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Carcass characteristics of Bali duck (*Anas* sp.) Fed with *Daucus carota* Leaf flour

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Abstract
Since the use of antibiotics is prohibited to improve the quality of animal products, as well as increase product yields, researchers have begun to focus on the use of phytogenic compounds as non-antibiotic growth promoters. So this research is important to do to examine the effect of giving carrot leaf meal (CLF) in the ration to increase the quantity and quality of carcass in Bali ducks. This study used 240 male Bali ducks aged two weeks with homogeneous body weight in a completely randomized design with 4 treatments and 6 replications. The four treatments were a group of ducks fed without CLF as a control (A); ration with 3% CLF (B); ration with 6% CLF (C); and rations with 9% CLF (D). The results showed that giving 3-6% CLF in the diet significantly ($P< 0.05$) increased feed consumption, body weight, carcass weight, carcass percentage, breast meat, and protein mass of duck meat compared to control (A) and 9% CLF(D). The percentage of abdominal fat and serum cholesterol levels in ducks that received treatment B, C, and D, decreased significantly ($P< 0.05$) compared to treatment A. It can be concluded that the use of 3-6% carrot leaf flour in the ration can increase the percentage carcass and meat protein mass. On the other hand, it reduces abdominal fat and serum cholesterol levels in Bali ducks.

Keywords: carrot leaves, carcass, abdominal fat, cholesterol, Bali duck

Introduction
Since the use of antibiotics is prohibited to improve the quality of animal products, as well as increase product yields, researchers have begun to focus on the use of phytogenic compounds as non-antibiotic growth promoters. The use of herbal plant leaves in feed can increase feed intake, feed conversion ratio, weight gain, and can increase tissue oxidative stability [1, 2].

Utilization of carrot leaves as a source of natural provitamin A in producing animal products can be used as an alternative for natural fortification of animal products in an effort to overcome the problem of vitamin A deficiency [3]. In addition, natural provitamin A compounds are much safer to consume than synthetically made vitamin A. Therefore, a feed supplement is needed that is able to produce meat that is free of antibiotics or other chemical substances.

Interesting to study its efficacy as a natural feed supplement is carrot leaf. Carrot (*Daucus carota* L.) is a type of vegetable that is well-known as a source of provitamin A (carotenoids). In every 1 ha carrot plant has an actual productivity of 15 tons of carrot tubers and 5% of it as waste and is not used as human food [4]. The nutrient content of carrot leaf flour is quite good, namely 9.27% crude protein; 19.64% crude fiber; 1.20% crude fat; 0.65% calcium; 0.51% phosphorus; and contains 2487 kcal/kg metabolized energy [5]. The phytochemical compounds contained in it are: saponins, flavonoids, and tannins [6] and several other phenolic compounds that have antimicrobial activity [7]. The antioxidant capacity of plants, mostly comes from phenolic compounds present in plant tissues and antioxidant activity decreases, as the amount of phenolic compounds present in plants decreases [8]. According to [9] that supplementation of herbal leaf extracts as much as 50 ml/liter of drinking water given to broilers significantly reduced abdominal fat and cholesterol levels in broiler serum and yolk cholesterol in laying hens [10]. Giving carrot leaves up to a level of 6% in the ration, apparently reduced broiler weight gain, but had no impact on feed consumption and feed efficiency [5]. Fermentation of carrot leaf flour can increase its nutritional value and at a level of 6% in laying hens rations can increase egg production and reduce cholesterol content in yolks [11]. Ürüşan *et al.* [12] reported that supplementation of carrot seed oil in broiler feed significantly increased carcass percentage.

Based on this, researchers are interested in studying the effect of *Daucus carota* leaf meal supplementation in the ration to increase carcass and reduce fat and cholesterol in male Bali ducks.

Materials and Methods

Animals and experimental design

This study used 240 male Bali ducks aged two weeks with homogeneous body weight in a completely randomized design with 4 treatments and 6 replications. The four treatments were a group of ducks fed without CLF as a control (A); ration with 3% CLF (B); ration with 6% CLF (C); and rations with 9% CLF (D). Each group treatment in six replications with 10 birds per cages. The size of each cages was: 150×100×60 cm^3 (length x width x height). The floor of the cage was made of bamboo slats. Concentrated feed was mash form and birds were free access to feed and drinking water during the experiment period. Body weight and feed intake were registered every week.

