

Effect of Oxidized Soybean Oil against Pomegranate Seed as Antioxidant on the *in vitro* Rumen Fermentation Parameters

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Received: 21-01-2013

Accepted: 16-04-2013

Introduction Oxidative stress is an inevitable consequence of intensive production due to mismatched balance between free radical production and natural antioxidant capacity of animals. Reactive oxygen species (ROS) refers to a group of free radicals produced by oxidative energy cycle and also recently demonstrated to be as a weapon for macrophage cells. Moreover, feed processing phenomena such as extruding and pelleting is one of the major sources of ROS production in feed due to lipid peroxidation and notably oxidation cascades in unstable organic matters of feed. Although ROS could be a source of adverse effect on fiber degradation in the gut of ruminant by reducing microbial population counts and diversity, because rumen bacterial, protozoal and fungal community as well as eukaryotes are susceptible to oxidative damages. Therefore, using plant or feed base antioxidant in the diet of dairy animals would be necessary in further feeding strategies. The aim of this study was to evaluate antioxidant capacity of pomegranate seed against the adverse effect of peroxide content of feed that induced by supplementation of oxidized soybean oil as energy and fiber source in preparturient dairy goats.

Materials and Methods The gas production experiment and batch culture degradability test were carried out to investigate the effects of fresh soybean oil (FSO), oxidized soybean oil (OSO) and biologically active constituents of pomegranate seed (PS) on microbial fermentation characteristics, kinetics of gas production, methane and carbon dioxide production, *in vitro* dry matter degradation (DMD), t 0.5, and lag time. Also, the calculated parameters e.g. microbial protein, molar proportion of volatile fatty acids, metabolizable energy (ME), and organic matter digestibility (OMD %) were evaluated for different treatments. The parameters were analyzed through the completely randomized design with repeated measurements. The treatments were 1) base diet and FSO (4% of dry matter (DM)), 2) base diet and OSO (4% of DM), and 3) base diet, OSO and milled PS (8% of DM). The OSO contained higher peroxide value (7.06 vs. 1.37 gram milliequivalent /kg oil), and more Trans fatty acid isomers than FSO.

Results and discussion OSO reduced total gas production, t 0.5, DMD, microbial protein, ME, OMD%, total carbon dioxide production, molar production of propionate, and moles numbers of total volatile fatty acids and increased the methane production, lag time, and molar proportion of acetate and butyrate when compared with FSO. Adding PS as antioxidant increased the total gas production, t 0.5, DMD, ME, OMD %, total carbon dioxide production, molar productions of propionate and acetate, and moles numbers of total volatile fatty acids, and reduced the lag time, methane production and molar proportion of butyrate significantly. The major observed effect of OSO that is important from an economical point of view in ruminant nutrition was reduced DM degradability. Depressed DM intake, negative energy balance, metabolic disorders and susceptibility to microbial disease and inflammation are expected in this oxidative situation. Also environmental importance of increased methane production by progressive effect of free radicals in proton partitioning in to methane production pathway in the rumen are significant, but could be improved by PS supplementation. PS may play a protective role against oxidized oil via flavonoids, polyphenols, special fatty acid contents, carotenoids and other bioactive compounds well documented in herbal medicine.

Conclusion In general, OSO feeding quantitatively and qualitatively reduced positive parameters of microbial fermentation, DMD, Microbial protein synthesis and VFA production but PS diminished the adverse effects of OSO and FSO feeding significantly. It seems that the PS has potential antioxidant compound reducing the harmful ROS effect on Microbial metabolism in the rumen as well as reducing progressive peroxidation cascades in feed and animal body.

Keywords: Antioxidant, Microbial fermentation, Oxidized soybean oil, Pomegranate seed.

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Nutritive value of wheat straw treated with gaseous or liquid ammonia through nylon bag and *in vitro* gas production techniques

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Received: 08-07-2012

Accepted: 25-07-2015

Introduction Feed shortage is the most important characteristic of Iranian animal industry. Increased costs of livestock production have caused the Iranian producers to reduce feed costs mainly by inclusion low quality crop residues into ruminants diets. It is estimated that around 20 million tons wheat straw produced in Iran every year. Both the digestibility and crude protein content of wheat straw are typically low. Since 1900, a wide variety of chemical treatments have been tested for their potential to improve the feeding value of wheat straw. Upgrading of wheat straw by ammoniation has been known for a long time, but application of this method of wheat straw treatment has received the least attention in the area (Khorasan Province, Iran). Therefore, the object of the present study was to evaluate the effect of gaseous and liquid ammonia on nutritive value of wheat straw through *in vitro* techniques.

Material and Methods One kg dry wheat straw was placed into the plastic cylinders with dimension of 1 m (diameter) and 1.8 m (height) and 0.8 mm (thickness). Gaseous and liquid commercial ammonia was injected or added to the wrapped straw at the rate of 2, 4 and 6 percent. The treatment time was 1 month at room temperature (20-25 °C). At the end of treatment period the cylinders were opened and the ammoniated straw exposed to the air for 4 days. The treated straws were sampled for the subsequent analyses. Dry matter degradability of the samples was done by using nylon bags (10x20 cm) with pore size of 40 micron. About 2 g ground samples (2 mm) were placed into the nylon bags and incubated in rumen of 4 permanently fistulated steers for 3, 6, 12, 24, 36, 48, 72, 96 and 120 hrs. The experimental steers were fed by the ordinary diet containing 65% forage and 35% concentrate twice daily. The Menke and Steingass method was followed for the *in vitro* gas production method.

Result and discussion Crude protein (CP) content of the treated wheat straw samples increased and their neutral detergent fiber (NDF) and acid detergent fiber (ADF) contents reduced significantly ($P < 0.05$) with increasing the level of ammonia in both gaseous or liquid forms, although, the 6% level was more affective. There were no significant differences between the experimental treatments in organic matter, ether extract and ash contents. Crude protein content increased from 3.71% in untreated wheat straw to 13.41% in treated straw with 6% ammonia in liquid form. The chemical composition measurements revealed that ammonia treatment in liquid form was more effective in comparison with the gaseous form. The increase in CP content of the treated wheat straw was in agreement with data reported by other workers. The lower levels of NDF and ADF of the straw due to ammonia treatments appear to be due to solubilization of hemicellulose component. The nylon bag measurements showed that soluble fraction (a and b), rate of degradation of fraction b (r), potential degradability (PD) and effective degradability (ED) were all associated with the level of applied ammonia. Dry matter disappearance significantly ($P < 0.05$) increased with increasing the level of ammonia mainly in gaseous form. For all the *in situ* parameters the most effective level of ammonia was 6%. Total produced gas after 24 hrs of incubation confirmed that the highest level of ammonia (6%) had the greatest effects on a, c, ME, NEL, OMD and SCFA parameters.

Conclusion The overall results showed that wheat straw treatment with 6% ammonia in either gaseous or liquid forms could improve its feeding value for ruminants significantly ($P < 0.05$). Straw treatment with ammonia in liquid form was totally more effective than the other form (gaseous). It seems that ammonia fixation in treated wheat straw with liquid ammonia has been related to the moisture content rather than its forms. In farm and commercial scales handling and application of large amount and liquid ammonia and treating straw is inapplicable. It was concluded that straw treatment with gaseous ammonia in presence of moisture at a level of 20-30 percent and environmental temperature of 20-30 °C result to the best improvement in case of nutritive

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value. This type of treatment can be easily applied in most areas of Iran during summer because the noted conditions are available.

