World Journal of Biology Pharmacy and Health Sciences
eISSN: 2582-5542
Cross Ref DOI: 10.30574/wjbphs
Journal homepage: https://wjbphs.com/

(REVIEW ARTICLE)

Phytochemical and pharmacological potential of *Impatiens balsamina*

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World Journal of Biology Pharmacy and Health Sciences, 2022, 12(02), 054–060

Publication history: Received on 01 October 2022; revised on 05 November 2022; accepted on 08 November 2022

Article DOI: https://doi.org/10.30574/wjbphs.2022.12.2.0185

Abstract

Impatiens balsamina is an annual herb, belongs to the family Balsaminaceae, commonly seen in India, China, and Korea. It is an erect plant commonly known as rose balsam and garden balsam. Studies shows that the plant contain many valuable phytoconstituents such as flavonoids, saponins, phenolics, naphthoquinones, and glycosides. The plant is used in traditional medicine for their antimicrobial, anti-inflammatory, anti-allergic and antidermatitic properties. The plant can also be used to treat burns, scalds, and lumbago. Flowers of the plant is used as dye in pastry. Seeds of this plant is edible. Leaves and stem are also edible when boiled. Leaves, stem, flowers are also having medicinal properties. Microscopical features of pollen grains shows that the pollen grains contain a vegetative and generative cell. Many studies have been done to identify the pharmacological properties of this plant. Some of the pharmacological actions of the plant include antipruritic, antidermatitic, antimicrobial, antitumor, wound healing, antidiabetic and antinociceptive. The present review summarizes information about the morphology, chemical constituents, and pharmacological actions of *Impatiens balsamina* for future works.

Keywords: *Impatiens balsamina*; Phytoconstituents; Flavonoids; Pharmacological action

1. Introduction

Medicinal plants have been used to treat many diseases in traditional medicine worldwide. Due to the continues use of allopathic medicines resistance has been developed against them by many pathogens. Also, the side effects produced by these medicaments are increasing day by day. So, the situation leads to the use of more useful medicaments with lesser side effects. India is a country with rich source of medicinal plants. Many plants have been used for treating many diseases traditionally.

Impatiens balsamina is a plant belongs to the family Balsaminaceae. It is an annual erect herb with soft watery stem, attaining up to 100 cm tall. Leaves are usually simple, alternate, sometimes lower ones with opposite, up to 13 cm long. Inflorescence 1-3 flowered. Flowers are single cup-shaped, white, pink, violet and red in color, pedicels up to 2cm long. Fruits are capsules, narrow on both ends 1-2 cm long and with small bristles [1].

Balsam plant has been studied to identify the cytological features of anthers. For the study four microsporangia of the plant has been studied and the results shows that the pollen grains belong to bicellular type consisting of a vegetative and a generative cell. Presence of starch grains and lipids were observed found abundant in the mature pollen grains [2].

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2. Phytoconstituents

The plant has been studied for the presence of many phytoconstituents and the results shows the presence of flavonoids, saponins, alkaloids, tannins, coumarins, and glycosides. One of the flavonoids present in the plant include kaempferol. Studies also shows the presence of reducing sugars and proteins in the plant. Phytoconstituents present in leaf include flavanols, lawsone, lawsone methyl ether. Aerial part of plant contain impatienol, and naphthoquinones. Flowers has been reported to contain flavanol, naphthoquinones and impatienol [3].

3. Pharmacological actions

These phytoconstituents are having many pharmacological actions. Some of the pharmacological actions of the plant include antimicrobial, anti-inflammatory, antipruritic, antidermatitic, antinociceptive, anti-neurodegenerative, antitumor, and antioxidant effect.

3.1. Anti-microbial property [4]

3.1.1. Methodology

Modified agar dilution method was used for the study. Culture medium was prepared with modified agar, to which test or reference sample has been added. Lawsone (compound 1), lawsone methyl ether (compound 2) and methylene-3,3'-bilawsone(compound 3) was used as test compounds. Tetracycline, ampicillin and ketoconazole was used as reference compound for aerobic bacteria, anaerobic bacteria, yeast and fungi. Millipore filter containing the microbes was introduced to the culture medium and kept for incubation under standard conditions. After incubation the minimal inhibitory concentration (MIC), minimal bacterial concentration (MBC), and minimal fungicidal concentration (MFC) was determined [5], [6].

