

# Potency Of Medicinal Leaves in the Growth Performance of Broiler Chicks

Levitah C. Mapatac

---

## **Abstract**

*The study is about the feed additives present in medicinal leaves was conducted to investigate the antibacterial and the phytochemical composition of the ethanolic leaf extract present in different medicinal leaves. Ethanolic extracts of Persia americana (avocado), Psidium guajava (guava), and Moringa olifera (malunggay) were tested using the paper disc diffusion method for antibacterial agent against the common poultry pathogens Escherichia coli and Staphylococcus aureus. Guava and avocado extract showed almost all the secondary metabolites screened while only flavonoids and alkaloids were present in the malunggay extract. The presence of secondary metabolites applied to broiler chicks as feed additives enhances the growth performance of the chicken. There were five treatments groups identified as distilled water, Vetracin, avocado decoction, guava decoction, and malunggay decoction. Using a statistical analysis of one-way ANOVA and Duncan's Multiple Range Test (DMRT), final weight and the weight gained has significant differences including some body parts of the chicken while the final circumferential measurement doesn't have a significant difference. Among the treatments, guava decoction had better weight yield among the experimental medicinal leaves. Therefore, this can be an alternative substitute for antibiotics in the chicken production and one way of eliminating the use of synthetic antibiotic application is through the utilization of the natural antibiotic extract from medicinal leaves which lessen the side effect in the treated animals and consumers.*

*Keywords: Antimicrobial assay, secondary metabolites, growth promoter, Persia Americana, Psidium guajava, Moringa olifera*

---

## **1.0 Introduction**

Poultry industry has become one of the growing and productive sources of income for Filipino families especially those who lives in rural areas in the country. In maintaining a good production, antimicrobial medicines are used by the raisers which can enhance the growth performance of the birds and protect the animals from diseases. However, the high cost of maintenance especially in the food additives and feeds is often the reason for

failures face by many poultry production business. A controversy arises also in the use of antimicrobial agent for the growth enhancer for poultry used by humans. Therefore the alternative strategies have been investigated to eliminate the possibility of chemical residue that will affect the consumer's health by using naturally occurring plant extract. Producers are, therefore, presently looking for locally available food additives, especially, in the case of alternative growth

enhancer. Thus, in the Philippines many producers and poultry raisers are innovative enough to make use of a natural and abundant plant source which is phytobiotics, environmentally friendly and abundant in the surrounding in keeping their fowls strong and healthy without the additional cost of

synthetic antibiotics. Thus, this paper considered to evaluate the use of antibiotics from herbal plant sources as growth promoters and to eliminate the use of synthetic growth promoters for the animal production.

### Experimental Procedure

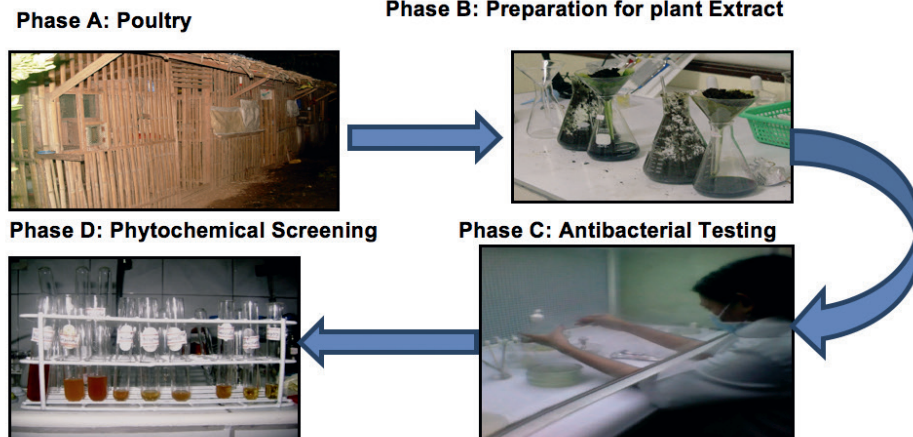


Figure 1. Schematic Diagram of the Study

## 2.0 Research Design & Methodology

The research design applied in this study is completely randomized design (CRD), this is used when treatments are assigned completely at random so that each experimental unit has the same chance of receiving any one of the treatment. For the CRD, any difference among experimental units receiving the same treatment is considered as experimental error. There was comparison between the weights and circumferential measurements of the chicks applied with distilled water (T1), distilled water with Vetracin (T2), decoction of avocado leaves (T3), guava leaves (T4) and decoction of malunggay leaves (T5). After 45 days of application, the mean weight and mean circumferential measurement of the experimental chicks were tabulated.

