Dept. of Animal and Clinical Nutrition.
Fac. of Vet. Medicine, Assiut Univ.

EVALUATION OF POULTRY LITTER AS A FEED COMPONENT IN LAMBS RATIONS

(With 9 Tables and 8 Figures)

By
A. N. SAYED; S. G. ABDO* and A. ABOU'L-ELLA*
*Dept. of Animal Production, Fac. of Agriculture, Al-Azhar Univ., Assiut Branch.
(Received at 23/12/2003)

تقييم فرشة الدواجن كمكون غذائي في علائق الحملان

عبدالباسط نصر سيد ، صابر جمعة عبده ، علي أبوالعلا

أجريت هذه الدراسة لبحث إمكانية إضافة فرشة الدواجن إلى علائق الحملان ومدي تأثيرها علي أداء الحيوان ومعدلات هضم المواد الغذائية والاتزان النتروجيني وصفات الكرش بالإضافة إلى بعض التغيرات البيوكيميائية ومعالم الذبيحة. وقد تم استخدام ثلاثة مجموعات تجريبية كل منها خمس من حملان أغنام ألرحماني بمتوسط وزن أبتدائي ٣٥,٥ كجم وعمر ٩ شهور للحيوان. غذيت المجموعة الأولى علي عليقة ضابطة لاتحتوي علي فرشة الدواجن وتكفي احتياجات الحيوان من البروتين والطاقة بينما غذيت المجموعات الثانية والثالثة علي علائق تم إضافة فرشة الدواجن إليها بمعدل ٣٠% و ٤٠% علي التوالي لمدة ٩٠ يوما وقد كانت العلائق كلها متكافئة في البروتين والطاقة وقد خلصت الدراسة إلى الآتي: عدم وجود أي فارق معنوي في كمية المادة الجافة المستهلكة بين المجموعات المختبرة بينما نقص معدل الزيادة في وزن الجسم مع زيادة نسبة إضافة فرشة الدواجن إلى ٤٠% مع عدم وجود فارق معنوي بين المجموعة الضابطة والمغذاة علي العليقة المحتواة علي ٣٠% فرشة الدواجن. لم يظهر أي فارق معنوي في هضم كل من المادة الجافة والعضوية والدهون ومستخلص خالي الازوت بينما تحسن هضم كل من البروتين الخام والألياف في العلائق المحتوية علي فرشة الدواجن مقارنة بالعليقة الضابطة. معدل هضم النتروجين المختزن كنسبة من المستهلك أوالممتص كان أعلي في المجموعة الضابطة والمجموعة المغذاة علي عليقة تحتوي علي ٣٠% فرشة الدواجن مقارنة بالمجموعة المغذاة علي عليقة تحتوي علي ٤٠%. عدم وجود أي فارق معنوي في تركيز كل من البروتين الكلي والالبيومين والجلوبيولين في مصل دم المجموعات المختبرة بينما زاد تركيز اليوريا وحمض البوليك في مصل دم الحيوانات المغذاة علي علائق محتوية فرشة الدواجن. عدم تأثر درجة الحموضة بالكرش بفرشة الدواجن بينما وجدت زيادة معنوية في العد البكتيري وتركيز الأحماض الطيارة في كرش المجموعة الضابطة وقلت تدريجيا مع زيادة مستوي فرشة الدواجن في العلائق في مقابل زيادة تركيز الامونيا في كرش هذه المجموعات. عدم تأثر معالم الذبيحة بإضافة فرشة الدواجن إلى العلائق فيما عدا زيادة وزن الأعضاء الداخلية في المجموعة الضابطة. وجود احتقان طفيف في الوريد المركزي في الكبد واستحالات في خلايا الأنابيب الكلوية في مجموعة الحملان

المغذاة علي علائق تحتوي علي نسبة عالية من فرشة الدواجن. من هذه الدراسة نستخلص أنه يمكن استخدام فرشة الدواجن بنسبة ٣٠% في علائق الحملان بدون أي تأثير ضار علي الأداء إلى جانب الاستفادة من هذه المادة في تكوين علائق رخيصة مما يوضح جدواها الاقتصادية.

SUMMARY

A feeding trial of 90 days duration was conducted to study the effect of replacing 30% and 40% of lamb rations by poultry litter on the performance, digestibility of nutrients, nitrogen utilization, rumen liquor characteristics in addition to some blood biochemical parameters. Carcass traits were also investigated in this study. Fifteen Rahmani lambs of 9 months age and average initial body weight of 35.5 kg were allotted into three groups (5 animals each). The first group was fed a basal ration and considered as control, while the second and third groups were fed rations in which poultry litter (PL) replaced 30 and 40% of the basal ration. There was no significant differences in the dry matter intake between the different experimental groups and the animals of the control one and those fed ration having 40% PL consumed nearly the same amounts of dry matter. Lambs fed on the ration containing high level of PL (40%) had significantly ($P<0.05$) decreased average daily gain and poor feed conversion ratio compared to those of the other two groups. No significant differences were observed in the digestibilities of DM, OM, EE and NFE of the experimental rations, while CP and CF digestibilites were improved in the tested rations containing PL compared to control one. Nitrogen balance and N-retention, as % of N-intake and absorbed were significantly ($P<0.05$) higher in animals of groups fed on ration containing 30% PL and control compared to lambs fed the ration containing 40% PL. No significant differences were observed among different treated groups in total blood serum protein, albumin and globulin, while urea and uric acid concentrations were significantly ($P<0.05$) higher in the serum of animals fed on PL rations compared to control. Ruminal pH was not affected significantly by PL addition, while there was significant differences ($P<0.05$) in the total bacterial count and TVFAs. The control group revealed higher values for these parameters followed by the groups fed on 30% and 40% PL. Rumen NH_3-N was increased significantly ($P<0.05$) by increasing PL level in the ration. Carcass traits were not affected significantly by the level of poultry litter in the rations inspite of the little increase in the weights of internal organs in the control group. Slight dilatation in the liver central vein and degeneration in the tubular epithelium of kidney were showed in the lambs fed the high level of PL (40%). In general, it could be concluded that poultry litter can be utilized efficiently and safely in rations of lambs up to level of 30% to overcome feed shortage and minimize feed costs.

