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# Effect on Sheep Performance of Feeding of Diets including different Levels of dried poultry Waste

# Einfluß der Fütterung mit verschiedenen Anteilen von trockenem Geflügelkot auf die Leistungen beim Schaf

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## 1. Introduktion

The ablility of ruminants to use uric acid in poultry excreta as well as their ability to digest fiber previously degraded in the digestive tract of the birds will make feeding of animals on poultry waste a method for recovering some of the potentially valuable nutrients in this material. In U.S.A. several states have approved legislation allowing for recycling of poultry waste into poultry and cattle diets. The Association of American Food Control Officials reported that the poultry waste may be used as an ingredient in sheep, lamb, beef and dairy cattle, broiler and layer chicken feeds.

Many workers found no differences in the performance of lambs when fed different levels of dried poultry waste or any other protein supplement (Rodrigues 1966 and 1967, Smith and Calvert 1972, Smith and Lindahl 1977, El-Sabban et al. 1970 and Koenig et al. 1978). Smith and Lindahl (1977) stated that cost of gain for lambs fed diet supplemented with dried poultry waste was lower than when alfalfa was used as a supplement.

Carcass characteristics and meat acceptability were not significantly different when feeding of poultry waste as a feed ingredient (El-Sabban et al. 1970, Meregalli et al. 1971 and Smith et al. 1979).

No substantial level of pesticide residues were detected in edible tissue when feeding of caged manure (El-Sabban et al. 1970). Huber (1971) recommended a 5 days withdrawal period in order to minimize the contamination level in the edible tissues. This work was designed in order to emphasize the importance of poultry waste as a protein supplement in a subtropical area „Egypt" for sheep feeding.

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## 2. Experimental Procedure

Four concentrate mixtures including 0, 15, 30 and 45% dried poultry waste (DPW) were formulated (Table 1). The first one was formulated to be typical to the classical feed mixture produced by the Ministry of Agriculture in Egypt. DPW replaced $^1/_3$, $^2/_3$ or all of the cotton seed meal mixture (decorticated cotton seed meal + cotton seed hulls 5 : 4) in mixtures 2, 3 and 4 respectively.

**Table 1: The formula of the four concentrate mixtures in percent**

| Item | Mix. 1 control | Mix. 2 | Mix. 3 | Mix. 4 |
|---|---|---|---|---|
| Dried poultry waste | 0.0 | 15.0 | 30.0 | 45.0 |
| Decort. CSM* | 25.0 | 16.7 | 8.3 | 0.0 |
| Cotton seed hulls | 20.0 | 13.3 | 6.7 | 0.0 |
| Wheat bran | 26.0 | 26.0 | 26.0 | 26.0 |
| Rice bran | 7.0 | 7.0 | 7.0 | 7.0 |
| Yellow corn | 19.0 | 19.0 | 19.0 | 19.0 |
| Salt | 1.0 | 1.0 | 1.0 | 1.0 |
| Lime stone | 2.0 | 2.0 | 2.0 | 2.0 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 |

* Decorticated cotton seed meal

Bean straw was used as a roughage in a roughage/concentrate ratio of $^1/_3$.

**Animals:**

Forty lambs of average six months age were assigned according to their body weights into four groups in order to have an equal average weight per head. Each group represented a treatment and was divided to 2 sub-groups (replicates), 5 animals each. Each replicate was housed in a separate pen.
The daily concentrate mixture offered ranged between 0.7 and 1.25 kg. Bean straw was used as a roughage representing one fourth of the whole intake. The average daily feed offered was calculated to meet the TDN. requirements of the animals according to the standards of the NRC (1975). The animals were weighed at the beginning of the experiment and the weekly before feeding in the morning. The growth trial period lasted for 16 weeks.

**Slaughter tests:**

At the end of the growth trial, four animals from each treatment were selected for slaughter and carcass quality. Dressing percentage was calculated. Samples from the 9th, 10th and 11th ribs were steaked to obtain homogenous samples for analysis. Lean, fat and bone were determined.
A panel test was made using leg meat from each treatment. The tasters recorded their observations for every unknown sample using one of the following grades: very good — good — normal — slightly bad or bad, for taste and oder. The data were statistically analysed.

