

# GROWTH AND SENSORY ANALYSIS OF BROILER AT DIFFERENT HERBAL WATER SUPPLEMENT

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**ABSTRACT** This study was conducted to determine the effect of different herbal extracts as water supplement on the growth and sensory performance of broilers. A Completely Randomized Design (CRD) was used with four (4) treatments and one (1) control and replicated three (3) times. The treatments that was used in the study was the following: Control- no herbal extract supplement; Treatment A-10% Lemon Grass (*Cymbopogon citrullus*); Treatment B-10% Gotu kola (*Centella Asiatica*); Treatment C-10% Oregano (*Origanum vulgare*); and Treatment D- 10% Horseradish tree (*Moringa oleifera*). The analysis shows a significant difference between the final weight and weight gained of broiler at different treatments, wherein treatment E showed the most significant effect followed by treatment D and treatment C while treatment B and A shows the same treatment effect. The supplementation of malunggay extracts into the water will commensurate a better growth performance of broiler. Also, in terms of feed conversion efficiency treatment E shows a best feeding efficiency compare to other treatments while treatment A, B and C shows the least feeding efficiency and shows lower efficiency compare to treatment D. There is a significant effect of supplementing malunggay extract at 10% level of solution to the growth performance and feeding efficiency of broiler. As to the analysis means on the sensory evaluation water supplementation of malunggay extract showed the most desirable chicken odor effect in the meat of broiler, while there was no significant effect on the other sensory characteristics of broiler chickens.

**Keywords:** Growth Performance, Sensory Analysis, Broiler, and Herbal Extracts

## INTRODUCTION

### Background of the study

In meat production, poultry is the fastest producing livestock worldwide and chicken meat is the second most popular meat in the Philippines. Poultry production has a big contribution in agricultural sector and chicken meat has been increasing faster than the other meat (Hui-Shung, 2007).

Organic poultry producers must establish preventative livestock health management practices. In organic production, the use of growth hormones, antibiotics, genetic engineering, and animal cloning are prohibited, such as the feeding of slaughter byproducts. Hence, there is a need of discovering new scientific knowledge on how to improve organic poultry production and health management.

As of today, there had been no researches on herbal extracts as water supplement for poultry production; hence this research is strongly proposed to provide organic poultry producer's new knowledge on organic poultry health management.

Poultry is the most progressive animal enterprise today. It is one of the world's major and fastest producers of meat. While in the Philippines, it has been a significant contributor to the country's agricultural sector. In 2010, the chicken population in the Philippines was estimated 159 million, slightly higher (0.2 percent) than last year's level. Layer and native chicken inventory grow by 13 and 2 percent, respectively. Almost 50 percent of the total chicken population was accounted for native or village chicken raised in backyard farms while the remaining 32.8% (broilers) and 18% (layers) were taken up by commercial broilers.

Medicinal plants have been identified and used throughout human history. Plants have the ability to synthesize a wide variety of chemical compounds that are used to perform important biological functions, and to defend against attack from predators such as insects, fungi and herbivorous mammals (plants.com, 2015).

Herbal medicine is use of plants for medicinal purposes, and the study of such use. Plants have been the basis for medical treatments through much of human history, and such traditional medicine is still widely practiced today. Modern medicine recognizes herbalism as a form of alternative medicine, as the practice of herbalism is not strictly based on evidence gathered using the scientific method. Modern medicine, does, however, make use of many plant-derived compounds as the basis for evidence-tested pharmaceutical drugs, and phytotherapy works to apply modern standards of effectiveness testing to herbs and medicines that are derived from natural sources.

