PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

Pakistan Journal of Nutrition 8 (2): 119-121, 2009
ISSN 1680-5194
© Asian Network for Scientific Information, 2009

Determination of Chemical Composition of *Senna-siamea* (Cassia Leaves)

Y.R. Alli Smith
Department of Biochemistry, University of Ado Ekiti, Ado Ekiti, Nigeria

Abstract: The study on the chemical composition of the leaves of one of the most popularly known tropical plants, *Senna siamea (*Cassia leaves) has been carried out by analyzing samples of the plant leaves collected from Ado-Ekiti in Ekiti State for chemical composition. The proximate, elemental, phytochemicals and toxicant composition of the leaves of *senna siamea* were determined by analyzing samples of identified leaves using recommended method of analysis. The result of the analysis shows that the percentage crude protein, crude fibre, moisture content, ash content, carbohydrate and crude fat of the leaves are 4.01%, 12.36%, 46.01%, 17.93%, 7.67% and 12.02% respectively. The result of the mineral composition in PPM (Part per million) shows that iron, magnesium, manganese, potassium, calcium, sodium, copper, phosphorus and lead are 112.00, 876.00, 35.10, 812.00, 932.00, 612.00, 0.84 and 0.34 respectively while cadmium and vanadium was not detected in the leaves. The photochemical analysis shows that the leaves contain anthraquinones, alkaloids, phylobatannins and saponin and the toxicant composition shows the presence of tannin, oxalate and phytate. The minerals present in leaves shows that the leaves are good sources of essential nutrients but the presence of the toxicants shows that these leaves should be properly processed before consuming them.

Key words: *Senna siamea*, chemical composition, proximate, minerals, phytochemicals and toxicants

Introduction

Plants have been found to be the source of energy for the animal kingdom. In addition, plant can synthesize a large variety of chemical substances that are of physiological importance (Kretovich, 2005). Medicinal plants therefore, are groups of plant which in one or more if its parts contain substances that can be used for the synthesis of useful drugs (Sofowora, 2000).

Today, lots of plant materials are used in the production of enormous array of medicines. Stuffness and Douros (1982) reported that 50% of all modern chemical drugs are of natural product origin. It was reported that 60-80% of the population in every developing countries of the world relies on medicinal plants in the treatment of some diseases. This is mainly because of shortage of hospitals and health centre as well as medical staff and financial constraints. Although the actual number of the medicinal plant is not known but there is no doubt that most of the plants around us are medicinal (Hill, 1992). Some of the common uses of medicinal plants sold in the markets include pain relief, antimalaria, treating of skin infections and fumigation (Hailu *et al*., 2005).

In the last two centuries, there has been serious investigations into the chemical and biological activities of plants and these have yielded compounds for the development of synthetic organic chemistry and the emergence of medicinal chemistry as a route for the discovery of more effective therapeutic agents (Roja and Rao, 2000).

Senna siamea is an evergreen tree commonly cultivated in our area especially in fuel plantation. It is a medium size tree up to 15-20cm tall, with a straight trunk up to 30 cm in diameter, bole short, crown usually dense and rounded at first, later becoming irregular and spreading with dropping branches, Bank grey or light brown, smooth but becoming slightly fissured with age (Bernard, 2005). *Senna siamea* is effective in managing constipation association with a number of causes including surgery, childbirth and the use of narcotic pain relievers (Hill, 1992). It is used locally as antimalaria drugs especially when decocted (the leaves, bark) (Lose *et al*., 2000). In traditional medicine, the fruit is used to charm away intestinal worms and to prevent convulsion in children. The young fruits and leaves are also eaten as vegetables in Thailand. The flowers and young fruits are used as curries (Kiepe, 2001).

This study is designed to determine the chemical composition of the leaves of *Senna siamea* for public and dietary awareness of its nutritional status.

Materials and Methods

Plant material preparation: The leaves of *Senna siamea* were collected from Ado-Ekiti and identified in the science herbarium of the department of Plant Science and Forestry, University of Ado-Ekiti, Ekiti State, Nigeria. The leaves were sun dried for about five days and then grounded into fine powder using a food blender. (without metal contamination). The grounded samples were stored in an air-tight labeled plastic container from which samples were removed for chemical analysis.

Table 1: Proximate composition of Senna siamea

Parameters	(%) Percentage
Crude protein	4.01±0.05
Crude fibre	12.36±0.03
Moisture content	46.01±0.22
Ash content	17.93±0.04
Crude fat	12.02±0.05
Carbohydrate	7.67±0.03

Preparation of plant extract: 100g of the powdered leaves sample was weighed into a container containing 100ml of hexane. This was lest for 5 days until the solvent evaporated completely and the leave was recovered. This was done to extract the active ingredients.

