PELLETING SORGHUM DIETS ON PERFORMANCE AND SHRINK OF SWINE

by

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CHAPTER I

INTRODUCTION

Feed represents 60-80% of the cost of producing pork. Feed processing has been shown to improve feed efficiency and to reduce feed costs. Dinusson *et al*. (1956) with barley, Seerley *et al*. (1962) with oats and Jensen (1966) with corn have all shown varied improved efficiency from pelleting. Additional information is needed on the value of pelleting sorghum-soybean meal rations for swine to determine the potential for this process to improve the utilization of sorghum diets. The objectives of this experiment were to study meal *vs* pelleted form of sorghum-soybean meal diets for growing-finishing swine and to investigate the effects of diet and sex on shrink at time of marketing.

CHAPTER II

LITERATURE REVIEW

Schneider and Burgman (1950) fed pigs free-choice from 45.4 kg to market weight on an identical ration in mash and pellet form. Pigs on the pelleted and meal rations gained .76 kg and 70 kg per head per day and required 4.66 and 6.26 kg of feed per kg of gain, respectively.

Thomas and Flower (1953) showed that pigs fed pelleted rations required an average of .236 kg less feed per kg gain, gained .05 kg more per day, and reached market weight 12 days sooner than pigs fed the same ration in a meal form. In 1953, Thomas and Flower showed a greater ($P<.05$) average daily gain for pellet-fed pigs as compared to meal-fed pigs. The average amount of feed required per kg gain was 3.45 kg for the pellet-fed pigs and 4.13 kg for those fed the meal. Pigs fed the pelleted ration reached market weight 14 days sooner than pigs fed the meal ration.

Steffen (1953) reported an experiment at Utah State Agricultural College in which 36.3 kg pigs were fed rations in meal and pellet form. Gains of .76 kg per day were made by pigs on the meal while those fed pellets had average gains of .81 kg with the latter pigs requiring nearly 10% less feed/gain.

Dinusson *et al*. (1956) stated that their experiments have shown a 12 to 15% increase in daily gains and 14 to 20% increase in feed efficiency as a result of pelleting barley rations for swine.

A summary by Dinusson and Bolin (1958) showed that pigs receiving pelleted rations gained 11.8% faster on 9.8% less feed over those

fed the same rations in meal form. Crumbling or pelleting three times had no advantage over a single pelleting as measured by rate of gain and feed efficiency of pigs. Pelleting and regrinding a ration before feeding in meal form did not appreciably improve rate of gain nor feed efficiency.

The results of 10 experiments were summarized by Conrad (1959), in which a barley ration was compared in meal and pelleted form. Pelleting of rations containing barley increased pig gains 14% and resulted in a 15% feed savings. Larsen and Oldfield (1960) reported that pelleting did not improve corn rations for pigs. Pigs fed pelleted rations gained weight more rapidly and had an improved ($P<.05$) efficiency of feed conversion over those fed barley meal.

The effects of hull and fiber on gain and efficiency of swine were reported by Dinusson _et al_. (1960). Pigs on pelleted rations will eat more per day on lower digestible energy rations and gain similarly to those on higher energy rations. In experiments with rations varying in fiber content from 6 to 13%, pelleting of rations increased gains by 10% and reduced feed required per kg of gain by 22% for growing fattening hogs. On pelleted rations for swine, for each percentage unit increase in crude fiber between 5 and 13%, there was an increase of 0.16 kg of feed needed per kg of gain.

Gorrill _et al_. (1960) found that pigs fed pelleted feed gained faster and had better feed efficiency than those fed meal feed. Pelleting increased dry matter and energy digestibility.

Three experiments were conducted by Seerley et al. (1962a) to study the effect of pelleting swine rations on rate of gain, feed intake, feed efficiency, energy digestibility and nitrogen digestibility. He showed that pelleting the high-corn rations significantly improved rate of gain and feed efficiency when feed intake was equalized between meal and pellet rations. Trends were the same for the 20% and 40% oat rations, but the differences were not statistically significant. Also, pelleting significantly improved daily gains and feed efficiency when the three test rations were equally and ad libitum fed to paired pigs. In both the equal and ad libitum feeding, the apparent energy digestibility of the high-corn pelleted rations was significantly greater than for the meal form of the same ration. On an equal feed intake, the apparent energy digestibility of the 40% oat diet in meal and pelleted form was not significantly different; however, digestibility of the meal form was significantly improved when fed ad libitum. Apparent nitrogen digestibility was the same for the high-corn and 40% oat rations in either meal or pellet forms.

