



Review Article

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A review of *Solennostemma argel*: Phytochemical, pharmacological activities and agricultural applications

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ABSTRACT

The present review aims to outline the research on biological activities and phytochemical composition of *Solennostemma argel* Del. Hayenne reported in literature from 1980 to late 2017. The plant is indigenous to Africa, has a beneficial side in the folk medicine, and is used to treat many diseases including kidney, liver, stomach diseases, and some allergies in different places worldwide, particularly in African countries, Saudi Arabia, and Palestine. Substantial studies indicate that *S. argel* contains a variety of compounds and provides diverse bioactivities with no toxicity. This review paper focuses mainly on the herbal uses, phytochemicals, pharmacological activities, and agricultural applications, further study should be given to identify and evaluate the potential compounds of Argel plant that have biological activities in medicine and agriculture, which should be useful for further advance study and application.

Keywords: Argel plant, folk medicine, biological activity, Sudan.

INTRODUCTION

The plant *Solennostemma argel* Del. Hayenne (Asclepiadaceae), is a desert plant indigenous to Africa, used in traditional medicine worldwide, particularly in African countries (Sudan, Libya, Chad, Egypt and Algeria), Saudi Arabia and Palestine [1, 2, 3, 4]. This plant is regarded as the richest source in Sudan and locally called Hargel, it is indigenous in the northern region [5], widely spread in the places between Dongola and Barber, particularly around Abu Hamad area [1]. Sudanese are used Hargel plant in traditional medicine as anti-inflammatory, anti-spasmodic, anti-rheumatic agent, carminative and as an anti-diabetic [4, 6, 7, 8]. The plant can used as anti-nutrition factors [9] and anticancer [10].

Botanical description

The plant is an erect herbaceous perennial plant that grows up to 60-100 cm tall, with several vigorous stems. The leaves are, oval, leathery and covered with fine hairs. It has numerous flowers with white petals, and a strong smell, flowering period extends from March to June. The fruits are box shape about 5 cm. long and 1.5-2 cm- wide, green with violet lines; they contain pubescent seeds [11].

Phytochemicals

Phytochemical of *S. argel* had been studied by many researchers [6, 12, 13, 14]. It has been studied from different parts of *S. argel* (leaves, stems, and flowers) and provided numerous ingredients and crystalline compounds [8, 15], Previous study conducted by [11] reported and classified some chemical constituents of *S. argel* are including acylated phenolic glycosides, namely argelin and argelosid, choline, flavonoids, monoterpenes, pregnane glucoside, sitosterol, and a triterpenoid saponin. Hamed, (2001) [13] described two of stemmosides (A, and B) as pregnane ester glycosides, and stemmin C as polyhydroxy pregnane of Argel plant.

Also, leaf extracts contain; quercetin, rutin, flavanones, and alkaloids, flavonoids, and kaempferol [16, 17], Murwan *et al.*, (2010) [9] reported that leaves of *S. argel* are characterized by having (64.8%) carbohydrates, about (15 %) was protein, and he found that crude oil, moisture content, and ash (1.6%, 4.4% and 7.7% respectively), they estimated that minerals content, whereat, they found high potassium about 0.54%, calcium, magnesium, and sodium(0.06%, 0.03%, and 0.01% respectively), while manganese, ferrous, lead, and copper were estimated as low percentages (0.001%, 0.002%, 0.002%, 0.001%, and 0.0001% respectively). And [9] fractionated the protein of argel leaves to different compounds including: albumin, non-nitrogenous protein, prolamine, globulins, and glutulin. In addition leaves of argel also contained anti-nutrition factors (phytic acid, and tannin) [9].

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Herbal Medicine

Historically, the first form of healthcare known to human is herbal medicine, it was the result of many observations of mankind and wild animals. Argel leaves are used to treat many diseases including kidney, liver, stomach diseases, and some allergies [18, 19, 20].

Infusion of leaves is used to treat gastrointestinal cramps, as laxative [21] stomach ache; anti-colic, urinary tract infections, cold and anti-syphilitic for prolonged period time between 40- 80 days [1, 22, 23] and as an anti-inflammatory [24].

Also, argel leaves are used to treat measles as incense, sometimes crushed leaves of argel are used as remedy to treat sciatica, neuralgia, and for supporting wounds and bronchitis [18, 22].

Taj Al- Deen and Al-Naqeb, (2014) [23] reported that, in Yemen argel leaves are used as herbal medicine for prevention of diabetes and the leaves are consumed as tea, and his result study was carried out biological investigation on argel leaves as a hypoglycemic agent.

