Biological Forum – An International Journal **7**(1): 1006-1016(2015)

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Effect of *Malva sylvestris* on Performance, Growth and Morphology of Small Intestine in Broiler Chickens

Behnam Kiani*, Ardeshir Hafcy Kordestany* and Hossein Ansari*

**Department of Animal Science, Faculty of Agriculture and Natural Science, Sanandaj Branch, Islamic Azad University, Sanandaj, IRAN.*
***Department of veterinary, Mahabad Branch, Islamic Azad University, Mahabad, IRAN.*

(Corresponding author: Behnam Kiani)
(Received 16 March, 2015, Accepted 15 April, 2015)
(Published by Research Trend, Website: www.researchtrend.net amir9002001@yahoo.com)

ABSTRACT: This study attempts to examine the effect of malva on performance, growth, cecal microflora and morphology of small intestine in broiler chickens. In this study, a total of 360 one-day broiler chickens (Ross 308 strain) were purchased from a factory called Morghe-Madar based in Salim-Jujeh Miandoab, Iran. There were 6 treatments each entailing 3 replications in which 20 one-day chickens were involved. The experimental conditions were identical in all the treatments, except for the diets varying according to additives. Moreover, the chickens were reared for 42 days, during which water was administered freely and seeds were given in a standard way. The control treatment or basic diet (free of antibiotic, free of malva) and the alternative treatment including the basic diet plus 150 mg of antibiotic in 1 kg of malva-free diet, while there were 100, 200, 300 and 400 mg of malva present in one kilogram of the diet. The feed intake and weight gain were recorded and performance traits were measured weekly. The broilers were slaughtered at 42 days of age. Having done the weighing, data was registered and evaluated. The results indicated that malva leaves insignificant effect on weekly feed intake and weight gain, i.e. the conversion ratio is little ($P<0.05$). Although the increased feed intake in the fourth and sixth weeks was significant, the weight gain and conversion ratio were insignificant. Therefore, it can be argued that the difference was due to experimental error, i.e. malva was ineffective on higher feed intake and palatability. Furthermore, the mean of body weights at 42 days of age showed no significant difference, which was also due to ineffectiveness of malva on increased feed and weight. In morphological terms, however, the villi colon length and crypt depth showed a significant difference at day 42. The highest increase was observed in the sixth and fifth treatments, which was significantly different from the control treatment. It can be inferred from this experiment that malva at 400 mg leaves an effect similar to that of virginiamycin at 150 mg/kg, thus leading to improved intestinal villi length and crypt depth, and ultimately greater absorption brought about by malva's anti-inflammatory and anti-microbial properties.

Keywords: Malva, virginiamycin, performance, villi length, crypt depth

INTRODUCTION

The rapidly growing development of population today on the one hand and the diminishing of natural feed sources on the other have compelled humans toward more economical feed production. The international World Health Organization and Feed and Agriculture Organization have since 1949 working on improvement in quantity of nutrients and quality of ingredients. Proteins are especially important because they cannot, unlike carbohydrates, be stored in the body, thus making it essential in the diet. Proteins play various roles in the body such as production of enzymes, nurturing and preserving tissues, production of hormones, antibodies and maintaining balance between water and electrolytes as well as acid-alkali balance in body tampons and finally, production of energy in case of insufficient carbohydrates and fat (Iowa State University, 2014). In recent years, the consumption of poultry meat has become popular and there has been special attention paid on rearing broiler chickens. Nutrition is the key factor contributing to production of poultry taking up about 75 to 80 percent of the expenditure. Chicken meat contains 200 calories, 2.20% protein and 6.12% fat. Due to desirable amount of proteins, it can be beneficial to the elderly for prevention of osteoporosis. Moreover, it is a good source of niacin (B3), a vitamin preventing age-related diseases such as Alzheimer's. It can also provide sufficient B6 vitamin for supplying energy in metabolism. Over the recent years, application of additives in poultry diet in order to boost nutritional efficiency has been focused by feed experts who use such material as medication and growth stimulant.

For instance, the growth stimulating antibiotics are additives used in low amounts for improvement of performance in broiler chicken diets. Regarding the fact that certain antibiotics consumed in broiler diet are also applied in treatment of human diseases, it becomes possible to create antibiotic-resistant bacterial strains through consumption of antibiotic residues found in poultry products leading to ineffectiveness of medical antibiotics in humans. Therefore, the residual of antibiotics in poultry products have overshadowed the consumption of such additives in broiler chicken diets (Ghalyanchi, Langeroud *et al*, 2008). Furthermore, incorporation of diet with herbs or their active ingredients for growth stimulation, higher safety and resistance against poultry-related diseases has been examined. Due to having effective components such as phenols, terpenoids and essential volatile oil extracts, alkaloids, lectins and others, certain herbs come with antibacterial and antioxidant properties, improve digestion, lower blood lipids and cholesterol, ultimately improving poultry growth. (Ghalyanchi Langeroudi, *et al.,* 2008). Malva has a variety of medical effects such as anti-inflammatory properties. Nowadays, malva is applied in treatment of dry coughs and as protective layer on inflamed mucous membranes (Seyed Mehdi Razavi, *et al.,* 2011). Malva has more than 10% of mucilage hydrolyzed into galactose, aracinoz, glucose, rhamnosus and galacturonic acid. Moreover, it contains certain amount of tanons and about 0.1 leucoanthocyanin as well as 7% of anthocyanin plus several mono, di and tetra-trepnoids (Gutillo, *et al.,* 2006). It seems that the use of natural and herbal combinations for reducing antibiotic effects is crucial in production of broiler chickens.

