Asian J. Adv. Basic Sci.: **2017, 5***(1),* 46-51
ISSN (Print): 2454 – 7492
ISSN (Online): 2347 – 4114
www.ajabs.org

Assessment of Elemental, Proximate and Phytochemical Analysis of *Solanum incanum* L. (Peels) from Albaha (KSA) Area

Bader Omer Burham

Department of Chemistry, Faculty of Science, Elbaha University, SAUDI ARABIA
* *Correspondance: E-mail: babrburham@yahoo.com*

(Received 25 Feb, 2017; Accepted 06 Mar, 2017; Published 09 Mar, 2017)

ABSTRACT: Assessment of the mineral composition, proximate, and phytochemical of *Solanum incanum* to screen phytochemical constituents of the medicinal plant named (*Solanum incanum* L.) belonging to family Solanaceae, was undertaken using standard methods. The plant under study used for coward milk and also in the manufacture of cheese, but it does also have various medicinal uses that make it a valuable addition to the diet. The air dried grind of the peels of the plant and the crude extracts acquired were submitted for elemental analysis using UV–VIS Spectrophotometer and to phytochemical screening for their phytochemicals. Phytochemical screening showed the presence of tannins, saponins, alkaloids, and flavonoids, using various standard methods and reagents. The presence of these phytochemicals are indicating the importance of this plant in both dairy feed and as in traditional medicine. It is therefore concluded that, *Solanum incanum* contains bioactive compounds and minerals that could enhance the curative process of health as well as nutritive value. The results of the crude extract revealed the proximately analysis showed the percentage of ash (11.3%), a moisture content (9.41%), and the mineral composition indicated high concentrations of copper (26.9 mg/kg) more than iron (20.0 mg/kg).

Keywords: Medicinal plants; *Solanum incanum*; Peels; Phytochemical screening and Mineral analysis.

INTRODUCTION: The medicinal plant *Solanum incanum* belong to the family Solanaceae deployed in the south of the Kingdom of Saudi Arabia in Albaha area (KSA), a mountain region. *S. incanum is* one of about 1,500 *Solanum* species in the world. Widely distributed in the Horn of Africa it shows characteristic thorny leaves, yellow fruits and blue flowers with yellow pistils. *S. incanum* propagated by seeds, which usually don't germinate quickly; one month, is needed to reach a germination rate of 50%. It is common as a weed, around houses, in overgrazed grass land and in road sides. It also found at forest edges and in bush land and grassland, from sea-level up to 2500 m altitude.[1] The eggplant (*Solanum incanum* L.) is not cultivated plant, mostly it is the purple (dark or light) variety, except in the peninsular region where there is the green variety which is cultivated and consumed throughout the world.

In Sudan, Niger, Namibia, and Rwanda the fruits are used as an ingredient of arrow poison and in Mozambique of fish poison**.** The large variation in toxicity makes it dangerous to transfer specific uses from one region to another. The fruit and the seed are used in Asia and Africa for curdle milk and to make cheese. Also, the plant is employed in Southern Africa and East for the treatment of fever, skin diseases, abdominal pains, general infections, stomachache and digestion. In addition the fruit of *Solanum incanum* is used for the treatment of skin diseases, sores, dandruff and wounds in Tanzania.[2]

There is a great interest in macro and trace element composition of medicinal plants. It is believed that great majority of elements act as key components of essential enzymes for vital biochemical functions. Inorganic nutrients or various minerals are also required for maintaining the health of the body and accordingly are consumed as herbal health drinks or in orthodox medicines. The quantitative estimation of trace elements concentration is important for determining the effectiveness of medicinal plants in treating various diseases and also to understand the pharmacological action.[3]

Phytochemicals are the naturally occurring compounds present in all plant parts which together with nutrients and fibers provide protection to plants and humans against diseases.

