



DPI-MA-P-0705BR-PU

Micro-Aid® Benefits Gastrointestinal Tract Health to Improve Animal Performance¹

Introduction

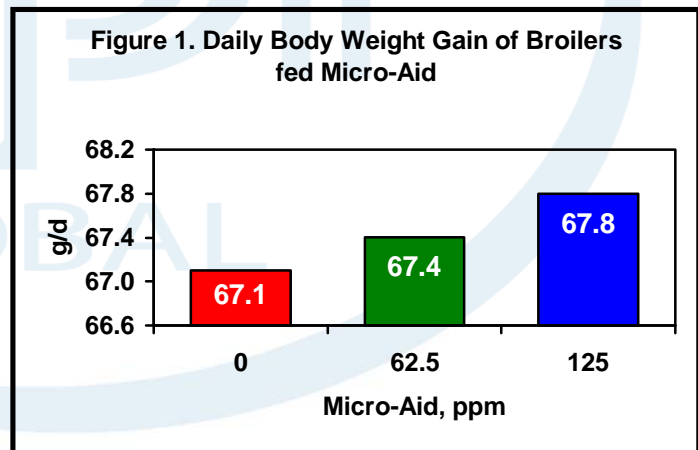
The environmental and performance benefits of Micro-Aid® Feed Grade Concentrate start within the animal by promotion of a healthier gastrointestinal tract environment, which improves the efficiency of dietary nutrient utilization and results in better animal performance. As well, better nutrient utilization means fewer nutrients are excreted into the environment where they can volatilize into ammonia or other noxious gases. The objective of this experiment was to use the broiler as a model for further evaluation of the effects of Micro-Aid® on performance and gastrointestinal tract health.

Materials and Methods

To accomplish the experimental objective, 960 1-day-old commercial broilers (Ross 308) were selected based on normal weight range and divided into three groups with eight replicates of 40 birds each. The groups were then allotted to three dietary treatments: 1) Control; 2) Control + Micro-Aid® at 62.5 ppm; and 3) Control + Micro-Aid® at 125 ppm. The Control diet was a corn-soybean meal based diet that also contained 4% porcine meat-bone meal, 4% distillers dried grains with solubles, and phytase, but no coccidiostat. Birds were allowed ad libitum access to feed during the three dietary phases: starter (0 to 14 days of age), grower (14 to 28 days of age), and finisher (28 to 42 days of age).

Birds were placed in floor pens to 42 days of age on “used” litter in an effort to stimulate a health challenge. Daily weight gain, feed consumption, and feed conversion (feed:gain) were determined for each dietary phase, as well as the overall 42 day period. Mortalities were recorded daily and values presented were adjusted accordingly. At the conclusion of the 42-day growing period, birds were euthanized individually with CO₂ and *pectoralis major* (*P. major*) yield was determined on eight birds per pen. Additionally, mid-jejenum intestinal tissue was fixed for histological examination and intestinal proliferation rate by immunocytochemical method using bromodeoxyuridine (BrDU).

Figure 1. Daily Body Weight Gain of Broilers fed Micro-Aid



¹ This experiment was conducted by Dr. T. J. Applegate at Purdue University, West Lafayette, IN, USA.