The whole of argel plant is used as incense to treat many diseases including: diabetes mellitus, hypercholesterolemia, cough, cold, jaundice and measles [1].

Pharmaceuticals

Osman *et al.*, 2014 [25] examined the effect of crude leaves extract of Argel plant on serum biochemical constituents and electrolytes in albino rats and to discuss their values in relation to kidneys and liver functions, the findings of this study suggested that the dose 600 mg of extract /Kg BW was more likely to have adverse effect on liver and kidneys of albino rats.

Anti-inflammatory

The anti-inflammatory activity was evaluated from the leaves extracts of *S. argel* using the carrageenan-induced Wister rats edema model, Argel extract exhibited an inhibition of inflammation, at a dose of 100 mg/kg body weight after 3hr (22%) of carrageenan administration [26]. In the same line, Innocenti *et al.*, (2010) [27] investigated the anti-inflammatory activity of Argel leaves by the Croton oil ear test in mice.

Antimicrobial

The plant was reported to have antimicrobial properties [12, 14, 25, 28], the antifungal and antibacterial properties of the aqueous extracts of *Solenostemma argel* against *Aspergillus niger*, *Penicillium italicum*, *Escherichia coli* and *Salmonella typhi* was investigated by Sulieman *et al.* (2009).

Anticancer

The aqueous extract of Argel leaves was showed activity against tumor tissue of Ehrlich Carcinoma (EC), hence, significantly reduce the risk of tumor volume and represent wide and high zones of apoptotic tumor cells [10].

Analgesic activity

Mudawi *et al.*, (2015) [29] studied the analgesic effects of leaves extract of *Solenostemma argel* by using hot plate and acetic acid induced wreathing technique respectively, tested in mice.

Antioxidant

Taj Eldeen *et al.* (2014) [23] studied the antioxidant activity (DPPH assays) of *Solenostemma argel* (leaves and stems). He reported that all extract exhibited high antiradical activity towards DPPH radical. The

scavenging activity of the pure antioxidant standard, ascorbic acid was 46% at lower concentration of 250µg/ml. The radical scavenging activity was increased by concentration to 63 at 500µg/ml and 77% and at 1000µg/ml. But at lower concentration (250 µg/ml) after 30 minutes, the reaction Argel extract was scavenged 32%, of the total radicals in the reaction system. Increased at higher concentration (1000 µg/ml) to 57 and 84% of the total radicals respectively.

Toxicity

A numbers of studies showed that Argel extracts have antioxidant and exhibited hypoglycemic effect without non-toxic effect, so, researchers suggested that Argel extract can be used in health food, a nutritional supplement and management of patho-oxidative disorders and diabetes [17, 30, 31].

AGRICULTURAL APPLICATION

Insecticidal

Because of eco-friendly to the environment and safety to the human health, botanical insecticides considered as safe alternatives compared to chemical insecticides [32]. Idris *et al.*, (2011) [8] report that, the farmers in Kassala State, Sudan are used argel shoots as pesticide to control pests on tomatoes (aphids, and white flies), and on okra (Egyptian bull worm).

Several studies are explored the potential of argel plant application as botanical insecticide to control; *Asterolicanium phoenicis*, aphids [8, 33], mosquito species, the causative agent of malaria in Sudan [33, 34, 35, 36], the adults of the Saw-toothed Grain Beetle, *Oryzaephilus surinamensis* [37], and *Henosepilachna elaterii* the melon ladybird beetle [28].

Nematicidal

Extract of Argel leaves represent high mortality rates against second-stage juveniles of *Meloidogyne incognita* after 24, 48 and 72 h using a normal binocular microscope [38].

Soil application

According to, soil additives of dry leaves of argel (either as growth promoting ingredients or botanical pesticide) enhanced the flowering and yield palm tree (a dry date cultivar) in the Northern State, Sudan [8, 33].

CONCLUSION

Collectively, further study should be given to evaluate the potential compounds of Argel plant that have biological activities in medicine and agriculture, it is consider that to find naturally compounds to replace synthetic which are being restricted and affect human health and Environment.

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REFERENCES

1. Elkamali HH, Khalid SA. The most common herbal remedies in Dongola province, Northern Sudan. *Fitoterapia* 1996; (69):118-121.

