The Journal of Agriculture and Natural Resources Sciences

Journal homepage: http://www.journals.wsrpublishing.com/index.php/tjanrs

Online ISSN: 2383-238X Print ISSN: 2423-4397

Review Article

Review of Selected Tropical Ethno-Medicinal Plants (Leaves) as Alternative to Synthetic Therapeutics in Livestock and Poultry Industries

M.A. Yahaya[1], P.K. Ajuogu[2,*] and O.A. Ekine[2]

[1]Department of Animal Production and Health, Faculty of Agriculture and Agricultural Technology, Federal University Dutsinma, Katsina State, Nigeria

[2] Department of Animal Science and Fisheries, Faculty of Agriculture, University of Port Harcourt, Choba, Rivers State, Nigeria

ARTICLE INFO

Corresponding Author:
P.K. Ajuogu
peter.ajuogu@uniport.edu.ng

How to Cite this Article:
Rabeeh, K.R.S., Abutaba, Y.I., Jadalla, J.B., Ali, M.A., Ebrahiem, M.A. (2015). Review of Selected Tropical Ethno-Medicinal Plants (Leaves) as Alternative to Synthetic Therapeutics in Livestock and Poultry Industries. *The Journal of Agriculture and Natural Resources Sciences*, 2(2), 423-428.

Article History:
Received: 4 March 2015
Accepted: 1 April 2015

ABSTRACT

Some of the ethno-medicinal plants used as an alternative to synthetic therapeutic agents are indigenous medicinal plants known to possess a wide range of therapeutic activities; including antiviral, antibacterial and antifungal properties. They are employed in dietary manipulation and in the form of feed additives to promote growth, enhance reproductive performance and general health improvements of the animals. They are used in place of synthetic therapeutic agents, due to the increasing resistance of some pathogens to synthetic drugs, coupled with climatic a change which exposes the animals to severe environmental stress thereby reducing the efficacy of the applied synthetic drugs, thus resulting to severe economic loss to the farmers. Four ethno-medicinal plants; *Azadirachta indica, Langucularia racemosa, Dasheen leaves and Vernonia amygdalina* were studied. The high content of phyto-chemical properties in these plants are indicative of their medicinal qualities, while their high nutrients compositions such as crude protein, fat, carbohydrate, fiber, vitamins and mineral components showed that the leaves could be a potential feedstuff sources of macro and micronutrients, that could probably be used in dietary manipulations and in the prevention and cure of various diseases in animals and man.

Keywords: Ethno-medicinal plants, phytochemicals, nutrients and therapeutic efficacy.

INTRODUCTION

Medicinal plants are of great significance to the health and general well-being of man and animals. The medicinal values of some of the ethno-medicinal plants used are found in their phyto-chemicals, nutrients and mineral composition that produces definite physiological action in the body systems thereby promoting growth; enhance reproductive performance, increases body immunity and general well-being of the animals (Ademola *et al.*, 2007; Wekhe *et al.*, 2009; Yahaya *et al.*, 2012). The constant application of synthetic antibiotics in poultry management has resulted to the build-up of bacterial resistance to the antibiotics (Madrid *et al.*, 2003 and Moser *et al.*, 2003). In January

2006, the use of synthetic antibiotics as growth promoters was prohibited by the European Union largely due to concern about bacterial resistance to the antibiotics coupled with exposure of human to cancerous substances and for the purpose of consumer food safety issues. Consequently, the livestock industry has been stimulated to search for replacements to antibiotics such as the organic acids, plant additives, short chain fatty acids, probiotics and some ethno-medicinal plants, etc.(Engherg, *et al*, 2000; Wekhe *et al*, 2002 and Yahaya *et al.*, 2013).

Various researches are currently on-going to discover some ethno-medicinal plants that can be used in place of synthetic antibiotics which may cure various illnesses and thereafter increase the turnover of the livestock and poultry farmers, (Bolukbasi *et al.*, 2006; Durunna *et al.*, 2009; Oko and Agiang, 2009). Interestingly, studies have identified several medicinal indigenous plants that can be used in place of synthetic antibiotics. (Adeniyi and Odufowora, 2000; Edeoga *et al.*, 2005; Njoku and Akumefula, 2007; Owen *et al.*, 2009).