Analysis of extract: The mineral constituents of the leaves namely iron, manganese, magnesium, potassium, calcium, sodium, copper, cadmium, lead, phosphorus and vanadium were determined using the methods of analysis described by A.O.A.C. (1990). The proximate analysis namely Crude protein, crude fibre, moisture content, ash content fat content and carbohydrate were also determined by the methods described by A.O.A.C.(1990).

The phytochemical constituent of the leaves namely Alkaloids, saponin, Anthraquinones, Tannins and phlobatanins were determined using the method of Trease and Evans (1978). Oxalate was determined using the method of Day and Ununderword (1986). Phytate was determined using the method of Wheeler and Ferrell (1971).

Results

The results of the determination of the proximate, elemental phytochemicals and antinutrients compositions of *Senna siamea* leaves are represented in Table 1, 2, 3 and 4 respectively.

Discussion

Proximate analysis of a food is the nutritional composition of that food. It is the estimation of the nutritive value of human food in its chemical form. The proximate analysis as shown In Table 1 reveals that *Senna siamea* contains protein (4.01%), crude fibre (12.36%), moisture content (46.01%), ash content (12.93%) crude fat (12.02%)and carbohydrate content (7.67%).

The values shows that the protein content is relatively low but it can contribute to the formation of hormones which controls a variety of body functions such as growth, repair and maintenance of body protein (Mau *et al.,* 1999). The moisture, Ash, crude fibre and crude fat content are relatively high. According to Michael and David (2002). The high content of ash is useful in assessing the quality of grading the plant and also gives an idea of the amount of minerals present in the sample. The fat content can be used for storage and transport forms of metabolic fuel. The relatively high carbohydrate content can be used as energy source and also it is necessary in the digestion and assimilation of other foods. The proximate composition of *Senna siamea* show a fairly good nutrient constitution when compared to other common vegetables such as *Amaranthus hybridus* (Nwaogu *et al.,* 2006).

Table 2: Elemental composition of *Senna siamea*

Parameters	Parts per million (PPM)
Iron (Fe)	112.00±0.05
Magnesium (mg)	876.00±0.04
Manganese (Mn)	35.10±0.10
Potassium (k)	812.00±0.05
Calcium (ca)	932.00±0.22
Sodium (Na)	612.00±0.02
Copper (Cu)	0.84±0.15
Cadmium (Cd)	ND
Lead (Pb)	0.34±0.04
Phosphorus (p)	10.84±0.20
Vanadium	ND

ND -Indicates not detected

Table 3: Phytochemical screening of *Senna siamea*

Phytochemical constituents	Ethanol extract
Saponins	+
Anthraquinones	+
Phytobatannins	+
Alkaloids	+

+ indicates present

Table 4: Antinutrient screening of Senna siamea

Antinutrients composition	Ethanol extract
Phytate	+
Tannin	+
Oxalate	+

+ indicates present

Table 2 shows the mineral content of *Senna siamea*. The need for supplementary diet rich in mineral content is necessary for a singular ration, to avoid metal deficiency syndrome like rickets and clarification of bones, as a result of calcium deficiency. Distorted enzymatic activity and poor electrolyte balance of the blood fluid are related to inadequate Na, k, mg and Zn, as they are the most required elements of living cells. The leaves of *Senna siamea* have fairly adequate concentrations of sodium, potassium, calcium, magnesium and iron in comparison with those reported for *A. hybridus* leaf extract (Nwaogu *et al.,* 2006)

The result of phytochemical screening and antinutrient composition of *Senna siamea* are given in Table 3 and 4 respectively. Saponin, alkaloids, antraquinones and phylobatannins were the major phytochemical identified in the leave extract. These phytochemical exhibit diverse pharmacological and biochemical actions when ingested by animals (Amadi *et al.,* 2006).

Saponin reduces the uptake at certain nutrients including glucose and cholesterol at the gut through intra-luminal physicochemical interactions. Hence, it has been reported to have hypocholesterolemic effect (Price *et al*., 1987) and thus may aid in lessening the metabolic burden that would have been placed in the liver. Alkaloids are often toxic to man and may have dramatic physiological activities hence their wide use in medicine (Shelton, 2000).

