Nig. J. Anim. Prod. 2018, 45(5):92 - 99

Proximate composition and phytochemical screening of coffee weed (Senna occidentalis) leaves as phytobiotic additive in poultry diets

Omoikhoje, S. O., Obasoyo, D. O., Okosun, S. E., Uwaya, J. I., Adamu, I. A. and Idahor, E. F.
Department of Animal Science, Ambrose Alli University, P.M.B 14, Ekpoma, Edo State, Nigeria.
Corresponding author: soomoikhojeaau@yahoo.com, stanleyoomoikhoje@aauekpoma.edu.ng

Abstract

The proximate and phytochemical screening of Senna occidentalis were carried out to assess some nutrients and phytobiotic properties of the leaves. The fresh leaves were thoroughly rinsed, sparsely spread on jute mat and dried at room temperature for 6 – 7 days until they became crispy, thereafter they were milled and subjected to proximate and phytochemical analyses. Data showed that the leaves had low moisture (9.35 9.35%), high crude protein (21.88 21.88%), crude fibre, crude fat, ash and nitrogen free extract (NFE) , of 19.72, 16.88, 9.70 and 22.47% respectively. The phytochemicals positively present were cardiac glycosides, phenols, flavols, flavonols and alkaloids, while saponnins were largely present. From the results, Senna occidentalis leaf meal can be a potential source of vegetable protein and some vital mineral elements as supplements to poultry feeds. Besides, the high levels of antioxidants and antimicrobial agents present in the sample which are known to promote growth by enhancing nutrient utilization, repair of worn out tissues and disease control could make Senna occidentalis leaves worthy of being a phytobiotic additive in poultry diets.

Keywords: Coffee weed, proximate, phytochemical, phytobiotic additive.

Introduction

Poultry production especially the production of broiler chickens offers the greatest scope for increasing the quality and quantity of protein intake in Nigeria because of the short generation interval and prolificacy. It is also regarded as a means of sustainable livelihood and a way of achieving a certain level of economic independence. Consequent upon this, Akinmutimi (2006) noted that nutrition account for over 70% recurrent cost in broiler chicken production but the major problem militating against the poultry industry generally is the competition between man and livestock for available feed resources, losses due to disease infestations and high or increasing cost of these feeds and feed ingredients (Niassy and Ekesi, 2016).

In order to improve livestock production and curb the losses due to disease infestations in livestock, producers have resorted to the use of antimicrobials to inhibit the growth of disease causing organisms and as growth promoters. It is acknowledged that the use of antimicrobials is one of the most successful chemotherapies against disease causing organisms (Guyue *et al*., 2014). Various antimicrobials have made significant contributions to the prevention, control and treatment of infectious diseases in animals since 1940s (Forman and Burch, 1947). The presence of antimicrobial resistant, non-pathogenic commensal bacteria in farms are considered a problem, as it provides a pool of transferable resistance genes (De Francesco *et al*., 2004). Besides, there is the problem of residual effects of drugs on animal products as well as high cost of the drugs and coverage area. However, available evidence indicated that indigenous health practices including medicinal plants are still being used to handle animal health problems in all livestock production systems (Maeda-Machangu *et al*., 1997). Since drugs and antibiotics are used in poultry feed to maximize the efficiency of production, product quality and control of diseases, plants and plant extracts from herbs and spices which are known to have medicinal properties can be used as alternatives to control diseases and improve feed efficiency. This is because they are known to contain bioactive compounds like tannins, saponins, alkaloids etc that have inhibitory activities against disease causing organisms. Plant derived natural products represent an attractive source of antimicrobial agents since they are natural, have manageable side effects and are available at affordable prices. Many of these plants extract have also been used as feed additives and have been proven to improve gut integrity of monogastric animals. However, research efforts by nutritionists have been geared towards the search for plant materials and their derivatives as natural antibiotics in animal feeds. Meanwhile, a wide range of drugs have been employed in the management of hypatic disorders in livestock but alternative approaches from the traditional medical systems have become increasingly popular in recent years (Stickel and Schuppan, 2007). Odoemelan (2013) reported that up to one-third of all commercial swine and chicken rations in Europe now use mixtures of herbs and spices to accelerate growth and maintain health. Some of these herbs and spices indigenous to Africa enhance nutrient utilization and performance of broiler chickens (Windisch, *et al*., 2008). Examples of these herbs and spices include: siam weed (*Chromolena odorata*), syndrella weed (*Syndrella modifera*), scent leaf (*Occinum grattisimum*), bitter leaf (*Veronia amygdalina*), neem (*Azadirachta indica*), moringa leaf (*Moringa oleifera*), aloe vera (*Aloe barbedensis*) coffee weed (*Senna occidentalis*) to mention but a few.