Laird and Robertson (1963) conducted an experiment testing meal, cubes, and cubes reground to meal for diets of growing-finishing swine. Pigs fed on cubes had significantly higher growth rates (7.1%) than those fed on meal. Feed conversion was significantly lower ($P<.001$) for cube-fed pigs, with a feed saving of 5.1% for the complete fattening period.

For growing pigs fed corn-soybean meal diets, Jensen (1966) concluded that the average daily gain was not affected by form of ration

fed, but pelleting decreased feed intake by 9.4% and increased gain per kg of feed by 9.6%. For the finishing pigs, the rate of gain was increased 6.4%, feed intake decreased 3.3% and gain per kg of feed increased 10% when the rations were fed in pellet form. Jensen also reported that individually fed pigs on milo-soybean meal rations consumed 8.5% less feed per day but gained 6.4% more weight per unit of feed when in pellet as compared to meal form. Finishing pigs, whether full or limit fed, responded more to pelleting than did the growing pig.

Nine experimental stations (North Central Regional Committee - 42, USDA, 1969) participated in a cooperative experiment. The main comparisons were origin of diet (central vs. locally mixed), form of diet (meal vs. pellet), and level of antibiotic supplementation (44 mg vs. 110 mg/kg of diet). Analysis of variance based on pen means demonstrated that none of the treatments significantly affected daily gain. Pelleting and feeding of diets containing the higher level of antibiotic resulted in very small but significant improvements in gain/feed ratio.

Studies by Hanke _et al_. (1972) on the effect of pelleting on the utilization of a corn-raw soybean diet were conducted. Pelleting of the diets resulted in a slight increase in daily gain compared with that obtained when the diets were fed in meal form, and gain/feed was also improved significantly. There was no indication that pelleting of the diet based on corn and raw soybeans improved the nutritional value of the protein due to heat generated during pelleting.

Research has shown that pelleting improves the performance of growing-finishing swine, although the reasons for the increased gains and improved feed efficiency with pelleted rations are not well understood. Improvement has been attributed to a denser feed, increased consumption, less dustiness and less feed wastage (Hoefer, et al. 1958; Conrad and Beeson, 1958). Smith (1957) stated that pigs benefit from the effects of partial cooking in the pelleting process and the partial gelatinization of starches.

The rate of food passage was determined by Seerley et al. (1962b) to evaluate the effect of pelleting swine rations. The mean particle retention time suggested that pelleted rations passed faster through the alimentary tract than the same rations in meal form.

Pelleted feeds have been implicated as contributing factors to the incidence of esophagogastric ulcers in swine. Reports by Reese et al. (1966) showed that the feeding of a ration containing a heat treated corn product or corn which was pelleted and reground had no effect on the development of ulcers.

Studies were conducted by Chamberlain et al. (1967) on the effects of pelleting a diet and a 24-hour fasting period on the incidence of ulcers in swine. A 24-hour fast prior to slaughter resulted in a significant increase in the number of pigs having a yellow deposit upon the esophageal area of the stomach. This condition was nearly absent in pigs "on feed" until just before slaughter. Pigs fed unpelleted feed had significantly fewer ulcers than those fed pellets or reground pellets.

Gamble et al. (1967) reported that pelleted diets in both the creep and grower-finisher diets produced significantly more total ulcers and a higher mean ulcer value in pigs than did the use of meal or the use of a pelleted creep followed by a meal grower-finisher.

Shrinkage

It has been reported that tissue shrinkage begins to occur by the thirteenth hour of transit in market hogs (Bjorka, 1938). However, Henning and Stout (1932) found that hogs slaughtered after periods of up to five days after removal from feed had carcass yields very similar to those slaughtered immediately. Yields showed a linear downward trend for each additional day exceeding five. Bowland and Standish (1966) credit fasting for a period of 68 hours with causing a significant reduction in backfat thickness and dressing percentage. However, it should be noted that water was also withheld in this study. Davidson et al. (1968) found that a 68 to 70 hour fasting period resulted in significant losses in weight of carcass and the four lean cuts.