The antinutritional contents include phytate, tannin and Oxalate. Oxalate can complex with most essential trace metals therefore making them unavailable for enzymatic activities and other metabolic activities. Tannins are capable of lowering available protein by antagonistic competition and can therefore elicit protein deficiency syndrome, 'kwashiorkor' Phytic acid has complicated effect in human system including indigestion of food and flatulence (Maynard, 1997).

These antinutritional factors can easily be reduced to tolerable limits by proper simple processing techniques such as soaking cooking, frying (Ekpo *et al*., 2004; Ekpo and Eddy, 2005b).

This present study reveals that *Senna siamea* contains essential nutrients for good human and animal health.

References

Amadi, B.A., C.O. Ibegbulen and A.C. Egbebu, 2006. Assessment of the effect of aqueous extract of pawpaw (*Asimina triloba*) root on organ weights and liver functions of albino rats. Int. J. Natl. Appl. Sci., 2: 79-81.

A.O.A.C., 1990. Medicinal plants in tropical West Africa. Cambridge University Press, London, 15: 76-78.

Bernard, M.L., 2005. The phytochemical analysis and antibacterial screening of extracts of *Tetracaptatum consphorum*. J. Chem. Soc. Nig., 6: 53-55.

Day, E.O. and B.Y. Underwood, 1986. Nutritional and potentially medicinal value of the leaves of *Senna siamea*. J. Pure Appl. Sci., 18: 12-14.

Ekpo, A.S., N.O. Eddy and P.G. Udofia., 2004. Effect of processing on the Elemental composition of beans. Proceedings of 28th Annu. Conf. Nig. Inst. Food Sci. Tech. (NIFST) Ibadan, pp: 217-218.

Ekpo, A.S. and N.O. Eddy, 2005b. Comparatives studies of the level of Toxicants in the seed of Indian almond (*Tecminalia catappa*) and Africa Walnuts (*Coula edulis*). Chem. Class. J., 2: 74-76.

Hailu, T., M. Endris, A. Kaleab and G. Tsige, 2005. Antimicrobial activities of some selected traditional Ethiopian medicinal plants used in the treatment of skin disorder. J. Ethnopharmacol., 100: 168-175.

Hill, A.R., 1992. Medicinal plants and tradition medicine in Africa. J. Int. Med., 39: 42-45.

Kiepe, P.L., 2001. Effect of cassia sianea hedgrow barriers on soil physical properties. Geoderma. J. integrative Med., 68: 113-720.

Kretovich, U.L., 2005. Principles of plant biochemistry permagon. Press oxford J. Food Sci., 54: 254-260.

Lose, G.A., S.J. Benard and D.E. Leihner, 2000. Studies on agro forestry hedgerow system with *Senna siamea* rooting patterns and competition effects. J. Sci., 38: 57-60.

Mau, J.L., M.B. Miklus and R.B. Beelman, 1999. Shelf life studies of foods and Beverages charalambous E.d. Chem. Biol. Phys. Nutr. Aspect., 57: 475-477.

Maynard. L.A., 1997. Animal Nutrition. McGraw Hill book Company Ltd. New York, pp: 47.

Michael, K.L. and M.P. David, 2002. The useful plants of West Tropical Africa Nigerian. J. Biochem. Molecular Biol., 12: 53-60.

Nwaogu, L.A., C.O. Ujowindu and A.I.Mgbemena, 2006. Studies on the Nutritional and phylochemical composition of *Amaranthus hybridus* leaves. Bio - Res., 4: 28-31.

Price, K.R., L.I. Johnson and H. Ferewick, 1987. The chemical and biological significant of saponins in food and feeding stuffs CRC critical Revigar in food. Sci. Nutr., 26: 127-135.

Roja, G. and P.S. Rao, 2000. Anticancer compound from tissue cultures of medicinal plant. J. Herbs, spices and medicinal plants., 7: 71-102.

Shelton, M.G., 2000. Standardized *Senna siamea* in the management of constipation in the puerperium. A Clin. Trial South Afr. Med. J., 57: 78-80.

Sofowora, E.E., 2000. Phytochemical screening of Nigerian medicinal plants lioydia J. Integrative Med., 41: 234-246.

Stuffness, M. and J. Douros, 1982. Current status of the NCl plant and animal product program. J. Natl. Prod., 45: 1-14.

Trease, M.T. and S.E. Evans, 1978. The phytochemical analysis and antibacterial screening of extracts of *Tetracarpetum conophorum*. J. Chem. Sci Nig., 26: 57-58.

Wheeler. A.B. and M.D. Ferrell, 1971. The phytochemical screening of extracts of *Senna siamea* J. Biochem., 13: 26-28.