Coffee weed (*Senna occidentalis*) L. (Syn: *Cassia occidentalis*.) is a small shrub of about 5-8m high which belongs to the family leguminosae. It is indigenous to the tropical regions of America and naturalized in Australia, east Africa, southern and eastern USA. Its seeds found in long pods are sometimes roasted and made into a coffee-like beverage (Taylor, 2005). The plant had been used as a natural medicine in the rain forest and other tropical areas for centuries and its roots, leaves, flowers and seeds have been employed in herbal medicine around the world (Sambasivam *et al*., 2016). *Senna occidentalis* is regarded as an edible weed of agriculture. This plant is widely consumed by local people as a coffee substitute. The seeds are brewed into a coffee like breverage for asthma and a flower infusion is used to treat bronchitis (Babitha, 2011). The roots are considered as tonic and diuretic; they are also used for menstrual problems, tuberculosis, anaemia and liver complaints and as a tonic for general weakness and illness (Arya, 2011). The leaves are used in gonorrhoea, fever, urinary tract disorder and edema (Yadav, 2010). *Senna occidentalis* extract is used to cure eye inflammations. It is also used for curing diarrhoea, dysentery, constipation, fever, eczema and venereal diseases. *Senna occidentalis* had been found to possess significant antibacterial, antifungal and diuretic properties. Sreejith *et al.* (2010) suggested the potentials of *S. Occidentalis* for the treatment of allergic and inflammatory diseases. From the foregoing, the present experiment was conducted to evaluate the proximate and phytochemical constituents of coffee weed leaves with a view to assessing its potential benefits as phytobiotic additive in poultry nutrition.

Materials and methods

Experimental location and climate

The experiment was carried out at the Poultry Unit of the Teaching and Research Farm, Ambrose Alli University, Ekpoma. The farm lies between latitude 6.44N and longitude 6.80E in Esan West Local Government Area, Ekpoma, Edo State, Nigeria. Ekpoma is within the South – South geo-political zone of Nigeria and has a prevailing tropical climate with a mean rainfall of about 1556mm. The mean ambient temperature ranges from 26°C in December to 34°C in February, relative humidity ranges from 61% in January to 92% in August with yearly average of about 82%. The vegetation represents an interface between the tropical rainforest and derived savannah.

Source and processing of fresh coffee weed leaves

Fresh coffee weed (*Senna occidentalis*) leaves were purchased from Ekpoma main market in Esan West Local Government Area, Edo State, Nigeria. The fresh leaves were thoroughly rinsed, sparsely spread on jute mat and dried at room temperature for 6 – 7 days until they became crispy. The leaves were turned regularly to avoid uneven drying and decay to ensure that the greenish colour of the leaves was maintained. Thereafter, dried crispy leaves were hammer milled through a 2mm sieve and stored in airtight containers to avoid the absorption of moisture till they were used for laboratory analyses.

Proximate analysis

The proximate composition of the leaf meal were determined in triplicates according to the standard procedures of AOAC (1990).

Phytochemical screening of Senna occidentalis leaves

The phytochemical screening was was performed on the extracts from the leaf meal using standard procedures (Odebiyi and Sofowora, 1978; Trease and Evans, 1989; Sofowora, 1993) (Odebiyi and Sofowora, 1978; Trease and Evans, 1989).

Test for glycosides

One millilitre (1 ml) of the leaf extract was dissolved in 1ml of glacial acetic acid containing one drop of ferric chloride solution. This was under-layered with 1ml of conc. H_2SO4 and the appearance of a brown ring indicated the presence of glycosides.

Test for saponins

The leaf extract of 0.5g was shaken with water in a test tube and was observed for frothing, while saponin rein weiss supplied by Merck was used as standard.

Test for flavanoids

A quantity (2ml) of the leaf extract was boiled in 10ml of distilled water and filtered. The filtrate was divided into two different portions A and B of 5ml each. To portion A, 10% Lead acetate solution was added in few drops and the presence of a yellowish precipitate indicated a positive result. While, 5ml of 20% NaoH and few drops of dilute Hcl were added to portion B, the formation of colourless solution indicated a positive test.

Test for phenolic compounds

The leaf extract (1ml) was added to 5mlml of 90% ethanol plus one drop of 10% $FeCl_3$, a pale yellow colouration indicated a positive test.