### Data Gathering

The measurement of initial weight and basal

circumference of each chick weighed before treatment. Measuring was taken 6am in the morning before feeding time every end of the week and measured in seven trials. Upon harvest, final measurement taken and recorded including the weight of the dressed chicken. The dressed chickens snuffed by cutting the neck. Internal randomized design (CRD), this. organs were taken out from the chickens' body and the rest of the body parts were cleaned, chopped and weighed separately as stated on the standard protocol for dressing chicken and feeding. (FAO Animal Production and Health Manual on Small Scale Poultry Production, 2004).

### Phase B: Preparation for Plant Extract

Leaves of the plant were freshly collected, washed and cut into small pieces. For the

extraction, 500 grams of fresh leaves of the plant material were soaked in 95% AR ethanol (1:5) for 24 hours for leaves sample. The solvent was then removed by rotary evaporation. The extract was stored inside the refrigerator until used for the laboratory analysis for phytochemical screening and antimicrobial analysis.

### Phase C: Antibacterial Assay

Paper disc diffusion method was used by the proponent to determine the antibacterial activity of avocado (*Persia Americana*), guava (*Psidium guajava*) and malunggay (*Moringa Olifera*) leaves extract. Bacteria of *Escherichia coli* and *Staphylococcus aureus* were inoculated into Nutrient broth (NB) at 37°C for 6 hours. The turbidity of the resulting suspensions was diluted with NB to obtain transmittance of 74.3% (absorbance of 0.132) at 600 nm. The percentage is found spectrophotometrically comparable to 0.5 McFarland turbidity standards. This level of turbidity is equivalent to approximately  $1.5 \times 10^8$  CFU/ml. These bacterial cultures were then inoculated on the surface of Mueller-Hinton agar (MHA) plates for bacteria. Subsequently, filter paper discs (6 mm diameter) saturated with extracts (25  $\mu$ L) was placed on the surface of each inoculated plate. The tests were carried out in triplicates. The plates were incubated at 37°C for 24 hours. At the end, of incubation, zones of inhibition were measured with a transparent ruler. Zones of clearing greater than 6 mm were considered susceptible to the extracts.

### Phase D: Phytochemical Screening for Secondary Metabolites

Phytochemical screening analysis of *Persia Americana*, *Psidium guajava*, *Moringa olifera* leaves extract was done by the proponent at

Chemistry Instrumentation Laboratory, Caraga State University, Ampayon, Butuan City using the standard test by Guevarra (2005) manual for phytochemical screening. To test for alkaloids, about 0.5 g of the extract was stirred with 5 ml of 1% aqueous hydrochloric acid on a steam bath. A few drops of Dragendorff's reagent were used to treat 1 ml of the filtrate. Turbidity or precipitation with this reagent was taken as evidence for the presence of alkaloids. Exact 0.5 g of the extract was dissolved in distilled water in a test tube. Frothing which persisted on warming was taken as preliminary evidence for saponins. Also, to test for presence of tannins, about 0.5 g of the extract was dissolved in distilled water and about 10 ml of bromine water added. Decolourization of bromine water indicated the presence of tannins. Borntrager's test was used for detecting the presence of anthraquinones. In this case 0.5 g of the plant extract was shaken with benzene layer separated and half of its own volume of 10% ammonia solution added. A pink, red or violet coloration in the ammoniacal phase indicated the presence of anthraquinones. The presence of cardiac glycosides was confirmed by Lieberman's test, Salkowski test and Keller-Killani test (Culei, 1982; Sofowora, 1993; Trease and Evans, 2002) and cyanogenic glycosides were carried out according to the methods described by Harborne (1973) and Trease and Evans (1983).

### 3.0 Results And Discussion

The graph below showed that group of chicken given with the leaf decoction from three different medicinal plants had the best performance in terms of increase in mean weight and circumferential measurement than the chicken given with distilled water and Vetracin. Among the three medicinal plants, guava decoction showed the highest

followed by malunggay decoction and the least among the medicinal plants was avocado decoction. The results emphasized that medicinal leaves had beneficial roles on the growth of broiler chicken than with distilled water and commercially made Vetracin.

