ANTIMICROBIAL EFFECT OF BI HERBAL MIXTURE OF*VERNONIA AMYGDALINA* (BITTER LEAF) AND *CARICA PAPAYA* (PAWPAW) LEAF EXTRACT ON DAY OLD CHICKS OF BROILER BREED

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A PROJECT WRITTEN IN THE DEPARTMENT OF SCIENCE LABORATORY TECHNOLOGY AND SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARDS OF A BACHELORS (B.sc) DEGREE IN THE UNIVERSITY OF BENIN, BENIN CITY, NIGERIA.

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CERTIFICATION

We certify that this research was carried out by IMIERE ABRAHAM NATHANIEL in the Department of Science Laboratory Technology, Faculty of Life Sciences, University of Benin, Benin City, Edo State, Nigeria.

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DEDICATION

This report is firstly dedicated to God for his grace and goodness, to me for the time and effort I put into my academics.

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My profound gratitude goes to my supervisor Dr. P.O Obaro for his guidance and dedication towards helping me to achieve so much knowledge that help me to complete my project work and

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ABSTRACT

Vernonia amygdalina leaf and *carica papaya* leaf have been employed to cure infections in traditional medicine, the plants have demonstrated a significant effect on microorganisms of bacteria, fungi and virus in various studies. The work aims to evaluate the antimicrobial effect of the decoction on the day old broiler chicks. The study decoction of pawpaw leaf and bitter leaf extract was extracted in ratio 1:1 in 5 liters of drinking water. Fifty (50), day old broiler chicks were used for the experiment. The study lasted for 4 weeks. Feed, drinking water and the decoction were provided ad libitum and standard routine management practices were followed. The chicks were divided into two treatments with 25 chicks per treatment. The first set labelled as T1 as control which were given plain water while the second set were labelled T2 as the treated chicks given the decoction as their drinking water. The result showed that there were distinct differencea in weekly weight gain and the final live weight $p<0.05$. Haematological indices showed that RBC, WBC, PCV, Lymphocytes and monocytes volume increased in the body of the chicks. Data were collected for body weight, ($p<0.05$). The results depict that there was significant ($p< 0.05$) differences observed in the body weight between T1 and other T2. In conclusion AVECAPA Decoction can be used in replacement of antibiotics.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the Study

Medicinal plants play a crucial role in the health of individuals and society. The medicinal value of some plants lies in the fact that certain chemical substances produce certain physiological effects in the human body. (Evbuomwan *et al.,* 2017).

Antimicrobial compounds are widely available in medicinal plants. A wide variety of medicinal plant extracts are utilized to treat a number of illnesses due to their potential antimicrobial activity. (Renisheya *et al.,* 2011). Herbal antibiotics of a complex nature are used to fight bacteria, purify the blood, boost the immune system, and improve certain organ system functioning. They function by merely destroying microorganisms and restoring bodily imbalances. (Bassapa and venu, 2013) *Vernonia amygdalina* is a special medicinal plant commonly found in West Africa and can be used as a effective anticancer, antibacterial, antimalarial, and antiparastic agent.(Koshy *et al.,* 2009). *Carica papaya* belongs to the papaya family. The herb is also described in forms with documented properties and as an antibacterial, analgesic, amoebic, anti-septic, cardiotonic, antiseptic, digestive, carminative, anti-pyretic, hypotensive, laxative, analgesic, stomachic and anthelmintic. (Afolayan, 2003). Traditional medicine has employed the leaf of the *Carica papaya* along with *Vernonia amygdalina* to cure infections. (Eraso *et al.,* 2006). Scientific studies have demonstrated the antibacterial, (Eraso et al., 2006), antifungal, (Eraso *et al.,* 2006; Alabi *et al.,* 2005), properties of the plant extracts.