2. Ahmed MM. Phytochemical, Antimalarial, Molluscicidal and antimicrobial activity of selected Sudanese Medicinal Plants with Emphasis on: *Nigella sativa* L. seeds. Ph.D. Thesis. University of Gezira, 2004.
3. Ahmed MA. The efficacy of four systemic insecticides using two methods of application against the green date palm pit scale insect (*Asterolicanium phoenicis* Rao) (Homoptera: Asterolicanidae) in northern Sudan. *Acta Horticulturae* 2007; 736:369-389.
4. Shayoub M, Haj E, Makawy A, Rasha R, Mona A. Adverse reaction of *Solenostemma argel* leaves, extraction and alkaloids tablets administered to patients. *Global J Trad Med Sys* 2013; 2(1):14-18.
5. Orange RA. Ecological and phyto-chemical studies on *Solenostemma argel* growing in Saudi Arabia. *J. of the College of Science; King Saud University* 1982; 13(1):17-24.
6. Kamel MS, Ohtani K, Hasanain HA, Mohamed H, Kasai R, Yamasaki K. Monoterpene and pregnane glucosides from *Solenostemma argel*. *Phytochemistry*, 1982; 53(8):937-940.
7. Hassan H, Hame A, El-Emary, Springue I, Mitome H, Miyaoka H. Pregene derivatives from *Solenostemma argel* leaves. *Pytochemistry* 2001; 57(4):507-511.
8. Idris TIM, Ibrahim AMA, Mahdi EM, Taha AK. Influence of argel (*Solenostemma argel* Del. Hayne) soil applications on flowering and yield of date palm (*Phoenix dactylifera* L.). *Agriculture and Biol. J. North America* 2011; 2(3):538-542.
9. Murwan K, Sabah E, Murwa A. Chemical composition, minerals, protein fractionation, and anti-nutrition factors in leaf of Hargel plant (*Solenostemma argel*). *Euro. J. Sci. Re.* 2010; 43(3):430-434.
10. Hanafi N, Mansour S. Antitumor efficacy of *Solenostemma Argel* and/or γ -irradiation against ehrlich carcinoma. *Journal of Biological Sciences* 2010; 10(6):468-479.
11. Elkamali H. Larvicidal activity of crude aqueous extracts of *Solenostemma argel* (Del. Hayne) against mosquito larvae. *J. of Herbs, Spices and Medicinal Plants* 2001; 8(4):83-86.
12. Roos SA, Medgalla SE, Dishay DW, Awad AH. Studies for determining antibiotic substances in some Egyptian plants: Screening for antimicrobial activities. *Fitoterapia* 1980; 5:303-308.
13. Hamed AI. New steroids from *Solenostemma argel* leaves. *Fitoterapia* 2001; 72(7):747-755.
14. Sulieman AE, Elzobair WM, Abdelrahim AM. Antimicrobial activity of the extract of *Solenostemma argel* plant. *J. Sci. & Techno* 2009; 10(3):104-115.
15. Plaza A, Perrone A, Balestieri M, Felice F, Balestrieric C. New unusual pregnane glycosides with anti-proliferative activity from *Solenostemma argel*. *Steroids* 2005; 70(9):594-603.
16. Tigani S, Ahmed S. *Solenostemma argel* tissue culture for production of secondary metabolites. *JGEB* 2009; 7(1):20-23.
17. Shafek RE, Michael HN. Antibacterial and antioxidant activity of two new kaempferol glycosides isolated from *Solenostemma argel* stem extract. *Asian journal of plant sciences* 2012; 11(3):143-147.
18. Tharib SM, El-Migdirab, Veitch GBA. A preliminary investigation of the potential antimicrobial activity of *Solenostemma argel*. *Pharm Biol* 1986; (24):101-104.
19. Faten AK, Ahmed HG, Nagwa AS, Enbaawy M. Studies for determining antimicrobial activity of *Solenostemma Argel* (Del) Hayne. 1-Extraction with methanol/water in different proportions. *Qatar Univ. Sci. J.* 1994; 14:138-146.
20. Elawad LME, Eweis EA, Abou-Bakr H. Larvicidal activity of Argel (*Solenostemma argel* Del Hyne) and Prickly Poppy (*Argemone mexicana* L.) Acetone Extracts against Mosquito Larvae of *Culex quinquefasciatus* (Say.) and *Anopheles arabiensis* (Diptera: Culicidae). *Egyptian Journal of Biological Pest Control* 2014; 24(1):259-264.
