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The Effect of Different Levels of *Tanacetum balasmita* Medicinal Plant Powder and Extract on Performance, Carcass Traits and Blood Parameters of Broiler Chicks

Research Article

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ABSTRACT

This experiment was conducted to evaluate the effects of different levels of dried aerial parts powder and extract of *Tanacetum balasmita* (TB) medicinal plant on performance, carcass traits and blood parameters of broilers. Two hundred eighty Ross-308 broilers from 10 to 42 days of age were used in a completely randomized design in 5 treatments and 4 replicates (14 birds per replicate). The treatment groups consisted of a control group (1) with no dried aerial parts powder or extract of TB and experimental groups 2 and 3 contained 0.5% and 1% of TB whereas experimental groups 4 and 5 contained 0.1% and 0.2% of TB extract, respectively. Using different levels and forms of TB significantly affected the performance, carcass traits and blood parameters of broilers ($P<0.05$). By increasing the level of TB powder to 1% the weight gain decreased and feed conversion increased, the best feed conversion related to group with 0.2% of TB, whereas the amount of daily feed intake was not affected. The highest liver percentage was resulted with 1% of *Tanacetum balasmita* powder. The level of blood glucose significantly decreased with 0.2% of TB extract. The lowest percentage of heterophile, the highest percentage of lymphocyte and the lowest ratio of heterophile to lymphocyte were observed with 0.2% of TB extract. The overall results showed that the use 1% of dried aerial parts powder of TB has adverse effects on broiler performance, while 0.2% of TB extract compared with control group, has positive effects on performance and blood parameters.

KEY WORDS blood metabolism, broilers, carcass traits, performance, *Tanacetum balasmita*.

INTRODUCTION

Antibiotics have been supplemented to animal to progress growth performance and protect animals from the adverse impacts of pathogenic and non-pathogenic enteric microorganisms (Dahiya *et al.* 2006). However, the use of therapeutic antibiotics in animal feed is not approved due to chances of development of antibiotic resistant microbes. Due to the mentioned reasons, most of the antibacterial performance promoters have been banned from January 2006, therefore various studies have been designed to use plants and herbs as alternative of synthetic antibiotics.

Herbs are identified to increase antimicrobial, antiviral, and antioxidative activities and to simulate the endocrine and immune system (Dahiya *et al.* 2006). In food industry, herbs, essential oils derived of herbs or their extracts having antioxidative properties are frequently used to improve quality and shelf life of meat products (Vichi *et al.* 2001), turkey meat (Botsoglou *et al.* 2000) and egg yolk (Botsoglou *et al.* 2000). On basis of pervious study, supplementing the dietary herbs (Cross *et al.* 2002, 2007) or plant extracts (Lee *et al.* 2003) would stimulate the productive performance of poultry. It was reported that one experiment, (2009) reported, the mixtures of garlic and ginger

significantly improved final live weight and weight gain of the 28 day old chicks than those of control birds (Ademola *et al.* 2009). Ginger at levels 0.5% and 1% improved feed consumption of broilers (Dias *et al.* 2006).

Ginger seems to have a digestion stimulating activity and in a study on rats had showed that gastric juice, bile, pancreatic and intestinal juices in rats was discovered **(**Platel and Srinivasan, 2000**)**. Some of researches were conducted on summer season, for example Al-Mashhadani *et al.* (2011) who showed that broilers given coriander oil, produced higher body weight. Shabaan (2012), who found that, thyme and cumin seed supplementation, did not influence productive performance in broilers fed to low energy diets compared to those fed by recommended energy diets. The primary role of medicinal plants in metabolism is attributed to appetite and digestion stimulating effects (Lewis *et al.* 2003).