A linear, but nonsignificant decrease in dressing percentage, was reported by Saffle and Cole (1960) for fasting periods up to 96 hours. No significant differences were found among fasting lengths with respect to yield of wholesale cuts.

The possibility that barrows and gilts may shrink at different rates was suggested by Stout and Cox (1959).

Heck (1957) indicated that shrink in shipping was reduced by feeding .9 to 1.4 kg of brown sugar per 5 gallons of clean drinking water, when such feeding started 48 hours prior to loading and when the hogs had access to water upon arrival at the terminal market.

Studies by Miller (1968) indicated that delayed slaughter while holding hogs at slaughter facilities for a period of up to 48 hours had no significant effect on the carcass yield. Pigs had access to water *ad libitum* during holdover.

CHAPTER III

MEAL VS PELLETED SORGHUM-SOYBEAN MEAL DIETS FOR GROWING-FINISHING SWINE

Summary

Two-hundred sixty-four crossbred pigs were used in three trials to study the effects of pelleting on the utilization of sorghum-soybean meal diets for growing swine. A fasting period of 18 hours was conducted to determine the effects of sex, diet, and their interaction on shrinkage.

The first trial involved a total of 96 pigs to study the effects of meal vs pellet form of diet for growing-finishing swine. Pigs fed the pelleted diet required 8% ($P<.01$) less feed per unit of gain than those on the meal form. Rate of gain was similar for pigs on the two diets. The effects of sex and diet form during an 18-hour shrink was also studied. Pigs on the pelleted diet had 11% ($P<.06$) less shrink than those on the meal. However, an interaction ($P<.06$) between sex and diet form was found.

The second trial involved a total of 72 pigs to study the effects of the diets: meal, pellet, and pellet plus .05% added lysine. Pigs on the meal diet gained .62 kg per head per day; those on pellet, .7 kg and those on pellet plus lysine, .71 kg. The average daily gain for the pigs on the pelleted diet was 12% ($P<.01$) higher than those on the meal form. Feed efficiency was 3.83, 3.24 and 3.34 kg of feed per kg of gain, respectively. Pigs fed the pelleted diet required 15.5% ($P<.01$) less feed per unit of gain than those on the meal form.

The third trial involved a total of 96 pigs to study the effects of meal vs pellet form of diet and the effects of sex for growing-finishing swine. Pigs on the meal gained .58 kg per head per day; those on pellet, .67 kg. The average daily gain for the pigs on the pelleted diet was 16% ($P<0.01$) higher than those on the meal form. Feed efficiency was 3.22 and 3.62 kg of feed per kg of gain, respectively. Pigs fed the pelleted diet required 11% ($P<0.03$) less feed per unit of gain than those on the meal form. There was no difference due to sex.

The second and third trials were combined to evaluate the shrinkage effects. Pigs on the pelleted diet had 9.5% ($P<0.02$) less shrink than those on the meal diet. The sex showed no difference, but an interaction between sex and diet form showed 14.3% ($P<.02$) less shrink for barrows on the pelleted diet than any other class.

Pelleting sorghum-soybean meal rations for growing-finishing pigs improved their performance in these three trials. Pelleting of the diets resulted in an increase in average daily gain ($P<0.001$) and the feed per kg of gain was also improved ($P<0.001$).

A summary of the three trials on shrinkage showed that the pigs on the pelleted diet had 8.5% ($P<0.01$) less shrink than those on the meal diet. There was no difference due to sex, but an interaction between sex and diet form ($P<0.01$) was found. Barrows on the pelleted diet shrank 12.5% less than any other class.

Introduction

Feed represents 60 to 80% of the cost of producing pork. One possibility of reducing feed cost is through feed processing. Pelleting has been shown to improve feed efficiency for swine by Dinusson *et al*. (1956) with barley, Seerley *et al*. (1962a) with oats and Jensen (1966) with corn. Although pelleting improves performance of growing-finishing swine, the reasons for the improved performance are not well understood. Improvement from pelleting has been attributed to an increase in density, increased consumption, reduced dustiness and less feed wastages (Hoefer *et al*., 1958 and Conrad and Beeson, 1958). More information is needed on the benefits from pelleting, especially with sorghum since it is the primary feed grain in West Texas.

