all the selected species contain protein and carbohydrate i.e., primary metabolites and in secondary metabolites steroid, tannin, alkaloid, phenol and terpenoids are present in all the species. Glycosides and saponin are absent in *I.batata* and flavonoid is absent only in *I.carnea*. In *I.aquatica* all the screened phytochemicals were present.

The presence of these bioactive phytochemical constituents of the plant shows different types of physical effects on the human body. Studies support that polyphenols prevent many cardiological, neurodegenerative diseases, osteoporosis, cancer and diabetes. Various animal based experiments had supported the protective effects of polyphenols in neurodegenerative disorders and brain function deterioration. Antioxidant properties of polyphenols have been studied widely but its mechanism of action is more than prevention of oxidative stress. As antioxidant they improve cell survival[19].

Flavonoids acts against bacterial, viral, cardiovascular diseases, cancer and other age related diseases. These act as secondary antioxidant and as a defence mechanism in plant tissues against biotic and abiotic stresses. Their functional hydroxyl group is responsible for scavenging free redicals and chelating metal ions In addition there hepatoprotective, antibacterial, anti- inflammatory, anti viral and anti cancerous activities have been also reported[20].

Alkaloids are being used as medicines, drugs in mixture, teas and poultices and for more than 4000 years. It contain different physiological activities in humans as well as in animals. Many alkaloids are used as caffeine (Psychostimulant), codeine (Anti tussive agent that suppresses the coughing reflex), cocaine (local anaesthetic), morphine (analgesic) and quinine (antipyretic)[21].

Various classes of terpenoids have shown cytotoxicity against variety of tumor cells and anticancer properties in animals. These compounds have been reported in reduction of oxidative stress, suppression of inflammation, induction of apoptosis, regulation of cell cycle, inhibition of cell proliferation and different signal transduction pathways. In the present investigation, we found that all the selected plant species contain phenol and flavonoids[22].

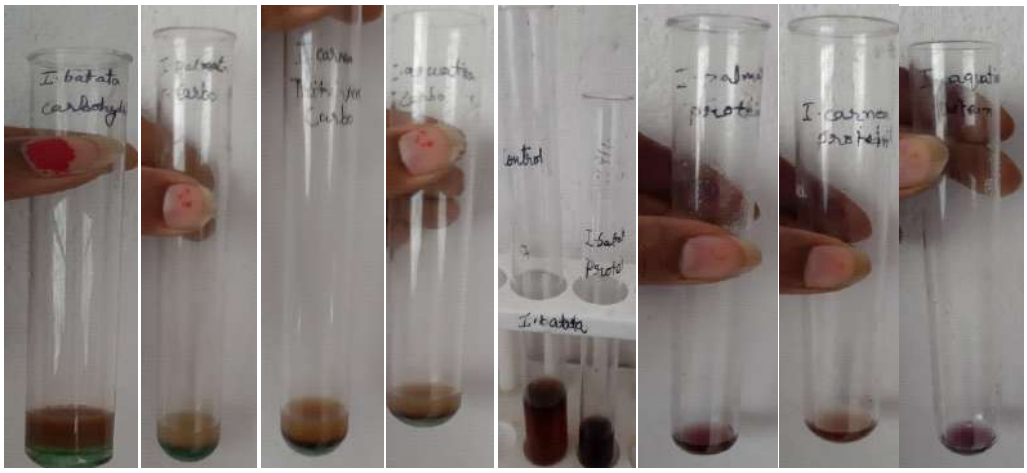
Plant steroids are the phytoconstituents found in both plant and animal kingdom. A specific class of steroids, glucocorticoids is widely used for the suppression of inflammation in chronic inflammatory diseases which are associated with increased expression of inflammation genes by binding to glucocorticoid receptors on multiple signaling pathways. However, some adverse effects are also seen due to their prolong uses such as immunosuppression, hypertension, osteoporosis and metabolic disturbance[23].