It is also stimulatory effects on pancreatic secretions such as digestive enzymes which help to digest and absorb more amino acids from the digestive tract. On other hand, the active components of herb plants act as a digestibility enhancer, balancing the gut microbial ecosystem and stimulating the secretion of endogenous digestive enzymes and thus improving growth performance in poultry (Williams and Losa, 2001).They have been reported that nettle powder has positive effects on carcass traits of broilers (Nasiri *et al.* 2011), whereas 1 g/kg nettle extract did not have any significant effects on growth performance of broilers (Khosravi *et al.* 2008). The genus *Tanacetum* is one of about 100 genera in the *tribe* Anthemideae and family Asteraceae. The basic chromosome number of the species in the *tribe* Anthemideae is 2n= 18. *Tanacetum balsamita* (TB) is a perennial herbal plant that can grow up to 80 cm (Keskito *et al*. 1998). TB has Eurasian origin showed different habitats (Kubo and Kubo, 1995).

It has been postulated that the Mediterranean is the primary origin of costmary and in the last three decades it has been naturalized and cultivated in different parts of the world (Hassanpouraghdam *et al*. 2008a; Hassanpouraghdam *et al*. 2008b).

The cultivation of costmary is reported in Iran, Turkey, Romania, Germany, Italy, Spain and England. Costmary has a long traditional usage as aromatic water in folk medicine of Iran. Finally we can claim that costmary is distributed in south and south-east of Europe and south-west of Asia but naturalized in most parts of the world.

Tanacetum balsamita (TB) contains various has a rich secondary metabo-lites with diverse biological and therapeutical activities (Kubo and Kubo, 1995; Abad *et al*. 2006; Marculescu *et al*. 2001a; Marculescu *et al*. 2001b).

These compounds consist of essential oil or volatile oil (monoterpenes and ses-quiterpens), phenylpropane derivatives, flavonoids (Flavonols, apigenine derivatives, scutellareine derivatives and luteoline derivatives), tannins and oligo-elements. Essential oil derived from leaves and flowers is the most important active compound of this plant.

Costmary essential oil is extracted by water and steam distillation of aerial parts and is a colorless to pale yellow liquid (Hassanpouraghdam *et al*. 2008a). In laying hens, diets with 1% TB aerial parts improved their performance and reduced the level of blood cholesterol (Nobakht *et al.* 2012).

It was reported using 1.5% and 2% TB aerial parts powder in laying hens diets had positive effects on their performance, egg traits and blood biochemical parameters (Nobakht and Moghaddam, 2013).

In the present study the effects of different levels of *Tanacetum balsamita* aerial parts powder and its extract on performance, carcass traits and blood parameters of broiler chicks were investigated.

MATERIALS AND METHODS

Animals and dietary treatments

Two hundred eighty Ross-308 broilers from 10 to 42 days of age were used in a completely randomized design in 5 treatments and 4 replicates (14 birds per replicate). The treatment groups consisted of a control group (1) with no dried aerial parts powder and extract of TB and experimental groups 2 and 3 contained 0.5% and 1% of TB, whereas experimental groups 4 and 5 contained 0.1% and 0.2% of TB extract, respectively. The diets were formulated to meet the requirements of broilers as established by the Ross 308 broilers feeding guide in grower (11-25 days) and finisher (26-42 days) (Tables 1 and 2). From 1 up to 10 days broiler used a pre-starter diet. Dried aerial parts of pennyroyal were supplied from local market and the compositions of it were determined according to AOAC (1994). *Tanacetum balsamita* (TB) extraction was done by Golbahar Company. *Tanacetum balsamita* (TB) powder and extract fine mixed with other ingredients. The diets and water were provided *ad libitum*. The lighting program during the experimental period consisted of a period of 23 hours light and 1 hour of darkness. Environmental temperature was gradually decreased from 33 ˚C to 25 ˚C on day 21 and was then kept constant.

Performance parameters

Body weight, feed intake and feed conversion were determined weekly on bird bases. Mortality was recorded. At the 42 day of age, two birds per replicate were randomly chosen, slaughtered and percents of carcass, abdominal fat, gizzard, breast, thigh and liver percents to total weight were calculated.