The carrot leaves used were post-harvest carrot leaves at the Carrot plantation in the Baturiti area, Tabanan Regency, Bali Province, Indonesia. Before being used in the ration, first the carrot leaves are crushed into small pieces with a grass crusher machine, then dried in the sun and crushed until smooth. More detail is presented in Figure 1.

Fig 1: The process of making carrot leaf flour

Live performance

Body weight gain (LWG), live weight (BW), feed consumption and feed conversion ratio for ducks were recorded separately every week. Feed consumption (grams per duck) was recorded every week in each replication (experimental unit). Total feed intake for each treatment was measured during the experimental period (age 2-8 weeks). Feed Conversion Ratio (FCR) is calculated as grams of feed consumed per gram of body weight gained. FCR is an indicator to measure the level of feed efficiency. The higher the FCR value, the lower the feed efficiency level. The rations given were commercial rations for ducks, containing 17% crude protein and 2900 kcal/kg metabolized energy [13].

Slaughter procedures

At the eighth week at the end of the study, all ducks were slaughtered to obtain carcass weight and carcass percentage. Carcass weight was obtained by slaughtering ducks by cutting the jugular vein in the neck to remove blood from the duck's body. Carcass percentage was calculated as fresh carcass weight divided by duck body weight before slaughter multiplied by 100%. The ducks that have been slaughtered are then cleaned of feathers, then their internal organs and digestive tract are removed. Head, crop, trachea, esophagus, heart, lung, and liver weights were excluded from the slaughter weights, to obtain carcass weights.

Observation of serum cholesterol concentration was carried out when the ducks were 8 weeks old (at the end of the study). Blood was taken from the vein at the base of the duck wing in each experimental unit. Analysis of cholesterol content using the Lieberman-Burchad method of [14]. The protein mass of the meat was obtained by analyzing a number of samples taken from the meat on the breast, when the ducks were 8 weeks old. The sample of finely ground meat was taken as much as 10 g to be analyzed for protein content by the Kjeldhal method [15]. The mass of meat protein is calculated by the following formula:

Breast meat protein mass = meat protein (%) x breast meat weight (without skin and bones).

Statistical analysis

The data obtained were analyzed by one-way ANOVA, if there was a significant difference ($P<0.05$) between treatments, then continued with Duncan's multiple distance test.

Results

The results are presented in Table 1. Average feed consumption, body weight, carcass weight, percentage of carcass, breast meat, and breast protein mass in ducks between treatments showed significant differences ($P<0.05$). Feed consumption, body weight, carcass weight, percentage of carcass, breast meat, and protein mass of breast meat in group B and C ducks were significantly higher ($P<0.05$) compared to group A and D ducks.

The highest percentage of carcass, breast meat, and meat protein mass was obtained in the duck group that was given 3-6% CLF (groups B and C), but when given 9% CLF (group D) there was a significant decrease ($P<0.05$) compared to group B and C ducks.

Table 1: Carcass characteristics of male Bali duck (*Anas sp*.) Aged 8 weeks given CLF.

Variables	Treatments[1]				SEM[2]
	A	B	C	D	
Feed consumption (g/bird/hari)	87.17b[3)]	96.65a	94.19a	88.29b	1.293
Final BW (g)	1290.85b[3]	1470.24a	1462.38a	1262.16b	22.909
Carcass weight (g)	712.29b	870.82a	862.07a	697.45b	42.805
Carcass percentage (%)	55.18b	59.23a	58.95a	55.26b	1.017
Breast meat (% carcass weight)	9.13b	9.85a	10.17a	9.24b	0.136
Breast meat (g)	65.03b	85.78a	87.67a	64.44b	4.183
Breast meat protein (%)	17.49a	18.25a	18.19a	17.36a	0.703
Breast meat protein mass (g)	11.37b	15.65a	15.95a	11.19b	1.108

Note:
1. Four levels of CLF in the diet, namely: 0%; 3%; 6%; and 9% as treatments A, B, C, and D, respectively
2. Standard error of the treatment means
3. Means with different superscripts within row values are significantly different ($P< 0.05$)

Table 2 presents the lipid profile of duck blood due to the administration of 3-9% CLF. Administration of 3-9% CLF in the diet of ducks from 2-8 weeks of age significantly ($P< 0.05$) reduced the total cholesterol concentration in duck serum compared to control (A). The concentration of triglycerides, high density lipoprotein (HDL), and low density lipoprotein (LDL) in duck serum between treatments did not show any significant difference (P>0.05). Total abdominal fat and total serum cholesterol levels in ducks that received treatment B, C, and D, decreased significantly ($P< 0.05$) compared to treatment A. More details are presented in Table 2.

