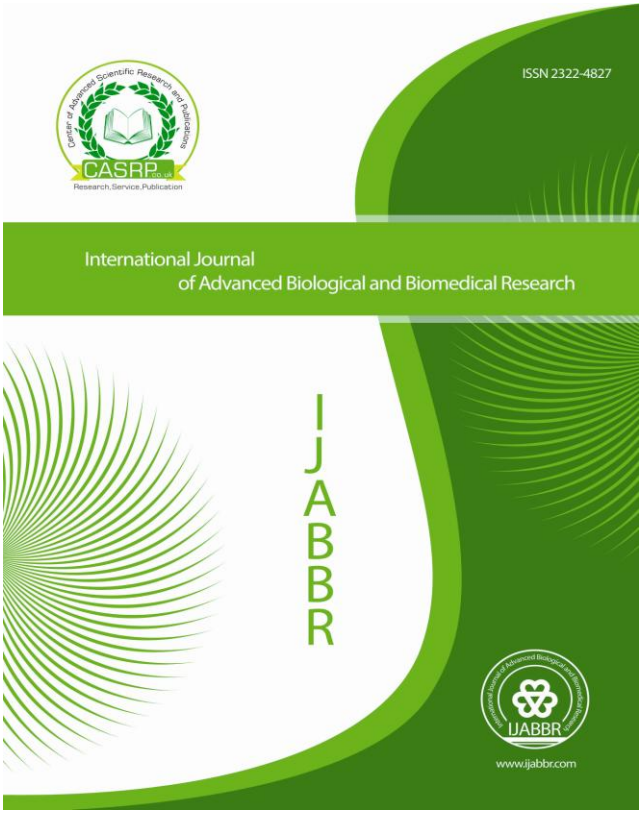

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Influence of *Saturejahortensis L.* essential oil in drinking water on broiler production and some blood biochemical parameters

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Abstract

This study was conducted to assay the use of Saturejahortensis L. (savory) essential oil in the drinking water on broiler production and blood glucose, uric acid, creatinin and cholesterol. Four hundred and twenty day old broiler chickens (Ross 308) was used in a completely randomized design with 6 treatments and 5 replicate. Experimental treatments included: 1) control, 2) Tween (a solvent for dissolving savory essential oil in it and then in water) to the amount of 1000 ppm and 100, 200, 300, 400ppm savory essential oil were mixed in tween in drinking water for broiler chickens during the growth period, respectively for other 4 treatments.The results show

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that adding savory essential oil to the drinking water of broiler chickens at ages 1 to 42 days makes a significant decrease in live weight and feed intake by broiler chickens compared with the control group ($P<0.05$). Treatments had no effects on blood biochemical parameters of glucose, creatinine, uric acid and cholesterol. Based on the results of this investigation it seems that savory essential oil in drinking water had negative effects on broiler production.

Keywords: Savory essential oil, Broiler production, Blood biochemical parameters.

1. Introduction

Increasing population and tendency to urbanization, shortage of critical factors such as food, water and even the air will follow. It is evident that providing enough resources for current population has been associated with some limitations. Global dimensions of food security are diverse and broad. Although some countries in terms of nutritional indicators show ideal digits, food poverty in many developing countries has become a serious problem. Despite having significant structural reforms that have been achieved in the production sectors, nevertheless Iran with a population of about 75 million far from optimal food system. On the other hand, given that 60-70% of the poultry's production cost is related to feed, providing feed for poultries is important. In order to providing the food requirements of the world population, it doesn't seem the perfect solution to increase the area under cultivation of crops and increasing the number of livestock units due to existing limitations. Therefore, the efficient use of available feed resources is the solution that it seems more appropriate. Also use of antibiotics in this regard has dating back for more, but use of it in poultry's ration due to concerns about resistance of pathogens factors to antibiotics, it has been removed from the rations of poultries and other farm animals (Choct, 2001; Christaki, 2004 ; Dibner and Richard, 2005; Doyle, 2001).

In Europe, removing the antibiotics from poultry rations causes death and disease, especially those Necrotic Enteritis, and reduce the performance (Choct, 2001; Dibner and Richard, 2005). Enzymes, probiotic, prebiotic, essential oils(Al- Kassie, 2008; Bölükbaşi, 2006; Christaki, 2004; Cross et al., 2007; Denli et al., 2004) and organic acids are alternatives that gradually were recommended by scientists (Ebrahimi et al., 2013; Ghalamkari et al., 2011; Jang et al., 2007; Khosravinia et al., 2013).

Some medicinal plants by having effective components such as phenols, terpenoids, extracted volatile oil, alkaloids, lectins and etc, they have antimicrobial effects, improve digestion, reduce lipid concentrations and cholesterol levels and antioxidant properties, and ultimately to improve poultry growth (Ebrahimi et al., 2013; Lee et al., 2003a; Lee et al., 2004a; Lee et al., 2004b; Lee et al., 2003b). In different studies, different forms of drug plants have been studied such as their powder and essences, but among of conducted studies on plant or savory essential oil have been more limited and due to the difference between the grown savory essential oil compounds in different regions, need to explore a variety of native plants and their effects on various parameters of broiler chickens becomes obvious. Savory is an annual grass with green leaves covered with dark gray narrow cross; flowers are small, white or dark red. The essential oil of this plant is about 30 to 35 percent. This plant contains effective consisted of Carvacrol, 40 to 50 percent Thymol, Alph-beta Pinene, and Linalool (Christaki, 2004).