Azadirachia Indica (Neem)

A. indica, normally found in Indian Subcontinent and in the dry forest areas of South and Southeast Asia including Pakistan, Sri Lanka, Thailand, Malaysia and Indonesia, but cultivated in most other countries of the world belongs to the plant family meliaceae (National Research Council, 1992).

Biswas *et al.*, (2002) reviewed the biological activities and medical properties of the plant and articulated the hypoglycemic effects of its leaves, stem, bark and seed oil. Neem tree (A. indica) has been identified as among the tropical plants that has not been thoroughly investigated as animal feed resource (Akpan *et al.*, 2008). (Schinutter, 1990: Tipu *et al.*, 2002) reported the neem tree to be medicinal and could be used as insecticide and pesticide and has anticoccidial effects on broilers production. Neem has attracted global attention due to its strong and inherent insecticidal properties, less persistent in the environment and not prone to the problem of pest resistance when compared with the synthetic insecticides (Jacobson, 1986).

Like neem leaf, the neem seed cake has been reported by Elangovan *et al.*, (2000) to be bitter and to contain toxic substances like *salanin, nimbin, azadirone* and *triterpenoids*, however, it could be fed in limited amount to rabbits with no adverse effect (Fajinimi *et al.*, 1990; Salawu *et al.*, 1994). Akpan *et al.*, (2008) reported that the inclusion of neem leaf extract in layer diet did not depress feed intake, but inclusion rate of more than 25% dietary neem leaf extract depressed egg production of laying birds.

Proximate composition screening of neem leaf meal (NLM) showed that it has the following proportional values; Moisture (5.50), Crude protein (19.56), Crude fibre (23.58), Lipids (1.24), Ash (7.79), NFE (47.66), Calcium (1.50) and Phosphorus (0.26), (Edache *et al.*, 2009)

Feeding trials experiment was carried out by Edache *et al.*, (2009) using rabbits fed diets containing 0%, 8%, 16% and 25% levels of neem leaf meal inclusion rate, and the results revealed significant effects on feed intake, with the control group of rabbits recording significant ($P<0.05$) feed intake than those consuming diets with NLM, they attributed this trend to the bitter nature of the neem leaf which reduces the palatability of the feed. Their observations accord with that of Bawa *et al.*, (2006), who fed rabbits with raw neem seed cakes and reported reduced feed intake amongst the rabbits on the experimental diets. Elangovan *et al.*, (2000) also established the presence of bitter triterpenoids in the neem seeds. However, Katiyar *et al.*, (1991) recommended removal of the bitter substances through washing with water or soaking in alkaline solution and urea ammoniation to improve palatability.

Langucularia Racemosa Leaves

A chemical and pharmacological survey of this plant in the Southern part of Nigeria revealed that the plant's leaves possess antiviral activity and healing properties which was attributed to its phytochemical properties (Bandaranayake *et al.*, 2002). The phytochemicals screening of this plant's leaves by Yahaya, (2012) revealed that it contains the following properties; Tannin (65.21), Alkaloid (6.01), Saponin (20.23), Flavonoid (7.46), and Phytate (1.10).

Bandaranayake, (1988) reported that, *Langucularia racemosa* leaves are rich sources of steroids, triterpens, saponin, flavonoid, alkaloids, and tannins. Wekhe *et al.*, *(*2002) reported that alkaloids are used as anti-parasites, anti-spasmodic and antigens. Ahamefule *et al.*, (2006) further submitted that flavonoid present in *langucularia racemosa*

functions in protection against inflammation, allergies, microbial effects and that the biological activities of saponin in this leaves exhibits antimicrobial, antitumor, inflammation inhibiting and cytotoxic activities.

