PELLETING *rations for* SWINE

By William E. Dinusson[1]

TWO main types or classes of barley are grown in the United States, malting and feed. This classification is very loose and in practice "feed" barley is any barley not accepted by the malting industry, regardless of variety. Thus, there is considerable variation in the quality of barley used in the feed industry.

High Protein Desirable

West coast barley is usually lower in protein than that produced in the North Central States and the malting varieties are often lower in protein than the feed varieties. Therefore, if the barley is to be used for feeding, grow a high yielding, high protein variety. However, much of the barley grown for malting, although unsuited for the malting industry, makes excellent feed when properly prepared and supplemented.

Barley has a legal weight of 48 pounds per bushel. At that weight the hulls form about 12 to 15 percent of the barley with a crude fiber content of 5 to 6 percent. Lighter, thinner kerneled barley has a proportionately greater hull content and a higher fiber content.

Corn, yellow No. 2, is the standard with which all energy feeds are compared. Average analysis from the tables from Morrison's Feeds and Feeding 22nd edition show barley to contain about 97 percent as much total digestible nutrients (TDN), 40 percent more protein, about twice as much phosphorus, three times as much calcium and, unfortunately, about two and one-half times as much crude fiber as corn. Thus, the additional protein offsets the slightly lower TDN of the barley.

Grind Barley For Swine

Barley should be ground for swine. Grinding increases the feeding value up to 24 percent, with an average of about 18 percent. Grinding does not entirely overcome the harmful effect of the hull and pigs waste feed by rooting the feed out of the feeder in an attempt to sort

the hull from the groat. The feed consumption of the meal is also reduced because of unpalatability and bulkiness. Fine grinding of barley stops the sorting of feed but does not always reduce the waste because the resulting dustiness reduces palatability and the bulkiness is further increased.

In 1950 the animal husbandry department at NDAC began experiments to search for ways to overcome the harmful effect of the fiber and improve the efficiency of utilization of barley for swine rations.

In the first two experiments pigs fed a complete ration, pulverized and pelleted, based on barley, gained 12 to 14 percent faster on 8 to 17 percent less feed as compared with identical rations fed in meal form. The pigs on the pelleted barley rations gained 10 to 14 percent faster than the pigs fed corn rations either pelleted or ground. The feed efficiency was similar. Several additional experiments have confirmed these early findings.

The rates of gain are not always greater on pelleted barley than corn, but compare very favorably. If the barley rations are properly balanced, pulverized and pelleted, barley rations are directly competitive with similar corn rations.

Feed efficiencies of both corn and pelleted barley rations have ranged from 300 to 365 pounds of feed per 100 pounds of gain and have averaged about 330 pounds. Feed efficiency varied with type and breed of pig, season, and quality of grain. These estimates are averages for pigs from 40 to 200 pounds in weight and based on research at the NDAC Experiment Station.

Pelleting Has Advantages

Pelleting of barley, oats and other grains with hulls, except proso, has several advantages. First, pulverizing and pelleting those grains minimizes the effect of the fiber by increasing the palatability, reducing the bulkiness and reducing the waste.

The reduction in bulkiness or increasing the density has a further advantage in that, research at this station indicates, if given a chance, pigs eat on the basis of energy content rather than on total pounds of feed. It has been observed that pigs fed a pelleted barley ration eat more pounds of feed per day than those on corn rations or barley rations in the meal form. This usually results in a more rapid gain and a more efficient gain.

Oats Respond To Pelleting

Oats, particularly good oats weighing 34 to 40 pounds per bushel (legal weight 32 pounds per bushel), respond to pelleting the same as barley. The hull content forms about 20 to 25 percent of the oats with a crude fiber content of 10 to 12 percent. This means that the energy (TDN) content is slightly lower per pound and this increases the pounds of feed required per pound of gain.

Research at NDAC indicates that oats as one-third of the grain in the ration are equal to barley and as the only grain for the young growing pig are worth more than for fattening pigs. Pigs getting pelleted oat rations from about weaning to 70 to 80 pounds in weight outgained those on pelleted barley or corn rations, but lost the advantages at weights of from 100 to 200 pounds. However, oats can be used to fatten swine up to 200 pounds and this is economical when the price per pound of oats is slightly less than that of barley.