Table 1 Composition of broilers experimental diets in growth period (11-25 days)

Feeds ingredients (%)	Control group	0.5% TB powder	1% TB powder	0.1% TB extract	0.2% TB extract
Corn	58.02	57.31	56.82	57.92	57.82
Soybean meal-42%	36.50	36.50	36.50	36.50	36.50
Soybean oil	2.25	2.38	2.50	2.25	2.25
Tanacetum balasmita (TB)	0.00	0.50	1.00	0.10	0.20
Oyster shell	0.49	0.47	0.45	0.49	0.49
Bone meal	1.80	1.80	1.79	1.80	1.80
Salt	0.29	0.29	0.29	0.29	0.29
Vitamin premix[1]	0.25	0.25	0.25	0.25	0.25
Mineral premix[2]	0.25	0.25	0.25	0.25	0.25
DL-methionine	0.15	0.15	0.15	0.15	0.15
Calculated composition					
Metabolisable energy (kcal/kg)	2900	2900	2900	2900	2900
Crude protein (%)	20.87	20.87	20.87	20.87	20.87
Ca (%)	0.91	0.91	0.91	0.91	0.91
Available phosphor (%)	0.41	0.41	0.41	0.41	0.41
Sodium (%)	0.14	0.14	0.14	0.14	0.14
Lysine (%)	1.20	1.20	1.20	1.20	1.20
Methionine + cysteine (%)	0.84	0.84	0.84	0.84	0.84
Tryptophan (%)	0.28	0.28	0.28	0.28	0.28

[1] Vitamin premix per kg of diet: vitamin A (retinol): 2.7 mg; vitamin D_3 (cholecalciferol): 0.05 mg; vitamin E (tocopheryl acetate): 18 mg; vitamin K_3: 2 mg; Thiamine: 1.8 mg; Riboflavin: 6.6 mg; Panthothenic acid: 10 mg; Pyridoxine: 3 mg; Cyanocobalamin: 0.015 mg; Niacin: 30 mg; Biotin: 0.1 mg; Folic acid: 1 mg; Choline chloride: 250 mg and Antioxidant: 100 mg.
[2] Mineral premix per kg of diet: Fe ($FeSO_4.7H_2O$, 20.09% Fe): 50 mg; Mn ($MnSO_4.H_2O$, 32.49% Mn): 100 mg; Zn (ZnO, 80.35% Zn): 100 mg; Cu ($CuSO_4.5H_2O$): 10 mg; I (K_1, 58% I): 1 mg and Se ($NaSeO_3$, 45.56% Se): 0.2 mg.

Table 2 Composition of broilers experimental diets in finish period (25-42 days)

Feeds ingredients (%)	Control group	0.5% TB powder	1% TB powder	0.1% TB extract	0.2% TB extract
Corn	68.08	67.51	66.94	68.08	68.00
Soybean meal-42%	28.14	28.10	28.08	28.04	28.02
Soybean oil	0.64	0.77	0.89	0.64	0.64
Tanacetum balasmita (TB)	0.00	0.50	1.00	0.10	0.20
Oyster shell	0.49	0.47	0.45	0.49	0.49
Bone meal	1.80	1.80	1.79	1.80	1.80
Salt	0.29	0.29	0.29	0.29	0.29
Vitamin premix[1]	0.25	0.25	0.25	0.25	0.25
Mineral premix[2]	0.25	0.25	0.25	0.25	0.25
DL-methionine	0.04	0.04	0.04	0.04	0.04
L-lysine	0.02	0.02	0.02	0.02	0. 02
Calculated composition					
Metabolisable energy (kcal/kg)	2900	2900	2900	2900	2900
Crude protein (%)	18.125	18.125	18.125	18.125	18.125
Ca (%)	0.82	0.82	0.82	0.82	0.82
Available phosphor (%)	0.37	0.37	0.37	0.37	0.37
Sodium (%)	0.14	0.14	0.14	0.14	0.14
Lysine (%)	1.00	1.00	1.00	1.00	1.00
Methionine + cysteine (%)	0.65	0.65	0.65	0.65	0.65
Tryptophan (%)	0.24	0.24	0.24	0.24	0.24

