



EFFECT OF DIET SUPPLEMENT OF DRY PEPPERMINT LEAVES ON PERFORMANCE, PRODUCTIVE INDEX AND THYROID HORMONES IN A BROILER

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Abstract

The study designed to investigate the impact of different peppermint leaves powder concentrations (*Mentha piperita*) on the production and content of triiodothyronine (T_3), thyroxine (T_4) in the blood of broiler chickens (serum). Broiler chickens 120, one-day-old (ROS 308) were divided into four nutritional treatments with 3 replicates of 10 birds each, with complete randomized design. A basal diet as control, a basal diet supplemented with 100(1%), 200 (2%) and 300(3%) mg/kg diet of peppermint powder, respectively. The findings showed substantial variations ($P \leq 0.05$) in body weight (BW), feed conversion ratio (FCR) and body weight gain, as well as a decrease in feed consumption at 35 days after the experiment in birds fed 200 mg of peppermint leaves powder. In treatment supplemented with 200 mg of peppermint leaves powder, the production index was found to be a significantly higher than other treatment classes at thirty-five days of age. Also, the results showed that the treatment of peppermint leaves powder concentration at 200 mg/kg of diet improved significantly serum T_3 and T_4 concentrations at 35 days of age compared to other treatments. Overall, results showed that supplementing peppermint leaves powder in the diet at a range of 200mg / kg has improved performance and product index, but an oxidative potential to improve thyroid gland function through the experimental period.

Key words : peppermint, Performance, Productive Index, Thyroid Hormones, Broiler.

Introduction

Following the prohibition of the use of antibiotics as growth promoters, researchers have found alternative natural growth promoters such as phytogenics. The use of phytogenics as feed additives is increasing notable improvements on the digestive system through its stimulatory and antimicrobial effects (Jang *et al.*, 2004). Furthermore, several researchers had reported the use of antibiotic in the broiler fed caused adverse effects. (Baharvand-Ahmadi *et al.*, 2015). The widespread problem in broiler farm due to using antibiotic like increasing costs of production with harming the safety of humans as a result of using pharmaceutical residues. Studies notes that the use of herbal material can play an important role in developing safe (organic) products, in

addition to increasing production (Baharvand-Ahmadi *et al.* 2016).

Peppermint (*Mentha piperita* L.) is a medicinal plant containing different kinds of essential oils, including menthol, mentone, methyl acetate, piperitone and cavone (Kizil *et al.*, 2010) Such essential oils facilitate biological effects like the production of antimicrobials (Dzamicet *et al.*, 2010) and antioxidation of bile acid secretion (Mkaddem *et al.*, 2009; Baliga and Rao, 2010; Twegh *et al.*, 2020) These herbs are commonly used around the world in the food, fragrance, cosmetics and pharmaceutical industries (Farhadi *et al.*, 2016) Menthol is the chemical component of peppermint. It is the principal phenolic constituent in the oil of peppermint that has antibacterial activity (Cabuk *et al.*, 2006). Several dietary

herbs, plant extracts, particularly essential oils, were studied for their antimicrobial and growth-promoting abilities (Bampidis *et al.*, 2005; Griggs and Jacob, 2005). Besides that, it has been suggested that factors like the technique utilized to extract the essential oil of the herb can affect the outcome of a test (Hernandez *et al.*, 2004). The extract's chemical composition seems essential to obtaining maximum effects (Cross *et al.*, 2002; Cross *et al.*, 2007). The present study was conducted to describe the effects on growth performance, productive index and thyroid hormones in broilers of the dietary dry peppermint leaves as growth promote supplementation.

