Serum Biochemistry and Organs Weight of Broilers Fed with Raw and Treated Ervil (*Vicia ervilia*) Seeds.

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Abstract

A study carried out to evaluate the effect of processing methods on broiler response to ervil seeds. Treatments were included a corn –soybean based diet; raw ervil seed (raw); ervil seed soaked in water for 12 h, autoclaved, then dried (SAD); ground ervil seed, soaked in water for 24 h, autoclaved and dried (GSAD); ground ervil seed, soaked in water for 47 h, cooked and dried (GSCD); ground ervil seed, soaked at 1%Acetic acid solution for 24h at 60°C (GAAS). All treated seeds were used at three levels (15, 30 and 45%). In all Ervil treatments, liver weights were higher in 30 and 45% in comparison to15% ($p<0.05$). Pancreas weight decreased in all detoxification methods in comparison to raw Ervil ($p<0.05$). Feeding 45% of raw seeds decreased serum T_3 and increased T_4 concentrations ($P<0.05$). GAAS and GSAD treatments decreased T_3 and alkaline phosphatase and increased T_4 ($P<0.05$). SAD treatment increased urea and T_4 while GSCD treatment increased T_4 and decreased T_3 and alkaline phosphatase ($P<0.05$). The results showed that GSCD and SAD treatments are more effective to detoxification of bitter vetch.

Introduction

Ervil (vicia ervilia) seeds are produced in the Asian and Mediterranean regions and are a cheap and rich source of energy and protein (Farran *et al.* 2001a). The use of ervil seed in ruminant diet and, when processed, in poultry diet has been reported (Fernandes-Figares *et al*., 1995; Farran *et al*., 2001b). Use of raw ervil seeds in poultry diet is restricted by the presence of various factors which are toxic for monogastric animal including protease inhibitors, lectins, tannins and canavanine.

To improve the nutritional quality and to provide effective utilization of ervil for non ruminant animals it is essential that anti-nutritional factors be removed or reduced. So, it is necessary to establish a processing technique(s) to insure its optimal utilization. In order to inactivate or reduce anti-nutrients, various conventional, simple processing methods have been used in legume seeds. (Barbour *et al*., 2001; Farran *et al*., 2001b). Heat treatment is an effective method of inactivating the lectin and protease inhibitors component, however the growth performance of chickens fed with heat treated seeds is still depressed (Farran *et al*, 2001a) and might be attributed to canavanine or other unknown anti-nutritional factors in this seed. So, in the present study we evaluated some complex processing methods to improve nutritional quality of ervil seeds for broiler chickens. The methods used to assess the toxic effects of legume seeds in poultry diets include the determination of one or more productive parameters such as weight gain, feed consumption or feed efficiency. In this study, we also used the serum biochemistry and organs' weight as indexes to evaluate effective different detoxification treatments of ervil seeds.

Material and Methods

A total of 1320 one-day old broiler chicks of a commercial breed were placed in 64 pens. Feed and water were provided *ad libitum*. The chicks were allocated randomly to 16 experimental diets. Treatments were included raw and four different processed bitter vetch seeds in three levels (150, 300, 450 g kg^{-1}) and a corn–soybean based diet as control. Each treatment group consisted of four replicates. Processing methods were included soaked in

water for 12 h, autoclaved, then dried at room temperature (SA**D**?); ground, soaked in water for 24 h, autoclaved and dried (GSA); ground, soaked in water for 47 h with exchange water every 12 h, cooked and dried (SC); ground, soaked at 1% acetic acid solution for 24h at 60°C (AA) ervil seed in three levels (15, 30, 45%). The diets were formulated to meet nutrient requirements according to NRC (1994). Two birds from each replicate were slaughtered after bleeding at days 28 and 42 and liver and pancreas were weighted and presented as a percentage of body weight. The following serum parameters were evaluated: urea, uric acid, T_3, T_4, alkaline phosphatase and cortisol. The results obtained from the experiment were analyzed by an analysis of variance using the general linear model (GLM) procedure of SAS and means were compared by Duncan's Multiple Range Test (SAS Institute, 1995).