[1] Vitamin premix per kg of diet: vitamin A (retinol): 2.7 mg; vitamin D_3 (cholecalciferol): 0.05 mg; vitamin E (tocopheryl acetate): 18 mg; vitamin K_3: 2 mg; Thiamine: 1.8 mg; Riboflavin: 6.6 mg; Panthothenic acid: 10 mg; Pyridoxine: 3 mg; Cyanocobalamin: 0.015 mg; Niacin: 30 mg; Biotin: 0.1 mg; Folic acid: 1 mg; Choline chloride: 250 mg and Antioxidant: 100 mg.
[2] Mineral premix per kg of diet: Fe ($FeSO_4.7H_2O$, 20.09% Fe): 50 mg; Mn ($MnSO_4.H_2O$, 32.49% Mn): 100 mg; Zn (ZnO, 80.35% Zn): 100 mg; Cu ($CuSO_4.5H_2O$): 10 mg; I (K_1, 58% I): 1 mg and Se ($NaSeO_3$, 45.56% Se): 0.2 mg.

Blood biochemical parameters

At 42 day of age two birds from each replicate (male and female) were randomly chosen for blood collection and approximate 5 mL blood samples were collected from the brachial vein. One ml of collected blood was transferred to tubes with EDTA for determination of blood cells parameters include: hematocrit, heterophile and lymphocyte (Gross and Siegel, 1983).

The remaining 4 mL blood was centrifuged to obtain serum for determination the blood biochemical parameters including: glucose, cholesterol, triglyceride, albumin, total protein and uric acid. Kit package (Pars Azmoon Company; Tehran, Iran) were used for determination the blood biochemical parameters using Anision-300 auto-analyzer system.

Statistical analysis

The data were subjected to analysis of variance procedures appropriate for a completely randomized design using the general linear model procedures of SAS (SAS, 2005). Means were compared using the Duncan multiple range test. Statement of statistical significance was based on $P < 0.05$.

RESULTS AND DISCUSSION

Performance parameters

The effects of different levels of dried aerial parts powder and extract of TB on performance of broilers summarized in Table 3. Different levels of powder and extract of TB had significant effects on performance of broilers (P<0.05). Using TB extract compared with aerial parts powder increased the amount of daily weight gain. The highest rate of daily weight gain (62.65 g/d) was observed with 0.1% of TB extract and the lowest weight gain (47.89 g/d) achieved with diet contained 1% of TB aerial parts powder. In contrast with 0.1% of TB extract, the amount of daily feed intake in group contained 0.2% of TB extract was low, the best feed conversion ratio (1.69) was resulted in group 5 with 0.2% of TB extract. In comparison to control group, dried aerial parts powder and extract of TB did not significantly change the amount of daily weight gain of broilers (P>0.05) meanwhile 1% dried aerial parts powder in contrast with diet contained 0.1% of extract significantly reduced the amount of daily weight gain (P<0.05). Decrease in the amount of daily weight gain without increase in daily feed intake caused the highest feed conversion ratio (2.27) was obtained with 1% of TB aerial parts powder (P<0.05). In comparison to control group, using aerial parts powder and extract of TB did not have any significant effects on the amount of daily feed intake (P>0.05). Decrease in the amount of daily weight gain with 1% of TB aerial parts powder may be related to higher fiber content of TB aerial parts powder.

Higher fiber increased the feed volume and passage in digestive tract, so the sufficient amounts of nutrients could not supply for growth supporting, for this reasons in contrast with other experimental groups, the amount of weight gain was reduced and feed conversion ration increased in this experimental group.