Materials and Methods

The experiments were conducted on 120 one day old broiler (Ross- 308) reared for 35 days from 17/11/2019 to 22/12/2019 in Agriculture College field – Basra. The bird's initial weight was (43.0 gm). Birds were randomly distributed into 4 treatments, each one contains 3 replicates (10 bird each) T₁ (control, a basal diet without any additives), T₂ (added 1% dried peppermint leaves), T₃ (added 2% dried peppermint leaves) and T₄ (added 3% dried peppermint leaves). Feed and water were supplied ad libitum, the feed prepared from the same field that content (2900, 3200 Kcal/ kg) metabolized energy, (23,19%) crud protein in starter and finisher diet respectively. The birds were randomly distributed across 12 cages (3 replicate/treatment). Throughout the experiment, continuous lighting supplied. The environmental condition of the field was kept at 35c° then decreased 3c° until constant at (20-21c°), humidity kept at 60%. The birds were given for Newcastle vaccine at age 7 days and Gambaro vaccine at age 14 days. According to recommendations of the National Research Council (NRC, 1994), all birds used for the experiment have been taken care of.

The peppermint (*Mentha piperita*) leaves purchased from the local market, then it was dried in shadow place and stored for futurity. Throughout this experiment in 1,3 and 5 weeks the body weight, feed intake, feed conversion ratio and body gain were recorded. In this study blood collected from thigh vein from 12 birds/treatment. At the end of the finisher period, two birds from each replicate were randomly selected and their blood samples were separated. Serum was stored at (-20c°) until assayed thyroid hormones. Total T₂ and T₃ levels were analyzed by the ELISA technique using a commercial kit purchased from Abbott company, United States- America.

The results obtained in the experiment were analyzed by one- way ANOVA and data performed by using Completely Randomized Design (CRD) according to

SPSS Software (2012).

Results and Discussion

The data from this study was reported that broilers feed on peppermint leaves resulted in a significant increase in live body weight at the end of rearing period at the third treatment compared to control and other treatments as show in table 1. The beneficial effect of 2% (200mg/kg) of peppermint leaves powder on raise live body weight average on increasing average live body weight. This result was agreed with Ocak, *et al.*, (2008) which noticed that peppermint to have decreased effects on gastrointestinal disorders, thus enhancing the digestive system and ameliorate feed efficiency (Mehranpoor 1995). Also, the peppermint antiseptic properties prevent the harmful growth of the bacteria in the alimentary tract, leading to greater digestion and absorption. The peppermint antiseptic property is a consequence of the existence of menthol Movaseghi (1990).

Sefidcon (1996) showed that peppermint has reinforced slow motion stomach and intestinal due to alpha humlone (NRC,1994). A further research has shown that peppermint extract induces ileum spasm neutralization in Indian pigs (Nanekarani *et al.*, 2012). On the other hand, many researchers recorded numerous results on peppermint use such as Al-Ankari, *et al.*, (2004) analyzed DPM supplementation (*Mentha piperita*) at rates of 0.25, 1.0, 1.5, and 2.0 percent in 35-day broiler diets and found that 1.5 percent DPM had beneficial BW and FCR. Likewise, Nobakht *et al.*, (2011) reported that feeding 0.5 percent of dried *Mentha pulegium* resulted in positive effects in broilers at age 42 on performance and carcass traits.

Table 2 shows the effect of dried peppermint leaves supplementation in diets on the intake of feed from broilers aged 35 days. The feed consumption of broilers fed dried peppermint leaves diets at 35 days of age was substantially reduced from control and other supplementation diets in third treatments. The higher body weight gain was seen in broilers that fed the diet of peppermint in the table 3 compared with control and other treatments this result was found in third treatments, which could be related to the recorded menthol properties (Lovkova *et al.*, 2001).

The active principles of essential oils serve as digestibility enhancers, balancing the gut microbial environment and stimulating the secretion of endogenous digestive enzymes and thus enhancing the efficiency of poultry growth (Cross *et al.*, 2007). Furthermore, peppermint 's principal compound is likely to increase the digestibility of diet as a digestive stimulant, thereby

Table 1: Effect of Peppermint leaves powder on average of the live body weight (gm) of broiler chickens, (Mean± SE).