Keyword: Gaseous or Liquid ammonia, Wheat straw Chemical treatment.



Feeding Value of *Silybum marianum* for Sheep and its Effect on Fiber and Protein Digestion

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Received: 02-05-2014

Accepted: 29-09-2015

Introduction Due to scarcity of forage and water resources and high feed prices in Iran, it seems that the utilization of native and cheap forage resources for ruminants is important. The Milk thistle (*Silybum marianum*) is distributed in different regions of Iran included: Gonbad Kavoods, Gorgan, Nodeh Kalardasht, Dareh Hezareh, Dasht Mugan, Poshtkoh, Mollassani, Shush, Hamidieh, Ramhormuz, Izeh and Kazeroon. The *Silybum marianum* seed extract and whole plant contain many compounds including Silybin A and B, Silychristin, Apigenin, deoxy silydianin (flavonolignans). Seeds of this plant has about 20 to 25 percent oil, which oleic acids (31.85 %), linoleic acid (45.36 % percent) and palmitic acid (8.25 %) are the major fatty acids of *Silybum marianum* seed. Also, the *Silybum marianum* contains flavonoids and anti-nutritional compounds such as tannins and nitrates. Tannins, unsaturated oils and other anti-nutritional compounds may have negative effects on the digestion of fiber and protein fractions. Tannins can make complexes with large number of nutrients, such as carbohydrates, proteins, bacterial cell membrane protein and carbohydrates, and even digestive enzymes. The *Silybum marianum* plants are native to northern areas of Ahvaz and abundantly growth as self-propelled. The farm animals in these area (sheep, goats, camels, water buffalo and native cows, etc.) graze this plant as well as the manual feeding, but there is little known about its effects on the health, performance and digestibility of nutrients (in particular on the fiber and protein, due to existing the tannin and unsaturated oils in it) in those animals, and no research work has been done about *Silybum marianum*. Therefore, this experiment was conducted to determine the feeding value of *Silybum marianum* and to measure its effects on rumen fermentation and digestion of fiber (straw) and protein constituents (soybean meal) feedstuff in Arabi sheep.

Materials and Methods Twelve male Arabi sheep with a mean body weight of 37 ± 1.2 kg were allocated to four dietary treatments in a completely randomized design. Experimental diets were including control diet (without *Silybum marianum*) and diets supplemented with different levels of *Silybum marianum* (50, 100 and 200 g/kg as diets 2, 3 and 4 respectively) that fed for 84 days. Dry matter intake, digestibility, fermentation parameters and blood metabolites were determined. Digestibility and gas production potential of wheat straw and soybean meal incubated with rumen fluid of sheep fed diets containing *Silybum marianum* were examined. The *in vitro* digestibility was measured by the two-step method. Gas Production was analyzed in triplicate as described by the Menke and Steingass.

Results and Discussion: The results showed that dry matter intake, rumen fermentation parameters and blood metabolites were significantly affected by the experimental diets ($P < 0.05$). Feeding *Silybum marianum* had no effect on pH and diets digestibility. The gas production of straw ($P < 0.05$) and soybean meal ($P > 0.05$) incubated with rumen fluid of sheep fed diets containing *Silybum marianum* reduced, except for diet containing 5% *Silybum marianum*. The *Silybum marianum* tannins and fatty acids were likely the limiting factors for feed intake. It was concluded that *Silybum marianum* essential oils, through olfactory stimulation, and due to having 25-20% oil, can be increased feed intake. The dry matter intake by cows fed diet containing 4.1% tannins, significantly decreased ($P < 0.05$), compared to the control diet and diets containing 2% tannins. In agreement with the present study, addition of dried or silage of pistachios by products, contain tannins, to Kermani rams

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diet, did not affect crude fiber apparent digestibility. The tannins may reduce digestion fiber through formation complexes with lignocellulose material and stop adhesive microorganisms or their enzymes. In this experiment, the use of *Silybum marianum* decreased rumen ammonia nitrogen concentration that could be reflected by the tannins. In cattle and sheep feeding with diets containing medium levels of tannin (less than 4%) the rumen protein degradability was reduced. The Silymarin from *Silybum marianum*, has probably been affected with effect on glucose 6-phosphatase enzyme negatively, then inhibit the gluconeogenesis, and led to blood glucose reduction. The results of some experiments show that the tannin decreases concentrations of ammonia and subsequent the urea nitrogen plasma through reduction of protein degradation rate.

Conclusion: The results suggested that addition of 20% *Silybum marianum* to diet of sheep have had no negative effect on rumen fermentation, wheat straw, soybean meal, and nutrient digestibility for sheep up to 20% of diet DM. Therefore, utilization of *Silybum marianum* in feeding small ruminants could be reasonable in some areas of Iran.

Key words: Blood metabolites, Digestibility, Gas production, Rumen ammonia nitrogen, Wheat straw

The effect of diets containing pistachio by products treated with electron irradiation, NaOH, and PEG on nutrients digestibility and performance of finishing Zandi lambs

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Received: 12-11-2014

Accepted: 30-08-2015

Introduction It has been estimated that PBP production based on fresh weight in Iran is over 400,000 MT annually. Pistachio by-products consist of 53.50% external hull (epicarp) with the remaining composed of leaves, mesocarp and kernel. The results of few studies showed feeding of low levels of PBP had no effects on sheep, dairy cow and goat performance. Ensiled of PBP with PEG, NaOH and urea then treated by electron irradiation could be caused to better nutrition value via deactivation of tannins. The aim of this study was to survey the effect of diets containing pistachio by products treated by electron irradiation, NaOH, and PEG on nutrients digestibility and performance of finishing Zandi lambs.

Materials and methods Twenty male Zandi lambs with the initial average body weight of 21 ± 1.52 kg were housed in individual pens and were allocated to four dietary treatments in a completely randomized design for 70 days. The basal diet consisted of 220 g/kg DM PBP, 130 g/kg DM wheat straw and 650 g/kg DM barley based concentrate. The four dietary treatments included control diet (Treatment 1; basal diet containing 22% PB), ER-PBP (Treatment 2; containing 22% electron irradiated PBP), NaOH-PBP (Treatment 3; containing 22% NaOH treated PBP) and PEG-PBP (Treatment 4; PEG added to basal diet as 15 g/kg of diets DM). Throughout the 70 d experiment, body weight was measured weekly. Feed intake and ort of lambs were recorded and sampled daily for determination of nutrient intake of DM, CP ($N \times 6.25$), EE and NDF as describes before.

Apparent total digestibility of nutrients was estimated by the marker ratio technique using acid insoluble ash (AIA) as an internal marker.

Blood samples (10 ml) were taken from jugular vein of lambs before morning feeding on d 70 of experiment. The serum concentrations of total protein (TP), albumin, creatinine, glucose and urea were determined using commercial laboratory kits (Pars Azmun Laboratory, Tehran, Iran) and an auto analyzer. The data were analyzed as completely randomized design. Duncan's multiple range tests were used to determine the differences amongst treatments. Significant levels were defined as those with probabilities of 0.05 or less.

Results and Discussion Nothing as the effects of dietary treatments were observed on FBW. Feeding ER-PBP diet to lambs tended to increase DMI and also increased ($P < 0.01$) weight gain and average daily gain compared to other treatments and control group. Inclusion of ER-PBP into the diets of lambs decreased ($P < 0.01$) FCR compared to control and other diets.