Table 2: Blood lipid profile and abdominal fat of male Bali ducks fed a diet containing CLF.

Variable	CLF level in ration (%)[1)]				Normal
	0	3	6	9	
Blood lipid profile					
Total cholesterol (mg/dL)	158.35a[2)]	142.71b	139.25b	136.84b	<200
Triglycerides (mg/dL)	57.61a	49.62a	46.39a	48.36a	<150
HDL (mg/dL)	88.27a	90.61a	92.74a	89.51a	>40
LDL (mg/dL)	50.89a	44.57a	42.93a	39.16a	<130
Pad-fat (% berat badan)	0.41a	0.39a	0.36a	0.32a	-
Abdominal-fat (% berat badan)	0.79a	0.67b	0.65b	0.59b	-

Note:
1. Four levels of CLF in the diet, namely: 0%; 3%; 6%; and 9% as treatments A, B, C, and D, respectively
2. Means with different superscripts within row values are significantly different ($P< 0.05$)

Discussion

The results showed that the use of 3-6% CLF in the ration significantly increased feed consumption. Likewise, body weight, carcass, carcass percentage, breast meat, and breast meat protein mass in ducks. This is caused by CLF which contains many phytochemical compounds, such as saponins, flavonoids, and tannins [6] and several other phenolic compounds that have antimicrobial activity, for example saponins have proven antimicrobial properties [7]. The decrease in the number of pathogenic bacteria in the digestive tract of ducks will result in optimal absorption of nutrients, thus increasing the performance of ducks. Ekayuni *et al*. [9] reported that supplementation of herbal extracts in broilers did not affect feed consumption, but could significantly increase body weight gain and feed efficiency. Similar results were reported by [16, 17] that supplementation of herbal mixtures into broiler feed significantly increased live weight and feed efficiency. According to [5], the use of CLF more than 4% in the ration can reduce body weight, while feed consumption and feed efficiency have no significant effect. So it is recommended that the use of CLF in feed is not more than the level of 2%. Contrary to the research results of [18] who received a significant decrease in feed consumption in broilers that were given carrot supplements compared to broilers that were not given carrot supplements.

Daucus carrota contains many phytochemical constituents (carotenoids, phenolic compounds, polyacetylene), vitamins (vitamin A, beta-carotene, lutein zeaxanthin, riboflavin, niacin, pathetic acid, vitamin B_6, folate, vitamin C, vitamin K) and minerals [19]. Prasetyo *et al*. [20] reported that CLF supplementation up to 6% in the diet had no effect on protein consumption and protein efficiency ratio, but could improve calcium retention. Reported by [1] that Pennyroyal herbal supplement reduces feed consumption and feed efficiency in broilers. According to [21] the observed increase in broiler weight gain was due to the opening properties of plant extracts by increasing gastric digestive juices and establishing a more balanced intestinal flora with their antimicrobial effect [1, 21, 22]. In contrast, [23] found that rations with orange peel oil did not affect broiler body weight.

Carcass weight, breast meat and breast meat protein mass in ducks increased with the supplementation of 3-6% CLF in the diet. However, at the 9% CLF level, there was a significant decrease in all these variables. One of the causes of this decrease was the high crude fiber content in CLF, which was 19.30% [5]. Poultry is not able to digest crude fiber, which is too high in the ration. As reported by [24] that rations containing high crude fiber sourced from rice bran cause the digestibility of the ration to decrease, so that the absorbed nutrients also decrease which has an impact on the growth of ducks.

Crude fiber cannot be digested by the digestive enzymes of the ducks, so it will soon be excreted through the feces, so the opportunity for absorption of nutrients in the digestive tract of ducks is reduced. As reported by [25], poultry is only able to digest about 5-10% crude fiber by microbes in the cecum. The increase in the crude fiber content of the ration significantly increased the rate of passage in the digestive tract of ducks, so

that there was not enough time for the intestinal villi to absorb the digested nutrients [26].