### 3. Results and Discussion

The feeding value of the roughage/concentrate mixtures used in this study was determined elsewhere; see table 2.

**Table 2: The feeding value of the concentrate mixtures**

| | Mix. 1 | Mix. 2 | Mix. 3 | Mix. 4 |
|---|---|---|---|---|
| TDN | 54.01 | 54.46 | 53.62 | 52.27 |
| Starch value | 43.08 | 44.32 | 44.09 | 43.37 |
| Digestible protein | 12.35 | 12.85 | 13.38 | 12.57 |

The average initial and final live weight of sheep used in this experiment along with the standard error and coefficients of variation are presented in Table 3. The data show that the variability of the weights are approximately similar for different treatments indicating that the differences in final live weight are referred essentially to treatment effect.

**Table 3: Initial and final live weight of lambs along with their standard error and coefficients of variation.**

| Treatment | Initial live weight | * S.E. | ** C.V. | Final live weight kg. | S.E. | C.V. |
|---|---|---|---|---|---|---|
| 1 | 24.85 | 1.08 | 13.73 | 40.69 | 1.47 | 11.42 |
| 2 | 24.68 | 0.98 | 12.55 | 41.84 | 1.34 | 10.12 |
| 3 | 24.60 | 1.11 | 14.26 | 39.04 | 1.73 | 14.00 |
| 4 | 24.78 | 0.97 | 12.37 | 37.85 | 1.36 | 11.35 |

*Standard error
** Coefficient of variation

Animals consuming concentrate mixture including 15% DPW (treatment 2) performed better than those consuming DPW free diet (control). Increasing the level of DPW to 30% or 45% in the concentrate mixture resulted in successive reduction in the average final live weight.

The average weekly weights of the experimental sheep are presented in Table 4. It could be seen that during the first 6 weeks of the experiment, figures varied among the four treatments and returned to similar ones at the end of the **6th** week. This is familiar when feeding different diets to animals, an adaptation period is required. The real effect on growth when feeding such mixtures started during the 7th and 8th weeks. Data of daily gain and feed and protein efficiency are presented in Table 5.

It is obviously clear that the animals of the 15% DPW diet (treatment 2) gained faster than the control (treatment 1). Increasing the DPW in the diet caused a decrease in the daily gain, a highly significant difference ($P < 0.01$) between treatment 2 and 4 was observed.

**Table 4: Average weekly weights of the experimental lambs in kgs.**

| Item | Treatment 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Initial wt. | 24.85 | 24.68 | 24.64 | 24.78 |
| 1 | 26.33 | 27.13 | 27.13 | 26.56 |
| 2 | 28.05 | 27.72 | 26.20 | 25.38 |
| 3 | 29.49 | 28.19 | 27.53 | 27.76 |
| 4 | 30.29 | 29.07 | 28.98 | 28.26 |
| 5 | 32.47 | 30.13 | 29.56 | 29.82 |
| 6 | 31.00 | 31.11 | 30.81 | 30.58 |
| 7 | 31.36 | 31.82 | 32.36 | 31.84 |
| 8 | 33.74 | 33.46 | 33.47 | 32.23 |
| 9 | 34.22 | 35.12 | 34.35 | 33.78 |
| 10 | 35.50 | 36.08 | 35.38 | 33.71 |
| 11 | 37.02 | 37.84 | 36.60 | 35.34 |
| 12 | 37.56 | 38.72 | 36.27 | 36.17 |
| 13 | 38.46 | 39.36 | 37.70 | 36.25 |
| 14 | 40.15 | 40.17 | 38.36 | 37.03 |
| 15 | 40.14 | 40.52 | 38.91 | 37.19 |
| 16 | 40.69 | 41.83 | 39.04 | 37.85 |