## Objectives

This study was conducted to determine the effect of different herbal extracts as water supplement on the growth and sensory performance of broilers. Specifically, this study aims to determine the following:

1. To determine the growth performance of broilers supplemented with different herbal extract in terms of Initial Weight, Final Weight, Feed conversion efficiency, Weight Gain, Water intake, and Feed Intake.
2. To determine the Sensory Characteristics in terms of: Odor, Texture, Appearance, Palatability, Tenderness, and General Acceptance.
3. To determine significant difference in growth performance of broiler supplemented with different herbal extract in terms of: Initial Weight, Final Weight, Feed conversion efficiency, Weight Gain, Water intake, and Feed Intake.
4. To determine significant difference in Sensory Characteristics of Broiler chicken in terms of Odor, Texture, Appearance, Palatability, Tenderness, and General Acceptance.

## MATERIALS AND METHODS

### Materials

The following are the materials needed in the conduct of study in gathering the data: Bowl jar, feeding through was used in feeding and watering the broilers. Bulb, switch, electrical wire, outlet and socket was used in lighting the chickens. Weighing scale, zip lock, containers, and butchering knife was used for slaughtering the broilers.

### Methods

#### Experimental Design and lay-out

A Completely Randomized Design (CRD) was used in this study. The study will have four (4) treatments and one (1) control that was replicated three (3) times. The treatments that was used in the study was the following:

Control- no herbal extract supplement

Treatment A- Lemon Grass (*Cymbopogon citrullus*) (10% of the amount of water)

Treatment B- Gotu kola (*Centella asiatica*) (10% of the amount of water)

Treatment C- Oregano (*Origanum vulgare*) (10% of the amount of water)

Treatment D- Horseradish tree (*Moringa oleifera*) (10% of the amount of water)

A	Control	C
C	D	B
B	C	Control
D	B	A
Control	A	D

#### Randomization Treatments

All treatments was represented by letters and was distributed randomly through draw lots.

#### Site of the Experiment

The experiment was conducted at Brgy. San Miguel, Buenavista, Guimaras on September 2016.

#### Construction of the Poultry House and Cages

The poultry house was made up of light materials such as Nipa, Bamboo, and nails. The building measuring 18ft. by 10ft. was built on August 2016.

#### Booking and Selection of the Stocks

The experimental stocks were book from Commercial Hatchery. The Chicks was paid cash during the delivery at Php 35/ head. The chicks were selected to ensure healthy stocks. Select only healthy birds. This is important for two reasons:

- It increases the chances of winning the price since healthy birds will have good physical condition and bright appearance.
- It reduces the chances of spreading diseases to other birds present in the show.

Floor Space, Feeder Space and Waterer Space. The floor is covered with 5 to 10 cm deep layer of rice hull. During brooding period, the day old chicks were confined in a brooder cage measuring 3 meters by 1.5 meters. During the rearing period, the birds were fully confined in a cage. Each bird requires a floor space of 1sqared ft. The feeder and waterer space also varies depending on the environmental temperature and health condition of the birds.

### **Disinfection of the Area**

The area was prepared and disinfected a week before the arrival of the stocks.

### **Transporting the Birds**

Transporting the birds in a clean cage with straw or wood shavings as bedding material. Do not provide water since it will spill and spoil the bedding material. If the birds are to be transported to a long distance, water should be provided at intervals during transport.

### **Arrival of Stocks**

One (1) hour before the arrival of the stocks the electric bulb inside the brooder was switched on to make the floor and wall heated and to have the desired brooding temperature. Bowl jars were filled with clean and potable drinking water. Upon the arrival, the chicks was placed inside the brooder, and will keep them undisturbed for more than four (4) hours.

The broiler chicks were provided with 5% sugar solution for drinking within three (3) hours of arrival. The purpose of adding sugar on their water is that it helps to replenish the depleted energy in the chicks due to long period of transportation. It may also stimulate the chicks to consume feed. Sweet water can also loosen up the impacted intestine and prepares the gut linings of chicks for the incoming feeds. Thereafter, they was given fresh feeds and water.

### **Brooding Management**

#### **Feeding**

According to Flavio Henrique, specialist (Cobb-Vantress South America) The brooding period – the first 14 days of the broiler's life – is the most sensitive period because the bird is changing from an immature thermo regulation system to a mature one.