The medicinal value of plants lies in bioactive phytochemical constituents that produce specific physiological action on the human body.[4]

Phytochemicals can be classified into two groups viz. primary and secondary according to their function in the plant body. Primary metabolites (sugars, amino acids, proteins, lipids, chlorophyll etc) are required for growth while secondary metabolites (alkaloids, essential oils, flavonoids, tannins, terpenoids, saponins,

phenolic compounds, cardiac glycosides etc.) play an important role in plant defense against herbivory[5 & 6] and other interspecies defenses. Secondary metabolites form the backbone of the modern medicine. Humans use secondary metabolites as medicines, flavorings and recreational drugs.

The eggplant has quite a number of chemical constituents, which may be responsible for many pharmacological activities .further work is required to investigate the extracts of peels for various pharmacological activities.

The eggplant has been reported to contain organic acid like oxalate which combines with soluble calcium in body fluids and can become a major concern for people with kidney and gall bladder ailments.[7]

In the medicinal value of plant trace elements plays a crucial role, in health and to cure disease. They play a nutritive, catalytic and balancing function in plants.[8] plants take them from the ground and conversion them into organic compounds that we consume them by eating either the plants or the animals that ate the plants. Many studies of plants were concerned with the assessment of the phyto-constituents and to establish the trace (Zn, Cu, Fe and Pb) and major K, Na, Ca, Mg and Al) elemental level of medicinally important plant. Secondly, this study determines the toxicity of the plants and safety levels for consumption. This research therefore reports on the phyto and elemental constituents of the above mentioned medicinal plant species.

MATERIALS AND METHODS:

Collection and Identification of Sample: Peels of *Solanum incanum* L. were collected from a local market in Albaha area of Southwest Kingdom of Saudi Arabia. Plant was identified in the Department of Biology, Faculty of Science by D. Haider Abdalgadir, Albaha University.

Preparation of Samples: The peels of *Solanum incanum* were selected and the part was cut in pieces, thoroughly washed with water to remove dirt and unwanted particles, dried at 105º C and ground in a porcelain mortar and pistol into powder before being used for analysis. The pulverized sample was stored in an air-tight container at room temperature.

Proximate Analysis: Proximate composition of the peels in *Solanum incanum* were determined, this include: the moisture, ash contents and absorbance were determined using the official method of the Association of Official Analytical Chemists (A.O.A.C)[11] as reported by Asibey-Berko[8] (Table 1and 2).

Analysis of mineral contents: Minerals composition of the peels in *Solamun incanum* was determined using the official method of the Association of Official Analytical Chemists (A.O.A.C)[11]. Tow grams of the sample was dry-ashed in an electric furnace at 550° C for 6 hours. The resulting ash was cooled in a desiccator and weighed. The ash was treated with 10 ml of 10% HNO_3 and then completed to 100ml double distilled water. The quantification was carried out using SP-3000 Plus model, UV-VIS Spectrophotometer, Optima, Tokyo, Japan, by using ammonium thiocyanate as a chromogenic reagent for Fe determination, and dimethylglycoxime as a chromogenic reagent for Fe determination**.**

Factors affecting the Concentration and Availability of the Mineral Elements: Several factors directly or indirectly influence the levels of minerals in plants and hence the amounts available for humans and animals that depend on plants for foods and feeds respectively. The amount of a particular nutrient in the diet may be insufficient to meet the requirements. However, the metabolism of the animal may be deranged by the interaction of dietary, environmental and genetic factors[9].

The nature and chemical composition of the soil are also involved in the location differences observed in the mineral elements present in grain sorghum[10].

Functions and Deficiency Symptoms of macro- and micro- elements in plant: The major functions of macronutrients to the plants macronutrients, Iron Fe^{2+}, Fe^{3+} component of cytochromes, electron transport, activates some enzymes, plays a role in chlorophyll synthesis. While the deficiency symptoms represented in Chlorosis, yellow and green striping in grasses. But Copper Cu^{+}, Cu^{2+} Component of many redox and lignin-biosynthetic enzymes , and the deficiency symptoms represented in Chlorosis, dead spots in leaves, stunted growth, terminal buds die, necrosis in young leaves.

