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KAHRAMANMARAŞ SÜTÇÜ İMAM UNİVERSİTY

GRADUATE STUDIES IN SCIENCE AND TECHNOLOGY

# EFFECT OF PEPPERMINT (*Mentha pipreitae*) AND BASIL (*Ocimum basilicum*) ON BROILER PERFORMANCE

ISMAEL ALI ISMAEL

MASTER THESIS

ANIMAL SCIENCE

KAHRAMANMARAŞ-TURKEY 2014

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M.Sc. thesis entitled "EFFECT OF PEPPERMINT (*Mentha pipreitae*) AND BASIL (*Ocimum basilicum*) ON BROILER PERFORMANCE" and prepared by Ismael Ali ISMAEL, who is a student at Animal Science Department, Graduate School of Faculty of Agriculture, Kahramanmaraş Sütçü İmam University, was certified by all the/majority jury members, whose signatures are given below.

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Director of Graduate School.

## DECLARATION

I hereby declare that all information in the thesis has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all the material and results that are not original to this work.

Ismael Ali ISMAEL

Note: The original and other sources used in this thesis, the declaration, tables, figures and photographs showing the use of resources, subject to the provisions of Law No. 5846 on Intellectual and Artistic Works.

**NANE *(Mentha pipreitae)*, REYHAN *(Ocimum bacilicum*) BITKISININ BROILER PERFORMANSINA ETKISI**

**(YÜKSEK LİSANS TEZİ)**

**Ismael Ali ISMAEL**

**ÖZ**

Araştırma, broiler performansı üzerine doğal yem katkı maddesi olarak nane ve reyhan bitkisinin etkisini araştırmak için yapılmıştır. Çalışmada amacı broiler piliçlerinin canlı ağırlık, canlı ağırlık artışı, yem tüketimi, yem dönüşümü, karkas ağırlığı, karkas radımanı, abdominal yağ ve karaciğer üzerine yem katkı maddesi olarak nane ve reyhan bitkisinin etkisi amaçlanmıştır. Denemede günlük Ross 308 210 adet broyler civcivleri 7 grup ve 3 tekerrür olacak şekilde rastgele bölmelere dağıtılmıştır. Toplam olarak 35. Günlük deneme periyodunda 210 adet broiler civcivi kullanılmıştır. Civcivler yem ve suyu serbest olarak tüketmişlerdir. Her bir grupta 30 adet civciv bulunmaktadır. Bununla birlikte herbir grup 3 tekerrür ve her tekerrürde 10 civciv bulunacak şekilde programlanmıştır. Her bir uygulama aşağıdaki denem rasyonlarının birini tüketmiştir, bunlar; 1) Kontrol rasyonu( nane ve reyhan içermeyen), 2) % 0.5 nane bitkisi, 3) % 1.0 nane bitkisi, 4) % 1.5 nane bitkisi, 5) % 0.5 reyhan bitkisi, 6) % 1.0 reyhan bitkisi, 7) % 1.5 reyhan bitkisi şeklinde hazırlanmıştır. Canlı ağırlık, canlı ağırlık artışı, yem dönüşüm oranı, yem tüketimi, karkas ağırlığı, karkas randımanı, abdominal yağ ve karaciğer ağırlığı ile ilgili datalar One Way varyans analiz ve Duncan çoklu karşılaştırma testi kullanılarak istatistiki analizi yapıldı. Canlı ağırlık, canlı ağırlık artışı, yem tüketimi, yem dönüşüm oranı, karkas ağırlığı, karkas randımanı, abdominal yağ ve karaçüğer ağırlığına ai ortamalar bakımından T4 (%1.5 nane) grubu diğer gruplara gore daha düşük değerle istatistiki olarak farklılık göstermiştir ($P< 0.05$) Fakat, karkas ağırlığı, karkas randımanı ve abdominal yağ bakımından gruplar arasında önemli bir farklılık bulunmamıştır. Araştırma sonucunda elde edilen bulgulara gore % 1 oranında nane ve kekik kullanmak performansa ve karkas özelliklerine istatistiksel olarak olumsuz etki yapmamıştır.

**Anahtar kelime:** Tıbbı aromati bitki, Nane *(Mentha pipreitae)*, reyhan *(Ocimum bacilicum*), Yem katkı maddesi, broiler performans, karkas özellikleri.

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Sayfa sayısı: 68

**EFFECT OF PEPPERMINT (*Mentha pipreitae*) AND BASIL (*Ocimum basilicum*) ON BROILER PERFORMANCE**

**(M.Sc. THESIS)**

**Ismael Ali ISMAEL**

**ABSTRACT**

This research was conducted to find out the effect of peppermint and basil as natural feed additives on broiler performance. The objective of the present study was to investigate the impact of the Peppermint and Basil as a feed additive on live body weight, body weight gain, feed intake, feed conversion ratio, carcass weight, abdominal fat and liver weight characterization of broiler chickens. Total of 210 broilers chick (ROSS 308) strain broiler chicks were selected and divided into 7 treatments and 3 replicates based on completely randomized design. One day-old chicks were reared for 35 days. Feed and water were provided ad libitum. Chicks were divided into seven treatments (30 birds each). Each treatment contained three replicates of 10 birds. Each group of birds were supplied with 0.5%, 1.0% and 1.5% of either peppermint or basil as feed additive and control group was supplied with neither peppermint nor basil in their ratio.  Data were collected on LBW, BWG, FCR, and FI were analyzed statistically using one way analysis of variance and means separated using Duncan's multiple range test. Mean LBW, BWG, FI, FCR and Liver weight against T4 (1.5% peppermint) was significantly ($P<0.05$) higher for broilers in other group. But had there were non-significant effect on the carcass, carcass yield and abdominal fat. Findings of the present study suggested that feeding peppermint and basil tend to be improve the growth performance and FCR of the broilers.

**Key words:** Medicinal plants, *Mentha pipreitae*, *Ocimum basilicum*, feed Additive, broiler performance and carcass characteristic.

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KAHRAMANMARAŞ/ TURKEY JANUARY, 2014 Ismael Ali ISMAEL

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# LIST OF ABBREVIATIONS

| | |
|---|---|
| **%:** | Percentage. |
| **BWG:** | Body weight gain. |
| **DES:** | Diffuse esophageal spasm. |
| **FCR:** | Feed conversion ratio. |
| **FI:** | Feed intake. |
| **LBW:** | Live body weight. |
| **LDL:** | Low-density lipoprotein. |
| **LES:** | Lower esophageal sphincter. |
| **MAP:** | Medicinal Aromatic Plant. |
| **USDA:** | United State National Nutrient Database for Agriculture. |
| **T:** | Treatment. |
| **WHO:** | World Health Organization. |
| **RDA:** | Recommended dietary allowance. |
| **NDF:** | Neutral Detergent Fiber. |
| **PPM:** | Peppermint. |

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## 1. INTRODUCTION

Since ancient times, herbs have been known for their potential usage as medicinal supplement or therapeutic features (Juven *et al*., 1994; Change, 1995). Herbals plants used in this study are peppermint (*menthe piperita*), or peppermint s and basil (*Ocimum basilicum*) are aromatic, almost exclusively perennial, rarely annual, herbs that are widely distributed and could be found in many environments. Those plants have beneficial effect on the digestive system and a good source for some minerals and vitamins and increased immunity (Brickell and Trevor, 2002).

Medicinal and aromatic plants constitute a major segment of the flora, which provide raw materials for use in the pharmaceuticals, cosmetics, and drug industries. It is estimated that 80% of the population in developing countries relies on traditional plant based medicines for their health requirements (Jerath *et al*., 2012). Twenty-five per cent of all of prescription drugs are derived from plants, many of them from tropical rainforests and as many as 70% of our pharmaceuticals are modeled after constituents found in plants. Even today, 80% of the world's population relies on botanical medicines as their primary means of health care. Scopolamine, quinine and curarine are just a few of the modern medicines derived from the rainforest (Wcupa, 2013).

Plants form the main ingredients of medicines in traditional systems of healing and have been the source of inspiration for several major pharmaceutical drugs. Roughly 50,000 species of higher plants have been used medicinally. This represents by far the biggest use of the natural world in terms of number of species. Around 100 plant species have contributed significantly to modern drugs. The use of medicinal plants is increasing worldwide, related to the persistence and sometimes expansion of traditional medicine and a growing interest in herbal treatments. The medicinal uses of plants grade into their uses for other purposes, as for food, cleaning, personal care and perfumery (Plantlife, 2013).

Even in many of modern medicines, the basic composition is derived from medicinal plants and has become acceptable for many reasons include; easy availability, least side effects, low prices, environmental friendless and lasting curative property; WHO has defined traditional medicine as "The sum total of all the knowledge and practices, whether explicable or not, used in diagnosis, prevention and elimination of physical, mental or social imbalance and relying exclusively on practical experience and observation handed down from generation to generation whether verbally or in writing" (Jerath *et al*., 2012).

## 1.1. Peppermint

Peppermint is first described by Carl Linnaeus in at the middle of $18^{th}$ century from specimens that had been collected in England. It is an herbaceous rhizomatous perennial plant growing to 30–90 cm tall, with smooth stems, square in cross section. Therhizomes are wide spreading, fleshy and bare fibrous roots. The leaves are from 4–9 cm long and 1.5–4 cm broad, the flowers are purple, 6–8 mm long with a four-lobed corolla (Wikipedia, 2013).

The leaves and stems, which contain menthol, are used medicinally, as a flavoring in food, and in cosmetics. The optimal time to harvest is before the plant begins to flower. Currently the United States produces 75% of the world's peppermint. Peppermint is widely used as a food, flavoring, and disinfectant (Herbalremedypro, 2013). Menthol is the primary active compound, which is found in peppermint, and it has tremendously effective uses for a variety of digestive and bowel complaints. Peppermint is used to treat irritable bowel syndrome, stomach upsets, bowel spasms and nausea and relieve flatulence. The compounds found in Menthol help by relaxing the smooth muscles that line the digestion tract, gently pushing matter though your system and aiding peristalsis. It is also an excellent digestive aid, as it facilitates the production of digestive fluids and increases circulation. When used together with more conventional treatment, it can effectively reduce the pain and irritation of symptoms. Peppermint is a carminative an agent that dispels gas and bloating in the digestive system and an antispasmodic capable of relieving stomach and intestinal cramps (Herbalremedypro, 2014).

Peppermint supports liver function by improving the flow of bile from the liver to the gallbladder. By increasing the amount of bile flow, peppermint leaf positively supports digestion by helping to break down fats and reduce bad cholesterol. Decreased cholesterol levels reduce the workload required from the liver. The exact proportions of these different compounds differ depending on one variety of peppermint to another. Also, the aromatic chemicals in the mint are concentrated when the plant is grown in areas with long, warm, bright summer days (Health.howstuffworks, 2013).

## 1.2. Basil

Basil, one of the oldest herbs, is believed to have originated in India and spread to Europe via the Middle East. Throughout history it has been regarded as having extraordinary powers, claiming fame in the realms of medicine. Basil, *Ocimum basilicum*, is a short-lived annual or perennial plant in the family Lamiaceae grown for its leaves, which are used as herb (Growing-basil, 2013).

The basil plant grows from a thick taproot and has silky green opposite oval leaves, which grow to be 3–11 cm, branching out from the central stem. The plant produces small white flowers, which are clustered on a single spike at the top of the plant. Basil plants are often grown as annuals but may survive for several seasons (Plant village, 2013).

Basil is often overlooked as a remedy for common health problems, although various civilizations have been using it for thousands of years. The main use of basil medicinally is as a natural anti-inflammatory. The same compound that makes it useful, as an anti-inflammatory is also believed to help combat bowel inflammation and rheumatoid arthritis. This may be because basil contains cinnamanic acid, which has been found to enhance circulation, stabilize blood sugar, and improve breathing in those with respiratory disorders. It is also know that basil is very high in antioxidants, especially when it is used as an extract or oil (Offthegridnews, 2014).

Antioxidants have become an important part of keeping our bodies healthy, and basil may be among the safest and most effective sources of these life-giving compounds. The various basils have such different scents because the herb has a number of different essential oils that come together in different proportions for various breeds. The citrus scent of lemon basil and lime basil reflects their higher portion of citral, which causes this effect in several plants including lemon mint, and of limonene, which gives actual lemon peel its scent. African blue basil has a strong camphor smell because it contains camphor and camphene in higher proportions (Wikipedia, 2013).

### 1.3. Broiler

Broilers are chickens bred and raised specifically for meat production. Typical broilers have white feathers and yellowish skin. The broiler chicken industry has shown unparalleled growth over the last 30 years, although there are now signs of a maturing market in many countries. The industry is relatively easy to establish and while there are regional differences, production systems in most countries are modeled in a similar manner. Because of the increased growth potential in modern strains of broiler, it is now realized that some degree of environmental control is essential. Chicken is usually the least expensive meat in most countries and consequently it is first or second for per capita consumption. This competitive situation has occurred due to continued improvements in efficiency of production that often necessitate acceptance of new ideas and innovations by poultry producers and agribusiness. Much of the success of the chicken meat industry relates to development of new consumer products, largely because of continued advances in further processing. Most commercial broilers bred for meat reach slaughter weight at between 5 to 7 weeks of age, although slower growing strains reach slaughter weight at approximately 14 weeks of age. Broilers and egg laying hen are the same species and share many characteristics, however, due to the rapid growth and selection for enlarged breast muscles; broilers are susceptible to different welfare concerns, particularly skeletal. Ross 308 is one of those chickens used for meat production commercially (Leeson, 2005).

This study aimed to investigate the effect of Peppermint and Basil on broiler performance (LBW, BWG, FI, FCR, Carcass Weight, carcass yield, Abdominal Fat and Liver Weight). The purpose of the present study is to investigate the effect of the peppermint and basil on experiment of body performance as a feed additive in growing chicks. Because peppermint and basil are a medicinal plants and containing certain essential amino acids, vitamins and some minerals it's important to investigate, LBW, BWG, FI, FCR, abdominal fat, and liver. Using Peppermint and basil as an aromatic plant and containing certain essential amino acids, vitamins and some minerals it's important to investigate broiler performance

# 2. LITERATURE

## 2.1. Peppermint Herbal

### 2.1.1. Selected species

*Mentha aquatica* – Water mint, or Marsh mint, *Mentha arvensis,* Corn Mint, Wild Mint and Japanese peppermint, *Mentha asiatica, Mentha australis, Mentha canadensis* (syn. *M. arvensis var. canadensis), Mentha cervina, Mentha citrata* (syn. *M. odorata)* – Bergamot mint (smells like Bergamot) *Mentha crispata, Mentha cunninghamii, Mentha dahurica , Mentha diemenica, Mentha gattefossei, Mentha grandiflora, Mentha haplocalyx, Mentha japonica, Mentha kopetdaghensis , Mentha laxiflora Mentha longifolia, Mentha micrantha , Mentha microphylla, Mentha pulegium* – Pennyroyal, *Mentha requienii* – Corsican mint, *Mentha sachalinensis Mentha satureioidesMentha spicata* – Spearmint, Curly mint, *Mentha suaveolens* (syn. *M. rotundifolia)* – Apple mint (smells like apples) and Pineapple mint (a variegated cultivar of Apple mint), *Mentha sylvestris* – Horsemint, Wild mint *Mentha vagans* (Mentha/cs.mcgill, 2013b).