Nutrients are absorbed at intestinal surfaces, the strategy in improvement and absorption of nutrients in the small intestine function contrary to the large one. Duodenum, jejunum and ileum constitute a broad network of villi and microvillies upon enterocytes (Moranjr, 2006). The main function of the large intestine is to absorb water from stool and absorb some digested nutrients. The large intestine is kept in its place by the cetroperitoneal space (Jaguie, 2012). The cecum is located as two processes 14 to 23 cm of length at the right side of the intestine, linking the small and large one. The cecum has numerous microorganisms which digest the cellulose found in nutrients, thus producing glucose as well as B and K vitamins. The materials created by fermentation are rarely consumed by poultry, because they are distant from the small intestine. The size and activity of cecum is greater in grass-eating birds than in insect and seed-eating ones. The initial level where nutrients and macromolecules enter body is the gastrointestinal tract comprising a large number of cells, blood vessels and connective tissues functioning as the major element in the immune system. Hence, the gastrointestinal tract is constantly exposed to digestive materials such as diet compositions and microorganisms, creating a complex link between these materials and the host tissue (Jones and Rick, 2003). Moreover, the gastrointestinal microflora in broiler chickens can influence digestion, health and liveliness of birds. Each factor contributes to a specific part of the process. (Amit Romach *et al.,* 2004).

Nowadays, consumers tend to purchase antibiotic-free items, which has shifted more focus on alternatives such as probiotics and herbal extracts to mention a few. The mechanism of antibiotics as growth stimulant is undoubtedly correlated with the interaction it makes with microbial population (Dibner, *et al.,* 2005).

Similarly, plants can be used as an alternative to growth stimulating antibiotics in poultry nutrition due to their antimicrobial properties. Many plants and their active elements have a wide range of anti-microbial activities. There is empirical evidence suggesting that plants and herbal extracts ideally stimulate bacterial growth and minimize the activity of pathogenic bacteria in poultry gastrointestinal tract. The major function of essences is to control pathogens, antimicrobial activity, antioxidant activity, assisting digestion as in stimulating endogenous enzymes, nitrogen uptake, odor inhibition and monitoring over production of ammonia (Ghalyanchi *et al*, 2008 and Prick *et al*, 2009). The effect of savory powder at different levels (0.005 and 0.01 percent) was compared to the antibiotic growth stimulant on performance, carcass traits, immune responses and immune parameters in broilers. This study indicated that adding 5 g/kg of savory powder increases body weight at 14, 28 and 42 days of age, which yielded no significant difference. The application of this amount of savory powder also led to the highest antibody titers against SRBC. These scholars concluded that diet supplement for broiler chickens at 5 g/kg of savory powder can be used as an alternative to antibiotic in poultry nutrition (Ghalamkari *et al.,* 2011). Researchers used thyme as an alternative to antibiotics in broiler diet, declaring that herbs can, either in full form or leaves, buds, can boost poultry performance. They also reported that thyme can be applied as an ideal alternative to antibiotics in poultry production (Khan *et al.,* 2012). Malva is a yearling applied in Iran as a medicinal plant. Both flower and leave of malva can leave great antibacterial effects on erwinia carotovora. Moreover, the malva extract leaves tremendous negative consequences on human pathogens, for instance, bacteria such as Staphylococcus aureus, Staphylococcus agalactiae, and *Enterococcus faecalis.* Malva can be applied as chemotherapeutic agents and disinfectant (Razavi, *et al.,* 2011). Malva has anti-inflammatory, astringent, laxative properties and was once applied in Native American traditional medicine for healing wounds, types of arthritis and fractures and painful swelling of the stomach as well as treating dry coughs.

There is documentary evidence suggesting that malva was once used in traditional medicine as an anti-inflammatory agent for respiratory and gastrointestinal tracts and skin (Camejo, *et al.*, 2003; Novais, *et al.*, 2004; Pieroni, *et al.*, 2004; Guarrera, *et al.*, 2005; Hlavaty, *et al.*, 1989). The effective combinations in malva include flavonoids, phenolic acids, tannins and volatile oils (Blumenthal, et al., 2000; Billeter, *et al.*, 1991; Proestos, *et al.*, 2005; Cutillo, *et al.*, 2006).

MATERIALS AND METHODS

In this study, a total of 360 one-day broiler chickens (Ross 308 strain) were purchased from a factory called Morghe-Madar based in Salim-Jujeh Miandoab, Iran. There were 6 treatments each entailing 3 replications in which 20 one-day chickens were involved. The experimental conditions were identical in all the treatments, except for the diets varying according to additives.

Moreover, the chickens were reared for 42 days, during which water was administered freely and seeds were given in a standard way.

The treatments included: Treatment 1: Control treatment or basic diet (free of antibiotic, free of malva), treatment 2: Basic diet + 150 mg of antibiotic in 1 kg of malva-free diet, Treatment 3: Basic diet + 100 mg of malva in 1 kg of diet, Treatment 4: Basic diet + 200 mg of malva in 1 kg of diet, Treatment 5: Basic diet + 300 mg of malva in 1 kg of diet and Treatment 6: Basic diet + 400 mg of malva in 1 kg of diet.

The basic diet can be seen in Table 1 balanced according to treatment variation by energy substances (oil and corn). The diet in all the treatments was identical during the rearing period in terms of raw protein percentage, calcium energy, available phosphor, lysine, methionine, methionine + cystine.

Table 1: Nutritional diet combinations for the experimental groups (percentage).