Key words: *evaluation, poultry litter, lambs.*

INTRODUCTION

The commercial poultry industry produces significant amounts of poultry litter, which consists of manure, bedding and spilled feed. Disposal of poultry litter is a major problem for large scale, intensive poultry operations. Refeeding litter, particularly to ruminants, may be a feasible solution of alleviating the poultry litter disposal problem as well as a method for recovering some of the potentially valuable nutrients that it contains (Abd El-Ghani *et al.*, 1999). Feeding of farm animals encounters many problems in many countries due to the limited availability of resources. In Egypt, against background of a rapidly increasing population that demands protein, there is additional need to decrease cost of feed. Shortage of concentrates and its ingredients in Egypt, and the relatively high prices are the major problem in animal production. The available feedstuffs cover less than 60% of the total requirements of ruminants (Ahmed, 1995). A lot of researches recommended the use of NPN sources in ruminants feeding to save the true or natural protein for other livestock animals, poultry and mainly for direct human consumption (Gihad *et al.*, 1989 and Bhattacharya, 1996). In Egypt, numerous scientific studies showed that utilization of poultry wastes (litter and manure) as a source of protein is considered to be the most strategic ingredients of the unconventional feeding system of ruminants (El-Ashry *et al.*, 2000; Gabr *et al.*, 1991, 1993 and 2001). Many published reports indicated the poultry litter could be used in ruminant rations owing to low cost ingredient and decreasing the cost of meat production (Gihad *et al.*, 1980). When processed by an acceptable method, poultry litter is an economical and safe source of protein, minerals and energy for many classes of ruminants (Kunkle *et al.*, 1997). Poultry litter is valuable mainly for its nitrogen content and fiber and several reports indicated that crude protein content ranged from 25.3 to 34.70% (Harmon *et al.*,1975 and Caswell *et al.*, 1978). The variation in the chemical composition of poultry litter may be due to the type of bedding material, the number of birds reared, ageing of the bedding material and the level of nutrients excreted out in the droppings of the birds (Bhattacharya and Tylor, 1975 and Kishan *et al.*, 1984). Laboratory analyses showed litter to generally average within the ranges of 20-25% crude protein, 55-60% TDN, 20-25% ash with significant levels of calcium, phosphorus and other macro and trace minerals (Barnes *et al.*, 1997).

Although all investigators reported that dried poultry litter could be used as a good non-protein nitrogenous constitute, it has not been used in animal nutrition by farmers in Egypt. Thus, the main objectives of this study was to investigate the efficiency of utilization of poultry litter by lambs. Rumen liquor characteristics and some blood biochemical parameters as well as carcass traits were also investigated.

MATERIALS and METHODS

Fifteen Rahmani lambs of 9 months age and average initial body weight of 35.5 kg were used in this study. The animals were allotted into three groups (5 animals each) designed as I, II and III. The first group was fed a basal ration and considered as control, while the second and third groups were fed rations in which poultry litter replaced 30% and 40% of the basal ration. All experimental rations were formulated to provide the recommended levels of total digestible nutrients (65%) and crude protein (14.5%) according to NRC (1985) for sheep. The rations were formulated and composed of a concentrate mixture and the roughage wheat straw. The animals were offered each's quota of concentrates and roughage mixed altogether. The physical and chemical composition of the ingredients and experimental rations are presented in Tables (1 and 2).

The rations were given twice daily at 9.00 a.m. and 5.00 p.m. and any residues were collected and weighed throughout the experimental period (90 days) and all animals had free access to clean water. Animals were weighed at the beginning and at the end of the experiment, and feed intake was recorded throughout the experimental period.

Ration ingredients were sampled, dried, ground and analyzed for different nutrients. The total amount of the daily fecal matter excreted per animal was collected daily, weighed, recorded, mixed thoroughly throughout the collection period and representative samples (one-fourth) were taken from each animal, dried for 24 hours at 60°C, pooled together, mixed ground and stored till analysis. The volumetric urinary output was collected daily from each animal in plastic containers and recorded, then representative samples (100 ml) were taken, acidified with 2 ml of concentrated HCl as a preservative and then stored in a refrigerator at 4°C for nitrogen determination. Ration ingredient samples were analyzed according to the official methods of AOAC (1990) for DM, CP, EE, CF and ash. Nitrogen free extract was calculated by difference. Nitrogen content of feces and urine samples were estimated according to AOAC (1990) for calculation of nitrogen balance.

Blood was sampled by jugular vein-puncturing every month before the morning meal. Serum was separated and stored at –20°C until analysis. Total serum protein, albumin, globulin, glucose, urea, uric acid and total cholesterol, were determined using standard kits supplied by Bio-Merieux (Baines/France).

At the end of the experiment, ruminal juice was collected from each animal in clean and sterile flask by using clean and sterile stomach tube. The colony forming units/ml of the ruminal juices were carried out by standard plate techniques (Baily and Scott, 1994). In addition, samples of rumen contents were collected for volatile fatty acids determination and ammonia concentration. As soon as the ruminal fluid samples were obtained, the hydrogen ion concentration was estimated using pH meter. Total volatile fatty acids (TVFAs) and ammonia were determined by gas-liquid chromatography (Intersmat, IGC 120 FB).

Digestion coefficient of the nutrients for the different experimental rations were calculated using the direct method.

The liver, kidneys, spleen and lungs were removed from the carcasses of all the three groups. Sample from different organs were stored in Zinker's formal solution for pathological examination. From each of the different samples, several sections were made, stained with heamatoxlin and eosin for routine histopathological examination (cited by Bancroft and Stevens, 1977).

Statistical analysis of the collected data was carried out according to procedures of completely random design, SAS (1995).

RESULTS and DISCUSSION

As the poultry litter (PL) high in its fiber and ash content, the rations containing PL were high in these criteria. Chauhan (1993) attributed the higher ash content to the excretion of minerals in the litter.

Dry matter intake, average daily gain and feed conversion of the different experimental groups are presented in Table (3). No significant differences in the dry matter intake were observed between animal groups. The animals of both the control and those fed 40% PL consumed nearly the same amounts of dry matter 973 g/d and animals fed the ration containing 30% PL consumed 937 g/d, indicating that the palatability of the tested rations was not affected by the incorporation of poultry litter. This was agreed with that reported with previous investigations (Kishan *et al.*, 1984; Lal *et al.*, 1986; Abd El-Gawad *et al.*, 1989 and Okeudo and Adegbola, 1993) who stated that incorporating dried poultry litter did not significantly affect daily dry matter intake in sheep.

