A Review of Recent Studies on The Phytochemical and Pharmacological Activity of Annona Muricata

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Research Article

Abstract

Medicinal plants have been used to treat illness and disease for thousands of years. Bioactive principles present in medicinal plants attribute to the therapeutic efficacy and it can be incorporated into modern medicine systems for the development of newer drug formulation for therapeutic ailments. Even now they are economically important, being used in the pharmaceutical, cosmetic, perfumery, and food industries. Screening of medicinal plants for antimicrobial activities and phytochemicals is important for finding potential new compounds for therapeutic use. In the present review, an attempt has been made to congregate the traditional, phytochemical, and pharmacological studies done on an important medicinal plant Annona muricata. Cyclo hexapeptides, acetogenins, annonaceous acetogenins were the major phytochemical compounds studied from this medicinal plant. The fruit is of economic value and hence cultivated and used widely as edible food. The plant possesses the major pharmacological activities includes Anti-viral activity, Anti-oxidant Activity, Larvicidal activity, Anti-inflammatory activity, Antipediculidal activity, Anti-bacterial activity, and wound healing. It also has an anti-carcinogenic and cytotoxic effect.

Keywords: Medicinal plants; Annona muricata; phytochemical; pharmacological activity

1. Introduction

Natural products, especially those derived from plants, have been used to help mankind sustain its health since the dawn of medicine. Over the past century, the photochemical in the plant has been a pivotal pipeline for pharmaceutical discovery. The importance of the active ingredients of plants in medicine has stimulated significant scientific interest in the biological activities of these substances. According to the World Health Organization, about 80% of the developing countries (e.g., Brazil, China, India, and Thailand) rely on traditional medicines, and of those, 85% use plants or their extracts as active substances. Numerous studies have been carried out to screen extracts from medicinal plants for the presence of novel compounds and an investigation of their biological activities. Plants have been known to be a reservoir of secondary metabolites that are being exploited as a source of bioactive substance for various pharmacological purposes.
Medicinal plants are considered as the basis for health preservation and care worldwide. One of the medicinal plants is Annona muricata. This plant is known as soursop (English) belongs to the Annonaceae family. This soursop tree is about 5-10 m tall and 15-83 cm in diameter with low branches. This plant is reported to be useful in the treatment of various health ailments such as fever (Magana et al., 2010), respiratory illness (Vandebroek et al., 2010), malaria (Boyom et al., 2011), liver, heart, and kidney infections (Badrie et al., 2009).

All parts of Annona muricata (soursop) are widely applied in alternative medicine and they are traditionally used in the treatment of infectious and chronic non-communicable diseases. The prevalence of chronic non-communicable diseases like cancer, obesity, cardiovascular diseases, coronary heart disease, diabetes mellitus in developing and developed countries has generated interest in food like soursop which can be of great importance. In contrast, the consumption level of soursop has dwindled and could become extinct (WHO, 1991).

2. Phytochemistry
Phytochemicals are bioactive chemicals of plant origin. They are regarded as secondary metabolites because the plants that manufacture them may have little need for them. They are naturally synthesized in all parts of the plant; leaves, stems, fruits, seeds, etc. i.e. any part of the plant body may contain active components. The quantity and quality of phytochemicals present in plant parts may differ from one part to another. Moreover, plant secondary metabolites present chemical and pharmaceutical properties interesting for human health (Raskin et al., 2002; Reddy et al., 2003). Extensive phytochemical evaluations on different parts of the A.muricata plant have shown the presence of various compounds, including alkaloids Yang et al., 2015, phenolics (PLs) Jiménez et al., 2014, cyclopeptides and essential oils. However, Annona species, including A.muricata, are a generally rich source of annonaceous acetogenin compounds (AGES). The presence of different major minerals such as K, Ca, Na, Cu, Fe, and Mg suggest that regular consumption of the A.muricata fruit can help provide essential nutrients and elements to the human body.

3. Anticancer Activity
The leaf extract was able to induce apoptosis in colon and lung cancer cells through the mitochondrial-mediated pathway. This antiproliferative effect was associated with a cell cycle arrest in the G1 phase (Moghadamtousi et al., 2014). Besides, the migration and invasion of colon cancer cells were significantly inhibited by the leaf extract. The activation of caspase 3 by the ethanolic extract of the leaves also demonstrated an apoptosis-inducing effect in myelogenous leukemic K562 cells, which was confirmed with a TUNEL assay (Erzirn et al., 2013). Syed Umar et al., 2016, reported that selected the soursop samples from its cultivation area as it could determine the potency and anticancer activity of certain soursop sample. B1 AMCE has a good profile to be a candidate for breast cancer treatment as it managed to induce the apoptosis of 4 T1 breast cancer cells, inhibited the metastasis in vitro and in vivo, regulating the immune system, and reduced the inflammation caused by cancer.