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Results and Discussion

Figures 1 thru 4 demonstrate that both feeding levels of Micro-Aid[®] proved beneficial to broiler performance. As previously mentioned in the Materials and Methods, birds were housed on “used” litter in an effort to stimulate a health challenge; however, the excellent performance of the Control birds would indicate that this did not occur. Even so, feeding Micro-Aid[®] at 62.5 and 125 ppm increased daily weight gain by 0.4 and 1.0%, respectively, compared with the Control group. Additionally, both feeding levels of Micro-Aid[®] reduced the incidence of mortality between 34 to 59%, while the higher level of supplemental Micro-Aid[®] also improved feed efficiency by 0.6%. It is remarkable to see any improvement in performance considering the excellent growth rate and feed conversion efficiency of the Control birds that were performing near their genetic potential. Furthermore, at a time when feed cost continues to escalate to unprecedented highs, improvements in performance like those seen with Micro-Aid[®] have even greater value to the producer. Of special interest is the fact that both feeding levels of Micro-Aid[®] improved *P. major* muscle yield by 3.0% in contrast to the Control birds (Figure 4), which is consistent with results from other Micro-Aid[®] studies. Using Georgia f.o.b. dock price for skinless, boneless breasts (\$1.195) at the time of experiment completion, the improvement in *P. major* yield due to Micro-Aid[®] makes those birds \$0.03 to \$0.04 more valuable than those not fed Micro-Aid[®] (Table 1). For a producer with a broiler house containing one million birds, this represents an additional \$30,000 to \$40,000 of income.

Figure 2. Feed Conversion Ratio (Feed:Gain) of Broilers fed Micro-Aid

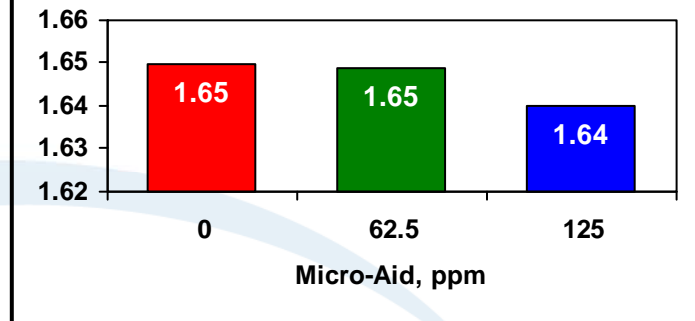


Figure 3. Mortality of Broilers fed Micro-Aid

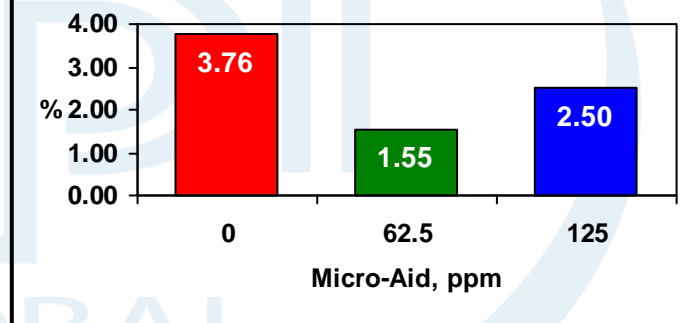
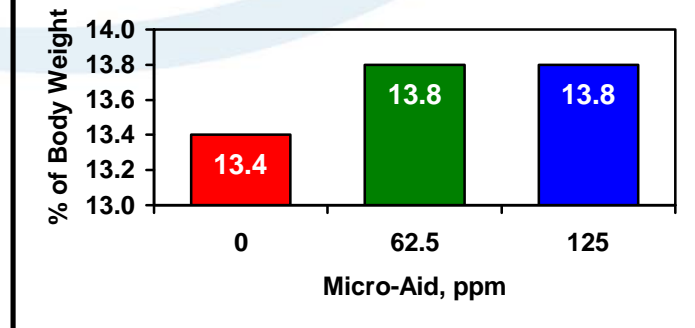


Figure 4. Pectoralis Major Muscle Yield of Broilers fed Micro-Aid



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Item	Micro-Aid [®] , ppm		
	0	62.5	125
Final body weight, lb	6.30	6.32	6.36
<i>P. major</i> weight, % of BW	13.4	13.8	13.8
<i>P. major</i> weight, lb	0.84	0.87	0.88
Georgia dock price for skinless boneless breasts, <i>P. major</i> value, \$/bird	\$1.195	\$1.195	\$1.195
	\$1.01	\$1.04	\$1.05