One common mistake is to think only of maintaining the proper temperature. We need to take care of other issues, too. A way to define these other issues is the 80-20 rule (Pareto's Law), which means that 80% of the consequences come from 20% of the causes. We should always think in our brooding about temperature, air quality, water and feed. Proper management of these areas was the key factor to uniformity, which results in good performance. We will assume that we receive good quality chicks from the hatchery, which means that the day-old chicks are active with bright eyes wide open, with strong and shiny shins, navels healed, without physical defects, no pathogens and with good maternal immunity.

The first week corresponds to 23% of the life of the 1.75g broiler, according to the latest Cobb Weight Supplement (April 2012). This first week represented 11% of the entire life in 1978 to achieve the same weight. So the proper commitment to a good start is very important for the broiler, and each good point achieved was rewarded in good performance. In many countries, some producers think that by the second week the birds are adults already and stop giving them external help to maintain good conditions. This could lead to one of the worst situations in the brooding period.

Linear feeding troughs were installed before the stocks were introduced in their respective treatment cages. A feeding space requirement of 65 cm/bird was followed in making the linear feeders (PNS, 2003). Organic commercial feeds were provided to the birds on ad libitum basis for the first week of brooding and were change to restricted feeding after a week until maturity.

For the first week of brooding, in addition to the feeding troughs, small amount of feeds was provided to assist the chicks to easily access the feeds. This helps the chicks find the feed more successfully in the first few days. The feeds and watering devices was placed close each other during the first week to ensure that the chicks eat and drink the feeds and water provided to them.

After initial brooding, feeds were placed away from the waterers to prevent wet feed and dirty water. Feeder height was adjusted regularly. After one week of brooding, the feeds was given on restricted basis. (Beutler, A., M.SC., 2007)

According to Chance Bryant, Technical Service Manager (Cobb-Vantress. Inc) water management is one of the most crucial components in a top-performing broiler flock. Broilers have advanced to grow faster, become larger with more breast meat, eat more feed at younger ages and be far more efficient than their predecessors, increasing their demand for water. All this has put more emphasis on the need for ample water supply and storage so birds can perform successfully. Here, we focus on water flow rates and water temperature - factors that sometimes get overlooked.

In high performing flocks, at around 21 °C, modern broilers on average will consume 1.8 to 2 times more water than

feed, in weight. Consumption is dependent on house temperature. In hot climates, flocks can consume up to 5 times in weight the amount of feed they intake.

Water consumption will vary depending on environmental temperature, feed quality and bird health:

- Water consumption increases by 6% for every increase in 1°C between 20-32°C.
- Water consumption increases by 5% for every increase in 1°C between 32-38°C.
- Feed consumption decreases by 1.23% for every increase in 1°C above 20°C

Any substantial change in water usage should be investigated as this may indicate a water leak, health challenge or feed issue. A drop in water consumption is often the first indicator of a flock problem. To evaluate flock performance properly we need to know how much water birds are consuming every day. More advanced water meters record not only 'daily' consumption attainable, but enable an understanding of consumption at critical times of the day and critical times during the flock -- both very relevant in assuring maintaining proper water intake. These critical times can include feed changes, turning birds out from the brood area to three quarters or full house, transitioning from power ventilation to tunnel, field vaccinations, etc. If you monitor consumption during these periods, you can better understand if flocks are being properly managed.

## Light Management

Naheeda Portocarero (UK) light is an important management tool in broiler production. If used successfully it can influence aspects of growth, productivity and behavior, and is therefore the subject of intense research. From presentations at the 2010 PSA meeting in the USA, it became clear that proper lighting regimes will lead to good flock performance.

While we know that light intensity has an impact on behavior and physiology, there is debate surrounding the optimum level that should be used. A comparison of different light intensities; 1, 10, 20 and 40 lux carried out at the University of Saskatchewan showed that birds exposed to 1 lux rested more and showed reduced foraging, preening, dust-bathing, stretching and wing-flapping behaviors in comparison to birds exposed to brighter light intensities. These birds also had bigger and heavier eyes. While there was no effect of light intensity on skeletal health, deep ulcerative footpad lesions decreased linearly as light intensity was increased. And although diurnal rhythms of serum melatonin were unaffected, these results suggest that very low light intensities can compromise the welfare of birds.