**Table 5: Average daily gain and feed and protein efficiency**

| Treatment | Av. daily gain/ head gm | Av. concen- trate fed/head gm | Feed efficiency gain/conc. fed | Dig. protein intake from roughage concen. | Protein efficiency gain/dig. protein |
|---|---|---|---|---|---|
| 1 | 141 ab | 1116 | 0.13 b | 184 | 0.77 ab |
| 2 | 153 a | 1116 | 0.14 a | 191 | 0.80 a |
| 3 | 129 cb | 1116 | 0.12 bc | 199 | 0.65 c |
| 4 | 117 cd | 1116 | 0.10 d | 187 | 0.63 cd |

Figures within the same row bearing different letters are significantly different ($P < 0.05$)

No significant difference was observed between the control and treatment 3 of the 30% DPW diet. When the DPW was increased from 15% up to 30% of the concentrate mixture the average daily gain dropped significantly ($P < 0.05$). The depression in gain occurred again with increasing DPW level from 30% to 45% of the concentrate mixture, but the decrease was not significant.

**Effect on feed and protein efficiency:**

Treatment 2 containing 15% DPW has the best feed efficiency among all treatments ($P < 0.01$). that the 15% DPW diet gives better results than the control diet (DPW free diet) is questionable. Perhaps the so called "unidentified growth factor" is responsible.

Digestible protein intake varied within a narrow range. This intake represented more than twice the requirements of the lamb. The limiting factor of formulating such high protein diets was the control one which was formulated to be typical to the classical feed mixture produced by the Ministry of Agriculture in Egypt.
Concerning protein efficiency, a highly significant difference ($P < 0.01$) was found between treatment 2 (15% DPW) and the other treatments containing DPW (3 and 4). The difference between treatment 1 and 2 was not significant while it was highly significant between treatment 1 and 4.
Summurizing the data of daily gain and feed and protein efficiency, the superiority of the experimental diets could be as follows:
1-Treatment 2 including 15% DPW.
2-Treatment 1 (control), DPW free diet.
3-Treatment 3 including 30% DPW.
4-Treatment 4 including 45% DPW.
It could be concluded that DPW was successively included in sheep diets with an optimum percent inclusion of 15%. This resulted in an improvement in the performance of the animals and feed and protein efficiency. On the other side, the inclusion of DPW in diets will lower the feed cost and enlarge the quantity produced without affecting its feeding value percent.

**Effect on carcass traits:**

It is clear from Table 6 that dressing percentage was the highest with the control lowest with treatment 4 and medium for treatment 2 and 3; differences are not significant. Bone weight in all treatments was almost similar but when it is computed as a percent of carcass, it showed a successive not significant increase with increasing DPW level in the diet. This could not be explained as a result of the increase in ash content of the DPW diets because the absolute figures of bones are approximately similar in all treatments. It might be attributed to the decrease in lean and fat content with increasing DPW levels.

**Table 6: Carcass traits of the different treatments**

| Item | | Treatment 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Slaughter wt. | kg | 43.75 ± 0.89 | 42.45 ± 1.75 | 39.80 ± 2.27 | 39.47 ± 0.97 |
| carcass wt | kg | 25.61 ± 1.03 | 22.68 ± 1.39 | 22.04 ± 1.37 | 19.86 ± 0.65 |
| Tail fat wt. | kg | 3.37 ± 0.39 | 2.54 ± 0.29 | 2.77 ± 0.39 | 2.52 ± 0.41 |
| Lean + fat | kg | 18.26 ± 0.73 | 16.08 ± 0.95 | 15.37 ± 1.01 | 13.54 ± 0.22 |
| Dressing % | | 58.53 ± 4.05 | 53.42 ± 2.47 | 55.37 ± 3.33 | 50.31 ± 1.92 |
| Lean | kg | 11.93 ± 0.87 | 10.71 ± 0.46 | 10.40 ± 0.81 | 9.55 ± 0.27 |
| Fat | kg | 6.33 ± 0.69 | 5.37 ± 0.76 | 4.97 ± 0.66 | 3.99 ± 0.33 |
| Bone | kg | 3.98 ± 0.08 | 4.06 ± 0.12 | 3.90 ± 0.08 | 3.80 ± 0.22 |
| Lean % of carcass | | 46.58 ± 1.94 | 47.22 ± 2.07 | 47.19 ± 1.96 | 48.09 ± 2.96 |
| Fat % of carcass | | 24.72 ± 2.63 | 23.68 ± 2.07 | 22.04 ± 1.97 | 20.09 ± 0.79 |
| Bone % of carcass | | 15.54 ± 0.70 | 17.90 ± 0.00 | 17.69 ± 1.64 | 19.13 ± 0.64 |
| Tail fat % of carcass | | 13.16 ± 1.32 | 11.20 ± 0.88 | 12.57 ± 1.17 | 12.69 ± 0.41 |