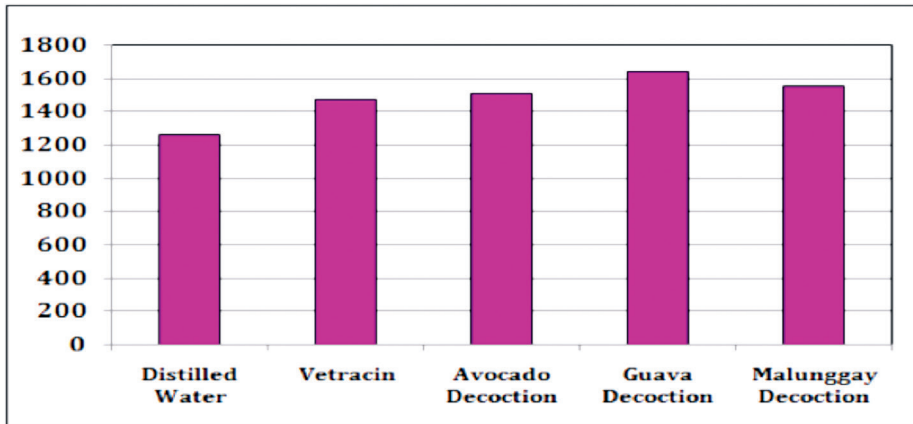


Figure 2. Final Body Weight (grams) of Boiler Chicken in Different Treatments

The proceeding graph indicates that the chicken given with avocado decoction has the highest circumferential measure than the other treatments with 38.6 cm of mean circumferential measurement. The group given with malunggay decoction followed with 38.2 cm. The group given with Vetracin and with guava decoction showed

similar mean circumferential measurement that was 37 cm although the group with guava decoction had the highest weight among the other groups treated. This implies that circumferential measure of broiler chicks has the same effect with the treated guava decoction and the commercial additives of Vetracin.

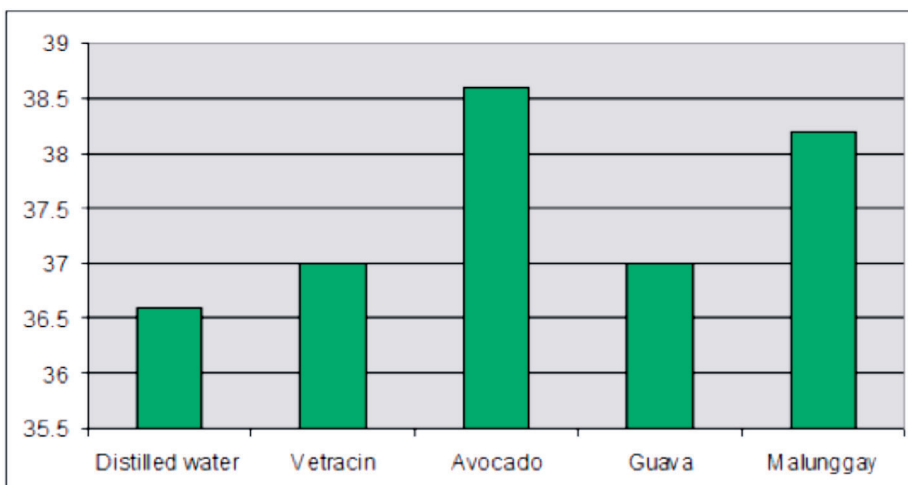


Figure3. Mean Weight Gained in the Circumferential Measurement of the Chicken in each Treatment

Table 1. Birds Performance in Every Treatments

	Distilled water	Vetracin	Avocado Decoction	Guava Decoction	Horse Radish Decoction
Final Weight (kg)	1264 <sup>c</sup>	1474 <sup>b</sup>	1511 <sup>ab</sup>	1643 <sup>a</sup>	1553 <sup>ab</sup>
Gain in Weight (kg)	1150 <sup>c</sup>	1368 <sup>ab</sup>	1369 <sup>ab</sup>	1509 <sup>a</sup>	1429 <sup>b</sup>
Final Circumferential Measurement (cm)	27.6	28.2	28.4	29.6	30.4
Feed Consumption (kg)	196.22	214	211.5	178.67	191.78
Dressing Percentage (kg)	74.1 <sup>c</sup>	78.48 <sup>b</sup>	79.38 <sup>ab</sup>	82.97 <sup>a</sup>	80.75 <sup>ab</sup>