21. Filipescu GGA, Gerorgeto E, Grizorescu E, Streil Gabriela. Pharmacognostic study of some Cassia L and *Solenostemma* L. I- Preliminary morphoanatomical and Chemical study of Cassia alata L. C. occ., dentolis L. C. mimosolides L-C, Angutifolia and *Solenostema argeria* L. A Stiint Univ. M. I. Cuza lasia, *Sect* 1985; 2a(31):53-56.
22. Boulos L. Medicinal plants of North Africa. Publications *Inc Algonac Michigan USA* ISBN 1983; (10):48001-286.
23. Taj Al- Deen A, Ghanya Al-Naqeb G. Hypoglycemic effect and *in vitro* antioxidant activity of methanolic extract from Argel (*Solenostemma Argel*) plant. *International Journal of Herbal Medicine* 2014; 2(2):128-131.
24. Jobeen FS, Tharib M, Veitch GBA. An investigation of the anti-inflammatory activity of *Solenostemma oleifolium*. *Fetoteropia* 1984; 55(3):186-189.
25. Osman HM, Shayoub MH, Babiker EM, Mounzer ME. The effect of ethanolic leaves extract of *Solenostemma argel* on blood electrolytes and biochemical constituents of albino rats. *Sudan Journal of Science (SJS)* 2014; 6(1). <http://sciencejournal.uofk.edu>
26. Ismaiel SMO, Mahmoud EN, Mahmoud AM. Anti-Inflammatory Activity of Some Indigenous Sudanese Plants. *Res. J. Pharmacognosy & Phytochem* 2014; 6(1):30-32.
27. Innocenti G, Dall'Acqua S, Minesso P, Budriesi R, Micucci M, Chiarini A. Evaluation of muscarinic M3-receptor antagonism of *Solenostemma argel* leaves. *Planta Med* 2010; 76:634.
28. Farah AA, Ahmed EH. Beneficial antibacterial, antifungal and anti-insecticidal effects of ethanolic extract of *Solenostemma argel* leaves. *Mediterranean Journal of Biosciences* 2016; 1(4):184-191.
29. Mudawi MME, Chidrawar VR, Yassin AYA, Habeballa RS, Abd E I-wahab MF, Sulaiman MI. Analgesic Activity of *Solenostemma argel* by Modulating Pain Nociception Pathway in Mice. *World Journal of Pharmaceutical Research* 2015; 4(4):187-197.
30. Shayoub ME. Design formulation and evaluation of *Solenostemma argel* tablets (ALHARGAL). Ph.D. Thesis, *Faculty of Pharmacy. University of Khartoum- Sudan*, 2003.
31. Mahaleh UA. Antibacterial sensitivity for some chemically diverse steroidal glycosides *in vitro*. *J. Agric. Soc. Sci.* 2012; 8:24-28.
32. Isman BM. Botanical insecticides, deterrents, and repellents in modern agriculture and increasingly regulated world. *Annual Review of Entomology* 2006; 51:45-66.
33. Awad KT, Khalid OA, Tagelsir IM, Sidahmed O. Argel (*Solenostemma argel* Del. Hayenne) applications for control of the date palm green scale insect (*Asterolicanium phoenicis* Rao) and yield enhancement. *ARPN J. of Agri Bio Sci* 2012; 7:6.
34. Feiha MH, Awad KT, Hatim G, Omar A. Water extracts of Hargal plant (*Solenostemma argel*, Del Hyne) and Usher (*Calotropis procera* Ail) leaves as natural insecticides against mosquito larvae. *J.Sc. Tech* 2009; 10(3):67.
35. Stngeland T, Alele PE, Katuura E, Lye KA. Plants used to treat malaria in Nyakayojo sub-county, western Uganda. *J Ethnopharmacol* 2011; 137(1):154-166.
36. Sameh FA, Abdelhalim AM. Survey on medicinal plants and spices used in Beni-Sueif, Upper Egypt. *Ethnobiol Ethnomed* 2011; 7:18.
37. Yousif RE, Taha AK. Evaluation of Some Plant Extracts against Adults of the Saw-toothed Grain Beetle, *Oryzaephilus surinamensis* (Linn.) (Coleoptera: Silvanidae). *Universal Journal of Agricultural Research* 2016; 4(5):170-174.
38. Elbadri GA, Lee DW, Park JC, Yu HB, Choo HY. Evaluation of various plant extracts for their nematocidal efficacies against juveniles of *Meloidogyne incognita*. *Journal of Asia-Pacific Entomology* 2008; 11:99-102.

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