Nutrient (percentage)	1-7 days of age	7-21 days of age	21-30 days of age	30-42 days of age
Corn	7.52	7.59	86.64	9.69
Wheat	0	0	0	0
Soybean meal	42	35	30	7.25
Vegetable oil	5.1	2.1	1	1
Bone meal	6.1	6.1	6.1	6.1
Oyster	8.0	8.0	8.0	8.0
NaCl	2.0	2.0	2.0	2.0
Mineral supplement	4.0	3.0	3.0	3.0
Vitamin supplement	4.0	3.0	3.0	3.0
DL-Methionine	25.0	15.0	12.0	12.0
Lysine	15.0	12.0	10.0	08.0
	100	100	100	100
Calculated chemical compounds				
Energy capable of metabolism (kg cal/kg)	2900	29950	3000	3015
Raw protein (%)	56.21	56.21	75.18	75.18
Raw fiber (%)	71.3	36/4	32.3	97.3
Calcium (%)	94.0	94.0	84.0	84.0
Available phosphor (%)	42.0	42.0	38.0	38.0
Sodium (%)	14.0	14.0	14.0	14.0
Linoleic acid (%)	43.1	36.1	29.1	23.1
Lysine (%)	25.1	25.1	1.02	1.02
Methionine (%)	39.0	39.0	34.0	34.0
Methionine + cysteine (%)	87.0	87.0	68.0	68.0
Tryptophan	28.0	29.0	24.0	25.0

The exception was experimental diets receiving certain amounts of malva (100, 200, 300 and 400 mg) plus virginiamycin (150 mg) per one kilogram of fodder. In order to prepare the dietary malva, the plant was first dried up and then milled in the form of full powder with identical particles. The virginiamycin applied in this experiment was supplied by Aras Bazar Co., and Iranian company. It was added as powder and mixed fully with the diet to be used in the second treatment as diet for the poultry, the performance of which was later evaluated. This experiment was conducted as a completely random scheme entailing six treatment and three replications. This experiment took place in a broiler chicken farm belonging to Chine Co. Miandoab based in Western Azerbaijan, Iran. The middle section of a salon was isolated by a total of 18 plastic color net boxes in 50 × 5.2 cm of dimensions. Every four boxes were equipped with a 100 watt lamp in a way to emit light evenly. The floor was covered with dry splinters 6 cm high.

The experiment took 42 days. The lighting program administered on the broiler chickens consisted of 24 hours of light during the first week followed by one hour until the end. The air conditioning in the salon was longitudinal according to necessities of the strain species.

The vaccination program was done according to Table 2 and prevalent diseases in the region. For preventing any damage to the vaccine virus, several Cevamune tablets were applied in one quarter per 25 liter of water. The vaccine water was obtained through the following formula taking into account two to three hours of thirst.

Chicken age × Number of chickens/ 100 = Water required by the vaccine

Prior to administration of vaccines, E vitamins + selenium were applied at 100 cc per 100 liter of drinking water so as to strengthen poultry immune system. Subsequently, the temperature was raised by two degrees for one day while C vitamin combination was applied plus aspirin at 100 g per 100 liter of water.

Table 2: The Vaccination program of the flock under study.

Vaccine strain	Vaccination procedure	Type of vaccine	Age (days)
Lasota + H120	Eye drops	Bronchitis + Newcastle	8
AIH9N2, NDHitchner	IM injection	Influenza + Newcastle	8
Gumbol	Drinking	Gambro	14
Avinew	Drinking	Newcastle	22
Avinew	Drinking	Newcastle	30
B1	Drinking	Newcastle	38

The mineral supplement applied per kilogram included:
*Manganese Sulfate 248 mg, iron sulfate 125 mg, zinc oxide 211 mg, copper sulfate 25 mg, calcium iodate 25 mg, selenium 0.5 mg, Choline 625 mg, antioxidant 2.5 mg.

**The vitamin supplement applied per kilogram included:
Vitamin A IU 22500, Vitamin 3D IU 5000, Vitamin 45 EIU, vitamin 5Kmg, vitamin B1 3.4mg, vitamin B2 16.5 mg, thiamine B12 0.05 mg, pantothenic acid 34.5g, folic acid 2.5mg, niacin 74mg , pyridoxine 7.3 mg , biotin 0.04 mg.

The poultry weights were recorded at the end of each week and placed in a specific table. At the end of the sixth week, the live weights, carcass, bursa of Fabricius, spleen, wings, heart, chest, gizzard, proventriculus, liver and thigh were separately weighed with a digital scale by precision of 0.01 g.

A. Histomorphological evaluation of small intestine

In order to run a histomorphological evaluation of the small intestine, three boilers were selected at the end of the rearing period (42 days) from each treatment, which made 18 broilers in total. Subsequently, the abdominal area was opened up to isolate 4 cm of the beginning section of the jejunum to be placed in 10% buffer formalin solution.

B. Statistical analysis

Having been recorded and organized, the statistical analysis of data was done through MS Excel using GLM and SAS2003, while the means were compared using Duncan's multiple-range test at significance level of 5%.

The data obtained from this experiment was analyzed through a complete random scheme based on the following statistical model.

$Y_{ij} = \mu + Ti + eij$

Y_{ij}= numerical value of each experimental observation

µ = mean of population

T_i = effect of diet

e_{ij} = effect of experimental error

RESULTS

A. Performance

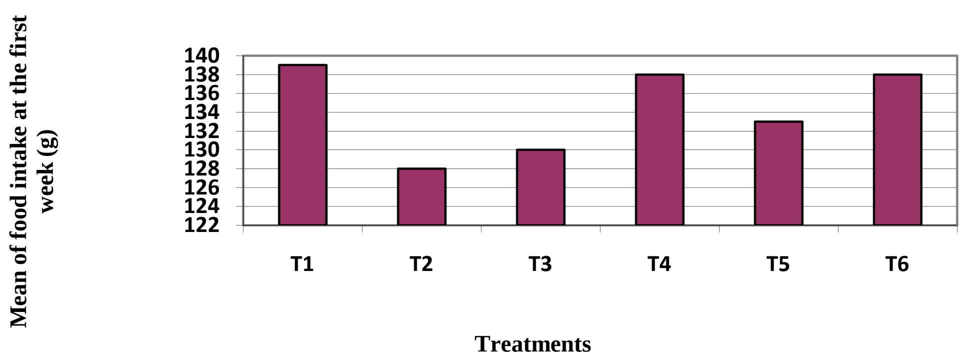
Table 3 illustrated the results concerning the effect of virginiamycin, various levels of malva on the feed intake. The results suggest that the highest feed intake for the control treatment took place at the first week, which indicated no significant difference from other treatments (P>0.05). At the second week, there was no significant difference observed in the level of feed intake between the treatments (P<0.05).

