PROXIMATE COMPOSITION AND PHYTOCHEMICAL SCREENING OF WATER LETTUCE (*Pistia stratiotes*) AS PHYTOBIOTIC ADDITIVE IN POULTRY FEEDS

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ABSTRACT

This study aimed at evaluating the proximate composition and phytochemical constituents of water lettuce (*Pistia stratiotes)*. Water lettuce (*Pistia stratiotes)* was harvested, cleaned and oven dried and grinded. 100 grams sample of the powdered whole water lettuce (leaves, stem and roots) was subjected to proximate and phytochemical analysis. The results obtained showed that moisture content, ash, crude protein (CP), ether extract (EE), crude fiber (CF), and nitrogen free extract (NFE) have the following values expressed as of 100grams (15.21, 39.9, 14.1, 2.05, 2.37 and 26.36 %) respectively, while the phytochemical screened showed (saponins, steroids, cardiac glycosides and flavonoides) are positively present (+) while (tannins, anthraquinone, alkaloids and terpenes) where negative (-). It was concluded that water lettuce can be utilized as a phytobiotic additive in poultry diets.

Keywords: Water lettuce (*Pistia stratiotes),* proximate composition, phytochemical, phytobiotic additive.

INTRODUCTION

The search for phytobiotic materials required as substitute to antibiotics in the poultry feed industry is fast gaining attention. Water lettuce (*P. stratiotes)* has been reported to serve as feeds for fish, pigs and some ruminant animals (Parsons and Cuthbertson, 2001). The choice of this water plant and its utilization in both human and some animals feeding is informed by its nutritional and medicinal attributes.

Water lettuce (*Pistia stratiotes* or *P. stratiotes)* is a perennial monocotyledonous aquatic plant that propagates naturally and through culturing by human. *P. stratiotes* is a free-floating, stoloniferous plant with sessile leaves in rosettes (Chadha, 1998). Water lettuce belongs to the Kingdom: Plantae, Phylum: Spermatophyta, Subphylum: Angiospermae, Class: Monocotyledonae, Order: Arales, Family: Araceae, Genus: Pistia and Species: *P. stratiotes*. It is mostly found in stagnant water ways of tropics and subtropical areas. However, scattered ephemeral populations have been reported in cold climate regions (Dray and Center, 2002). It is presently use by local herbal practitioners for the treatment of liver cirrhosis in the Northern part of Nigeria. The plant was reported to have antifungal properties and antidermatophytic activity (Premkumar and Shyamsundar, 2005). The oil extract is used in the treatment of worm infestations, tuberculosis, asthma and dysentery and is applied externally to treat skin diseases, inflammation, piles, ulcers, syphilitic infections and burns (Kirtikar and Basu, 2002). A large number of medicinal properties are attributed to the plant, particularly the leaves. The plant is considered antiseptic, antitubercular, and antidysentric as well as an anodyne for eyewash in many African countries. Other medicinal benefits includes the Juice extract, ash content that are variously used in the treatment of fungal and other bacterial infections like ringworm, eczema, leprosy, ulcers, piles, and syphilis (Kirtika and Basu, 2001).

This research therefore aims at evaluating the proximate and phytochemical composition of whole plant with the view of assessing its potential for utilization as a phytobiotic in poultry nutrition.

MATERIALS AND METHODS

Harvesting of Water lettuce: The water lettuce was harvested from the research ponds of the Fisheries Department by hand picking at the Nassarawa State University, Shabu, Lafia Campus. The plant was identified using Voucher specimen for reference.

Processing Method: The harvested whole plant (leaves, stem and roots of *P.stratiotes*) was cleaned with distilled water and then placed in a sterilized sample bottle and was taken to the Animal Science Laboratory, Nassarawa State University, Keffi, Shabu, Lafia Campus where it was oven dried at the temperature of 100°C for 24hours. The oven-dried water lettuce was then grinded to powdered form before it was used for the various analyses.

Analytical Methods

Proximate analysis: The powdered samples was analyzed for moisture, crude protein, ether extract, crude fibre and total ash using the standard methods (AOAC, 2000) while nitrogen free extract (NFE) was determined by difference.