1.2 Farm Birds (Poultry).

The term "poultry" refers to a group of birds that are raised or hunted for food (such as pheasants) or kept for meat and eggs (such as chickens). Feathered creatures include birds. The poultry group of birds consists of the following: Turkey, Guinea hens, domestic chicken (bird), and duck and Ostriches, Quails, Pheasants, and Geese (sometimes known as waterfowl), doves and pigeons.(Adebiyi, 2020). Poultry are domesticated birds raised for its flesh as well as its eggs. Birds including chicken, turkey, duck, goose, ostrich, quail, pheasant, guinea fowl, and peafowl are included in this. (Aho, 2004). Humans can get food, and fiber from poultry in the form of eggs, meat, and feathers. Three different kinds of poultry are breeds for laying (breeds known for their capacity for egg production), meat breeds (bred for their meat) and multipurpose breeds (bred for their egg and meat). (Karri, 2020)

1.3 Broilers as Farm Birds

Broilers breeds are any domestic chickens (Gallus gallus domesticus) that have been bred and raised especially to produce meat. (Kruchten, 2002), While slower growing breeds achieve slaughter weight at about 14 weeks of age, the majority of commercial broilers do so between four (Bessei, 2006) and six weeks of age. Typical broilers have yellowish skin and white feathers. When referring to younger chicks under 2.0 kilos (4+12 lb), as opposed to the larger roasters, the terms "broiler" or "broiler-fryer" are also occasionally used (Gerrard, 2019). In just 5 to 7 weeks, modern commercial broilers are raised to reach a slaughter weight of roughly 2 kg. (Turner *et al.*, 2005).

1.4 Care and Maintenance of Broiler Chicks

Constant care and attention are needed for poultry. An expert should provide or oversee this care. Before obtaining chicks, beginners who want to raise poultry should educate themselves on details of information on proper care.(Ralph *et al,* 2003)

1.4.1 Temperature for Brooding

In order to maintain their health and growth, newly hatched chicks must be kept in a small temperature range because they cannot regulate their body temperatures at extreme high or low ambient temperatures. Chicks need an environment that is between 85 and 87 degrees Fahrenheit (29.5 to 30.5 degrees Celsius) at hatch, or a cooler environment with added radiant heat. Chicks can also be effectively grown in a cool room close to a warmer location (95°F, 35°C at day-old). This is also known as "cool room brooding." Up until about six weeks of age, when they can control their body temperature within the ranges typically encountered in commercial poultry houses, (Ralph *et al.,* 2003)

1.4.2 Space

The amount of space needed for hens raised for meat depends on their size, housing, and management style. If raised on litter, broiler chicks should have a minimum floor area of 72 square inches (465 cm2) per bird until they are 49 days old.(Ralph *et al.,* 2003)

1.4.3 Bird Litter

Chicks from litter are frequently raised on floors that have two to four inches (5-10 cm) of fresh litter material on them. It is possible to use a variety of litter materials effectively. Although chopped straw, peanut hulls, sawdust, and other materials are occasionally used, wood shavings and rice hulls are favored. Chemicals, infections, and other contaminants must be absent from the litter material, and it shouldn't be very dusty. It is best to use materials that are both absorbent and

highly insulating. If the preceding flock had no health issues or unexpected mortality, the litter might be reused. Areas that are wet and caked should be cleaned up, and new litter should be added as needed. Litter may be kept in good shape with the right airflow. When litter cake starts to form, it needs to be removed or the litter needs to be stirred. (Ralph *et al.*, 2003)

1.4.4 Ventilation

Ventilation is necessary to maintain a healthy environment, acceptable air quality for poultry, and the right amount of moisture in the litter. In order to remove carbon dioxide and ammonia from chicken houses and to provide oxygen, air exchange is necessary. However, removing heat and moisture from litter homes typically necessitates more air exchange than is necessary to remove carbon dioxide and ammonia. Birds should not be exposed to ammonia for longer than 10 to 20 ppm. Young birds are more susceptible than adult birds to harm to the lungs, trachea, and eyes if this limit is routinely exceeded.(Ralph *et al.*, 2003)

1.4.5 Chick Guard

In order to keep the chicks contained until they figure out where the heat, food, and water are, chick guards are utilized. When the chicks are 6 to 8 days old, the area inside the brooder ring is gradually expanded, and the guard is taken off. If chicks are raised in a smaller space, such as a partial home, guards may not be required. Chick guards may be built of metal, corrugated cardboard, welded wire, or any other appropriate material. Ideally, the guard material would be 12 to 15 inches height (from 30 to 38 cm) and length that is enough to create a large ring around the heat source.(Ralph *et al.*, 2003)