3.1.2. Results

Results shows that compound 2 has more fungicidal effect, followed with compound 1 and 3. Compound 2 is active against gram positive and gram-negative aerobic bacteria. Compound 3 showed antibacterial effect against *S. epidermidis*, *B. subtilis* and not active against *S. aureus*, and *E. coli*. Compound 1 also active against all the tested microbes.

3.2. Antipruritic and antidermatitic activity [7],[8],[9],[10]

3.2.1. Methodology

Four-week-old *NC mice* with no symptoms were administered with 100 mg/kg/day of *Impatiens balsamina* until 13 weeks old. Dermatitis was evaluated by placing mice in polysulphonic cage under standard laboratory conditions for 2 days and observing their scratching behavior for 20 min. As a negative control *C3H mice* was used.

3.2.2. Results

Results shows that 35% ethanolic extract of *Impatiens balsamina* reduced the pruritic effect in *NC mice* with dermatitis.

3.3. Biological activity of oleanane -type triterpenoidal glycosides [11],[12],[13]

3.3.1. Methodology

Assessment of NO generation and cell viability BV-2 cells were seeded in 96 -well plate and incubated in the presence of the test compound and lipopolysaccharides for 1 day. Produced NO_2 was evaluated with Griess reagent. Absorbance was measured against 570nm.MTT assay was used for cell viability study.

3.3.2. Results

Results shows that compound 1 has showed higher cell viability followed with compound 2 and 3.

3.4. Antinociceptive activity of methanol extract of flowers [14]

3.4.1. Methodology

Acetic acid induced writhing test [15]

The mice were treated with test drug or extract and then with 0.7% acetic acid after 15 and 30 min respectively at the dose of 10ml/kg body weight. Number of writhing were counted for 10 min after acetic acid treatment.

3.4.2. Result

Oral administration of the extract causes reduction in writhing as compared to control group.200 and 400 mg/kg doses shows better antinociceptive activity.

3.4.3. Methodology

Hot plate test [16],[17]

Paw licking behavior of mice were observed for 15 s before and after drug treatment and compared with that of control groups.

3.4.4. Results

200 and 400mg/kg doses shows significantly increased reaction time.

3.4.5. Methodology

Tail immersion test [18]

The latency between tail immersion and withdrawal was observed at 30,60,90 and 120 min of extract treatment.

3.4.6. Result

The extract shows significant increased latency period at 100,200 and 400 mg/kg doses.

3.4.7. Methodology

Formalin test [17]

Mice were injected with 20µl of 1.35% formalin into sub planar region of right paw 30 min after extract treatment and 15 min after injection of morphine. Licking of injected paw was observed at 5,15 25 min after formalin injection.

3.4.8. Result

Extract treatment reduces formalin induced paw licking behavior at 100,200 and 400 mg/kg doses.

3.4.9. Methodology

Hole cross test [19]

A cage with fixed partition having a hole of 3cm diameter was used. The number of passages of the mice through the hole from one chamber to other was counted for a period of 3 min, at 0, 30, 60, 90 and 120 min after the treatments.

3.4.10. Result

The extract did not produce significant decrease of movement in comparison to control group in the doses at 100,200 and 400 mg/kg at 60 min. However significant decrease in movement was produced at 90 and 120 min.

3.4.11. Methodology

Open field test [20]

The number of squares visited by the mice was counted for 3 min at 0,30,60,90 and 120 min after treatment.

3.4.12. Result

Significant inhibition of locomotion was produced at 100,200 and 400 mg/kg doses.