Siri *et al*. [27], stated that the increase in crude fiber content in the diet caused a decrease in fat absorption and energy digestibility (DE). According to [28], nitrogen absorption decreased, because the transit time of digesta in the digestive tract decreased, as a result of increased fiber content in the ration. Mangisah *et al*. [29] reported that the higher the crude fiber content of the ration, the lower the digestibility of the ration, which resulted in a decrease in the growth of ducks.

According to[30], the mass of meat protein is an indicator to see the good or bad of protein deposition which is influenced by protein synthesis and degradation. Meat protein mass can increase if the synthesized protein exceeds the degraded protein, which will affect the productivity of chickens. The mass of protein in chicken meat is related to the mass of calcium in meat, because the total mass value of meat protein is influenced by calcium levels in the form of ions [31]. The use of carrot leaf flour in the ration at the level of 3-6% significantly increased the breast meat and protein mass of duck breast meat. This increase is closely related to the increase in protein consumption and the presence of phytochemical compounds in carrot leaves. Tang *et al*. [32] stated that the increased consumption of protein and amino acid lysine in broilers caused an increase in breast meat compared to lower consumption of protein and lysine. The same thing was reported by [33] that increasing protein consumption would increase carcass weight, carcass percentage, and breast meat. Contrary to the research results of [34] who found that the addition of carrot waste flour (2-6%) into the ration actually reduced the protein mass of the meat, while the calcium mass of the meat had no significant effect.

Reported by [12] that cold-pressed carrot seed oil supplementation can cause an increase in slaughter weight, carcass weight, and broiler carcass percentage. The same thing was reported by [16, 17] that supplementation of herbal mixtures into broiler feed, significantly increased live weight and carcass characteristics of broilers. Giving 10% sweet potato leaf flour can increase the protein mass and calcium of meat [35].

Supplementation of 3-9% CLF in the diet significantly reduced abdominal fat and serum cholesterol levels in ducks. The decrease was due to the content of phytochemical compounds and the high content of crude fiber in CLF. Carrots demonstrated the effect of reducing cholesterol absorption in rats fed carrots [36]. The results of research by[19] showed that carrot intake may exert a protective effect against cardiovascular disease associated with atherosclerosis. Likewise, the results of the study by [37] which reported that pad fat and abdominal fat in ducks decreased with increasing crude fiber content in the ration. Crude fiber in the digestive tract of ducks is able to bind bile acids, bile acids function to emulsify fats from rations, so that they are easily hydrolyzed by lipase enzymes. When most of the bile acids are bound by crude fiber, the emulsion of lipid particles formed is less, so that the activity of the lipase enzyme is reduced. As a result, a lot of lipids will be excreted with feces because they are not absorbed by the body, so that body tissues will contain less lipids.

Supplementation of herbal leaf extract as much as 50 ml/liter of drinking water in broilers significantly reduced abdominal fat and cholesterol levels in broiler serum [9] and cholesterol in yolks [10]. Samudera and Hidayatullah [37] stated that duck abdominal fat decreased with increasing crude fiber content in the ration. Ürüşan *et al*. [12] reported that the addition of carrot seed oil supplementation in the basal ration had no effect on the biochemical parameters of broiler serum. Furthermore, it was also reported that carrot seed oil supplementation resulted in positive changes in weight gain, carcass yield, number of lactic acid bacteria, and storage time of breast meat.

Conclusion

It can be concluded that the supplementation of 3-6% carrot leaf flour in the ration can increase feed consumption, carcass, breast meat, and breast meat protein mass in ducks. On the other hand, it reduces abdominal fat and total serum cholesterol levels in Bali ducks (*Anas sp*.).