1.4.6 Feeding and Watering Program

Having an adequate quantity of feeders and waterers is crucial for chicks in their early development. The most important nutrition for a chick that has just hatched is water. In order to keep chicks from becoming dehydrated and to help them find water sources, water is frequently provided to them before food. Following the placing of the chicks, food may be introduced right away or a few hours later. Equipment used to feed and water chicks must be of the right size so that they can do it comfortably, feed is frequently placed on egg flats or in plastic trays to aid chicks in finding food. It is best to move feeder locations gradually to allow the chicks to become accustomed to them.(Ralph *et al.,* 2003)

1.4.7 Vaccination

Based on knowledge of the diseases to which birds are likely to be exposed, an immunization program should be developed and integrated into the flock's management system. When the flock is being stressed out by other factors, vaccinations shouldn't be given. Vaccines should be acquired and administered following consulting with vaccine producers. When serological monitoring tests are available, they should be regularly used to check for an immunological response after immunization.(Ralph *et al.,* 2003)

1.4.8 Cleaning and Disinfection of Premises and Equipment

Commercial chicken houses should be cleaned and disinfected on a regular basis to reduce disease pathogens. These may be carried out once a year or more frequently if disease issues have arisen. Before reintroducing new birds, the structure and equipment used to house the poultry should be thoroughly cleaned and sanitized. The area around the chicken houses should be cleared of manure (including litter), ideally the entire property (Ralph *et al.,* 2003)

1.4.9 Disposal Of Dead Bird

The proper recycling of nutrients without contaminating surface or ground water occurs as a result of successful techniques of dead bird disposal that avoid the transmission of infections to surviving birds. (Ralph *et al.*, 2003)

Plate 1.4: Pictorial presentation of a day old broiler chicks.

Photo credit : Elizabeth Michael

Table 1.4.2: Spacing Requirements

The following space requirement is recommended for broiler

Space Requirement	
a. Day-old to three weeks	9.14 cm/chick
b. 3 weeks to 4 weeks.	15.24 cm/chick
c. 5 weeks to Market Age	30.48 cm/bird
Feeding Space	
a. Day-old to 4 weeks.	2.5 cm/bird
b. 4 weeks to 8 weeks	5 to 6.5 cm/bird
Watering Space	
a. Day-old to 4 weeks.	0.5cm/birdortwo3.79Ldrinkingfountains/100birds
b. 4 weeks to 8 weeks.	0.6 to 1 cm/bird or two 7.5/L drinking water/100 birds

Source : (Adebiyi, 2020)

Table1.4.8: Vaccination Schedule

S/NO	Age	Vaccine	Route of Administration
1	1st day	Marek's at hatchery	S/C at Neck
2	5-7th day	RDV F1	I/O or I/N
3	14th day	IBD Vaccine	I/O or I/N
4	21st day	RDV Lasota	Drinking water
5	28th day	IBD Vaccine Booster	Drinking water

Source : (Adebiyi, 2020)

1.4.10 Aim

To determine the Antimicrobial effect of *Vernonia amygdalina* (Bitter Leaf) and *Carica papaya* (PawPaw) Leaf extracts on broiler chicks and their invitro antimicrobial effect on microorganisms.

1.4.11 Objective

Misuse and over usage of these synthetic drugs in poultry have led to drug resistance in the fight against microorganisms. Many alternative strategies are under investigation for the effective, economic and environment friendly control of coccidiosis, including the use of medicinal plants. Antimicrobial drugs may lead to the development of drug resistance and drug residues. Herbal extracts could be an attractive alternative. This research was undertaken to evaluate the antimicrobial outcome of Bitter Leaf and Pawpaw Leaf on broiler chicks

