

Activity of Saponin in the parts of the medicinal plant *Abutilon indicum*

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Abstract

In different aspects of life, plants form a vast field of uses such as furniture, ornaments, decoration, stationary, buildings and others. Among those uses of plants are the medical ones because of the vast varieties of plant types, the low cost and the wide range of safety when use them. Mallow family includes small trees diversity of different parts like herbs, shrubs and flowering plants. Considering the chemical structure, it confines huge range of compounds like vitamins, alkaloids, saponin glycosides, proteins, carbohydrates, flavonoids and others. Because the *Abutilon indicum* has reported to have analgesic, antioxidant, laxative, anthelmintic and diuretic properties, it was chosen to be the topic of study in this review. Of these mentioned compounds saponin comes on priority and it was extracted from different plants beside abutilon such as sugar beet, soymilk, strawberry, plum and chickpea. The defense system of plants bases on saponin as it forms the attack line against pathogens. Saponin can be found in percentage about 30% in the leaves of *Abutilon indicum* and it is seen to have cholesterol and glucose lowering properties beside antitumor ones. The study about the pharmacological properties of *A. Indicum* in Iraq area was recommended by the author to establish its effects against chronic diseases depending different doses in experimental animals.

Keywords: Abutilon indicum, Saponin

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Introduction

The *Abutilon indicum* as a whole plant was pharmacologically studied and its action revealed. The family of Malvaceae plants comprises huge genus scientifically called *Abutilon indicum* Linn which is called in different names according to countries such as Kanghi (hindi), country mallow (english), thuthi (tamil) and atibala (sanskrit) [1, 2]. This plant comes in varying forms like little trees, herbs, shrubs and woods [3]. The plant *Abutilon* presents in varying species like *A. vitifolium*, *A. bidentatum*, *A. pannosum*, *A. figarianum*, *A. mauritianum*, *A. grandiflorum* and *A. crispum* [4]. The world territorial distribution of this plant majorly occurs in Bangladesh, India and Pakistan [5]. Sesquiterpene lactones, vanillic, mucilage, important oils, caffeic



acid, carbohydrates, saponins, coumarins, phenolic, tannins, terpenoids, flavonoids, glycosides, steroids, proteins, organic acid, sterols, triterpenoids, alkaloids, gums, , fixed oil, and fumaric acid, are the major chemical compounds of *A. indicum* [6]. It was proven to be highly safe and of therapeutic value better than those of synthetic origins [7]. The extracts from *A. indicum* can be gained by different techniques and solvents such as acetone, aqueous petroleum ether and ethanol [8]. Considering the body weight, *A. indicum* does not affect it positively or negatively [9]. It was mentioned that *A. indicum* possesses stimulatory effect to the immune system which makes it a choice as an anticancer, strong antagonist to estrogen, acetaminophen induced nephrotoxicity antidote, healing of wounds, treatment of diabetes and candidiasis [10, 11, 12, 13, 14]. Due to its flavonoid contents, *A. indicum* flower extracts might be useful as protecting agent to the liver and against analytic malformations of hematological origin [15, 16]. Knowing as sapogenin, the saponin is about aglycon bound with moiety of glycan [17]. The active surface saponins are formed due to the ability of saponin in a manner similar to foams to produce constant soap in watery solutions and these saponins fall into three categories of glycosides; alkaloids, triterpenoids and steroid [18,19]. These plant origin compounds are of great value in pharmaceutical, food and aesthetics industries [20, 21]. Other sources are considered as sources of saponins like sea cucumber, endophytic fungi, and star fish [22, 23].

Abutilon indicum parts and its applications

Aplication of A. indicum leaves

Different chemical compounds are found in the leaves of *A. indicum* such as galactose, amino acids, fructose and glucose [24]. The content of the leaves of saponin forms about 30% which can be important source for industry of human contraceptive as it is a source of steroid hormones. The *Echis carinatus* venom was found to be inhibited by the methanolic and hexane *A. indicum* leaves extracts [25]. It was found that these extracts have an activity similar to those of antioxidant system of catalase, glutathione, and superoxide dismutase against the peroxidation of lipids [26, 27]. Another efficacy of the leaves extracts has been shown against different pathogenic agent and disorders like diabetes, *Trichophyton rubru* fungus, cardiac and hepatic protective and anti-arthritis [28, 29, 30,31]. Considering the activity of leaves against bacteria, it is seen very potent and better than that of roots or stems against *E. coli*, *Bacillus subtilis*, *Klebsiella pneumonia* and *Pseudomonas aeruginosa* [32, 33]. Bioactive compounds like saponins, phenolic acids, tannins and alkaloids were found fluently in the methanolic leaves extract of *A. indicum* which makes it potent against *Moniezia expanza* [34] while the aqueous extracts showed an activity against diabetes and convulsions [35, 36].