The objectives of this experiment were to study the effects of meal *vs*. pelleting form of sorghum-soybean meal diets for growing-finishing swine and to investigate the effects of form of diet and sex on shrinkage.

Experimental Procedure

In all trials, the pigs utilized were crosses of the Yorkshire, Hampshire and Duroc breeds. Pigs were reared in a completely enclosed confinement facility from birth to market. During the growing-finishing period reported in these trials, the pigs were housed in 1.83 x 4.27 m pens with partially slatted aluminum floors. Each pen was equipped with a three-hole self-feeder in which feed was available *ad libitum*.

The sorghum-soybean meal diets used are shown in Table 1. A 16% protein diet was used until the pigs weighed approximately 56.7 kg, then a 14% protein diet was fed until pigs were removed from test. Both diets used in these trials were formulated from sorghum and soybean meal supplemented with minerals, vitamins and antibiotic to meet the requirements set by the National Research Council (1973). The sorghum was purchased from a local elevator and consisted of a mixture of hybrid varieties. The soybean meal was solvent processed 44% protein. Sorghum for both the meal and pelleted diets was ground through a hammer mill with 3.175 mm screen. Pellets were produced by conditioning with steam before passing through a die 4.76 mm in diameter and 6.35 cm thick. The feed was mixed in quantities of one ton. The pigs were individually weighed at biweekly intervals. When the average weight of the pen reached 56.7 kg, they were weighed at weekly intervals until the weight of approximately 97.5 kg. At this weight, the pigs were taken off test and held in a pen without feed or water for 18 hours. The pigs were confined to pens identical to the pens used in the study. The number of pigs/pen was kept constant. The only difference was that strange pigs were penned together. The pigs were then reweighed to determine shrink.

Trial 1

A total of 96 pigs weighing approximately 27.7 kg were allotted by litter, sex and weight to one of two dietary treatments. The pigs were divided into eight pens of twelve pigs each and each treatment

Table 1. COMPOSITION OF DIETS

Ingredients	Protein Percent 16	14
Sorghum	75.7	82.25
Soybean Meal	21.0	15.0
Salt	0.3	0.3
Diacalcium Phosphate	1.1	0.9
Calcium Carbonate	0.9	0.8
Vitamin Trace-Mineral Mix[a]	1.0	0.75

[a]Contains the following mineral, vitamin and antibiotic per kg of premix.

A IU	4400
D IU	440
E IU	11
K mg	4.4
Ribflavin mg	4.4
Niacin mg	2.2
d-calcium pantothenate mg	19.8
Choline Chloride mg	440
B_{12} mcg	22
Chlorotetracycline mg	22
Iron g	5
Manganese g	2.75
Copper g	.55
Zinc g	10
Iodine g	.075

was replicated four times. The trial was designed to determine the effects of pelleting swine diets. The trial was conducted for 121 days, starting October 14, 1977 and ending February 23, 1978. Feed efficiency and average daily gain were calculated for the entire length of the trial. Average daily gain and feed efficiency were used to evaluate the performance of the animals.

Trial 2

A total of 72 pigs weighing approximately 53.5 kg were allotted by litter, sex and weight to one of the three following dietary treatments; meal, pellet and pellet plus .05% lysine. The pigs were divided into six pens of twelve pigs each and each treatment was replicated once. Due to the heat produced in the pelleting process, there was a possibility that some of the lysine in the diet was tied up and made unavailable for digestion, therefore, .05% lysine was added to the diet to determine if lysine had been made unavailable. The trial was conducted for 75 days, starting February 16, 1978 and ending May 5, 1978. Feed efficiency and average daily gain were calculated for the entire length of the trial. Average daily gain and feed efficiency were used to evaluate the performance of the animals.