*abc means in the same row followed different superscripts are significantly different ( $P < 0.05$ ).*

Table 2. Mean Weight of Different Body Parts (grams)

Body Parts	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>
Head and Neck	81	80	90	100	105
Wings	112 <sup>b</sup>	140 <sup>ab</sup>	140 <sup>ab</sup>	130 <sup>b</sup>	160 <sup>a</sup>
Chicken Breast	196 <sup>b</sup>	244 <sup>a</sup>	220 <sup>b</sup>	310 <sup>a</sup>	270 <sup>a</sup>
Thighs	165	240	240	280	240
Feet	49 <sup>b</sup>	50 <sup>b</sup>	50 <sup>b</sup>	85 <sup>a</sup>	60 <sup>ab</sup>
Heart	10.28 <sup>c</sup>	10.52 <sup>bc</sup>	10.93 <sup>b</sup>	11.678 <sup>a</sup>	11.194 <sup>a</sup>
Liver	49.194 <sup>d</sup>	49.892 <sup>c</sup>	50.926 <sup>b</sup>	51.874 <sup>a</sup>	51.484 <sup>a</sup>
Intestines	95.664 <sup>c</sup>	97.88 <sup>ab</sup>	97.974 <sup>ab</sup>	97.28 <sup>b</sup>	98.674 <sup>a</sup>
Other Parts	108 <sup>c</sup>	140 <sup>c</sup>	220 <sup>a</sup>	180 <sup>b</sup>	170

*abc means in the same row followed different superscripts are significantly different ( $P < 0.05$ ).*

The mean values between the carcasses of chicken given with different treatments regarding weight. The other parts showed significant difference except for thighs, head and neck. The

significant differences of the carcass in every treatment mean the chicken were affected by the feed additive intake. The feed intake of the chickens affects the weight of different body parts.

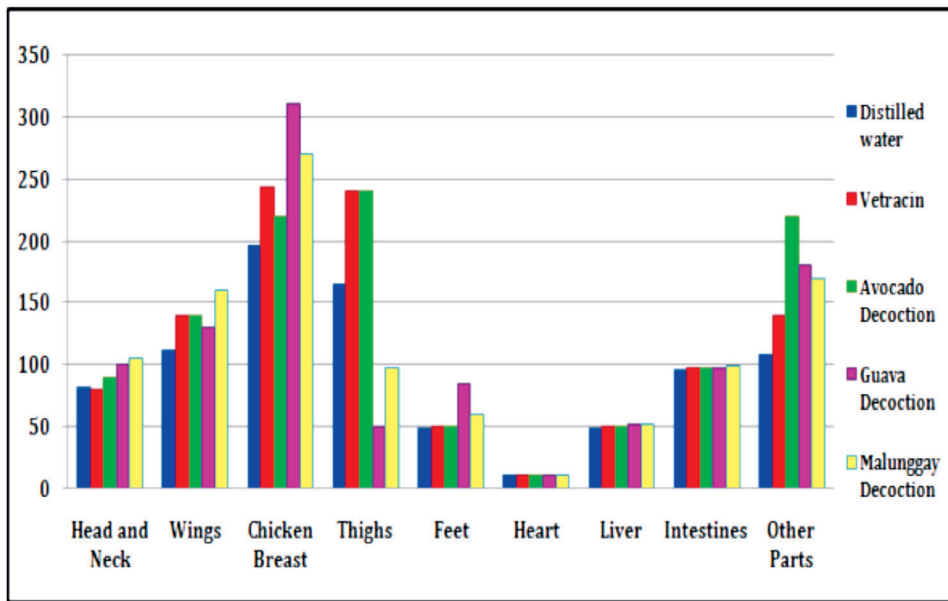


Figure 4. Mean Weight of the Carcass

The mean values between the carcasses of chicken given with different treatments regarding weight showed significant differences in different body parts except for thighs, head and neck. The significant difference of the carcass in every treatment means that the chickens were affected by the feed additives intake. The feed intake of the chicken affects the weight of different body

parts. The study made by David, et.al. (2012) revealed that selected herbal dietary supplements significantly improved the growth performance and carcass yield of broiler chicken compared to the commercial feed additives and Moringa fruit powder of 0.1% increased the gizzard fat content while 0.1% *Malunggay* leaf powder reduced the same.