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Plants antibiotics

The use of medicinal plants as an alternative to synthetic pharmaceuticals has been welcomed in many nations, due to their natural antimicrobial properties (Epidi *et al.*, 2016). Over 30,000 antimicrobial molecules have been extracted from plants, and over 1340 species have been identified as having specific antimicrobial activity. (Tajkarimi *et al.*, 2010). Many bioactive secondary metabolites found in plants have the potential to treat a variety of diseases. Flavonoids, phenols, phenolic glycosides, unsaturated lactones, sulfur compounds, saponins, cyanogenic glycosides, and glucosinolates are a few examples of these substances. (Quiroga *et al.*, 2001). Flavonoids, alkaloids, tannins, and terpenoids are just a few of the phytochemicals found in medicinal plants that have antimicrobial activities (Wamidh and Adel, 2010). Plant-derived natural compounds are a desirable source of antimicrobial agents since they are safe and inexpensive, especially for rural communities in underdeveloped nations. (Ghosh *et al.*, 2008).

2.2 Plants with Antibiotics

Garlic is a very potent plant for the treatment of diseases that are resistant to antibiotics. The most significant active ingredient in garlic(*Allium sativum*), allicin, is more potent than regular penicillin. and performs well against microorganisms. Garlic's antibacterial, antifungal, and antiviral qualities are known across the world as a preventative measure.Garlic extract is also a highly efficient treatment for many types of bacteria, including *Salmonella* and *Escherichia coli* (*E. coli*), herpes viruses, influenza, and other infections. (Nathan, 2019), ginger is a natural antibiotic it has antibacterial properties, which is good for nausea and motion sickness. (Reena and Sharad, 2020), clove water extract is efficient against a range of microorganisms, including

Pseudomonas aeruginosa, *Staphylococcus aureus*, and *E. coli*. Eugenol, one of the clove's active ingredients, has great antibacterial effects since it may destroy the outer layer of bacterial cells, *S. typhi* is susceptible to the antibacterial effects of eugenol. Devi *et al.,* 2010), tumeric is a well-known Indian spice with flavor and antimicrobial qualities. The chemical compound Curcumin, is an active component of turmeric and has a crucial role in the treatment of bacterial and biofilm growth. Karaman *et al.*, 2013).

2.3 Bitter Leaf as an Antibiotics

East and West Africa are both home to the valuable medicinal herb *Vernonia amygdalina* (Olamide and Agu, 2013). These metabolites can be utilized as medicines because of their ability to combat bacteria. *Vernonia amygdalina*, is one of these potent plants with these characteristics. It contains a variety of therapeutically significant active ingredients, including saponins, flavonoids, alkaloids, and tannin (Olamide and Agu, 2013). According to Ghamba *et al.*, (2014), the antimicrobial activity of these leaves makes it a potential herb for drug development due to its inhibition effects on bacterial growth. According to Oboh and Enobhayisobo (2009), the aqueous extract of

the leaves has an inhibitory effect on the growth of, Staphylococcus aureus, and the, Escherichia coli.

***Plate* 2.4: *V.Amygdalina* (Bitter leaf)**

***Photo credit*: Elizabeth Michael**

2.4 Papaw Leaf as an Antibiotics

Pawpaw (*Carica papaya*), which is common throughout tropical Africa, provides a number of health benefits Because it contains a large amount of proteolytic enzymes including chymopapain and papain, which have antibacterial, antiviral, and antifungal characteristics. (Kadiri *et al.,* 2016; Oloruntola *et al.,* 2018).

Papaya leaves have the potential to be a natural antibacterial that may be employed in some foods. (Romasi, *et al.,* 2011). The papaya leaves extract has the compounds with antibacterial properties which can be utilized as antibacterial agents in original drugs for the treatment of gastroenteritis, uretritis, otitis media, and wound infections. (Awah *et al.,* 2017) It has been used to treat digestive problems and intestinal worms as well as warts, sinusitis, eczema, cutaneous tubercules and hardness of the skin.(Pranita A. Gulhane, 2020)

Plate 2.5: Pictorial representation of *C.papaya* leaf

Photo credit: Elizabeth Michael

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Procurement Materials and Formulation of bi-herbal mixture *Vernonia amygdalina* and

CHAPTER FIVE

5.0 DISCUSSION

5.1. Qualitative Phytochemical Analysis

Recommendation

The bi herbal extract of *Vernonia amygdalina* and *carica papaya* is recommended for improvement of growth performance of the broiler chicks, and provision of nutrients.