Test for alkaloids

Dragendoff Wagner's reagent and Picric acid were used to test for alkaloids. About 1 ml each of the leaf extract was transferred into three labelled test tubes A, B and C. To portion A, 2ml of Dragendoff's reagent (made up of a mixture of Potassium Bismuth Iodide salt) was added. The presence of a reddish brown precipitate indicated a positive test. To portions B and C, 2 mls each of Wagner's reagent and Picric acid were respectively added and the presence of reddish brown and yellowish precipitates indicated positive tests.

Results and discussion

The proximate components of the leaf meal as shown in Table 1 indicated 9.35, 21.88, 19.72, 16.88, 9.70 and 22.47% of moisture content, crude protein, crude fibre, crude fat, ash and nitrogen free extract (NFE), respectively. The low moisture content of the sample implied that the leaf meal can be preserved for a long period after drying at room temperature. This will perhaps increase the relative concentration of the nutrients and improve the shelf life of the meal (Ikewudi and Catherine, 2009). The 21.88% crude protein content of the sample suggests that the leaves can serve as source of protein in livestock feed if dried. However, this value was higher than that of *Senna occidentalis* seed meal (19.92%) and *Boerhavia diffusa* (21.35%) but compared favourably with that of *Senna obtusifolia* seed meal (21.89%) as reported by Augustine *et al.* (2014) and Wuanor *et al.* (2012).

Table 1: Proximate composition of *Senna occidentalis* leaves

Component	Quantity (%)
Moisture	9.35
Crude protein	21.88
Crude fibre	19.72
Crude fat	16.88
Ash	9.70
Nitrogen free extract	22.47

The crude protein values of 28.44, 29.54 and 30.40% recorded for *Amaranthus spinosis* (Carew *et al.,* 2012), *Senna obtusifolia* (Ingweye *et al*., 2010) and *Momordia charantia* (Sese *et al.*, 2012), respectively were higher than the value obtained in the present study. Meanwhile, the crude protein value recorded in this study was within the ranges of values for other wild legumes (Pugalenthi *et al*., 2004; Pugalpenthi *et al*., 2007). Although, the crude fibre (19.72%) was low compared to that of *Tridax procumbens* (27.67%) but can still be of advantage in enhancing the bioavailability of the proximate components to animals feeding on it and not bound up in indigestible fibre. In addition, high fibre foods are also known to support bowel regularity, maintain normal cholesterol and blood sugar levels, reduce constipation and used for the prevention of heart diseases and some types of cancer (WHO, 2008). The value obtained in the present study was however higher than 18.52 and 12.45% for *Senna occidentalis* and *Senna obtusifolia* seed meals, respectively (Augustine *et al.,* 2014). The crude fat (16.88%) was higher than 3.57, 4.33, 3.57, 2.45, 10.78 and 12.45%, respectively recorded for *Boerhavia diffusa, Tridax procumbens, Amaranthus spinosis, Momordia charantia, Senna occidentalis* and *Senna obtusifolia* seed meals (Carew *et al.,* 1989; Sese *et al.*, 2012; Wuanor *et al.*, 2012; Augustine *et al.,* 2014). Ash content (9.70%) of *Senna occidentalis* leaf meal was lower than those of *B. Diffusa* (14.30%), *T. Procumbens* (14.00%) and *A. Spinosis* (15.50%) but higher than those of *Senna occidentalis* (4.16%) and *Senna obtusifolia* (4.33%) seed meals recorded by Augustine *et al.* (2014). This is reflective of the fact that *Senna occidentalis* leaf meal is a potential source of high amount of some dietary minerals (Awasthi and Verma, 2007). The NFE was estimated to be 22.47% and was lower than 38.21% reported by Seriki *et al.* (2017) for water lettuce (*Pistia stratiotes*).

The phytochemical screening of *Senna occidentalis* leaf meal revealed the presence of cardiac glycosides, saponins, phenols, flavols, flavonols and alkaloids (Table 2). The presence of the cardiac glycosides is an indication that when animals feed on the leaf, it will serve as source of heat and energy to their system, add bulkiness to their bowels, assist in the complete oxidation of fats and form components of DNA. Saponins which are steroid or interpenoid glycosides characterised by their bitter or astringent taste, foaming properties and their haemolytic effect on red blood cells were largely found in the sample. Meanwhile, the consumption of saponins have been encouraged because of their hypocholesterolemic activity (Oakenful and Sidhu, 1989). Generally, phenols are any compound containing a benzene ring with one or more hyroxy (OH-) group such as phenolic acids, flavonoids, condensed tannins, coumarins, alkyl resorcinols etc. They impart taste, odour, colour and oxidative stability in plant based foods (Naczk and Shahidi, 2004). Besides, a high positive correlation between total phenols and antioxidant activity in sorghum grains have been reported by Guajardo-Flores *et al.* (2006) which suggested that the antioxidant activity was contributed by the phenolic compounds. Flavols and flavonols are flavonoids which are present in the plant and are antioxidants as well as antimicrobial agents against a wide range of microorganisms by inhibiting their membrane bound enzymes (Chowen, 1999). While, mentholated flavonoids are incomplete protein of plant origin in vegetables, cereals and legumes and are among the essential amino acids that cannot be synthesised by the body and therefore must be present in protein food consumed. Thus, flavonoids promote growth, repair of worn out tissues, serve as source of energy in the absence of carbohydrates and fats, build hormones that assist in the regulation of body processes and build antibodies that fight infections and diseases (Idris *et al.,* 2017). The presence of alkaloids in this plant is worthy of note because of their protective metabolic roles.

