Study on the effect of dry extract of *Tribulus terrestris* on the forage consumption rate in japanese quail (*Coturnix coturnix japonica*)

Issledvane na efekta na suh ekstrakt ot *Tribulus terrestris* varhu rashoda na furag pri japonski padpadazi (*Coturnix coturnix japonica*)

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Abstract

An investigation of Vemo Herb® additive on the forage consumption rate in Japanese quail (Pharaoh breed) has been conducted. The experiment was carried out for 10 weeks with 52 female and 16 male sexually matured Japanese quails *(Coturnix coturnix japonica)* distributed in four groups: control group (without additive), first experimental group - 4 mg*kg^{-1} of live weight for 10 weeks; second experimental group - 10 mg*kg^{-1} of live weight during the first five weeks of the study (after that the product was no more supplemented) and third experimental group - 10 mg*kg^{-1} of live weight during the whole study period. It was observed, a tendency of decreasing of the forage consumption rate for the whole experimental period (no statistical significance) for all the experimental groups compared to the control group, but some of the weekly differences are significant.

Keywords: extract of *Tribulus terrestris*, forage consumption rate, japanese quails

Резюме

Проведено е изследване на прилагането на добавката Vemo Herb® върху разхода на фураж при Японски пъдпъдъци (порода Фараон). Опитът продължи 10 седмици с 52 женски и 16 мъжки полово зрели Японски пъдпъдъци *(Coturnix coturnix japonica)*, разпределени в 4 групи, контролна (без добавка), първа опитна (добавка 4 mg*kg^{-1} ЖМ), втора опитна-10 mg*kg^{-1} ЖМ през първите 5 седмици от опита и трета опитна (10 mg*kg^{-1} ЖМ през целия опит). Установена

е обща тенденция на намаляване на разхода на фураж в продължение на опита (без статистическа достоверност), за всички опитни групи в сравнение с контролната група, като някои от седмичните разлики са статистически достоверни.

Ключови думи: екстракт от *Tribulus terrestris*, разход на фураж, японски пъдпъдъци

Introduction

Phytobiotics acquire greater importance in modern animal breeding practices as a substitute for antibiotics and for some allopathic medicine remedies, which is largely due to the fears of bacterial resistance. Their role in organic production of animal products is indisputable. Those are products of plant origin, which supplemented to food or drinking water, increase the immunity and improve the general state of the organism (Panda et al., 2009). The Bulgarian dry extract of the annual grassy plant *Tribulus terrestris* under the trade name VemoHerb T®, produced by the company Vemo - 99 Ltd. Sofia, Bulgaria, is exactly such a product. It is rich in biologically active substances: Furostanol saponins (mainly protodioscin - 55 to 65% - and protogracillin), tannins (up to 10%), flavonoids - rutin (up to 10%), glycosides, etc. (Tomova, 1987). The extract improves the reproductive function (Grigorova and Kashamov, 2007; Kashamov, 2009; Schmidt et al., 2009), productivity (Tomova, 1987; Valchev et al., 2008) and the health status (Grigorova et al., 2008; Petkova et al., 2009) of farm animals and fowl. A number of studies in that area confirmed the positive effect of VemoHerb T on egg productivity and egg quality in hens (Grigorova, 2008; Grigorova et al., 2007), guinea fowl (Nikolova et al., 2010) and quails (Nikolova and Penkov, 2010). In the last years an increase of live weight has been reported in all the production trends in Japanese quail farming. For example, at the end of the 80s the live weight of the Estonian breed (egg production type) was 195 - 200 g for the female birds and 170 -180 g for the male ones (Pigareva and Afanasyev, 1989), while nowadays it is 240 and 212 g, respectively (Genchev, 2014). Explanation could be found in the fact that the larger fowls have more reserves for maintaining sustainable and higher egg productivity, on the one hand, and, on the other - the aged male fowls could be fattened to a higher live weight (Genchev, 2014; Genchev, 2011). According to Genchev (2014) the daily forage consumption rate for a laying fowl in the different populations of Manchurian and Pharaoh breeds under the conditions of Bulgaria varied greatly (from 36 g to 48 g for Manchurian breed and from 40 g to 50 g for Pharaoh breed). Significant effect is exerted by the egg-laying stage, temperature in the premises (Djouvinov and Mihailov, 2005), provision of enough water (Penkov et al., 2013) etc.