Results and Discussion

The results are shown in Table 1. Liver weight in 28 and 42 days old birds fed GSCD and GSAD diets, respectively, was significantly ($P<0.05$) higher than control. In 28 days old chicks GSCD and SAD showed significant difference with untreated group ($P<0.05$). In 6 week old birds no significant differences was observed in liver weight. At both ages, increasing bitter vetch levels from 15 to 30 and 45 percent resulted in significant ($P<0.05$) increase in liver and pancreas weight. These results confirm the finding of Ocieo et al (1980a, b) that showed the size of pancreas was greater for chickens given 12, 25 and 35% raw Vicia ervilia than control. Probably pancreas is target for canavanine and usually pancreas is affected more than other organs (Thomas and Rosenthal, 1987). Trypsin inhibitor is the other factor that maybe contributes in increasing pancreas weight in chicks fed on raw bitter vetch.
Feeding SAD seeds increased serum urea significantly ($p<0.05$), but uric acid concentration didn't change with feeding raw and treated ervil seeds. Adding raw and treated ervil seeds to diet increased T_4 and decreased T_3 concentrations. It could be attributed to effect of anti-nutritional factors in ervil seeds, especially cyanogenic glycosides on thyroid gland and iodine metabolism. In 28 days old chicks, feeding SAD seeds resulted to higher concentration of cortisol than others and increasing ervil seeds from 15 and 30 to 45 percent, increased cortisol concentration significantly ($p< 0.05$). At 28 days old chicks that fed with raw and treated ervil seeds alkaline phosphatase concentration decreased significantly than control and at 42 day old chicks, feeding raw, AA and SA treatments reduced alkaline phosphatase significantly ($P<0.05$). This reduction may be an effect of canavanine in these seeds. Rosenthal (1977) showed that the biological effect of canavanine include a reduction of protein and glycoprotein synthesis, inhibition of alkaline phosphatase activity and inhibition of RNA synthesis.
It could be concluded that GSCD and SAD are more effective to detoxification of ervil seeds.

Table1. Effect of raw and treated ervil seeds on organs weight (Liver; LW, Pancreas; PW) and serum biochemical parameters at 42 days old broilers.

	LW (%)	PW (%)	Urea (mgL^{-1})	Uric acid (mgL^{-1})	T_3 ($ngdL^{-1}$)	T_4 ($ngdL^{-1}$)	Cortisol (mgL^{-1})	ALP (mgL^{-1})
Treatment								
Control	2.16^{b}	0.20^{b}	15.0^{b}	4.10^{ab}	3.00^{a}	56.0^{c}	11.40	2983^{a}
Raw	3.31^{a}	0.36^{a}	14.4^{b}	4.10^{ab}	2.34^{b}	329.4^{a}	12.18	1232^{c}
AA	3.26^{a}	0.35^{a}	16.0^{b}	3.48^{b}	2.18^{b}	233.8^{b}	17.58	2050^{b}
GSCD	2.65^{ab}	0.30^{a}	16.2^{b}	3.47^{b}	2.40^{ab}	280.7^{ab}	16.25	3103^{a}
SAD	2.65^{ab}	0.26^{b}	22.8^{a}	4.66^{a}	2.26^{b}	238.4^{b}	15.38	2988^{a}
GSAD	2.55^{b}	0.29^{a}	13.8^{b}	4.14^{ab}	2.02^{b}	272.0^{ab}	133.33	1819^{b}
level								
15%	2.40	0.26^{b}	15.0^{b}	15.0^{b}	3.10^{a}	102.0^{c}	10.70	2616
30%	2.34	0.46^{a}	16.1^{ab}	16.1^{ab}	2.21^{b}	275.6^{b}	8.75	2322
45%	2.91	0.49^{a}	17.9^{a}	17.9^{a}	1.91^{c}	232.2^{a}	12.60	2419

$^{a-c}$- Values with no common following letter in each column differ significantly ($p<0.05$)

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