Yahaya *et al.,* (2013) fed adult rabbits at the highest inclusion rate of 90grams of the leaves per kilogram feed and recorded significant weight gain and feed efficiency with low feed intake in the treated experimental rabbits when compared with the control. Similarly, Yahaya, et al. (2012) investigated the reaction of buck rabbits white blood cells to the intake of the *Laguncularia racemosa* leaves as feed additives at highest inclusion rate of 90gram per kilogram of feed, and the results obtained shows that the leaves did not introduce exogenous toxic substances of foreign body that will adversely influence the white blood cell counts Therefore, it is convenient to suggest that *Laguncularia racemosa* leaves may be used in manipulation of animal feeds and equally serve as medication in place of synthetic therapeutics in the prevention and treatment of certain diseases.

Dasheen Leaves

The leaves of this plant acts as defensive mechanisms against pest (Bassey *et al.,* 2009) Minute bundles of oxalate crystals are present in *dasheen leaves* which have irritating effects (Ukpai and Ejidoh. 1989). The Phytochemical analysis revealed that *dasheen leaves* contain the followings; phytate (0.20%), phenol (0.29%), tannin (0.44%), saponin (0.37%), flavonoid (0.73%), alkaloid (1.25%), hydro-cyanide (13.40%) and oxalate (0.28%) (Bassey *et al.,* 2009). The results of mineral ($mg^{100\text{-}1g}$) analyses assessed by Bassey *et al.* (2009) showed that the leaves contain Calcium (281.90); Magnesium (29.6); Potassium (408.83); Sodium (65.06); Zinc (0.07); Iron (7.25); Copper (0.28), and Manganese (0.77
Flavonoid is the most common widely distributed groups of plant phenolic (Ahamefule *et al.,* 2006). Its biological function includes protection against allergies, inflammation, platelet aggregation, microbes, ulcer and tumors (Okwu and Okwu, 2004). It therefore means that *dasheen leaf* is medicinal. Flavonoids have also been reported to function as pigments, an indication that the leaves can serve as pigmented agents in feeds (Bassey *at al.*, 2009). Alkaloids are used as analgesic, antispasmodic, and bacterial antigens (Stray, 1998). The leaves show significant physiological effects when administered to animals (Ahamefule *et al.,* 2006). Potassium was found to be the most abundant of the elements in the leaves, followed by Calcium, Sodium and Iron in that order (Bassey *et al.,* 2009). These elements made the leaves to compare favorably with other leguminous crops.

The leaves also contained a very high level of vitamins. Vitamin C is known to be for skeletal calcification, prevention of anemia and scurvy, it also acts as an antioxidant, (Hunt *et al.,* 1980). As a result of the high levels of vitamin C in *dasheen leaves*, the plant could be used in herbal medicinal applications for the treatment of common cold and other diseases, like prostate cancer and improvement of animal's immunity, egg laying in poultry and reproductive performance (Okwu and Okwu, 2004; Okwu and Okeke, 2003).

Dasheen leaves could compete favorably with other fodder feeds in terms of mineral and vitamin compositions. However, the anti-nutritional factor could be a threat to the animals, unless it is processed to eliminate or reduce the toxic components.

Vernonia Ainvgdalina (Bitter Leaf)

Vernonia arnygdatina (bitter leaf), is a browse plant that has medicinal properties. The plant is locally abundant in Asian countries and in the Southern part of Nigeria (Fajemisin *et al.,* 2009; Taiwo *et al.,* 2009). It is a shrub of 25m tall with petiolate of about 6.00mm wide (Ojiako and Nwanjo, 2006), and it is cultivated in Southern Nigeria, mainly for its nutritional values (Igile *et al.*,1995a). This plant has been observed to be eaten by goats in most parts of the Niger Delta area in Nigeria (Aregheore *et al.,* 1998).