### 2.1.2. Botanical name

Medicinal species: *Mentha piperita*. It is thought to be a natural hybrid between spearmint (*Mentha spicata*) and water mint (*Mentha aquatica*).

Common names: Peppermint, lamb mint, brandy mint, balm mint, curled mint, amenta, lammint.

Botanical family: *Leguminosae* or *pea* (Wikipedia/Mentha, 2013a).

Peppermint leaves Peppermint in flowering stage Peppermint leaves and flowers

Figure 2.1. Peppermint (*Mentha piperita)* plant which used in this study as feed additive in broiler diet in three figures (plant leaves, Plant flowers, leaves and flowers of Peppermint).

### 2.1.3. Plant description

Peppermint plants grow to about 40 - 90 cm tall and it is native to Europe and Asia, is naturalized to North America, and grows wild in moist and mild temperature areas. Some varieties are indigenous to South Africa, South America, and Australia. The entire plant has a very characteristic odour, due to the volatile oil present in all its parts, which when applied to the tongue has a hot, aromatic taste at first, and afterwards produces a sensation of cold in the mouth caused by the menthol it contains (Botanical, 2013).

*Mentha piperita L.* is a sterile, perennial herb originating from a hybridisation between watermint (*Mentha aquatica*) and spearmint (*Mentha spicata*), and therefore must be propagated vegetatively. Peppermint is a summer-growing perennial with upright, usually purplish, smooth stems growing to 1 m in height. The lance-shaped leaf margins are finely toothed, their surfaces smooth, both above and beneath, or very slightly hairy (hardly visible), on the principal veins and midrib on the underside. The whorled clusters of little reddish-violet flowers are in the axils of the upper leaves, forming loose, interrupted spikes, and rarely bear seeds. The whole plant is cut at flowering stage for steam distillation. The oil is found on the undersides of the leaves (Figure 2.2) basically (Saeopa and Karwil, 2012).

Figure 2.2. Main parts of Peppermint (*Mentha piperita)* which used in the diet as feed additive in broiler diet.

### 2.1.4. Chemical components

Peppermint contains numerous plant derived chemical compounds that are known to have been anti-oxidant, disease preventing and health promoting properties. The mint herb contains no cholesterol; however, it is rich in essential oils, vitamins and dietary fiber, which helps to control blood cholesterol and blood pressure inside the human body.

Table 2.1. Peppermint (*menthe piperita*), fresh leaves, nutritive value per 100 g.

| **Principle** | **Nutrient Value** | **Percentage of RDA** |
|---|---|---|
| Energy | 70 Kcal | 3.5% |
| Carbohydrates | 14.79 g | 11% |
| Protein | 3.75 g | 7% |
| Total Fat | 0.94 g | 3% |
| Cholesterol | 0 mg | 0% |
| Dietary Fiber | 8 g | 20% |
| **Vitamins** | | |
| Folates | 114 µg | 28% |
| Niacin | 1.706 mg | 10.5% |
| Pantothenic acid | 0.338 mg | 6.5% |
| Pyridoxine | 0.129 mg | 10% |
| Riboflavin | 0.266 mg | 20% |
| Thiamin | 0.082 mg | 7% |
| Vitamin A | 4248 IU | 141% |
| Vitamin C | 31.8 mg | 53% |
| **Electrolytes** | | |
| Sodium | 31 mg | 2% |
| Potassium | 569 mg | 12% |
| **Minerals** | | |
| Calcium | 243 mg | 24% |
| Copper | 329 µg | 36% |
| Iron | 5.08 mg | 63.5% |
| Magnesium | 80 mg | 20% |
| Manganese | 1.176 mg | 51% |
| Zinc | 1.11 mg | 10% |

(Source: USDA National Nutrient Data Base, 2013), RDA: Recommended dietary allowance.

The mint herb contains no cholesterol; however, it is rich in essential oils, vitamins and dietary fiber, which helps to control blood cholesterol and blood pressure inside the human body. The herb parts contain many essential volatile oils like menthol, menthone, and menthol acetate. These compounds effect on cold-sensitive receptors in the skin, mouth and throat, the property which is responsible for the natural cooling-sensation that it initiates when inhaled, eaten, or applied on the skin. The essential oil, menthol also has been analgesic, local anesthetic and counter-irritant properties. Research studies have also been suggested that the compounds in the peppermint relax intestinal wall and sphincter smooth muscles through blocking calcium channel at cell receptor levels. Peppermint -herb is an excellent source of minerals like potassium, calcium, iron, manganese and magnesium. 100 g fresh herb provides 569 mg of potassium. Potassium is an important component of cell and body fluids that helps control heart rate and blood pressure. Manganese and copper works as co-factors for the antioxidant enzyme, superoxide-dismutase. Further, it is rich in many antioxidant vitamins, including vitamin A, beta-carotene, vitamin-C and vitamin E. The leaves of mint also contain many important B-complex vitamins like folates, riboflavin and pyridoxine (vitamin B-6); and the herb are an excellent source of vitamin-K (Nutrition-and-you, 2013a).

### 2.1.5. Effect of peppermint on broiler performance

Durrani *et al.* (2007) used three levels extract of wild peppermint infusion at the rate of A=50 mL/ L-1, B=40 mL/ L-1, C=30 mL/ L-1 and D= group control of fresh drinking water were provided to chicks, respectively and group D was kept as control, each group was replicated four times with 10 chicks per replicate, reared for 35 days. Mean feed intake was significantly ($p<0.05$) higher in-group A than other groups and lower in-group B (40 mL/ L-1) and Mean FCR value for group A and D was indifferent. Improved FCR in-group B was due to higher body weight gain and lower feed intake in this group that received mint infusion at the rate of 40 mL/ L-1 of water. Also the three level of infusion used in this study have shown increased body weight gain compared with control group D, but the best level that had highest effect was that of group B (40 mL/ L-1).

Amasaib *et al*. (2013) conducted to determine the possible effects of addition different levels of spearmint on broiler chick's performance. One hundred and twenty eight day old unsexed broiler chicks were used in this experiment. Birds were distributed randomly into 16 pens. The experimental diets were formulated with four levels of spearmint of 0, 1, 1.5 and 2%. Feed and water were freely accessed. The effect of feeding graded levels of spearmint on weekly feed intake is presented. The results revealed that the dietary treatment had no statistically significant effect on feed intake. The highest feed intake was obtained by the birds fed 1% spearmint during second and third week and The data for feed conversion ratio is illustrated .The results showed the effect of spearmint on feed FCR which was found to be insignificant in the first five weeks of age, but it is significantly affected by addition of spearmint in the sixth week. This may be due to change in environment during this week and increasing of bird's age. Their data has also shown that weekly body weight gain was affected by supplementation of spearmint. Birds fed 1% spearmint in the second and third week were grown better than those fed relatively higher levels of spearmint.

Toghyani *et al*. (2010) used 240 of ROSS 308 in five treatments each treatment contain four replicates, control group and 2g/kg and 4g/kg black seed, 4g/kg and 8g/kg peppermint add to the stander diet. LBW measured at 28 of age was significant and 42 days of age is non-significant. Broilers fed 4 g/kg black seed significantly showed the most efficient FCR (0–42 days). At 42 days of age, two birds per replicate randomly chosen were slaughtered and abdominal fat, liver, pancreas, weighed and calculated as a percentage of live body weight also organ eights and carcass non-significant.

Khodambashi *et al.* 2012 used virginiamycin, fructomix and peppermint oil on productive performance, immune response, intestinal morphology and digestibility of broilers. Used 240 Ross 308 male broilers were randomly divided to five treatments each treatment contain 12 chicken per pen. Control group, the basal diet supplemented with 200 mg/kg virginiamycin; 200 mg/kg peppermint oil; 400 mg/kg peppermint oil; 500 mg/kg fructomix. Feeding chickens for 6 weeks, at the end of experiment to investigate effect of different treatments on broilers BW, LWG, FI, and FCR virginiamycin-fed broilers had the highest BW compared with other groups. Furthermore, broilers supplemented with virginiamycin had higher LWG ($P<0.001$) and FI in the second (days 22–42) and the overall (days 1–42) experimental period, compared with all other treatments. In the overall growing period (days 1–42), the FCR of virginiamycin (1.74) and 200 mg/kg peppermint oil (1.75) groups were better compared with control group and 400 mg/kg peppermint oil groups.

Erhan *et al.* (2012) used pennyroyal (Mentha pulegium L.) on two different levels (0, 0.25 or 0.50%) on the growth performance and *E. coli* and lactic acid bacteria count in the jejunum of broilers. Also used 150 broiler chicks (Ross 308), at the one day of age, were allocated to 3 dietary treatments (5 replicates), each treatment contain 10 chicks per replicate. All the birds were housed in batteries from 1 to 21 days, then in grower broiler pens from 21 to 42 days under standard conditions. The final body weights and body weight gains were non- significant in all groups. The addition of pennyroyal to the broilers' feed led to decrease in the feed intake. The gain-to-feed ratios for 0, 0.25, and 0.50% dietary pennyroyal were 1.50, 1.50 and 1.41, respectively. The addition of pennyroyal reduced E. coli count and increased the lactic acid bacteria count of the jejunum (P<0.01). In conclusion, dietary supplementation of pennyroyal improved feed conversion ratio and lactic acid bacteria count, as well as decreased *E. coli* count, of the jejunum in broilers. Pennyroyal supplementation did not affect body weight and weight gain. Feed consumption decreased linearly with increasing levels of pennyroyal supplementation. Increasing levels of pennyroyal supplementation linearly decreased feed conversion ratio in for broilers. There were no differences in hot carcass, hot carcass yield, and liver and heart weights among the treatment groups. Supplementation of 0.50% pennyroyal into diet reduced feed intake and improved feed conversion ratio. The addition of pennyroyal to the broiler feed led to a decrease in the *E. coli* count in the jejunum. It was also found that a number of lactic acid bacteria in the jejunum of broilers were increased by dietary inclusion of pennyroyal. Based on the results of this study, it can be recommended to supplement broiler feed with pennyroyal. These findings justify further research on the pennyroyal in diverse dosages and situations to fully explore its effect.

### 2.1.6. Effect of beppermint on carcass characteristics

Galib and Al-Kassie (2010) conducted to determine the performance of broilers fed diets supplemented with dry peppermint (*Mentha piperita L.*). A total of 200 (Hubbard) broiler chicks were used in this study five levels of whole peppermint, 0.00%, 0.25%, 0.5%, 1.0% and 1.5% were incorporated into the basal diet for six weeks. The feeding period for all groups lasted for 42 days. It also shows that there was liver weight of control group was higher than those of the other groups.

Durrani et al. (2008) experimented the possible effects of medicinal plants on the performance of the chickens they used one hundred and sixty day-old broiler chicks which were divided into four groups (A, B, C and D; each group representing four replicates with 10 chicks per replicate). Group A, B and C were respectively given peppermint in feed at the rate of 5, 10 and 15 g/kg of feed and group D was kept control. No differences in abdominal fat deposition were found in treated and untreated groups.

Amasaib *et al*. (2013) determined the effect of addition different levels of spearmint on broiler chick's performance. One hundred and twenty eight day old unsexed (Cobb) broiler chicks were used in this experiment. Birds were distributed randomly into 16 pens. The experimental diets were formulated with four levels of spearmint of 0, 1, 1.5 and 2%. Dressing percentage of broiler chicks during experimental period is illustrated. The carcass was not significantly affected by addition of spearmint.

## 2.2. Basil Herbal

### 2.2.1. Selected species

African blue basil *(Ocimum basilicum X Ocimum kilimandscharicum),* Camphor basil, African basil *(Ocimum kilimandscharicum),* Cinnamon basil *(Ocimum basilicum* 'Cinnamon'*),* Dark opal basil *(Ocimum basilicum* 'Dark Opal'*),* Globe basil, dwarf basil, French basil *(Ocimum basilicum* 'Minimum'*),* Hoary basil *(Ocimum americanum* formerly known as *Ocimum canum), Holy Basil (Ocimum tenuiflorum,* formerly known a *Ocimum sanctum),* Spice Basil *(a cultivar of Ocimum americanum,* which is sometimes sold as Holy Basil*),* Lemon basil *(Ocimum americanum),* Lettuce leaf basil *(Ocimum basilicum* 'Crispum'*),* Purple basil *(Ocimum basilicum* 'Purpurescens'), Queen of Siam basil *(Ocimum basilicum* citriodorum*),* Rubin basil *(Ocimum basilicum* 'Rubin'*)* (Tilebeni, 2011).

### 2.2.2. Botanical name

Medicinal species: *Ocimum basilicum* L.

Common names: basil, basilica, basilikum, basilienkraut, albahaca, sweet basil.

Botanical family: *Lamiaceae* (*Labiatae*)

Basil leaves | Basil in flower stage | Basil leaves and flowers

Figure 2.3. Basil (*Ocimum basilicum)* plant which used in this study as feed additive in broiler diet in three figures (plant leaves, Plant flowers, leaves and flowers of basil).

### 2.2.3. Plant description

Basil, *Ocimum basilicum*, is a short-lived annual or perennial plant in the family *Lamiaceae* grown for its leaves, which are used as an herb. The basil plant grows from a thick taproot and has silky green opposite (paired) oval leaves, which grow to be 3–11 cm long and 1–6 cm branching out from the central stem. The plant produces small white flowers, which are clustered on a single spike at the top of the plant. Basil plants are often grown as annuals but may survive for several seasons with some care and can reach heights between 30 and 130 cm depending on the variety (Plant village, 2013).

Basil may also be referred to as sweet basil, St. Joseph's wort, thai basil, lemon basil or holy basil depending on the variety and is native to India and other tropical regions of Asia. Basil belongs to the genus *Ocimum* and is a member of the mint family (*Lamiaceae*). The genus includes over sixty species of annuals, non-woody perennials and shrubs native to Africa and other tropical and subtropical regions of the Old and New World. There is some disagreement in the literature as to the exact number of species in the genus. This is due to the fact that the genus is still being studied by researchers and to basil's "promiscuous" nature. Basils cross easily, and recent studies have led to a reclassification of portions of the genus. The final word on species is still not in! To complicate matters, there are other plants outside the *Ocimum* genus with the common name of basil, including basil thyme (Acinos arvensis) and wild basil (Clinopodium vulgare). These plants are not traditional basils and will not be discussed at length in this guide. Physically, basils are characterized by square, branching stems, opposite leaves, brown or black seeds (also called nutlets) and flower spikes, but flower color and the size, shape, and texture of the leaves vary by species. Leaf textures range from smooth and shiny to curled and hairy, and flowers are white to lavender/purple. Leaf color can also vary, from green to blue/purple, depending on the species. Most people are familiar with sweet basil, *Ocimum basilicum*, the common culinary basil, but the world of basils offers a wide array of plants with a great diversity of flavors, scents, and uses. There are many species and cultivars of basil. Some of the more popular basils include sweet, specialty fragrant purple-leaved, bush, and miniature or dwarf (Kirtland, 2003).