Saponins are compounds having high molecular weight of sugar molecule and triterpene or steroid aglycon, so there are two types of saponins; triterpene saponins and steroid saponins. These are therapeutically important as they show hypolipidemie and anticancer activity of cardiac glycosides[24]. Phenolic groups these are used as antiseptic. In ayurvedic medicine system, tannin rich plants are used to treat leucorrhoea, diarrhea and rhinnorhoea[25]. Glycosides are the phytochemicals used to treat congestive heart failure and cardiac arrhythmea. These compounds work by inhibiting the Na+/K+ pump[26].

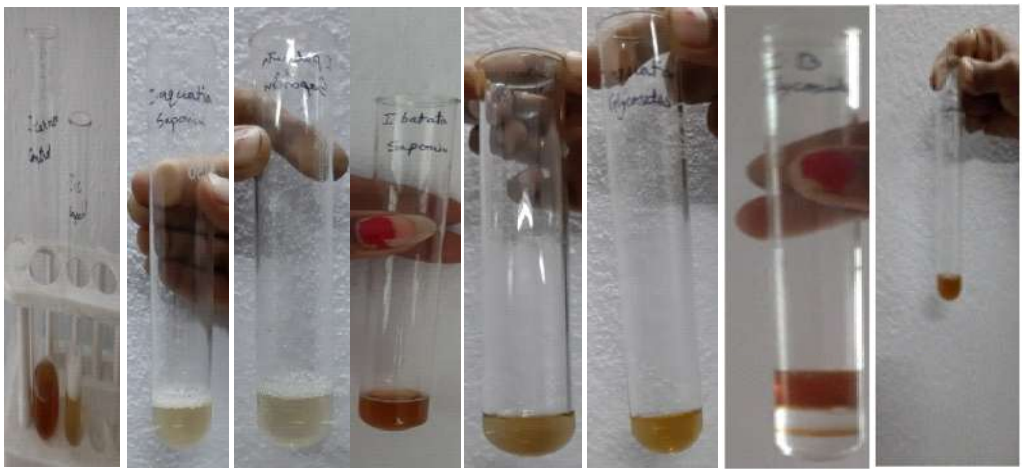
So through phytochemical screening one could detect the various important compounds which could be used as the base of modern drugs for curing various diseases. It is reported that the polyphenolic compounds, as like phenolic acids, flavonoids and tannins, commonly found in different plants and exert multiple biological response[27].

Photographs

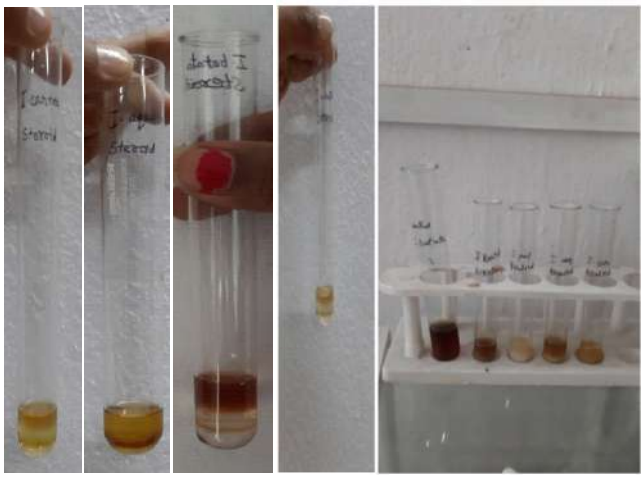
Picture 1 : Preparation of extract of different species of *Ipomoea*



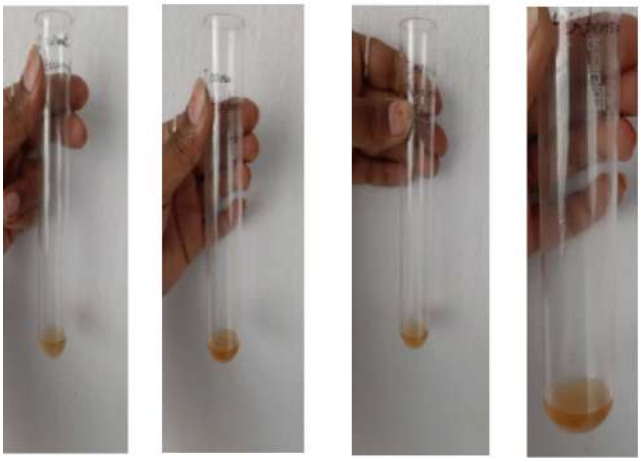
Picture 2: Phytochemical screening of primary metabolites (carbohydrate and protein)