The leaf of V. ainvgdalina are consumed by man as vegetable and has been found to stimulate the digestive system and also used as ethno-medicinal remedy against leech which transmits bilharziose (John, 1994). Free living chimpanzees eat the leaves if they were attacked by parasites (John, 1994). The leaves are used to make beer instead of hops in Nigeria (Aregheore *et al.,* 1998). The plant, especially the leaves have been found useful in the therapy of diabetes and as anti-oxidant (Akah and Okafor, 1992; Uhegbu and Ogbuehi, 2004; Nwajo, 2005), asthma,

schistosomiasis, malaria, measles, diarrhea, tuberculosis, abdominal pains, fevers and cough (Masaba, 2000), Results of the phytochemical content analysis in V. *ainygdalina* includes; saponin, sesquiterpenes, lactones, flavonoids, steroid and glycosides such as vernoniosides A, A2, A3, A4, B1, B2, B3, D and E have been isolated from the plant (Ohigashi, 1994; Aregbeore *et al.*, 1997). But it is yet to be ascertained which of these are responsible for some observed biological significance of the plant.

Vernonia ainygdalina leaf meal (VALM) being an alternative protein in animals feed resource containing about 13.10% CP (Aregheore *et al.*, 1998; Owen *et al.*, 2009) it can be used as protein supplement and energizer when consumed by man and animals. The proximate composition results obtained showed that the, energy content and mineral profiles of VALM are 86.40% DM; 21.50% CP; 13.10% CF; 6.80% Fat; 11.05% Ash and 527.83 ME Kcal kg. (Owen *et al.*, 2009) Also the mineral components revealed 3.25% CA; 0.40% Mg; 0.03% P: 0.006°o Fe; 0.33% K and 0.05% Na. (Owen *et al.*, 2009). Various authors have reported different values of CP for VALM; Anne (1999) reported 5.3%; while Durunna *et al*., (2009) reported 15.60. However, Aletor *et al*. (2002) obtained a CP value of 32.60 from V. ainygdalina extracts. This high value of CP could have resulted from the possible release of bond nutrients within the plant materials since the nutritive and minerals availability of plant leaves were improved following extraction (Oko and Agiang, 2009).

The high Ca and low Na values of VALM could be of nutritional advantage in humans, poultry and other livestock. The high calcium content in VALM could confirm its value as a useful material for diabetes regulation, bones formation and repairs, and enhance quality of egg production in laying birds (Okaka and Okaka, 2001; Oko and Agiang, 2009). Also, given the direct relationship between sodium intake and occurrence of hypertension in humans, the low content of Na in VALM becomes advantageous in the maintenance of homeostatic balance in man and animals (Adeniyi and Odufowora, 2000; Okwu and Josiah, 2006; Njoku and Akumefule, 2007; Oko and Agiang, 2009).

The review on this plant has shown that it has good nutrient and mineral profiles to serve as sources of protein, energy, organic matter and homeostatic balance in man and animals. Furthermore, this exercise has provided some biochemical bases for the ethno-veterinary uses of VALM in the treatment and prevention of diseases in livestock and poultry industry.

CONCLUSION

Phytochemicals, Nutritional and Mineral reviews of the above plants definitely could assist animal scientists tremendously in the establishment of non-toxic feed supplements, which could be used as sources of nutrients, and as replacements for synthetic antibiotics in livestock and poultry industries. The above observations could assist farmers in reducing the cost of production and maximization of profit. Also, these findings will further create job opportunities for the unemployed young Nigerians by engaging them on commercial production of these plants for economic benefits, thus, arresting the restiveness of the youths. It is apparent to note that the study of some of the indigenous ethno-medicinal plants in Nigeria and their effects on livestock nutrition and health status especially in the treatment of various illnesses that continue to build resistance to synthetic antibiotics will become an ever-increasing research topic in the domain of animal scientists due to their high beneficial impacts.

As our understanding of the specific phytochemicals, nutrients and mineral contents of some of the indigenous ethno-medicinal plants increases, livestock and poultry farmers stand at advantage to maximize their profits through the use of these identified indigenous plants as an alternative to some nutrients and synthetic antibiotics. Equally, Government should financially encourage animal scientist to further research on more indigenous ethno-medicinal plants to boost livestock and poultry production in Nigeria, thereby creating more job opportunities to young Nigerians

REFERENCES

Ademola ,S. G., Farinu, G. O., Adelowo, O. O., Lawal, T.E., and Babatunde, G. M. (2007). Antimicrobial activity of garlic and ginger mixtures serum lipid profile and growth performance of broilers fed the mixtures. *Brown J. Agric.*, 4, 103-113.