4. Antioxidant Activity
The identification of antioxidants from natural products has become a matter of great interest in recent studies for their noteworthy role in nullifying the destructive effects of ROS (Chen et al., 2003). The antioxidant activity of the A.muricata leaves was found to be stronger than A. Squamosa and A. reticulata species as shown through different in vitro models, such as ABTS, nitric oxide, and hydroxyl radicals (Baskar et al., 2007).
5. Antipediculicidal activity
Antipediculicidal activity showed ethyl acetate had the highest average mortality percentage rather than petroleum ether and methanolic extracts. The highest concentration of drugs in all extracts performed better than the lowest concentration. In vivo study of ethyl acetate (highest concentration), i.e., 100.0 mg/ml had complete recovery of lice infestation in poultry and its premises. Seed extracts of A.muricata Linn exhibited strong anti pediculicidal activity and, thus, it is a good source of acaricidal activity (Vijayalingam et al., 2016). Antipediculicidal activity of various solvents petroleum ether, methanol, and ethyl acetate seed extracts of A.muricata Linn was evaluated on lice infestation, collected from desi birds. The collected lice were randomly divided into several groups for the solvents petroleum ether, methanol, and ethyl acetate seed extract were subjected for the study. The pour-on method was used as described (Vihan and Agarwal, 2007).

6. Larvicidal activity
Biological larvicides are useful for the improvement of local natural resources. Local plant as potential biological larvicides generally from families Annonaceae, including soursop (Annona muricata L.). Empirically, it has been much research done on the soursop as larvicides. The plant parts are potential as larvicides are seed (semen) Mulyawati et al., 2010. Soursop seed (with shell beans) has larvicidal activity against Ae.aegypti with an LC50 value of 244.27 ppm for the ethanol extract of the seeds of soursop. Besides, Ward et al., 2004 reported that seeds of soursop and sugar apple seed (without seed coat) affect mortality of Chrysomya bezziana fly larvae.

7. Anti-inflammatory activity
Various non-steroidal anti-inflammatory drugs (NSAID) are widely used clinically for inflammatory diseases as well as rheumatoid arthritis. However, despite their great number, their therapeutic efficacy seems to be hampered by the presence of several undesired, and often serious, side effects. It would, therefore, be highly desirable to find less toxic alternatives, and some medicinal botanicals might be candidates for such alternatives. Chan Pit Foong and Roslida Abdul Hamid, (2012) investigated the possible anti-inflammatory effect of ethanolic extract from the leaves of AML in acute and chronic inflammation by using different animal models from the reported studies. The initial inflammatory response is developed within hours, but more critical clinical signs are observed from the 10th post-inoculation day and thereafter and the changes remain detectable for several weeks (Colpaert et al., 1982). Tripathy et al., 2009 demonstrated AML extract can suppress the swelling of the paws in both acute and chronic phases. This may be due to the suppression of the inflammatory mediator released due to the induction of CFA.

8. Antibacterial Activity
Annona muricata is an edible fruit-bearing evergreen tree with large glossy dark green leaves. It is cultivated throughout India. The extracts from its leaf, stem roots, and seeds have demonstrated antibacterial activity against a plethora of microorganisms Vijayameena et al., 2013. The leaf extract of A.muricata is a naturally derived solution that has been used to treat various bacterial diseases, such as pneumonia, diarrhea, urinary tract infections, and some skin diseases Gajalakshmi et al., 2012. It has not demonstrated any toxic effect so far. The synergism of flavonoids, steroids, and alkaloids found in the extracts of A.muricata is attributed to its antibacterial activity Muthu et al., 2015. Leaf extract of Annona muricata is used in the treatment of various bacterial infectious diseases such as pneumonia, diarrhea, urinary tract infection, and even some skin disease. Annona muricata extract contains a wide spectrum of activity against a group of bacteria that are responsible for the most common bacterial
diseases. Thus, the plant possesses an abundance of antibacterial compounds (Pathak et al., 2010).

9. **Anti-viral activity**
Annona muricata extract was screened against Herpes simplex virus-1 (HSV-1) and clinical isolate (obtain from the human keratitis lesion) to test whether they inhibit the cytopathic effect of HSV-1 on Vero cells which is indicative of anti-HSV-1 potential. The minimum inhibitory concentration of ethanolic extract of A.muricata was found to be 1 mg/ml which shows that the A.muricata could be used as the potential antitherpetic drugs Isela Alvarez et al., 2008.

10. **Wound Healing Activity**
The knowledge about wounds and their management remains still in the primitive and stunted stage. A wound is a disrupted state of tissue that is caused by the physical, chemical, microbial or immunological insult which heals either by regeneration or fibroplasia finally. The wound healing activity of alcoholic extract of stem and bark of Annona muricata was found to show the obvious reduction in the area of the wound which was tested in the albino rats which proves their possible use in the healing the wound (Pathak et al., 2010).

11. **Conclusion**
The present study highlights the possible use of Annona muricata leaves extracts as a source of antioxidants and as antibacterial agents that can be used to prevent diseases. Phytochemical screening of the plants showed the presence of alkaloids, carbohydrates, coumarins, flavonoids, glycosides, phenolic compounds, phytosterols, proteins, quinones, saponins, steroids, and terpenoids. The constituents reported from the present study gives further idea for detailed studies on clinical and therapeutic aspects. Future research should be addressed on the application of using Annona muricata leaves as natural remedies and to protect against the diseases.

**Conflict of Interest:** The author declares no conflict of interest.

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