Trial 3

A total of 96 pigs weighing approximately 37.6 kg were divided into barrows and gilts and allotted within sex by litter and weight to one of the two dietary treatments; meal and pellet. The pigs were divided into eight pens of twelve pigs each and each treatment was

replicated once. This trial was designed to determine the effects of sex, pelleting diets and their interaction. The trial was conducted for 112 days, starting February 12, 1978 and ending June 29, 1978. Feed efficiency and average daily gain were calculated for the entire length of the trial. Average daily gain and feed efficiency were used to evaluate the performance of the animals.

Chemical Analysis

Total crude protein content was determined by the Kjeldahl method and expressed as N x 6.25. Procedure was outlined in the official methods of Analysis of the Association of Official Chemists (1970).

Statistical Analysis

Feed efficiency and average daily feed intake were analyzed using average data of pigs in each pen. Average daily gain and shrink was analyzed by individual pig data. Statistical analysis of the data were conducted according to the procedure by Li (1964). Analysis of variance was used to determine the statistical probability of observed differences in average daily gain, average daily feed intake, feed efficiency and shrinkage. When a significant treatment difference existed, Duncan's New Multiple Range Test (1955) was used to determine which treatment means were significantly different.

RESULTS AND DISCUSSION

Performance of the pigs in trial 1 is shown in table 2. Pigs fed the pelleted diet gained slightly faster and consumed less feed

than those fed the diet in meal form. Feed required per unit of gain for pigs fed pelleted form was 8% less (P<.01) than for those fed the meal form (3.26 kg versus 3.54 kg). Feed wastage was not observed to be a problem.

The effect of sex and form of diet on shrinkage of pigs is shown in table 3. Twenty-one pigs of each sex fed on each diet were used in this study. Pigs fed the meal diet had a greater (P<.06) shrink than those fed the pelleted diet (4.43 versus 3.94 kg). An interaction (P<.06) was found between sex and form of diet. Gilts had less shrink than barrows on the meal diet while barrows shrank less than gilts on the pelleted diet. More variation in shrink was found among both barrows and gilts fed the pelleted diet than among those fed the meal diet, as shown by the larger standard deviation for pigs fed the pellets.

Performance of the pigs in trial 2 is shown in table 4. Pigs on the meal diet gained .62 kg per head per day; those on pellet, .70 kg; and those on pellet plus .05% lysine, .71 kg. Feed efficiency was 3.83, 3.24 and 3.34 kg of feed per kg of gain, respectively. There was no significant difference between the pelleted diet and the pellet plus .05% lysine diet, so they were combined for further analysis. The average daily gain for the pigs on the pelleted diet was 12% (P<.01) higher than those on the meal form. Pigs fed the pelleted diet required 15.5% (P<.01) less feed per unit of gain than those on the meal diet. The pigs fed pellets tended to eat less feed per day than those on meal, which is in agreement with the results of trial 1.

Table 2. PERFORMANCE OF PIGS FED MEAL VS PELLET DIETS IN TRIAL 1

	Diet Form	
	Meal	Pellet
Number of pigs	48	48
Initial weight kg	27.7	27.7
Final weight kg	98.9	99.3
Average daily gain, kg	.64	.67
Average daily feed, kg	2.27	2.1
Feed/gain	3.54[a]	3.26[b]

[a,b]Means in a row with different superscripts differ (P<.01).

Table 3. EFFECT OF SEX AND DIET FORM ON SHRINKAGE TRIAL 1[a]

	Diet Form					
	Meal			Pellet		
Sex	Gilt	Barrow	Total or Average	Gilt	Barrow	Total or Average
Number of pigs	21	21	42	21	21	42
Average 18-hour Shrink, kg	4.17[bc]	4.69[b]	4.43	4.19[bc]	3.69[c]	3.94
Standard deviation, kg	.72	.81	.79	1.02	1.3	1.18

[a]Pigs weighed approximately 97.5 kg and were held off feed and water for 18 hours.

[b,c]Means in a row with different superscripts differ. (P<.06).

Table 4. PERFORMANCE OF PIGS FED MEAL, PELLETED, PELLETED PLUS ADDED .05% LYSINE DIETS IN TRIAL 2.