Adeniyi, B.A. and Odufowora, R.O. (2000). In – vitro antimicrobial properties of *Aspilia African. Afri. J. Biomed. Res., 3* (3), 167 – 170.

Ahamefule, F.O., Obua, B.E., Ibeawuchi, J.A., and Udosen, N.R. (2006). The nutritive value of some plants browsed by cattle in Umudike, Southeastern Nigeria. *Paki .J. of Nutri*., 5 (5), 404 – 409.

Akah, P.A., and Okafor, C.I. (1992). Blood Sugar loweing effect of Vernonia amyfdalina Del in experimental rabbit. *model Phytother Res*., 6, 171 – 173.

Akpan, M.J., Enyenihi, G.E., Obasi, O.L., Solomon, I.P., and Udedibie, A.B.I. (2008). Effects of dietary neem leaf extract on the performance of laying hens. *Proc. 33rd Ann. Conf Nig. Soc. Anim Prod March*, 20th – 25th, pp: 396 – 398.

Aletor, O., Oguntokun, M.O., and Aletor, V.A. (2002). Proximate Composition, Energy and Mineral profiles of some conventional and under-utilized focus feed resources. *Proc. 27thAnn. Conf; Nig Soc for Anim. Prod (NSAP*), March 17 – 21st, Fed. univ. Of Tech. Akure, Nig., pp: 135 – 138

Anne, R. (1999). The role of wild foliage plants in the diet; A case study of Lushota Tanzania. *Ecol. Food Nutr*., 8, 87 – 93

Aregheore, E.M., Makkar, H.P., and Becker, S.K. (1997). Chemical composition and Tannis in leaves of some browse plants from Delta (Central Nigeria) easten by ruminants. *Proc. Soc. Nutr. Phyiol*, 5, 11 – 15

Aregheore, E.M., Makkar, H.P., and Becker, S.K. (1998). Feed value of some browse plants from the central zone of the Delta State. *Nigeria Tropical Science*, 38(2), 97 – 104.

Bandaranayake, W.M. (1998). Mangroves and their products; In: Russo, L., Etherington, T. and Vantomme, P.(eds); Non Wood Forest Product News. *Food and Agricultural Organization of the United Nations (F.A.O)* Rome, Italy, 5, 24-30.

Bandaranayake, W.M. (2002). Mangroves and their products In: Russo, L., Etherington, T. and Vantomme, P.(eds), Non Wood Forest Product News. Food and Agricultural Organisation of the United Nations (F.A.O) Rome, Italy, 5, 24-25.

Bassy, O., Nsa, E.E., Anya, M.I., Edets G.D., Umoren E.P., and Oko, L.N. (2009).The phytochemistry, vitamin and mineral content of dasheen (Colocasia esculanta) leaves. *Proc. 34th Ann. Conf; Nig. Soc. for Anim. Prod (NSAP),* march 15th – 18th, Uyo – Nigeria, pp: 426 – 428.

Bawa, G.S., Orunmuyi, M., Agbaji, A.S., Ladan, Z., Omage, J.J., and Cdekeifi, U.O. (2006). Effect of different methods of processing neem (A. indica) seeds on performance of young rabbits. *Proc. 31sst Ann. Conf ; Nig. Soc.for Anirn. Prod*. March, pp: 3 19-323.

Biswas, K., Chattopadhyay, I., Banerjee, R.K., and Bandyopadhyay, U. (2002). Biological activities and medicinal properties of neem (Azadirachta indica). *Curr. Sci*., 82 (11), 1336 - 1344.

Bolukbasi, S.C., Erhan, M.K. and Ozkan, A. (2006). Effect of dietary thyme oil and vitamin C on growth, lipid oxidation, meat fatty acid composition and serum lipoprotein of broilers. *S. Africa. J. Sci.*, 36 (3), 189- 196.