Copper is a constituent of enzymes like cytochrome coxidase, amine oxidase, catalase and it plays a role in iron absorption. Copper is an essential micro-nutrient necessary for the haematologic and neurologic systems,[11] it is necessary for the growth and formation of bone, formation of myelin sheaths in the nervous systems, helps in the incorporation of iron in haemoglobin. [12]

Iron functions as haemoglobin in the transport of oxygen. In cellular respiration, it functions as essential component of enzymes involved in biological oxidation such as cytochromes[13].

The biochemistry and functions of the individual mineral elements: The basic functions performed by the minerals are: they are structural components of body tissues, are involved in the maintenance of acid-base balance and in the regulation of body fluids, in transport of gases and in muscle contractions[14].

Determination of Copper Iron content in Sample by Spectrophotometer: In the determination of Copper we convert it into coloured complex by addition diethylglycoxime reagent. The following procedure was carried out: 5 ml of the stock Copper solution (1000 ppm) were pipetted and 3 ml of diethylglycoxime reagent standard were added into a clean 100 ml volumetric flask and diluted to volume. Some of this solution were placed the cuvette of the UV/ VIS spectrophotometer, and also double distilled water was used as blank in order to scan for the wavelength of the maximum absorbance (Table 3). A series of 5 standard concentration solutions of Cu (0.01, 1.0, 0.5, 3.0 and 5.0 ppm were prepared from the stock solution of Copper (1000 ppm) and the absorbance at the wavelength of maximum absorbance were measured. Absorbance versus concentration was plotted (Figures 1 & 2). Unknown sample solutions were treated in the same way (diethylglycoxime reagent). The absorbance unknown sample solutions were measured. These absorbance values were referred to their related concentrations in the calibration.

Determination of Copper and Iron content in Sample by Spectrophotometer: In the determination of iron we convert it into iron (111)–thiocyanate complex, distinguished red color. The following procedure was carried out: 5 ml of the stock iron solution (1000ppm) were pipetted and 3 ml of standard NH_4 SCN were added into a clean 100 ml volumetric flask and diluted to volume. Some of this solution were placed the cuvette of the UV/VIS spectrophotometer, and also double distilled water was used as blank in order to scan for the wavelength of the maximum absorbance (Table 3). A series of 5 standard concentration solutions of Fe (111) (1.0, 5.0, 10, 15 and 20 ppm were prepared from the stock solution of iron (1000ppm) and the absorbance at the wavelength of maximum absorbance were measured. Absorbances versus concentration were plotted (Figure 1 & 2). Unknown sample solutions were treated in the same way (Thiocyanate). The absorbance unknown sample solutions were measured. These absorbance values were referred to their related concentrations in the calibration graph.

Phytochemical screening: An aqueous extract of the sample was prepared by soaking one gram of the powdered samples in 50 ml of distilled water for 24 hours. The extract was filtered using Whatmann filter paper No 42 (125 mm). Chemical tests were carried out on the aqueous extract and on the powdered samples to identify the constituents using standard procedures.

Test for saponins: the presence of saponins in the test sample was done using the Harbone.[15] The test for saponins is known as Froth test. In Froth test 2 ml of the aqueous extract were mixed with 6 ml of distilled water in a test tube. The mixture was well shaken vigorously and the formation or the forth indicated the presence of saponins (Table 4).

Test for tannins: The determination of the presence of tannins in the test sample was carried out using Ferric Chloride $FeCl_3$ test described by Harbone.[15] Two grams of the dried powdered samples was added into 10 ml of distilled water. The mixture was shaken for 20 minutes and the filtrate used as aqueous extract. Two ml of aqueous extract was added into a test tube and 3 ml of distilled water was added to it and shaken very well for homogenate two drops of dilute Ferric Chloride was added to the mixture the formation of very dark precipitate indicated the presence of tannins (Table 4).

Test for Alkaloids: the presence of alkaloids in each sample was investigated using the method described by Okwu.[16] Two grams of sample is shaken with 5 ml of 2% HCl on a steam bath and filtered with Whatmann filter paper no. 42. To 1 ml of filtrate added 0.5 ml of Wagner' s reagent (2 ml of iodine and 3 g of potassium iodide were dissolved in 20 ml of distilled water and made up to 100 ml with distilled water). A reddish brown precipitate indicated the presence of alkaloids (Table 4).