The highest amount of feed intake was associated with control treatment, while the lowest amount was seen in the case of the second treatment with 150 mg/kg of virgina. The sixth treatment received the highest intake with 400 mg of malva at the third week, but it showed no significant difference from the other experimental treatments (P<0.05). At the fourth week, the sixth treatment received the highest feed intake with 400 mg/kg, which made a significant difference together with the control treatment (P<0.05). At the fifth week, the feed intake showed no significant difference between the treatments (P<0.05). The highest amount of feed intake was observed in the second treatment at 150 mg/kg, while the lowest belonged to the fourth treatment. There was no significant difference between the treatments in terms of feed intake at the sixth week. The highest amount of feed intake was observed in the sixth treatment with 400 mg/kg of malva, which made no significant difference from the third and sixth treatments, but it was significantly different from the second and fifth treatments as well as the control. Graph (1-6) show effect of Virginia and various level of malva on mean of feed intake (g) per week.

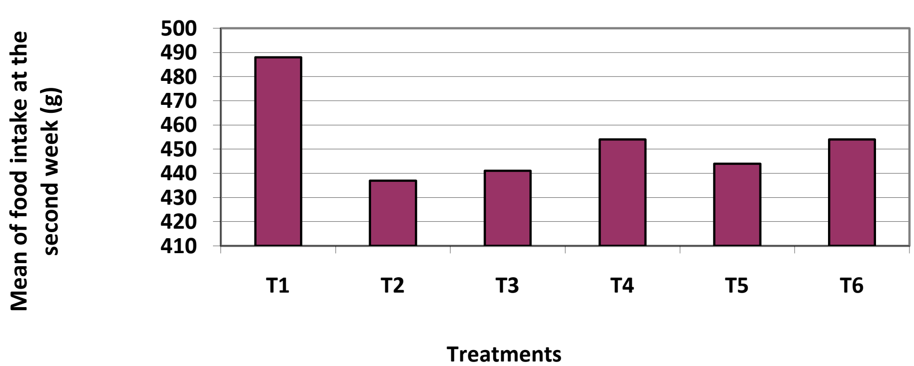
Table 3: The effect of Virginia and various level of malva (kg diet) on mean of feed intake (g) per week.

Weekly weight (g)	Experimental treatments						
	Control	**Virginiamycin 150 mg**	**Malva 100 mg**	**Malva 200 mg**	**Malva 300 mg**	**Malva 400 mg**	**P-value**
First week	139.33	128.66	130	138.33	133.33	138	0.373
Second week	488	437	441.67	454	444	454.33	0.104
Third week	938.33	1032.67	1012.67	981.67	1020.67	1029	0.076
Fourth week	1837.33	1741	1708	1738	1734.67	1823.33	0.002
Fifth week	2753	3093.3	2886.7	2606.7	2951.6	2966.7	0.242
Sixth week		4138.33	4067.3	4062.33	4118.6	4232.67	0.009

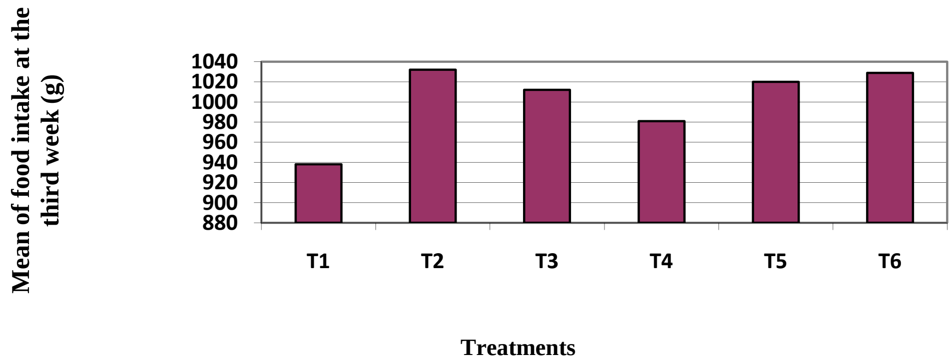
a, b, c, d mean values in each row is significantly different from the odd letters (P>0.05).



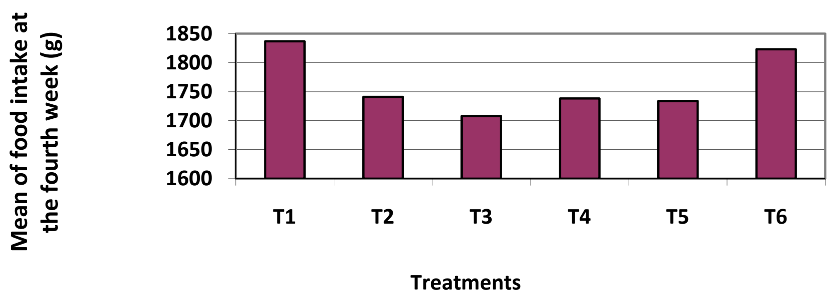
Graph 1: The effect of Virginia and various levels of malva (kg diet) on mean of feed intake (g) at the first week.