Durunna, C. S., Chiaka 1.1., Udedibie, A.B.1., Ezeokeke, C.T., and Obikonu, H.O. (2009). Value of bitter leaf, (Venocia amygdalina) leaf meal as feed ingredient in the diet of finisher broiler chicken Proc. of the Conf on Global Food Crisis, April 19th - 24, Fut, Owerri - Nigeria, pp: 38- 42.

Edache, J.A., Musa, U., Karsin, P.D., Yisa, A., and Okpala, E.J. (2009). Effects of graded levels of neem (A;odiracitu indica) leaf meal on the performance of growing rabbits. *Proc. 31stAnn.Conf. Nig. Soc. for anim. Prod*. March 15th - I8 Uyo, Nigeria, pp: 359 —361.

Edeoga, H.O., Okwu, D.E., and Mbasie, B.O. (2005). Phytochemicals constituents of some Nigerian medicinal plants. *Afri. J. Biotech*, 4 (7), 685 - 688.

Elangovan, A.V., Verma, S.V.S., Sastry, V.R.V., and Singh, S. (2000). Effect of feeding neem (Acadirehia md/ca) kernel meal on growth, nutrient utilization and physiology on .lapenese quaiis (Cc. ,aponica) .*Osfia - Ausir. J. Ani. Sci*. 13(9), 1272-1277.

Engberg, R.M.,Hedemann, M.S., Leser, T.D., and Jensen, B.B. (2000). Effect of zinc Bacitracin and S'alinon:ycin on intestinal microflora and performance of broilers. *Poidi. Sd*., 99, 1311 – 1319.

Fajemisin, A.N., Alokan, J.A., Onibi, G.E., Aro, S.O., and Fadiyiniu, A.A. (2009). Response of '4 esl African dwarf ewes fed Vernonia amygdaline leaf meal in cassava starch residue - based diet. *Proc. Nig. Soc. for Anim. Prod NSAP, 34th Ann. Conf.* March 15 - 181 Uyo, Nigeria, pp: 480 – 482.

Hunt, S., Gofi, L.V., and Holbrook, J. (1980). Nutrition principles and chemical practices. John Wille and Sons Nm, New York, pp: 49 – 52.

Igile, G.O., Oleszek, S.B., Jurzysta, M., Aquino, R., Totninns, N., and Pizza, C. (1995a). Vernuniosiclcs D and E. novel, saponins from Vernonia amygda/ina. *Del. j. Nat. Pi'od*. 58: 1438 – 1443.

Igile, G.O., Oleszek, W., Burda. S., and Jurzysta, M. (1995b). Nutritional assessn: cnt of Vernonia amygdaline in growing mice. *J. Agric. Food, Owerri*, 43, 2162 -2166.

Jacobson, M. (1986). Neem tree natural resistance par excellence; In; Natural resistance of Ants 'c pest, role of phytochernicals substances. Symposium series no. 296 American'Chemicai Society Washington D.C., USA.

John, B.G. 1994. Evaluation of anthelmintic properties of ethno-veterinary plant preparation used as livestock dewormers in pastoralists and small holder farmers in Kenya. Ph.D. (Thesis. Swedish University of Agricultural Science, Uppsala, Sweden.

Katiyar, R.C., Sastr, V.R.V., and Agrawal, D.K. (1991). Urea and alkali treated neem kernel cake as livestock feed. P:'i. Rer, .4nim. Nutr. Div. IVRI. lzatanagar. India.

Madrid, L., Hernandez, F., Gracia, V., Orengo, J., Megian, M.O., and Sevilla, V. (2003). Effect of plant extracts on leal apparent digestibility and carcass yield in broilers at level of farm. In: *Proc. 14th Euro. Symp. Poult. Nutr., Aug., Lillehammer*, Norway, p: 189.

Masaba, S.C. (2000). The antimalarial activity of some traditional medicinal plants. *Ethiopian J. Health Develop*. 13:211-216.