These findings is not in agreement with other reports had been done with TB aerial parts powder in laying hens (Nobakht *et al.* 2012; Nobakht and Moghaddam, 2013). Their reported that, using TB aerial parts powder up to 2% of laying hens diets has positive effect on their performance. The differences may be related to bird type. In laying hens in contrast with broilers, digestive tract is more developed, so can tolerate higher amount of fiber, for this reason higher fiber in laying hens diets did not have any adverse effects on their performance, meanwhile decreased the amounts of weight gain and increased the feed conversion ratio of broilers.

Carcass traits

The effects of different levels of TB dried aerial parts powder and extract in feeds on carcass traits of broilers are shown in Table 4. Different levels of TB powder and extract had significant effects on liver weight of broilers (P<0.05). The highest liver weight was observed with 1% of TB aerial parts powder. Without liver weight, in contrast with control group, different forms and amounts of TB did not have any significant effects on carcass traits of broilers (P>0.05). Higher liver weight obtained with using 1% of TB aerial parts powder may be related to the amount of fiber diet. For digestion of fibrous diet more activation of digestive organs such as liver are need. The size of liver by more activation increased.

The enlargement of liver size with 1% of TB is not of in agreement with pervious reports in use of other medicinal plants in broilers (Nasiri *et al.* 2011; Nobakht *et al.* 2012). On the base of Nasiri *et al.* (2011) reports, diets contained 1.5% of nettle, did not increase the liver size, but also decreased it in broilers, meanwhile Nobakht *et al.* (2012) reported that savory medicinal plant powder up to 2% of broilers diets did not have significant effects on their liver weight. The difference in the results may be related to plants species and quality, diets ingredients and management status of broilers farms.

Blood parameters

The effects of different levels of dried aerial parts powder and extract of TB in feeds on blood biochemical parameters of broilers are presented in Tables 5 and 6. The effects of different levels of TB powder and extract had significant effects on the blood glucose level (P<0.05). Using 0.2% of TB extract decreased the blood glucose level. Decrease in the level of blood glucose may be related to positive effects of medicinal plants substances on pancreatic juice such as insulin secretion (Lee *et al.* 2003). In this experiment using 0.2% of TB extract may be caused the proper amount of insulin supply in the blood and reduced the level of blood glucose.

Table 3 Effects of using different levels of *Tanacetum balasmita* (TB) powder and extract on performance of broilers (10-42 days)

Treatments	Weight gain (g/d)	Feed intake (g/d)	Feed conversion ratio
Control	56.29^{ab}	96.86	1.72^{b}
0.5% TB powder	54.24^{ab}	102.12	1.88^{b}
1% TB powder	47.89^{b}	108.66	2.27^{a}
0.1% TB extract	62.65^{a}	108.71	1.74^{b}
0.2% TB extract	59.00^{ab}	99.72	1.69^{b}
SEM	3.94	7.62	0.09
P-value	0.0746	0.8856	0.0421

The means within the same column with at least one common letter, do not have significant difference (P>0.05).
SEM: standard error of means.

Table 4 Effects of using different levels of *Tanacetum balasmita* (TB) powder and extract on blood biochemical parameters of broilers

Treatments	Carcass	Abdominal fat	Gizzard	Breast	Thigh	Liver
Control	65.52	2.06	2.77	38.45	32.89	3.59^{ab}
0.5% TB powder	71.61	2.14	3.21	35.68	26.45	3.85^{ab}
1% TB powder	67.37	1.94	3.47	34.54	27.21	4.18^{a}
0.1% TB extract	73.42	2.52	3.01	35.94	26.10	3.37^{b}
0.2% TB extract	68.23	2.43	3.43	34.03	27.00	3.67^{ab}
SEM	2.55	0.19	0.22	1.46	2.00	0.18
P-value	0.2511	0.2102	0.2085	0.3097	0.1785	0.0695

The means within the same column with at least one common letter, do not have significant difference (P>0.05).
SEM: standard error of means.