Conclusion

In conclusion the bi herbal formulation of *Vernonia amygdalina* (bitter leaf) and *Carica papaya* (pawpaw) leaf have significant effect on broiler chicks for growth promotion, increased immunity, Blood cell volume and nutrients.

REFERENCES

Adebiyi O.A. 2020. Poultry production. poultry industry in nigeria ISBN: 978-978-970-17-6

Abdalla, F.M., Ostica, E., Picarelli, Z.P., Abreu, L.C., Avellar, M.C. and Porto, C.S. (2004). Effect of estrogen on muscarinic acetylcholine receptor expression in rat myometrium. Endocrinology, 213:139–48

Adaay, M.H., Al-Dujaily, S.S., Ferial, K. and Khazzal F.K (2013). Effect of aqueous extract of Medicago sativa Salvia officinalis mixture on hormonal, ovarian and uterine parameters in mature female mice. Journal of Material Environmental Science, 4(4): 424-433.

Adedapo, A. A., Abatan, M.O. and Olorunsogo O. (2007). Effect of some plants of the spurge parameters in rats. *Veterinarski,* 77: 29 -38

Adedeji, T. A., Amao, S. R., Popoola, A. D. and Ogundipe, R. I. (2015). Fertility, hatchability and eggs quality traits of Nigerian locally adapted chickens in the derived savanna environment of Nigeria. *Journal of Biology, Agriculture and Healthcare,* 5(17): 36-42.

Afolabi, S. S., Oyeyode, J. O., Shafik, W., Sunusi, Z. A. and Adeyemi, A. A. (2021). Proximate analysis of poultry-mix formed feed using maize bran as a base. *International Journal of Analytical Chemistry*, 21:8-9.

Afolayan, A.J. 2003. Extracts from the shoots of Arctotis artotoides inhibit the growth of bacteria and fungi. *Pharmaceutical Biology*. 41: 22-25.

Ahmad, I. and Beg, A.Z. (2001) Antimicrobial and Phytochemical Studies on 45 Indian Medicinal Plants against Multi-Drug and Resistant Human Pathogens. *Journal of Ethnopharmacology*, 74, 113-123.

Aho, P. (2004). Challenges and opportunities for marketing poultry products in developed and developing countries. *Presented on behalf of The American Soybean Association in Romania and Turkey*, pp. 1-16.

Akang, E. N., Oremosu, A. A., Dosumu, O. O., Noronha, C. C. and Okanlawon, A. O. (2010). The effect of fluted pumpkin (*Telferia occidentalis*) seed oil (FPSO) on testis and semen parameters *Agriculture And Biology Journal of North America* 2:151-7525

Akpanyung, E. O. (2005). Proximate and Mineral Element Composition of Bouillon Cubes Produced in Nigeria. *Pakistan Journal of Nutrition,* 4, 327–329. 10.3923/pjn.2005.327.329

Alabi D. A, Oyero L.A, and Amusa N.A, "Fungitoxic and phytotoxic effect of Vernonia amygdalina Del., Bryophyllum pinnantus Kurz, Ocimum gratissimum (Closium) L and

Eucalypta globules (Caliptos) Labill water extracts on cowpea and cowpea seedling pathogens in Ago-Iwoye, South Western Nigeria," World *Journal of Agricultural Science*, vol. 1, pp. 70–75, 2005

Ansari, M. A. , Ahmad, Z. A. , & Aafaqi, R. (2004). Organizational leadership in the Malaysian context In Tjosvold D. & Lueng K. (Eds.), Leading in high growth Asia: *Managing relationship for teamwork and change* (pp. 109–138).

Awah N.S., Agu K.C., IIkedinma J.C., Uzoechi A.N., Eneite H.C., Victor-Aduloju A.T., Umeoduagu N.D., Onwuatuegwu J.T.C., Ilikannu S.O., Antibacterial Activities of the Aqueous and Ethanolic Extracts of the Male and Female Carica papaya Leaves on Some Pathogenic Bacteria. *Bioengineering and Bioscience*, 5(2): 25-29, (2017).