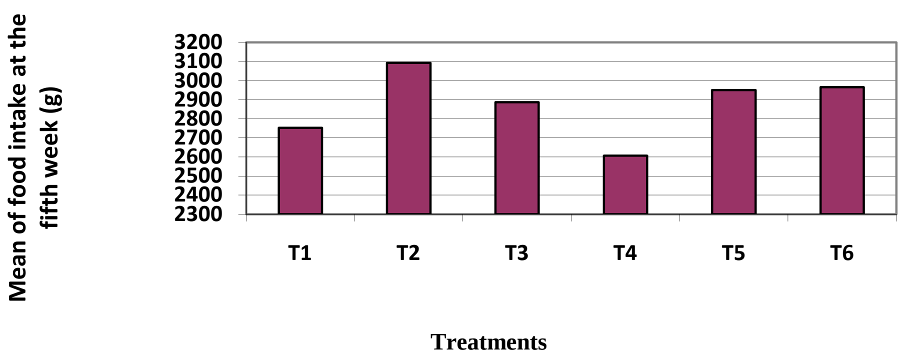
Graph 2: The effect of Virginia and various levels of malva (kg diet) on mean of feed intake (g) at the second week.



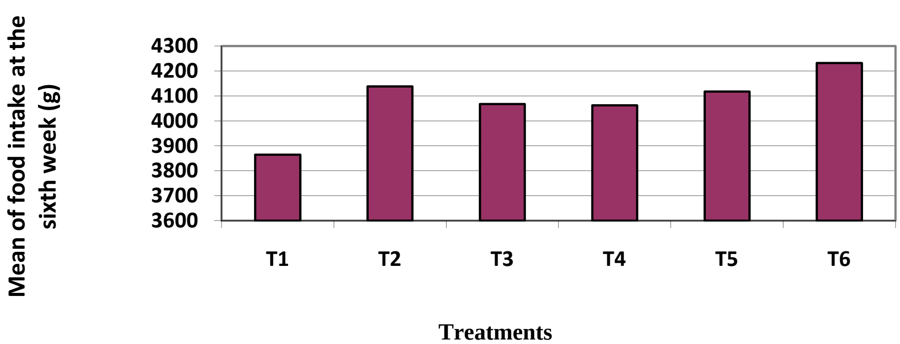
Graph 3: The effect of Virginia and various levels of malva (kg diet) on mean of feed intake (g) at the third week.



Graph 4: The effect of Virginia and various levels of malva (kg diet) on mean of feed intake (g) at the fourth week.



Graph 5: The effect of Virginia and various levels of malva (kg diet) on mean of feed intake (g) at the fifth week.



Graph 6: The effect of Virginia and various levels of malva (kg diet) on mean of feed intake (g) at the sixth week.

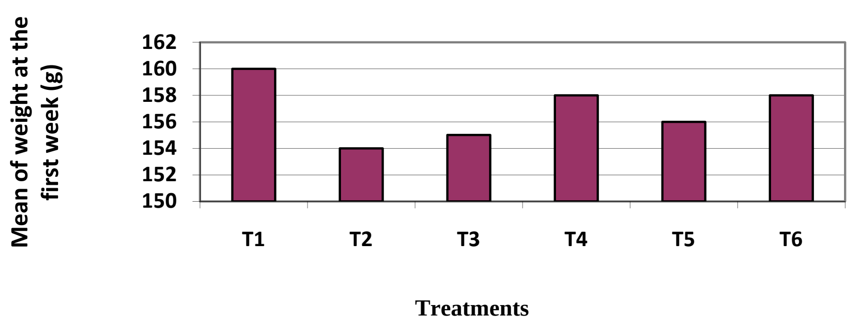
B. Mean of weekly weight

The results obtained from the means of weekly weight have been demonstrated Table 4 and the following graphs. At the first week, the fourth and sixth treatments showed the greatest mean of weight, while there was no significant difference from other experimental treatments (P>0.05). Moreover, the lowest mean of weight was observed at the first week in the case of the second treatment at 150 mg/kg of Virginiamycin. At the second week, there was no significant difference between the poultry weights in the experimental treatments (P>0.05). The highest mean of weight was observed in the control group which was free of malva and Virginia, where there was insignificant difference. Next to that, the mean of weights in the sixth treatment contained 400 mg/kg of malva. The lowest mean of weight was seen in the control treatment free of malva and Virginia.

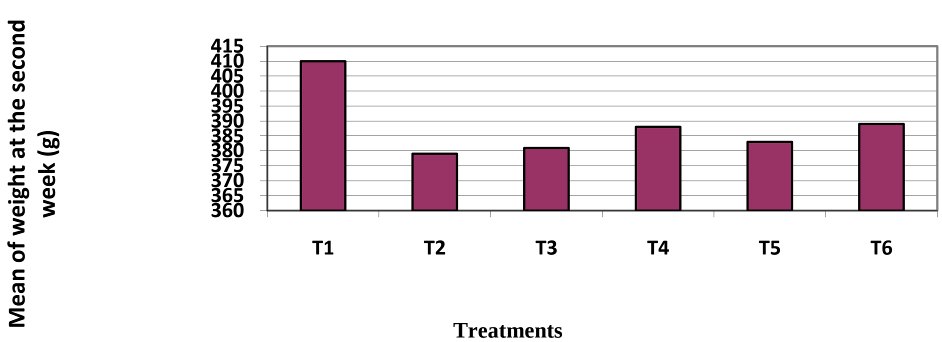
Table 4: The effect of Virginia and various levels of malva (diet kg) on mean of weekly weight (g) at 42 days of age.