Irradiation of PBP increased ($P < 0.01$) digestion of diets DM and CP compared to the control group. Digestion of EE and NDF was increased ($P < 0.01$) in ER-PBP and NaOH-PBP diets.

Serum levels of true protein (TP) was increased ($P < 0.01$) in lambs fed PEG-PBP diets compared to other groups.

Conclusion It can be concluded that irradiation of pistachio by-product is a useful treatment to improve nutritional value of pistachio by-product as a feed ingredient for sheep. Further studies are necessary to evaluate the effects of other physicochemical treatments of PBP on lamb performance and to evaluate the economic value of including PBP in ruminant diets.

Key words: Digestibility, Pistachio by product, Radiation, Zandi lamb.

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Nutrient Digestibility, Rumen Fermentation Parameters, and Production Performance in Response to Dietary Grain Source and Oil Supplement of Holstein Dairy Cows

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Received: 08-11-2013

Accepted: 17-02-2014

Introduction High-producing dairy cows require large amounts of concentrates that are rich in energy and crude protein to meet their nutrient requirements. Cereal grains and oil supplements are commonly used for increasing energy density of diets fed to high-producing dairy cows. Dietary grain source (barley vs. corn) and oil supplement (soybean- vs. fish oil) resulted in varied dry matter intake and milk production responses in different research studies based on effects on nutrient digestibility and rumen fermentation characteristics. Therefore, the main purpose of this study was to determine the effects of, and interactions between, grain source and oil supplement on the feed intake, rumen fermentation characteristics, nutrient digestibility and lactational performance of Holstein cows.

Materials and Methods Eight lactating multiparous Holstein cows (parity = 3.3 ± 1.3 and days in milk = 77 ± 22.1 ; mean \pm SD), were used in a replicated 4×4 Latin square design with 25-d periods. Each experimental period consisted of an 18-d diet adaptation period and a 7-d collection period. Cows within a square were assigned randomly to dietary treatments. Cows were blocked into 2 squares of 4 cows each based upon milk production, and days in milk, and within blocks were assigned to 1 of the 4 experimental diets with a 2×2 factorial arrangement: 1) BF = barley-based diet supplemented with fish oil at 2% of dietary DM, 2) BS = barley-based diet supplemented with soybean oil at 2% of dietary DM, 3) CF = corn-based diet supplemented with fish oil at 2% of dietary DM, and 4) CS = corn-based diet supplemented with soybean oil at 2% of dietary DM. The TMR amounts offered and refused were measured daily for each cow and DMI determined daily for each cow. Cows were milked three times daily at 0200, 1000, and 1800 h in a herringbone milking parlor. Milk yield for all cows was recorded and sampled at each milking during the last 7 d of each period. Milk samples were composited in proportion to milk yield, preserved with potassium dichromate, stored at 4°C, and analyzed for fat, protein, lactose, and total solids using an infrared analyzer (MilkoScan 134 BN; Foss Electric, Hillerød, Denmark). At the end of each experimental period, rumen samples were obtained at 4 h after the morning feeding using the stomach tube technique. Rumen pH was determined immediately after the samples were collected using a mobile pH meter (HI 8314 membrane pH meter, Hanna Instruments, Villafranca, Italy). Rumen fluid samples were acidified by sulfuric acid and analyzed for volatile fatty acid by gas chromatography (model no. CP-9002 Vulcanusweg 259 a.m., Chrompack, Delft, the Netherlands). Two fecal grab samples per cow were taken from the rectum twice daily across day 19 to 23 of each period and frozen at -20°C until analyzed. Acid detergent insoluble ash was used as an internal marker to determine apparent total-tract nutrient digestibility. Data were composited within period and analyzed with the MIXED MODEL procedure of SAS (SAS Institute, 2003) to account for effects of square, period within square, cow within square, treatments (grain source and oil supplement), and the interaction between grain source (barley vs. corn) and oil supplement (fish oil vs. soybean oil).

Results and Discussion Apparent total-tract digestibility of dry matter ($P = 0.05$) and ether extract ($P < 0.01$) were greater in the corn- vs. barley-based diets. Fish oil tended ($P = 0.07$) to decrease and decreased ($P = 0.03$) apparent total-tract digestibility of non-fibrous carbohydrate and ether extract as compared to soybean oil, respectively. An interaction of main treatment effects tended to occur for molar concentration of propionate ($P = 0.09$). Barley-based diets increased molar concentration of propionate compared to corn-based diets for cows fed soybean oil, but not for cows fed fish oil. Dry matter intake tended ($P = 0.09$) to be greater for barley- vs. corn-based diets, but was reduced for the fish oil compared to soybean oil supplemented diets ($P < 0.01$). Grain source did not affect milk yield or milk composition. Compared to soybean oil, fish oil negatively affected milk yield

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and milk composition. Feed efficiency remained unchanged among treatments.

Conclusion Results indicated that grain source and oil supplement do not interact to affect productive performance of lactating cows. Due to lowering DM intake, feeding fish- vs. soybean-oil, but not changing diets fermentability, did not influence production performance of lactating cows.

Keywords: Barley grain, Corn grain, Dairy cow, Fish oil, Soybean oil

Effects of soy-lecithin, soy-oil and tallow on performance and expression of SREBP-1 gene in broiler chickens

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Received: ??-0?-20??

Accepted: ??-0?-20??

Introduction Using vegetable oils and animal fats in poultry diets have beneficial effects for poultry production. They often have higher biological value than expected, increasing dietary metabolizable energy, which usually results in higher growth rates and better feed efficiency. Sterol-regulatory element binding proteins (SREBPs) play a key role in transcriptional regulation of cholesterol metabolism in response to cholesterol levels in the cell. This study was carried out to evaluate the effects of soy-lecithin, soy-oil and tallow on performance and expression of SREBP-1 gene in the liver of broiler chickens.

Materials and methods A total of 768 male broiler chickens (Ross 308 strain) were used in a completely randomized design as a 3×4 factorial arrangement with 4 replicates and 16 chicks per each. Broiler chickens were fed with three types of fat (soy-lecithin, soy-oil and or tallow) and four levels of fat (0, 1, 2, and 3) from day 1 to day 42. Experimental diets were formulated to be isocaloric and isonitrogenous. At 42 d, liver samples of birds washed with normal saline, put into the liquid nitrogen tank and transferred to -80°C freezer. Relative real-time polymerase chain reaction (RT-PCR) was performed to assess HSP70 gene expression in the heart and liver of broiler chickens. Total RNAs were extracted from the homogenised tissues using high pure RNA isolation kit (Roche, Basel, Switzerland). RNA concentration was assayed by spectrophotometer nano-drop (MD-1000) in wavelength of 260/280 nm. Synthesis of cDNA was done by gene PAK RT universal kit (Fermentas, Hanover, MD, USA), with reverse specific primer and hexanucleotide random primer. Genotype and sequence of the primers of B-actin and SREBP-1 was collected from the National Center for Biotechnology Information (Bethesda, MD, USA). Then, specific primers were designed by primer-5 software and examined by BLAST for checking the specificity of primers. Synthesis of the primers was done by Sigma Company. Qualitative PCR showed that primers designed well and there was no non-specific band or primer dimer (Figures 1 and 2). Optimization of annealing temperature was examined with melting curve by applied biosystems-7300 RT-PCR system. The highest ΔR_n and the lowest Ct were considered to determine the optimum annealing temperature, which was 62°C for both genes. The optimum level of primers was $0.15 \mu\text{L}$. Real time PCR was executed in triplicate. Reaction conditions were 45 cycles of a three phase PCR (denaturation at 95°C for 15 s; annealing at 62°C for 30 s; extension at 72°C for 30 s) after an initial denaturation step (95°C for 10 min). In real-time assay, a melt curve analysis, performed at the end of the PCR cycles, will confirm specificity of primer annealing. The thermal profile for melting curve is 95°C for 15 s, 60°C for 1 min; 95°C for 15 s and 60°C for 15 s. The efficiency calibrated model is a more generalized $\Delta\Delta\text{Ct}$ model. In this model, Ct is the sign of the first cycle that amplification curve begins to rise. The model considers both Ct of target gene and also Ct of reference gene or housekeeping gene. ΔCt for each target gene is then calculated by subtracting the Ct number of target gene from that of housekeeping gene for each sample. $\Delta\Delta\text{Ct}$ for each gene was calculated by subtracting the ΔCt of target sample from that of control sample.