Lambs fed the ration containing high level of PL (40%) had decreased significantly ($P<0.05$) average daily gain (86.1 g/d) compared to the control and group fed on ration containing 30% PL. (116.7 and 111.11 g/d, respectively). Animals of treated groups comprised 4.79 and 26.22% loss in weight gain compared to the control one. These results showed that total or daily body gain of lambs fed on rations containing poultry litter, in generally, were lighter than that of control lambs. Similar results were obtained in the previous studies (Hadjipanayiotou *et al.*, 1993; McCaskey *et al.*, 1994 and Helali *et al.*, 1995). However, reduced animal performance recorded when PL formed high level of the total ration mainly attributed to energy dilution (Kishan *et al.*, 1984).

Feed conversion ratio was better in both the control and group II (8.33 and 8.44, respectively) compared to the group III (11.31). These agreed with that reported by Matter *et al.* (1995) and Animut *et al.* (2002) who found that feed conversion of the control ration gave the best feed conversion compared to tested ration containing high poultry litter. However, Murthy *et al.* (1995) reported that inclusion of cage layer droppings up to 30% in feed of lambs and kids had no adverse effect on growth, feed efficiency and nutrient utilization. At higher levels of poultry litter, growth rate was depressed as well, probably because dried poultry litter is low in the essential amino acids needed by animal and also because of excessive amount of calcium as reported by Okeudo and Adegbola (1993) and Bhattacharya (1996).

Results concerning digestibility of nutrients for different experimental rations are presented in Table (4). There were no significant differences between the experimental rations in the digestibilities of DM, OM, EE and NFE. Similar results were obtained with Lal *et al.* (1986) who stated that digestibilities of DM, EE and NFE were statistically similar in the control and the 25% PL rations of sheep but significantly depressed on increasing the level of PL in the ration and this may be due to the high levels of CF and ash. The improvement in CP digestibility in the tested ration (30% PL) could be either due to increase microbial protein synthesis in the rumen caused by more degradable protein in the form of NH_3-nitrogen being available to rumen microbes (Mehrez, 1992) and/or to the complementary effect of undegradable ration protein and microbial protein (Orskov, 1982). Digestion coefficient of CF was higher in rations containing PL (62.87 and 58.35%) compared to control one (55.70%). This may be due to the exposure of poultry litter fibre to the enzymes and organisms in the digestive tract of the poultry making it more available and efficiently utilized by the microorganisms in the rumen (Abd El-Gawad *et al.* 1989; Gabr *et al.*, 1991 and 1993; Chauhan, 1994 and El-Ashry *et al.* 2000).

The nutritive value (Table, 4) expressed as total digestible nutrients (TDN) was not significantly affected when PL replaced 30% of total ration, but slightly decreased ($P<0.05$) when the PL level reached 40% of total ration compared with the control. Similar trend was obtained by Khaims *et al.* (1992) and Gabr *et al.* (2001). There were no pronounced differences in digestible crude protein (DCP) among all tested ration indicating that groups utilized PL rations efficiently as those given the traditional feedstuffs in control ration.

Nitrogen balance (g/d) and N-retention, as % of N-intake and absorbed (Table, 5) were significantly ($P<0.05$) higher in animal groups fed the control (11.57, 50.99 and 60.93) and ration II (10.96, 50.28 and 56.99) than lambs fed ration III (8.91, 39.10 and 48.08). Similar results were found in sheep by Kishan *et al.* (1984) who reported that nitrogen retention decreased with increasing the proportion of poultry litter in the composite rations. In contrast, Singh and Negi (1986) found that the gross nitrogen retention or that expressed of total N intake decreased in sheep fed rations containing poultry litter.

The results revealed that tested blood constituents (Total protein, albumin and globulin) were not significantly ($P<0.05$) affected by PL incorporation of lamb rations (Table, 6). Such result could indicate that inclusion of PL had no adverse effects on blood components which satisfactory suggest quite equal health condition. Similar results were obtained by Khattab *et al.* (1995) and Gabr *et al.* (2003). Urea and uric acid concentrations were significantly ($P<0.05$) higher in the serum of animals fed on PL rations compared to control. These results are in accordance with those obtained by Mabjeesh *et al.* (1996) and Gabr *et al.* (2001) who reported significant increase for both of urea-N and NH3-N concentrations in the goats fed on poultry manure compared with the control group. In addition, Caswell *et al.* (1978) and Rude *et al.* (1994)

noted that blood urea nitrogen was higher in sheep fed the poultry litter than in sheep fed control rations. Serum glucose and total cholesterol were significantly ($P<0.05$) higher in the control group and this agreed with that reported by Gabr *et al.* (2001) who found slight reduction in glucose in the goats fed dried poultry manure rations

The obtained results revealed that PL levels did not significantly affected ruminal pH values (Table, 7). Similar results reported by Yildiz *et al.* (1995) and Gabr *et al.* (2003) when dried poultry litter was used at 30% in sheep rations. There were significant differences ($P<0.05$) in the total bacterial count and TVFAs and the control group recorded the highest values followed by 30% and 40% groups respectively. These results agreed with that reported by Mudgal *et al.* (1983) who found gradual decrease in the rumen microbes with the increase of PL level in the ration. The same was recorded by Chen and Jan (1992) and Gabr *et al.* (2001) who found that TVFAs concentrations were slightly decreased with goats fed dried poultry manure rations compared with control. Rumen NH_3-N was increased significantly ($P<0.05$) by increasing PL level in the rations and this may be attributed to the relatively high nitrogen content of the PL (Bhattacharya and Taylor, 1975).

Data in Table (8) show carcass traits for the lambs fed of the three groups. Results concluded that PL exerted no significant effects on carcass traits, however, the absolute weights of the internal organs (heart, liver, kidney, spleen, lung and tests) were significantly ($P<0.05$) higher in the control. This agreed with that reported by Ilian *et al.* (1988) and Gabr *et al.* (2003) who found no significant changes in carcass traits of sheep fed on poultry manure. In addition, Khattab *et al.* (1995) found no significant effects on carcass traits of buffalo calves fed on rations containing 20 and 40% poultry litter and control one.