Table 3. Antibacterial activity of *Escherichia coli* and *Staphylococcus aureus* in Medicinal plant extract by Disc Diffusion Method

Plant extract	<i>S. aureus</i>	<i>E. coli</i>
Avocado	17 (active)	18.17 (active)
Guava	18.83 (active)	21.83 (very active)
Malunggay	13.17 (partially active)	22.67 (very active)

Legend: means < 10mm (inactive), 10-13 mm (partially active), 14-19 mm (active), and > 19mm (very active) by Guevarra, 2005.

The plant extract undergoes antibacterial test using diffusion technique for each bacterium sample. Having a sample bacterium of gram-negative *Escherichia coli* and gram-positive

*Staphylococcus aureus* as test microorganisms, test showed that the different extract has an effect on the activity of the said bacteria. Among the leaf extracts, *P. guajava* showed the highest

antibacterial activity against *E. coli* but was less active against *S. aureus*. *P. Americana*. Avocado leaf extract also showed very active activity against *Staphylococcus aureus*. *Escherichia coli* the most resistant with the organisms tested, but recent findings showed guava extracts demonstrate antimicrobial activity against different strains of *E. coli* (Ali & Zahran, 2010). The results of these tests were good indications that the used leaves had

antibacterial properties corresponding to their important roles in chicken growth (Sadeghi, et.al. 2011).

This suggest that the use of herbal plant as decoction as substitute feed additives is beneficial on the growth performance of the broiler chicks especially in the mean weight yield hence this could resist bacterial attack from *S. aureus* and *E. coli* which will hinder the growth of broiler chicks.

Table 4. Phytochemical Screening of the Ethanolic Extract of Medicinal Plant Leaf

Secondary metabolites obtained	Avocado	Guava	Malunggay
Alkaloids	++	+	+++
Steroids	-	+	-
Anthraquinones	+	+	-
Flavonoids	+	+	+
Saponins	+	+	-
Tannins	+	+	-

- absent; + = slightly present; ++ = moderately present; +++ = highly present

The present metabolites could have a contribution to the overall effect of the extract as it were in this study. This showed the different metabolites that were essential for an antibiotic effect. These antibiotic effects may enhance the growth performance of the broiler chicks and phytochemical screening of the leaves indicated the presence of alkaloids, flavonoids, anthraquinones, saponins, steroids and condensed tannins. As showed in the antibacterial testing, all the extracts exhibited bacterial inhibition. In the investigation made by Khaligh et. al. (2011) supplemented medicinal plants used as food additives showed significant enhancement in broiler bird's performance resulted to the most consistent improvement in immunological properties and antibody of the broiler chicks.

Phytobiotics results in the synergistic interaction of antibiotic and presence of phytochemicals through the interaction of

complex molecules as effective growth enhancer in broiler chicks (Cowan, 1999). For instance tannins activate the iron deprivation which is vital for protein enzymes to function (Scalbert, 1991). According to Chung et.al. (1993) with the presence of tannic acid inhibits the growth of parasites namely; *Bacteroides fragilis*, *Clostridium perfringens*, *E. coli* and *Enterobacter cloacae* in the intestine of broiler chicks. Alkaloid is known to be a DNA precursor and an inhibitor of DNA synthesis through topoisomerase inhibition (Karou et al., 2006). While saponins display an antimicrobial activity is based on their ability to form complexes with sterols present in the membrane of microorganisms and cleanse the digestive system of broiler chicks (Hernandez, et.al. 2004).



#### 4.0 Conclusion

The result of the study showed that medicinal plants indicated significant difference regarding potency in the growth performance compared to distilled water and Vetracin. Among the medicinal leaves, Guava decoction had the best performance as growth enhancer among the tested medicinal plants as feed additives. This was due to the secondary metabolites present in the leaf that has a component responsible for the inhibition of the tested bacteria; *Escherichia coli* and *Staphylococcus aureus*. The phytochemicals compounds such as alkaloids, anthraquinones, flavonoids, tannins, steroids and saponins in guava, avocado and malunggay leaves extract is beneficial as alternative feed additives for enhancing the growth of broiler chicks in the poultry industry. Thus, could possibly eliminate the chemical residues that may cause harmful effect to the health of the consuming public. Synthetic antibiotics in comparison to herbal plant products are proven to be natural, less toxic, residue free and effective feed additives in broiler production. Medicinal plant decoctions from avocado, guava and malunggay may be a proper candidate to fulfill the demand of poultry industry in search for safe and efficient growth enhancers.