Moser, M., Messi, K.R., Pfitter, H.P., and Wenk, C. (2003). Influence of the phytogenic feed additive. Sangroit on zootechnical effects in broilers in field trials. In: *Proc. 14th Euro. Symp. Poult. Nutr., Aug*., Lillehammer. Norway, P: 205

National Research Council. (1992). Neem: A tree for solving global problems. National Academy Press, Washington, D.C., pp: 23 - 30.

Njeku, P.C., and Akumefula. M.L. (2007). Phytochemical and nutrient evaluation of spondias mombin leaves. *Pak. J. Nutri*., 6(6), 6l3-615.

Nwajo, H.U. (2005) Efficacy of aqueous leaf extract of Vernon/a amygdaline on plasma lipoproteins and oxidative status in diabetic rat model. *Nig. J. Physiol. Sci*. 20: 39 -42.

Ohigashi, M. (1994). Assessment of antibacterial activity of some traditional medicinal plants *Ethiopian J. Health Develop.* 13, 211-216.

Ojiako, O.A., and Nwanjo. H.U. (2006). Is Vernonia amygdaline hepatotoxic or hepatoprotective; Response from biochemical and toxicity studies in rats. *Afric. J. ureni*. 5 l8: 1648- 1651.

Okaka, J.C., and Okaka, A.N.O. (2001). Food composition spoilace and shelf life extension, Oxford Academic Publishers, Enugu, Nigeria, pp: 54- 56.

Oko, K., and Agiang, E.A. (2009). Phytochemical eaLation of 3 extractants of Aspilia African leaves. Proc. of the Intern Conf on Global Food Crisis April l - 24. FUT. Owerri, Nigeria, pp: 87- 90.

Okwu, D.E., and Josiah, C. (2006). Evaluation of the chemical composition of two Nigerian medicinal plants. *Afri. J. Biotech*., 5(4), 357—361.

Okwu, D.E., and Okeke, O. (2003). Phytochemical screening and mineral composition of chewing stick in South Eastern Nigeria. *Global J. Pure Appl. Sd*. 9, 235 – 238.

Okwu, D.E., and Okwu, M.E. (2004). Chemical composition of Spondias monbin linn plant parts. *Journal of Sustainable Agriculture and the Environmen*. 6(l), 30-37.

Owen, Q.J., Amakiri, A.O, David, E.U., Nyeche, V.N., and Ndor, L. (2009). Proximate composition, energy content and mineral profile of Vernonia amygdalina (Bitter Leaf) meal. Proceedings 14th Annual Conference Animal Science Association of Nigeria (ASAN), 14th – 17th September, Ogbomoso, Oyo State, pp: 173 – 176.

Salawu. M.B., Adedeji, S.K., and Hassan, W.A. (1994). Performance of broilers and rabbit given diets containing full fat neern (A. indica). *seed meal. Ani. Prod*., 58, 289.

Schrnutter, H. (1990). Properties and potentials of natural pesticides from the neeni tree (A, md/ca) Ann. *Re Entomology*, 35, 271 -299.

Stray, F. (1998). The natural guide to medicinal herbs and plants Trger Book International London, pp: 12- 16.

Taiwo, L.A., Odeigha. P.G.C., and Ogunkanmi, L.A. (2009). The glycaemic effects of Vernon/a amygdalina and V tenoreana with tolbutainide in rats and the implications for the treatment of diabetes mellitus. J. *Sci. Re Dcv*., l, 122-130.

Tipu, M.A., Pasha, T.N., and Ali, Z. (2002), Comparative efficiency of salinorn'.cin sodium and neem (4 lodica) as additive ànticoccicidal in broilers mt. *J. Poult. Sci*. 1, 94 – 98,

Wekhe, S.N. (2002). The effect of *Alcohornea-cordifolia* 0n the gonads, liver, spleen, pancreas and bursa of fabricus of broiler *Proc. 27th Ann. Conf, NSAP, FUT, Akure*, March 17-21, pp:86-87.