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## Effect of Yucca Saponin on Urease Activity and Development of Ascites in Broiler Chickens

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**Abstract:** The study was conducted to ascertain the effect of "Norponin 200 Liquid" on urease activity and development of ascites in broiler chickens. Two commercial broiler rations were prepared containing 2810 Kcal/kg metabolizable energy and 20 % crude protein starter and 2900 Kcal/kg metabolizable energy and 18.50 % crude protein, finisher ration. 240 chicks were divided into four groups i.e. A, B, C and D, respectively. Each group had 60 birds and groups were further subdivided into 6 replicates having 10 birds each. Each group offered different concentrations of Norponin 200 Liquid. Group A was control group i.e. without medication. Groups B, C and D were offered 2.5, 5.0 and 7.5 ml Norponin 200 liquid/100 liter of drinking water, respectively. The data regarding feed consumption, weight gain, FCR, urease activity inside the intestine and in the excreta, mortality and economics were recorded. It was concluded that group D offered Norponin 200 Liquid at 7.50 ml/100 liter of drinking water had comparatively better results than groups B and C offered 2.5 ml and 5.0 ml Norponin 200 liquid/100 liter of drinking water and control group A.

**Key Words:** Yucca saponin, Urease activity, Ascites

### Introduction

Poultry is one of the short duration and efficient avenue to convert the agro-industrial by products and wastes into a high quality protein for human consumption. Poultry feed constitutes about 70-75% of the production cost of meat and eggs (John, 1976). Success in rearing broilers for maximum weight gain is not only depends upon the strain of birds and management but also on high quality feed. One of the poor managerial practices is the production of ammonia gas in poultry house. Poor management practices and wet litter are the factors, which lead to the condition favouring the continual release of ammonia from the litter into the bird's environment. Ammonia is the most noxious gas in animal housing. It is a product of bacterial breakdown of uric acid (Belyavin, 1992). Various stress factors including aerial ammonia, dust, respiratory diseases, nutritional conditions and rapid temperature changes can caused ascites

problem in poultry. Ascites is defined as accumulation of a plasma-like fluid in the peritoneal cavity (Bezuidenhout, 1988). Other characteristic symptoms of the disease process are the enlarged, flaccid heart and variable liver changes (Riddell, 1991).

The recent increase of ascites in broilers reared at low elevations may be related to the genetics of the modern broiler. It has been suggested that the broiler, enhanced through selection for rapid body weight gain and increased gain efficiency, is approaching its metabolic limit for growth in relation to oxygen consumption (Scheele *et al.*, 1991). Therefore, these broilers may not be able to adapt to increased oxygen demands related to environmental stress.

Although ascites can occur throughout the year, it is mainly associated with cold weather, when poultry house ventilation is reduced to minimize heating expenses. Poor ventilation allows for accumulation of noxious gases (e.g. NH<sub>3</sub>, CO<sub>2</sub>,

CO) and dust. Present day technology has allowed only the removal of ammonia from the confinement units via ventilation and its reduction in concentration through less dense populations, anti microbial agents, plus the use of performance type masking solutions which will only cover up, but do not solve the problem. Those solutions results in increased operational costs, which is certainly not desirable in today's economical environments. It should be possible to inhibit the release of gaseous ammonia through the inhibition of the enzyme (urease) which catalyse the reaction resulting in the release of gaseous ammonia.

*Yucca schidigera* is believed to inhibit the production of ammonia by bacteria in the gut. Feeding of *Yucca* extract resulted in increases in average daily gain and in some cases, decreases in feed : Gain (Walker, 1993). In Pakistan, *Yucca* saponin is marketed under the brand name of "Norponin 200 Liquid". It is a concentrated processed extract from *Yucca Schidigera* plant. The active ingredient in the product is saponins. *Yucca schidigera* is a very special plant species found almost exclusively in the Mexican State of Baja, California and to a lesser extent in the Southern deserts of the U.S.A. In drinking water of animals, it is used as ammonia inhibitor and growth promoter in cattle, layers, broilers, rabbits and pets.

The present study was, therefore, designed to determine the effect of *Yucca* saponin on urease activity and development of ascites in broiler chickens.