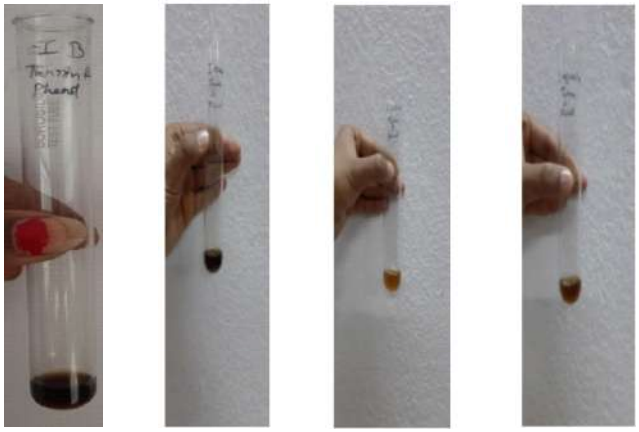
Picture 3: Screening of saponin and glycosides



Picture 4: Screening of steroid and alkaloid



Picture 5: Screening of terpenoid



Picture 6: Screening of tannin and phenol

Picture 7: Screening of flavonoid

CONCLUSION

On the basis of result, it can be concluded that all the selected plant species contain high amount of phytoconstituents except *I.batata* in which glycoside and saponin are absent. Further work is needed to analyse more information about these valuable, non toxic and natural compounds so that they can be used in different pharmaceutical purposes. The presence of various primary and secondary metabolites indicates that the above plants have various pharmacological uses and can show antimicrobial activity.

REFERENCES

1. **Austin DF. 1997.** Convolvulaceae (morning glory family). http:// ag.arizona.edu/herbarium/assoc/ people/daustin/convolv. html, acessed May 2011.
2. **Austin DF, Huáman Z. 1996.** A synopsis of *Ipomoea* (Convolvulaceae) in the Americas. *Taxon* **45:** 3-38.
3. **Cao S, Guzza RC, Wisse JH, Miller JS, Evans R, Kingston DGI. 2005.** Ipomoeassins A-E, cytotoxic macrocyclic glicoresins from the leaves of *Ipomoea squamosa* from the Suriname rainforest. *J Nat Prod* **68:** 487-492.
4. **Pereda-Miranda R, Bah M. 2003.** Biodynamic constituents in the mexican morning glories: purgative remedies transcending boundaries. *Curr Top Med Chem* **3:** 111- 131
5. **Tseng CF, Mikajiri A, Shibuya M, Goda Y, Ebizuka Y, Padmawinata K, Sankawa U. 1986.** Effect of some phenolics on the prostaglandin synthesizing enzyme system. *Chem Pharm Bull.* **34:**1380-1383.

6. **Okudaira R, Kyanbu H, Ichiba T, Toyokawa T. 2005.** *Ipomoea* extracts with disaccharidase-inhibiting activities. *Jpn. Kokai Tokkyo Koho* JP2005213221.

7. **Mamum M.M., Billah M.M., Ashek M.A., Ahasan M.M.,Hossain M.J. and Sultana T. 2003.** Evaluation of diuretic activity of *Ipomoea aquatica* in mice model study. *J. Med.Sci.,* **3:** 395-400.

8. **Duke J.A. and Wain K.K. 1981.** Medicinal Plants of the world. *Computer index with more than,* **85(3)**.

9. **Ma SC, Du J, But PPH, Deng XL, Zhang YW, Ooi VEC, Xu HX Lee SHS, Lee SF. 2002.** Antiviral Chinese medicinal herbs against respiratory syncytial virus. *J Ethnopharmacol.* **79:**205-211.