### 2.2.4. Chemical components

Basil herb contains many polyphenolic flavonoids like orientin and vicenin. These compounds were tested in-vitro laboratory for their possible anti-oxidant protection against radiation-induced lipid per-oxidation in mouse liver. Basil leaves contain much health benefiting essential oils such as eugenol, citronellol, linalool, citral, limonene and terpineol. These compounds are known to have anti-inflammatory and anti-bacterial properties (Table 2.2).

Table 2.2. Basil (*Ocimum basilicum*), fresh leaves, nutritive value per 100 g.

| **Principle** | **Nutrient Value** | **Percentage of RDA** |
|---|---|---|
| Energy | 23 Kcal | 1% |
| Carbohydrates | 2.65 g | 2% |
| Protein | 3.15 g | 6% |
| Total Fat | 0.64 g | 2% |
| Cholesterol | 0 mg | 0% |
| Dietary Fiber | 1.60 g | 4% |
| **Vitamins** | | |
| Folates | 68 µg | 17% |
| Niacin | 0.902 mg | 6% |
| Pantothenic acid | 0.209 mg | 4% |
| Pyridoxine | 0.155 mg | 12% |
| Riboflavin | 0.076 mg | 6% |
| Thiamin | 0.034 mg | 2.5% |
| Vitamin A | 5275 IU | 175% |
| Vitamin C | 18 mg | 30% |
| Vitamin E | 0.80 mg | 5% |
| Vitamin K | 414.8 µg | 345% |
| **Electrolytes** | | |
| Sodium | 4 mg | 0% |
| Potassium | 295 mg | 6% |
| **Minerals** | | |
| Calcium | 177 mg | 18% |
| Copper | 385 mg | 43% |
| Iron | 3.17 mg | 40% |
| Magnesium | 64 mg | 16% |
| Manganese | 1.15 mg | 57% |
| Zinc | 0.81 mg | 7% |

(Source: USDA National Nutrient Data Base, 2013), RDA: Recommended dietary allowance

The herbs' parts are very low in calories and contain no cholesterol, but are very rich source of many essential nutrients, minerals, and vitamins that are required for optimum health. Basil herb contains exceptionally high levels of beta-carotene, vitamin A, cryptoxanthin, lutein and zea-xanthin (Nutrition-and-you, 2012b). Vitamin K in basil is essential for many coagulant factors in the blood and plays a vital role in the bone strengthening function by helping mineralization process in the bones. Basil herb contains a good amount of minerals like potassium, manganese, copper, and magnesium. Potassium is an important component of cell and body fluids, which helps control heart rate and blood pressure. The body as a co-factor for the antioxidant enzyme, superoxide dismutase, uses manganese. Basil leaves are an excellent source of iron, contains 3.17-mg/100 g of fresh leaves (about 26% of RDA). Iron, being a component of hemoglobin inside the red blood cells, determines the oxygen-carrying capacity of the blood (Whfoods, 2013).

### 2.2.5. Effect of basil on broiler performance

Onwurah *et al*., (2011) determined the effect of basil (*Ocimium basilicum L.*) and the beneficial inclusion level in broiler chicks coccidial infection. The study was carried out with two hundred and forty chicks for three weeks. The experimental design Randomized Design. The main polt factors were dry and fresh basil while the sub-plot factors were different basil inclusion levels of 0.0g, 0.5g, 1.0g, 1.5g and 2.0g basil/kg feed and water -l. The sub-plot treatments were 180 coccidia challenged chicks replicated thrice with 10 chicks /replicate treated with basil while the control experiment had 60 unchallenged and untreated chicks. Feed intake was not significantly different. However, there are numerical differences in feed intake Feed conversion and live weight were significantly different

Al-Kelabi and Al-Kassie (2013) studied the effect of basil on three hundred one-day-old Hubbard broiler chicks. Chicks were weighed and randomly divided into 10 treatments groups, with 2 replicates (15chicks each). These groups were fed with the following rations: The 1st group was fed the basal diet (control group). The 2nd, 3rd and 4th groups were fed the basal diet+0.3, 0.4 and 0.5 % basil powder for the first 3 weeks only respectively. At the 5th, 6th and 7th groups were fed the same basal diet +0.3, 0.4 and 0.5 % basil powder for the second 3 weeks respectively. While the 8th, 9th and 10th were fed the same basal diet with 0.3, 0.4 and 0.5 % basil powder along the whole six weeks. The experiment was terminated when birds were 6 weeks old. Feed intake was affected by addition of a sweet basil powder in the diet. The results showed that there was a significant difference in feed intake during the first period (1-3 weeks), second period (4-6 weeks) and also whole period. A significant ($P<0.05$) difference noticed in feed intake for the second three weeks and whole periods among the treated groups. During the first period (1-3weeks old) showed significant ($P<0.05$) increase in live body weight for treatments T3, T4 and T10 compared with other treated groups and control, but treatments T2 showed lower live body weight than other treated groups and control and The experiment was terminated when birds were 6 weeks old. There were significant differences between treated groups and the control in the daily body weight gain throughout the different periods of the experiment. In the first period (0-3wks), the daily body weight gain of treatments T3, 4 and 10 was significantly the highest values compared with other treatments and the control groups. Another study was conducted to find the effect of Fenugreek (*Trigonella Foenum-Graecum L.*), parsley (*Petroselium sativam L.*) and Sweet Basil (*Ocimum basilicum L.*) seeds as natural feed additives on broiler performance. A total of 120 day-old chicks were reared for 42 days. Chicks were divided into four treatments (30 birds each). Each treatment contained three replicates of 10 birds. Each treatment was fed on one of the following experimental diets: 1/ Control diets (without supplementation). 2/ Control diets supplied with Fenugreek at 3 g/kg of the diet. 3/ Control diets supplied with parsley at 3 g/kg of the diet. 4/ Control diets supplied with Basil at 3 g/kg of the diet. Also feeding different type of Medicinal Aromatic Plants supplementation significantly affected Feed Intake value during the experimental period. Broiler fed basil, parsley and fenugreek seeds had the lower feed intake value during 42 days of age while there are insignificant differences appeared when chicks fed fenugreek seeds during 21 days as compared with control groups. The improvement in feed intake with the addition of MAP could be due to essential oils and their main component, which stimulated the appetizing and digestive process in animals there was no significant difference in FCR showed between fenugreek, parsley and control groups at 21 days of age. While chicks fed the diets supplemented with basil at levels 3 g/kg had the best FCR value at the two ages as compared to control groups (Abbas, 2010).

Odoemelam *et al*., (2013) used basil (*Ocimum gratissimum*) in three levels T2=1%, T3=1.5%, T4=2% with control group=T1. supplemented diets on growth, carcass quality and organoleptic properties of broiler chickens was investigated using seventy two broilers in a 56 day feeding showed that *Ocimum gratissimum L.* have no significant effect on feed intake and body weight gain. However, it has a significant effect on feed conversion ratio. Adding 1% of *Ocimum gratissimum L.* has favourable effect on feed conversion ratio. Also the results refers that there were significant differences in dressed weight, thigh, wing and head. As well as it has a higher and significant perception of flavor, juiciness and general acceptability of broiler meat by panelist as *O. gratissimum* inclusion in diets increased. It can be concluded that birds fed 1% *Ocimum gratissimum L.* gave better results and can be recommended to achieve better feed conversion ratio, carcass quality and organoleptic properties.

AL-Kassie (2009) used three hundred day-old broiler chick's essential oil in broiler nutrition as a natural growth promoter. Different levels of essential oil derived from thyme and cinnamon were added to a standard diet to determine its effects on feed intake, live weight gain, feed conversion ratio and blood constituents. Were divided into five equal groups No essential oil, 100 ppm essential oil derived from thyme (T2), 200 ppm essential oil derived from thyme (T3), 100 ppm essential oil derived from cinnamon (T4) and 200 ppm essential oil derived from cinnamon (T5). Experiments were carried out for 42 days. Results showed that chicks fed with 200 ppm essential oil derived from thyme and cinnamon had significantly higher ($P<0.05$) feed intake, body weight gain and feed conversion ratio, followed by chicks fed with 100 ppm essential oil derived from thyme and cinnamon compared with control group, which showed the lowest performance. Moreover, the chicks fed with ration containing essential oil derived from thyme and cinnamon had reduced ($P<0.05$) serum cholesterol. The total proteins increased significantly ($P<0.05$) for the groups consuming 200 ppm essential oil derived from thyme and cinnamon. In conclusion, essential oil could be considered as a potential natural growth promoter for poultry at the level of 200 ppm, depending on the kind of essential oil derived from herbal plants.

### 2.2.6. Effect of basil on carcass characteristics

Abbas, (2010) studied to find out the effects of Fenugreek (*Trigonella Foenum-Graecum L.*), parsley (*Petroselium sativam L.*) and Sweet Basil (*Ocimum basilicum L.*) seeds as natural feed additives on broiler performance. A total of 120 day-old chicks were reared for 42 days. Chicks were divided into four treatments (30 birds each). Each treatment contained three replicates of 10 birds. Each treatment was fed on one of the following experimental diets: 1) Control diets (without supplementation). 2) Control diets supplied with Fenugreek at 3 g/kg of the diet. 3) Control diets supplied with parsley at 3 g/kg of the diet. 4) Control diets supplied with Basil at 3 g/kg of the diet. Results presented feeding 3 g/kg of fenugreek, parsley and basil seeds not significantly affected liver and abdominal fat.

AL-Kassie, (2009) used essential oil in broiler nutrition as a natural growth promoter. Different levels of essential oil derived from thyme and cinnamon were added to a standard diet to determine its effects on feed intake, live weight gain, feed conversion ratio and blood constituents. Were divided into five equal groups No essential oil (control group), 100 ppm essential oil derived from thyme (T2), 200 ppm essential oil derived from thyme (T3), 100 ppm essential oil derived from cinnamon (T4) and 200 ppm essential oil derived from cinnamon (T5). Experiments were carried out for 42 days. Results showed that different levels of oil extract derived from thyme and cinnamon also had significant effects on dressing percentage, abdominal fat and internal organs percentage (liver, heart and gizzard). Results revealed that the inclusion of oil extracts improved the performance significantly ($P<0.05$) in treatments 3 and 5 compared with control. Moreover, chicks fed with diet containing 200 ppm of oil extracts derived from thyme and cinnamon had significantly higher liver percentage and lower abdominal fat percentage compared to control.

### 2.3. Broiler (Ross 308)

Intensification of the broiler chicken industry started in the late 1950's, when the use of 'dual purpose' chickens for egg and meat production ceased and new poultry strains were produced specifically for meat production. Broiler chicken is a combination of several breeds. Desirable characteristics include white feathers and abundant breast meat. Breeding is done in the traditional manner. There is no “genetic engineering” or “genetic modification” in the industrial production of chicken. Broilers are chickens raised specifically for meat. Most broilers have a fast growth rate with a high feed conversion ratio and low activity levels. In five weeks, broilers can reach a dressed weight of 1.8-2.25 kg, and slaughtering of broilers at the end of the 6$^{th}$ week is a common application in intensive farms. Both male and female broilers are slaughtered for their meat and broilers provide most of the world’s production and consumption of poultry meat. Broilers and egg laying hen are the same species and share many characteristics, however, due to the rapid growth and selection for enlarged breast muscles; broilers are susceptible to different welfare concerns, particularly skeletal. Ross 308 is one of those chickens used for meat production (NCC, 2010).

Ross is a breed selected for their balanced genetic development and continuous improvement in the production of poultry meat for commercial purposes. This concept reaffirms that Ross 308 broiler breeders and commercial baby chicks deliver a consistent results derived from their strong genetic potential that gives the breed the ability to achieve outstanding performance in fertility and production of hatching eggs to produce healthy and high performing commercial broiler chicks. Provided that the collection, preparation and immunization mechanisms are properly adjusted, flocks will have a high and homogenous growth, yielding superior performance levels in terms of: Outstanding net weight of meat, particularly breast meat that can reach 18.86% of boneless breast meat for a 2 kg bird Unprecedented feed conversion rate (FCR) Shorter growth period for chicks to reach the standard selling weight Strong and solid legs and articular tendons Lohman Commercial Layer Chicks: The Lohmann Layer Chicks are the oldest and finest breed in the field of commercial layer production worldwide (Katkootalwadi, 2013).

The Ross 308 satisfies the demands of customers who require a bird that performs consistently well and has the versatility to meet a broad range of end product requirements. The Ross 308 breeder produces a high number of eggs combined with good hatchability to optimize chick cost in situations where broiler performance is important. The Ross 308 is recognized globally as a broiler that will give consistent performance in the broiler house. Integrated and independent producers value the growth rate, feed efficiency and robust performance of the Ross 308 (en.aviagen, 2013).

## 3. MATERIAL AND METHODS

### 3.1. Material

#### 3.1.1. Animal material

Animal material in this research were 210 broiler chicks (Ross 308), one-day-old (broiler), and they were generously obtained from Gaziantep hatchery (local hatchery) and placed in closed house in the poultry experiment farm of Animal Science Department, Agriculture Faculty, Kahramanmaras Sutcu Imam University - Turkey.

Chick Ross

Chicken

Figure 3.1. Broiler (Ross 308) used as animal material in this study left figure is chicks (3 days old) right figure chicken (35 days old).

#### 3.1.2. Source and chemical analysis of peppermint and basil

Peppermint and basilused in current study were obtained from the Maras's bazaar Kahramanmaras/ Turkey. Chemical analysis for each plant was conducted at feed laboratory/ USKIM and feed analysis laboratory in department of Animal Science for main contents (crude protein, crude fat, crude fiber, dry matter and ash). The basic analysis results were shown as tabulated form for peppermint and basil in Tables 3.1 and 3.2 respectively.

Table 3.1. The nutritive value of Peppermint (*menthe piperita*) used in this study were as follow.

| **Principle** | **Nutrient Value %** |
|---|---|
| Dry matter | 98.08 |
| Crude protein | 14.56 |
| Crude fiber | 21.09 |
| Crude fat | 2.92 |
| Ash | 9.40 |

Table 3.2. The nutritive value of Basil (a 100gr) used in this study were as follow.

| **Principle** | **Nutrient Value %** |
|---|---|
| Dry matter | 98.75 |
| Crude protein | 22.08 |
| Crude fiber | 25.52 |
| Crude fat | 2.10 |
| Ash | 17.78 |

### 3.1.2.1. Dry matter

Dry matter refers to remaining part of the food material after removal of water. The nutrients in feeds, are part of the dry matter portion of the feed; determination the dry matter content of feed provides a measure of the amount of a feed that is required to supply an amount of nutrients value to the animals. There are two temperatures that use for drying feed samples 135 $^{o}$C for 2 hours this procedure is applicable for the forages with low volatile acid content and 105 $^{o}$C for 16-24 hours procedure for the forages with high volatile acid content.

