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Effect of Different Levels of the Raw and Processed Vetch Seed (*Vicia sativa*) on Broiler Performance

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Abstract: An experiment was conducted to study the effects of different levels of raw and processed vetch (*Vicia sativa*) seeds on broiler performance. The experiment was carried out in a Completely Randomized Design. Four hundred and seventy six day-old broilers of male Hubbard strain were used. Seven treatments (dietary contain 0, 10, 20 and 30% levels raw or processed vetch seeds) were arranged by 4 replications and 17 broilers in each. The experiment period was 42 days and diets were isonitrogenous and isocaloric. Body weight gain was reduced significantly ($p < 0.05$) by 20 and 30% raw and processed vetch seeds in comparison with control. No significantly difference was shown in body weight gain by 10% processed and 20% raw vetch seeds compared with control group. The similar reaction was found in feed conversion ratio between treatments with exception by 30% raw dietary vetch seed. The results of this study have shown that desirable performance was observed by 10% of common vetch seeds in broiler performance.

Key words: Vetch seed, broiler, processed, performance

INTRODUCTION

With the outbreak of bovine spongiform encephalopathy (BSE or cow mad) and foot and mouth disease, the consumption of poultry meat is going to increase. In addition using of meat and bone meal derived from cattle and pigs are prohibited. Therefore, plant protein has to be used more frequently. Usually soybean meal as a protein and standard protein source is notable, but in Asia availability of soybean meal in animal feed is low for two responses: first, soybean is as human food. Secondly, production soybean in tropical area is too low (Modir Sanei, 1994).

Seed crops in throughout of the world and many countries where they producing and adapted to their specific environment and are used as a source of protein in animal and poultry feed (Sadeghi *et al.*, 2004). Some species of leguminous family are sources of cheap protein for animals (Lopez Bellido, 1994). Vetch seed was used in animal feeding in particularly as a protein source alternative by treated in diet (Fernandez-Figares *et al.*, 1995; Farran *et al.*, 2001a). However, raw vetch seed is detrimental to monogastric animals, especially chickens.

The adverse effects arise from the presence of some antinutritional factors in the raw seeds including vicine, convicine and β -cyanoalanin (Ressler *et al.*, 1997; Berger *et al.*, 2003). Leguminous seeds have been evaluated by several detoxifications, including soaking in

water, acetic acid, sodium bicarbonate and potassium bicarbonate solution and boiling (D-Mello and Walker, 1991; Udedie, 1991; Farran *et al.*, 1995; Barbour *et al.*, 2001; Farran *et al.*, 2001a). The objectives of this study were examined the raw and processed (cooking in water) vetch seed effect on broiler performance.

MATERIALS AND METHODS

This study was carried out in animal research station of Bu-Ali Sina University at March 2005 in Hamadan-Iran and animal care committee in Bu-Ali Sina University in Iran confirmed experiment. Four hundred and seventy six day-old broilers of male Hubbard strain with 7 treatments (dietary contain 0, 10, 20 and 30% levels raw and processed vetch seed) were placed. Four replications and 17 chickens in each were used in this study. Feed and water were provided as ad libitum methods, which included: vetch seeds cooking in water (60 min at 100°C) and dried (48 h) for decreasing antinutritional agents. True Metabolizable Energy corrected by nitrogen (TME_n) and Apparent Metabolizable Energy corrected by nitrogen (AME_n) of the vetch seed were determinate by using the precision-fed rooster assay (Sibbald, 2000). A chemical composition of both raw and processed vetch seed were similar with exception in fat of raw vetch seed (0.63%), which was higher than processed vetch seed (0.10%). The diets were formulated to meet nutrient

Table 1: Formulation ratios and feed ingredients for chicken in 1-21 days (%)

Feed ingredients	Control	1	2	3	4	5	6
Coru	55.20	51.00	46.70	42.80	50.80	46.50	42.00
Soybean	33.69	48.06	22.48	16.76	28.26	22.80	17.50
Vetch seed	-	10.00	20.00	30.00	10.00	20.00	30.00
Concentrates	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Sunflower oil	3.80	3.60	3.40	3.03	3.60	3.36	3.15
Oyster shell	0.94	1.00	1.00	1.17	1.00	1.10	1.20
Mineral	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Vitamin	0.25	0.25	0.25	0.25	0.25	0.25	0.25
DCP	0.61	0.49	0.48	0.20	0.49	0.30	0.12
Salt	0.19	0.19	0.20	0.20	0.19	0.19	0.20
DL-Met	0.07	0.16	0.25	0.34	0.16	0.25	0.33
ME	3050.00	3050.00	3050.00	3050.00	3050.00	3050.00	3050.00
CP	22.00	22.00	22.00	22.00	22.00	22.00	22.00