10. **Ferreira A.A., Amaral F.A., Duarte I.D.G., Oliveria P.M., Alves R.B., Silveira D., Azevedo A.O., Raslan D.S. and Castro M.S.A. 2006.** Antinoceptive effect from *Ipomoea cairica* extract. *J.Ethnopharmacol.* **105:**148-153.

11. **Lima OOA, Braz-Filho R 1997.** Dibenzylbutyro lactone lignans and caumarins from *Ipomoea cairica. J.Braz Chem Soc.* **8:**235-238

12. **Cho MK, Jang YP, Kim YC, Kim SG 2004.** Arctigenin, a phenylpropanoid dibenzylbutyro lactone lignan, inhibits MAP kinases and AP-1 activation via potent MKK inhibition: the role in TNF-alpha inhibition. *Int Immunopharmacol.* **10-11:** 1419-1429.

13. **Eich E, Pertz H, Kaloga M, Schulz J, Fesen MR, Mazumdar A, Pommier Y. 1996.** Arctigenin as a lead structure for inhibitors for human immunodeficiency virus type-1 integrase. *J Med Chem.* **39:**86-95.

14. **Ojha G., Mishra K.N. and Mishra A. 2016.** Pharmacological used and isolated chemical constituents of *Ipomoea digitata*: A Review. *IOSR Journal of Pharmacy and Biological Sciences*. **11(3):**1- 4.

15. **Egami EL, Magboul AL, Omer ME, Tohami EL. 1988.** Sudanese plant used I folkloric medicine: screening for antibacterial activity: *Fitotherapia*. **59:**369-73.

16. **Ikeda Kyoko, Kato Atsushi, Adachi Isao, Haraguchi Mitsue and Asano Naoki. 2003.** Alkaloids from the poisonous plant *Ipomoea carnea*. Effects on Intracellular Lysosomal Glycosidase Activities in Human Lymphoblast Culture. *J. Agric. Food Chem*., **51(26):** 7642-7646.

17. **Srivastava D. and Shukla K. 2015.** *Ipomoea cairica*: a medicinal weed with promising health benefits. *International Journal of Information Research and Review*. **2(5):** 687-694.

18. **Wadood, A., Ghufran, M., Jamal S.B., Naeem, M., Khan, A., Gaffar, R. and Asnad. 2013.** Phytochemical analysis of medicinal plants occurring in local area of Mardan. *Biochem. & Analy. Biochemis.* **2:** 1-4.

19. **Scalbert, A., Johnson, I.T. and Saltmarsh, M. 2005.** Polyphenols: antioxidants and beyond. *Am J Chin Nutr.* **81:** 215S-7S.

20. **Kumar, S. and Pandey, A.K. 2013.** Chemistry and biological activities of flavonoid. *The Scientific World Journal*. 1-16.

21. **Robert M.F. and Wink, M., 1998.** Alkaloid biochemistry, ecology and medicinal application. Plenum press New York.

22. **Thopplil, R.J., Bishayee, A., 2011.** Terpenoids as potential chemoprotective and therapeutic agents in liver cancer. *World Journal of Hepatology.* **3:** 228-249.

23. **Patel, S.S. and Savjani, J.K. 2015.** Systematic review of plants steroids as potential anti-inflammatory agent: current status and future perspectives. *The Journal of Phytopharmacology*. **4:** 121-125.

24. **Doughari, J.H. 2012.** A global perspective of their role in nutrition. '*Intech'* www.intechopen.com.

25. **Ashok, P.K. and Upadhyaya, K., 2012.** Tannins as astringent. *Journal of Pharmacognosy and Phytochemistry*. **1:**45-50.

26. **Krishnaiah, D., Deve, T., Bono, A. and Sarbathy, R. 2009.** Studies on phytochemical constituents of six Malaysian medicinal plants. *Journal of Medicinal Plant Research*, **3:** 067-072.

27. **Han X, Shen T, Lou H. 2007.** Dietry polyphenols and their biological significance. *International Journal of Molecular Science*. 950-988.

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