#### 5.0 References

- Adedeji O.S., et al. (2014). Performance and quality assessment of broiler chickens fed different graded levels of *Aspilaafricana* leaf meal, *Sch. Acad. J. Biosci.*, 2(1): 33-38.
- Adeyemi, O. S., Akanji, M. A., & Oguntoye, S. A. (2009). Ethanolic leaf extract of *Psidium guajava*: Phytochemical and trypanocidal activity in rats infected with *Trypanosoma brucei brucei*. *Journal of medicinal plants research*, 3(5), 420-423.
- Ali, F. H., & Zahran, D. A. (2010). Effect of growth enhancers on quality of chicken meat during cold storage. *Advance Journal of Food Science and Technology*, 2(4), 219-226.
- Antia, B. S., Okokon, J. E., & Okon, P. A. (2005). Hypoglycemic activity of aqueous leaf extract of *Persea americana* Mill. *Indian journal of pharmacology*, 37(5), 325.
- Chung, K. T., et al. (1993). Growth inhibition of selected food-borne bacteria by tannic acid, propyl gallate and related compounds. *Letters in Applied Microbiology*, 17(1), 29-32.
- Cowan, M. M. (1999). Plant products as antimicrobial agents. *Clinical microbiology reviews*, 12(4), 564-582. Retrieved from [www.ncbi.nlm.nih.gov/pmc/articles/PMC88925](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC88925).
- David, L. S., et al. (2015). Effects of moringa based feed additives on the growth performance and carcass quality of broiler chicken. *Tropical Agricultural Research*, 24(1).
- Faridah, A. (2008). Effects of herbal marinades on the shelf-life of chilled chicken 'Satay'. Faridah Ahamad (Doctoral dissertation, Universiti Teknologi MARA). Retrieved from [www.researchgate.net/publication/277124250](http://www.researchgate.net/publication/277124250).
- Guevara, B. Q. (2005). A guidebook to plant screening: Phytochemical and biological. University of Santo Tomas Publishing House.



- Hernandez, F., et al. (2004). Influence of two plant extracts on broilers performance, digestibility, and digestive organ size. *Poultry Science*, 83(2), 169-174. Retrieved from [ps.oxfordjournals.org/content/83/2/169](http://ps.oxfordjournals.org/content/83/2/169)
- Khaligh, F., et al. (2011). Evaluation of different medicinal plants blends in diets for broiler chickens. *Journal of Medicinal Plants Research*, 5(10), 1971-1977.
- Larson, C. T., Gross, W. B., & Davis, J. W. (1985). Social stress and resistance of chicken and swine to *Staphylococcus aureus* challenge infections. *Canadian journal of comparative medicine*, 49(2), 208. Retrieved from [https://www.researchgate.net/.../231520488\\_Nations](https://www.researchgate.net/.../231520488_Nations), Rome.
- Ogbo, E. M., & Oyibo, A. E. (2008). Effects of three plant extracts (*Ocimum gratissimum*, *Acalypha wilkesiana* and *Acalypha macrostachya*) on post harvest pathogen of *Persea americana*. *Journal of Medicinal Plants Research*, 2(11), 311-314.
- Olorunsanya, A. O., et al. (2010). Growth performance and carcass analysis of broiler chickens fed graded levels of toasted *Albizia lebbek* seed meal. *Pakistan Journal of Nutrition*, 9(9), 873-876.
- Scalbert, A. (1991). Antimicrobial properties of tannins. *Phytochemistry*, 30(12), 3875-3883.
- Sonaiya, E. B. and Swan, E. J. (2004). *FAO Animal Production and Health Manual on Small Scale Poultry Production*, Food and Agriculture Organization of the United Nations, Rome. Retrieved from [www.fao.org/docrep/008/y5169e/y5169e00.HTM](http://www.fao.org/docrep/008/y5169e/y5169e00.HTM)
- Triana, E., & Nurhidayat, N. (2009). The *Escherichia coli* growth inhibition activity of some fermented medicinal plant leaf extract from the Karo Highland, North Sumatra. et al. (2014). Performance and quality assessment of broiler chickens fed different graded levels of *Aspilaafricana* leaf meal, *Sch. Acad. J. Biosci.*, 2(1): 33-38.
- Adeyemi, O. S., Akanji, M. A., & Oguntoye, S. A. (2009). Ethanolic leaf extract of *Psidium guajava*: Phytochemical and trypanocidal activity in rats infected with *Trypanosoma brucei brucei*. *Journal of medicinal plants research*, 3(5), 420-423.
- Ali, F. H., & Zahran, D. A. (2010). Effect of growth enhancers on quality of chicken meat during cold storage. *Advance Journal of Food Science and Technology*, 2(4), 219-226.
- Antia, B. S., Okokon, J. E., & Okon, P. A. (2005). Hypoglycemic activity of aqueous leaf extract of *Persea americana* Mill. *Indian journal of pharmacology*, 37(5), 325.
- Chung, K. T., et al. (1993). Growth inhibition of selected food-borne bacteria by tannic acid, propyl gallate and related compounds. *Letters in Applied Microbiology*, 17(1), 29-32.
- Cowan, M. M. (1999). Plant products as antimicrobial agents. *Clinical microbiology reviews*, 12(4), 564-582. Retrieved from [www.ncbi.nlm.nih.gov/pmc/articles/PMC88925](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC88925).

