Original Article

Preliminary phytochemical evaluation and seed proximate analysis of Surib (*Sesbanialeptocarpa* DC.)

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Abstract:

Background: Surib (*Sessbanialeptocarpa*) of the family Leguminosae is a wild plant widely spread in Gezira scheme and sometimes its seeds unavoidably get mixed with machinery-harvested crops especially wheat. Different parts of Surib have been used traditionally for various illnesses in Africa where the plant spread widely.

Objectives: To evaluate the nutritional value of Surib.

Methods: The preliminary phytochemical screening was performed using the conventional chemical tests using precipitation and color reagents as appropriate, while the standard methods of the Association of Official Analytical Chemists, 1980 were used for the determination of the proximate seed composition.

Results: Preliminary phytochemical screening of different plant parts (seeds, leaves and roots) extracts showed the presence of alkaloids in seeds and roots. Seeds and leaves of the plants were found to contain saponins, flavanoids, anthraquinones and tannins while the roots are devoid of these constituents. Proximate analysis of the seed revealed that carbohydrates and crude fibers constitute about 80% while proteins and fats values were 5.25 and 6.13% respectively.

Conclusion: The nutrient value of Surib seed is negligible for its low content of proteins and fatty substances and thus it is of no use as animal or human food. The qualitatively determined anti-nutrient phytoconstituents as tannins, alkaloids, saponins and flavanoids in the seed could be considered as another main limitation to effective utilization of Surib as an animal feed and/or human food.

Keywords: Sesbania leptocarpa, proximate analysis, phytochemical screening.

The genus Sesbania belongs to the family Leguminosae (Fabaceae/Papilionaceae). Members of the genus Sesbania are known for fast growth rates as a very high affinity for association with several nitrogen-fixing Rhizobia in the soil that cause formation of numerous and large nodules in the plant roots. Members of this genus also have several potential uses: including forage, poles for light construction, fuel wood, pulpwood, live fences and shade trees[1].

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However, due to phytoconstituents (antinutrients), there may be adverse effects on animal productivity and health when Sesbania comprises a high proportion of diets for long periods[2]. The anti-nutritional factors (ANF) include saponins, tannins, coumarins, flavanoids, polyphenolics, alkaloids, phytates, lectins, cyanogenic glycosides, cardiac glycosides, terpenes, non-protein amino acids[3].

Surib (*Sesbanialeptocarpa*) is a wild plant widely spread in Gezira scheme. Surib seed get mixed with machinery-harvested crops especially wheat. Its seeds comprise the major plant part and its use in human food and animal feed was not yet evaluated.

Objective:

To determine the nutrients and anti-nutrients values of Surib.

Materials and methods:

Plant material

Fresh leaves, roots and seeds of Suribcollected from different locations and spaces of El Razi-campus during December 2009.

Extraction of plant material

Thirty grams from powdered leaves, seeds and roots were separately macerated in 100ml of ethanol, methanol, chloroform and distilled water for 24 hours in a conical flask at room temperature with intermittent shaking then each extract was filtered, concentrated (20% solution) and kept in a refrigerator until use.

Preliminary phytochemical screening of different extracts of Surib plant parts

As described by Jigna and Sumitra[4] the following tests were carried out:

Test for tannins: To 2ml water extract of different plant parts, 2ml of 10% ferric chloride solution was added. Blue-black precipitate indicates the presence of tannins.

Test for alkaloids: To 2ml methanolicextract of different plant parts, 1ml of 1% hydrochloric acid was added, and heated in a water bath for 10 minutes. 1ml from each solution was taken and 6 drops of Dragendorff's reagent/Wagner's reagent/Mayer's reagent were added and mixed. Orange precipitate/ brownish-red precipitate/ creamish precipitate respectively indicate the presence of alkaloids.

Test for saponins: To 0.5 ml methanolic extract of different plant parts, 5ml distilled water was added in a test tube and vigorously shaken. Persistent froth volume produced, checked each 10 minutes for 30 minutes, indicates presence of saponins.

Test for cardiac glycosides (Keller-Kiliani test): To 2ml methanolicextract of different plant parts, 1ml glacial acetic acid, six drops of 10% ferric chloride solution and six drops of concentrated sulphuric acid were added in a test tube. Green-blue color indicates the presence of cardiac glycosides.

Test for steroids and terpenes (Liebermann-Burchard reaction): To 2ml chloroform extract of different plant parts, 2ml acetic anhydride and few drops concentrated sulfuric acid were added in test tube. Blue-green ring between layers indicates the presence of steroids and pink-purple ring indicates presence of terpenes.

Test for flavanoids: Test for flavanoids was carried out according to methods mentioned by Ahmed[5], which include:

Shinoda's test: To 2ml ethanol extract of different plant parts, 0.5ml concentrated hydrochloric acid and few pellets of magnesium turning were added in a test tube. Pink-tomato red color indicates the presence of flavanoids.

To 2ml ethanol extract of different plant parts, 1ml of 1% potassium hydroxide solution was added. Dark yellow color indicates the presence of flavanoids.

To 2 ml ethanol extract of different plant parts, 1 ml of 1% aluminum chloride in methanol was added in a test tube. Yellow color indicates presence of flavanols, flavanones and/or chalcones.

To 2ml ethanol filtrates for different plant parts, 0.5ml concentrated Hydrochloric acid and few drops from amyl alcohol were added in a test tube and shaken. Red color indicates presence of flavanoidal glycosides.