Table 5 Effects of using different levels of *Tanacetum balasmita* (TB) powder and extract on blood biochemical parameters of broilers

Treatments	Triglyceride (mg/dL)	Cholesterol (mg/dL)	Albumin (mg/dL)	Total protein (mg/dL)	Uric acid (mg/dL)	Glucose (mg/dL)
Control	51.04	134.20	1.717	4.464	3.173	152.827^{a}
0.5% TB powder	44.42	134.18	1.640	4.020	2.930	155.697^{a}
1% TB powder	47.08	140.60	1.787	4.224	2.383	155.583^{a}
0.1% TB extract	34.87	117.38	1.737	3.927	3.943	150.527^{a}
0.2% TB extract	44.92	113.35	1.724	3.600	3.883	128.427^{b}
SEM	7.53	12.08	0.10	0.27	0.71	5.66
P-value	0.6536	0.4681	0.8872	0.2775	0.5249	0.0315

The means within the same column with at least one common letter, do not have significant difference (P>0.05).
SEM: standard error of means.

Table 6 Effects of using different levels of *Tanacetum balasmita* (TB) powder and extract on blood cells of broilers

Treatments	Hematocrit (%)	Hetrophile (%)	Lymphocyte(%)	Hetrophile to lymphocyte
Control	33.667	21.000^{ab}	78.000^{abc}	0.271^{abc}
0.5% TB powder	35.000	18.000^{ab}	81.341^{ab}	0.222^{bc}
1% TB powder	34.667	24.000^{a}	73.667^{c}	0.330^{a}
0.1% TB extract	32.334	23.000^{a}	76.667^{bc}	0.271^{abc}
0.2% TB extract	33.667	16.667^{b}	83.000^{a}	0.201^{c}
SEM	1.89	1.81	1.90	0.031
P-value	0.8673	0.0714	0.0309	0.0652

The means within the same column with at least one common letter, do not have significant difference (P>0.05).
SEM: standard error of means.

Compared with control group, except to blood glucose, using different forms and amounts of TB did not have any significant effects on blood biochemical parameters of broilers (P>0.05). In the other studies that were conducted with different levels of TB aerial parts powder in laying hens (Nobakht *et al.* 2012; Nobakht and Moghaddam, 2013), had been reported that with 1% and 2% of TB aerial parts powder, the blood triglyceride and cholesterol levels of hens significantly decreased.

These differences in the results may be related to bird species, feed ingredients and TB aerial parts powder quality. In those studies TB powder could not significantly changed the level of blood glucose in laying hens. Different levels of TB powder and extract had significant effects on heterophile and lymphocyte count and ratio of heterophile to lymphocyte (P<0.05). The lowest percentage of hetrophile (16.6%), the highest percentage of lymphocyte (83.0%) and the lowest ratio of heterophile to lymphocyte

(0.201) were resulted with 0.2% of TB extract in broiler diets. The immune system generally benefits from the herbs and spices rich in flavonoids, vitamin C and carotenoids. These compositions increase immunity of laying hens by decrease their stress (Frankič *et al.* 2009). So, decrease of stress by use different composition of herbs and spices lead to improving immunity parameters of blood. Decrease in immunity status by using 0.2% of TB extract may be associated with the body health status of broilers. More than of blood cells, by using 0.2% of TB extract, birds in this treatment had the best performance and the lowest blood glucose.

In laying hens, TB powder compared with control group did not change the blood cells count and ratio (Nobakht *et al.* 2012). Differences between results in broilers and laying hens may be related to birds' species, age, health status, amount and quality of TB areal parts.

CONCLUSION

The overall results showed that feeding broilers *Tanacetum balasmita* extract up to 0.2% in diets compared with control group, has positive effects on performance and blood parameters, meanwhile diets with 1% of *Tanacetum balasmita* had adverse effects on broiler performance and blood cells.

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