3.5. *In-vitro* antidiabetic and anthelmintic activity of hydro alcoholic extract of *Impatiens balsa mina* roots [21]

3.5.1. Methodology-In-vitro antidiabetic activity

- Alpha-amylase inhibitory activity [22],[23],[24]

Reaction mixture containing 50µl phosphate buffer (100mM, pH = 6.8), 10µl α–amylase (2U/ml), and 20µl of varying concentrations of extract (0.1, 0.2, 0.3, 0.4, and 0.5 mg/ml) was pre incubated at 37°C for 20 min. Then, the 20µl of 1% soluble starch (100mM phosphate buffer pH 6.8) was added as a substrate. Incubated further at 37°C for 30 min; 100µl of the DNS color reagent was then added and boiled for 10 min. The absorbance was measured using photo colorimeter at 540 nm. Acarbose was used as a standard. Without test (extract) substance was set up in parallel as control and each experiment was performed in triplicates [22-24]. The results were expressed as percentage inhibition.

3.5.2. Result

The extract shows antidiabetic activity

3.5.3 In-vitro anthelmintic activity

- Adult Motility Assay (AMA) [25],[26],[27]

AMA was conducted on 75 mature *Pheretima posthuma* worms. Test was performed in 5cm diameter glass Petri dish [25-27]. Three concentrations of plant extract were used. There were 5 groups as follows:

- Group I: Hydro alcoholic extract at10mg/mL
- Group II: Hydro alcoholic extract 25mg/ml
- Group III: Hydro alcoholic extract at 50mg/mL
- Group IV: Albendazole at 100mg (positive control);
- Group V: Water (negative control).

The inhibitions of motility of worms were used as indication of worm mortality or paralysis, and were observed till 7hr. post treatment. Worms not showing any motility were picked out and kept in lukewarm water at 40 ˚C for 10 minutes and, in case of revival in motility, the observed worms were counted as alive; otherwise, they were counted as dead.

3.5.4 Result

The extract shows anthelmintic activity.

3.6. Antianaphylactic activity [28]

3.6.1. Method

Male *ddY mice* of 6 weeks were used for the study. They were sensitized subcutaneously on day 0 with 50µg of HEL emulsified in Freund's incomplete adjuvant. On day 9 mice were given 50µg of HEL i.v. HEL-sensitized mice in control group were challenged with bovine serum albumin [29].

3.6.2. Result

The treated groups show decrease in rate of anaphylaxis and mortality when compared to control group at 256 mg/kg dose.

3.7. Antioxidant property [30]

3.7.1. Method

DPPH scavenging assay [31]

Extract at various concentrations was mixed with methanol and were added to freshly prepared methanolic solution of DPPH. Solution was allowed to stand for 30 min at room temperature and absorbance was measured at 517 nm.

Reducing power assay [32]

Extract in various concentrations were mixed with methanol. Later mixed with phosphate buffer (0.5 mL, 0.2M, pH 6.6) and potassium ferricyanide (0.5 mL, 1%). Incubate the above mixture at 50 ^{0}C for 20 min. Later add 0.5 mL of 10% (w/v) of trichloroacetic acid and centrifuge at 3000 rpm for 10 min. 1.5 ml of above solution was mixed with equal volume of distilled water and 0.1 mL of 0.1%(w/v) of ferric chloride. After 10 min measure absorbance at 700 nm.

3.7.2. Results

DPPH scavenging assay

Scavenging activity of diethyl extract was strongest, followed with methanol, chloroform and water extracts.

Reducing power assay

Diethyl extract showed significant reducing power followed by methanol, chloroform, water and petroleum ether extracts.

4. Conclusion

The present review was to detail about the phytoconstituents and pharmacological actions of *Impatiens balsamina*. The plant contains many useful phytoconstituents such as flavonoids, saponins, alkaloids, tannins, coumarins, and glycosides. The plant has many pharmacological actions due to the presence of these phytoconstituents. Some of these pharmacological actions are antimicrobial, anti-inflammatory, antipruritic, antidermatitic, antinociceptive, anti-neurodegenerative, antitumor, and antioxidant effect. Thus, this review can be used for future studies.

Compliance with ethical standards

Acknowledgments

Our sincere thanks to Prof. E. Tamil Jothi sir for encouraging and supporting us throughout the work.