Test for anthraquinones

Anthraquinone glycosides test: To 2.5g powdered material of different plant parts, 10 ml of 20% sulphuric acid and 2ml of 2% ferric chloride solution were added in a test tube, boiled in a water bath (refluxed) for 30 minutes, allowed to cool, and filtered. The solution then extracted with 10 ml chloroform in separating funnel. Chloroform layer separated and concentrated to about 4ml and 2.5ml of 10 % ammonia solution added. Pink-red color acquired by the alkaline layer indicates the presence of anthraquinone glycosides.

Free anthraquinones test: To 5ml the ethanol extract of different plant parts, 10 ml of water was added, boiled and allowed to cool. Then 2ml of the solution was shaken with 5ml chloroform. The chloroform layer separated and concentrated to about 2 ml. 2-3ml ammonia solution was then added. Pink-red color acquired by the alkaline layer indicates the presence of free anthraquinones[5].

The following chemical tests were carried out according to the methods mentioned by Ogbonnia, et al.[5]:

Test for carbohydrates (Molisch's test): In this method, to 2ml ethanol extract of different plant parts, two drops of Molisch' test reagent (α-naphthol in ethanol) was added in a test tube and mixed thoroughly. Gently 5ml of concentrated Sulphuric acid were added. Purple color at the interface indicates the positive test.

Test for reducing sugars (Fehling's test)

In this method, to 2ml of Fehling's reagent (copper sulphate/sodium potassium tratrate in water) in an empty test tube, three drops ethanol extract of different plant parts, were added and boiled in a water bath at 60 °C. Green suspension and red precipitate indicates the positive test.

Test for cyanogenic glycosides: To 3ml ethanol extract of different plant parts, 2ml sterile water was added in a conical flask. Freshly prepared sodium picrate paper was placed at stopper and the solution was heated to boil. Change of color of sodium picrate paper from yellow to different shades of red indicates the presence of cyanogenic glycosides.

Proximate analysis of Surib seeds: Proximate analysis of the seeds was carried out according to the standard methods of the Association of Official Analytical Chemists, 1980 and as adopted by Ruzainah, et al.[6]. Each result was carried out in duplicate. Averages were calculated as fed thereafter.

Results:

Phytoconstituents in different plant parts of Surib are shown in Table 1.

Table 1. Preliminary Phytochemical Screening of Different Plant Parts Extracts of Surib:

Constituents	leaves	Roots	Seeds
Tannins	+	-	+
Alkaloids			
Dragendorff's reagent	-	+	+
Mayer's reagent.	-	+	+
Wagner's reagent.	-	+	+
Saponins	+	-	+
Cardiac glycosides	+	-	+
Sterols	+	-	-
Terprenes	+	-	+
Flavonoids			
Shinoda's test.	+	-	+
KOH 1% test	+	-	+
ALCL3 1% test	+	-	+
Amyl alcohol test	-	-	-
Anthraquinones			
anthraquinone glycosides	+	-	+
free anthraquinone	-	-	-
Carbohydrates			
Molisch's test	+	+	+
Fehling's test	+	-	+
Cyanogenic glycosides	-	-	-

Abbreviations: (+) present, (-) absent

The proximate compositions of the seeds of Surib are presented in Table 2.

Table 2: Proximate Composition of Surib Seeds

Component	Value as fed (% Composition)
Moisture	5.77
Crude protein	5.25
Crude lipid	6.13
Crude fibre	12.49
Ash content	3.36
Carbohydrate	67

Discussion:

Results of phytochemical screening revealed that none of the plant parts tested had shown the presence of cyanogenic glycosides. The results also revealed that leaf and seed extracts contain tannins, saponins, cardiac glycosides, terpenes, flavanoids, anthraquinone glycosides, carbohydrates and reducing sugars, while root extracts contain only alkaloids and carbohydrates. Sterols and triterpenes that known to be of wide distribution in plant kingdom[7] were detected by the observation of strong distinctive color reactions obtained. Alkaloids found in Surib plant parts (root and seed) were detected in trace amount and presented by a faint characteristic color reaction. The occurrence of alkaloids in the plant samples is questionable since other constituents (proteins and amino acids) may acquire the same color responses. However, sesbanimide, a toxic alkaloid has been isolated and identified in seeds of many Sesbania species[8].

For Surib seeds carbohydrate content recorded the highest (67%) amongst the composition while the ash content was found to be as high as 3.36%. The crude fibre and ash content values are important in term of the suitability of the seed cakes for compounding of animal feeds[9]. However, Surib seeds would be unsuitable for animal feeds in view of its high ash (> 2.5%) and crude fiber, although it contains high proportion of carbohydrates than that of other legumes as ranging 23 to 66 %[10].

The protein content of Surib is 5.25% and for a feedstuff to be regarded as potential protein source, its crude protein level must exceed 20%[10]. Therefore, Surib is not a suitable protein sourcecompared to the high protein levels detected in three Sesbania species *S. aculeate* (33.1%), *S. rostrata*(32.0%) and *S. sesban*(32.3%)[11].

The low moisture and lipid content will prevent rancidity and result in the elongation of the shelf life[11], but on the other hand the low lipid content of Surib could deprive samples being favorable source of fats.

Conclusion:

The nutrient value of Surib seed is negligible for its low content of proteins and fatty substances, high ash and crude fiber. The presence of anti-nutrient phytoconstituents as tannins, alkaloids, saponins and flavanoids in the seed could be considered as main limitation to its effective utilization as animal and/or human food.

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