Results and discussion Soy-lecithin improved birds' average daily feed intake and average daily body weight gain during the whole experimental period ($P < 0.05$). Soy oil caused the best feed conversion ratio during the whole period of rearing. Average body weight, average daily gain and average daily feed intake increased as the dietary fat level increased ($P < 0.05$). Breast, thigh, liver, abdominal fat pad, proventriculus and gizzard, back and neck, duodenum, ceca weights and expression of SREBP-1 were not affected by type or level of supplemental fat. With increasing the dietary fat level the edible carcass and heart weights improved. Fat at the level of 1 percent caused the highest jejunum weight. The highest wing and ileum weights were found by soy lecithin and tallow, respectively. Highest level of serum HDL was shown by chicken fed diet without fat and diet containing soy oil.

Conclusion Since dietary soy-lecithin had a similar growth performance compared to soy oil, it can be

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included as an energy source in broiler chickens diets. Further studies should be done to clear the physiological mechanisms of soy-lecithin on birds' performance.

Keywords: Broiler Chicken, Gene Expression, Soy-lecithin, Soy-oil, Tallow



Evaluation of α -tocopherol acetate, peel and extract pomogrante antioxidative potential in diet contained fish oil on meat quality boiler chickens

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Received: 28-01-2013

Accepted: 05-11-2013

Introduction Poultry meat enriched with long-chain polyunsaturated fatty acids n-3 (PUFA Lc n-3) can make a nutritionally meaningful contribution to Western diets in which consumption of PUFA Lc n-3 is low. Enrichment of poultry meat with this fatty acid is usually achieved by inclusion of fish oil in broiler diet (23, 24). However, meat enriched in this way is susceptible to quality deterioration by lipid oxidation during storage or cooking, leading to reduction in nutritive value and accumulation of lipid oxidation products (10). Oxidation is a very general process affecting lipids, pigments, proteins, DNA, carbohydrates, and vitamins (11). The objective of this study was to evaluate the effects of dietary α -tocopherol (α -Toc), pomegranate peel extract (PPE) and pomegranate peel (PP) on fatty acid profile, aoxidation and phenolic compounds in raw thigh and breast meat during refrigeration.

Materials and methods Peels of pomegranate were harvested in October 2011 from pomegranate trees (Ardestani, variety) in Khorasan Razavi province (East, Iran). Dried powders of peels (2.5 g) were extracted with 40 mL of methanol solvent at room temperature for 6 hours. Three hundred and eighty four 1-d-old male broiler chicks (Ross 308) were randomly allotted to 8 groups with 4 replicates of 12 birds. Eight dietary treatments including control diet without feed additives, control diet mixed with 200 mg/kg α -Toc, control diet mixed with PPE (100, 200 and 300 mg/kg), and control diet mixed with PP (1, 2 and 3 g/kg). In all diets 2% fish oil were added to enhance the enrichment of unsaturated n-3 fatty acid in birds. One broiler chick was randomly selected from each pen of 42 d of age. The antioxidative potential and various meat quality characteristics were determined on 0, 7, and 11 days of refrigerated storage. Total phenols content in the aqueous supernatant was estimated by the Folin-Ciocalteu method (33). 1, 1-Diphenyl-2-picrylhydrazyl (DPPH) radical scavenging activity was estimated according to Blois' (2). Lipid oxidation in sample was determined as the TBARS value by using the method described by Ahn *et al.* (1). Fatty acid profile of samples was determined by gas chromatography (7). Data were subjected to ANOVA using the GLM procedures of SAS (27).

Results and discussion The FA composition of the diets, particularly PUFA Lc n-3, was modified and increased by the inclusion of fish oil in diet. The concentration of saturated fatty acid in the thigh and breast meat was not influenced in broilers fed PP, PPE, and α -Toc diets as compared to control group. The results indicated that the tissue of broilers have a limited capacity for alteration of their saturated fatty acids (7). Monounsaturated fatty acid (MUFA) content in thigh and breast was decreased in birds fed diet containing PP, PPE and α -Toc compared to control group ($P < 0.05$). The increase storage of PUFA decreased the synthesis of MUFA by inhibiting the activity of 9-desaturase complex which is the key enzyme needed to convert SFAs to MUFAs and this is compatible with our results (25). Concentration storage of Linolenic acid, Eicosapentaenoic acid, Docosapentaenoic acid, and Docosahexaenoic acid in the thigh and breast meat of broilers fed diet containing PP, PPE and α -Toc were higher than that of the control birds. This can be due to the antioxidative effects of phenolics compound added in diets. Diet-containing antioxidant may inhibit the oxidation of PUFA (13). Thigh and breast meat of the broilers fed α -Toc and PPE diets had significantly higher total phenolic content when compared with control or PP diets. Polyphenolic compounds in PPE are distributed, retained, and remained functional in muscle (28). Nagendra Prasad *et al.* (20) suggested that polyphenol content showed highest relations with total antioxidant capacity. The development of lipid oxidation in the thigh and breast meat from broilers was delayed by diets antioxidants (PP, PPE, and α -Toc). The thigh and breast meat from the broilers fed PPE, α -Toc and PP diets produced low MDA in spite of the higher content of PUFA Lc n-3 in diets which deteriorates the quality of the meat. These results agree with the other studies which depicted that the oxidation lipid decreased in broilers fed on various PUFA levels and α -Toc acetate. This was inhibited due to the

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antioxidant activity of α -Toc acetate (11). The large amount of phenolics contained in PP and PPE diets may cause its strong antioxidant ability, extend the shelf life, and improve the quality of meat products. The DPPH radical scavenging activity of the thigh and breast meat from the broilers fed α -Toc and 200 and 300 mg/kg PPE in diets were significantly higher than that of the control group during the entire storage period, whereas lower significant difference was found in broilers fed PP diet compared to control birds. Phenolic compounds present in the natural plant oils react with lipid and hydroxyl radicals and convert them into stable products (13).

