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THE MINERAL AND PHYTOCHEMICAL ANALYSIS OF THE LEAVES OF *Senna alata* and *Cajanus cajan* AND THEIR MEDICINAL VALUE

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ABSTRACT

The chemical composition of *Senna alata* and *Cajanus cajan* were investigated. The mineral analysis in mg/100g indicated that the leaves contained sodium, potassium, calcium, magnesium, zinc, iron, manganese, phosphorus, however, lead, and copper were absent in *Cajanus cajan*. The Phytochemical analysis of the plants showed that the two medicinal plants contained alkaloids, tannins, steroids, saponins, phlobatannin, terpenoid, flavonoid, cardiac glycoside, while steroid and cardiac glycoside was not found in *Cajanus cajan* and *Senna alata* respectively. The medicinal plants also contained antinutrient phytin phosphorus, oxalate, phytic acid and phenol.

Keywords: Phenol, Phytin, Flavonoids, Oxalate.

INTRODUCTION

Medicinal plants are plants which contain substances that could be used for therapeutic purposes or which are precursors for the synthesis of useful drugs **[1]**. The medicinal value of these plants lie in bioactive phytochemical constituents that produce definite physiological action on the human body **[2]**. *Senna alata* belongs to the family *Fabaceae* and found mostly in the tropical countries including: Nigeria, India, North and South America, Mexico and Brazil. The local names are 'Asunrin oyinbo' (Yoruba), 'Koroga' (Hausa), 'Igoro' (Benin). It is traditionally used to relief pains and also used in the treatment of cutlass associated wounds, gonorrhea, burns and ulcers **[3, 4,**

5]. The decoction of the stem is inhaled for the treatment of catarrh and bronchitis **[6]**.

Cajanus cajan also belongs to the plant family, *Fabaceae* and found mostly in the tropical regions including Nigeria, Mexico, India, South America, Sub-saharan Africa **[7]**. It is known by English name – Red grain yellow dahl, French – Ambrerade, India – Archar, Yoruba – Feregede **[8]**. All parts of the plants are strongly intoxicant narcotic, aphrodisiae and anodynous the commonly used parts of the plants by traditional medical practitioners are the leaves, seeds and the roots **[6]**. The leaves are burnt and the smoke is inhaled for the relief of asthma and cough. Moreover, the leaves are useful in the relief of menstrual pain and inflamed breast **[1]**. It is also prescribed by herbalist for mental illness, insanity and insomnia **[6]**.

The aim and objectives of this study was to know the constituent of the leaves of *Senna alata* and *Cajanus cajan* through mineral and phytochemical analysis.

MATERIALS AND METHODS

Collection of Plant materials

The fresh plants were collected from a local farm in Ado-Ekiti, Ekiti State, Nigeria. Identification and authentication were carried out in the herbarium section of the Department of Plant Science, Ekiti State University, Ado-Ekiti, Ekiti State, Nigeria.

Processing of Plant Materials

The fresh leaves of the following plants *S. alata* and *C. cajan* were air dried at 28^{o}C for 30days. They were grounded into fine powder using an electric blender and stored in a cool dry container until use.

Mineral analysis

The minerals of the samples were analyzed using the solution obtained by dry ashing the sample at 550°C and dissolving it in HCl (25ml) and 5% Lanthanum chloride (2ml), boiling, filtering and making up to standard volume with deionized water. Mn, Cu, Co, Zn, Fe, Mg, Na, and Ca were determined with a Buck Atomic Absorption Spectrometer **(Buck Scientific, Model 200A/200, Inc. East Norwalk, Connecticut, U.S.A)**. Sodium was measured with a Corning 405 flame photometer **(Corning Halstead, Essex, UK, Model 405) [9].** The detection limits had previously been determine using the methods of **[10]** as Mn 0.01, Cu 0.005, Co 0.05, Zn 0.005, Fe 0.02, Mg 0.002, Ca 0.04, Na 0.001, ppm (all for aqueous solutions).

The optimum analytical range was 0.5 to 10 absorbance units with coefficient of variation of 0.05 to 0.40% phosphovanado-molybdate

method using a Spectronic 20 colorimeter **(Galenkamp, London, UK) [9]**. All chemicals were BDH analytical grade.

Phytochemical analysis

Quantitative phytochemical screening to determine the presence of alkaloids, tannins, saponins steroids, phlobatannin, terpenoids, flavonoid and cardiac glycosides using standard methods as described by **[11, 12, 1]** were carried out.