Bessei W (2006). "Welfare of broilers: A review". *World's Poultry Science Journal*. 62 (3): 455–466. doi:10.1017/s0043933906001085. S2CID 86638983.

Chakraborti, S. , Chakraborti, T. , Mandal, M. , Mandal, A. , Das, S. , & Ghosh, S. (2002). Protective role of magnesium in cardiovascular diseases: A Review. *Molecular and Cellular Biochemistry*, 238, 163–179.

Devi, K. P., Arif, S., Nisha, R., Sakthivel, S., Pandian, K. (2010). Eugenol acts as an antibacterial agent against Salmonella typhi by disrupting the cellular membrane. *Journal of Ethnopharmacology*.,130:107–115.

Duke ,JA. A., (1998).The use of medicinal food as medicine . *Journal of Medicinal Food,* 1(1):53-55

Effraim, K. D., Salami, H. A. and Osewa, T. S. (2000) Effect of Aqueous leaf Extract of Ocimum gratissimum on Heamatological and Biochemical Parameters in Rabbits. *African Journal of Biomedical Research,* 3:175-179.

Epidi, T. T., Nwani, C. D. and Ugorji, N. P., 2016. Prevalence of malaria in blood donors in Abakaliki Metropolis, Nigeria. Scientific Research and Essay: 3(4): 162-164

Erasto, P., Grierson, D. S and Afolayan, A. J "Bioactive sesquiterpene lactones from the leaves of Vernonia amygdalina," *Journal of Ethnopharmacology*, vol. 106, no. 1, pp. 117–120, 2006

Evbuomwan, l; chukwuka, ep; obazenu, ei; ilevbare, l (2017).Antibacterial Activity of Vernonia amygdalina Leaf Extracts against Multidrug Resistant Bacterial Isolates. *Journal of Applied Sciences and Environment Management*. Vol. 22 (1) 17-21. doi: https://dx.doi.org/10.4314/jasem.v22i1.4

Gerrard, Gene (January 7, 2019). "What Are the Main Types of Chicken?". *The Spruce Eats*. Retrieved June 16, 2020.

Ghamba PE, Balla H, Goje LJ, Halidu A, Dauda MD. 2014. In vitro antimicrobial activities of Vernonia amygdalina on selected clinical isolates. *International Journal of Current Microbiology and Applied Sciences*., 3(4): 1103-1113

Ghosh, A.; Das, B.K.; Roy, A.; Mandal, B.; Chandra, G. Antibacterial activity of some medi cinal plant extracts. *Journal of Natural Medicines*. 2008, 62, 259–262. [

Gberikon Grace Mwuese, Fredrick Ityolumun Iyoula, Smart Tersagh Ichor (2019). Effect of Bitter Leaves Extract on Bacteria Isolated from Soils of Some Mechanic and non-Mechanic Sites in Makurdi Metropolis. *International Journal of Applied Sciences and Biotechnology* Volume 7(1): 81-87. DOI: 10.3126/ijasbt.v7i1.23302

Hafeez A., Mehmood., Mazhar F. Oral zinc supplementation in pregnant women and its effect on birth weight: a randomized controlled trial. *Archives of Disease in Childhood*. (Fetal and Neonatal Edition), 2005. 90:F170 – F171.

Hanachi P., Golkho S., Norrozi M. The association of serum zinc levels with socio-demographic factors, red and white blood cells count in pregnant women. *Journal of Applied Sciences*., 2008. 8(24):4679 – 4683

Idu, M., Erhabor J., Timothy, O. and ovuakporie-uvo, O. (2014). Market survey and heavy metal screening of selected medicinal plants sold in some market in Benin City Nigeria. *International Journal of Humanities, Arts, Medicine and sciences,* 1(1):1-14

Iranloye, B.O. (2002). Effect of chronic garlic feeding on some haematological parameters. *African journal of Biomedical Responses,* 5: 81-82.