The pathological study revealed that animal groups fed on ration containing 40% PL showed dilatation in the central vein of liver (Fig. 1) and slight degeneration in the tubular epithelium of kidney with few interstitial cellular reaction (Fig. 3) in addition to exuhation of the lymphocytic elements on the red pulp of spleen (Fig. 5). The liver of the group fed on ration containing 30% PL was more or less normal (Fig. 2) with slight interstitial cell reaction in the kidney (Fig. 4) beside blastogenic reaction were observed in the white pulp of spleen (Fig. 6). The lungs in both groups was more or less of normal histological appearance (Fig. 7) and normal histological structure of the testes (Fig. 8). At higher litter intakes, high concentrations of ammonia were found in the rumen and consequently high blood urea nitrogen concentrations may be the cause of liver and kidney damage as reported by Silanikove and Tiomkin (1992)

Table (9) show feed costs of live body gain and economic feed efficiency. Feed cost for the lambs fed on rations containing poultry litter was significantly lower ($P<0.05$) than that for control one. Results obtained in the present study concluded that use of ration containing 30% PL for lambs increase economic feed efficiency to 318.36% compared to control ration. The results in the present study were similar to those reported by Gihad (1976) and Helali *et al.* (1995) who reported that substituting concentrate meals with poultry manure in sheep rations reduced the cost.

The overall results showed that poultry litter could efficiently incorporated up to 30% in the rations of lambs without serious adverse effects. This result could be a useful mean to overcome feed shortage and minimize feed costs. Moreover, using poultry litter in animal feeds will alleviate pollution problems.

ACKNOWLEDGEMENT

The authors would like to express their deep gratitude and appreciation for the valuable assistance provided from Dr. S. Kh. Abdel-Ghaffar, Dept. of Pathology and Clinical Pathology, Fac. of Vet. Med., Assiut Univ.

REFERENCES

Abd El-Gawad, A.M.; Hanafy, M.A.; Shousha, M.A. and Salem, O.A.I. (1989): Digestibility and blood palambeters for sheep fed rations containing poultry manure. 3rd Egyp.-British Conf. on Animal, Fish and Poultry Production.pp. 431-440.

Abd El-Ghani, A.A.; Galal, A.Gh.; Meiske, J.C. and El-Feel, F.M.R. (1999): Poultry litter as feedstuff for gestating beef cows. Egyp. J. Nutr. And Feeds, 2:155-165.

Ahmed, M.A.B. (1995): Use of farm by-products in animal nutrition. M.Sc.Thesis, Fac. of Agric., Al-Azhar Univ.

Animut, G.; Merkel, R.C.; Abebe, G.; Sahlu, T. and Goetsch, A.L. (2002): Effects of level of Poultry litter in rations containing wheat straw on performance of Alpine doelings. Small Rumin. Res., 44 (2):125-133.

AOAC, Association of Official Analytical Chemists (1990): Official Methods of Analysis. Vol. I.14th ed., AOAC, Arlington, VA.

Baily, W.R. and Scott, E.G. (1994): Diagnostic microbiology 9 th Ed.,the C.V.Mosby,Saint Louis.

Bancroft, J.D. and Stevens, A.S. (1977): Foreword by Donson, J.M.P. Theory and practice of histological techniques. Churchill Living Stone Edinburg, New York, pp.222.

Barnes, K.C.; Smith, S.C.; Britton, J.G. and Miller, D.M. (1997): Effect of poultry litter on weight gain of winter cattle. Livestock Nutrition, Columbia, Missouri.

Bhattacharya, A.N. (1996): Poultry manure. J.Animal Sci., 25:367.

Bhattacharya, A.N. and Fontenot, J.P. (1966): Protein and energy value of peanut hull and wood shaving poultry litter. J.Anim.Sci., 25:367.

Bhattacharya, A.N. and Taylor, J.C. (1975): Recycling animal waste as a feedstuff: A review. J.Anim.Sci., 41:1438-1457.

Caswell, L.F.; Fontenot, J.P. and Webb, K.E. (1978): Fermentation and utilization of Poultry litter ensiled at different moisture levels. J.Anim.Sci., 46:803.

Chauhan, T.R. (1993): Nutritional evaluation of urea/poultry litter enriched wheat straw-based rations to adult buffaloes. Buffalo J., 9(3): 187-194.

Chauhan, T.R. (1994): Comparative feeding value of urea/dried poultry excreta supplemented sugarcane tops silage to buffaloes. Ind.J. Dairy Sci., 47:11

Chen, K.J. and Jan, D.F. (1992): Effect of ensiled dry poultry waste in native goat ration on the rumen as evaluated by in vitro method. J.Taiwan Livestock.Research, 25:65.

El-Ashry, M.A.; Saleh, H.M.; El-Fouly, H.A. and Amin, S.O. (2000): The effect of different levels of caged layer dropping in male lamb rations on growth performance and semen characteristics. Egypt.J.Nutr. and Feeds, 3:1

Gabr, A.A.; Abdelhamid, A.M. and El-Ayek, M.Y. (1991): Nutritional evaluation of dried poultry litter in comparison with berseem hay and their mixtures as feeds for sheep. J.Agric.Sci.Mansoura Univ., 16:2004.

Gabr, A.A.; El-Ayek, M.Y. and Mehrez, A.Z. (1993): Effect of long term feeding of ration containing dried poultry litter on digestibility and growing lamb performance. J.Agric.Sci., Mansoura Univ., 18:3437.

Gabr, A.A.; Mehrez, A.Z.; Abd El-Khabir, A.M.; Abdel-Aziz and El-Zalaky, O.A. (2001): Performance and some blood plasma constituents of lactating goats fed rations containing formaldehyde treated dried poultry manure. Egypt.J.Nutr. and Feeds, 4:47-61.

Gabr, A.A.; Shehata, E.I.; Ahmed, M.E. and Azzam, M.H. (2003): Performance and carcass traits of Rahmani lambs fed rations containing dried poultry manure with addition of bentonite clay. Egypt.J.Nutr. and Feeds, 6(2):173-188.

Gihad, E.A. (1976): Value of dried poultry manure and urea as protein supplements for sheep consuming low quality tropical hay. J.Anim.Sci., 42:3.

Gihad, E.A.; Abdel Gawad, A.M.; El-Nouby, H.M; Gomaa, I.A. and Mohamed, A.H. (1989): Digestibility and acceptability of ammoniated rice straw by sheep. 3rd Egyptian-British Conf. On Animal, Fish and Poultry Production, 7-10 Oct., Alex.Univ.

Gihad, E.A.; El-Bedawy, T.M. and Mehrez, A.Z. (1980): Fiber digestibility by goats and sheep. J.Dairy Sci., 63:1701.

Hadjipanayiotou, M.; Labban, L.M.; Kronfoleh, A.; Verhaeghe, L.; Naigm, T.; Al-Wadi, M. and Amin, M. (1993): Studies on the use of dried poultry manure in ruminant rations in Syria. Livestock Anim. Res. For Rural Develop., 5(1):39-45.