Conclusion The results of the present study demonstrate that breast and thigh meat in broiler may be successfully enriched with LC PUFA n-3 by the addition of fish oil to the diet. Long-chain fatty acid n-3 was higher in broilers fed α -Toc and/or PPE at the rate of 200 or 300 mg/kg diets. The DPPH radical scavenging activity, TBARS, and total phenolic content in the thigh and breast muscle were improved significantly in the PPE and α -Toc fed birds. In conclusion, supplementation of diets with 200 and 300 mg PPE / kg can improve the anti-oxidative potential and functional qualities of thigh and breast meat in broilers. The PPE was an effective antioxidant as α -tocopherol in enriching the broiler meat.

Key words: Antioxidant, Fatty Acid, Meats Broiler, Peel pomegranate, Phenolic compounds.



The effects of using of mineral and organic toxin absorbents on broiler performance and internal organs weight in experimental aflatoxicosis

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Received: 31-08-2013

Accepted: 29-06-2015

Introduction The occurrence of mycotoxins in foods and feeds is a problem of major concern in all over the world. Profitability of poultry production can be greatly affected due to the frequency of feed contamination and the detrimental effects of these toxins on the performance. Aflatoxins, a group of closely related and biologically active mycotoxins, are produced by strains of *Aspergillus flavus* and *Aspergillus parasiticus*. They commonly occur as natural contaminant of poultry feeds. Domestic animal species such as chickens, ducks, cattle and turkeys consuming sublethal doses of aflatoxins for several days developed a toxic syndrome in which liver damage was the most significant change. The biological effects of aflatoxins could be categorized into two groups, long term and short term effects. Long term effects included chronic toxicity, cancer, birth defects and genetic alterations. Aflatoxins affected all poultry species, although they generally take relatively high levels to cause mortality, low levels can be detrimental if continually fed.

Material and Methods This study was conducted to determine the efficacy of mineral, organic toxin absorbents, humic acid and yeast cell wall on performance and internal organs weight of broilers in experimental aflatoxicosis. This study was conducted in a completely randomize design with 432 Ross-308 broilers with 9 treatments, 4 replicates and 12 broilers in each replicate. Treatments included diet without aflatoxin, 2: diet contaminated with aflatoxin, 3: diet contaminated with aflatoxin and supplemented with 0.20 Humic acid, 4: diet contaminated with aflatoxin and supplemented with 0.40 Humic acid, 5: diet contaminated with aflatoxin and supplemented with 0.60 Humic acid, 5: diet contaminated with aflatoxin and supplemented with 0.80 Humic acid, 6: diet contaminated with aflatoxin and supplemented with 0.80 Humic acid, 7: diet contaminated with aflatoxin and supplemented with 1.00 Humic acid, 8: diet contaminated with aflatoxin and supplemented with 0.50 sodium bentonite, 9: diet with aflatoxin and supplemented with 0.10 yeast cell wall. The experiment was done between 7-35 days.

Results and Discussion The results showed that aflatoxin and its absorbents significantly affect the performance and internal organs weight of broilers ($P < 0.05$). In aflatoxicosis and toxin absorbents diets the amounts of daily feed intake in contrast with control group increased. The lowest amount of weight gain was observed in aflatoxicosis diet. Using 0.2% of humic acid in aflatoxicosis diet significantly improved weight gain and feed conversion ratio. Using all three types of toxin absorbents, improved the liver and bursa fabricius weight. The growth performance of chicks can be influenced by the addition of aflatoxin to the diet. Contaminated experimental diets with aflatoxin and toxin absorbents in contrast with control group increased the amount of daily feed intake. Increase in the amount of feed intake by using contaminated corn can be related to energy content of corn grains. Contaminated grains with aflatoxin decrease the amount of grains energy. So, birds for supplying sufficient amount of energy intake more amount of diets. By consuming high levels of feed, highly amount of nutrients supplied for biological activity, so the amount of daily weight gain in experimental groups without group 2 especially in starter period increased and feed conversion ratio improved. Increase the percentages of liver and weight of bursa fabricius in 2 experimental group can be related to harmful effects of aflatoxin in diet, whereas these effects reduced by using toxin absorbents.

Conclusion The overall results showed that using aflatoxin in broiler diets have adverse effects on performance of broilers. Using diets with aflatoxin contaminated can improve their performance in contrast with other toxin absorbents.

Keywords: Aflatoxicosis, Broilers, Humic acid, Sodium bentonit, Yeast cell wall.

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Effect of Essential Oils of Peppermint, Lemon, Thyme and Ajwain on Performance, Blood Metabolites and Hepatic lipogenic Gene Expression of Broilers

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Received: 30-12-2013

Accepted: 29-09-2015

Intoduction Essential oils (EOs) are important aromatic components of herbs and spices which are complex mixtures of secondary plant metabolites consisting of low-boiling-phenylpropenes and terpenes. Their biological activities have been known and utilized since ancient times in perfumery, food preservation, flavoring, and medicine. Some of their biological activities include antibacterial, antifungal, anti-oxidant and anti-inflammatory effects. The ban on the use of antibiotics as growth promoters has stimulated the search for alternative feed supplements in animal production. EOs have received attention in recent years as potential 'natural' alternatives for replacing antibiotic growth promoters (AGPs) in animal diets due to their positive impact on growth performance and welfare. A number of studies have been carried out to investigate the effects of EOs on broiler performance rather than the physiological effects, but the results have not been consistent (or constant). The purpose of this study was to investigate the effects of four essential oils (*Thymus vulgaris*, *Mentha piperita*, *Citrus lemon*, *Carum copticom*) on growth performance, some of the serum biochemistry parameters and lipogenic gene expression in broiler chickens.

Materials and Methods A total of 312, 1-day-old broiler chicks were allocated in completely randomized design to 13 groups with 6 replicate cages per treatment. After 2-day adjustment with the basal diet, the birds were randomly assigned to the corresponding experimental diets supplemented with 0 (Control), 50, 100 and 150 mg/kg diet essential oils extracted from *Crum copticum*, *Thymus vulgaris*, *Mentha piperita* and *Cirtus lemon*. The basal diet composed of maize-soybean meal prepared in our laboratory and all birds had free access to water for the entire period. Food intake and BW were recorded to determine growth performance and feed: gain ratio. At the end of the experiment (42 day) blood samples (6 samples per treatment) were taken for measuring biochemical analysis including total protein, triglyceride, total cholesterol, HDL-c and LDL-c by commercial kits. Samples of the liver were collected on day 42 after slaughter (6 samples per treatment) and the hepatic expression of the genes encoding malic enzyme (ME), fatty acid synthase (FAS) were determined with reverse transcription-polymerase chain reaction (RT-PCR) using SYBR green as a flourophore monitored in a real time mode.