It is an interesting to notice that lean % of the carcass has an approximately constant figure in all treatments. Fat figure is the highest in the control and decreasing with increasing DPW level. This may be due to the low efficiency of feeds containing DPW.

**Panel test for meat acceptability:**

No significant difference was found among treatments for taste and oder, treamtment 2 has the best taste and oder among all treamtments.

**Effect on animal health:**

Incorporating DPW in the diets was made after solar drying of waste without any further treatment (thermally or chemically). The experimental animals were under sanitary observation. Animals appeared healthy, appetite, urination and defecation were normal. The process of digestion seemed to be optimum without any digestive troubles such as impaction or diarrhea. No mortality happened during the experimental period. No dropping in wool occured in any of the treatments.

## 4. Summary

Four concentrate mixtures having practically similar feeding value and including 0, 15, 30 or 45% dried poultry waste (DPW) were formulated. Forty growing sheep were assigned into 4 equal groups, each group was fed on one of the mixtures in a roughage concentrate ratio of 1 : 3.
The average daily gain was 141, 153, 129 and 117 gm. respectively for the mentioned levels. Feed efficiency figures were 0.13, 0.14, 0.12 and 0.10 while for protein efficiency were 0.77, 0.80, 0.65 and 0.63 for the four levels respectively. Differences between level 2 and the other levels was significant ($P < 0.01$) for feed efficiency while it was significant ($P < 0.01$) between treatment 2 and the other treatments including DPW (3 and 4) for protein efficiency.
Dressing percent decreased with increasing DPW level but the differences were not significant. Figures for lean percent were almost similar while bone percent increased with increasing DPW level.
No significant difference was detected among treatments for taste or oder. Meat produced from the level of 15% DPW has the best acceptability. Animals appeared healthy; the process of digestion seemed to be optimum. No mortality happened. No dropping in wool occurred.

## Zusammenfassung

Einfluß der Fütterung mit verschiedenen Anteilen von trockenem Geflügelkot auf die Leistungen beim Schaf

Der Einfluß von vier Futterrationen mit verschiedenen Anteilen von trockenem Geflügelkot (TGK; 0, 15%, 30% bzw. 45%) auf die Leistungen beim Schaf wurde untersucht. Die durchschnittliche tägliche Zunahme war bei den vier Behandlungen 141, 153, 129 bzw. 117 g. Die Tiere der 2. Behandlung mit 15% TGK nahmen

signifikant schneller als der 1. Behandlung (Kontrollgruppe) zu. Eine Erhöhung des Anteils an TGK in der Ration verminderte das Wachstum der Tiere. Die Tiere der 2. Behandlung waren significant besser als der anderen Behandlungen bezüglich der Futterverwertung und als der 3. und 4. Behandlung bezüglich der Proteinverwertung. Mit Erhöhung des Anteils an TGK in der Ration verschlechterte sich die Schlachtausbeute, auch wenn die Differenzen nicht signifikant sind. Bei den untersuchten Kriterien bezüglich der Fleischqualität, dem Gesundheitszustand und der Mortalität zeigten die Behandlungen keine Unterschiede.

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