January 1997

# Effect of Dried Poultry Waste on Performance of Finishing Yearling Steers

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Feeding dried poultry waste is an effective means of supplementing dry-rolled corn finishing diets by providing a portion of the dietary degradable protein and minerals necessary to meet animal requirements.

**Summary**

*Two trials evaluated dried poultry waste (DPW) as a source of rumen degradable protein for finishing steers. In Trial 1, diets were supplemented with DPW or urea to provide equal amounts of degradable protein. In Trial 2, dietary DPW inclusion was based on its mineral content rather than its degradable protein contribution. In both trials, high levels of dietary DPW diminished ADG and feed efficiency. However, animal performance obtained with lower levels of DPW did not differ from urea or control treatments. Results indicate DPW is an effective means of supplementing both rumen degradable protein and minerals in finishing diets.*

## Introduction

Dry-rolled corn finishing diets can be deficient in ruminally degradable

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intake protein (DIP), limiting synthesis and growth of rumen bacteria, and diminishing both carbohydrate fermentation and microbial protein flow to the small intestine. Although the protein in corn is known to be extensively digested in the total digestive tract, approximately 60 percent of the CP in dry-rolled corn escapes ruminal degradation in finishing diets. These diets should be supplemented with a source of ruminally available nitrogen, thereby enhancing microbial activity, DM digestibility, and consequently, animal performance.

Supplementation of finishing diets with DIP can be achieved with non-protein nitrogen. Urea provides ruminally available ammonia for microbial protein synthesis, and constitutes an economical alternative to sources of natural protein. Dried poultry waste (DPW) contains uric acid which can serve as a source of ammonia in a manner similar to urea. Although DPW (4.5% N) is lower in CP than urea (46% N), research indicates that it is a viable alternative to urea for DIP supplementation (1996 Nebraska Beef Report, pp. 31-33).

The objectives of this research were to evaluate DPW as a source of DIP and minerals for finishing cattle, and assess how dietary levels of DPW influence dry matter intake and performance.

## Procedure

*Trial 1*

One hundred sixty yearling steers (725 lb) were used to evaluate DPW as a source of DIP relative to urea in a 155-day finishing trial. Cattle were adapted to grain in 21 days using common adaptation diets containing 7.2% of the DM as DPW. Adaptation diets contained 45, 35, 25, and 15% roughage (DM basis) and were fed for 3, 4, 7, and 7 days, respectively. Following the grain adaptation period, steers were blocked by weight and assigned randomly to one of five treatments in a 2 x 2 plus 1 factorial treatment arrangement. Four pens were used for each treatment, each containing eight steers. Dietary DIP levels varied with additions of urea or DPW to a control diet that contained no supplemental DIP. Treatments consisted of: 1) Control 3.7% DIP, 2) Urea 6.5% DIP, 3) Urea 7.8% DIP, 4) DPW 6.5% DIP, and 5) DPW 7.8% DIP. The DIP requirement was estimated to be about 6.8 percent of diet dry matter. The 6.5 percent level was designed to be below the requirement and the 7.8 percent level was designed to be somewhat in excess of the requirement.

Diet DM consisted of 7.5 percent roughage (50% alfalfa hay, 50% corn silage), and 65 to 75 percent dry-rolled corn depending on DPW inclusion (Table 1). All diets contained 25 g/ton Rumensin, 10 g/ton Tylan, supplemental vitamins A, D, and E, and trace minerals. Dietary CP ranged from 8.0 percent (control) to 12.0 percent (7.8% DIP treatments). Control and urea diets were balanced to provide a minimum of .7% Ca, .35% P, and .7% K. To provide an equal level of supplemental DIP, these mineral levels were exceeded in both the DPW, 6.5% DIP (1.1% Ca, .5% P, .75% K) and DPW, 7.8% DIP (1.5% Ca, .5% P, .85% K) treatments.

*Trial 2*

One hundred eighty yearling steers (758 lb) were used in this 115-day fin-

**Table 1. Composition of diets fed in Trials 1 and 2 (% DM basis).**

| | Treatment | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Trial 1 | | | | | Trial 2 | | |
| Item | Control | Urea 6.5% DIP[b] | Urea 7.8% DIP | DPW[a] 6.5% DIP | DPW 7.8% DIP | 0% DPW | DPW 3.5% of DM | DPW 7% of DM |
| Dry-rolled corn | 74.9 | 73.9 | 72.9 | 69.2 | 64.6 | 73.0 | 73.0 | 73.0 |
| Corn silage | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | — | — | — |
| Alfalfa hay | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | — | — | — |
| Alfalfa haylage | — | — | — | — | — | 10.0 | 10.0 | 10.0 |
| Molasses | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 5.0 | 5.0 | 5.0 |
| DPW[a] | — | — | — | 9.7 | 14.3 | — | 3.5 | 7.0 |
| Urea | — | 1.0 | 1.4 | — | — | .5 | .2 | — |
| Wheat middlings | — | — | — | — | — | 7.8 | 5.6 | 2.7 |
| Limestone | 1.4 | 1.3 | 1.3 | — | — | 1.3 | .4 | — |
| Potassium chloride | .3 | .3 | .3 | — | — | — | — | — |
| Dicalcium phosphate | .2 | .2 | .2 | — | — | — | — | — |
| Salt | .2 | .2 | .2 | — | — | .3 | .2 | .2 |
| Tallow | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 2.0 | 2.0 | 2.0 |
| Supplement[c] | 2.9 | 3.0 | 3.6 | 1.0 | 1.0 | .1 | .1 | .1 |

[a]Dried poultry waste; 30% CP, 9.6% Ca, 2.3% P, 2.5% K, and .63% Na.
[b]Ruminally degradable intake protein.
[c]Contained vitamins, trace minerals, Rumensin 80, and Tylan blended with finely ground corn (Trial 1), or pelleted with wheat middlings (Trial 2).