Treatments	One week	Third week	Fifth week
TC	131.66±5.35	513.89±60.54	1455.3 ^c ±1.14
T ₁	138.47±10.54	518.33±56.70	1474 ^c ±95.99
T ₂	148.33±13.36	598.61 ^a ±42.57	1670 ^a ±42.89
T ₃	140.67±4.46	569.30±35.41	1527.9 ^b ±43.78
Significance	N. S	N. S	S

TC= control, T₁= 1% (100 mg\ kg) dried peppermint leaves, T₂= 2% (200mg\kg) dried peppermint leaves, T₃= 3% (300mg\ kg) dried peppermint leaves. N.S mean no significance between all treatment, * mean significantly (P<0.05).

Table 2: Effect of Peppermint leaves powder on feed intake of broiler chickens, (Mean± SE).

Treatments	One week	Third week	Fifth week	Total
TC	222.40±6.11	642.54±17.66	1646.6±45.27	2511.53 ^a ±14.29
T ₁	187.88±5.70	628.09±17.26	1559.2±42.86	2375.22 ^b ±12.40
T ₂	192.18±7.39	616.63±16.95	1549.9±38.90	2358.70 ^c ±11.54
T ₃	183.48±7.06	640.02±17.59	1552.9±38.98	2376.43 ^b ±12.51
Significance	N. S	N. S	N. S	S

TC= control, T₁= 1% (100 mg\ kg) dried peppermint leaves, T₂= 2% (200mg\kg) dried peppermint leaves, T₃= 3% (300mg\ kg) dried peppermint leaves. N.S mean no significance between all treatment, * mean significantly (P<0.05).

Table 3: Effect of Peppermint leaves powder on weight again of broiler chickens, (Mean ± SE).

Treatments	One week	Third week	Fifth week	Total
TC	88.66±5.35	470.2±34.49	766.6±36.56	723.6 ^c ±25.46
T ₁	95.47±10.54	416.4±28.74	819.3±60.98	776.3 ^c ±33.42
T ₂	105.3±13.36	448.1±18.40	956.0±12.97	913.0 ^a ±14.91
T ₃	97.69±7.73	417.2±43.04	900.5±27.89	857.5 ^b ±26.22
Significance	N. S	N. S	N. S	S

TC= control, T₁= 1% (100 mg\ kg) dried peppermint leaves, T₂= 2% (200mg\kg) dried peppermint leaves, T₃= 3% (300mg\ kg) dried peppermint leaves. N.S mean no significance between all treatment, * mean significantly (P<0.05).

Table 4: Effect of Peppermint leaves powder on feed conversion rate of broiler chickens, (Mean ± SE).

Treatments	One week	Third week	Fifth week	Total
TC	2.53±0.21	1.37±0.12	2.15±0.14	3.47 ^a ±0.15
T ₁	2.00±0.19	1.52±0.13	1.92±0.17	3.05 ^b ±0.01
T ₂	1.87±0.12	1.37±0.05	1.61±0.05	2.58 ^c ±0.01
T ₃	1.87±0.08	1.54±0.10	1.72±0.07	2.77 ^b ±0.05
Significance	N. S	N. S	N. S	S

TC= control, T₁= 1% (100 mg\ kg) dried peppermint leaves, T₂= 2% (200mg\kg) dried peppermint leaves, T₃= 3% (300mg\ kg) dried peppermint leaves. N.S mean no significance between all treatment, * mean significantly (P<0.05).

raising the intake rate of nutrients in the early stages of birdlife, without influencing feed conversion.

The findings of this study showed that supplementation had a major impact on broiler efficiency including feed

conversion rate (Table 4). Our tests showed that powdered peppermint (2%) had beneficial effects on FCR. In particular, this result agrees with Nobakht and Aghdam Shahriar (2011) indicate that 2% of herbal medicinal mixtures (mallow, thorny camel and mint) increased daily weight and FCR than the control group, Probably due to the antibacterial and antifungal activity botanicals in the experiment. Similarly, Ghalib and Al-Kassi, (2010) found an increase in BWG and FCR under peppermint powder dietary treatment. Mimica-Dukic *et al.*, (2003), used mint oil in broiler diet, and observed an enhancement in bile secretion rate, bowel safety, increased growth rate and lower feed intake, resulting in better FCR.