Table 2: Phytochemical screening of *Senna occidentalis* leaves

Parameters	Results
Cardiac glycosides	+
Saponins	++
Phenols	+
Flavols	+
Flavonols	+
Alkaloids	+

Key: + = Present, ++ = Largely present

Conclusion

It is crystal clear from the proximate analyses that *Senna occidentalis* leaf meal can be a potential source of vegetable protein and vital mineral elements as supplements to poultry feeds. The high levels of antioxidants and antimicrobial agents that could promote growth by enhancing nutrient utilization, repair of worn out tissues and disease control is also worthy of note. The use of the leaf meal and its extracts in livestock feeding particularly monogastrics to evaluate their biological and medicinal values is recommended.

References

A. O. A. C. 1990. *Official methods of Analysis*. Association of Official and Analytical Chemists, Washington DC U.S.A.

Arya, V. A. 2011. Antioxidant activity of organic and aqueous leaf extracts of *Cassia occidentalis* L. In relation to their phenolic content. *Nat Prod. Res.* 25: 1473 – 1479.

Awasthi, L. P. And Verma, H. N. 2007. *Boerhaavia diffusa.* A wild herb with potent biological and antimicrobial properties. *Asian J. Of Ayurvedic Medicine.* 12:15-20

Babitha, S. A. 2011. Stimulatory effect of *Cassia occidentalis* on melanoblast differentiation and migration. *Arch Dermatol Res.* 303: 211-216.

Chowen, M. M. 1999. Plant products as antimicrobial agents. *Clinical Microbio. Reviews.* 12: 564-582

Defrancesco, K. A., Cobbold, R. N., Rice, D. H., Besser, T. E. And Hancock, D. D. 2004. Antimicrobial resistance of commensal *Escherichia coli* from dairy cattle associated with recent multi resistance salmonella outbreaks. *Vet. Microbiol.* 98: 55 – 61.

Dykes, L. And Rooney, L. W. 2007. Phenolic compounds in cereal grains and their health Benefits. *Cereal Foods World.* 52(3):105-111. Http://www.aaccnet.org/publications plexus/cfw/pastissues/2007.

Forman, C. R. And Burch, J. E. 1947. Use of sodium sulphonamides as single injection specific treatment in foot rot. *J. Of American Vet. Med. Assoc.* 111: 208 – 214

Guajardo-Flores, D., ., Cardenas-Hinojosa, A.P.,P., Dykes, L., ., mcdonough, C.M M. And Rooney, L.W W. 2006. Comparison of total phenols, antioxidant activity and tannin content in different grains. AACCI *Ann. Meeting Absracts.* Http://www.aaccnet.Org/meetings/2006/Abstracts. 231htm.

Guyue, C. Hafiz, I. H. Haihong, H., Lingli, H., Menghona, D., Xiaohui, A., Yuloan, W. Zahid, I., Zheli, L and Zonghui, Y. 2014. Benefits and risk of antimicrobial use in food producing animals. *Frontiers in Microbiol.* 5: 288-302

Idris, D. Y., Jibia, S. S., Ikhamia, A. I., Oni, O. O., Umunagbu, M. N., Aigbavboa, M. O., Alimi, H. M., Owoyemi, A. E. And Kamal, R. M. 2007. Proximate analysis and phytochemical screening of discarded spoilt orange included in the feed of livestock. *Proceedings.* 42nd Annual Conference of the Nigerian Society for Animal Production (NSAP). Pg 370-373

Ikewunchi, J. C. And Catherine, C. I. 2009. Comparative study of mineral element composition of some common Nigerian medicinal plants. ISSN 1996-0875

Ingweye, J. N., Kalio, G. A., Ubua, J. A. And Umoren, E. P. 2010. Nutritional evaluation of wild sickle obanliku, south-eastern, Nigeria. *American J. Of Food Technol.* 5: 1 – 12.