Cross et al. (2007) have been studied five plants, savory (*SatureiaHortensis*), Yarrow rosemary, Marjoram (a rate of 10gon10 kg) and their essential oil (a rate of 1g on 10 kg) on growth and digestibility in 7 to 28 days broiler chickens. The essential oil of thyme (*Thymus vulgaris*) and yarrow plant have the greatest effect on performance, while the savory (*SatureiaHortensis*) and Yarrow essential oil had little effect. Jang et al. (2007) have been studied the effect of a mixture of essential oil including Thymol and Carvaecrol in both 25 and 50 mg levels on secretion of digestive enzymes. Essential oils increased trypsin, Alpha-amylase, and pancreas' activity than the control group and the group was contained antibiotics. Lee et al. (2003a) concluded that effect of Thymol and carvacrol on plasma lipids of 200 mg per kg broiler chickens, decreased triglycerides and plasma phospholipids and had not any effect on HDL.

The goal of this investigation was to study the effect of the use of savory essential oil in drinking water on production traits and blood biochemical metabolites of broiler chickens.

2. Materials and methods

In this experiment 420 one day old broiler chickens (Ross 308) with 6 treatments and 5 replicate in a completely randomized design was placed on 30 groups. During the testing three types of starter, grower and finisher ration for days 0-7, 8-21 and 22-42 respectively during 42 days was fed to broiler chickens. To make savory essential oil soluble in water at a ratio of 2 to 1, it was mixed with a substance called Tween. Tween possible effects are considered on performance and studied indicators of an experimental treatment that broiler chickens were fed into the treatment alone with Tween in the experiment. All factors such as temperature, light, water, ventilation and vaccination were similar for all treatments and based on local veterinary office.

Table 1
Experimental rations related to rearing period.

Ingredients %	Starter	Grower	Finisher
Corn	53.58	56.15	65.65
Soybean meal	40.69	37.46	28.65
Sunflower oil	1.45	2.50	2.33
Di-calcium phosphate,	1.56	1.44	1.01
Shell powder	1.28	1.36	1.15
Salt	0.27	0.3	0.3
Baking soda	0.1	0.03	0
Mineral supplements	0.25	0.25	0.25
Vitamin supplements	0.25	0.25	0.25
HCL-Lysine	0.19	0.17	0.15
DL-Methionine	0.31	0.03	0.22
Threonine	0.07	0.06	0.04
Metabolizableenergy(Kcal/kg diet)	2850	2950	3050
Crude protein	22.50	21.35	18.15
Lysine	1.38	1.28	1.05
Methionine	0.63	0.6	0.49
Methionine + cysteine	0.99	0.95	0.8
Threonine	0.93	0.87	0.73
Calcium	1.05	0.97	0.86
available phosphorus	0.5	0.46	0.4

Supplied per kg of vitamin mixture: Vitamin A: 7.2gr; Vitamin D: 7. gr; Vitamin E: 14.4gr; Vitamin K3: 1.6gr; Vitamin B1: 0.72gr; Riboflavin: 3.3gr, Pantothenic acid: 12gr, niacin: 12160 mg; Vitamin B6: 6.2 mg; Biotin: 0.2 gr; Vitamin B12 - 0.6 gr; choline chloride 440. Supplied per kg of mineral mixture: manganese (oxide): 64 gr; iron ($FeSO_4$) -100 gr; zinc (oxide): 44 gr; copper ($CuSO_4$):16 gr; iodine (calcium iodate): 64 gr; selenium (1%): 8 gr; cobalt :0.2 gr.

2.1. Performance

At the end of each period, the weight of all chickens in each experimental unit was measured by scales with accuracy of 5 grams. To calculate the body weight of broiler chickens in each experimental unit by digital scales with accuracy of 5 grams at the end of days 7, 21 and 42, were weighed. Consumed feed on daily basis and the chicks were weighed and it placed to chickens. Changes in consumed rations are measured from starter ration to growth ration and from growth ration to final ration, then remaining feed was deducted from the amount of consumed feed. If there are losses in the experimental unit, the amount of consumed feed was corrected according to the live chickens. Feed conversion ratio in 0 to 7, 8 to 21, 0 to 21, 22 to 42 and 0 to 42 days of life were calculated. This conversion ratio was calculated by gain dividing to feed intake for each period.

2.2. Blood biochemical parameters

On 42th day from each treatment, 3 poultry selected randomly and blood samples were taken from jugular vein and centrifuged at 2500×g for 15 min to obtain sera (SIGMA 4-15 Lab Centrifuge, Germany)and the

parameters of cholesterol, glucose, uric acid and creatinine were analyzed by Pars Azmoon kits (Pars Azmoon Co. Iran, Tehran).