Phytochemical screening: Phytochemical examination of the oven dried and grinded samples was carried out using the standard methods (Sofowora, 1993; Trease and Evans, 1989; and Harbone, 1973) adopted by Ari *et al.* (2014) at the Biochemistry Division, National Veterinary Research Institute, VOM, Jos, Plateau State.

RESULTS AND DISCUSSION

Proximate Composition: The result of proximate analysis is presented in Table 1. The result indicates a moisture and ash content of 15.21% and 39.90% respectively. The moisture content of P. stratiotes is low, this indicates that their shelf life will be long and also implies a great economic importance since moisture content is associated with increase in microbial activities during storage (Abdullahi, 2002). The moisture content was higher than that of water lettuce root and stems reported by Wasagu *et al.*, 2013. The ash content is higher than that of the leaves and lower than the roots as reported by Wasagu *et al.* (2013). The high ash content is an indication of mineral contents (Oyeleke, 1984). The crude protein (CP) content is 14.11%. It is far higher than the crude protein content reported by Wasagu *et al.* (2013) for leaves and roots. Nonetheless, it is worthy to mention that the crude protein content of plants may vary considerably between species and cultivars of species, and that such variations depend on various factors such as climate, water bodies in which the plants and other adaptive factors under which the plant was grown, as well as maturity at harvest and length of time for which the sample has been stored (Heiman, 1980).The crude protein content is an indication that water lettuce is capable of contributing to protein content when incorporated in a diet. The ether extract (EE) content is 2.05%. It's slightly lower than that of the leaves and slightly higher than that of the roots reported by Wasagu *et al.* (2013). The crude lipid is also low compared to the reported values (8.3 – 27%) in some vegetables consumed in Nigeria and Republic of Niger (Senna *et al.*, *1998*). Values of similar range have been reported for other plant species, proving that *P. stratiotes* is a poor source of lipid. Thus, it is health wise to reduce fat consumption to avoid obesity, heart diseases and other related problems. The crude fibre content is 2.37%. The fibre content was lower than the reported values for milk weed (Hassan *et al.*, 2007). The crude fiber content of the whole plant is also lower than that of the leaves and roots reported by Wasagu *et al.* (2013). The disparity may be due to the fact that stem also constitute an integral part of the whole plant. High fiber foods however, support bowel regularity, help maintain normal cholesterol levels and blood sugar levels, reduce constipation and also use for prevention of heart disease and certain types of cancer (WHO 2008). Carbohydrate content estimated as nitrogen free extract (NFE) was 26.36%, this is however expected to vary with levels of maturity as maturing plants store very little carbohydrate (Osagie, 1992). The result obtained for NFE in the whole plant is lower than what was observed in the case of the leaves and roots as reported by Wasagu *et al.* (2013).

Phytochemical screening: The result of phytochemical screening of water lettuce *(Pistia stratiotes)* is presented in table 2. The result shows negative tannin, anthraquinone, alkaloids and terpenes content, while saponins, steroids, cardiac glycoside and flavonoides are positive. Belmar *et al.* (1999) reported that saponin can alter cell wall permeability and cause a toxic

effect when consumed by an animal. Saponin was also reported to affects feed utilization, absorption and digestion in chicken (Jenkins and Atwal, 1994). Some plant saponins (e.g. from oat and spinach) may enhance nutrient absorption and aid in animal digestion. However, saponins are often bitter to taste, and so can reduce plant palatability (e.g., in livestock feeds), or even imbue them with life-threatening animal toxicity (Foerster, 2006) while other saponins are toxic to cold-blooded organisms and insects at particular concentrations. Further research is therefore needed to define the roles of these natural products in their host organisms (Foerster Hartmut, 2006) especially monogastic animals like poultry in order derive maximum benefits as phytobiotics and prebiotics additives in immune responses and nutrient utilization by poultry. It is important to note that cyanogenic glycosides found in this plant is a precursor for Hydrogen Cyanide which can cause respiratory failure and dysfunction of the nervous system (D'Mello, 2000)

CONCLUSION

The present study shows that, *Pistia stratiotes* contains some high level of antioxidants that might have positive effects on the physiology of poultry while the anti nutrient content of this plant is also noted. Therefore, studies on its utilization in poultry diets are recommended to further determine their effects on gross performance of poultry.