Equipment and tools: (Sensitive balance for measurement. / Dry substance containers/ Drying Oven /Desiccator).

Working technique:

Empty containers were weighted and recorded (W1). Approximately 20 g for the samples were weighted (W) in containers. The containers with samples were put in the drying oven in 105 ºC for 24 hours. After that containers were removed and cooled it in the desiccator and reweighed (W2). After that dry matter content of the samples were determined (Nielsen, 2010) as follows:

Dry matter (g/kg) = $(W_2\text{-}W_1/W) \times 100$

W1= Weight of containers.

W2= Weight after 24 h drying containers with samples.

W= Samples weight.

Figure 3.2. Sample of peppermint and basil on the electrical oven to measure and calculate dry matter in this study.

### 3.1.2.2. Ash

Ash is an inorganic part of the dry matter, which carbon does not contribute in the composition, including minerals and inorganic salts in dry matter and remain of feed material after placed in the burning oven temperature of 550 ° C for 5-6 h.

Equipment and tools: (Sensitive balance for measurement/ burning container (crucible): A cup-shape container used in laboratories and made from any material that resists high temperatures (Porcelain)/ Burning oven: Usually electrically heated and modified automatically to the required level of temperature, works between 0-1200º C/ Desiccator).

Working technique:

The crucible containers were burn at 550 ºC and cooled in desiccators then weighted (W1), Approximately 1-2 g from dried samples were weighted (W) in containers and placed in a burning oven then heated to 550 ⁰C for 5-6 hours, then the containers were removed to desiccator and cooled it to room temperature. After that containers with samples were weight (W2). The ash content of samples was determined as the weight of materials remaining in the containers at the end of processes then the ash content of samples were determined (Nielsen, S., 2010) as follow:

Ash % = (W2-W1/W) ×100

W1= weight of containers.

W2= weight after 5-6 h burning containers with samples.

W= Samples weight.

Figure 3.3. Crucible and samples of peppermint and basil in to the burner oven to measure and calculate ash for experimental plants in this study.

**3.1.2.3. Crude protein**

The Kjeldahl method was used for the analysis of crude protein in feeds. This procedure consists of three essential steps: 1) digesting the sample in sulfuric acid in the presence of a catalyst, which results in the conversation of nitrogen to ammonia. 2) Ammonia distillation. 3) Determination of ammonia by titration with a standard solution (HCl).

Equipment and tools: (Sensitive balance for measurement/ Kjeldahl flasks, 800 ml/ Kjeldahl digestion unit and distillation device/ Kjeldahl rack/ Conical flask 250-500 ml/ Digital Burette).

Chemicals:

(Concentrate sulfuric acid $H_2SO_2$ (%98 and D=1.84 g/cm³)/ Sodium hydroxide (titrant), concentration (c= 0.1 mol/l)/ 2% $H_3BO_3$ (Boric acid) solution (w/w); 20 g pure boric acid weighed in 1000 ml beaker and add 800 ml of distilled water then slightly mixing/ Kjeldahl tablets composed of 10g anhydrous potassium sulfate ($K_2SO_4$), 0.3g copper sulfate ($CuSO_4$) anhydrous, 0.1g pumice/ Hydrochloric acid).

Working technique:

For digestion step, approximately 0.5-1g of sample was weighted on filter paper and recorded then the sample was put in Kjeldahl flasks. After that 2 Kjeldahl tablets and 20 ml sulfuric acid were added for each Kjeldahl flask and put in burner unit in Kjeldehl unite the water aspirator and ventilation fan for fume extraction of the Kjeldahl unit was turned on. Then heating the mixture with burners to about 370ºC- 400ºC for 2- 3 hours, then the burners were turned off and let flasks sit for 5-10 minutes. The flasks were removed from burners and placed on Kjeldahl rack. The water aspirator was turned off and the flasks were cooled for 30 minutes. The Purpose of this step is to break down the bonds between the polypeptides together and convert them to simple chemicals such as water, carbon dioxide, and ammonia. Thirty ml of boric acid was added to 500 ml Erlenmeyer flask for each sample after digestion. The flasks were put on the Kjeldahl unit for distillation and the sodium hydroxide and pure water were connected with distillation unit and turned on water for condensing after that changed color from the red to blue. Then the Erlenmeyer flask was removed for Titration. In this step, ammonia will separate from the digestion mixture, which changes the ammonium ions into ammonia gas. The ammonia is collected through boiling and distillation of the gas. (Nielsen, S., 2010)

Figure 3.4. Kjeldahl method and flasks to digest protein in the peppermint and basil in this study and calculate crude protein.

### 3.1.2.4. Crude fat

Fat is important to all aspects of feed production and processing. Crude fat content is determined by extracting the fat from the sample using a solvent, then determining the weight of the fat recovered. As lipids/fats are relatively non-polar molecules, they can be pulled out of a sample using relatively non-polar solvents. With a non-polar solvent, only non-polar molecules in the sample dissolve while polar ones do not. Problems arise

Equipment and tools: (Analytical balance/ Electrical drying oven to be operated at 105ºC± 1ºC/ Soxhlet extraction unit comprising/ Round bottom flask, 150 mL/ Soxhlet extractor with 60 mL siphoning capacity and condenser/ Cellulose extraction thimbles (28 x80 mm)/ Heat source/ Desiccator with silica gel desiccant).

Method:

(Weigh 2-3g of the dried food sample into extraction thimble/ Place the thimble inside the Soxhlet Apparatus/ Connect a dry pre-weighted solvent flask beneath the apparatus and add required quantity of solvent and connect the condenser/ Adjust the heating rate to give a condensation rate of 2-3 drops and extract for about 16hours/ After completing the extraction, remove the thimble and reclaim ether using the apparatus/ Complete the removal of ether on a boiling bath and dry flask at 105ºC for 30 mins/ Cool in a desiccator and weigh. **(**Nielsen, S., 2010**)**

Crude Fat (% of Dry matter) = (weight of fat (x)/ weight of sample (w))*100

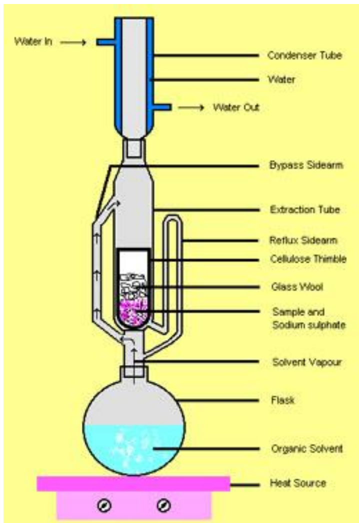


Figure 3.5. Soxhlet unit to extract fat calculate crude fat in the peppermint and basil in this study.

### 3.1.2.5. Crude fiber

This value represents all of the cell wall contents. It includes cellulose, hemicelluloses, and lignin. NDF represents the total fiber component of the feed. It is a value that expresses total fiber content.

Equipment and tools: (Sensitive balance for measurement/ Drying-Oven/ Desiccator/ Magnetic mixer/ Beaker, 500-600 ml/ Glass crucible/ NDF-boiling apparatus).

Chemicals:

(Cetyl-trimethylammoniumbromide/ Sodium dodecyl sulfate/ Ethylenedinitrilotetra acetic acid disodium salt dehydrate, Titriplex III/ Sodium tetraborate decahydrate/ Di-Sodium phosphate/ Sodium metabisulfite/ Triethylene glycol/ Sulfuric acid/ Acetone).

Working technique: For NDF analysis 18.61 g of ethylene dinitrilote tra acetic acid disodium salt dehydrates and 6.81 g of Sodium tetraborate decahydrate were wighted and put in a big beaker. Then 300 ml of distilled (pure) water was added and the chimicals were dissolved, after that 30 g of Sodium dodecyl sulfate and 10 ml of Triethylene glycol were dissolved in another beaker. Then this solution was added to the first soulution. 4.56 g from Di-Sodium phosphate was dissolved in small beaker with distilled (pure) water by heating. After all the solutions were Combined in a beaker and completed with distilled water to 1 lit. The pH of this solution was set to be (6.9-7.1)

Figure 3.6. Measure and calculate crude fiber in the peppermint and basil by using NDF-boiling apparatus in this study.

The crucibles were dried in an oven at 105 oC for 2 hours and weighted (W1). Approximately 0.5-1 g (W) of Silage sample was weighed into the crucibles then 100 ml of neutral detergent solution was added. After that those crucibles with samples were boiled for 1 hour in NDF-boiling apparatus after heating. When boiling is finished the content was filtered. After filtering the content was washed with distilled water and acetone twice. Then crucibles were removed and dried at 80 $^{o}$C for 10-12 hours and cooled in the desiccator and reweighed (W2) then NDF content of samples were determined (Goering and Van, 1970) as follows:

NDF (g/kg DM) = (W2-W1/W)*100

W1=weight of crucibles

W2= weight after drying crucibles with samples

W= Samples weight

### 3.1.3. Housing of the chicks

The chicks were reared at poultry farm of Animal Science Department in Kahramanmaras / Faculty of Agriculture-University of Kahramanmaras Sutcu Imam/ Turkey. The house and its equipment's were washed and disinfected by spraying with (Omiside 1% v/v), after the house was closed and evaporated with by (Formalex) composed of (powder 400ml)/300-400m$^3$, when the two portion mixing from gas left for 12-24 hour then open the door. The houses prepared insure proper (closed) temperature, ventilation, light and humidity for 24 hours before chick's arrival. Chicks were distributed randomly to each treatment and replicates in the floor mesh cages (dimentions, L x H x W: 1.5m x 1m x 1.5m), covered with (7) cm depth of wood material. Vitamin solution at concentration added to drinking water and introduced to the chicks and provided throughout the experimental period (35 days). Circular plastic feeder and trough of (45) cm diameter were used during the first 3 days Of age, afterwards hanging plastic feeder and through used to provide proper area of feeding and water to each bird in each treatment, the height of feeders and troughs and water to each bird in each treatment, the height of feeders and troughs were adjusted according to age at the level of birds back height.

Broiler rearing pens                    Pen for rearing broiler

Figure 3.7. Design and pens that used for rearing broiler (ROSS 308) in this study which used in the experimental.

Feeder system                    Drinker system

Figure 3.8. Feeder and drinker system equipment's which used for rearing chicken in this study.

### 3.1.4. Feeding

The chicks for the first three days were fed on standard diet after that were feed on two rations starter between 3 -21 day-old, and grower ration was used between 22-35 day-old and ingredients of these rations were shown in Tables 3.3 and 3.4 respectively.

Table 3.3. Ingredient and chemical content for experimental broiler starter rations (3-21 day)

| Treatment / Ingredient | | T1 | T2 | T3 | T4 | T5 | T6 | T7 |
|---|---|---|---|---|---|---|---|---|
| Yellow Corn | Kg | 475 | 475 | 475 | 475 | 475 | 475 | 475 |
| Soybean Meal (47) | Kg | 224 | 224 | 224 | 224 | 224 | 224 | 224 |
| Full -fat soybean | Kg | 200 | 200 | 200 | 200 | 200 | 200 | 200 |
| Bonkalit flour | Kg | 55 | 55 | 55 | 55 | 55 | 55 | 55 |
| Wheat middling | Kg | 15 | 10 | 5 | 0 | 10 | 5 | 0 |
| Peppermint | Kg | 0 | 5 | 10 | 15 | 0 | 0 | 0 |
| Basil | Kg | 0 | 0 | 0 | 0 | 5 | 10 | 15 |
| Limestone | Kg | 11.02 | 11.02 | 11.02 | 11.02 | 11.02 | 11.02 | 11.02 |
| Dicalcium phosphate 18 | Kg | 10.69 | 10.69 | 10.69 | 10.69 | 10.69 | 10.69 | 10.69 |
| Salt | Kg | 3.03 | 3.03 | 3.03 | 3.03 | 3.03 | 3.03 | 3.03 |
| D-L Methionine | Kg | 2.56 | 2.56 | 2.56 | 2.56 | 2.56 | 2.56 | 2.56 |
| L-Lysine | Kg | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| Broiler Vitamin mix | Kg | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Broiler Mineral mix | Kg | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Multy Enzyme | Kg | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Anti Coccidial | Kg | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| TOTAL (Kg) | | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 |
| **Chemical contents in rations** | | | | | | | | |
| Dry Matter | % | 87.21 | 87.21 | 87.21 | 87.21 | 87.21 | 87.21 | 87.21 |
| Energy ME Kcal/Kg | | 3100 | 3100 | 3100 | 3100 | 3100 | 3100 | 3100 |
| Crude Protein | % | 23.5 | 23.5 | 23.6 | 23.6 | 23.5 | 23.6 | 23.6 |
| Crude Fat | % | 5.98 | 5.98 | 5.98 | 5.98 | 5.98 | 5.98 | 5.98 |
| Crude fiber | % | 3.6 | 3.7 | 3.8 | 3.9 | 3.6 | 3.7 | 3.8 |
| Ash | % | 5.7 | 5.8 | 5.9 | 6 | 5.8 | 5.9 | 6 |
| Methionine | % | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 |
| Lysine | % | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 |
| Methionine & Cysteine | % | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| Calcium | % | 1 | 1 | 1.01 | 1.01 | 1 | 1.01 | 1.01 |
| Phosphorus (Available) | % | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| Phosphorus (Total) | % | 0.63 | 0.63 | 0.63 | 0.64 | 0.63 | 0.64 | 0.64 |
| Sodium | % | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 |
| Potassium | % | 0.96 | 0.96 | 0.97 | 0.98 | 0.96 | 0.97 | 0.98 |
| Chlorine | % | 0.22 | 0.22 | 0.22 | 0.22 | 0.22 | 0.22 | 0.22 |
| Linoleic Acid | % | 3.16 | 3.16 | 3.17 | 3.16 | 3.16 | 3.16 | 3.17 |
| Na+K-Cl, Meq/Kg | | 252.19 | 252.19 | 252.22 | 252.19 | 252.19 | 252.21 | 252.22 |