### Materials and Methods

The experiment was conducted at Department of Animal Nutrition, University of Veterinary and Animal Sciences, Lahore. Two hundred and forty (240) one-day-old broiler chicks were purchased from a commercial hatchery. The chicks were randomly divided in to four (4) groups i.e. A, B, C and D. Each group had 60 birds and groups were further sub-divided into six (6) replicates having 10 birds each. Experimental room was cleaned and fumigated. It was also well ventilated and equipped with electricity. Room was opened for

Table 1: Composition of broiler rations

Ingredients	Broiler Starter	Broiler Finisher
	Percent	Percent
Corn	20.00	19.40
Rice tips	27.53	33.29
Rice polishing	10.00	10.00
Soybean meal	20.36	14.68
Canola meal	12.00	10.00
Com gluten meal 60 %	01.48	04.00
Molasses	05.00	05.00
Dicalcium phosphate	01.56	01.82
Limestone	01.02	00.81
Methionine	00.05	00.00
Premixes	01.00	01.00

Table 2: Chemical profile of broiler rations

Chemical Profile	Broiler Starter	Broiler Finisher
	Metabolizable energy (Kcal/kg)	2810
Crude protein %	20.00	18.50
Ether extract %	03.18	03.14
Crude fiber %	04.14	03.81
Calcium %	00.95	00.90
Available Phosphorous %	00.45	00.40
Lysine %	01.11	00.95
Methionine %	00.43	00.38
Linoleic acid %	01.11	01.10

2-3 days before starting the experiment. Drinkers, feeders and other utensils were cleaned and disinfected with a disinfected. The chicks were reared in battery brooders up to 28 days of age on starter ration and in grower batteries from 29-42 days of age on finisher ration. The chicks were brooded at 95 °F during the first week and therefore, the temperature was reduced by 5 °F every week until it reached 75 °F. Twenty-four hours light was provided throughout the experimental period. The birds were having free access to feed and water. The composition and calculated nutrient profile of rations were shown in the Table 1 and 2.

Two commercial rations were formulated. One was broiler starter ration containing 20 % CP and 2810 Kcal/Kg metabolizable energy and second was broiler finisher ration containing 18.5 % CP and 2900 Kcal/Kg metabolizable energy. All the four groups were fed on same broiler starter and broiler finisher ration. There were 4 groups in the experiment i.e. A, B, C and D, respectively. Group A was a control group i.e.

Table 3: Mean values of feed consumption (FC), weight gain (WG) and feed conversion ratio (FCR) at 28<sup>th</sup> day of experiment

Groups	FC (gms)	WG (gms)	FCR
A	1738	868	1.99
B	1792	928	1.92
C	1783	934	1.90
D	1805	958	1.88

Table 4: Mean values of feed consumption (FC), weight Gain (WG), feed conversion ratio (FCR), urease activity (UA) and mortality (M) at 42<sup>nd</sup> day of Experiment

Groups	FC (gms)	WG (gms)	FCR	UA (%)	M (%)
A	3847	1741	2.20	75	8
B	3813	1809	2.10	50	5
C	3831	1857	2.05	25	0
D	3827	1895	2.01	10	0

without medication. There was addition of 2.5 ml, 5.0 ml and 7.5 ml Norponin 200 liquid/ 100 ml of drinking water in groups B, C and D, respectively.

Yucca saponin is a concentrated product, used for lowering the levels of ammonia and other noxious gases from poultry excreta and slurry. The active ingredient in the product are saponins extracted from Yucca schidigera plant. The parameters studied were feed consumption, weight gain, FCR, urease activity in the intestine and in the excreta, mortality and economics. The data collected was subjected to statistical analysis by Analysis of Variance and Least Significant Difference (LSD) test using SPSS10 software.

### Results and Discussion

Mean values for feed consumption, weight gain, FCR and mortality percentage at 28 days of age are presented in Tables 3. The mean values for feed consumption, weight gain, FCR, urease activity and mortality for zero to 42nd day are shown in Table 4.

The average feed consumption per bird at 42<sup>nd</sup> day in groups A, B, C and D were 3847, 3813, 3831 and 3827 grams, respectively. The highest feed consumption of 3847 gms was recorded in group A, while lowest feed

consumption of 3813 g/ bird was recorded in group B. Data was statistically analysed and comparison between the means differences was made by LSD test. No significant difference was observed between all four groups i.e. A, B, C and D, respectively. The results of present studies are in line with the results of Anthony *et al.* (1994); Korol *et al.* (1995) who reported that the broiler chickens fed on rations containing Yucca schidigera extract had no significant difference in feed intake between different groups.