**Table 2. Effect of dried poultry waste and urea supplementation on performance of finishing steers.**

| | Treatment | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Trial 1 | | | | | Trial 2 | | |
| Item | Control | Urea 6.5% DIP[b] | Urea 7.8% DIP | DPW[a] 6.5% DIP | DPW 7.8% DIP | 0% DPW | DPW 3.5% of DM | DPW 7% of DM |
| Intake (DM) | 25.40 | 25.22 | 25.73 | 24.86 | 24.81 | 28.57[c] | 28.56[c] | 27.43[d] |
| ADG | 3.59[cd] | 3.72[cd] | 3.80[c] | 3.57[d] | 3.32[e] | 4.40[c] | 4.33[c] | 4.02[d] |
| Feed/gain[f] | 7.07[c] | 6.78[c] | 6.77[c] | 6.96[c] | 7.47[d] | 6.49[c] | 6.59[cd] | 6.82[d] |

[a]Dried poultry waste.
[b]Ruminally degradable intake protein.
[c,d,e]Means with unlike superscript within a trial and row differ ($P < .10$).
[f]Analyzed as gain to feed, the reciprocal of feed to gain.

ishing trial. Steers were blocked by weight and assigned randomly, within block, to treatments consisting of 0, 3.5, or 7% DPW (% of diet DM). Six pens provided the mean for each treatment with ten animals per pen. Animals were adapted to grain by the same means used in Trial 1, with the exception that DPW was not included in the adaptation diets. Diets contained (DM basis) 73% dry-rolled corn, 10% alfalfa haylage, and 10% pelleted supplement containing the DPW (Table 1). Wheat middlings were replaced by DPW in the supplement to obtain the desired dietary levels. Diets were balanced to provide 6.9% DIP (12.0% CP), .7% Ca, .35% P, and .7% K, based on contributions from DPW. Urea, limestone, salt, and trace minerals were replaced by nutrients in DPW as dietary levels increased from 0 to 3.5 and 7 percent. In Trial 2, DPW inclusion was based on meeting requirements for both DIP and minerals without contributing excessive ash. Therefore, lower dietary DPW levels were used than in Trial 1, wherein DPW was incorporated to obtain a specific DIP level and provided an excess of Ca, P, and K.

In both Trials 1 and 2, steers were implanted initially with Revalor. Initial weights were the average of two weights obtained on consecutive days before feeding. Final weights were based on hot carcass weights divided by a common 62% dressing percentage. Liver abscess scores and hot carcass weights were taken at slaughter, whereas fat thicknesses at the 12th rib, quality grades, and yield grades were recorded following a 48-hour chill.

## Results

In Trial 1, dry matter intake was not significantly different among treatments. However, sorting of the DPW was apparent at the 7.8 percent level of DIP indicating lower diet palatability at high inclusion rates. Cattle assigned to the DPW 7.8 percent DIP treatment exhibited lower ADG ($P < .10$) than those consuming the other four diets (Table 2). However, steers fed the DPW 6.5 percent DIP diet gained similarly to steers fed urea at the same level of DIP. Feed efficiency exhibited by the DPW 7.8 percent DIP treatment was significantly lower than both the control diet and other treatments containing supplemental DIP.

The diminished feed efficiency and ADG associated with the DPW 7.8 percent DIP diet may have resulted from the high level of dietary minerals, especially Ca, contributed by the amount of DPW necessary to reach this level of DIP. Dried poultry waste comprised 14 percent of the diet DM in this treatment, substantially lowering the concentration of dry-rolled corn. Depressed performance may have been due to lower diet $NE_g$ rather than an inability of DPW to sufficiently provide DIP.

In Trial 2, both ADG and dry matter intake were lower when DPW made up 7 percent of the diet DM (Table 2). However, the 3.5 percent DPW treatment was not different than the urea control for either measure ($P > .10$). Feed efficiency was lower at the 7 percent DPW level relative to the control, although the urea control did not differ from the 3.5 percent DPW treatment. Supplements containing DPW were pelleted in this trial to reduce the tendency for sorting that was exhibited in Trial 1. However, orts collected from pens assigned to the 7 percent DPW treatment appeared to have a higher proportion of pellets than was present in the initial diet. Because the pellets were the primary source of dietary DIP, performance of cattle receiving the 7 percent DPW treatment may have been limited by the actual amount of DIP consumed.

Measures of carcass quality, yield, fat depth, and liver abscesses were not negatively influenced by DPW in either of the two trials.

These studies indicate that DPW can be an effective source of both ruminally degraded protein and minerals when included at low levels in dry-rolled corn finishing diets. Supplementing high concentrate diets with DPW to enhance ruminal ammonia concentration may also eliminate the need for some macro-mineral supplementation. When fed at excessive levels, DPW may cause a nutrient imbalance by replacing energy with minerals, diminishing performance and decreasing palatability.

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