In the third treatment, peppermint leaves were added to the broiler diet shown in table 5 indicating an effect on the productive index ($p \leq 0.05$), which appears more strongly compared to control and other treatments. Such findings may be linked to the herbal plant, which may enhance the poultry digestion system, boost liver function and rise digestive enzymes in the pancreatic system. Also, herbal plant improves the metabolism of carbohydrates and proteins in the main organs will increase the growth rate (Mellor, 2000). Therefore, the 2% (200) mg of peppermint leaves may be improved the digestive enzyme more than 1% (100) mg and 3% (300) mg of dried peppermint. This result may be related to the positive effect of 2% dried peppermint leaves on production performance than leading to increase broiler production index. In addition, peppermint's antiseptic property inhibits the harmful growth of bacteria in the digestive system which has contributed to improved digestion and absorption. Peppermint's antiseptic activity benefits from the presence of menthol Movaseghi (1990).

According to the data given in table 6, the experimental diets (200mg of peppermint leaves powder/kg of diet) at the end of the period, significantly affected the serum content of T₂ and T₃, that is, the amount of T₂ and T₃ in the blood of chicken improved the thyroid function compared to other treatments, but similar with result of four treatment. In another hand, this result does not agree with the study by Ahmadi (2010), who found that the addition of rapeseed meal to the diet did not improve the

Table 5: Effect of Peppermint leaves powder on Productive index of broiler chickens, (Mean \pm SE).

Treatments	Productive index
TC	119.82 ^d \pm 99.83
T ₁	138.07 ^c \pm 49.07
T ₂	184.93 ^a \pm 14.29
T ₃	157.59 ^b \pm 41.49
Significance	S

TC= control, T₁= 1% (100 mg\ kg) dried peppermint leaves, T₂= 2% (200mg\kg) dried peppermint leaves, T₃= 3% (300mg\ kg) dried peppermint leaves. N.S mean no significance between all treatment, * mean significantly (P<0.05).

Table 6: Effect of Peppermint leaves powder on thyronine and thyroxine hormones in serum of broiler chickens, (Mean \pm SE).

Treatments	T ₃	T ₄
TC	1.65 ^b \pm 0.009	2.67 ^b \pm 0.089
T ₁	1.57 ^b \pm 0.115	3.10 ^{ab} \pm 0.240
T ₂	1.95 ^a \pm 0.110	3.51 ^a \pm 0.250
T ₃	1.70 ^b \pm 0.124	2.06 ^b \pm 0.268
Significance	S	S

TC= control, T₁= 1% (100 mg\ kg) dried peppermint leaves, T₂= 2% (200mg\kg) dried peppermint leaves, T₃= 3% (300mg\ kg) dried peppermint leaves. N.S mean no significance between all treatment, * mean significantly (P<0.05).

T₂ and T₃ levels in broiler serum.

Probably by their immune-stimulating properties, such herbal plants have beneficial effects on livestock growth and health (Guo *et al.*, 2004). Peppermint also comprises polyphenolic compounds and thus might have potent antioxidant activity (Dorman *et al.*, 2003). This may affect thyroid action as a result of stimulating the secretion of T₂ and T₃ from the thyroid gland to broiler blood as all performance characteristics have been improved.

Conclusion

Peppermint leaves powder improved live body weight, weight gain and feed conversion at level 2 % (200mg/kg diet), but other levels 1% (100mg/kg diet) and 3% (300/ kg diet) had a negative impact on broiler efficiency. Feeding 2% of peppermint leaves powder has beneficial effects on thyroid hormones and the development of the production index.

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