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References

1. Erhan MK, Bölükbaşi ŞC, Ürüşan H. Biological activities of pennyroyal (*Mentha pulegium* L.) in broilers. Livest Sci 2012;146:189-192.
2. Ürüşan H, Bölükbaşı ŞC. Effects of dietary supplementation levels of turmeric powder (*Curcuma longa*) on performance, carcass characterıstıcs and gut mıcroflora in broiler chickens. J Anim. Plants Sci 2017;27(3):732-736.
3. Nicolle C, Cardinault N. Effect of Carrot intake on cholesterol metabolism and on antioxidant status in cholesterol-fed rat. European J of Nutrition 2003;42:254-261.
4. Taher M, Supramana dan G. Suastika. Identifikasi *Meloidogyne* penyebab penyakit umbi bercabang pada wortel di Dataran Tinggi Dieng. Jurnal Fitopatologi 2012;8(1):16-21.
5. Muzaki MDR, Mahfudz LD, Muryani R. The effect of waste Carrot product (*Daucus carrota* L) powder in the diet on broiler chickens performance. Jurnal Ilmu Ternak 2017;17(1):14-20
6. Puspani E, Bidura IGNG, Sumadi IK, Nuriyasa IM, Candrawati DPMA. Growth performance, meat cholesterol and β-carotene content in rabbit fed with Carrot leaves, grass, and concentrates. International Journal of Multidisciplinary Approach and Studies 2019;06(3):32-41
7. Bukar A, Uba TI, Oyeyi. Antimicrobical profile of *Moringa oleifera* Lam. ekstracts against some food-borne microorganism. Bayero Journal of Pure and Applied Sciences 2010;3(1):43-48.
8. Sharma KD, Karki S, Thakur NS, Attri S. Chemical composition, functional properties and processing of carrot: A review. Journal of Food Science and Technology 2012;49:22-32.
9. Ekayuni AA, Bidura IGNG, Partama IBG. The effect of water extract of two leaves (*Moringa oleivera and Sauropus androgynus*) on growth performance and meat cholesterol levels in broilers. J. Biol. Chem. Research 2017;34(1):72-79.
10. Bidura IGNG, Partama IBG, Putri BRT, Watiniasih NL.