- David, L. S., et al. (2015). Effects of moringa based feed additives on the growth performance and carcass quality of broiler chicken. *Tropical Agricultural Research*, 24(1).
- Faridah, A. (2008). Effects of herbal marinades on the shelf-life of chilled chicken 'Satay'/Faridah Ahamad (Doctoral dissertation, Universiti Teknologi MARA). Retrieved from [www.researchgate.net/publication/277124250](http://www.researchgate.net/publication/277124250).
- Guevara, B. Q. (2005). A guidebook to plant screening: Phytochemical and biological. University of Santo Tomas Publishing House.
- Hernandez, F., et al. (2004). Influence of two plant extracts on broilers performance, digestibility, and digestive organ size. *Poultry Science*, 83(2), 169-174. Retrieved from [ps.oxfordjournals.org/content/83/2/169](http://ps.oxfordjournals.org/content/83/2/169)
- Khaligh, F., et al. (2011). Evaluation of different medicinal plants blends in diets for broiler chickens. *Journal of Medicinal Plants Research*, 5(10), 1971-1977.
- Larson, C. T., Gross, W. B., & Davis, J. W. (1985). Social stress and resistance of chicken and swine to *Staphylococcus aureus* challenge infections. *Canadian journal of comparative medicine*, 49(2), 208. Retrieved from [https://www.researchgate.net/.../231520488\\_Nations](https://www.researchgate.net/.../231520488_Nations), Rome.
- Ogbo, E. M., & Oyibo, A. E. (2008). Effects of three plant extracts (*Ocimum gratissimum*, *Acalypha wilkesiana* and *Acalypha macrostachya*) on post harvest pathogen of *Persea americana*. *Journal of Medicinal Plants Research*, 2(11), 311-314.
- Olorunsanya, A. O., et al. (2010). Growth performance and carcass analysis of broiler chickens fed graded levels of toasted *Albizia lebbek* seed meal. *Pakistan Journal of Nutrition*, 9(9), 873-876.
- Scalbert, A. (1991). Antimicrobial properties of tannins. *Phytochemistry*, 30(12), 3875-3883.
- Sonaiya, E. B. and Swan, E. J. (2004). FAO Animal Production and Health Manual on Small Scale Poultry Production, Food and Agriculture Organization of the United Nations, Rome. Retrieved from [www.fao.org/docrep/008/y5169e/y5169e00.HTM](http://www.fao.org/docrep/008/y5169e/y5169e00.HTM)
- Songsang, A., et al. (2008). Effect of garlic (*Allium sativum*) supplementation in diets of broilers on productive performance, meat cholesterol and sensory quality. *In Conference on International Research on Food Security, Natural Resource Management and Rural Development, University of Hohenheim, Tropentag*.
- Triana, E., & Nurhidayat, N. (2009). The *Escherichia coli* growth inhibition activity of some fermented medicinal plant leaf extract from the Karo Highland, North Sumatra.