## Temperature

Litter temperature is the most important because day-old chicks are extremely dependent on floor contact to help regulate the changing temperatures. The ratio of body surface to body mass is large in the day-old chick and it decreases with age, so the young chick will therefore lose heat faster than an adult bird. The young chick's body is covered in down which has a poor insulating value, so if temperature is not controlled it will lose heat rapidly through radiation and conduction. We suggest having the litter preheated and stabilized 24 hours before placement which means preheating of 48 hours in many broods, depending on the season, region and outside temperature. A comfortable chick will breathe through its nostrils and lose 1-2g of moisture in the first 24 hours. The yolk contains this amount of moisture – they will lose weight but not become dehydrated. If the birds are exposed to cold temperature, they will try to save or make heat by huddling or by burning feed to keep warm, which affects feed conversion ratio and this, is the most expensive way.

If the ambient temperature is 26°C (78.8°F), the same moisture loss (1-2g) in the yolk will last the chick three days. This is why, in practical terms, when we see large yolks we can say that the bird was cooled in the first few days. In the opposite case, with temperature too high, the birds will try to remove heat or avoid producing heat, pant to lose heat (losing FCR) and stop eating. If chicks start panting they can lose 5-10g of moisture in the first 24 hours and then dehydration will occur. The correct temperature will also influence the bird health and immunity because immune system development and stress is costing energy and when the birds are not comfortable during this development they was more sensitive to infections and less immune competent. The chick's internal temperature (cloaca measurement) should be maintained between 40.4-40.6°C (104.7-105.1°F); below 40°C (104.0°F) is cold and above 41°C (105.8°F) will lead to panting.

According to Muchacka and Herbut (2007), reduced and elevated air temperature during the first period of rearing reduced the rate of growth, with clear differences observed in the group of birds reared at lower temperature. Baarendse, et al. (2006) reported that rearing chicks during the first five days of life at 28°C (82.5°F) has a long term negative effect on further growth and development. Ideal would be 32°C (89.6°F) with 30-50% relative humidity (RH) in the litter at placement.

For the first two weeks the chicken house should feel too warm for the caretaker – if not, the temperature is likely to be too low for the chicks. We suggest the air temperature in the brooding area at placement, with 30-50% RH, begin at 33°C (91.4°F); at seven days, with 40-60% RH, 30°C (86°F); and at 14 days, same RH, 27°C (80.6°F). If the humidity is less than above, increase the temperature by 0.5-1.0°C (1°F). If relative humidity is greater than above, reduce the house temperature by 0.5-1.0°C (1°F). Always use bird behavior and effective temperature as the ultimate

guide to determine the correct temperature for the birds. Chicks from smaller eggs (younger breeder flocks) require higher brooding temperatures because they produce less heat (about 1°C) for the first seven days. According to the seasonal climate it is very important to have tools to heat and cool the air, and options to provide correct air flow and distribution. Do not forget that the broilers in a brooding phase do not need air velocity more than 0.3m/s at floor level.

### **Pre- Conditioning**

Pre- Conditioning was done 14 days after the arrival of the birds. It will help the birds to adapt to changes in environment, temperature and climate.

### **Distribution of Stocks in Different Cages**

The distribution of the stocks was done after pre-conditioning period. There were five (5) birds per cages.

### **Disease Prevention**

Farmers have a documented pest control program to reduce the risk of diseases being carried on to the farm by rodents. Strict records are kept by the farmer of the chickens' health, growth and behavior, so that any emerging disease problem is rapidly identified and acted upon.

Disease prevention is an essential strategy for poultry producers. It is much more beneficial to the birds and to the commercial poultry producer to prevent disease from occurring rather than to rely on treatment. The agents which sound bio security practices attempt to prevent include bacteria, viruses, protozoa, fungi, parasites, and any other agents capable of introducing an infectious disease into a poultry flock.