Kadiri O, Olawoye B, Fawale OS, Adalumo OA (2016) Nutraceutical and antioxidant properties of the seeds, leaves, and fruits of Carica papaya: potential relevance to human diets, the food industry, and the pharmaceutical industry—a review. *Turkish Journal of Agricultural Technnology* 4:1039–1052

Kadiri, H.E., Asagba, S.O. (2019). The chronic effects of cyanide on oxidative stress indices in the domestic chicken (Gallus domesticus L.). JoBAZ 80, 30 (2019). https://doi.org/10.1186/s41936-019-0098-y

Karaman, M., Firinci, F., Arikan A. Z., Bahar, I. H. (2013). Effects of imipenem, tobramycin and curcumin on biofilm formation of Pseudomonas aeruginosa strains. Microbiolgy ofBulletin.,47:192–4.

Karri Rama R 2020), Introduction to poultry farming https://www.academia.edu/43806750/introduction_to_poultry_farming

Koshy, P; Sri-Nurestri, AM; Wira-Karnian, S; Sim, KS; Saravana, K; Hong, SL; Lee, GS; Syarifat, NSA (2009). Antimicrobial activity of some medicinal plants from Malasia. *American Journal of Applied Science*. 6 (8): 1613-1617.

Kruchten, Tom (November 27, 2002). "U.S Broiler Industry Structure" (PDF). National Agricultural Statistics Service (NASS), *Agricultural Statistics Board, U.S. Department of Agriculture.*

Lee, B., Sur, B., Shim, I., Lee, H. and Hahm, D.H. (2015,). *Angelica gigas* ameliorate depression-like symptoms in rats following chronic corticosterone injection. *Journal of Complementary Alternative Medicine,* 15:210.

Lovejoy, J.C. (2002). The influence of dietary fats in insulin resistance current diabetes reports.*International Journal Of Plant Medicine,* 2(5): 430-440

Mohajeri, D., Mousavi, G. and Mesgari, M. (2007). Subacute toxicity of Crocus sativus L. (Saffron) stigma ethanolic extracts in rats. *American Journal of Pharmacology and Toxicology, 2*: 189-193.

Mohd, A. M. , Idris, M. B. , & Abdulrasheed, A. (2006). The mineral composition and proximate analysis of T. occidentalis (Fluted Pumpkin) leave consumed in Kano metropolis. Northern Nigeria. *American Chemical Science Journal*, 10, 1768–4.

Moukette B. M, A. C. Pieme, P. C. N. and Biapa E. (2015) "*In vitro* ion chelating, antioxidative mechanism of extracts from fruitsand barks of *Tetrapleura tetraptera* and their protective effects. *International Journal of Pharmacognosy,* 3: 8-15.

Nathan, N. S. (2019). 12 Best Natural Antibiotics for Infections, *Medlife*. https://www.medlife.com/blog/12-best-natural-antibiotics-infection/.

Nirosha N, Mangalanayaki R. Antibacterial activity of leaves and stem extract of *Carica papaya L*. *International Journal of Advanced Pharmaceutical Biology and Chemistry*. 2013;2(3):473–476

Oboh FOJ, Enobhayisobo EI. 2009. Effect of aqueous extract of *Vernonia amygdalina* leaves on plasma lipids of hyperlipidaemia adult male albino New Zealand rabbits. *African Science*., 10, 4

Okaka, J. C. , Akobundu, E. N. T. , & Okaka, A. N. C. (2006). Food and human nutrition: An integrated approach (3rd ed., pp. 132–142). Enugu, Nigeria: Ocjanco Academic Publishers.

Okpuzor, J., Ogbunugafor, H.A. and Kareem, G.K. (2009). Hepatoprotective and hematologic effects of fractions of Globimetula braunii in normal albino rats. *EXCIL Journal*. 8: 182-189.

Olamide SO and Agu GC (2013) The Assessment of the Antimicrobial Activities of *Ocimum gratissimum* (Wild Basil) and *Vernonia amygdalina* (Bitter Leaf) On Some Enteric Pathogen Causing Dysentery or Diarrhea in Patients. *International Journal of Engineering Science* (IJES) 2(9): 83-96.