Test for flavonoids: The determination of the presence of flavonoids in the sample was done using the acid-alkaline. Two ml of aqueous extract was added into a test tube and a few drops of concentrated ammonia were added, the formation of a yellow colouration shows the presence of flavonoids (Table 4).

RESULTS AND DISCUSSION: Minerals are inorganic nutrients, usually required in small amounts from less than 1 to 2500 mg per day, depending on the mineral. The importance of mineral elements in human, animal and plant nutrition has been well recognized.[17]

The presence of some of the trace minerals are needed by the body in very little amount though they are also useful. These trace minerals include Cu and Fe they are important for immune system function, energy metabolism and anti-oxidant function. The results of chemical quantitative detection described that the percentage of the ashes of the kidneys was found 11.3

% and the percentage of moisture of *Solanum incanum* 9.41% in the peels, basis on dry weight (Table 1).The trace metals content of *S. incanum* showed that Cu (26.9 mg/kg) more than that of Fe (20.8 mg/kg) in (Table 3).

From the result, *Solanum incanum* contained appreciable amount of these minerals and so a rich source of these minerals. The amount of minerals found in these species compared well with the NAFDAC. Mineral elements like potassium, iron, zinc, calcium, traces of chromium and magnesium play an important role in the maintenance of normal glucose-tolerance and in the release of insulin from beta cells of islets of langerhans.[18]

The results of the preliminary phytochemical qualitative analysis of *S. incanum* (peels) carried out on the aqueous extract were summarized in (Table 4) which include constituents such as tannins, saponins, alkaloids, flavonoids, phenols and several other aromatic compounds are secondary metabolites in the selected plant which could be responsible for the observed antimicrobial property and that serve a defense mechanism against prediction by many microorganisms. The results showed in (Table 4) showed qualitative detection of active chemical components in *S. incanum* peels, containing the tannins and saponins this is in line.[19]

Where the importances of tannins lie in being a source of energy consumed by the plant in the vital process of metabolism, It is also a material phenolic disinfectant which protect the plant from insects and pathogenic fungi.[20] Tannins, the high molecular weight polyphenolic compounds found naturally in many plants and have been found to play a protective role in plants against micro-organisms, unfavourable climatic conditions and damage by animals.

Also peels of *S. incanum* gave a positive detection for saponins, which confirms the use of saponins for keeping the blood level, especially those isolated from the bark of the plant.[21]

So saponins are being promoted commercially as dietary supplements and nutraceuticals in traditional medicine preparations. The presence of saponins and glycoalkaloids protects plant from microbial pathogens. Paczkowski *et al.* studied the biosynthesis of steroidal saponin and glycoalkaloids.[22] Flavonoids are the most common group of polyphenolic compounds in the human diet and are found ubiquitously in plants. Flavonoids are natural organic compounds have solubility in water, and they are usually found in the aqueous solution of plant cell.[23] There are found freely or derivatives glycocides so there are found in citrus fruits, beans, onions and other.

Flavonoids have multiple health benefits contribute to giving the attractive color of fruits and vegetables and show the bait.[24] Phenols and phenolic compounds have tremendous antimicrobial potential. They have been extensively used in disinfections and remained the standards with which other bactericides are compared. The presences of alkaloids make this fruit highly nutritional and medicinal. Alkaloids have various pharmacological effects such as antiarrhythmic, anticholinergic, analgesic, antitumor, antihypertensive, antipyretics, antimalarial, stimulant, and many more and often used as medications and recreational drugs.[25]

Table 4 showed qualitative analysis of phytochemicals present in *S. incanum* the result revealed that this plan contain a significant amount of Alkaloids which is known to give plant a bitter taste. Phytochemicals such as alkaloids, flavonoids, steroids, terpenoids, phenols, saponins and tannins present in different extracts exhibit a number of biological activities and protect from most of the chronic diseases.