### **Preparation of Herbal Extract**

1. Prepare a clean jar for the storage and a blender to get the extract.
2. Collect the desired amount of fresh leaves.
3. Wash and chop the leaves finely and place them inside the blender.
4. Pour 20% of water into the blender.
5. Blend the leaves.
6. After blending, the extract was strained through a piece of cloth and poured into a clean jar.
7. The desired volume of extract can be used for desired purposes.

### **Routing Care of the Birds**

Waterers were regularly cleaned to ensure that the birds are provided with clean drinking water. Water was given ad libitum. Fecal droppings and rice hull was removed from feeding and drinking troughs before feeds was served.

### **Experimental chicks**

A total number of 75 commercial broiler day old (Arbor Acre) chicks was bought from Iloilo City and was cared in the experimental shed in San Miguel, Buenavista, Guimaras.

### **Sensory Evaluation**

Sensory evaluation was conducted after slaughtering. The meat was evaluated by its taste, color, tenderness, texture, odor, and general acceptability to determine the effects of horseradish, lemongrass, gotu kola and oregano extracts to the meat. Fifteen (15) meat samples (breast parts) was taken and tested, following the ratings below. The meat was roasted using an oven after testing the texture of the fresh meat.

### **Tenderness**

Fifteen samples will represent each treatment combinations after dressing, and whole breast parts were taken. The meat was roasted inside the oven for fifty minutes with 250°C. The number of chews before swallowing was used to determine its tenderness. The lesser the number of chews, the more tender is the meat.

Rating	Description	Chew count
4.21-5.00	Very tender	1-5
3.41-4.20	Tender	6-10
2.61-3.40	Just Tender	11-15
1.81-2.60	Tough	16-20
1.00-1.80	Very Tough	21-25

## Odor

The roasted breast was placed on coded plates for evaluation of the odor. The samples were smelled by the testing panelists. The evaluation was based on the following scale:

Rating	Description
4.21-5.00	Extremely desirable chicken odor
3.41-4.20	Moderately desirable chicken odor
2.61-3.40	Just normal chicken odor
1.81-2.60	Slightly undesirable chicken odor
1.00-1.80	Extremely undesirable chicken odor

## Texture (Fresh)

After dressing, fresh meat samples were evaluated as to the texture based from the scale below:

Rating	Description
4.21-5.00	Extremely rigid
3.41-4.20	Moderate rigid
2.61-3.40	Rigid
1.81-2.60	Loose
1.00-1.80	Extremely loose

## Texture (Cooked)

The quantification of the texture of the roasted meat was evaluated based from the scale below.

Rating	Description
4.21-5.00	Extremely rigid
3.41-4.20	Moderately rigid
2.61-3.40	Rigid
1.81-2.60	Loose
1.00-1.80	Extremely loose

## Taste

The panelist for the taste was non-smokers, non-drinkers or liquor and has no false teeth. They did not take any sweet or salty foods two (2) hours before the evaluation. The taste was rated using the following scale:

Rating	Description
4.21-5.00	Extremely desirable chicken taste
3.41-4.20	Moderately desirable chicken taste
2.61-3.40	Just normal chicken taste
1.81-2.60	Slightly undesirable chicken taste
1.00-1.80	Extremely undesirable chicken taste

## Composition of Testing Panelist

The testing panelist for sensory evaluation of meat was composed of five students, five professionals, and five farmers. Before the evaluation, there was a short briefing for them to be informed about the rating of the samples.

## Statistical Analysis

Data collected was analyzed using One Way Analysis of Co-variance (ANCOVA) at 1% and 5% level of significance. Significant mean was compared using Duncan's Multiple Range Test (DMRT).

## RESULTS AND DISCUSSIONS

### The Growth Performance of Broiler

The table 1 below shows the Growth Performance of Broiler supplemented with different Herbal Extract. As to the initial weight, treatment A (control-no herbal supplementation) gained 238.3g, while treatment B (lemongrass extract) gained 246.0g, treatment C (gotu kola extract) gained 255.0g, treatment D (oregano extract) gained 270.0g, and treatment E (horseradish extract) gained 290.0g.