Weekly weight (g)	Experimental treatments						
First week	**Control**	**Virginiamycin 150 mg**	**Malva 100 mg**	**Malva 200 mg**	**Malva 300 mg**	**Malva 400 mg**	**P-value**
Second week	160	154	155	158	156	158	0.432
Third week	410	379	381	388	383	389	0.079
Fourth week	642	700	689	675	691	698	0.073
Fifth week	1068	1021	1006	1020	1020	1060	0.103
Sixth week	1504	1667	1580	1586	1592	1600	0.138
	1832	1969	1933	1930	1960	2015	0.068

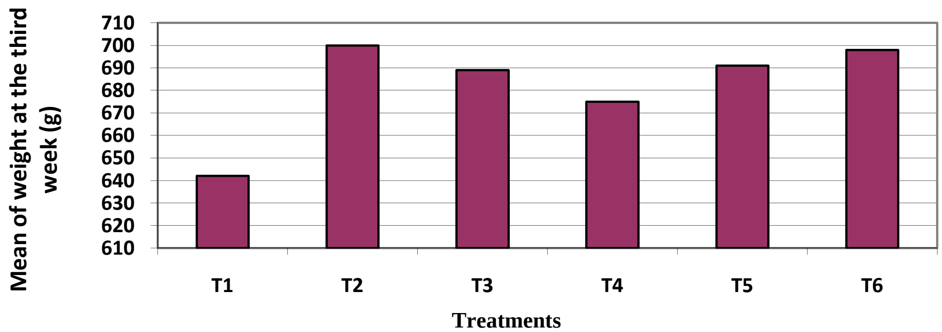
a, b, c, d mean values in each row is significantly different from the odd letters (P>0.05).



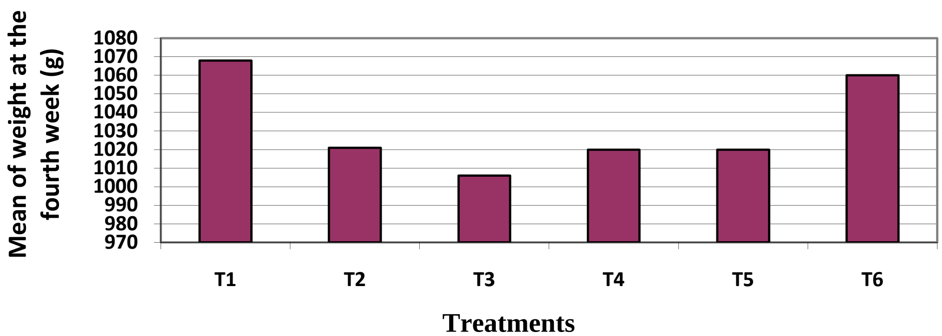
Graph 7: the effect of Virginia and various levels of malva on the mean of poultry weight (g) at the first week.



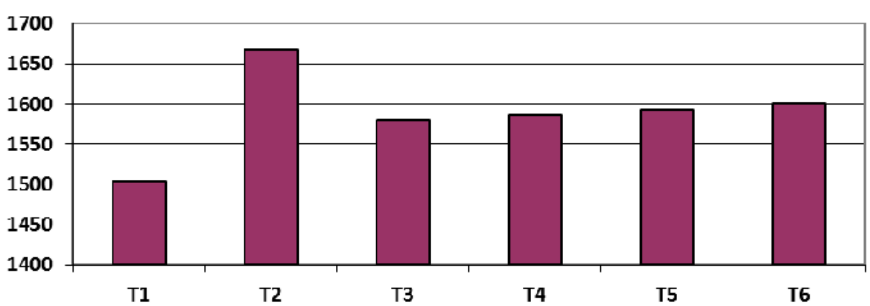
Graph 8: the effect of Virginia and various levels of malva on the mean of poultry weight (g) at the second week.



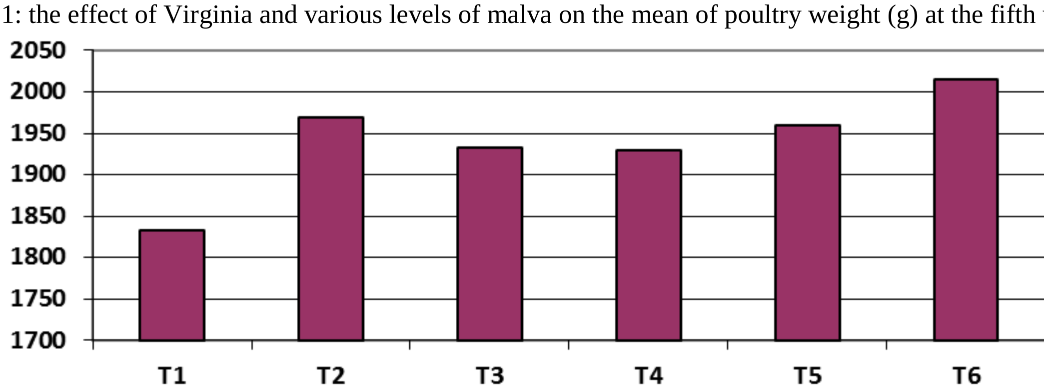
Graph 9: the effect of Virginia and various levels of malva on the mean of poultry weight (g) at the third week.



Graph 10: the effect of Virginia and various levels of malva on the mean of poultry weight (g) at the fourth week.



Graph 11: the effect of Virginia and various levels of malva on the mean of poultry weight (g) at the fifth week.



Graph 12: the effect of Virginia and various levels of malva on the mean of poultry weight (g) at the sixth week.

C. Feed conversion ratio (FCR)

The results obtained from the experiment regarding the FCR in each week have been shown in Table 5. At the first week, the sixth and fourth treatments indicated the highest ratio with 400 and 200 mg/kg of malva, respectively. As compared to the other treatments, however, there was no significant difference (P>0.05). Furthermore, the lowest FCR was observed in the second treatments. At the second week, there was no significant difference between the FCR of the experimental treatments. The highest FCR was observed in the control treatment, while the lowest was associated with the second treatment with 150 mg/kg of Virginia. At the third week, the FCR showed no significant difference between the experimental treatments (P>0.05). At the fourth week, there was no significant difference between the FCR of the experimental treatments (P>0.05). The largest conversion ratio was observed in the sixth treatment with 400 mg/kg of malva as well as the control treatment. The lowest level was observed in the case of the third treatment. At the fifth week, there was no significant difference between the FCR of the treatments (P>0.05). The highest CFR was observed in the second treatment, while the lowest was associated with the fourth treatment with 200 mg/kg of malva. At the sixth week, the greatest FCR was observed in the fifth treatment with 300 mg/kg, which was significantly different from other treatments (P<0.05). The lowest level was associated with the sixth treatment with 400 mg/kg of malva.