Preliminary phytochemical screening actually helps in isolating and characterizing the chemical constituents present in the plant extracts and the knowledge of the chemical constituents of plants is desirable to understand herbal drugs and their preparations and finally in discovering the actual value of folkloric remedies.

Table 1: Proximate composition of *S. incanum.*

Parameters	***%***
Ash content	11.3
Moisture	9.41

Table 2: Absorbance of solution of *S. incanum* (peels).

Parameters at λ_{max}	**Absorbance**
Cu (at 372 nm)	0.007
Fe (at 370 nm)	0.005

Table 3: Trace metals content of *S. incanum* (peels).

Parameters	***S. incanum***	
	ppm	**mg/kg**
Cu	0.269	26.9
Fe	0.208	20.8

Table 4: The qualitative analysis of phytochemicals present in *S. incanum* (peels).

Phytochemical	*S. incanum*
Steroids	+++
Tannins	+++
Saponins (Forth test)	+++
Alkaloids	+++
Flavonoids	+

+++ = richly present; ++ = moderately Present; + = Slightly Present; - = Absent

Figure 1: Absorbance of solutions of iron as a function of concentration.

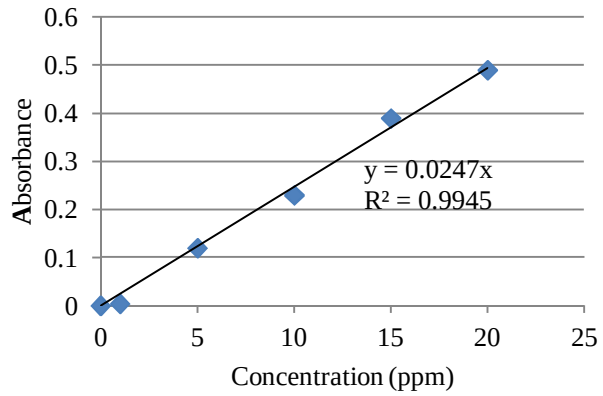
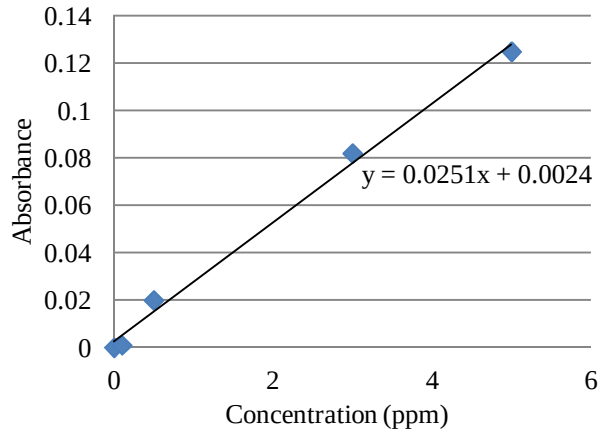


Figure 2: Absorbance of solutions of copper as a function of concentration.



CONCLUSION: *Solanum incanum* is enriched with important phytochemical and elemental constituents in significant amounts including minerals and secondary metabolites in the peels of the plant. In the results, the presence of phytochemicals along with minerals can make *Solanum incanum* a potential drug. However, further study is necessary to quantify, isolate, characterize and to evaluate biological activity of the particular compound for drug development.

REFERENCES:

1. Lester R. N., Hasan S. M. Z. (1991) Origin and domestication of eggplant from *Solanum incanum*, in Africa and Asia, in: J. G. Hawkes, R. N. Lester, M. Nee, N. Estrada, (Eds.), Solanaceae III: Taxonomy, Chemistry, Evolution. The Linnean Society of London, London, p. 369-387.
2. Teijo Y., (2004) Extraction and Planar Chromatographic Separation Techniques in the Analysis of Natural Products. University of Helsinki, http://ethesis.helsinki.fi/.
3. Tadzabi K., Maina H. M., (2013) ON Maitera; J. S., Ezekiel, *J. Chem. Pharm. Res*., 5(9):150-156.
4. Akinmoladun A. C., Ibukun E. O., Afor; E. M. and Obuotor; E. O. (2007) Farombi. *Sci. Res. Essays*, 2(5), 163-166.
5. Hill A. F. (1952) Economic, A Botany Textbook of useful plants and plant products, 2nd edn. McGarw-Hill Book Company Inc, New York.
6. Edeoga H. O., Okwu D. E. and Mbaebie, B.O. (2005) *Afr. J. Biotechnol.*, 4(7), 685-688.
7. Bonsu K. O., Fontem D. A., Nkansah G. O., Iroume R. N., wusu; O. O. and Schippers R. (2002) Diversity within the Gboma, eggplant (Solanum macrocarpon), an indigenous vegetable from West Africa, *Ghana J. Horticulture*, 1, 50–58.
8. Grubben G. J. H. and Denton O. (2004) *Plant Resources of Tropical Africa II:Vegetables* Leiden, Wageningen: Backhuys Publishers) 35-198 .
9. Gordo R. F. (1977) Poultry Diseases. The English Language Book Society and Bailliere Tindall, London.
10. Deosthale Y. G. and Belavady B. (1978) Mineral and Trace Element Composition of Sorghum grain: Effect of Variety, Location and Application of the Nitrogen Fertilizer, *Ind. J. Nutr. Dietet.*, 15, 302 - 308.
11. Tan J., Burns D. L. and Jones H. R. (2006) Severeataxia, myelopathy and peripheral neuropathy 16-due to acquired copper deficiency in a patient with history of gastrectomy, *J. Paenteral Nutr*, 30, 446-450.
12. Chandra R. K. (1990) Micro-nutrients and immune functions: An overview, Annal New York Acad. Sci. 587, 9-16.
13. Malhotra V. K. (1998) Biochemistry for Students. Tenth Edition. Jaypee Brothers Medical Publishers (P) Ltd, New Delhi, India.
14. Murray R. K., Granner D. K., Mayes P. A., Rodwell V. W. and Harper's (2000) Biochemistry, 25th Edition, McGraw-Hill, Health Profession Division, USA.

15. Harbone J. (1973) Experimental methods in analytical chemistry Chapman and Hall, New York, 140-145.

16. Okwu D. E. (2005) Evaluation of the phytonutrients , mineral and vitamin content of some varities of Yam (*Discorea*spp), *International Journal of Molecular Medicine and Advances in Science.*, 22–203.

17. Underwood, Darby, Simsek A., and Aykut O., (1971, 1976, 2007)) Evaluation of the microelement profile of Turkish hazelnut (Corylusavellana L) varieties for human nutrition and health, *Int. J. Food Sci. Nutr.*, 58, 677-688.

18. Gayathri P., Devi S. G., Srinivasan S. and Saroja S. (2010) *Hygeia. J. D. Med.,* 2(1), 57-62.

19. Saad, Shukri, the judge, Abdullah.,Abdul Karim and Mohammed (1988) medicinal and aromatic plants and toxic in the Arab world. Khartoum, p 477.

20. Qutb and Fawzi Taha (1988) Medicinal plant cultivation and components, Dar Mars Publishing Riyadh, in, 110-112.

21. Pillion D. J., Atchison J. A., Wany R. X. and Meezan E. (1994) Alky Glycosides Enhance systemic Absorption of Insulin Applied Topically to the Rateye, *J. Pharma & Exper. Thera.,* 271, 1274 – 1280 .

22. Kantamreddi V. S. S. N., Lakshmi N., and Kasapux V. V. V. S., (2010) *Int. J. Pharm. Bio Sci.*, 1(4), 351-358.

23. N. Pace and G. J. Mackinney (1994) *American chem. Soc.*, 63, 3594-3595.

24. Bors W., Michel C. and stettmair K. (1997) Antioxidant Effect of Flavonoids. Minireview, ISO press, Neuherbery, Germany,

25. Tadzabia K., Maina H. M., Maitera O. N., and Ezekiel J. S. (2013) *J. Chem. Pharm. Res.*, 5(9), 150-156.