The effect of water extract of two leaves (*Allium sativum* and *Sauropus androgynus*) on the egg production and yolk cholesterol level in layer hens. Pakistan Journal of Nutrition 2017;15(1):23-31
11. Bidura IGNB, Siti NW, Wibawa AAPP, Tirta Ariana IN, Puspani E. The effect of Carot leaves meal fermented in diets on egg production, yolk cholesterol and beta-carotene in yolk of hens. Annals of the Romanian Society for Cell Biology 2021;25(6):18705-18711; URL article: https://www.annalsofrscb.ro/index.php/journal/article/view/9400/6856
12. Ürüşan H, Erhan MK, Bölükbaşı SC. Effect of cold-press Carrot seed oil on the performance, carcass characteristics, and shelf life of broiler chickens. The Journal of Animal & Plant Sciences 2018;28(6):1662-1668
13. National Research Council. Nutrient requirements of poultry. 9th Ed. National Academy Press, Washington, DC 1994
14. Lieberman A, Burchard R. Enzymatic method to determined cholesterol. Engl. J. Med 1980;271:915-924.
15. AOAC. Official Methods of Analysis of AOAC International. 18th Ed. Association of Official Analytical Chemists, Arlington USA 2005.
16. Alçiçek A, Bozkurt M, Çabuk M. The effects of an essential oil combination derived from selected herbs growing wildin Turkey on broiler performance. S. Afr. J. Anim. Sci 2003;33(2):89-94.
17. Alçiçek A, Bozkurt M, Çabuk M. The effect of a mixture of herbal essential oils, an organic acid or a probiotic on broiler performance. S. Afr. J Anim. Sci 2004;34(4):217-222.
18. Hammershoj M, Kidmose U, Steenfeldt S. Deposition of carotenoids in egg yolk by short-term supplement of coloured carrot (*Daucus carota*) varieties as forage material for egg-laying hens. Journal of the Science of Food and Agriculture 2010;90:1163-1171.
19. Shakheel BM, Tripthi Saliyan, Satish S, Karunakar Hedge. Therapeutic uses of *Daucus carota*: A Review. International Journal of Pharma And Chemical Research I 2017;31(21):138-143
20. Prasetyo TJ, Yunianto VD, Mahfudz LD. Effect of use of waste product of Carrot (*Daucus carota* L) meal in the diet to effiency use protein and Calcium broiler chicken. JITP 2018;6(2):102-109
21. Williams P, Losa R. The use of essential oils and their compounds in poultry nutrition. World Poultry-Elsevier. 2001;17:14-15.
22. Bölükbaşı ŞC, Erhan MK. Effect of dietary thyme (thymus vulgaris) on laying hens performance and escherichia coli (E. coli) concentration in feces. Int. J. Nat. Eng. Sci 2007;2:55-58.
23. Erhan MK, Bölükbaşı ŞC. Citrus peel oils supplementation in broiler diet: effects on performance, jejunum microflora and jejunum morphology. Rev. Bras. Cienc. Avic 2017. Special Issue Nutrition/015-022. http://dx.doi.org/10.1590/1806-9061-2016-0274
24. Bidura IGNG, Sudana IB, Mahardika IG, Suyadnya IP, Candrawati DPMA, Aryani IGA. The implementation of *Saccharomyces spp.n-2* isolate culture (isolation from traditional yeast culture) for improving feed quality and performance of male Bali duckling. Agricultural Science Research 2012;2(9):486-492 http://www.resjournals.com/ARJ/Index.htm
25. Denbow DM, Ravindran V, Kornegay ET, Yi Z, Hulet RM. Improving Phosphorus availability in soybean meal for broiler by supplemented phytase. Poultry Sci 1995;74:1831-1842.
26. Son JH, Ragland D, Adeola O. Quantification of digesta flow into the caeca. Brit. Poult. Sci 2002;43:322-324
27. Siri S, Tobioka H, Tasaki I. Effects Of Dietary Cellulose Level On Nutrient Utilization In Chickens. AJAS 1992;5(4):741-746.
28. Cao BH, Zhang XP, Guo YM, Karasawa Y, Kumao T. Effects of Dietary Cellulose on Growth, Nitrogen Utilization, Retention Time of Diets in Digestive Tract and Caecal Microflora of Chickens. Asian-Aust. J. Anim. Sci 2003;16(6):863-866
29. Mangisah I, Sukamto B, dan MH, Nasution. Implementasi Daun Eceng Gondok Fermentasi Dalam Ransum Itik. J. Indon. Trop. Anim. Agric. 2009;34(2):127-133
30. Mirnawati B, Sukamto dan VD. Yunianto. Kecernaan protein, retensi nitrogen, dan massa protein daging ayam broiler yang diberi ransum daun murbei (*Morus alba* L.) yang difermentasi dengan cairan rumen. J Ilmu dan Teknologi Peternakan 2013;3(1):25-32.
31. Winedar, Hanifiasti S. Listyawati dan Sutarno. Daya cerna protein pakan, kandungan protein daging dan pertambahan berat badan ayam broiler setelah pemberian pakan yang difermentasi dengan effective microorganisms-4 (EM-4). J. Bioteknol 2006;3(1):14-19.
32. Tang MY, Ma QG, Chen XD, Ji C. Effects of dietary metabolizable energy and lysine on carcass characteristics and meat quality in Arbor acres broiler. AJAS 2007;20(12):1865-1873.
33. Al-Batshan HA, Hussein EOS. Performance and carcass composition of broiler under heat stress: The effect of dietary energy and protein. Asian-Austalian Journal Animal Science 1999;2(6):914-922.
34. Prabowo LD, Mahfudz, dan U. Atmomarsono. Calcium and protein meat mass due to the use of waste product of Carrot powder in ration. Jurnal Sain Peternakan Indonesia 2019;14(2):201-207.
DOI: https://doi.org/10.31186/jspi.id.14.2.201-207
35. Lutfitiana BM, Mahfudz dan LD, Suthama N. Pemberian tepung daun ubi jalar fermentasi terhadap massa kalsium dan protein daging pada ayam kampung super. Jurnal Pengembangan Penyuluhan Pertanian 2018;15(28):24-31 http://jurnal.polbangtanyoma.ac.id/index.php/jp3/article/view/12/39
36. Gramenzi A, Gentile A. Association between Certain Foods and Risk of Acute Myocardial Infarction in Women. BMJ 1990;300:771-773.
37. Samudera R, dan A, Hidayatullah, Warna kulit, lemak abdomen, dan lemak karkas *et al*. (*Anas Plathyrhincos Borneo*) jantan akibat pemberian azolla dalam ransum. Animal Production 2008;10(3):164-167.