Oloruntola OD, Agbede JO, Ayodele SO, Ayedun ES, Daramola OT, Oloruntola DA (2018a) Gliricidia leaf meal and multienzyme in rabbits diet: effect on performance, blood indices, serum metabolites, and antioxidant status. *Journal of Animal Science Technology* 60:24

Oyugi, D.A Luo, X., Lee, K.S., Hill, B., and Izevbigie, E. B. "Activity markers of the antibreast carcinoma cell growth fractions of *Vernonia amygdalina* extracts," *Proceedings of the Society for Experimental Biology and Medicine*, vol. 10, p. 3181/0811, 2009.

Pranita A. Gulhane, Mohini J. Madhugiri and Ankita V. Khadekar. Antibacterial Evaluation of Papaya Leaves Against Skin Infection Causing Bacterial Pathogens. *International Journal of Pharmacy and Biological Sciences*-IJPBSTM (2020) 10 (2): 55-61. Online ISSN: 2230-7605, Print ISSN: 2321-3272

Quiroga, E.N.; Sampietro, A.R.; Vattuone, M.A. Screening antifungal activities of selected medicinal plants. *Journal of Ethnopharmacology*. 2001, 74, 89–96. [

Ralph Ernst, Duncan McMartin, Francine Bradley, Donald Bell, James Millam and edited by Carolyn Stull 2003. Broiler Care Practices. https://www.thepoultrysite.com/articles/broiler-care-practices.

Ramah, A., Yasuda, M., Ohashi, Y., Urakawa, M., Kida, T., Yanagita, T., ... & El-Shewy, E. A. (2020). Different doses of tannin reflect a double-edged impact on broiler chicken immunity. *Veterinary immunology and immunopathology*, 220, 109991. [

Rasilingam, D., Duraisamy, S. and Subramanian, R. (2009), Anticonvulsant activity of bioflavonoid gossypin. *Bangladesh Journal of Pharmacology*, 4(1):51– 54.

Reena Gupta and Sharad Sharma. (2020). Herbal Antibiotics. *Bulletin of Environment, Pharmacology and Life Sciences*., Vol 9[11] 2020 : 136-142 ISSN 2277-1808

Renisheya JJ, Malar T, Johnson M, Mary UM, Arthy A. Antibacterial activities of ethanolic extracts of selected medicinal plants against human pathogens. *Asian Pacific Journal of Tropical Biomedicine* 2011; 576-578.

Romasi, Elisa Friska; Karina, Jessica; and Parhusip, Adolf Jan Nexson (2011) "Antibacterial Activity of Papaya Leaf Extracts Against Pathogenic Bacteria," *Makara Journal of Technology*: Vol. 15 : No. 2 , Article 12. DOI: 10.7454/mst.v15i2.936

Sharif B.H. and Gabi Baba1, H.Y. (2013). Hematological and Histological changesinduced on the Selected Organs of (Wistar) Rats by leaf extracts from herbs of ethnomedicinal application. *Nigerian Journal of Chemical Research*, 18:15-19

Tajkarimi M., Ibrahim S., Cliver D. Antimicrobial Herb and Spice Compounds in Food. Food Control. 2010;21:1199–1218. doi: 10.1016/*journal of food control* .2010.02.003.

Tan, M.P. and Gyulemetova, R. (2012). *Tribulus terrestris* possesses antihypertensive activity. *Planta Medica*, 26:341.

Turner, J.; Garcés L. and Smith, W. (2005). "The Welfare of Broiler Chickens in the European Union". *Compassion in World Farming Trust*.

Wamidh H. Talib and Adel M. Mahasneh (2010). Antimicrobial, Cytotoxicity and Phytochemical Screening of Jordanian Plants Used in Traditional Medicine. *Journal of molecules volume* 15, issue 3 15(3), 1811-1824; https://doi.org/10.3390/molecules15031811

Yahaya, M., Adamu, S., Salau, I., & Sambo, S. (2019). Processing Effect of Nutritional and Anti-Nutritional Content of African Locust Bean Seeds (Parkia biglobosa Benth). Greener *Journal of Agricultural Sciences*, 8, 370-375