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REFERENCES

Abdullahi S.A. (2002). Evaluation of the Nutrient composition of some freshwater fish families in Northern Nigerian. *Journal of Agriculture and Environment*, (2): 141-150.

Ari, M., M., S. E. Alu, B. D. Longtep, I. Alum, A. H. Usman, S. M. Kwassau and J. P. Onu, (2015) Nutrient Composition and Phytochemical Screening of Crushed, Toasted and Fermented

Roselle (Hibiscus sabdariffa L) Seeds: *Annual Research & Review in Biology*: 7(1): 39-44

Audu SA, Mohammed I, Kaita HA. (2007) Phytochemical screening of the leaves of Lophira

lanceolata (Ochanaceae). *Life Science Journal*; 4(4): 7579.

Ayanwale B.A. and M. M. Ari, (2002). Replacement value of parkia filicoidea in broiler. *Journal of agric technology*. 1:42-52.

Belmar, R. R., Nava-Montero C., Sandoval-castro and McNab J. M, 1999. Jack bean (*Canavalia ensiformis L. D.C*) in poultry diets: anti nutritional factor and detoxification studies- a review. *World Poultry Journal Science*. 55:37-59.

Bjelakoni, G., Nikolora, D., Gluad, L.L., Simonette, R.G. and Gluad, C. (2007). Mortality in randomized trials of antioxidants supplements for primary and secondary prevention. nSystem review and Metal Analysis. *Journal of American Malnutrition Association*, 297(8): 842- 857.

Chadha Y.R, (1998) A dictionary of Indian raw material and industrial products. New Delhi: *Council of Scientific and Industrial Research*; The Wealth of India Raw materials; pp. 123–4.

Damon M. (2009). The importance of Vitamin A in your diet. Association content, *Health and wellness* (associated content. com)

D'Mello J.P.F., (2000). Anti nutritional factor and mycotoxins. In: farm animal metabolism and nutrition. *CAB international Wallingford, UK*. Pp: 383-402

Fact sheet, (2009). vitamin E fact sheet, office of Dietary Supplements. *National Institute of Health*. Bethesda, Maryland 20892 U.S.A.

Foerster, Hartmut (2006). *"MetaCyc Pathway: saponin biosynthesis I". Retrieved 23* February 2009.

George O. (2009). The role of Vitamin E (The Vitamin and Nutrition centre) © 2009. *www.vitaminsnutrition.org.ion*

Hassan, L.G., Aliyu, F. and Umar, K.J. (2005). Nutritional values of four Species of egg plant (Solanum spp.) consumed in Sokoto metropolis. *Bulletin of the Science Association of Nigeria*, 26: 362-327.

Hassan, S.W., Umar, R.A., Ladan M.J., Nyemike, P., Wasagu R.S.U., Lawal, M. and Ebbo .A. A. (2007). Nutritive value,

phytochemical and Antifungal Properties of Pergularia tomentosa L. (Asclepiadaceae). *International Journal of Pharmacology*, 3(4): 334-340.

Harborne JB. (1973) Phytochemical methods: A guide to modern techniques of plant analysis. *Chapman A & Hall London*; 49-279.

Heiman, W. (1980). Fundamental of food chemistry, *Ellis Horwood Limited*, England pp. 21: 234, 25.

Jenkins, K. J. and Atwal M. S. (1994). Effects of dietary saponnins on faecal bile acids and neutral sterols and availability of vitamin A and E in the chick, *Journal of Nutritional Biochemistry*, 5: 134-137

John, A. (2009). Health benefits of Vitamin C, Importance of vitamin C *www.articlesbase.com* 1st July.