	Diet Form		
	Meal	Pellet	Pellet + Lysine
Number of pigs	24	24	24
Initial weight kg	53.5	53.5	53.5
Final weight kg	97.5	98.4	100
Average daily gain, kg	.62[a]	.70[b]	.71[b]
Average daily feed, kg	2.39	2.26	2.37
Feed/gain	3.83[a]	3.24[b]	3.34[b]

[a,b]Means in a row with different superscripts differ (P<.01).

Performance of the pigs in trial 3 is shown in Table 5. Barrows had a higher average daily gain, ate more feed per day and had an improved feed efficiency than gilts on the same diet, but the difference was not significant. Since there was little difference, the data for both barrows and gilts were combined to show the difference of meal and pelleted diets. Pigs on the meal gained .58 kg per head per day, and those on pellet, .67 kg. The average daily gain for the pigs on the pelleted diet was 16% ($P<.01$) higher than those on the meal diet. Feed efficiency was 3.22 and 3.62 kg of feed per kg of gain, respectively. Pigs fed the pelleted diet required 12.4% ($P<.03$) less feed per unit of gain than those on the meal diet. However, pigs on the pelleted diet in this trial ate 11.7% more feed per day than pigs on the meal diet, but this difference was not significant.

The effect of sex and form of diet on shrinkage of pigs in trials 2 and 3 is shown in Table 6. A total of 155 pigs were used in this study. The pigs in trials 2 and 3 reached 97.6 kg at the same time, so were combined to test shrinkage. Pigs fed the meal diet had a greater ($P<.02$) shrink than those fed the pelleted diet (5.20 versus 4.75 kg). An interaction ($P<.02$) was found between sex and diet form. Gilts had less shrink than barrows on the meal diet while barrows shrank less than gilts on the pelleted diet which is in agreement with the data from trial 1. More variation in shrink was found among both barrows and gilts fed the pelleted diet than among those fed the meal diet. The pigs in trials 2 and 3 shrank more than pigs in trial 1 probably because of the hot weather.

Table 5. PERFORMANCE OF PIGS FED MEAL VS PELLETED DIETS ACCORDING TO SEX IN TRIAL 3

	Diet Form and Sex					
	Meal			Pellet		
	Gilts	Barrow	Total or Average	Gilts	Barrows	Total or Average
Number of pigs	24	24	48	24	24	48
Initial weight	38.6	36.7	37.6	38.6	37.2	37.9
Final weight kg	96.6	95.7	96.2	98.4	98.9	98.6
ADG kg	.55	.60	.58[a]	.64	.70	.67[b]
ADF kg[e]	1.96	2.22	2.09	2.27	2.37	2.32
Feed/gain ratio[e]	3.54	3.3	3.62[c]	3.26	3.18	3.22[d]

[a,b]Means with different superscripts within each row are different (P<01).

[c,d]Means with different superscripts within each row are different (P<03).

[e]Data for pelleted diets for both barrows and gilts represent only one observation as feed records were lost for one pen for each treatment.

Table 6. EFFECT OF SEX AND DIET FORM ON SHRINKAGE - EXPERIEMTNS 2 & 3

	Diet Form					
	Meal			Pellet		
	Gilt	Barrow	Total or Average	Gilt	Barrow	Total or Average
Number of pigs	34	30	64	38	53	88
Average 18-hour Shrink, kg	5.06[a]	4.99[a]	5.19	5.09[a]	4.43[b]	4.76
Standard deviation, kg	1.3	1.24	1.27	1.2	1.19	1.24

[a,b]Means in a row with different superscripts differ (P<.07).

Pelleting sorghum-soybean meal rations for growing-finishing pigs improved their performance as shown in Table 7 for the combined data for the three trials. Pelleting of the diets resulted in a 12.7% increase in average daily gain ($P<.001$) and the feed per kg of gain was also reduced ($P<.001$) by 10%.

The combined data agrees with most work already conducted on pelleting rations for growing-finishing swine. However, as compared to Jensen's (1966) data on pelleting sorghum, the present data indicate a greater benefit from pelleting. He reported a 6.4% increase in gain on 8.5% less feed as compared to 12.7% increase in gain on 10% less feed in this experiment (Table 7). Others (NRC - 42, 1969; Larsen and Oldfield 1960; Hoefer et al. 1958) have found small benefits from pelleting corn-soybean meal diets.