Table 3.4. Ingredient and chemical content for experimental broiler starter rations (22-35 day)

| Treatments / Ingredients | | T1 | T2 | T3 | T4 | T5 | T6 | T7 |
|---|---|---|---|---|---|---|---|---|
| Yellow Corn | Kg | 486 | 486 | 486 | 486 | 486 | 486 | 486 |
| Soybean Meal (47) | Kg | 116 | 116 | 116 | 116 | 116 | 116 | 116 |
| Full -fat soybean | Kg | 291 | 291 | 291 | 291 | 291 | 291 | 291 |
| Bonkalit flour | Kg | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| Wheat middling | Kg | 15 | 10 | 5 | 0 | 10 | 5 | 0 |
| Peppermint | Kg | 0 | 5 | 10 | 15 | 0 | 0 | 0 |
| Basil | Kg | 0 | 0 | 0 | 0 | 5 | 10 | 15 |
| Limestone | Kg | 11.53 | 11.53 | 11.53 | 11.53 | 11.53 | 11.53 | 11.53 |
| Dicalcium phosphate 18 | Kg | 11.05 | 11.05 | 11.05 | 11.05 | 11.05 | 11.05 | 11.05 |
| Salt | Kg | 3.13 | 3.13 | 3.13 | 3.13 | 3.13 | 3.13 | 3.13 |
| D-L Methionine | Kg | 2.24 | 2.24 | 2.24 | 2.24 | 2.24 | 2.24 | 2.24 |
| L-Lysine | Kg | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 |
| Broiler Vitamin mix | Kg | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Broiler Mineral mix | Kg | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Multy Enzyme | Kg | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Anti Coccidial | Kg | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| TOTAL (Kg) | | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 |
| **Chemical contents in rations** | | | | | | | | |
| Dry Matter | % | 87.18 | 87.18 | 87.18 | 87.18 | 87.18 | 87.18 | 87.18 |
| Energy ME Kcal/Kg | | 3200 | 3200 | 3200 | 3200 | 3200 | 3200 | 3200 |
| Crude Protein | % | 22 | 22 | 22.01 | 22.02 | 22 | 22.01 | 22.02 |
| Crude Fat | % | 7.5 | 7.5 | 7.5 | 7.5 | 7.5 | 7.5 | 7.5 |
| Crude fiber | % | 3.74 | 3.75 | 3.79 | 3.84 | 3.77 | 3.79 | 3.84 |
| Ash | % | 5.65 | 5.69 | 5.72 | 5.75 | 5.68 | 5.75 | 5.77 |
| Methionine | % | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 |
| Lysine | % | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| Methionine & Cysteine | % | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 |
| Calcium | % | 1 | 1.01 | 1.02 | 1.03 | 1.01 | 1.02 | 10.3 |
| Phosphorus (Avaibly) | % | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| Phosphorus (Total) | % | 0.63 | 0.63 | 0.63 | 0.63 | 0.63 | 0.63 | 0.63 |
| Sodium | % | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 |
| Potassium | % | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Chlorine | % | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 |
| Linoleic Acid | % | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Na+K-Cl, Meq/Kg | | 239.84 | 239.89 | 239.88 | 239.91 | 239.84 | 239.89 | 239.92 |

### 3.1.5. Lighting programs

The following lighting program was applied on rearing chicks as following: Light should be provided 24 hours a day for broilers. At this time will increase feeding time, increase weight gain. Two 40-watt bulbs are used for 210 chickens at the experiment room. This used for prevent panic or piling if the electricity goes off during the project.

### 3.1.6. Heating programs

Whole House Brooding system was used and indirect heating source of control temperature in the house in the first seven days of brooding are the most critical for properly heating and caring for broiler chicks. If chicks are chilled, they won't grow properly. If chicks are too warm, they can become dehydrated. This may lead to death or delayed growth. Thus, we prepared the experiment room for 24 hours before the chicks arrived. Table 3.5. Showed daily temperature in experiment room.

Table 3.5. Daily temperatures in the experimental room

| Day | Temperature °C | Day | Temperature °C | Day | Temperature °C |
|---|---|---|---|---|---|
| 1 | 33 | 14 | 25 | 27 | 25 |
| 2 | 33 | 15 | 26 | 28 | 24 |
| 3 | 32 | 16 | 25 | 29 | 25 |
| 4 | 30 | 17 | 25 | 30 | 25 |
| 5 | 28 | 18 | 25 | 31 | 25 |
| 6 | 28 | 19 | 25 | 32 | 25 |
| 7 | 28 | 20 | 25 | 33 | 24 |
| 8 | 27 | 21 | 24 | 34 | 24 |
| 9 | 27 | 22 | 26 | 35 | 24 |
| 10 | 26 | 23 | 25 | | |
| 11 | 26 | 24 | 24 | | |
| 12 | 26 | 25 | 25 | | |
| 13 | 26 | 26 | 24 | | |

## 3.2. Methods

### 3.2.1. Experimental design

A total of 210 three day old, because for the first three days chicks was fed stander diet after that unsexed broiler chicks were randomly distributed into seven treatments (210 chicks) each treatment in the same weight non-significant between groups as we show in Table 3.6. Each treatment divided into three replications each replication Contain (10 chicks). The dietary peppermint and basil for each treatment as fallowing:

T1= the control group chicks fed the standard diet (S.D).

T2= Chicks fed S.D include 0.5% Peppermint (5g /kg).

T3= Chicks fed S.D include 1% Peppermint (10g /kg).

T4= Chicks fed S.D include 1.5% Peppermint (15g /kg).

T5= Chicks fed S.D include 0.5% Basil (5g /kg).

T6= Chicks fed S.D include 1% Basil (10g /kg).

T7= Chicks fed S.D include 1.5% Basil (15g /kg).

The weight of chicks were taken and randomly housed in floor pens with wood material. Artificial lighting is provided throughout the experiment. The temperature of the house and vaccination program applied based on broiler raisers recommendations. The chicks of each treatment were fed the respective diets and water was provided ad libitum throughout the five weeks. The average live body weights, body weight gains, feed intake and conversion ratio were measured on a weekly basis. Birds were slaughtered by cutting the throat and jugular vein using a sharp knife near the first vertebra. From each replicate 2 birds (each treatment 6 birds) were picked for eviscerating to calculate the dressing percent without the edible giblets (Heart, Liver and Gizzard) after recording their total live-weight.

Table 3.6. Body weights of birds used in this thesis at the start of experiment.

| Groups | Number of Chicks | Chicks Weight (g) |
|---|---|---|
| T1 | 10 | 753±8.71 |
| T2 | 10 | 749±17.00 |
| T3 | 10 | 753±8.66 |
| T4 | 10 | 735±6.22 |
| T5 | 10 | 733±6.36 |
| T6 | 10 | 742±7.09 |
| T7 | 10 | 736±3.18 |

The experimental design in this study which was used in this thesis include number of chicks, treatments, groups, number of replicates and levels of the plants, also contain study traits.

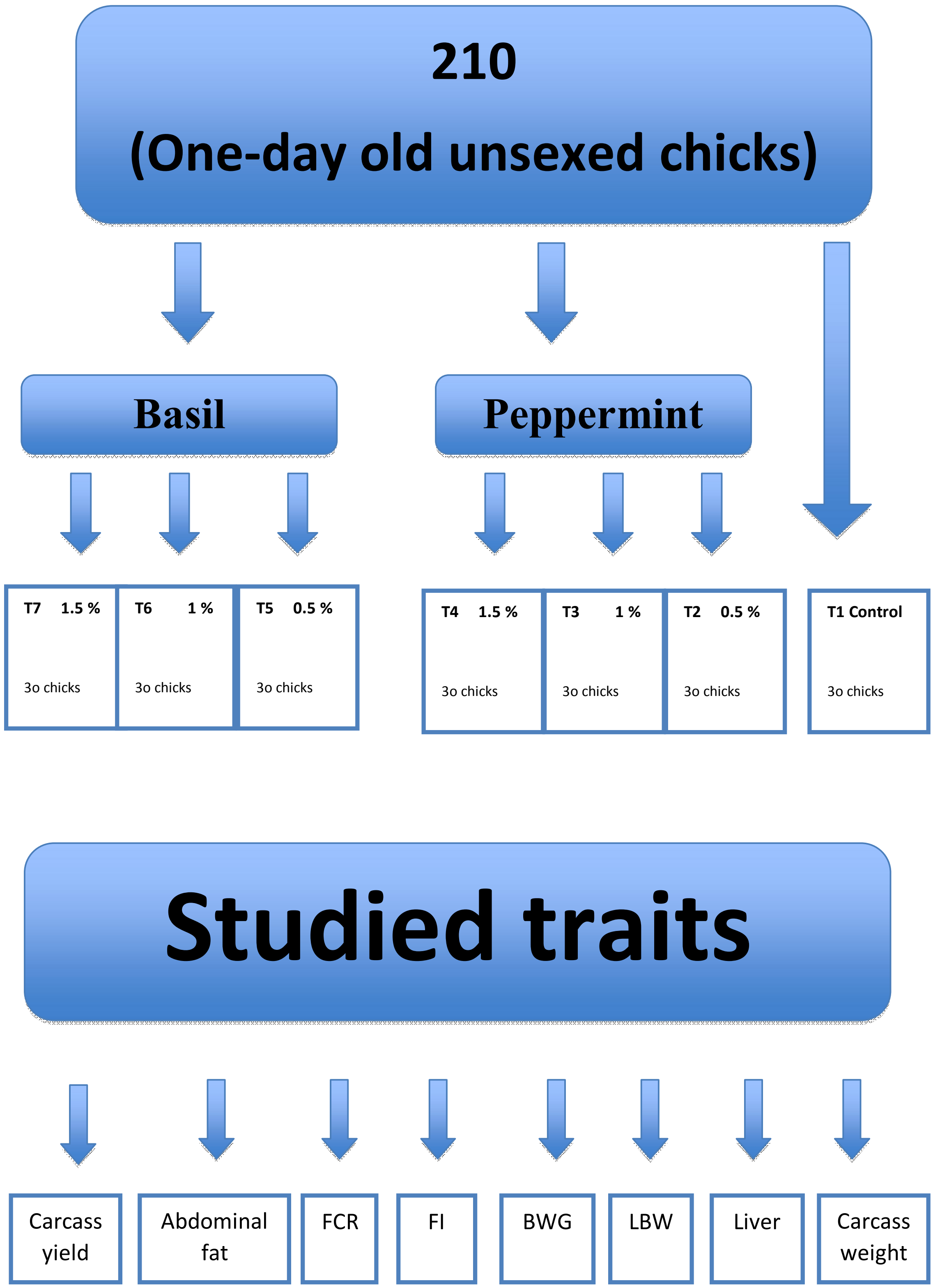


Figure 3.9. The experimental design which used in this thesis also explain treatments and traits.

### 3.2.2. Performance traits

BWG and LBW: At Three day old and at the end of each week, digital scales weighted birds for live body weight and body weight gain was calculated by using this equation:

Weight gain (g) = LBW at the end of the week-LBW at the beginning of the week

(Naji, 2006).

FI and FCR: Feed intake in each pen or replicate was recorded and measured weekly and feed conversion ratio was calculated by following equation:

Feed conversion ratio= FI during a period/ Weight gain during the same period (Naji, 2006)

### 3.2.3. Carcass characteristics

In the final week was recorded carcass weight were slaughtered by cutting the throat and jugular vein using a sharp knife near the first vertebra. From each replicate 2 birds (each treatment 6 birds) were picked for eviscerating to calculate the carcass weight without head, feat, intestine, feet and the edible giblets (Heart, Liver and Gizzard).

Two birds were randomly selected from each cage and individually weighed. The birds were slaughtered and eviscerated by hand. The carcasses were further processed by removal of the abdominal fat and by splitting into carcass at the final day. Also the data were subjected to statistical analysis using SPSS computer program.

Two birds were randomly selected from each cage and individually weighed. The birds were slaughtered and eviscerated by hand. Broiler is one of the most commonly eaten meats, Chicken liver does contain a large amount of cholesterol, but it also supplies healthy doses of many essential vitamins and minerals. Liver in each pen or replicate was recorded and measured in the final week and calculated.

### 3.2.4. Statistical analysis

The data were subjected to statistical analysis using SPSS computer program (statistical Package for Social Science) for windows, according to Dytham. Descriptive statistics were used for the analysis of the data result as follow, means and stander error. The analytical tests which used to compare between the different groups. Ready SAS statistical software (1998) was used and data analysis was done using Complete Randomize design (CRD). Differences between means were tasted using (Duncan, 1955), at 0.01, 0.05 and depending on the mathematical model of following:

$Y_{ij} = \mu + T_i + e_{ij}$

As:

$Y_{ij}$= value seen for prescription

$\mu$= Over all mean.

$T_i$= the effect of treatment.

$e_{ij}$= random error

# 4. RESULTS

## 4.1. Effect of Peppermint and Basil on Broiler Performance at the 1st Week

Table (4.1.) refers to the effect of different levels of peppermint and Basil on broiler performance at the 1st week. The different level of peppermint and basil had non-significant ($P \leq 0.05$) effect in LBW, BWG and FI at 1st week of age and different level of peppermint and basil had significant ($P \leq 0.05$) effect in FCR at 1st week of age. At 1st week of age the broiler on T1 the control (without adding peppermint & Basil) and T6 achieved highly significant ($P \leq 0.05$) on FCR as compared with other treatments, but there were non-significant differences between T2, T3, T4, T5 and T7 at the 1st week also between T1 control and T6 increases in FCR as compared with other treatments. But at 1st week of age the broiler on T3 (1% PPM) highest FCR compared with other treatments.

At the treatments T2, T4, T5, and T6 showed significant ($p \leq 0.05$) decreases in as compared with T3, but there were non- significant effect if compare between T2 and T4, T5, T6 at the 1st week of age.

Table 4.1. Effect of peppermint and basil on broiler performance at 1st week

| Groups | LBW (g) | BWG (g) | FI (g) | FCR |
|---|---|---|---|---|
| | X ±SE | X ±SE | X ±SE | X ±SE |
| T1 Control | 170±0.01 | 90±0.01 | 100±0.01 | 1.07±0.016[a] |
| T2 Peppermint (0.5%) | 180±0.01 | 100±0.01 | 110±0.01 | 1.09±0.003[ab] |
| T3 Peppermint (1%) | 170±0.01 | 100±0.01 | 110±0.01 | 1.13±0.021[b] |
| T4 Peppermint (1.5%) | 170±0.01 | 100±0.01 | 110±0.01 | 1.11±0.025[ab] |
| T5 Basil (0.5%) | 170±0.01 | 90±0.01 | 100±0.01 | 1.09±0.014[ab] |
| T6 Basil (1%) | 170±0.01 | 100±0.01 | 100±0.01 | 1.05±0.003[a] |
| T7 Basil (1.5%) | 170±0.01 | 90±0.01 | 100±0.01 | 1.09±0.07[ab] |

[a & b] Means within rows with different superscripts differ significantly at (p≤ 0.05)

### 4.2. Effect of Peppermint and Basil on Broiler Performance at the 2nd Week

Table (4.2.) refers to the effect of different levels of peppermint and basil on broiler performance at the 2nd week. The different level of peppermint and basil had significant (P≤0.05) effect in LBW, BWG, FI and FCR at 2nd week of age.