RESULTS AND DISCUSSION

The mineral composition (in mg/100g) of *S. alata* and *C. cajan* leaves are shown in **Table 1**. The values of sodium in the plants varied from 30.25 (*S. alata*) to 28.85 (*C. cajan*) while that of potassium varied from 37.60 (*S. alata*) to 35.12 (*C. cajan*). The ratio of sodium to potassium was less than 1 (0.8); therefore consumption of the plants would reduce high blood pressure disease because Na:K is less than one as recommended by **[13]**.

The value of calcium and phosphorous in the leaves of *S. alata* and *C. cajan* varied from 40.31 (*S. alata*) to 37.85 (*C. cajan*) for calcium and from 73.50 (*S. alata*) to 68.31 (*C. cajan*) for phosphorous. Calcium and phosphorous are associated with each other for growth and maintenance of bones, teeth and muscles **[14, 15]**. The calcium level in the leaves studied were comparable favourably with the values reported in some green leafy vegetables consumed in Nigeria and some wild edible leaves grown in Eastern Amatolia, Turkey **[16]**. The phosphorous content was comparable favorably with that of *Ipomeae batatas* with 37.28 **[17]**. Therefore, *S. alata* and *C. cajan* are good sources of calcium and phosphorous which aids intestinal absorption because the ratio of Ca: P in leaves was (0.54) close to unity **[18]**.

Magnesium content of *S. alata* and *C. cajan* varied from 36. 42 (*S. alata*) to 30.38 (*C. cajan*). These were high when compared to *Xylopia aethiopia* (2.42) **[19]**. Magnesium is a composition of chlorophyll and it is an important content in connection with Ischemic heart disease and calcium metabolism in bones **[20]**.

Zinc content of *S. alata* and *C. cajan* varied from 35.47 (*S. alata*) to 32.70 (*C. cajan*) These were low when compared to the mineral analyzed for in *Pilostigma thioningi* (70.10) **[21]**. Zinc is involved in normal functioning of immune system **[22]** and is associated with protein metabolism. The leaves were found to be a good source of zinc because it is far above 6.23 recommended by RDA **[23]**.

Iron content of *S. alata* and *C. cajan* varied from 7.26 (*S. alata*) to 8.03 (*C. cajan*). These values were comparable favourably with the values reported for *Ipomea batata* 16.00 **[17]** but low when compared to the values of other green leafy vegetables as reported by **[22]**. Iron is an essential trace element for haemoglobin formation, normal functioning of central nervous system and in the oxidation of carbohydrates, protein and fats **[24]**. This perhaps justifies the already locally established function of the plant in the regulation of haemoglobin level.

The values of manganese in the leaves of *S. alata* and *C. cajan* varied 0.54 (*S. alata*) to 0.75 (*C. cajan*). This suggests that *S. alata* and *C. cajan* do not contribute or rather cannot be used as a substitute for other blood forming leafy vegetables.

Copper and Lead were absent in *C. cajan* but present in minute quantity in *S. alata* with 0.01 for copper and 0.03 for lead. However, it has been reported that lead and copper are highly toxic even at low concentrations **[25]**.

The result of phytochemical analysis of the leaves of *S. alata* and *C. cajan* are shown in **Table 2**. The two medicinal plants contained alkaloids, tannis, saponins, steroids, phlobatannin, terpenoids, flavonoids and cardiac glycosides while steroid was absent in *S. alata.* Alkaloids has been found to have microbiocidal effect and the major anti-diarrheal effect is probably due to their effects on small intestine and antihypertensive antifungal, anti-inflammatory, anti fibrogenic effect **[26]**. However, the result of this work is similar to the findings of **[27]** who reported the presence of alkaloid in *Cnidoscolus aconitifolius.* Some alkaloids are useful against HIV infection as well as intestinal infection associated with AIDS **[28]**. The presence of alkaloids in the two medicinal plants makes them recommendable for patient as alkaloids posses a significant pharmacological property.

Tannin is non toxic and can generate physiological responses in animals that consume them **[29]**. Tannin can be toxic to filamentous fungi, yeast and bacteria. The presence of tannin in the medicinal plant suggests the ability of these plants to play major roles as antifungal anti diarrheal, antioxidant and anti hemorrhoidal agent **[30]**.

Saponins showed a positive result in the leaves of *S. alata* and *C. cajan.* This compound has been reported to have antihyper-cholesterol, anti-inflamatory, cardiac depressant properties by **[12]** and appear to kill or inhibit cancer cells without killing the normal cells in the process **[31]**.