Results and discussion The results showed that the body weight, feed intake and feed conversion ratio of broilers at day 42 were not affected by supplementing EOs to the basal diet. However, daily body weight gain of broilers at 21 day decreased significantly ($P<0.05$) by dietary supplementation of 150 ppm *Mentha piperita* essential oil compared to control and some of the treatment groups. In the previous studies, variable effects of EOs on performance have been reported. The variability in the efficacy of EOs on animal performance could be attributed to the composition of the basal diet (less digestible diet), level of feed intake, hygienic standards and environmental conditions. Other factors that could affect the results of in vivo experiments are: harvesting time and state of maturity of plants, extraction methods of plants, method and duration of conservation and storing and possible synergistic or antagonistic effect of the bioactive compounds. The concentrations of serum cholesterol, total protein, triglyceride, total cholesterol, HDL-c and LDL-c were not affected by treatments. The absence of hypochlostrtrolemic and hypolipidemic effects of applied essential oils in the present study may be

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attributed to rapid urinary excretion of essential oil metabolites and composition of the basal feed. Treatments had no significant effect on the expression of mRNA for fatty acid synthase compared to control. In chicks fed the diet supplemented with 150 ppm mint essential oil, malic enzyme mRNA expression was significantly ($P \leq 0.05$) enhanced compared with chicks fed the basal diet. The reason for this effect is unknown, but it may be attributed to Stress-Induced Metabolic or metabolic stress inducing by upper dose of mint EO that may predispose broilers to hepatic steatosis. In general, results of the present study propose a possible role for some herbal essential oils in the regulation of broiler metabolism. However, contrary to our previous assumption, this role may not be antilypogenic. Moreover, according to the results it could be claimed that EOs may have differential and dose response effects on lipid metabolism in broilers. In conclusion, supplementation of Mint EO at upper levels (150 ppm) is not recommended as feed additive in broiler diets.

Keyword: Blood biochemical metabolites, Broilers, Essential oils, Gene expression, Performance.

Estimation of Inbreeding Coefficient and Its Effects on Lamb Survival in Sheep

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Received: 04-02-2014

Accepted: 14-06-2015

Introduction The mating of related individuals produces an inbred offspring and leads to an increased homozygosity in the progeny, genetic variance decrease within families and increase between families. The ration of homozygosity for individuals was calculated by inbreeding coefficient. Inbred individuals may carry two alleles at a locus that are replicated from one gene in the previous generations, called identical by descent. The inbreeding coefficient should be monitored in a breeding program, since it plays an important role at decreasing of homeostasis, performance, reproduction and viability. The trend of inbreeding is an indicator for determining of inbreeding level in the herd. Inbreeding affects both phenotypic means of traits and genetic variances within population, thus it is an important factor for delimitations of genetic progress in a population. Reports showed an inbreeding increase led to decrease of phenotypic value in some of the productive and reproductive traits.

Materials and Methods In the current study, the pedigree data of 14030 and 6215 records of Baluchi and Iranblack lambs that collected from 1984 to 2011 at the Abbasabad Sheep Breeding Station in Mashhad, Iran, 3588 records of Makoei lambs that collected from 1994 to 2011 at the Makoei sheep breeding station and 6140, records of Zandi lambs that collected from 1991 to 2011 at the Khejir Sheep Breeding Station in Tehran, Iran were used to estimating the inbreeding coefficient and its effects on lamb survival in these breeds. Lamb survival trait was scored as 1 and 0 for lamb surviving and not surviving at weaning weight, respectively. Inbreeding coefficient was estimated by relationship matrix algorithm (A=TDT) methodology using the CFC software program. Effects of inbreeding coefficient on lamb survival were estimated by restricted maximum likelihood (REML) method under 12 different animal models using ASReml 3.0 computer programme. Coefficient of inbreeding for each lamb added to models as a covariate. The most appropriate model for this trait was determined by Akaike's Information Criterion (AIC) test.

Results and Discussion The number of survival records for Baluchi, Iranblack, Makoei and Zandi sheep breeds were 10793, 4826, 3588 and 6140, respectively. The inbred individuals were 17.63, 58.25, 4.88 and 36.32 per cent for Baluchi, Iranblack, Makoei and Zandi sheep, respectively, (2473, 3620, 175 and 2230 head respectively). The mean of inbreeding coefficient for whole and inbred populations for Baluchi lambs were 0.66 and 3.73 per cent, respectively, for Iranblack lambs were 4.59 and 7.90 per cent, respectively, for Makoei lambs were 0.25 and 4.86 per cent, respectively and for Zandi lambs were 1.22 and 3.61 per cent, respectively. Maximum of inbreeding coefficient for Baluchi, Iranblack, Makoei and Zandi lambs was 31.25, 34.70, 25.00 and 31.35 per cent, respectively. The mean of lamb survival in Whole and inbred population for Baluchi lambs were 89.11 and 88.30 per cent, respectively, for Iranblack lambs were 84.44 and 83.84 per cent, respectively, for Makoei lambs were 90.40 and 86.95 per cent, respectively and for Zandi lambs were 87.37 and 86.90 per cent, respectively. The average of inbreeding coefficient for 4 breeds was increased. The estimation of positive inbreeding coefficient trend for Baluchi, Iranblack, Makoei and Zandi were 0.035 ± 0.012 , 0.31 ± 0.03 , 0.010 ± 0.012 and 0.020 ± 0.012 per cent on each year, respectively. The most suitable model for survival in Baluchi, Iranblack, Makoei and Zandi breeds was 7, 12, 2 and 1, respectively. The regression coefficient of inbreeding on lamb survival were -0.26 ± 0.11 , -0.35 ± 0.11 , -0.25 ± 1.83 and -0.04 ± 0.20 per cent for Baluchi, Iranblack, Makoei and Zandi sheep, respectively.

Conclusion The levels of inbreeding below 5% in whole population, or annual rates of inbreeding under 1% unlikely result in substantial reduction of performance and economic income in sheep production and serious genetic variation in the population. Inbreeding depression was observed for survival trait although the levels of inbreeding coefficient were acceptable in all of the breeds investigated in this study. Therefore, the general policy in the flocks should be continued to avoid mating between close relative parents and use of enough sires

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and dams selected per annum. Estimated inbreeding coefficients for Baluchi and Iranblack breeds showed high degree of close mating in these herd and due to the significant effect of inbreeding on survival, it is suggested that this breeding stations should use a breeding plan to avoid mating of close relative animals.

Keywords: Baluchi sheep, Inbreeding depression, Iranblack sheep, survival.

Estimates of genetic and environmental factors on growth and mortality in Karakul lambs

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Received: 15-04-2014

Accepted: 14-10-2014

Introduction Lamb production is the largest part of income in sheep industry. Therefore, the mortality rate of lambs is a key factor in profit of the sheep breeding. Mortality rate of lambs (or Lamb mortality rate) in different breeds of sheep under different climatic conditions is varying from 15% to 50% and an average of 9% to 20% has been reported. Survival rate is a combination trait that is influenced by various factors such as management, weather condition, and behavior of dam and lamb, as well as genetic effects. Quantification of non-genetic effects on mortality rate can be useful in controlling lamb survival rate and increasing profitability of sheep breeding. Therefore, identification of genetic and environmental factors affecting the productive capacity of indigenous breeds in different area is the main priority that should be considered in breeding programmes. Therefore, the objective of this study was to estimate genetic and environmental factors of growth traits and mortality in Karakul lambs. To estimate the genetic and environmental parameters of Karakul lambs before weaning growth and mortality records of 4929 lambs from 207 rams and 1856 ewes at Sarakhs Karakul sheep breeding station, from 1994 to 2009 were used.