The average weight gain per bird at 42<sup>nd</sup> day in groups A, B, C and D were 1741, 1809, 1857 and 1895 grams, respectively. Maximum weight was gained by the birds of group D i.e. 1895 grams while minimum weight was gained by the birds of group A i.e. 1741 grams. The data was statistically analysed and comparison between the means differences was made by LSD test. All groups i.e. A, B, C and D were significantly different ( $P < 0.05$ ) from each other. The results of present study are in agreement with the findings of Cheeke and Nakuae (1993), who reported that dietary Yucca schidigera extract reduced atmospheric ammonia in poultry and increased growth rate. The results of present study are also in agreement with the finding of Maqbool *et al.* (1996); Deaton *et al.* (1984); Johnston *et al.* (1980), who reported that weight gain was significantly greater in birds supplemented with Yucca saponin as compared to control. The results of present study are also in agreement with Andrew (1990); Carlile (1984); Yeo and Kyulf (1997), who reported that chicks exposed to excessive levels of ammonia gas were significantly lower in body weight as compared to control.

The average feed conversion ratio values for broiler chickens at 42<sup>nd</sup> day in different groups i.e. A, B, C and D were 2.20, 2.10, 2.05 and 2.01 per bird, respectively. Group D showed the best feed efficiency i.e. 2.01 per bird while group A showed the poorest feed efficiency i.e. 2.20 per bird. The data was statistically analysed and comparison between the means differences was made by LSD test. Group A was significantly different ( $P < 0.05$ ) from all other three groups i.e. B, C and D, respectively.

Group B also significantly different ( $P < 0.05$ ) from group D. There were no significant differences between B and C groups and between C and D groups, respectively. The results of present study are supported by Goodall (1980); Johnston *et al.* (1980); Eckel (1997); Malecki *et al.* (1995) who reported that Yucca schidigera plant extract improved overall efficiency of feed conversion.

Urease activity of intestinal contents and excreta was measured qualitatively by the conversion of uric acid to ammonia gas in the presence of phenol red indicator (Jowaman *et al.*, 1999). Results showed that maximum urease activity was observed in group A where approximately 75 % surface of petri-dish was appeared to cover with red-purple particles (very active stage). In group B, approximately 50 %, in group C, approximately 25 % and in group D few scattered red purple particles (approximately 10 %) were observed on the surface of petri-dish. The results of present study are in agreement with the findings of Yeo and Kyulf (1997), who reported that dietary Yucca saponin decreased urease activity in the small intestine of young chicks and may be beneficial for improving animal health and growth, especially during early life. The findings of Goodall *et al.* (1988); Podgorski *et al.* (1996); Eckel (1997); Husnain (1997) are in agreement with the results of this study, who reported that Yucca saponin decreased ammonia production and urease activity.

Mortality due to ascites was recorded in groups A and B only. In group A, total 5 birds were died and in group B, total 3 birds were died due to ascites. The percent mortality in group A was 8 % and in group B was 5 %, respectively. No mortality was recorded in groups C and D. The results of present study are also in agreement with the findings of Tymez *et al.* (1996), who reported that Yucca saponin mohavensis when added to a diet given to broiler chickens reduced the incidence of pathological changes caused by ascites hypoxia. The findings of Korol *et al.* (1995) and Malecki *et al.* (1995) are in agreement with the result of this study, who reported that with the addition of Yucca saponin in feed resulted in fewer cases of ascites in broiler chickens as compared with untreated

groups.

Total cost of starter cum finisher ration from 0-6 weeks in groups A, B, C and D was Rs. 31.393, 31.643, 32.284 and 32.760 per bird, respectively. Total live weight gain of birds in different groups i.e. A, B, C and D was 1.741, 1.809, 1.857 and 1.895 kg, respectively and the cost of one kg live weight gain of birds was Rs.18.031, 17.491, 17.385 and 17.287, respectively.

Comparative study of Yucca saponin used in different concentrations in different groups i.e. A, B, C and D, in the present trial, showed that group D (offered 7.5 ml of Norponin 200 Liquid/100 liter of drinking water) was least cost as compared to other groups i.e. A, B and C, respectively. The results of present study are in agreement with the findings of Goodall (1980); Eckel (1997) who reported that Yucca saponin caused significance improvement in economical desirable traits, such as gain, conversions and carcass characteristics.

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