The greatest benefit from pelleting has been obtained from pelleting higher fiber feeds, as shown by Hoefer et al. (1958). They reported that the feed efficiency of pelleted over meal diets increases as the level of oats increased up to 40%. They also stated that pigs fed diets containing certain feeds; particularly barley, oats and alfalfa meal have yielded a greater response than diets containing corn. The general concept was developed that pelleting increased the density of the diet which allowed for greater intake as shown by Dinusson et al. (1960). They found that pigs on pelleted diets will eat more per day of lower digestible energy diets and gain similarly to those on higher energy diets.

Table 7. SUMMARY OF PERFORMANCE OF PIGS FED MEAL VS PELLET IN ALL THREE TRIALS

	Diet Form	
	Meal	Pellet
Number of pigs	120	144
Initial weight, kg	35.3	38.3
Final weight, kg	97.5	99.0
Average daily gain, kg	.61[a]	.69[b]
Average daily feed, kg	2.22	2.26
Feed/gain	3.63[c]	3.26[d]

[a,b]Means in a row with different superscripts differ (P<.01).

[c,d]Means in a row with different superscripts differ (P<.001).

Pond and Maner (1974) stated that contrary to early beliefs, pelleting has not resulted in increased feed intake; on the contrary, generally there is no significant change in feed intake or a very minor reduction in total feed consumed. Becker et al. (1965) and Seerley et al. (1962a) have shown that the beneficial effects of pelleting are not dependent upon a greater feed intake by animals fed pellets over those fed meal which is in agreement with data from this study as faster and more efficient gains were obtained from similar levels of feed intake. However, in the third trial, pigs fed pellets ate 11.7% more feed than those fed the meal diet. In addition, Becker et al. (1965) showed that pigs fed pelleted feeds reground into a meal exhibited beneficial effects, thus indicating that the physical characteristics of the pellet have little or no significance. However, Slinger (1973) stated that the grinding of pellets does not return it physically to the mash form, therefore, one should not discount the value of physical change.

Other benefits indicated by Gorrill et al. (1960) and Seerley et al. (1962b) were that pelleting increased the digestibility of the energy of certain rations. The former workers noted that pelleting increased the digestibility coefficient of dry matter and gross energy but not of crude protein.

It has been suggested that partial cooking and partial gelatinization of the dietary starch could be beneficial to the pig. In agreement with this idea, Jensen and Becker (1965) reported that the apparent enzyme-soluble starch values for the unpelleted and pelleted

corns were 4.0 and 7.9% respectively, indicating that the pelleting process had rendered the carbohydrate fraction more susceptible to enzymatic action.

Slinger (1973) reported that the beneficial effect of steam-pelleting is due to an increase in metabolizable energy as indicated by several experiments where a local commercial pelleting machine was used.

Hence, it seems likely that the pellet process causes some chemical and/or physical change that enables the pig to digest and utilize the diet more completely.

A summary of the shrinkage effects of all pigs show that the pigs on the pelleted diet had 8.5% ($P<.01$) less shrink than those on the meal diet. There was no difference between barrows and gilts but an interaction between sex and diet form showed 12.5% ($P<.01$) less shrink for barrows on the pelleted diet than any other class (Table 8). This agrees with Stout and Cox (1959) who suggested the possibility that barrows and gilts may shrink at different rates. The pigs in this experiment were held off feed and water for 18 hours even though Miller (1968) indicated that 48 hours off feed had no significant effect on the carcass yield.

The federal law prohibits livestock to be transported for a period longer than thirty-six consecutive hours without unloading for the purpose of giving feed, water and rest for a period of at least five consecutive hours.

Table 8. SUMMARY OF EFFECTS OF SEX AND DIET FORM ON SHRINKAGE

	Diet Form					
	Meal			Pellet		
Sex	Gilt	Barrow	Total or Average	Gilt	Barrow	Total or Average
Number of pigs	56	52	54	59	77	66
Average 18-hour shrink, kg	4.72[a]	4.82[a]	4.77	4.76[a]	4.22[b]	4.49
Standard deviation, kg	2.48	2.41	2.45	2.51	2.7	2.68

[a,b]Means in a row with different superscripts differ ($P<.001$).

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