Harmon, B.W.; Fontenot, J.P. and Webb, K.E. (1975a): Ensiled Poultry litter and corn forage.I. Fermentation characteristics. J.Anim.Sci., 40 (1): 144-155.

Helali, E.A.; Mohamed, A.A.; El Khimsawy, K.A. and Borai, M.A. (1995): Use of some farm by-products in buffalo calves feeding. Proc. 5th Sci.Conf.Animal Nutrition, 1:129-136.

Ilian, M.A.; Razzaque, M.A. and Salmau, A.J. (1988): Unconventional feeds for sheep: Effects on performance and meat quality and composition. Biological Wastes, 24(2): 115-125.

Khamis, H.S.; El-Shaer, H.M. and Salem, O.A. (1992): Fatting sheep on rations of Poultry ensiled with green berseem. Egypt.J.Anim. Prod., 29:75.

Khattab, H.M.; El-Sayed, H.M.; Elwan, K.M. and Ragheb, E.E. (1995): Poultry litter incorporation in the fattening rations of male buffalo calves. Proc. 5th Sci.Conf.Animal Nutrition, 1:145-151.

Kishan, J.; Lall, D. and Negi, S.S. (1984): Poultry litter based complete ration for sheep. Ind.J.Anim.Sci., 54:267.

*Kunkle, W.E.; Jacob, J.P.: Tervola, R.S.; Miles, R.D. and Mather, F.B. (1997):*Poultry litter: Feeding to ruminants. Florida Cooperative Extension Service, Inst. Of Food and Agric. Sci., Univ. of Florida.

Lal, D.; Saraswat, M.L.; Negi, S.S. and Singh, B. (1986): Effect of energy supplement on poultry litter based ration of sheep. Ind.J.Anim.Nutr., 3(1):17-20.

Mabjeesh, S.J.; Arieli, A.; Bruckental, I.; Zamwell, S. and Tagari, H. (1996): Effect of type of protein supplementation on duodenal amino acid flow and absorption in lactating dairy cows. J.Dairy Sci., 79:1792.

Matter, B.B.; Mahmoud, A.M.; Kuoret, I.S. and Abou-Selim, I.A. (1995): Effect of feeding various sources of non protein nitrogen on the performance of lactating Friesian cows. Proc. 5th Sci.Conf.Animal Nutrition, 1:1-10.

McCaskey, T.A.; Britt, S.N.; Ruffin, B.G.; Eason, J.T. and Strickland, R.L. (1994): Feed value of Poultry litter for stocker cattle. Highlights of Alabama Agric. Res. 41(1):12.

Mehrez, A.Z. (1992): Influence of roughage:concentrate ratio on N requirements of rumen microbes for maximal rate of fermentation. Proc. Of the Intern. Conf. on Manipulation of Rumen Micro-organisms to improveEfficiency of Fermentation and Ruminant Production. Alex.Egypt, pp.234.

Mudgal, V.D.; Toro, V.A. and Walli, T.K. (1983): Influence of levels of poultry litter on the in vivo rumen metabolism and in vitro protein synthesis. J. Nuclear Agr.Biol., 12:76.

Murthy, K.S.; Reddy, M.R. and Reddy, G.V.N. (1995): Utilization of cage layer droppings and poultry litter as feed supplements for lamb and kids. Small Rumin.Res., 16(3): 221-225.

NRC, National Research Council (1985): Nutrient requirements of sheep. 6th ed. National Academy Press, Washington, D.C.

Okeudo, N.J. and Adegbola, A.A. (1993): Utilisation of dried caged-hen manure and cassava peels for intensive sheep production. Trop. Anim. Health Prod., 25(4):234-238.

Orskov, E.R. (1982): Protein nutrition in Ruminants. Academic Press Inc., London.

Rude, B.J.; Rankins, D.L.and Dozier, W.A. (1994): Nitrogen and energy metabolism and serum constituents in lambs given Poultry poultry litter processed by three deep-stacking methods. Anim. Prod., 58(1): 95-101.

SAS (1995): User's Guide: Statistics, V.7.SAS Inst., Inc., Cary, NC.

Silanikove, N. and Tiomkin, D. (1992): Toxicity induced by poultry litter consumption: Effect on measurments reflecting liver function in beef cows. Anim. Prod., 54: 203-209.

Singh, B. and Negi, S.S. (1986): Studies on the effect of supplementing extra energy to poultry litter based rations of sheep. Ind.J.Anim.Nut., 3(2):76-80.

Yildiz, G.; Fidanci, U.R.; Mugali, O.H. and Bayram, J. (1995): Influence of dried poultry manure in ration on feed evaluation and some parameters in the rumen of Akkarman lambs. Vet.Fakut.Dergisi, Ankara Univ., 42:153.

Table (1): Chemical composition of the ration ingredients (%)

Items	Ingredients			
	Corn, ground	Soybean meal	Poultry litter	Wheat straw
Dry matter	88.0	89.6	84.5	89.0
Crude protein	8.9	44.0	25.3	3.6
Ether extract	3.5	0.5	2.3	1.8
Crude fibre	2.9	7.0	18.6	41.6
Ash	1.5	6.0	14.1	7.8
TDN*	80	78	77	44

* Total digestible nutrients: from tables of NRC (1985).

Table (2): Physical and chemical composition of the experimental rations (%)

Ingredients	Experimental rations		
	I Control	II (30% PL)	III (40% PL)
Physical comp.:			
Corn, ground	41.00	20.00	15.00
Soybean meal	22.00	8.50	4.00
Poultry litter	---	30	40
Molasses	---	6.00	6.00
Wheat straw	35.1	34.6	34.1
Limestone, ground	1.00	---	---
Common salt	0.50	0.50	0.50
Min.mixt.*	0.15	0.15	0.15
AD_3E**	0.25	0.25	0.25
Chemical comp.:			
Dry matter	88.89	86.74	86.31
Crude protein	14.59	14.53	14.63
Ether extract	2.18	2.05	2.08
Crude fiber	17.33	21.15	22.34
NFE	59.34	53.16	50.99
Ash	6.56	9.11	9.96
TDN***	65.40	65.03	65.00

*Mineral mixture: each 100g contains; 25.6g Na, 1.6g K, 4.6g Ca, 1.8g P, 4g Mg, 300mg Fe, 32mg Mn, 1.5mg Cu, 15mg I, 5mg Zn, 1mg Co and 1mg Se (AGRICO-international company).