In terms of final weight, treatment E gained 1227.0g, treatment D gained 1143.0g, treatment C gained 1071.0g, treatment B gained 1024.0g, and treatment A gained 1009.0g. The analysis showed a significant difference between the final weight of broiler at different treatments, wherein treatment E showed the most significant effect followed by treatment D and treatment C while treatment B and A shows the same treatment effect. The result implies that the supplementation of malunggay extract into the water will commensurate a better growth performance of broiler.

When it comes to weight gained, treatment E gained 936.66g, treatment D gained 873.33g, treatment C gained 815.33g, treatment B gained 778.33g, and treatment A gained 770.33g. The analysis showed a significant difference between the weight gained of broiler at different treatments, wherein treatment E showed the most significant effect followed by treatment D and treatment C while treatment B and A shows the same treatment effect. The result implies that the supplementation of malunggay extract into the water will commensurate a better growth performance of broiler in terms of weight gained.

Looking at the daily water intake in which the analysis showed a no significant differences wherein the treatment A consumed 1070ml, treatment B 1083ml, treatment C 1101ml, treatment D 1081ml and treatment E 1120ml.

As observed in the daily feed intake of the broiler the analysis showed a no significant differences between the feed consumption of the experimental animals, wherein treatment A consumed 381.7g, treatment B 407.1g, treatment C 411.3g, treatment D 390.4g, and treatment E 374.6g.

The analysis showed a significant difference between the feed conversion efficiency of broilers at different treatments wherein, treatment E with FCE value of 0.39 shows the most efficient followed by treatment D with 0.44, treatment C with 0.49, treatment B 0.52 and treatment A with 0.49. The result implies that treatment E shows a best feeding efficiency compare to other treatments while treatment A, B and C shows the least feeding efficiency and shows lower efficiency compare to treatment D.

The result of this study was supported by some of the related findings such that, *Moringaoleifera* tree contains high crude protein (CP) in the leaves (251 g/kg DM) and negligible content of tannins and other anti-nutritive compounds and offers an alternative source of protein to ruminants (Nouala et al., 2006) and non-ruminants. The seeds contain high amount of CP, followed by flowers and leaves, suggesting that *M. oleifera* can be used as a protein source for both livestock and humans. The fact that the seeds contain higher CP content than other parts suggests that suggesting that they can be used as a valuable source of protein. Ojukwu (2012) stated that *Moringa* leaves are periodically harvested to make a sauce, locally known as "mboum" or can be used to feed poultry, pigs and cattle.

Malunggay (*Moringaoleifera*) is one of the herbs containing bioceutical agents that could substitute synthetic growth enhancers and supplements in broiler and other livestock production. Some of the published studies pertaining to its potential involved the study of Lannaon (2007). He reported that performance of Starbro broilers given with Malunggay (*M. oleifera*) leaf decoction, revealed the improvement of feed consumption, daily weight gain, final weight and profit compared to the control group.

Furthermore, Du et al. (2007) evaluated the effects of dietary supplementation of *Moringaoleifera* on growth performance, blood characteristics and immune response of Arbor acres strain broilers. It was found out that increasing supplementation of *Moringaoleifera* decreases contents of uric acids, triglycerides and albumin/globulin ratio in the serum of broilers. Hence, immune response of broilers increases significantly.