Unfortunately, proso (hog millet) has not responded to pelleting as have the other grains. This problem is receiving attention and proso ra-

tions are not recommended for pelleting, as yet. Additional research will be needed to find out how best to use proso for pelleting swine rations. Proso is an excellent grain when fed in the meal form.

Screenings Not Recommended

The use of screenings is not recommended in pelleted swine rations. A good grade of screenings, weighing 48 pounds per bushel and consisting mainly of pigeon grass, broken kernels of cereal grains, wild buckwheat and a small percentage of the small seeds, such as mustard, pigweed etc., was used in a pelleted ration and the experimental pigs refused to eat the pellets and actually lost weight. Smaller percentages of screenings with grain tend to reduce palatability and to reduce feed efficiency.

One type of screenings was used which showed promise—"mill oats." This screenings byproduct was consumed by the pigs in large quantities with fair gains, but feed efficiency was poor and on a dollar and cents basis was not equal to a barley ration even though the price per ton of the mill oats was only about one-half that of barley. This preliminary research suggests that screenings do not make a "cheap" feed for growing fattening swine.

Improves Thin Barley

The problem with thin, light barley, or even with barley "needles," has been investigated. Research shows that barley weighing 37 pounds per bushel is worth about 90 percent the value of 46 to 48-pound barley. When this thin barley is pulverized and pelleted in complete rations, the pigs tend to eat enough more to make up for the lower energy and the rates of gain are similar to those on plump barley. Feed efficiency is affected and it takes about 10 percent more feed per pound of gain of the light compared with the plump barley. In fact, research shows that pelleting increases the value of the thin barley to a greater extent than that of plump barley but, of course, not up to the level of plump barley rations.

Supplement For Barley

Balancing a ration based on barley and taking advantage of the higher protein value of the barley create a problem. Most commercial mixed supplements are formulated primarily for use with corn. To make a 13.5 percent protein ration based on 9 percent protein corn requires about 85 pounds of corn and 15 pounds of a 40 percent supplement. To get a 13.5 percent protein ration based on barley (12 percent) requires about 94 pounds of barley and 6 pounds of the 40 percent supplement. Thus, less than one-half as much protein supplement is needed for the barley ration as the corn ration. If the vitamin and mineral additions were added to the supplement in amounts such that 15 pounds per hundred would meet requirements of the swine, then adding only 6 pounds per hundred in the barley ration would mean less than one-half of the vitamin and mineral requirements was added.

In short, for best and most economical results, a supplement should be formulated especially for barley. Because of the higher vitamin fortifications that are necessary, such a supplement will be slightly more expensive per ton but will result in a cheaper barley ration because so much less will need to be added to meet all requirements.

Another problem exists in this balancing of protein. The North Dakota Agricultural Experiment Station is experimenting to find the best supplement or combination of

supplements, or even amino acid additions, which will give the cheapest and best results. With the present knowledge it is apparent that lysine is the limiting essential amino acid of barley. The supplements which are good in this respect are blood meal, fish meal, meat scraps and possibly soybean oil meal. Linseed oil meal and cottonseed oil meal are lacking in lysine. Because only 1½ percent protein addition is needed (13.5 minus 12 equals 1.5) when barley is used, it is more difficult to find a supplement which will adequately supply lysine when small amounts are added. This is not true in corn rations which need 4.5 percent protein additions (13.5 minus 9 equals 4.5).

Only supplements high in lysine and of good protein quality should be used for barley rations. Additional research will answer the question and give a formula which will be efficient for use with barley and probably also for oat rations.

Fine Grinding Advised

Other questions which have come up in regard to pelleted rations include the one of "binders" for pelleting. Binders, such as sodium bentonite, should not be necessary. Firm pellets which do not crumble to meal can be made without any binders.

Fineness of grinding of barley for pelleting is another problem. At present it seems advisable to pulverize the barley before pelleting. This fine grinding minimizes the effect of the fiber.

Another question is that of adding molasses. Molasses can be added up to 5 percent. It does assist in pelleting. None of the nitrogen in molasses is in the form of protein. Whenever a pound of molasses is substituted for a pound of barley there is a loss of .12 pound of protein which must be added from some other source. Because the cost per pound of molasses is usually higher than barley, and increases the cost of additional protein, this has minimized the value of the addition of molasses.

Research to date at NDAC has indicated that the increased efficiency does not quite pay for the added cost of pelleting corn rations.

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