1, 2, 3: Raw vetch seed; 4, 5, 6: Processed vetch seed 10, 20, 30%, respectively; Concentrates, Crude protein 40%, Crude fat 5%, Crude fiber 1%, Ca 8%, P 4%, Lysine 3.85%, Methionine 3.70%, Met+Cys Metabolizable energy 2100 kcal/kg, Na 2.20% ME, Metabolizable energy based on kcal/kg; Mt. Methionine; Lys, Lysine; Mineral supplementation: Magnesium oxide, 62% 32000; Iron sulphate, 20% 50000; Zinc oxide, 0.77% 31800; Copper sulphate, 0.25 800; Vitamin supplementation: A, 1800000; D₃, 400000; Riboflavin, 0.72 g; vitamin E, 3600 (Unit vitamin international); K₃, 400; B₁, 355; B₂, 1320; B₃, 960; B₅, 5960; B₆, 5/88; B₉, 300; B₁₂, 30; H₂, 20; coline chloride, 100000 (mg)

Table 2: Formulations ration and feed ingredients for chicken in 22-42 days (%)

Feed ingredients	Control	1	2	3	4	5	6
Coru	66.00	61.91	57.71	53.40	61.70	57.20	52.70
Soybean	25.45	19.80	14.19	8.59	19.99	14.55	9.17
Vetch seed	-	10.00	20.00	30.00	10.00	20.00	30.00
Concentrates	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Sunflower oil	1.85	1.60	1.37	1.16	1.63	1.46	1.28
Oyster shell	0.99	1.07	1.07	1.06	1.08	1.07	1.06
Mineral	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Vitamin	0.25	0.25	0.25	0.25	0.25	0.25	0.25
DCP	0.15	0.15	-	-	-	-	-
Salt	0.06	0.07	0.06	0.07	0.06	0.09	0.07
DL-Met	-	0.04	0.13	0.22	0.04	0.13	0.22
ME	3050.00	3050.00	3050.00	3050.00	3050.00	3050.00	3050.00
CP	19.00	19.00	19.00	19.00	19.00	19.00	19.00

1, 2, 3: Raw vetch seed; 4, 5, 6: Processed vetch seed 10, 20, 30%, respectively; Concentrates, Crude Protein 40%, Crude fat 5%, Crude fiber 1%, Ca 8%, P 4%, Lysine 3.85%, Methionine 3.70%, Met+Cys Metabolizable energy 2100 kcal/kg, Na 2.20% ME, Metabolizable energy based on kcal/kg; Mt. Methionine; Lys, Lysine; Mineral supplementation: Magnesium oxide, 62% 32000; Iron sulphate, 20% 50000; Zinc oxide, 0.77% 31800; Copper sulphate, 0.25 800; Vitamin supplementation: A, 1800000; D₃, 400000; Riboflavin, 0.72, gram; vitamin E, 3600 (Unit vitamin international); K₃, 400; B₁, 355; B₂, 1320; B₃, 960; B₅, 5960; B₆, 5/88; B₉, 300; B₁₂, 30; H₂, 20; coline chloride, 100000 (mg)

requirements according to NRC (1994) recommended in Table 1 and 2. Crude protein and metabolizable energy of vetch seed determined for two period starter and grower (22 and 19% CP, 3050 kcal/kg, respectively). Diets were isonitrogenous and isocaloric and contain the suitable levels of Methionine, Lysine, Vitamins and Minerals. Chickens were weighed at the start, during and end, of the experiment. Live weight and total feed consumption per pen were recorded and feed conversion ratio was calculated at 21 and 42 days of age (NRC, 1994). Three birds from each replicate with similar average weight were slaughtered at the end of experiment. The results obtained of this study were analyzed by an analysis of variance using the procedure of SPSS and means were tested by Duncans Multiple Range test.

RESULTS AND DISCUSSION

Apparent Metabolizable Energy (AME), Apparent Metabolizable Energy corrected by nitrogen (AME_n), True

Metabolizable Energy (TME) and True Metabolizable Energy corrected by nitrogen (TME_n) in raw and processed vetch seed was, respectively (2552, 2840, 3168, 3078 kcal/kg) and (2688, 2968, 3304, 3215 kcal/kg). Processing causes to improvement vetch seed metabolizable energy, which was also, noted by Farran *et al.* (2001a).

No significant differences were found by 10% of raw and processed vetch seed in comparison with control diets (p>0.05). These findings are in agreement with Darre *et al.* (1988). In contrast raw and processed vetch seeds in 20 and 30% treatments caused a significantly reduction in body weight gain in comparison to control diet (p<0.05) (Table 3). These estimated were due to increasing vetch seed percentage in diet by increasing non-nutritional concentration (Darre *et al.*, 1988; Ergun *et al.*, 1986). This result is in agreement with Santidrian *et al.* (1980). Although antinutritional factors can be removed in vetch seed by cooking procedure but high level vetch seed in diet causes to deleterious effect

Table 3: Chicken performance by different levels of vetch seed (g)