The aim of the present study was to establish the effect of VemoHerb product (dry extract of Tibulus terrestris) on the forage consumption rate for a laying fowl and per egg in Japanese quail of Pharaoh breed.

Materials and Methods

The experiment was carried out for 10 weeks with 52 female and 16 male sexually matured Japanese quails *(Coturnix coturnix japonica)* distributed in four groups - one control and three experimental (13 female and 4 male fowls in each group). The fowls were raised in single-storey net cages. The studied product was supplemented to the drinking water of the experimental groups every day, at the following daily rates: First experimental group - 4 mg*kg^{-1} of live weight for 10 weeks; Second experimental group - 10 mg*kg^{-1} of live weight during the first five weeks of the study (after that the product was no more supplemented) and Third experimental group - 10 mg*kg^{-1} of live weight during the whole study period. Every day the egg-laying capacity, the egg weight and the forage consumption rate were reported. All the groups were fed on one and the same combined feed for reproductive fowls (Table 1). Preliminary weighed forage at the rate of 40 g per fowl was given twice a day. Before each feeding, the waste of the previous feeding was collected, weighed and deducted from the previous amount of forage. The construction of the feeding racks reduced to the minimum the losses of the spilled forage. The amount consumed by the male fowls was proportionally eliminated. The actual daily forage consumption rate for a fowl and the forage consumption rate per egg were reported by weeks.

Table 1. Content and nutritive value of standard combined feed for reproductive quails

Таблица 1. Съдържание и хранителна стойност на стандартен комбиниран фураж за пъдпъдъци носачки

Components	Компоненти	%
Maize	Царевица	62
Soya groats (44)	Соев шрот (44)	20.0
Fish flour (60)	Рибено брашно (60)	4.5
Sunflower expeller (27)	Слънчогледов експелер (27)	5.0
Chalk	Креда	7.0
Potassium phosphate	Калциев фосфат	1.0
Salt	Сол	0.2
L - lysine	L - лизин	0.2
DL - methionine	DL - метионин	0.1
Content in forage:	Съдържание във фуража	%
Crude protein	Суров протеин	18.6
Lysine	Лизин	0.115
Methionine	Метионин	0.74
Calcium	Калций	3.12
Total phosphorus	Общ фосфор	0.65
Metabolizable energy MJ*kg^{-1}	Обменна енергия MJ*kg^{-1}	11.5

Eggs and forage amounts were weighed using Ohaus balance with a precision of 0.01 g. The experiments were according the requirements for humane treatment of breeder hens – BG Regulation No 25/2006 (citation by Genchev, 2014).

Results and Discussion

The results about the forage consumption rate for laying quails of Pharaoh breed, treated with the food additive VemoHerb T (dry extract TT) are presented in Table 2. The studied food additive did not have a significant effect on the forage consumption rate for a quail layer in average for the period. A slight tendency to improvement of forage conversion was reported with the increase of the product rate and the period of treatment: from 35.92 ± 4.90 in the First experimental group to 34.74 ± 3.74 g in the Third experimental group, versus 36.44 ± 4.69 g of forage per fowl in the Control group of laying quails. Statistically significant decrease of the values of that characteristic was established in ninth - tenth week of the egglaying stage, which coincided with the peak of egg-laying and the end of growth and development of that agricultural poultry species. In the ninth week of egglaying, the difference was reported between the Control and the Third experimental group ($P < 0.001$), the Control and the Second group ($P < 0.05$), the First and the Second groups ($P < 0.001$), the First and the Third groups ($P < 0.001$) and the Second and the Third experimental groups ($P < 0.05$). In the tenth week of egg-laying, statistically significant difference was established between the Control and the Third group ($P < 0.01$) and the First and the Third group of quails ($P < 0.001$). The results could be explained by the fact that until the end of the growth period of that species (about the age of 8-12 weeks), the forage consumed is used for the accumulation of both egg and body weight. Concerning the forage consumption rate per egg, statistically significant differences were reported between the Control and the First group ($P < 0.01$) and the First and the Third experimental groups ($P < 0.05$) again in the tenth week of egg-laying. In all the rest productive weeks and for the whole experimental period, a more obviously expressed tendency to a decrease of the forage consumption rate per egg, compared to the previously discussed characteristic, was reported for the groups fed on the higher rate of the studied food additive. Based on the results obtained, it could be concluded that *Tribulus terrestris* increases to a higher degree the forage efficiency for egg formation rather than for body weight accumulation. The differences of the additive on the mean values of the forage consumption per egg for the period of the study were statistically insignificant.