Disclosure of conflict of interest

No conflict of interest.

References

[1] Chandan Kumar Dash, MD. Harun AR Rashid, Syeda Sharmeen Sultana, M. Oliur Rahman. Cytotaxonomy of four floral variants of *Impatiens balsamina* L. Journal of Bangladesh academy of sciences, 2019; 43(1):1-9.

[2] Shujuan Yang, Li Peng, Han Bao. Cytological features of developing anthers in Rose balsam. Journal of American society for horticultural science, 2018; 143(2):95-100.

[3] Mohammad Zafar Imam, Nazmun Nahar, Saleha Akter, Md. Sohel Rana. Antinociceptive activity of methanol extract of flowers of *Impatiens balsamina*. Journal of ethnopharmacology, 2012; (142):804-10.

[4] Athip Sakunphueak, Pharkphoom Panichayupakaranant. Comparison of antimicrobial activities of naphthoquinones from *Impatiens balsamina*. Natural product research, 2012; 26(12):1119-24.

[5] Lorian, V. (1996). Antibiotic in Laboratory Medicine (4th ed.). Baltimore: Williams & Wilkins.

[6] Voravuthikunchai, S., Lortheeranuwat, A., Jeeju, W., Sririrak, T., Phongpaichit, S., & Supawita, T. Effective medicinal plants against enterohaemorrhagic *Escherichia coli* O157:H7. Journal of Ethnopharmacology, 2004;9: 49–54.

[7] Hisae Oku, Kyoko Ishiguro. Antipruritic and antidermatitic effect of extract and compounds of *Impatiens balsamina* L. in Atopic Dermatitis model *NC mice*. Phytotherapy research,2001; 15:506-10.

[8] Ishiguro K., Oku H. Antipruritic effect of flavanol and 1,4 naphthoquinone derivatives from *Impatiens balsamina* L. Phytother Res,1997;11:343-7.

[9] Ishiguro k., Oku H. Screening method for PAF antagonist substances on the phenolic compounds from *Impatiens balsamina* L. Phytother Res ,1999; 13:521-5.

[10] Fukumoto H., Ishiguro k., Isoi k., Semma M. Antihistamine effects of an ethanol extract from the white petals of *Impatiens balsamina* L. Phytother Res ,1995;9:567-70.

[11] Tae Hyun Lee, Won Se Suh, Lalita Subedi, Sun Yeou Kim, Sang Un Choi, Kang Ro Lee, Chung Sub Kim. Three new oleanane -type triterpenoidal glycosides from *Impatiens balsamina* and their biological activity. Plants,2020(Aug);9:1083.

[12] Blasi E., Barluzzi R., Bocchini V., Mazzolla R., Bistoni F. Immortalization of murine microglial cells by a v-raf/v-myc carrying retrovirus. J. Neuroimmunol,1990;27: 229–37.

[13] Choi Y., Lee M., Lim S., Sung S., Kim Y. Inhibition of inducible NO synthase, cyclooxygenase-2 and interleukin-1β by torilin is mediated by mitogen-activated protein kinases in microglial BV2 cells. Br. J. Pharmacol, 2009; 156: 933–40.

[14] Mohammad Zafar Imam, Nazmun Nahar, Saleha Akter, Md. Sohel Rana. Antinociceptive activity of methanol extract of flowers of *Impatiens balsamina*. Journal of ethnopharmacology, 2012;(142):804-10.

[15] Vogel, H.G., 2007. Drug Discovery and Evaluation: Pharmacological Assays. Springer, Berlin.

[16] Eddy, N.B., Leimbach, D. Synthetic analgesics: II. Dithienylbutenyl and dithienylbutylamines. Journal of Pharmacology and Experimental Therapeutics, 1953; 107:385–93.

[17] Coelho, L.P., Reis, P.A., Castro, F.L., Gayer, C.R.M., Lopes, C.S., Silva, M.C.C., Sabino, K.C.C., Todeschini, A.R., Coelho, M.G.P. Antinociceptive properties of ethanolic extract and fractions of *Pterodon pubescens Benth*. seeds. Journal of Ethnopharmacology ,2005; 98: 109–16.