Abutilon indicum roots

It was reported that these roots – belonging to *A. indicum* – has anti-inflammatory, antifungal and antibacterial activity [37]. The reason of this activity is due to the presence of special fatty acids making the oils of nondrying nature such as sitosterol, linoleic, lauric, oleic, myristic,

palmitic, stearic, and caprylic ones [38]. Sesquiterpene lactones can be derived from *A. indicum* roots [39].

A. indicum seeds

The seeds of *A. indicum* are fluent with the fatty acids palmitic, oleic, stearic and linoleic with high antioxidant activity beside their use as different remedies such as the treatment of cough, laxatives, fever, and dysentery of chronic nature, urinary disorders [40, 41].

Plant collection and extraction

Different parts of *A. indicum* like seeds, leaves or roots are washed out by tap water then rinsed well with distilled water three times then they are dried by air. Processed parts then are kept dried in shade at room temperature after being cut for one week to prepare a fine powder. After that, 10 g of concentrated powder were dissolved in 100 ml distilled water and settled on hot plate with stirring for one day predisposing to be filtered with (what-man no.1) filter paper. The formed extract then was centrifuged at 3000 rpm passing 10 mins and then kept sterile vigorously in containers within a refrigerator for future use.

Saponin extraction

From specific area fluent with *A. indicum*, the leaves of this plant were collected. The processing of these leaves comprised 2-3 washing in distilled water and then kept dried in shade after being cut into tiny pieces. To extract saponin, the tiny pieces of leaves were crushed by mortar and pestle and the yield powder was kept in air tightened bottle then the crushed leaves were dipped in acetone and methanol of a ratio 1:5 volume per volume mixture. The powder and solvent mixture were let to get saturation for 24 hours after mixing them at ratio 1 g powder with 10 ml solvent. The later step was the centrifuging of the mixture for 10 minutes at temperature 4C° and centrifuging rate 2000 rpm. This step was followed by filtration of mixture using number 1 Whatman's paper and further filtration is done afterwards using cellulose acetate layer 0.2µ containing syringe [42].

Detection of saponin

The process of detection the presence of saponin is done by mixing 1 ml of any of the plant extracts with 200 ml of distilled water and they are settled for 15 minutes in a container equipped on a shaker. When a foam is formed, this will indicate the presence of saponin. The traditional ways of indicating the presence of saponin principally depend three aspects; foam formation, chemical nature and the saponin blood hemolytic property [43].

Bioactivity of saponin

Environment is fluent with saponin in field of plant. It has growing reputation nowadays for its uses in different aspects of life such as anticancer and in the food stuff of animals as it was reported to lower plasma and hepatic glucose and cholesterol levels after being purified [44, 45]. Other aspects of uses of saponins are the immunological stimulating role due to their adjuvant immune exciting effect [46], having anti-nutritional properties but with limited recommended usage because of their bitterness [47, 48], besides their antibacterial, antiviral and antiprotozoal activities [49, 50]. Furthermore, the hemolytic action of saponin on red blood



corpuscles might be linked to the chemical nature of the glycon and sugar moiety of its side chain and the cholesterol based structure of the membranes of red corpuscles themselves, which predispose facilitation of reaction with saponin leading to change in membranous permeability and then hemoglobin loss [51, 52, 53].

Isolation of saponin

The traditional methods of isolation are applied to extract saponin such as soxhlet extraction and the major one is the organic solvent maceration beside soxhlet while the most recent ones are still under experimental ways such as acceleration with solvent microwave and ultrasound extraction [54].

Test of saponin

Forth Test is depended for this purpose which states that to detect saponin presence, 1ml of extracted plant is diluted in 25 ml distilled water and kept well mixed in graduated container for 15 minutes. When a foam of 1cm distance is formed, this indicates the presence of saponin [55].

Conclusion

The purpose of this study was to elucidate the importance of saponin in extracts of *A. indicum* plant. It was found that this compound is safe and nontoxic when it is dosed orally to lab animals at dose ups to 10g/kg of body weight. Most of drugs all around the world come from plant origin up to 30%. Most scientists complain the difficult chemical saponin structure and the inability to link its actions with its structure. Diverse and variant uses of saponin are reported like anticancer, cytotoxic, immune-stimulant lowering cholesterol, lowering glucose and others and its use in vaccinations of humans is still under work exploiting its adjuvant hemolytic property [56, 57]. Saponin is extracted from different plants beside *A. indicum* like chickpea, plum, sugar, asparagus, strawberry, soymilk and beet and it was found that saponin is fatal if injected intravenously [58, 59]. Activity of saponin took no enough interest by Iraqi searchers as it is true for Pakistan, India and tropical world regions.

Competing interests

The authors declare that they have no competing interests.

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