

Technical Bulletin #32

— FEEDING TRIAL PERFORMANCE REPORT —

SUMMARY: A research trial was conducted in April, 1999 by Dr. Ji at Agriculture University of China to examine the digestive enzyme activity and intestinal morphology of nursery pigs receiving various proteins (fishmeal, DPS and plasma). There was no significant difference in enzyme activity among various proteins. DPS and plasma did stimulate villus growth and crypt cell development of nursery pigs.

MATERIALS AND METHODS: Six different treatments were used:

Control Diet — 6.0% fishmeal Treatment 2 — 2.5% DPS 50RD Treatment 4 — 2.5% AP 950 + 2.5% DPS 50RD
Treatment 1 — 3.5% plasma (AP 950) Treatment 3 — 3.5% DPS 50RD Treatment 5 — 5.0% DPS 30

All diets were equal in protein and key amino acids. Substitution was made by replacing some fishmeal with DPS or AP 950. Ninety crossbred pigs weaned at 26 to 29 days of age were used. Pigs were housed 5 pigs per pen and 3 pens per treatment.

After 14 days of testing 1 pig from each pen, or 3 pigs per treatment, were sacrificed. Stomach and duodenum samples were collected and tested for enzyme activity. Intestine samples were taken from the middle 10 mm of the duodenum, jejunum and ileum. The intestinal morphology (villus height and crypt depth) was determined by microscope. The remainder of the pigs stayed on test for an additional 21 days. The growth performance was measured and is discussed in Technical Bulletin # 31.

RESULTS AND DISCUSSION: Enzyme Activity. The activity of enzyme per unit of mucous membrane had a low correlation to growth performance. There was a trend for higher levels of digestive enzymes in pigs fed DPS or AP 950. Enzyme levels are shown in Table 1. None of the differences were of a significant nature (P<.05).

TABLE 1. Effect of fishmeal, plasma protein and DPS on enzyme activity of weaned piglets.

Treatment	Control	Treatment 1	Treatment 2	Treatment 3	Treatment 4	Treatment 5
Pepsin (PE/g)	857	902	853	899	790	949
Lipase (U/g)	447	1,147	1,473	1,317	635	1,328
Amylopsin (U/g)	6,110	14,681	17,509	14,808	11,125	11,175
Trypsin (U/g)	362	342	342	378	345	301
Chymotrypsin (U/g)	2.07	1.73	1.23	1.87	2.83	3.23

Intestinal Morphology. AP 950, DPS 50RD and DPS 30 improved the intestinal development of the pigs. Compared to the control diet, AP 950 and DPS significantly increased the VH/CD of duodenum and VH of the ileum. There was also a trend for AP 950 and DPS to increase VH of duodenum and decrease CD of jejunum. All measurements are shown in Table 2. Analysis indicates a high correlation existed between growth performance and intestinal morphology. This indicates that AP 950, DPS 50RD and DPS 30 could improve digestion and absorption of nutrients, and then improve growth performance and decrease diarrhea index. Under an electron microscope the villus of the control group are atrophied and flat, while the villus of Treatment 3 (3.5% DPS 50RD) have a clear outline and are sticking out.

TABLE 2. Effect of fishmeal, plasma protein and DPS on intestinal morphology of weaned pigs.

Treatment	Control	Treatment 1	Treatment 2	Treatment 3	Treatment 4	Treatment 5
Duodenum VH	267.3	275.6	273.5	322.1	309.9	349.4
Duodenum CD	182.3	140.0	158.0	127.6	167.1	142.8
Duodenum VH/CD	1.47b	1.98ab	1.81ab	2.54a	1.90ab	2.45a
Jejunum VH	391.9ab	276.5c	349.4abc	422.3a	306.9bc	440.6a
Jejunum CD	164.0	133.7	121.5	124.6	127.6	142.8
Jejunum VH/CD	2.43	2.11	2.91	3.40	2.44	3.10
Ileum VH	133.7c	227.9ab	179.3bc	282.6a	112.4c	224.8ab
Ileum CD	112.3ab	127.6a	124.6a	136.7a	72.9b	115.5a
Ileum	1.22	1.84	1.48	2.07	1.57	1.95

Treatments without common superscripts (a,b,c) differ P<.05. VH=villus height, CD=crypt depth

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