Steroids also showed a positive result in the leaves of *C. cajan* which are of importance and interest in pharmacy due to their relationship with such compounds as sex hormones **[32]** and promote immune function in the skin and also reduce inflammation **[33]**. **[34]** reported the presence of steroids in *Acalypha hisphida*.

Phlobatanins were detected in the two medicinal plants. The report of this work is similar to the findings of **[34]** who reported the presence of phlobatannin in *A. hispida* and *A. racemosa*. This compound inhibits the growth of many microorganisms like fungi, yeast, bacteria and viruses **[29]**.

The *S. alata* and *C. cajan* contained terpenoid. Terpenoids called petalostemumol, showed excellent activity against *Bacillus subtilis* and *Staphylococcus aureus* and lesser activity against gram negative bacteria as well as *Candida albicans* **[36]**.

In this study, the leaves of *S. alata* and *C. cajan* contained flavonoid. It modifies the body's reaction to allergens, virus and carcinogens. It has been reported to show anti inflammatory and antimicrobial activity **[36]**. **[37]** reported the presence of flavonoids in *A. hybridus*. Cardiac glycoside showed positive result in the leaves of *S. alata*. The cardiac glycoside has been used for over two centuries as stimulant in cases of cardiac failure and diseases **[12, 38]**. This perharps justifies the already locally established function of the plant in the treatment and management of hypertension **[39]**.

The phenol content (in %) of the two medicinal plants were 0.35 and 0.22 respectively as shown in **Table 3**. It is considered bacteriostatic against both fungi **[40]** and bacteria **[41]**.

The values of oxalate content (mg/ml) of the leaves of *S. alata* and *C. cajan* were 6.54 and 7.38 respectively but are higher than *Musa sapentum* with 0.72 **[41]**, *Butryospernum parkii* with 1.5 **[39]**, *Spondias mombin* with 0.9 **[42]** and lower than the reported values for cotton leaves 0.22 **[39]**. High oxalate level in food may reduce the bio availability of such metal as calcium. The phytin phosphorus values (in mg/ml) of the leaves of *S. alata* and *C. cajan* were 24.13 and 21.26 respectively which are low compared to the values reported for *Zingiber officinale* 28.83 **[43]** but higher than wild yam tubers with 1.7 **[40]**. The phyitc acid intake of 4.9 is said to decrease iron absorption by 4.5 folds in humans.

Therefore, these medicinal plants can be consumed because the levels of antinutrient do not reach lethal dosages **[10]**.

It is established that only high content of these antinutrients prevent the absorption of Mineral like iron, magnesium, potassium and calcium which are essential for metabolism in the body. Reduction of antinutrients in foods may be necessary especially when their levels are higher than those generally regarded as safe for human consumption. This can be accomplished through different hydrothermal treatments, which also enhances the nutritional qualities: increase palatability and digestibility of foods **[43]**.

Table 1: Results of Mineral Analysis of the Two Medicinal Plants (mg/100g)

S.NO.	TEST	*Senna alata*	*Cajanus cajan*
1.	Sodium	30.25	28.85
2.	Potassium	37.60	35.12
3.	Calcium	40.31	37.85
4.	Magnesium	36.42	30.38
5.	Zinc	35.47	32.70
6.	Iron	7.26	8.03
7.	Lead	0.03	Not Detected
8.	Manganese	0.54	0.75

Table 2: Results of Phytochemical Analysis of the Two Medicinal Plants

S. No.	TEST	*Senna alata*	*Cajanus cajan*
1.	Alkaloid	+	+
2.	Tannin	+	+
3.	Saponin	+	+
4.	Steroid	-	+
5.	Phlobatannin	+	+
6.	Terpenoid	+	+
7.	Flavonoid	+	+
8.	Cardiacglycoside	+	-

+ = Presence of constituents; - = Absence of constituents

Table 3: Results of Anti Nutrient Analysis of the Two Medicinal Plants

S.NO.	TEST	*Senna alata*	*Cajanus cajan*
1.	**Tannin content (%)**	**4.56**	**3.87**
2.	**Phenol (%)**	**0.35**	**0.22**
3.	**Phytin phosphorus (mg/ml)**	**24.13**	**21.26**
4.	**Saponin (%)**	**3.25**	**2.18**
5.	**Alkaloids (%)**	**1.05**	**0.67**
6.	**Flavonoid (%)**	**0.33**	**0.33**
7.	**Oxalate (mg/ml)**	**6.54**	**7.38**

CONCLUSION

Plants have contributed immensely to the medical field. It has been the source of most drugs used for combating infections. The two plants used in this study were found to contain the important constituents needed to combat various kinds of infections in human beings.

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