Kirtikar KK, Basu BD. (2001). The Indian medicinal Plants. Dehradun: *Oriental Enterprises*;. pp.3576–9.

Kirtikar, K.R. and Basu, B.D. (2002). Indian medical plants, Delhi. *Sri Satguru publications*. Pp41: 392397.

Ladan, M.J., Lawal, M., Abubakar, M.K and Bagudu, B (2005). Proximate composition and essential amino acids profiles of five varieties of wild yam tubers found in Zuru area of Kebbi State, Nigeria. *Bulletin of the Science Association of Nigeria*, 26: 529-535.

Nelson, D.C. and Cox, M.M. (1999). Lehninger Principle of Biochemistry, 4th Ed, W. H. Freeman and Company New York pp 361-362. *Nigerian Journal of Basic and Applied Science* (December, 2013), 21(4): 253-257

Obasi NL, Egbuonu ACC, Ukoha PO, Ejikeme PM. (2010). Comparative phytochemical and antimicrobial screening of some solvent extracts of Samanea saman pods. *African journal of pure and applied chemistry*; 4(9): 206-212.

Omoninhenle, S.I., Okoyoman, G and Okeieimen, F.E. (2004). Bioavailability of iron in some locally available fruits and vegetables. Proceedings of the 27th *International Conference of the Chemical society of Nigeria*, University of Benin, Benin City Nigeria. Pp. 118-121.

Osagie, O.U. (1992). Yam tubers in storage: An up to date review of the biochemical composition of the yam, *Post-harvest Research Unit, Department of Biochemistry, University of Benin*, Benin City, Nigeria, p 247.

Oyeleke, A. (1984). Outline of Food Analysis. *Ahmadu Bello University Zaria*, Nigerian pp. 58.

Parsons, WT and Cuthbertson. EG (1992) Noxious Weeds of Australia. Inkata Press. Pp. 38-41.

Premkumar, V.G. and Shyamsundar, D. (2005). Antidermatophytic activity of Pistia stratiotes. *Indian Journal of Pharmacology*, 37: 127-128.

Senna, L.P., Vanderjert, D.J., River, C.T., Sim, A.T.C. and Muhammad, R.H. (1998). Analysis of nutritional components of eight famine foods of Repbulic of Niger. *Plant Foods for Human Nutrition*, 52: 17-30.

Sofowora A. (1993). Medicinal plants and traditional medicines in Africa. *Chichester John Willey & Sons New York.*; 44(93):256.

Trease G.E. and Evans W.C. (1989) A Text-book of Pharmacognosy. *Baillier Tindall Ltd, London.*; 1-53.

Wasagu, R .S.U., M. Lawal, S. Shehu, H.H. Alfa and C. Muhammad. (2013). Nutritive values, Mineral and Antioxidant properties of Pistia stratiotes (Water lettuce): *Nigerian Journal of Basic and Applied Science.*: 21(4): 253-257

WHO (2008). World Health Organisation. Fact Sheet No 134 Revised December.

Roopashree TS, Dang R, Rani SRH, Narendra C. Antibacterial activity of anti-psoriatic herbs: Cassiatora, Momordica charantia and Calendula officinalis. *International Journal of Applied Research in Natural Products* 2008; 1(3): 20-28.

Table 1. Comparative Proximate Composition of water lettuce

Parameters	Leaves (%)*	Roots (%)*	Whole plant (%)**
Moisture content	4.50	4.50	15.21
Ash	35.20	44.50	39.9
Crude protein	6.96	3.18	14.11
Ether extract	2.17	1.83	2.05
Crude fiber	17.50	20.50	2.37
NFE	38.21	30.00	26.36

*** Wasagu et al. (2013). ** Analyzed results**

Table 2. Phytochemical profile of whole water lettuce (*P. stratiotes*)

PARAMETERS	AQUEOUS
Tannins	-ve
Anthraquinone	-ve
Alkaloids	-ve
Terpenes	-ve
Saponins	+ve
Steriodes	+ve
Cardiac glycoside	+ve
Flavonoides	+ve

-ve means negative, +ve means positive