Materials and Methods The data were used in this study included a total of 4929 record of lamb birth weight, 1 and 3 months of age, average daily gain from birth to weaning (growth traits before weaning) and mortality rate of lambs from birth to 1, 2, 4, 8 and 14 weeks (mortality rate of lambs before weaning). Data were collected during the years 1994 to 2010 in karakul breeding station in Sarakhs. The data were edited and pedigree file and data file were prepared. Uni-variate animal model was used to estimate the genetic parameters as following: $y = X\beta + Z_1a + Z_2m + \epsilon$ where y is the vector of record, b is the vector of fixed effects (year, sex, type of birth, age of dam), a is the vector of direct additive genetic effects, m the vector of maternal additive genetic effects, X , Z_1 and Z_2 are the matrix of coefficients (0 and 1) that relate b , a and m to records and ϵ is the vector of residuals. Analysis of each trait was performed considering the significant factors in the model including sex, birth-type, birth-year, dam-age and ewe weight at birth. In the analysis of maternal effect model for growth traits and Cox regression for mortality traits were used. Cox Regression in SPSS software was also used to calculating the survival function. (Co) variance components were estimated by Restricted Maximum Likelihood (REML) with uni-variate animal model. The genetic, phenotypic and environmental trends were estimated as regression of average breeding values on year of birth, regression of average phenotypic values on year of birth and, difference between genetic and phenotypic trends, respectively.

Results and discussion The results showed that year of birth had a significant effect on all traits ($P < 0.001$). Age of dams also had significant effects on all of the traits ($P < 0.01$) with the exception of average daily gain from birth to weaning weight. Direct heritability of birth weight, 1 and 3 months of age, average daily gain from birth to weaning were 0.16 ± 0.03 , 0.15 ± 0.01 , 0.17 ± 0.04 and 0.21 ± 0.05 , respectively. Their maternal heritability was also 0.005 ± 0.0001 , 0.06 ± 0.14 , 0.003 ± 0.0001 and 0.1 ± 0.03 , respectively. The genetic, phenotypic and environmental trends were 0.012 ± 0.002 , -0.0145 ± 0.006 , -0.0265 ± 0.008 for birth weight, 0.028 ± 0.004 , -0.115 ± 0.012 , -0.143 ± 0.016 for weight of 1 month and 0.125 ± 0.001 , 0.245 ± 0.003 and -0.12 ± 0.004 for weaning weight. The genetic, phenotypic and environmental trends of average daily gain from birth to weaning weight were 0.015 ± 0.001 , -0.013 ± 0.01 and -0.028 ± 0.011 , respectively. The highest mortality rate of lambs was between birth and 1 week of age probably due to incompatibility of lambs with condition after parturition. Mortality rate after this period was decreased. Direct heritability of mortality traits were increased from 0.01 ± 0.01 to 0.06 ± 0.02 by increasing age, against maternal heritability was decreased.

Conclusion Due to their low to moderate heritability of growth traits, genetic selection is effective for growth trait. However, the mortality traits will not have significant change by genetic selection due to very low

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heritability of these traits. Therefore, attention must be paid to control and improve the environmental factors for these traits. Cumulative mortality per centage of lambs to weaning age was 15%. According to the results, it can be said for any improvement, environmental conditions must be corrected by rearing lambs.

Keywords: Cox regression, Growth traits, Karakul sheep, Lamb mortality.



Study of QTL Effects Distribution on Accuracy of Genomic Breeding values Estimated Using Bayesian Method

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Received: 17-06-2014

Accepted: 20-07-2015

Introduction Genetic evaluation and estimation of breeding value are one of the most fundamental elements of breeding programmes for genetic improvement. Recently, genomic selection has become an efficient method to approach this aim. The accuracy of estimated Genomic breeding value is the most important factor in genomic selection. Different studies have been performed addressing the factors affecting the accuracy of estimated Genomic breeding value. The aim of this study was to evaluate the effect of beta and gamma distributions on the accuracy of genetic evaluation.

Materials and Methods A genome consisted of 10 chromosomes with 200 cm length was simulated. Markers were spaced on 0.2 cm intervals and different numbers of QTL with random distribution were simulated. Only additive gene effects were considered. The base population was simulated with an effective size of 100 animals and this structure continued up to generation 50 to creating linkage disequilibrium between the markers and QTL. The population size was increased to 1000 animals in generation 51 (reference generation). Marker effects were calculated from the genomic and phenotypic information. Genomic breeding value was computed in generations 52 to 57 (training generation). Effects of gamma 1 distribution (shape=0.4, scale=1.66), gamma 2 distribution (shape=0.4, scale=1) and beta distribution (shape1=3.11, shape2=1.16) were studied in the reference and training groups. The heritability values were 0.2 and 0.05.

Results and Discussion The results showed that accuracy of genomic breeding value reduced with passing generation (from 51 to 57) for two gamma distributions and beta distribution; this decrease may be due to two factors: recombination has negative impact on accuracy of genomic breeding value and selection reduces genetic variance as the number of generations increases. Accuracy of genomic estimated breeding value increased as the heritability increased so that the high heritability had more accuracy than low heritability in same QTL number. Number and distribution of genes is an important factor for accuracy of estimated breeding value. Duncan test was conducted by SPSS software. Results illustrated that there was no significant difference between the different distributions. Comparing accuracy of estimated breeding value showed that in the low heritability scenario with 10 and 20 QTL, gamma distribution 2 and gamma distribution 1 performed well, respectively, whilst in 50 and 100 QTL scenario, beta distribution was superior in both Lasso and Ridge methods. In the high heritability scenario with 50, 100 QTL gamma distributions 2 were superior in both Lasso and Ridge methods. With four QTL (10, 20, 50 & 100), in high heritability scenario, estimated genomic breeding value was often increased by increasing the number of QTL. This may be due to increasing linkage disequilibrium between markers and QTL. In general, the gamma distribution led to the increased accuracy of the estimations in both Lasso and Ridge methods.

Conclusion Marker density, method to estimate marker effects, QTL distribution, number of QTL, number of generations and trait heritability are some effective factors on accuracy of estimated genomic breeding value. The accuracy of estimated genomic breeding value is output of these factors and the distribution of genes is an important factor for accuracy of estimated genomic breeding value. We can conclude that, accuracy is reduced with increasing number of generations from base population to training population while the accuracy of estimated genomic breeding value is increased when breeding value of the reference group is used in lieu of the phenotypic records. In addition, accuracy of estimated genomic breeding value is enhanced by increasing heritability, so that, between three the distributions simulated in high heritability scenario, gamma 2 distribution increased accuracy of the estimates. Although, the size and distribution of QTL effects still greatly influence the

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effectiveness of the genomic prediction methods, but as a suggestion, models of genetic variation of genomic assessment should be considered, since a method of estimating breeding value may have (or produce) a better estimation with a specific model.

Keywords: Accuracy, Breeding value, Genomic selection, QTL distribution.

Estimation of genetic, phenotypic and environmental trends for body weights at different ages in Lori sheep

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Received: 03-09-2014

Accepted: 17-05-2015

Introduction Lori sheep is one of the most important breeds in Iran that is mostly bred in Lorestan province, north-east of Khuzestan and some areas of Ilam provinces. The name of this breed is derived from Lori tribe, which is one of the major nomadic groups of Zagros Mountain in western areas of Iran. Lori sheep is resistant to mountain conditions and hot and dry plains. This sheep breed has strong constitution, good traveling ability with suitable conformation as a mountain sheep. It is one of the predisposed breeds to fattening and often is traditionally kept by villagers and nomadic tribes in the area. In such a system output is lower than in an intensive system. Meat production in Iran is one of the most valuable traits for livestock breeders. Also, sheep meat has remarkable values rather than the meat of other animals and is popular between people. Thus accurate estimations of genetic parameters of these traits are considered by breeders. Accurate prediction of breeding value of animals is one of the best tools available to maximize genetic gain. Success of a breeding programme can be evaluated by actual change in breeding value expressed as a proportion of expected theoretical change of the breeding value mean for the trait under selection. Several methods are being developed to measuring the genetic changes in the animal population. Carrying out experiments in comparable environmental conditions over a period of several generations is difficult, thus genetic trend estimation is problematic over time and changes in performance may reflect, to some extent, both environmental and genetic changes. In order to overcome such a problem, Hill (1972) proposed that by simultaneously maintaining a control population it is possible to removing the effect of environmental changes, but this is not cost-effective, particularly over a long period of time. Best linear unbiased prediction (BLUP) is the best approach for prediction of breeding values and estimation genetic gain. Little information is available on the estimation genetic trends for body weight traits in Lori sheep. Hereupon the objective of the present study was to estimate genetic, phenotypic and environmental trends for body weight traits at different ages in Lori sheep to assess the breeding programmes.