Maeda-Machangu, A. D., Mutayoba, S. K., Laswai, G. H., Kurcoisita, R. V., Kimamboi, S. K., Kondela, A. And Kassy, H.

1997. Local knowledge in animal health in different livestock production systems in Tanzania. *Tanzanian Vet. Asoc. J.* 16: 230 – 255.

Naczk, M. And Shahidi, F. C. 2004. Extraction and analysis of phenolics in food. *J. Of Chromatography.* 1050: 95.

Niassy, S. And Ekesi, S. 2016. Contribution to the knowledge of entomophagy in Africa. 2(3): 137 – 138.

Odebiyi, O. O. And Sofowora E. A. 1978. Phytochemical Screening of Nigerian Medical Plants. *Lloydia* 41(3): 234 – 246.

Odoemelan, V. U., Nwagu, K. O., Ukachukwu, S. N., Eseonu, B. O., Okoli, I. C., Etuk, E. B., Ndalakwute, E. K., Etuk, I. F., Aladi, N. O. And Obguewu, I. P. 2013. Carcass and organoleptic assessment of broilers fed *Ocinum gratissimum* supplemented diets. *Proceedings* of the 38th Conference Nigeria Society of Animal Production, Rivers State. University of Science and Technology, Port Harcourt. 36: 767 – 770.

Pugalenthi, M., Vadivel, V., Gurumoorthi, P. And Janardhanan, K. 2004. Comparative nutritional evaluation of little known legumes, *Tamarindus indica, Erythrina indica* and *Sesbania bispinosa. Trop. And Subtrop. Agro. Ecosystem.* 4: 107-123.

Pugalenthi, M., Vadivel, V. And Janki, P. 2007. Comparative evaluation of protein quality of raw and differently processed seeds of an under utilized food legume (*Abrus precatorius*) (L). *Livestock Res. For Rural Devpt.* 19(168): 56-69.

Sambasivam, M., Vellingiri, V. And Pemaiah, B. 2016. Studies on physicochemical and nutritional properties of aerial parts of C*assia occidetalis* L. *J of Food and Drug Anal.* 24: 508 – 515.

Seriki, O. A., Ari, M. M., Adua, M. M., Ogah, D. M. And Okunsebor, S. A. 2017. Proximate composition and phytochemical screening of water lettuce (*Pistia stratiotes*) as phytobiotic additive in poultry feeds. *Proceedings.* 42nd Annual Conference of the Nigerian Society for Animal Production (NSAP). Pg 882-885

Sese, B., Okpeku, M. And Kpun, P. 2012. Proximate and phytochemical assessment of *Momordica charantia. Proceedings.* 37th Annual Conference of the Nigerian Society for Animal Production (NSAP). Pg 624-625

Sofowora, A. 1993. *Medicinal plants and traditional medicine in Africa.* Spectrum Books Limited, Ibadan. Pg 289.

Sreejith, G., Latha, P. G., Shine, V. J., Anuja, G. I., Suja, S. R., Sini, S., Shyama, S., Pradeep, S., Shikha, P. And Rajasekharan, S. 2010. Anti-allergic, anti-inflammatory and anti- lipid peroxidant effects of *Cassia occidentalis* Linn. *Indian .J. Exp. Biol.* 48(5): 495 – 498.

Steel, R. G. D and Torrie, J. H. 1990. *Principal and Procedures of Statistics. A Biometrical Approach.* 3rd edn, mccraw Hill Book Co., New York.

Stickel, F. And Schuppan, D. 2007. Herbal medicine in the treatment of liver diseases. *Dig. Liver. Dis.*

39(1): 293 – 304.

Taylor, L. 2005. The healing power of rainforest herbs. *Tropical Plant Database.* Pg 95-104

Trease, G. E. And Evans, W. C. 1989. *Pharmacognosy* 11th edn., Bailliere Tindall, London. Pp. 45 – 50.

WHO 2008. World Health Organisation. Fact Sheet. No 134

Windisch, W. Schedle, K., Plitzner, C. And Kroismayr, A. 2008. Use of phytogenic products as feed additives for swine and poultry. *Journal of Animal Science*, 86(14): 140 – 148.

Wuanor, A. A., Ahemen, T. And Akuete, T. 2012. Proximate and mineral compositon of *Boerhaavia diffusa* in Southern Guinea Savannah Ecological Zone of Nigeria. *Proceedings.* 37th Annual Conference of the Nigerian Society for Animal Production (NSAP). Pg 348-349

Yadav, J. 2010. *Cassia occidentalis L.* A review on its ethobotany phytochemical and pharmalogical profile. *Fitoterapia*. 81: 223 -230.

Received: 14th August, 2018
Accept 21st December, 2018