2.3. Statistical analysis

All data were analyzed using GLM model of SAS [18] (SAS Institute Inc, 2008) for analysis of variance. Significant differences among the treatments were identified at 5% level by Duncan's multiple range tests.

3. Results

Adding savory essential oil to the drinking water of chicken in period of 1-42 days resulted in a significant decrease in chickens' live weight gain compared with the control group (Table 2). There were significant difference among Control, Tween and Savory 100 ppm treatments vs. Savory 300 and 400 ppm in daily weight gain. In addition there was significant difference between Savory 300 and 400 ppm. The control had highest daily weight gain (54.34 g/day/chick).

Table 2
The effect of savory essential oil in drinking water on broiler production (0-42 days).

Treatment	Daily weight gain (g/day/chick)	Daily feed intake (g/day/chick)	Feed conversion ratio (g/g)
Control	54.34^{c}	104.43^{bc}	1.92^{a}
Tween	53.95^{c}	104.15^{bc}	1.93^{ab}
Savory 100	51.06b^{c}	107.21^{c}	2.10^{c}
Savory 200	47.74a^{bc}	97.29^{ab}	2.04^{abc}
Savory 300	45.02^{a}	94.63^{a}	2.09^{bc}
Savory 400	50.60^{b}	95.93^{ab}	1.90^{a}
P-value	0.008	0.004	0.03
SEM	0.71	1.32	0.054

Tween: Tween 1000 parts per million,Savory 100: 100 parts per million Savory oil +200 parts per million Tween, Savory 200: 200 parts per million Savoryoil +40 parts per million Tween, Savory 300: 300 parts per million Savory oil +600 parts per million Tween, Savory 400: 400 parts per million Savory oil +800 parts per million Tween. SEM: Standard Error of Means. a-c: In each column means with different superscript had significant differences (p≤0.05).

Table 3
The effect of savory essential oil in drinking water on broiler production (0-42 days).

Treatment	Glucose (mg/dl)	Uric acid (mg/dl)	Creatinine (mg/dl)	Cholesterol (mg/dl)
Control	282.21	5.93	0.255	115.70
Tween	288.79	6.05	0.236	120.76
Savory 100	273.00	5.77	0.252	117.63
Savory 200	291.38	5.25	0.246	112.67
Savory 300	263.57	5.43	0.297	117.77
Savory 400	268.00	4.92	0.287	119.70
P-value	0.25	0.23	0.48	0.81
SEM	28.43	0.13	0.02	10.19

Tween: Tween 1000 parts per million,Savory 100: 100 parts per million Savory oil +200 parts per million Tween, Savory 200: 200 parts per million Savoryoil +40 parts per million Tween, Savory 300: 300 parts per million Savory oil +600 parts per million Tween, Savory 400: 400 parts per million Savory oil +800 parts per million Tween. SEM: Standard Error of Means.

Treatments of savory essential oil caused a significant reduction (p≤0.05) in feed intake than the control group (Table 2). Savory 300 ppm treatment had the lowest feed intake than control (94.63 g/day/chick) and Savory 100 ppm treatment had the greatest one (107.21g/day/chick).

Groups of Savory 100 and 300 ppm had negative significant on feed conversion ratio than control ($p \leq 0.05$). The best feed conversion ratio was related to the treatment of Savory 400 ppm (1.90 g/g). Treatments had no effects on blood biochemical metabolites (Table 3).

4. Discussion

According to this research results can be concluded that adding savory essential oilto drinking water of chickens has a negative effect on feed intake, resulting in weight gain of broilers that the major reason for this observation can be reducewater consumption, reduce the rate of digestion feed and in the gut andintestinal microbial population is likely to change. Probably bitter taste of*Saturejahortensis* L. essential oil in drinking watercaused lower water and feed consumption and concluded lower performance (Ebrahimi et al., 2011; Ghalamkari et al., 2011; Razzghi et al., 2008; Vosough et al., 2010; Zamanimoghaddam et al., 2007).It is probably possible to using savory essential oil as a feed restricting agent in poultry diet.

The highest daily weight gain at 42 days of life is related to the control and treatment of water was added Tween. It was denoted that Tween had not any negative impact on performance, alone. In the same period the least amount of body weight and daily weight gain was related to treatments that levels of 200 and 300 parts per million savory was added to their drinking water. Of course the reduction in water consumption can be reduced by drinking with savory water disposal helped birds and poultry in order to improve ventilation and itis also useful to reduce coccidiosis disease. Different levels of savory essential oil in drinking water had no effects on blood metabolites in parallel with other investigation (Ebrahimi et al., 2013; Ghalamkari et al., 2011; Vosough et al., 2010). Uric acid concentration is an index to determine distractive effects of supplemental additives in diet on liver. In our research, different levels of savory essential oil in drinking water of broilers had no negative effects.

5. Conclusion

Based on the results of this investigation it seems that savory essential oil in drinking water had negative effects on broiler feed intake and in conclusion on weight gain. Therefore, it is probably possible to using savory essential oil as a feed restricting agent in poultry diet.

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