Table 5: Effect of Virginia and various level of malva on FCR in each week.

Feed conversion ratio (FCR)	**Experimental treatments**						
First week	**Control**	**Virginiamycin 150 mg**	**Malva 100 mg**	**Malva 200 mg**	**Malva 300 mg**	**Malva 400 mg**	**P-value**
Second week	0.86	0.82	0.83	0.87	0.84	0.87	0.253
Third week	1.18	1.14	1.15	1.16	1.15	1.16	0.285
Fourth week	1.45	1.47	1.46	1.44	1.47	1.47	0.057
Fifth week	1.71	1.7	1.69	1.7	1.7	1.71	0.122
Sixth week	1.82	1.85	1.82	1.64	1.84	1.84	0.333
	2.11	2.09	2.1	2.1	2.16	2.09	0.063

a, b, c, d mean values in each row is significantly different from the odd letters (P>0.05).

D. Mean of body weights in terms of live weight

The results obtained in relation to the effect of various levels of cmalva on the mean of body weights in terms of live weight have been illustrated in Table 6. The results suggest that there was no significant difference at the 42 days of age between the live weight and other body organs of experimental treatments (P>0.05). Comparing the experimental treatments, the greatest mean of live weight belonged to the sixth treatment with 400 mg/kg of malva, which showed no significant difference from other experimental treatments, while the lowest mean of live weight was observed in the control treatment. In this rearing period, the mean of thigh weight indicated no significant difference between the treatments (P>0.05), where the highest level was observed in the sixth treatment with 400 mg/kg of malva and the third treatment with 100 mg.kg of malva, while the lowest amount was associated with the control treatment. The largest mean of chest weight was observed in the second treatment with 150 mg/kg of Virginiamycin and the sixth treatment with 400 mg/kg of malva, which showed no significant difference from the other experimental treatment, while the lowest amount was associated with the third treatment with 100 mg/kg of malva. The results indicated that the mean of wing weight was not significantly different in the experimental treatments (P>0.05). The obtained results indicate that there is no significant difference between the mean of liver weight in the experimental treatments (P>0.05). The mean of heart weight in the third treatment with 100 mg/kg of malva showed the highest level among the experimental treatments at 42 days of age, while it showed no significant difference from the other treatments (P>0.05). There was no significant difference between the mean of spleen weight in the experimental treatments (P>0.05). The largest mean of proventriculus weight was observed in the control treatment free of antibiotics and malva, which indicated no significant difference from the other treatments (P>0.05). The mean of gizzard weight showed no significant difference between the experimental treatments (P>0.05). The mean of bursa weight showed no significant difference between the experimental treatments (P>0.05). The highest level belonged to the sixth group with 400 mg/kg of malva.

Table 6: Effect of Virginia and various levels of malva on live weight and mean of organ weights in terms of live weight (g) at 42 days of age.

Parameter (g)	Experimental treatments						
	Control	Virginia 150 mg	Malva 100 mg	Malva 200 mg	Malva 300 mg	Malva 400 mg	P-value
Live weight	1828.67	1969.67	1933	1930.0	1960	2015	0.324
Thigh	290.00	316.67	333.33	300.00	316.67	333.33	0.638
Chest	373.33	420.00	296.67	400.00	410.00	420.00	0.069
wing	100.00	126.67	100.00	113.33	123.33	113.33	0.072
Liver	42.17	42.92	45.15	49.41	42.90	42.30	0.813
Heart	7.20	8.91	11.96	9.25	7.35	9.66	0.184
Spleen	2.51	2.24	2.23	2.96	2.01	2.51	0.888
Proventriculus	8.75	8.59	7.91	8.16	8.34	8.08	0.989
Gizzard	39.28	27.70	31.33	29.53	44.00	49.99	0.144
Bursa	0.95	1.05	0.84	1.36	1.04	1.40	0.088

a, b, c, d mean values in each row is significantly different from the odd letters ($P>0.05$).

E. Intestinal morphology

The results concerning the relationship with the effect of various levels of malva on intestinal morphology (jejunum) have been reported in Table 7 and the following graphs. The results indicate that there is a significant difference at 42 days of age between the villi length and crypt depth, the ratio of which was observed in the experimental treatments ($P<0.05$). Comparing the experimental treatments, the sixth one with 400 mg/kg of malva and then the fifth treatments with the largest villi length showed the highest levels, neither of which indicated a significant difference from other treatments. Moreover, the lowest amount was associated with the control treatment free of malva and Virginiamycin.

The fourth treatment with 200 mg/kg of malva showed the highest crypt depth between the experimental treatments, where there was significant difference observed in the second and third treatments ($P<0.05$), while the lowest level was associated with the control treatment free of malva and Virginiamycin. There was a significant difference observed in the ratio of villi length to crypt depth in the experimental treatments ($P<0.05$). The highest ratio belonged to the third treatment with 100 mg/kg of malva, which was significantly different from the sixth, fifth and fourth treatments. Moreover, the lowest ratio of villi length to crypt depth was observed in the fourth treatment with 200 mg/kg of malva.

Table 7: Effect of various levels of malva on jejunum morphological traits of small intestine for broiler chickens at 42 days of age.