Table 2. Forage consumption rates in egg-laying quails of Pharaoh breed, treated with VemoHerb T

Таблица 2. Разход на фураж при пъдпъдъци носачки от порода Фараон, третирани с VemoHerb T

Group	Control group		First group		Second group		Third group	
Група	Контролна група		Първа група		Втора група		Трета група	
Week	FC layer[1], g	FC egg[1], g	FC layer, g	FC egg, g	FC layer, g	FC egg, g	FC layer,g	FC egg, g
Седмица	Xmean±Sx	Xmean±Sx	Xmean±Sx	Xmean±Sx	Xmean±Sx	Xmean±Sx	Xmean±Sx	Xmean±Sx
1	28.37±0.97	144.1±101	27.78±0.76	134.1±107	27.79±0.39	133.7±99	28.20±0.54	112.2±47
2	30.75±1.37	61.49±6.70	28.34±2.35	63.08±10.98	29.02±1.55	56.53±13.4	28.07±0.8	53.97±14.6
3	33.55±0.83	71.48±11.28	34.04±0.71	62.73±11.54	33.34±1.08	41.93±3.79	33.16±0.84	38.68±4.32
4	35.43±0.71	62.03±13.14	36.13±0.47	42.14±4.67	35.78±0.35	41.97±2.96	35.39±0.67	37.48±1.21
5	36.09±0.32	50.38±5.33	36.13±0.47	42.14±4.67	35.78±0.35	41.97±2.96	36.12±0.53	38.37±1.93
6	36.57±0.43	51.42±7.39	36.36±0.50	46.19±6.38	36.03±0.23	42.47±3.20	36.12±0.53	38.97±1.93
7	37.23±1.81	59.11±14.13	36.78±0.68	47.96±9.17	36.38±0.34	42.06±2.60	35.99±0.32	38.56±1.18
8	39.41±1.81	59.11±14.13	38.15±1.36	48.79±5.85	36.88±0.50	42.67±3.01	36.20±0.76	41.99±3.73
9[2]	42.96±1.09 a1c1	62.82±11.10 b2	43.00±0.39 a2a3	56.25±4.02 c4	38.93±0.73 a2c1c3	48.82±4.35	36.47±0.32 a1a3c3	42.50±4.03 b2c4
10[2]	43.39±0.90 b1	69.33±20.65	42.60±0.46 c5	55.72±4.57	41.08±0.73	52.02±7.14	40.18±0.65 b1c5	54.28±8.24
Aver. for the per. Ср. за пер.	36.44±4.69	68.55±42.48	35.92±4.90	60.82±42.95	35.06±3.96	54.25±41.61	34.74±3.74	50.20±26.79

[1] – FC layer = fodder consumption per layer; FC egg = fodder consumption per egg

[2] – a – P ≤ 0.01; b – P ≤ 0.1; c – P ≤ 0.5 (see discussions)

Conclusions

The studied food additive did not have a significant effect on the mean values of forage consumption per egg for the whole period of study. Statistically significant increase in forage conversion was established at the end of quail growth and development, i.e. about ninth-tenth week of the laying cycle, which coincided with the egg-laying peak. *Tribulus terrestris* increases to a higher degree the efficiency of forage use for egg formation rather than for body weight accumulation.

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