
THE EFFECT OF HERBS FEEDING ON ANTIOXIDANT LIVER ACTIVITY

Kabourkova E.; Lichovnikova M.; Adam V.

Department of Morphology, Physiology and Genetics, Faculty of Agronomy, Mendel University in Brno, Zemedelska 1, 613 00 Brno, Czech Republic

E-mail: xkabour1@node.mendelu.cz

ABSTRACT

The aim of the project was to evaluate the effect of 1.5% fodder supplement of rosemary leaf (RL), yarrow bloom (YB), plantain leaf (PL), oregano haulm (OH) or red grape pomace (GP) on broiler liver antioxidant activity. Used methods are FRAP, FRK and DPPH. Measured oxidative stress values are MT, GSH, GSSG, GSH/GSSG and monitored biochemical parameters are albumin, uric acid and bilirubin in blood. Values like MT, GSH, GSSG and GSH/GSSG are observed in liver also. The greatest antioxidant activity was significantly ($P < 0.05$) detected in oregano supplement by FRK method compared to plantain and rosemary supplements by the same method.

Key words: FRAP, FRK, DPPH, antioxidant activity, oxidative stress, herbs

INTRODUCTION

European Union has banned using of antibiotics like growth stimulators in fodder for all member states since 1st of January 2006. That's why there are efforts to find out herbs with a positive effect on animal health. The research was conducted to detect the effect of herbs feeding on antioxidant activity and selected biochemical markers and antioxidants in chicken's organism.

MATERIAL AND METHODS

The experiment was taken during 35 days. In total, 192 one day old female chickens Ross 308 were used. Chickens were kept in double-deck cage technology. All of them were fed by complete feed mixture (BR1) for first 10 days. After 10 days female chickens were divided into 6 groups (see table 1). Each group has 3 repetitions with 10-11 members. From tenth day chickens were fed by the other complete feed mixture (BR2). The compositions of complete feed mixtures are shown in table 2. Chickens were fed ad libitum. The difference between groups was 1.5% supplement of a plant complement in the other complete feed mixture (BR2). Plant's supplements were rosemary leaf (RL), yarrow bloom (YB), plantain leaf (PL), oregano haulm (OH) or red grape pomace (GP). The control group (Co) had 1.5% supplement of wheat.

Thirty-fifth day of experiment was picked 6 chickens from every single group and killed by decapitation. Immediately after decapitation were taken samples of blood and liver. Liver samples were processed the day of decapitation.

The antioxidant activity was measured by FRAP, FRK and DPPH method in blood. Further measured oxidative stress values were metallothionein (MT), reduced glutathione (GSH), oxidized glutathione (GSSG), GSH/GSSG ration and monitored biochemical parameters were albumin, uric acid, bilirubin in blood. Values like MT, GSH, GSSG and GSH/GSSG were observed in blood and liver. The antioxidant activity was expressed like a trolox equivalent (TE).

Tab. 1 The scheme of the experiment

Group	Herbs	Portion in complete feed mixture (%)	Number of repetitions	Total number of chickens in a group
RL	Rosemary leaf	1.5	3	30
YB	Yarrow bloom	1.5	3	30
PL	Plantain leaf	1.5	3	31
OH	Oregano haulm	1.5	3	30
GP	Grape pomace	1.5	3	31
Co	Wheat	1.5	3	31

Tab. 2 The composition of complete feed mixture BR 1 and BR 2 (%)

Components	BR 1	BR 2
Wheat	30.0	41.5
Corn	30.0	22.0
Soybean Meal	32.0	27.0
Rape-oil	4.0	4.0
Herbs*	0.0	1.5
Premix	4.0	4.0

* rosemary, yarrow, plantain, oregano or red grape pomace

RESULT AND DISCUSSION

The synthetic antioxidants are highly effective, but they can have an undesirable effect on enzymes in human body. Therefore there are efforts to find out new and safety antioxidants from nature sources. It is expected that nature antioxidants protect body cells against oxidation (SHAHIDI, 1997). The usage of herbs like antioxidants sources requires further exploring (TAPSELL et al., 2006).

Our results showed very interesting differences among herbs and methods used (see table 3). Significantly, the FRAP method showed the highest antioxidant activity in blood ($P < 0.05$) in Co group ($4.2 \mu\text{M TE}$) at all. While SHAHIDI (1997) found the highest antioxidant activity for rosemary leaves extract.

Further, the highest antioxidant activity in blood ($P < 0.05$) was reached for 1.5% supplement of OH ($3.9 \mu\text{M TE}$) measured by FRK method. DPPH method showed the group with 1.5% supplement of YB (1.6 TE) like the group with the highest antioxidant activity ($P < 0.05$) in blood. Also JANG et al. (2008) confirmed the positive effect ($P < 0.05$) of herbs supplements on antioxidant activity measured by DPPH method.

The expression and induction of MT is related with oxidative stress and cells apoptosis (YANG et al., 2006). MT concentration was higher ($P < 0.05$) for PL ($2.1 \mu\text{M TE}$) then for RL ($1.9 \mu\text{M TE}$) and Co ($1.9 \mu\text{M TE}$) in blood. There was no effect ($P > 0.05$) on MT concentration in liver.

Values of bilirubin were different ($P < 0.05$) between OH ($5.9 \mu\text{M TE}$) and Co ($3.6 \mu\text{M TE}$) in blood. Low level of bilirubin in blood correlates with a risk of pathologies in organism. Slightly increased level ensures protection of organism (VÍTEK, 2012).

There was no effect ($P > 0.05$) on GSH/GSSG ration in blood. However the ration of GSH/GSSG was higher ($P < 0.05$) for RL ($5.7 \mu\text{M TE}$) then for GP ($1.1 \mu\text{M TE}$) in liver. When an organism is in oxidative stress, GSSG grows up and GSH/GSSG ratio goes down.

The supplements of RL, YB, PL, OH or GP had no effect ($P > 0.05$) on albumin concentration in blood of chickens.

The group of GP ($236.5 \mu\text{M TE}$) and group of YB ($245.4 \mu\text{M TE}$) had lower ($P < 0.05$) concentration of uric acid then Co ($467.6 \mu\text{M TE}$) and OH ($400.6 \mu\text{M TE}$) in blood. High level of uric acid in blood is connected with high antioxidant capacity (WARING et al., 2003).

Tab. 3 The effect of herb feeding on antioxidant activity in blood

Group	Co	RL	YB	PL	OH	GP
Metod used	Average					
FRAP	4.2 ^a	2.7 ^b	3.8 ^a	2.0 ^b	2.6 ^b	3.9 ^a
FRK	3.9 ^b	3.5 ^a	3.7 ^{ab}	3.5 ^a	3.9 ^b	3.8 ^b
DPPH	1.1 ^b	0.8 ^b	1.6 ^c	0.8 ^b	0.6 ^{ab}	0.2 ^a

a, b, c – differnt letters mean statistically significant differences

CONCLUSIONS

The aim of this research was to explore the effect of herbs feeding on antioxidant activity and selected biochemical markers and antioxidants in chicken's organism. Based on experimental results, a positive effect of herbs feeding has been confirmed.

The highest antioxidant activity has been found in blood of oregano haulm group. The highest positive effect on the monitored biochemical parameters in blood has rosemary leaf supplement in fodder. With the rosemary leaf supplement has been reached also the best antioxidant activity in liver.

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