AD_3E, each g of AD_3E contains 20000 IU vitamin A, 2000 IU vitamin D and 400 IU vitamin E (AGRICO-international company). * TDN:Total digestible nutrients: calculated from NRC (1985)

Table (3): Performance and feed efficiency of lambs during experimental period

Items	Experimental groups		
	I	II	III
Int. body weight (kg)	35.5±1.50	35.5±1.20	35.5±1.10
Fin. body weight (kg)	46.0±1.10	45.5±1.00	43.25±1.12
Total weight gain (kg)	10.50±0.70 [a*]	10.00±0.50 [a]	7.75±0.35 [b]
Av. daily gain (g)	116.7±7.00 [a]	111.11±4.20 [a]	86.1±3.50 [b]
Growth rate (%)	29.58	28.17	21.83
Av. daily feed intake:			
TDMI (g/head)	972.10±8.12 [a]	937.56±7.22 [a]	973.67±8.05 [a]
TDN (g/head)	642.56±8.95 [a]	615.79±6.93 [b]	605.04±6.01 [b]
DCP (g/head)	94.88±1.03 [a]	98.44±1.00 [a]	98.34±1.01 [a]
Feed conversion ratio:			
Kg DM / Kg gain	8.33	8.44	11.31
Kg TDN / Kg gain	5.51	5.54	7.03
Kg DCP / Kg gain	0.813	0.886	1.14

*Figures in the same row having the same superscripts are not significantly different (P<0.05)

Table (4): Digestion coefficient of nutrients and nutritive value of the experimental rations

Items	Experimental rations		
	I	II	III
Digestion coefficient (%):			
Dry matter	69.29±1.39 [a*]	68.07±0.93 [a]	67.93±0.79 [a]
Organic matter	72.31±0.82 [a]	70.52±0.28 [a]	71.37±0.42 [a]
Crude protein	66.90±0.74 [b]	72.23±3.52 [a]	69.07±1.26 [ab]
Ether extract	66.22±1.50 [a]	64.76±1.93 [a]	61.65±1.97 [a]
Crude fiber	55.70±1.32 [b]	62.87±1.31 [a]	58.35±1.01 [ab]
Nitrogen free extract	73.21±1.07 [a]	73.15±0.94 [a]	70.81±0.98 [a]
Nutritive value (%DM): **			
TDN	66.10±1.15 [a]	65.68±1.05 [a]	62.14±1.10 [b]
DCP	9.76±0.75 [a]	10.50±0.59 [a]	10.10±0.80 [a]

*Figures in the same row having the same superscripts are not significantly different (P<0.05).
**TDN: Total digestible nutrients, DCP: Digestible crude protein (calculated after digestion coefficient determination).

Table (5): Nitrogen utilization for the experimental groups

Items	Experimental groups		
	I	II	III
Nitrogen intake (g/h/d)	22.69±0.25 [a*]	21.80 ±0.17 [a]	22.79±0.20 [a]
Fecal nitrogen (g/h/d)	3.70±0.10	2.57±0.15	4.26±0.30
Digested nitrogen (g/h/d)	18.99±0.15	19.23±0.20	18.53±0.18
Urinary nitrogen (g/h/d)	7.42±0.30	8.27±0.25	9.62±0.40
Nitrogen balance (g/h/d)	11.57±0.50 [a]	10.96±0.45 [a]	8.91±0.62 [b]
N.B. % of intake	50.99±2.10 [a]	50.28±2.50 [a]	39.10±3.12 [b]
N.B. % of absorbed N	60.93±2.90 [a]	56.99±3.10 [a]	48.08±3.56 [b]

*Figures in the same row having the same superscripts are not significantly different ($P<0.05$)

Table (6): Serum biochemical parameters of the experimental groups

Items	Experimental groups		
	I	II	III
Total protein (g/100ml)	7.30±0.04 [a*]	7.03±0.02 [a]	7.14±0.06 [a]
Albumin (g/100ml)	3.47±0.06 [a]	3.53±0.02 [a]	3.44±0.04 [a]
Globulin (g/100ml)	3.83±0.06 [a]	3.50±0.01 [a]	3.70±0.11 [a]
Alb/glob ratio	0.91±0.03	1.01±0.01	0.93±0.04
Glucose (mg/100ml)	68.67±4.18 [a]	60.33±0.24 [b]	59.33±0.47 [b]
Urea (mg/100ml)	39.91±0.87 [b]	46.41±0.21 [a]	49.02±0.41 [a]
Uric acid (mg/100ml)	4.47±0.18 [b]	5.9±0.15 [a]	6.13±0.13 [a]
Total cholesterol (mg/100ml)	130.33±0.62 [a]	108.33±4.25 [b]	126.67±1.18 [a]

*Figures in the same row having the same superscripts are not significantly different ($P<0.05$)

Table (7): Rumen liquor characteristics of the experimental groups

Items	Experimental groups		
	I	II	III
pH of the rumen	6.13±0.28 [a*]	6.23±0.24 [a]	6.13±0.07 [a]
Total bacterial count (/ml)	1.73×10^{8} [a] $\pm 1.2 \times 10^{7}$	3.26×10^{7} [a] $\pm 1.0 \times 10^{6}$	1.45×10^{4} [b] $\pm 1.0 \times 10^{3}$
VFA conc. (meq/100 ml R.L)	9.72±0.26 [a]	9.13±0.10 [a]	7.89±0.14 [b]
Ammonia (meq/100 ml R.L)	23.61±0.50 [b]	26.64±0.48 [a]	28.00±0.34 [a]

*Figures in the same row having the same superscripts are not significantly different ($P<0.05$)