At the 2nd week of age the broiler on T1 the control and T2 achieved highly significant (P≤0.05) on LBW as compared with other treatments, but there were non-significant differences between T1 and T2, T3 and T6, T4 and T5, T7 at the 2nd week of LBW. But also at 2nd week of age the broiler on T1 increase LBW as compared with other treatments. At the treatments T4, T5 and T7 showed significant (p≤0.05) increases in LBW as compared with T3 and T6, but there were non- significant effect if compare between T1 and T2, T3 and T6, T4 and T5 and T7 which give lowest LBW at the 2nd week of age.

At the 2nd week of age the broiler on T1 the control achieved highly significant (P≤0.05) increase on BWG as compared with other treatments, but there were non-significant differences between T1 and T2, T2 and T3, T3 and T4 and T5 and T6 and T7 at the 2nd week of BWG. At the treatments T2 showed significant ($p \leq 0.05$) increases in BWG as compared with T4 and T5 and T6 and T7 but there were non- significant effect if compare between T1 and T2, T2 and T3, T3 and T4 and T5 and T6 and T7, but T4 which give lowest BWG at the 2nd week of age.

At the 2nd week of age the broiler on T1 and T2 achieved highly significant ($P \leq 0.05$) increase on FI as compared with T4 and T5, but there were non- significant differences between T1 and T2 and T3 and T6 and T7, T4 and T5, T2 and T3 and T4 and T5 and T6 and T7 at the 2nd week of FI. At the treatments T1 showed significant ($p \leq 0.05$) increases in as compared with T4 and T5, but there were non- significant effect if compare between T1 and T2 and T3 and T6 and T7, but T4, T5 which give lowest FI at the 2nd week of age.

At the 2nd week of age the broiler on T1 and T2 and T5 and T6 achieved highly significant ($P \leq 0.05$) increase on FCR as compared with T3 and T4 and T7 but there were non- significant differences between T1 and T2 and T5 and T6, T3 and T4 and T7 at the 2nd week of FCR. At the treatments T1 showed significant ($p \leq 0.05$) increases in FCR as compared with T3 and T4 and T7, but there were non- significant effect if compare between T1 and T2 and T5 and T6, but T4 which give lowest FCR at the 2nd week of age.

Table 4.2. Effect of peppermint and basil on broiler performance at 2nd week

| Groups | LBW (g) | BWG (g) | FI (g) | FCR |
|---|---|---|---|---|
| | X ±SE | X ±SE | X ±SE | X ±SE |
| T1 Control | 480±0.01$^{a}$ | 310±0.00$^{a}$ | 380±0.00$^{a}$ | 1.26±0.004$^{c}$ |
| T2 Peppermint (0.5%) | 470±0.00$^{a}$ | 300±0.01$^{ab}$ | 380±0.00$^{ab}$ | 1.27±0.01$^{bc}$ |
| T3 Peppermint (1%) | 450±0.01$^{ab}$ | 280±0.01$^{bc}$ | 370±0.01$^{ab}$ | 1.30±0.009$^{ab}$ |
| T4 Peppermint (1.5%) | 440±0.01$^{b}$ | 270±0.01$^{c}$ | 350±0.01$^{b}$ | 1.33±0.004$^{a}$ |
| T5 Basil (0.5%) | 440±0.01$^{b}$ | 280±0.01$^{c}$ | 350±0.01$^{b}$ | 1.29±0.013$^{bc}$ |
| T6 Basil (1%) | 460±0.01$^{ab}$ | 280±0.00b$^{c}$ | 370±0.01$^{ab}$ | 1.28±0.013$^{bc}$ |
| T7 Basil (1.5%) | 440±0.01$^{b}$ | 280±0.00b$^{c}$ | 360±0.01$^{ab}$ | 1.30±0.012$^{ab}$ |

$^{a-c}$ Means within rows with different superscripts differ significantly at ($p \leq 0.05$)

### 4.3. Effect of Peppermint and Basil on Broiler Performance at the 3rd Week

Table (4.3.) refers to the effect of different levels of peppermint and basil on broiler performance at the 3rd week. The different level of peppermint and basil had significant ($P \leq 0.05$) effect in LBW, BWG, but different level of peppermint and basil had there were non- significant effect in FI and FCR at 3rd week of age.

At the 3rd week of age the broiler on T1 achieved highly significant ($P \leq 0.05$) increase on LBW as compared with other treatments. But there were non- significant differences between T1 and T2, T2 and T3 and T4 and T5 and T6 and T7 at the 3rd week of LBW. At the treatments T1 showed significant ($p \leq 0.05$) increases in LBW as compared with other treatments, but there were non- significant effect if compare between T1 and

T2, T3 and T4 and T5 and T6 and T7, but T4 and T7 which give lowest LBW at the 3rd week of age.

Also at the 3rd week of age the broiler on T1 and T2 and T3 and T5 and T6 achieved highly significant (P≤0.05) increase on BWG as compared with T4 and T7. But there were non- significant differences between T1 and T2 and T3 and T5 and T6, T2 and T3 and T4 and T5 and T6 and T7 at the 3rd week of BWG.

At the treatments T1 and T2 showed significant (p≤0.05) increases in BWG as compared with other treatments, but there were non- significant effect if compare between T1 and T2, T2 and T3 and T5 and T6, T4 and T7 but T4 which give lowest BWG at the 3rd week of age. But in the 3rd week FI and FCR were non- significant differences between treatments.

Table 4.3. Effect of peppermint and basil on broiler performance at 3rd week

| Groups | LBW (g) | BWG (g) | FI (g) | FCR |
|---|---|---|---|---|
| | X ±SE | X ±SE | X ±SE | X ±SE |
| T1 Control | 1010±0.01$^{a}$ | 530±0.01$^{a}$ | 580±0.00 | 1.09±0.01 |
| T2 Peppermint (0.5%) | 970±0.01$^{ab}$ | 500±0.01$^{ab}$ | 550±0.01 | 1.11±0.01 |
| T3 Peppermint (1%) | 950±0.02$^{b}$ | 500±0.02$^{ab}$ | 540±0.04 | 1.09±0.04 |
| T4 Peppermint (1.5%) | 920±0.01$^{b}$ | 470±0.03$^{b}$ | 530±0.01 | 1.14±0.07 |
| T5 Basil (0.5%) | 930±0.03$^{b}$ | 490±0.02$^{ab}$ | 530±0.02 | 1.09±0.01 |
| T6 Basil (1%) | 950±0.01$^{b}$ | 490±0.00$^{ab}$ | 530±0.01 | 1.11±0.01 |
| T7 Basil (1.5%) | 920±0.01$^{b}$ | 480±0.00$^{b}$ | 540±0.01 | 1.13±0.01 |

$^{a\,\&\,b}$ Means within rows with different superscripts differ significantly at (p≤ 0.05)

### 4.4. Effect of Peppermint and Basil on Broiler Performance at the 4th Week

Table (4.4.) refers to the effect of different levels of peppermint and basil on broiler performance at the 4th week. The different level of peppermint and basil had significant ($P \leq 0.05$) effect in LBW, BWG, FI and FCR at 4th week of age.

Also at the 4th week of age the broiler on T1 and T2 and T3 and T5 achieved highly significant ($P \leq 0.05$) increase on LBW as compared with other treatments. But there were non- significant differences between T1 and T2 and T3 and T5, T2 and T3 and T5 and T6 and T7, T4 and T6 and T7 at the 4th week of LBW. At the treatments T1 and T2 showed significant ($p \leq 0.05$) increases in LBW as compared with other treatments, but there were non- significant effect if compare between T1 and T2 and T3 and T5, T2 and T3 and T5 and T6 and T7, T4 and T6 and T7 but T4 which give lowest LBW at the 4th week of age.

At the 4th week of age the broiler on T1 and T2 and T3 and T5 and T6 and T7 achieved highly significant ($P \leq 0.05$) increase on BWG as compared with T4. But there were non- significant differences between T1 and T2 and T3 and T5 and T6 and T7 at the 4th week of BWG. At the treatments T1 and others showed significant ($p \leq 0.05$) increases in BWG as compared with T4, but T4, which give lowest BWG at the 4th week of age.

At the 4th week of age the broiler on all treatments achieved highly significant ($P \leq 0.05$) increase on FI as compared with T4. But there were non- significant differences between T1 and T2 and T3 and T5 and T6 and T7, T2 and T4 and T6 and T7 at the 4th week of FI. At the treatments T1 and T3 showed significant ($p \leq 0.05$) increases in FI as compared with other treatments, but there were non- significant effect if compare between T1 and T2 and T3 and T5 and T6 and T7, T2 and T4 and T6 and T7 but T4 which give lowest FI at the 4th week of age.

At the 4th week of age the broiler on T4 achieved highly significant ($P \leq 0.05$) increase on FCR as compared with other treatments. But there were non- significant differences between T1 and T2 and T3 and T5 and T6 and T7 at the 4th week of FCR. At the treatments T4 and showed significant ($p \leq 0.05$) increases in FCR as compared with other treatments, but there were non- significant effect if compare between T1 and T2 and T3 and T5 and T6 and T7, but T5 which give lowest FCR at the 4th week of age.

Table 4.4. Effect of peppermint and basil on broiler performance at 4th week

| Groups | LBW (g) | BWG (g) | FI (g) | FCR |
|---|---|---|---|---|
| | X ±SE | X ±SE | X ±SE | X ±SE |
| T1 Control | 1570±0.04$^{a}$ | 560±0.03$^{a}$ | 890±0.03$^{a}$ | 1.59±0.04$^{b}$ |
| T2 Peppermint (0.5%) | 1510±0.02$^{ab}$ | 540±0.02$^{a}$ | 860±0.02$^{ab}$ | 1.58±0.00$^{b}$ |
| T3 Peppermint (1%) | 1500±0.04$^{ab}$ | 550±0.02$^{a}$ | 870±0.02$^{a}$ | 1.60±0.02$^{b}$ |
| T4 Peppermint (1.5%) | 1400±0.02$^{c}$ | 460±0.02$^{b}$ | 790±0.01$^{b}$ | 1.74±0.06$^{a}$ |
| T5 Basil (0.5%) | 1500±0.03$^{ab}$ | 570±0.001 $^{a}$ | 880±0.03$^{a}$ | 1.54±0.04$^{b}$ |
| T6 Basil (1%) | 1470±0.01$^{bc}$ | 520±0.01$^{a}$ | 830±0.01$^{ab}$ | 1.61±0.04$^{b}$ |
| T7 Basil (1.5%) | 1440±0.00$^{bc}$ | 520±0.01$^{a}$ | 830±0.01$^{ab}$ | 1.60±0.02$^{b}$ |

$^{a-c}$ Means within rows with different superscripts differ significantly at ($p \leq 0.05$)

### 4.5. Effect of Peppermint and Basil on Broiler Performance at the 5th Week

Table (4.5.) refers to the effect of different levels of peppermint and basil on broiler performance at the 5th week. The different level of peppermint and basil had significant ($P \leq 0.05$) effect in LBW, BWG, FI but different level of peppermint and basil had there were non- significant effect in FCR at 5th week of age.

At the 5th week of age the broiler on T1 and T2 and T5 achieved highly significant ($P \leq 0.05$) increase on LBW as compared with other treatments. But there were non-significant differences between T1 and T2 and T5, T3 and T4 and T6 and T7 at the 5th week of LBW. At the treatments T1 showed significant ($p \leq 0.05$) increases in LBW as compared with other treatments, but there were non- significant effect if compare between T1 and T2 and T5, T3 and T4 and T6 and T7, but T4 which give lowest LBW at the 5th week of age.

At the 5th week of age the broiler on T1 and T5 achieved highly significant ($P \leq 0.05$) increase on BWG as compared with other treatments. But there were non-significant differences between T1 and T5, T2 and T3 and T4 and T6 and T7 at the 5th week of BWG. At the treatments T1 and T5 showed significant ($p \leq 0.05$) increases in BWG as compared with other treatments, but there were non- significant effect if compare between T1 and T5, T2 and T3 and T4 and T6 and T7, but T6 and T7 which give lowest BWG at the 5$^{th}$ week of age.

At the 5$^{th}$ week of age the broiler on T1 and T5 achieved highly significant ($P \leq 0.05$) increase on FI as compared with other treatments. But there were non- significant differences between T1 and T2 and T3 and T4 and T5 and T6, T2 and T3 and T4 and T6 and T7 at the 5$^{th}$ week of FI. At the treatments T1 and T5 showed significant ($p \leq 0.05$) increases in FI as compared with other treatments, but there were non- significant effect if compare between T1 and T2 and T3 and T4 and T5 and T6, T2 and T3 and T4 and T6 and T7, but T4 which give lowest FI at the 5$^{th}$ week of age.

At the 5$^{th}$ week of age the broiler on FCR were non- significant differences between treatments.

Table 4.5. Effect of peppermint and basil on broiler performance at 5$^{th}$ week

| **Groups** | **LBW (g)** | **BWG (g)** | **FI (g)** | **FCR** |
|---|---|---|---|---|
| | X ±SE | X ±SE | X ±SE | X ±SE |
| T1 Control | 2260±0.06$^{a}$ | 690±0.03$^{a}$ | 1140±0.05$^{a}$ | 1.64±0.04 |
| T2 Peppermint (0.5%) | 2130±0.03$^{ab}$ | 620±0.01$^{b}$ | 1060±0.02$^{ab}$ | 1.72±0.01 |
| T3 Peppermint (1%) | 2110±0.08$^{b}$ | 620±0.04$^{b}$ | 1070±0.05$^{ab}$ | 1.73±0.02 |
| T4 Peppermint (1.5%) | 2020±0.01$^{b}$ | 620±0.01$^{b}$ | 980±0.03$^{ab}$ | 1.57±0.06 |
| T5 Basil (0.5%) | 2150±0.03$^{ab}$ | 650±0.01$^{ab}$ | 1090±0.01$^{a}$ | 1.69±0.02 |
| T6 Basil (1%) | 2080±0.02$^{b}$ | 610±0.01$^{b}$ | 1070±0.03$^{ab}$ | 1.76±0.04 |
| T7 Basil (1.5%) | 2050±0.03$^{b}$ | 610±0.03$^{b}$ | 1070±0.03$^{b}$ | 1.74±0.04 |

$^{a\,\&\,b}$ Means within rows with different superscripts differ significantly at ($p \leq 0.05$)

### 4.6. Effect of Peppermint and Basil on Totally Broiler Performance

Table (4.6.) refers to the effect of different levels of peppermint and basil on totally broiler performance. The different level of peppermint and basil had significant (P≤0.05) effect in LBW, BWG, FI and FCR.

At the totally broiler on T1 and T2 and T5achieved highly significant (P≤0.05) increase on LBW as compared with other treatments. But there were non- significant differences between T1 and T2 and T5, T3 and T4 and T6 and T7, T2 and T3 and T5 and T6 and T7 at the totally of LBW. At the treatments T1 and T5 showed significant (p≤0.05) increases in LBW as compared with other treatments, but there were non- significant effect if compare between T1 and T2 and T5, T3 and T4 and T6 and T7, T2 and T3 and T5 and T6 and T7 , but T4 which give lowest LBW at the totally broiler performance.