Table 1. The Growth Performance of Broiler supplemented with different Herbal Extract

Treatment	Initial Weight (g)	Final Weight (g)	Weight Gained (g)	Daily Water Intake (ml)	Daily Intake (g)	Feed FCE
A	238.3	1009D	770.33D	1070	381.7	0.49C
B	246.0	1024D	778.33D	1083	407.1	0.52C
C	255.0	1071C	815.53C	1101	411.3	0.49C
D	270.0	1143B	873.33B	1081	390.4	0.44B
E	290.0	1227A	936.66A	1120	374.6	0.39A
F-Test		**	**	ns	ns	**
CV%		2.96	3.87	3.53	5.54	6.78

## The Sensory Characteristics of Broiler

Table 2 shows the sensory characteristics of broiler supplemented with different herbal extract. As to the odor, the evaluation shows a significant difference of broiler at different treatments, wherein treatment E with an average of 4.7, treatment D with 4.26 and treatment B with 4.23 shows the most desirable chicken odor effect followed by treatment C with 3.29 and treatment A with 3.82 shows the same effect.

As observed the evaluation showed no significant difference in the tenderness of the meat, wherein treatment A with an average of 11.95, treatment B with 13.19, treatment C with 11.64, treatment D with 11.9 and treatment E with 11.53. All treatments were tender.

When it comes to the taste in which the evaluation shows no significant difference wherein, treatment A with an average of 3.86, treatment B with 3.88, treatment C with 4.46, treatment D with 4.04, and treatment E with 4.04.

Looking at the texture (fresh) the analysis shows a no significant difference wherein, treatment A with an average of 3.68, treatment B with 3.55, treatment C with 3.79, treatment D with 3.75 and treatment E with 3.76. All treatments were moderate.

In terms of texture (cooked) in which the analysis showed a no significant difference wherein, treatment A with an average of 3.62, treatment B with 3.57, treatment C with 3.93, treatment D with 3.68 and treatment E with 3.66. All treatments were moderate. While the general acceptability in which the result shows a no significant difference wherein, treatment A with an average of 4.19, treatment B with 4.19, treatment C with 4.33, treatment D with 4.19 and treatment E with 4.42.

**Table 2. The Sensory Characteristics of Broiler supplemented with different Herbal Extract**

Sensory	Treatment	Mean	Interpretation
Odor (Desirability as Chicken odor)	A	3.82B	Moderate
	B	4.23A	Extreme
	C	3.93B	Moderate
	D	4.26A	Extreme
	E	4.7A	Extreme
	f-test	**	
	CV%	2.79	
Tenderness (Chew counts)	A	11.95	Tender
	B	13.19	Tender
	C	11.64	Tender
	D	11.9	Tender
	E	11.53	Tender
	f-test	ns	
	CV%	12.94	
Taste (Desirability as Chicken taste)	A	3.86	Moderate
	B	3.88	Moderate
	C	4.46	Extreme
	D	4.04	Moderate
	E	4.04	Moderate
	f-test	ns	
	CV%	3.31	
Texture-fresh (rigidness)	A	3.68	Moderate
	B	3.55	Moderate
	C	3.79	Moderate
	D	3.75	Moderate
	E	3.76	Moderate
	f-test	ns	
	CV%	5.33	
Texture-cooked (rigidness)	A	3.62	Moderate
	B	3.57	Moderate
	C	3.93	Moderate
	D	3.68	Moderate
	E	3.66	Moderate
	f-test	ns	
	CV%	4.99	
General Acceptability	A	4.19	High
	B	4.19	High
	C	4.33	Very High
	D	4.19	High
	E	4.42	Very High
	f-test	ns	
	CV%	3.4	



## CONCLUSIONS

As observed in the study, the researcher concluded the following:

1. There is a significant effect of supplementing malunggay extract at 10% level of solution to the growth performance and feeding efficiency of broiler.
2. As to the analysis means on the sensory evaluation water supplementation of malunggay extract showed the most desirable chicken odor effect in the meat of broiler.

## RECOMMENDATIONS

Based on the study conducted, the researcher recommended the following:

1. Water supplementation of 10% malunggay extract to enhance the growth performance and feeding efficiency of broiler.
2. Water supplementation of 10% malunggay, and lemongrass extract to enhance the desirable chicken of broiler.
3. The same study can be conducted increasing the levels of malunggay extract as water supplement in order to evaluate the maximum level of effectiveness of the extract in the growth performance of broilers.

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