Table (8): Carcass traits of the experimental groups

Items	Experimental groups		
	I	II	III
Fasting carcass weight (kg)	51.00±3.15^{a}	44.00±2.87^{b}	43.00±3.01^{b}
Empty carcass weight (kg)	26.425±2.10^{a}	22.077±1.76^{a}	21.935±2.20^{a}
Dressing %	51.81±1.00^{a}	50.18±1.03^{a}	51.01±1.10^{a}
Head and limb weight (kg)	4.750±0.24^{a}	3.550±0.30^{a}	4.250±0.20^{a}
Heart (g)	190±10.80^{a}	150±8.75^{b}	140±9.15^{b}
Liver (g)	760±33.10^{a}	600±25.12^{b}	540±20.62^{b}
Kidney (g)	240±15.23^{a}	150±9.52^{b}	140±8.50^{b}
Spleen (g)	85±6.10^{a}	50±5.38^{b}	50±4.90^{b}
Lung (g)	650±26.80^{a}	680±25.18^{a}	550±20.35^{b}
Tests (g)	300±12.15^{a}	240±13.10^{b}	270±16.08^{ab}
Rumen full (kg)	10.0±0.58^{a}	8.150±0.46^{a}	8.00±0.70^{a}
Rumen empty (kg)	2.700±0.26^{a}	3.525±0.20^{a}	2.250±0.10^{a}
Front quarters (kg)	10.900±0.80^{a}	8.075±0.61^{a}	8.620±0.50^{a}
Hind quarters (kg)	8.850±0.93^{a}	6.800±0.58^{a}	7.900±0.85^{a}

*Figures in the same row having the same superscripts are not significantly different ($P<0.05$)

Table (9): Economic evaluation of lambs fed the tested rations

Items	Experimental groups		
	I	II	III
Feed costs (L.E)	77.39±2.10^{a}	52.82±1.82^{b}	47.66±1.50^{b}
Price of body gain (L.E)	94.50±4.02^{a}	90.00±3.62^{a}	69.75±3.93^{b}
Net revenue (L.E)	17.11±1.00^{c}	37.18±1.10^{a}	22.09±0.95^{b}
Economic feed efficiency (%)	22.11±2.80^{c}	70.39±2.58^{a}	46.35±3.15^{b}
Relative economic feed efficiency	100	318.36	209.63

*Figures in the same row having the same superscripts are not significantly different ($P<0.05$)