The performance benefits elicited by Micro-Aid[®] in the current experiment, as well as those observed in numerous other studies are attributed to the beneficial effect Micro-Aid[®] has on gastrointestinal tract health. Previous Micro-Aid[®] research reports a reduction in intestinal ammonia, which can damage absorptive tissue. However, data in Table 2 indicate that Micro-Aid[®] increased absorptive tissue area as evidenced by the greater villus height and crypt depth of those birds fed Micro-Aid[®] vs. those in the Control group. This greater absorptive tissue area is visualized in Figure 5, which depicts histological slides of jejunal sections collected from the three treatment groups. Also of importance is the fact that absorptive tissue turnover was reduced by almost 1.5 days. Slowing tissue turnover time will reduce maintenance cost and spare nutrients for other metabolic processes (e.g., protein accretion of *P. major* muscle). Both greater absorptive tissue area and reduced tissue turnover time would support improved dietary nutrient utilization and allow for better broiler performance as was the case with the increased daily weight gain and *P. major* yield of those birds fed Micro-Aid[®].

Item	Micro-Aid [®] , ppm		
	0	62.5	125
Villus height, $\mu\text{m}/\text{villi}^{\text{a}}$	892	933	950
Crypt depth, $\mu\text{m}/\text{villi}^{\text{a}}$	148	152	147
Goblet cells, $\#/\text{villi}^{\text{b}}$	125	128	148
Turnover time, days ^c	6.5	8.0	7.9

^a $\mu\text{m}/\text{villi}$ = micrometers per villi.
^bGoblet cells are epithelial cells whose function is to secrete mucus.
^cTurnover time was calculated from: $((\text{villus height} + \text{crypt depth}) / \text{cell migration rate})$.



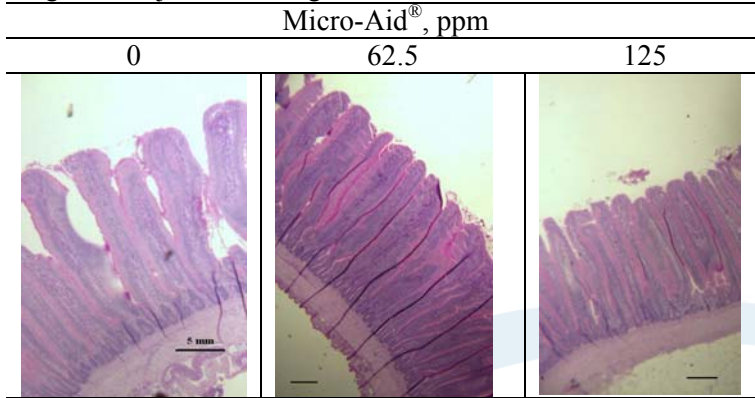
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Figure 5. Jejunal Staining of Broilers Fed Micro-Aid®



^aBar represents 5 mm with 4X objective lens

Conclusions

- Supplementation of Micro-Aid® Feed Grade Concentrate at both 62.5 and 125 ppm improved broiler growth, feed efficiency, and mortality compared with the Control diet, with 125 ppm of Micro-Aid® generating the greatest response. At a time when feed cost continues to escalate to unprecedented highs, improvements in performance like those seen with Micro-Aid® have even greater value to the producer.
- Feeding Micro-Aid® at either 62.5 or 125 ppm improved *P. major* muscle yield by 3.0% in contrast to the Control birds. Using Georgia f.o.b. dock price for skinless boneless breasts (\$1.195) at the time of experiment completion, the improvement in *P. major* yield due to Micro-Aid® makes those birds \$0.03 to 0.04 more valuable than those not fed Micro-Aid®.
- An increase in absorptive tissue area (i.e., increased villus height and crypt depth), as well as a reduction in tissue turnover time due to Micro-Aid® indicate an improvement in gastrointestinal tract health of broilers and supports improved dietary nutrient utilization and animal performance.



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