At the totally broiler on T1 and T5 achieved highly significant (P≤0.05) increase on BWG as compared with other treatments. But there were non- significant differences between T1 and T2 and T3 and T5, T2 and T3 and T4 and T5 and T6 and T7, T4 and T6 and T7 at the totally of BWG. At the treatments T1 and T5 showed significant (p≤0.05) increases in BWG as compared with other treatments, but there were non- significant effect if compare between T1 and T2 and T3 and T5, T2 and T3 and T4 and T5 and T6 and T7, T4 and T6 and T7, but T4 which give lowest BWG at the totally broiler performance.

At the totally broiler on T1 and T2 achieved highly significant (P≤0.05) increase on FI as compared with other treatments. But there were non- significant differences between T1 and T2 and T3 and T5 and T6 and T7, T2 and T3 and T4 and T5 and T6 and T7 at the totally of FI. At the treatments T1 and T2 showed significant (p≤0.05) increases in FI as compared with other treatments, but there were non- significant effect if compare between T1 and T2 and T3 and T5 and T6 and T7, T2 and T3 and T4 and T5 and T6 and T7, but T4 which give lowest FI at the totally broiler performance.

At the totally broiler on T6 and T7 achieved highly significant (P≤0.05) increase on FCR as compared with other treatments. But there were non- significant differences between T1 and T2 and T3 and T4 and T5, T2 and T3 and T4 and T5 and T6 and T7, T6 and T7, at the totally of FCR. At the treatments T6 and T7 showed significant (p≤0.05) increases in FCR as compared with other treatments, but there were non- significant effect if compare between T1 and T2 and T3 and T4 and T5, T2 and T3 and T4 and T5 and T6 and T7, T6 and T7, but T1 and T5 which give lowest FCR at the totally broiler performance.

Table 4.6. Effect of peppermint and basil on totally broiler performance

| Groups | Total LBW (g) | Total BWG (g) | Total FI (g) | Total FCR |
|---|---|---|---|---|
| | X ±SE | X ±SE | X ±SE | X ±SE |
| T1 Control | 2939±61.76[c] | 2186±62.88[c] | 3095±83.13[b] | 1.42±0.009[a] |
| T2 Peppermint (0.5%) | 2803±28.44[bc] | 2054±34.64[abc] | 2960±46.43[ab] | 1.44±0.002[ab] |
| T3 Peppermint (1%) | 2789±73.51[ab] | 2036±80.08[abc] | 2955±115.93[ab] | 1.45±0.002[ab] |
| T4 Peppermint (1.5%) | 2643±4169[a] | 1908±43.50[a] | 2762±42.48[a] | 1.45±0.013[ab] |
| T5 Basil (0.5%) | 2803±39.32[bc] | 2070±32.97[bc] | 2955±72.81[ab] | 1.43±0.017[ab] |
| T6 Basil (1%) | 2742±25.32[ab] | 2000±20.55[ab] | 2919±43.42[ab] | 1.46±0.008[b] |
| T7 Basil (1.5%) | 2712±28.84[ab] | 1977±26.10[ab] | 2892±25.10[ab] | 1.46±0.017[b] |

[a - c] Means within rows with different superscripts differ significantly at ($p \leq 0.05$)

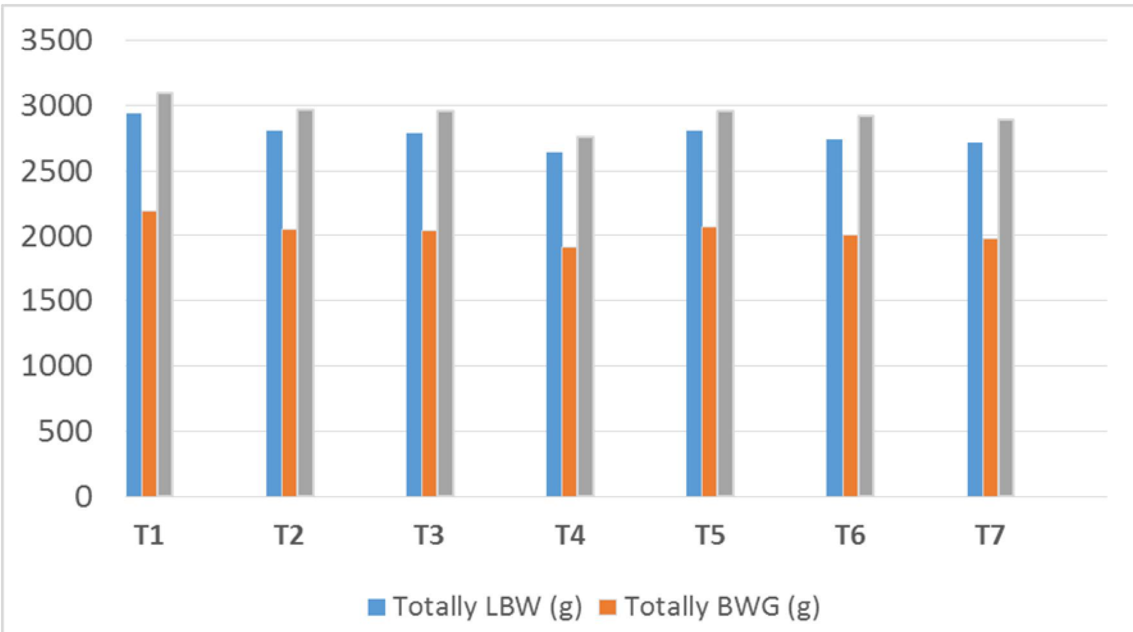


Figure 4.1. Totally broiler performance for 35 days of the experimental time

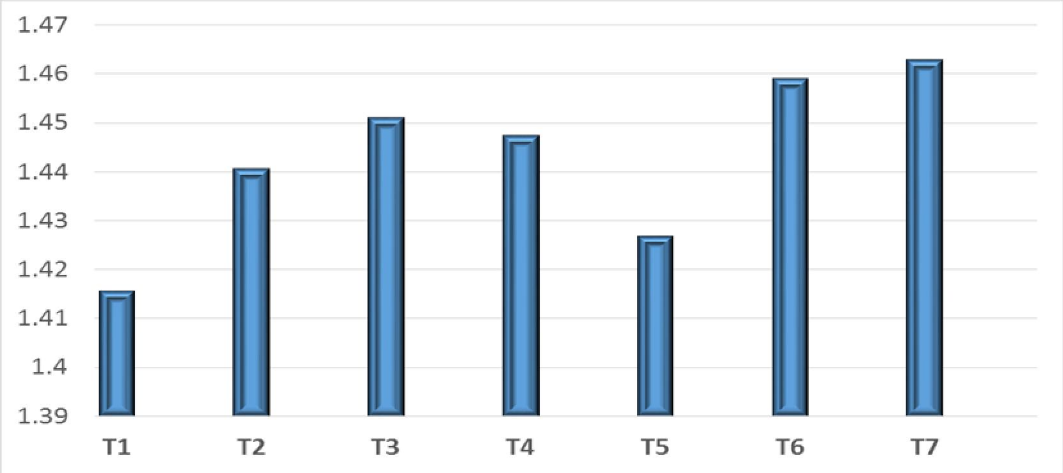


Figure 4.2. Totally FCR for the 35 days between the groups

### 4.7. Effect of Peppermint and Basil on Broiler Performance at the Final Day

Table (4.7.) refers to the effect of different levels of peppermint and basil on broiler performance at the final day we use final LBW because haven't tools and place to slaughter chicken in the 35 day we wait 2 days extra until organizing tools and place. The different level of peppermint and basil significant (P≤0.05) effect in final LBW and liver weight at the final day of age. But different level of peppermint and basil had there were non- significant effect in carcass weight and abdominal fat and carcass yield at the final day of age.

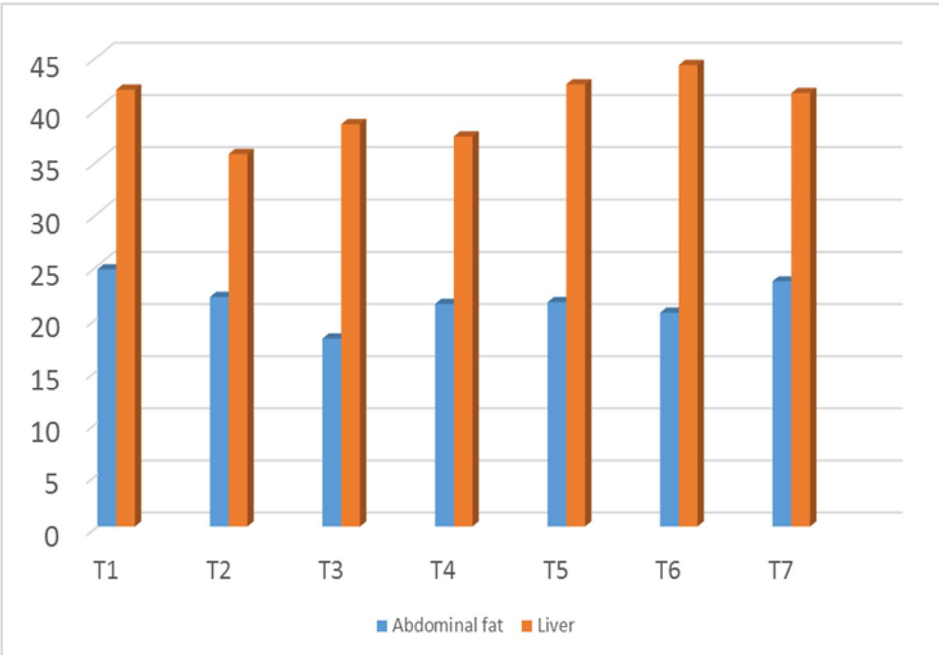


Figure 4.3. Carcass characteristics at the final day

Table 4.7. Effect of peppermint and basil on broiler performance at final day

| Groups | Final LBW (g) | Carcass weight (g) | Carcass yield % | Abdominal Fat (g) | Liver Weight (g) |
|---|---|---|---|---|---|
| | X ±SE | X ±SE | X ±SE | X ±SE | X ±SE |
| T1 Control | 2413±49.33$^{b}$ | 1777±47.94 | 73.73±3.12 | 24.67±4.00 | 41.83±1.30$^{bc}$ |
| T2 Peppermint (0.5%) | 2281±20.51$^{ab}$ | 1741±89.36 | 76.45±3.25 | 22±1.52 | 35.67±0.92$^{a}$ |
| T3 Peppermint (1%) | 2288±82.05$^{ab}$ | 1801±32.23 | 79.11±4.18 | 18±0.76 | 38.50±0.28$^{abc}$ |
| T4 Peppermint (1.5%) | 2178±12.19$^{a}$ | 1687±91.52 | 77.56±4.31 | 21.33±2.72 | 37.33±1.92$^{ab}$ |
| T5 Basil (0.5%) | 2313±28.08$^{ab}$ | 1755±52.48 | 75.85±1.41 | 21.50±2.59 | 42.33±2.35$^{bc}$ |
| T6 Basil (1%) | 2228±23.55$^{a}$ | 1705±50.17 | 76.53±1.70 | 20.50±1.25 | 44.17±1.48$^{c}$ |
| T7 Basil (1.5%) | 2205±35.83$^{a}$ | 1720±30.98 | 78.06±1.62 | 23.50±2.46 | 41.50±2.78$^{bc}$ |

$^{a-c}$ Means within rows with different superscripts differ significantly at ($p \leq 0.05$)

At the final day of age the broiler on T1 and T5 achieved highly significant ($P \leq 0.05$) increase on LBW as compared with other treatments. But there were non-significant differences between T1 and T2 and T3 and T5, T4 and T6 and T7, T2 and T3 and T5 at the final of liver weight. At the treatments T1 and T5 showed significant ($p \leq 0.05$) increases in LBW as compared with other treatments, but there were non-significant effect if compare between T1 and T2 and T3 and T5, T4 and T6 and T7, T2 and T3 and T5, but T4 which give lowest LBW at the final day of age.

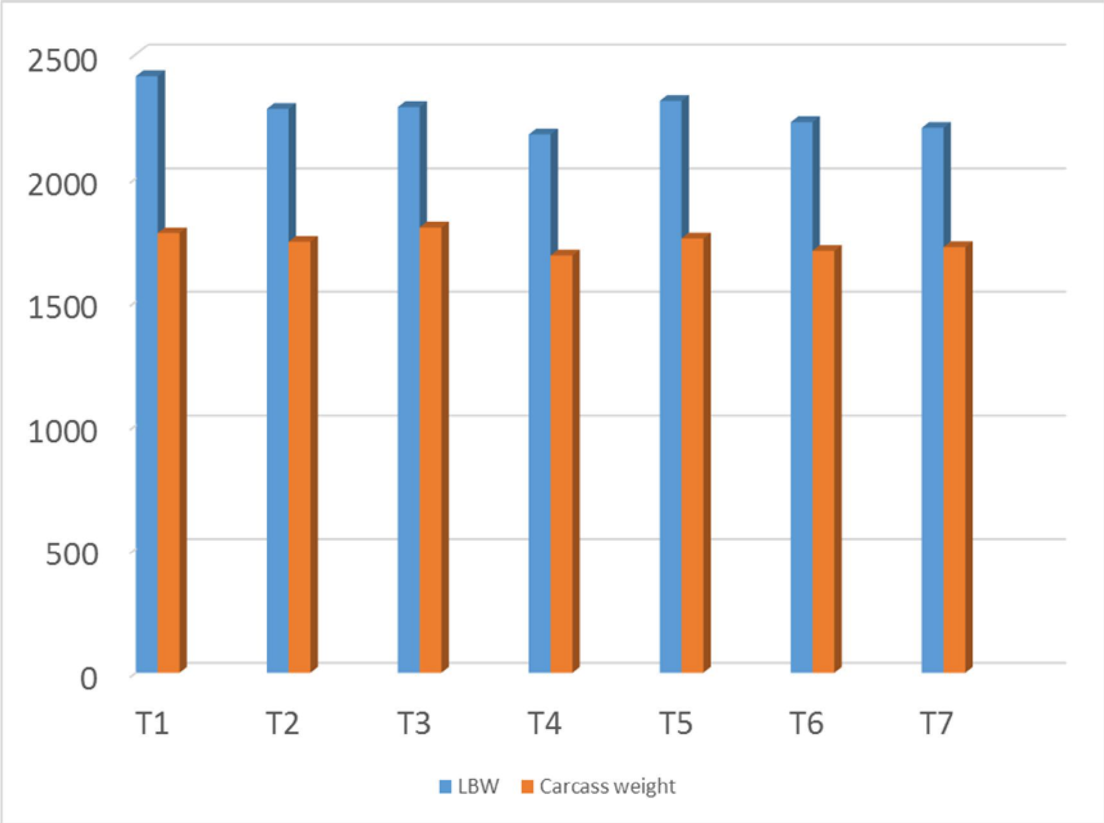


Figure 4.4. Broiler performance for the final day

At the final day of age the broiler on T6 achieved highly significant ($P \leq 0.05$) increase on liver weight as compared with other treatments. But there were non- significant differences between T1 and T5 and T7, T2 and T3 and T4, T1 and T5 and T6 and T7 at the final of liver weight. At the treatments T5 showed significant ($p \leq 0.05$) increases in liver weight as compared with other treatments, but there were non- significant effect if compare between T1 and T5 and T7, T2 and T3 and T4, T1 and T5 and T6 and T7, but T2 which give lowest liver weight at the final day of age.