Treatments/period	Daily weight gain		Feed intake		Feed conversion ratio	
	Starter (1-21 days)	Grower (22-42 days)	Starter (1-21 days)	Grower (22-42 days)	Starter (1-21 days)	Grower (22-42 days)
Control	33.8±0.19 ^a	67.5±2.95 ^a	44.2±2.23 ^a	145.0±3.17 ^a	1.3±0.07 ^a	2.2±0.05 ^a
RVS 10%	33.2±0.31 ^{ab}	65.0±2.06 ^{ab}	45.1±0.87 ^a	140.5±1.87 ^a	1.4±0.02 ^{bc}	2.2±0.04 ^a
RVS 20%	32.6±0.54 ^{bc}	64.3±1.15 ^b	43.8±0.67 ^a	138.9±2.87 ^a	1.4±0.01 ^{abc}	2.2±0.02 ^a
RVS 30%	28.5±0.63 ^d	54.4±2.0 ^d	39.6±0.22 ^c	122.4±4.65 ^a	1.4±0.03 ^c	2.3±0.07 ^a
PVS 10%	32.2±0.73 ^{ab}	65.0±0.66 ^{ab}	44.0±1.35 ^a	140.4±6.80 ^a	1.3±0.02 ^{ab}	2.2±0.08 ^a
PVS 20%	31.9±0.31 ^c	59.7±1.28 ^c	41.9±0.72 ^b	130.0±3.71 ^b	1.3±0.02 ^{ab}	2.2±0.03 ^a
PVS 30%	28.5±0.19 ^d	51.6±1.81 ^d	38.3±0.23 ^c	114.8±1.78 ^d	1.3±0.01 ^{ab}	2.2±0.06 ^a

Means with common superscripts in same column are not significantly different (p<0.05). RVS: Raw Vetch Seed; PVS: Processed Vetch Seed

Table 4: Actual and relative weight of supply organs by different levels of vetch seed (%)

Treatments/period	LW (%)	Breast	Leg	Liver	Pancreas
Control	71.67±0.01	38.30±0.01	29.30±0.01	2.76±0.01	0.35±0.00
RVS 10%	69.70±0.02	37.73±0.02	30.01±0.01	4.25±0.01	0.36±0.00
RVS 20%	69.73±0.04	38.22±0.01	30.05±0.01	4.43±0.01	0.37±0.00
RVS 30%	70.43±0.02	37.26±0.01	30.55±0.01	4.17±0.01	0.39±0.00
PVS 10%	69.85±0.02	37.40±0.01	29.66±0.01	4.16±0.01	0.36±0.00
PVS 20%	71.58±0.02	37.91±0.02	29.39±0.01	4.28±0.01	0.34±0.00
PVS 30%	71.42±0.02	38.17±0.01	29.99±0.01	3.92±0.01	0.35±0.00

RVS: Raw Vetch Seed, PVS: Processed Vetch Seed

than results are obtained by Tate (1996), Farran *et al.* (2001b) and Chowdhury *et al.* (2001), that could be related to more antinutritive content in vetch seed in this study.

No significant differences were indicated in 10% and 20% raw vetch seeds and 10% processed vetch seeds compared with control group (Table 3). These results have demonstrated that there is no effect on feed consumption by using various levels of vetch seeds in diet (Darre *et al.*, 1988). Increasing the level of the vetch seed in 10 to 20 and 30% of diets decreased feed intake that could be associated with the presence of antinutrition factors in this seed. This result confirmed by NRC (1994).

At 21 days. No significant differences were obtained in feed conversion ratio between treatments with exception by 30% raw dietary vetch seed (Table 3). The similar trend was found at 42 days of age. Other researchers have shown that using of vetch seed causes to increasing feed conversion ratio (Farran *et al.*, 2001b). The result of this study is agreement with Ocio *et al.* (1980b).

Actual and relative weights of organs influenced by different levels of vetch seed are presented in Table 4. No significant differences were found between thigh, breast, liver, pancreas weight ratio to carcass in vetch seed treatments compared with control diet (p>0.05).

No significant differences was shown between vetch seed treatments and control in mortality (p>0.05). These results was documented in the findings by Ocio *et al.* (1980a) who were showed no significant differences in chicks fed on diets containing 18, 25 and 35% raw bitter vetch seed and control. The results showed that antinutritional factors in bitter vetch seed although has dramatic effects on bird performance, but in this study mortality was not significantly differences among vetch seed groups and control

(p>0.05), this may be due to strain of bird by high resistance in this respect.

These results have shown that vetch seed in diet dose not effect undesirable reflection on safety broiler but 30% diet vetch seed causes to untidy and turbid feathers, which could be due to anti-nutritional effects of vetch seeds on sulfur amino acids metabolic especially Methionine (Tate, 1996). Undesirable reaction on growth and feed intake of broiler were not found by raw and processed vetch seed (Darre *et al.*, 1988). Farran *et al.* (1995) have shown that using 25% levels of vetch seed in layers diet could be decreased feed intake, eggs production and increased feed convention ratio.

CONCLUSION

The results of this study have shown no adversely effect on broiler performance and organ reflection by 10% of vetch seeds. Therefore this seed could be a suitable plant protein as an alternative source in broiler feeding.

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