[18] Toma, W., Graciosa, J.S., Hiruma-Lima, C.A., Andrade, F.D.P., Vilegas, W., Brita, A.R.M.S., 2003. Evaluation of the analgesic and antidermatogenic activities of *Quassia amara* bark extract. Journal of Ethnopharmacology ,85;19–23.

[19] Takagi, K., Watanabe, M., Saito, H. Studies on the spontaneous movement of animals by the hole cross test: effect of 2-dimethylaminoethane, its acyl esters on the central nervous system. Japanese Journal of Pharmacology,1971; 21: 797–810.

[20] Gupta, B.D., Dandiya, P.C., Gupta, M. L. A psychopharmacological analysis of behavior in rat. The Japanese Journal of Pharmacology ,1971; 21:293–298

[21] Yasodha Tandrima M., Swapna G., Ankitha M., Vishal T., Bhagya Sri P. *In-vitro* antidiabetic and anthelmintic activity of hydroalcoholic extract of *Impatiens balsamina* roots. EAS Journal of Pharmacy and Pharmacology, 2021;3(2):38-44.

[22] Narkhede, M. B., Ajimire, P. V., Wagh, A. E., Mohan, M., & Shivashanmugam, A. T. *In vitro* antidiabetic activity of Caesalpina digyna (R.) methanol root extract. Asian Journal of Plant Science and Research,2011; 1(2): 101-106.

[23] Stalin, C., Vivekanandan, K., & Bhavya, E. *In vitro* antidiabetic activity of *Cardiospermum halicacabum* leaves extracts. Global Journal of Medical Research,2013; 13(7): 41-43.

[24] Sangeetha, R., & Vedasree, N. *In vitro* α-amylase inhibitory activity of the leaves of *Thespesia populnea*. International Scholarly Research Notices, 2012: 25.

[25] Goswami, S., Pandey, A., Tripathi, P., Singh, A., & Rai, A. An *in vitro* evaluation of the anthelmintic activity of *Hedychium spichatum* rhizomes and *Zingiber zerumbet* rhizomes on the *Pheritima Posthuma* model: A comparative study. Pharmacognosy research, 2011;3(2): 140.

[26] Kakade, R.T., Sandu, N., & Senthilkumar, K.L. *In-vitro* anthelmintic activity of leaves and stems extract of *Bryophytum sensitium* Linn. Asian J. of Plant Sci. and Res,2013; 3: 64-8.

[27] Zenebe, S., Feyera, T., & Assefa, S. *In vitro* anthelmintic activity of crude extracts of aerial parts of *Cissus quadrangularis* L. and leaves of *Schinus molle* L. against *Haemonchus contortus*. BioMed research international, 2017.

[28] K. Ishiguro, H. Fukumoto, T. Murashima, M. Semma, K. Isoi. Antianaphylactic effects of the ethanolic extract from the petals of *Impatiens balsamina* L. in mice. Phytotherapy research, 1992; 6:112-3.

[29] Semma, M., Sakato, N., Fujio, H., and Amano, T. (1981). Regulation of delayed-type hypersensitivity (DTH) response to hen egg-white lysozyme (HEL). Immunol. Lett,3: 57-61.

[30] Bu-Li Su, Rong Zeng, Jin- Yin Chen, Chu-Ying Cheng, Juan -Hua Guo, Chang- Gan Huang. Antioxidant and antimicrobial properties of various solvent extracts from *Impatiens balsamina* L. stems. Journal of food science, 2016;77:C614-9.

[31] Loizzo MR, Tundis R, Chandrika UG, Abeysekera AM, Menichini F, Frega NG. 2010. Antioxidant and antibacterial activities on foodborne pathogens of *Artocarpus heterophyllus Lam*. (Moraceae) leaves extracts. J Food Sci, 75:M291–5.

[32] Hsu B, Coupar IM, Ng K. 2006. Antioxidant activity of hot-water extract from the fruit of the Doum palm, *Hyphaene thebaica*. Food Chem ,98:317–28