## 5. DISCUSSION

### Effect of Peppermint and Basil on Broiler Performance

For the first week the results revealed that the dietary treatment had no significant effect ($P<0.05$) on the body weight gain and these results were in parallel to the findings of Amasaib *et al.*, ( 2013) who used spearmint as feed additive to the diets of birds. The findings of the present study were also in the line of (Galib *et al.*, 2010), who found insignificant effect of addition of peppermint on broiler body weight, but with improving performance compared to the control. Same results were noted by (Demir *et al.*, 2008) concerning the effect of spearmint on broiler body weight.

The results of Amasaib *et al.*, (2013) revealed that the dietary treatment had no significant effect ($P<0.05$) on feed intake. The birds fed 1% spearmint during second and third week obtained the highest feed intake. The increment in feed intake, which was illustrated in this study, may be due to the flavor effect of spearmint (Deyoe *et al.*, 1962). The insignificant effect of addition of spearmint to the basal diet may be due to the fact that, the diets were isocaloric and it is expected that the feed consumption could be similar (Scott *et al.*, 1982), or may be due to the similar environmental during this period.

Durrani *et al.* (2007) were reported the similar results that mean body weight gain was significantly higher for group B than the other three groups. No difference in the mean body weight gain of group A and C was observed, indicating that level of mint infusion used in these two groups have same influence. The three level of infusion used in this study have shown increased body weight gain compared with control group, but the best level that had highest effect was that of group B. The findings of this thesis is supported by the results of Al-Ankari *et al.* (2004) who reported that wild mint (*M. longifolia*) inclusion to broiler diet resulted a significant increase in mean body weight gain. The findings of this experiment could also be correlated to the findings of Durrani *et al.* (2006) who reported that broiler diet containing medicinal plant (*Curcuma longa*) resulted in significantly higher weight gain as compared to control. In addition antimicrobial, antifungal, antioxidant and anti-inflammatory effects of peppermint and basil were also reported by several reserchers (Ali, 1999; Uma-devi, 2001; Padurar *et al.*, 2008). Similarly, the supplementation of poultry diets with aromatic plants have a stimulating effects on digestive system of the animals through the increasing the production of digestive enzymes and by improving the utilization of digestive products through enhanced liver function (Hernandez *et al.,* 2004).

Live body weight due to effect of basil as a feed additive is presented. During the first period (1-3weeks old) showed significant ($P<0.05$) increase in live body weight for treatments T3, T4 and T10 compared with other treated groups and control, but treatments T2 showed lower live body weight than other treated groups and control. This could be due to the amount of the active compounds present in basil powder were not quite enough as compared with feed consumed during this period to show an increase in the validity and absorption capability of the nutrient constituent to get benefit from food (Hamodi and Al-Mashhadany, 2008). While during the second period (4- 6 weeks old) the results of T8, T9 and T10 recorded the highest significant ($P<0.05$) increase in live body weight as compared with other treated and control groups. However, during the studied period, it was showed a significant ($P<0.05$) increase in live body weight in T8, T9 and T10 treated groups compared with the other treated and control groups, while T5 showed the lowest value of live body weight compared with other treated and control groups. Present results are in agreement with the finding of Cabuk et al., (2003) in the importance effect of active substances in the medicinal and aromatic plants (cinnamate and eugenol) as an active substances and digestive stimulators, also its effect as antimicrobials, especially the intestinal microbes that located in the digestive system.

Murray et al., (199) reported that the improvement in body weight may be due to the presence of fat soluble, unidentified factors and essential fatty acids in medicinal and aromatic plant, or due to stimulating effect on the digestive system of broilers (Hernandez *et al*., 2004). Such improvement may be due to the anti-spasmodic and carminative properties of therapeutic plants (Osma and Abd El-Wahab, 2009), and similarly antipyretic, antispasmodic, stomachic antioxidant and antimicrobial activities of basil (Hussain et al., 2008). These finding were disagreement with those of Azoua (2001) who noted that adding fenugreek to broiler diet resulted in increased body weight. Also feeding different type of medicinal and aromatic plants supplementation significantly ($p<0.05$) affected feed intake value during the experimental period. Broiler fed basil, parsley and fenugreek seeds had the lower feed intake value during 42 days of age while there are insignificant differences appeared when chicks fed fenugreek seeds during 21 days as compared with control groups. The improvement in feed intake with the addition of MAP could be due to essential oils and their main component which stimulated the appetizing and digestive process in animals (Cabuk *et al*., 2003). Abaza (2007) indicated that fenugreek seeds caused significant decrease in feed consumption. There was no significant difference in FCR showed between fenugreek, parsley and control groups at 21 days of age. While chicks fed the diets supplemented with basil at levels 3 g/kg had the best FCR value at the two ages as compared to control groups. These results agree with the finding of El-Gendi *et al*., (1994) who indicated that there was an improvement in feed conversion with feeding herbal products as feed additives that could be attributed to their effect on improving the digestibility of dietary protein in the small intestine.

The rsults of Toghyani *et al*., (2010) were in parallel to the findings of Al-Ankari *et al.* (2004) who observed the beneficial influence of wild mint on broilers productive performance but later in another study Ocak *et al.* (2008) failed to monitor any significant effect of dry peppermint on broiler performance and carcass traits. Al-Beitawi and El-Ghousein (2008) also reported the positive effect of feeding black seed to broilers on body weight, FCR and some carcass characteristics. Those results agree with Rabia (2010), who reported that chicks fed basil diets had significantly heaviest body weights than those fed the control and fenugreek diets. They increased as inclusion level increased. This could be attributed to the presence of essential oils in basil. These volatile essential oils have been shown to contain biologically active components (Desphande and Tipnis, 1977). Juvocimere I and II contained in basil have been reported as potent juvenile analogs (Nishida *et al*., 1984). Several researchers have also reported improved body weight, body weight gain, feed conversion efficiency. Also feed intake was not significantly ($P>0.05$) different. However, there are numerical differences in feed intake. The slight numerical differences in feed intake of the treatments over the control is in agreement with the Herb Society of America (2004) which states that basil has appetizing properties. This has a positive implication to feed industries and farmers alike, as the feed miller is interested in profit accrued from bulk sales.

Feed conversion and live weight were also found to be significantly ($P<0.05$) different. This result agrees with Rabia (2010), who reported that chicks fed basil diets had significantly heaviest body weights than those fed the control and fenugreek diets. They increased as inclusion level increased. This could be attributed to the presence of essential oils in basil. These volatile essential oils have been shown to contain biologically active components (Desphande and Tipnis, 1977).

The results of this study support the observations of Spirling and Daniels (2001) who reported that mint has a positive effect on digestion and can strongly affect feed intake. These results could also be supported by the findings of Mimica-Dukic *et al.*, (1999) who reported that pharmacological properties of wild mint were resulted in increased intestinal motility, total bile secretion, hepatic anti-oxidant status and feed intake. The findings of the present study are in agreement with Grieve (1981) and Chopra *et al.* (1992) they reported that wild mint has significant effect on the feed conversion efficiency in studies on animals. The findings of this study could be supported by the findings of Larson (1988) who reported that wild mint infusion significantly increased intestinal efficiency and give better feed conversion efficiency. Brander (1985) reported that wild mint has antimicrobial properties and could be used as growth promoter; to improve feed utilization and weight gain in poultry.

AL-Kassie, (2009) showed that extract oil derived from thyme and cinnamon in broiler diets improved body weight gain, feed intake and feed conversion ratio, which may be due to active materials (thymol and carracerol) in these plants which are considered as digestion stimulating factors, in addition to their antimicrobial activity against bacteria found in the intestine (Cabuk *et al.*, 2003). Moreover, the improvement of body weight gain and feed conversion are due to the active materials (Cinnamaldehyde and eugenol) found in cinnamon, causing greater efficiency in the utilization of feed, resulting in enhanced growth. There is an evidence to suggest that herbs, spices and various plant extracts have appetite and digestion stimulating properties and antimicrobial effects (Kamel, 2001).

Amasaib *et al.,* (2013) showed the effect of spearmint on FCR which was found to be insignificant in the first five weeks of age, but it is significantly affected by addition of spearmint in the sixth week. This may be due to change in environment during this week and increasing of bird's age.

Al-Kelabi and Al-Kassie (2013) reported that feed intake was affected by addition of a sweet basil powder. The results showed that there was a significant difference in feed intake during the first period (1-3 weeks), second period (4-6 weeks) and also whole period. In the first period T8 and T9 showed significantly lowered feed intake than other groups. A significant difference noticed in feed intake for the second three weeks and whole periods among the treated groups, while T8, T9 and T10 groups shows a significantly lowered feed intake in whole period as compared with other groups, especially the control group showed the highest level of this trait. Present results agreed with the findings of Yurtseven *et al.*, (2008) who found significant and linear reduction in feed intake due to sage extract. Rabia (2010) indicated that feeding different types of MAP as feed additive significantly affected feed intake value during the experimental period, while Abd El- Latif *et al.*, (2004) found that the lowest values of feed intake and best feed conversion ratio with the addition of 0.5% chamomile flower to the Japanese quail feed diets. Mehmet *et al*, (2008) found that feed intake was reduced linearly by increasing doses of black seeds extract during 0 to 12 weeks of age. The results in this study were in contrast with the findings of Erener *et al.*, (2010) who found that supplementation of black seeds increased feed intake of broiler chicks. Moreover, the results of that study were in contrast with Cabuk *et al.*, (2003) found that feed intake to be improved with the addition of MAP and attributed to essential oils and their main components which stimulate the appetizing and digestive process in animals. The lowest values of feed intake in this study occurred in the groups those treated with sweet basil powder, these may be attributed to the strong smell and sharp taste of the extract since these are properties known to characterize antioxidants in basil plants (Telci *et al.*, 2006). Feed conversion ratio is regarded as a bird to convert the diet into a live body weight. Significant ($P<0.05$) differences were observed feed conversion ratio among treated and control groups in the three periods, however, T8, T9 and T10 in the 2$^{nd}$ period and whole period of the experiment showed a significant improvement as compared with other treatments and control groups. Present results were supported with the findings El-Gendi *et al.*, (1994) indicated that there was an improvement in feed conversion with herbal products used as feed additives, and could be important economic indicator on the ability of attributed to their effect on improving the digestibility of dietary protein in the small intestine. Narahari *et al.*, (2004) reported that basil leaves and other herbs be added in laying hens diet improved the egg weight, feed efficiency and health of hens. Also daily Body weight gain was found there is a significant ($P<0.05$) differences between treated groups and the control in the daily body weight gain. These results are in agreement with many published research works (Craig 1999; Triantaphyllou *et al.*, 2001; Abdo-Zeinab *et al.*, 2003; Soliman and Abdo-Zeinab, 2003). The main constituents of sweet basil include chavicol methyl ether or estragole, linalool and eugenol, and that carried out by (Ravid *et al.* 1997) whom suggested that linalool is the most active agent responsible for antibacterial activity, which caused an increase in broilers body weight gain, and linalool considered as the more active antimicrobial among most of sweet basil components and caused sterilization of the gastrointestinal tract, as a result of improving feed utilization and causing an increasing in daily body weight gains.

**Effect of Peppermint and Basil on Carcass Characteristics**

These results were in agreement with the findings of Lee *et al.* (2003) determined an increase in relative liver weight for birds given thymol, but this was seen only at the age of 21 d and not at 40 days that led increases of body weight. The leaves of peppermint also contain many important B-complex vitamins like folates, riboflavin and pyridoxine and the herbs are an excellent source of vitamin-K (USDA, 2012). A significant role in maintaining epithelial lining membrane of the organs and systems then increase their effectiveness (Hencken, 1992; Vendrell *et al*., 2001), thereby improving the feed intake, FCR, body weight and body weight gain, also herbal because of their high percentage fiber content which led to reduce the speed passage of food into the gastro-intestinal tract and thereby increase the rate of digestion and absorption of feed materials (Eovechov, 1972; Kwropatcin, 1982 and Naji and Kabro, 1999).

Galib and Al-Kassie (2010) showed the effect of peppermint on liver weight. They also reported that liver weight of control group was higher than those of the other groups. No differences in abdominal fat deposition were found in treated and untreated groups. Findings of the present study are supported by Hernandez *et al.* (2004) and Ismail *et al.* (2004), who reported no influence of treatment on weight of liver, in broilers, fed herbal plants extracts. Abbas, (2010) presented that feeding of 3 g/kg of fenugreek, parsley and basil seeds had not significantly affected liver, carcass and abdominal fat. Dressing percentage of broiler and the carcass weights were not significantly affected by addition of spearmint (Amasaib *et al*., 2013).

AL-Kassie (2009) showed that extract oil derived from thyme and cinnamon in broiler diets improved body weight gain, feed intake and feed conversion ratio, which may be due to active materials (thymol and carracerol) in these plants which are considered as digestion stimulating factors, in addition to their antimicrobial activity against bacteria found in the intestine (Cabuk *et al*., 2003). These results agree with the work of Langhout (2000), who showed that oil extracts could stimulate the digestion system in poultry, improve the function of liver and increase the pancreatic digestive enzymes. Enhancement of the metabolism of oil, carbohydrates and proteins in the major organs would increase growth rate of these organs (Mellor, 2000a;b).

## 6. CONCLUSIONS

In poultry meat production birds have to face several challenges disturbing the normal functioning of the organism. Mainly, the gastrointestinal tract may be influenced resulting in impaired absorption of nutrients and by this in reduced performance. Most characteristics of 0.5% peppermint and 0.5% basil treatments groups achieved high significant differences as compared with the other treatments. Supplementation of diet with 0.5% peppermint and 0.5% basil have beneficial effects on the live body weight, body weight gain, feed intake and feed conversion ratio.

According to the above conclusions the following recommendations could be stated:

The development of food culture and health and in particular by encouraging the usage of different kind of herbs as feed additives instead of using as a growth promotes poultry feed for the way the media in the country. Peppermint and basil are advisable to be used as feed additive in poultry diets especially in broiler. Further studies needed to be undertaken on the impact of different species of herbs on poultry production. Use different levels of peppermint and basil or uses different plants to improve broiler performance. Further studies needed to experimented to understand the possible effects of these medicinal plants on survival rate and variability of gut microbes of birds, since their potential effects against coccidial and other pathogenic microorganism.

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