Jejunum micrometer	Experimental treatments						
	Control	Virginia 150 mg	Malva 100 mg	Malva 200 mg	Malva 300 mg	Malva 150 mg	P-value
villi length	933.3	1133.3	1046.6	1020.0	1253.3	1346.6	0.000
Crypt depth	174.0	206.0	190.0	300.6	298.0	289.3	0.000
VH/CD	5.37	5.49	5.51	3.39	4.22	4.65	0.000

a, b, c, d mean values in each row is significantly different from the odd letters ($P>0.05$).

DISCUSSION AND CONCLUSIONS

The level of feed intake during the fourth week in the control and sixth treatment with 400 mg/kg of malva showed a significant difference, similar to the sixth treatment at the sixth week with 400 mg/kg oh malva.

This significance level can actually be due to experimental error or measurements instruments, since malva has high amount of fibers as well as anti-inflammatory effect for the intestine, highly palatable and generally all the experiments conducted so far have not concerned the effect of malva on feed intake. The mean of weight in the treatments showed no significant difference in all the weeks (P<0.05). However, there was the highest mean of weight in the sixth treatment which was substantially different from the control treatment. Next to that, there was the fifth treatment the effect of which was similar to the second treatment, i.e. Virginia. Such weight difference could be associated with the anti-inflammatory and anti-microbial properties of malva. According to the results obtained by Jafari *et al.* (2011) carried out on various levels of malva extract and great burdock at 200 ppm in the fourth group, which was a mixture of the two extracts, the highest separated weight belonged to the great burdock, while the weight of malva group was greater than that of the control. Considering the presence of natural anti-inflammatory and anti-septic materials such as tannins, anthocyanins, flavonoids and locoanthocyanins found in malva, the increased level of absorption was significant. Based on the studies done on morphological changes made in duodenum the highest villi length was observed in the sixth treatment (400 mg/kg of malva) and the sixth one (300mg/kg of malva) and the second one (150 ppm Virginiamycin per kilogram), while the lowest was observed in the control treatment. Furthermore, the investigation into crypt depth indicated the lowest level belonged to the control treatment (free of malva and Virginiamycin) while the highest belonged to the fourth treatment.

REFERENCES

Amit Romach E, Sklan D, Uni Z. (2004). Microflora ecology of chicken Intestine.

Billeter M, Meier B, Sticher O.(1991). 8-hydroxyflavonoid glucuronides from *Malva sylvestris*. *Phytochemistry;* **30**: 987-990.

Blumenthal M, Goldberg A, Brinckmann J. Herbal. (2000). Medicine: Expanded Commission E Monographs. Marshmallow leaf. Austin, TX: American Botanical Council; Newton, MA: Integrative Medicine Communications.

Camejo-Rodrigues J, Ascensao L, Bonet MA, Valles J. (2003). An ethnobotanical study of medicinal and aromatic plants in the Natural Park of "Serra de Sao Mamede" (Portugal). *J Ethnopharmacol;* **89**: 199-209.

Cutillo F, D'Abrosca B, Dellagreca M, Fiorentino A, Zarrelli A. (2006). Terpenoids and phenol derivatives from *Malva sylvestris* silvestris. *Phytochemistry;* **67**: 481-485.

Dibner JJ, Richards JD. (2005). Antibiotic growth promoters in agriculture. History and mode of action, *Poul Sci.;* V: **84**, PP: 634-643.

Ghalyanchi Langeroudi A, Kiaei SMM, Modirsanei MM, Mansouri B, Shojaie Estabrash, A. (2008). Comparison of chemical and biological growth promoter with two herbal natural feed additives on broiler hick's performance. *J. Animvet. Adv* **N7**. PP.570-574.

Guarrera PM. (2005). Traditional phytotherapy in Central Italy (Marche, Abruzzo, and Latium). *Fitoterapia*; **76**: 1-25.

Gutillo F, Abrosca D, Dellogreca B, Fiorentino M, Zarrelli A. (2006). Trepenoids and phenol derivatives from malva sylvestris silvestris, *Phytochemistry*, **N. 67**. PP: 481-485.

Hlavaty P, Capek P, Rosik J. (1989). *Althaea officinalis*-source of mucous compounds for dermatology and cosmetics. *Farm Obz;* **58**: 155-163.

Iowa state university extension and outreach. (2014). Ames 2150 Beardshear Hall, 1800, 262-380.

Jafari B. (2011). Influence of Malva sylvestris sylvestries and great burdock on performance. Carcass quality and blood parameters in malebroiler chickens, *Annals of Biological research*, **N. 2**; PP: 506-509.

Jaguie J. (2012). Avian digestive system. *American Research learning, Natolia*, N: 28.

Jones FT, Ricke SC. (2003). Observatikons of the history of development of antimicrobials and their use in poultry feeds. *Poultry science* **V: 82**, PP: 613-617.

Moranjr ET. (2006). Anatomy microbes and fiber, department of poultry science, Auburn University, 5416.

Novais MH, Santos I, Mendes S, Pinto-Gomes C. (2004). Studies on pharmaceutical ethnobotany in Arrabida Natural Park (Portugal). *J Ethnopharmacol;* **93**: 183-195.

Pieroni A, Quave CL, Villanelli ML. (2004). Ethnopharmacognostic survey on the natural ingredients used in folk cosmetics, cosmeceuticals and remedies for healing skin diseases in the inland Marches, Central-Eastern Italy. *J Ethnopharmacol;* **91**: 331-344.

Proestos C, Chorianopoulos N, Nychas GJ, Komaitis M. (2005). RP-HPLC analysis of the phenolic compounds of plant extracts. Investigation of their antioxidant capacity and antimicrobial activity. *J Agric Food Chem.*, **53**:1190-1195.

Razavi SM, Zarrini Gh, Molavi Gh, Glasenia Gh. (2011). Bioactivity of *Malva sylvestris*. *Journal. Med Sci.;* .**N.14** (6).