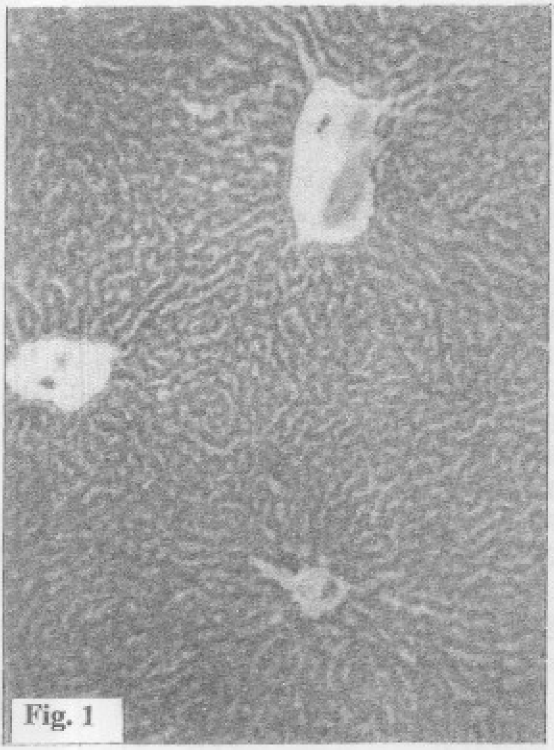

Fig. 1

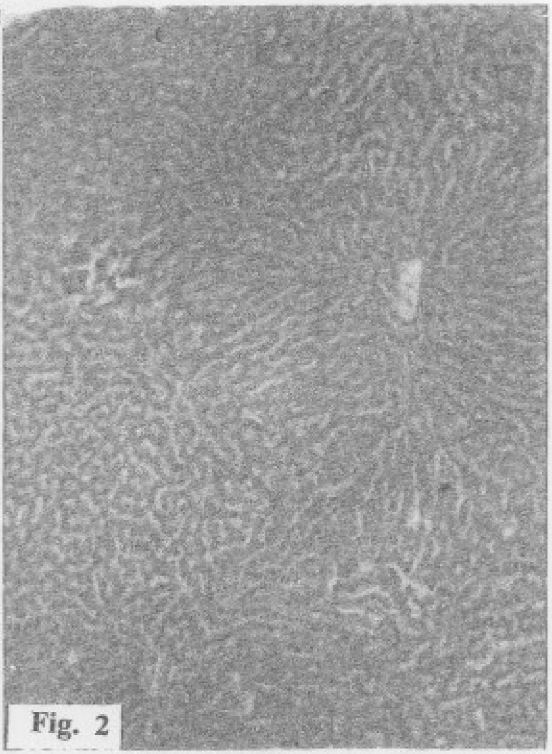

Fig. 2

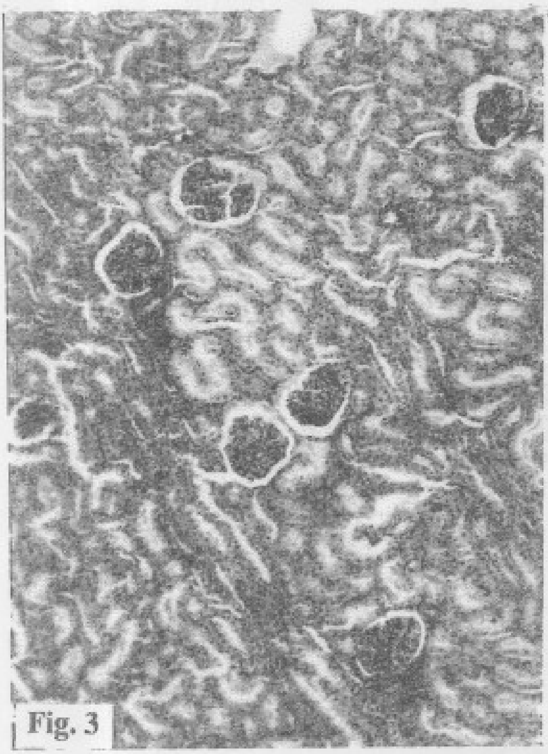

Fig. 3

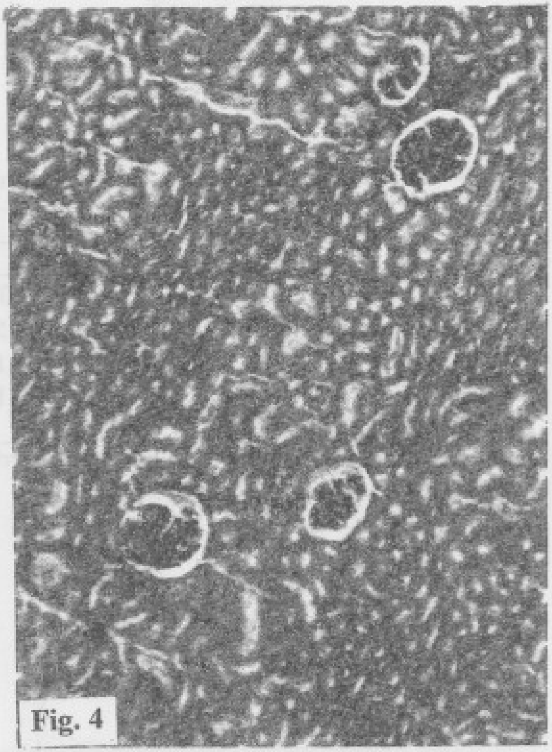

Fig. 4

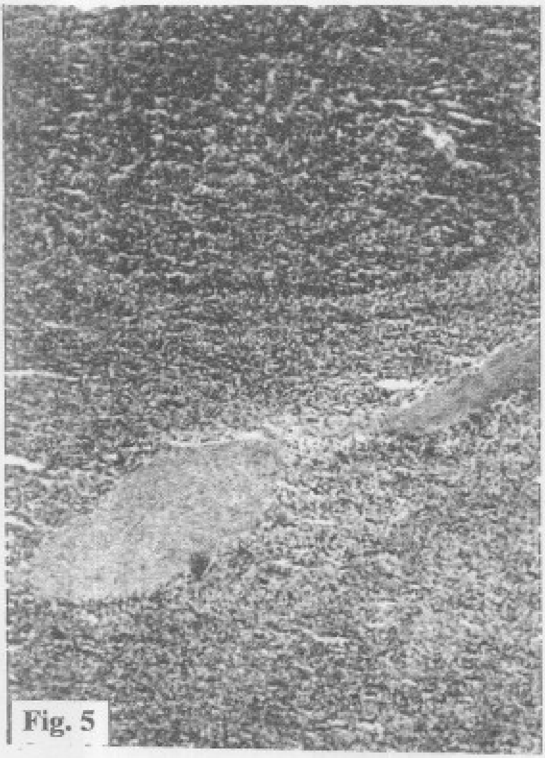

Fig. 5

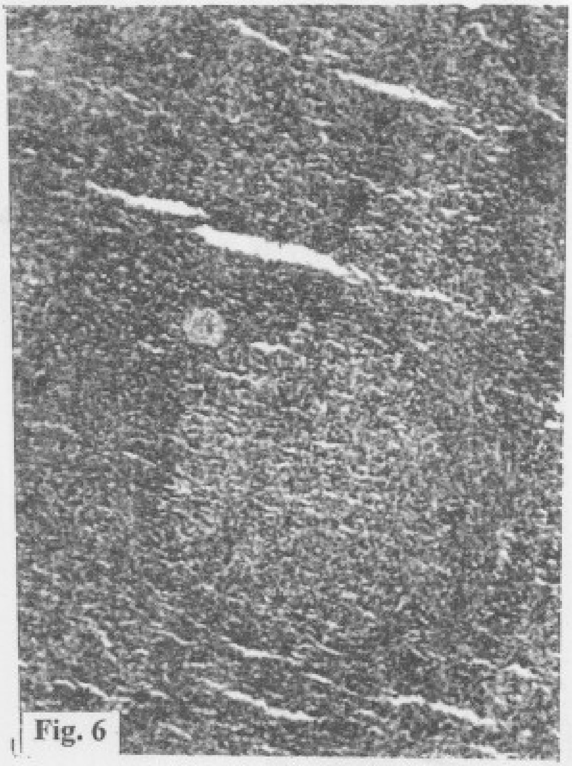

Fig. 6

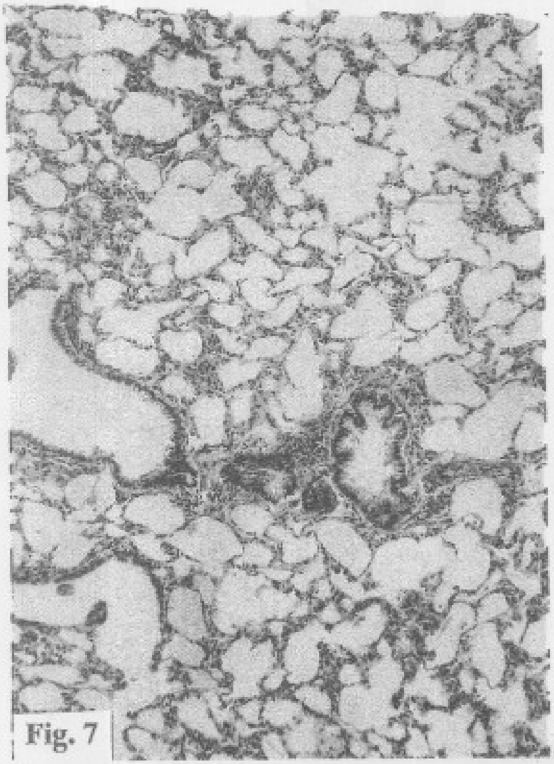

Fig. 7

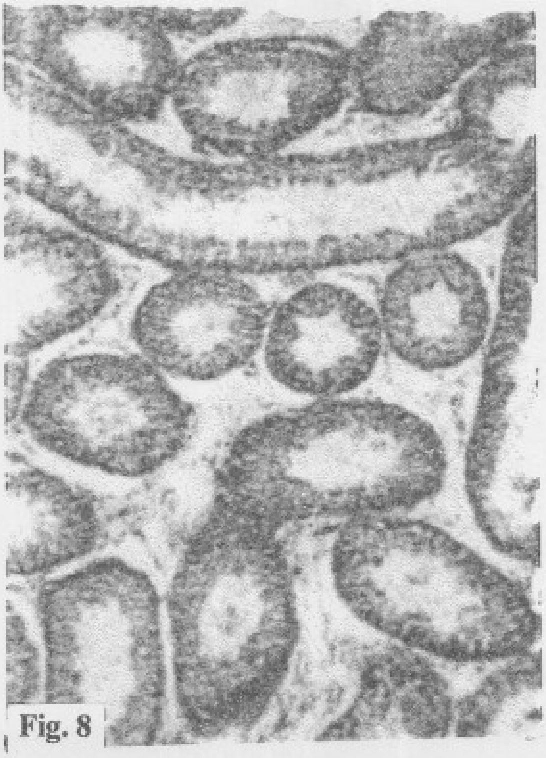

Fig. 8