Material and Methods In the current study, 6440, 5646, 5073 and 4757 records of birth weight (BW), weaning weigh (WW), 6-month weigh (6MW) and 9-month weigh (9MW) of Lori sheep were used. Data were collected from 2001 to 2010 by the agricultural and natural resources research centre of Lorestan province Lorestan Agricultural & Natural Resources Research Center. Direct and maternal heritability were estimated using restricted maximum likelihood by fitting six uni-variate animal models. Akaike's information criterion (AIC) was used to selecting (to select or in/for selecting) the most appropriate model for each trait. Breeding values were estimated by the best model for uni-variate analysis. Genetic, phenotypic and environmental trends were calculated by regression of means of predicted breeding values, phenotypic means and difference between estimated means of breeding values and phenotypic means on birth year for each trait, respectively. Wombat software was performed to obtaining direct and maternal (co) variance components and heritability estimations for body weight at different ages in Lori sheep. Genetic trends analyses were performed by the regression procedure of the SAS software package.

Results and Discussion The phenotypic trends for BW, WW, 6MW and 9MW were 0.016, 0.065, 0.032 and -0.783 kg per year, respectively. The direct genetic trends for BW, WW, 6MW and 9MW were 0.008, 0.001, 0.055 and 0.076 kg per year, respectively. The direct genetic trends were significant for all of the traits with the exception of 9MW. Genetic gain for BW, WW, 6MW and 9MW were 0.061, 0.007, 0.139 and 0.150 kg after 10 years, respectively. Hence, genetic gain for all of the studied traits was low.

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Conclusion In studied flock, the effective major factors in low genetic gain were the lack of a proper selection criteria and environmental and management conditions changes. Agricultural Jihad Organisation of Lorestan province has performed a breeding programme to improve Lori sheep by replacing the original breed rams in local flocks. This approach is very suitable and it is necessary to continue. Economic selection index method is an important tool that can help to improve (improving/to improve) genetic progress for body weight traits at Lori sheep.

Keywords: Body weight traits, Genetic trend, Lori sheep, Phenotypic trend.

Effects of Discontinuous Administration of Dietary Mannan oligosaccharide and β -1,3-glucan on Hematological and Blood Serum Biochemical Parameters of Rainbow trout (*Oncorhynchus mykiss*)

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Received: 26-08-2014

Accepted: 03-08-2015

Introduction Bans and restrictions of antibiotics as feed additives in fish culture in many countries have resulted in the increase in studies on alternative dietary supplements such as prebiotics to enhance the health and production of cultured fish. Prebiotics are nondigestible food ingredients that beneficially affect the host by selectively stimulating the growth and/or activity of one or a limited number of bacteria in the colon. In addition, prebiotics promote the growth of lactic acid bacteria that are beneficial to health and lessen the density of pathogenic microorganisms. Because of the conservation of immune system, it is suggested that alternate administration of different immunostimulants may activate different parts of immune system of shrimps and take advantage of different immunostimulants to solve the problem of immunity fatigue and enhance the immunity continuously. However, there is no report on the discontinuous administration of immunostimulants for rainbow trout. Thus, considering the strategic importance of this species, the goal of this study was to assess the effects of discontinuous administration of dietary mannan oligosaccharide and β -1,3-glucan on hematological and blood serum biochemical parameters of rainbow trout.

Materials and Methods A 6-week trial was conducted to compare the effects of discontinuous administration of dietary mannan oligosaccharide and β -1,3-glucan on hematological and blood serum biochemical parameters of rainbow trout (*Oncorhynchus mykiss*). Four feeding strategies were set, including feeding prebiotic-free diet continuously (control), feeding dietary prebiotic continuously (1.5 g kg^{-1}), feeding dietary alternately (one week prebiotic+one week control diet and 2 Day prebiotic+5 Day control diet). Juveniles were fed the experimental diet in rate of 4% of the body weight per day, spread across two feeding time. At the end of the experiment, three fish were sampled randomly from each tank and were anesthetized with clove solution, and blood was drawn from the caudal vein, using a syringe. Then, blood samples were introduced to both heparinized and non-heparinized tubes in order to perform haematological and biochemical studies, respectively. Blood sera were obtained by centrifuging blood samples at 3000 rpm for 5 min, and the sera were removed with a disposable transfer pipette and stored at -20°C until analysis for biochemical and hematological studies. The determined Parameters were the number of red blood cells (RBC), white blood cells (WBC), hematocrit (PCV), and hemoglobin (Hb). Differential white blood cell counts, including neutrophils (heterophiles), lymphocytes and monocytes were also identified. Statistical analysis was carried out using one-way analysis of variance using SPSS. Differences between means were determined using Duncan's multiple test ($P < 0.05$).

Results and Discussion The results showed that WBC, Hb, PCV, Lymphocyte, Monocyte, Heterophyl, protein, albumin were higher but the level of cholesterol and triglyceride were lower in continuously administration of prebiotic than other feeding strategies and control group, although there were no significant effect. There were significant increase in RBC in continuously strategy. It seems that the improvement in hematological and blood serum biochemical parameters in feeding dietary prebiotic continuously may be attributed to the stimulation of growth of beneficial bacteria such as lactic acid bacteria which improved microvilli alignment and increased resistance against pathogens. The reasons for the different results are not clear yet. Phagocytic activity measurement was not performed in this study, but it may be proposed that elevated leucocyte levels could have been responsible for the increase in the activity enhancing defense mechanism during feeding. The increase in the serum protein and albumin levels in feeding dietary prebiotic continuously is considered to be associated with a stronger innate response in fish. However, the decreased albumin and total protein in other strategy and control group in the current study would be indicative of an abnormality in liver or kidney functions. However, unlike current study, shrimps fed with dietary β -glucan discontinuously 2 days

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followed by the basal diet for 5 days showed the highest immunity. It appears that the different basal diet, level of prebiotic supplementation, adaptation period, animal characteristics (species, age, stage of production), microbiota loading, period and hygienic conditions of the experiment can cause these differences.

Conclusion The result indicated that continuously applying mannan oligosaccharide and β -1,3-glucan at the level 1.5 g kg^{-1} into the diet caused improved hematological and blood serum biochemical parameters of rainbow trout. This study encourages further research on different aspects of prebiotic continuously administration in rainbow trout as well as immunological studies to determine the effects of this strategy on the immune system and disease resistance.

Keywords: Blood variables, Prebiotic, Rainbow trout (*Oncorhynchus mykiss*).