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SOME RESULTS IN STOCK FEEDING.

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The Bulletins published by the Station will be sent free to any farmer applying for them.

\*Connected with Second Judicial Department Branch Station.

†Connected with Fertilizer Control.

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SOME RESULTS IN STOCK FEEDING.

F. H. HALL.

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THE NEW CORN PRODUCT.

Among the recently exploited stock foods is **The new, one for which somewhat extravagant claims old.** have been made, but which is really only a very familiar fodder in slightly modified form.

The great war vessels of today require between their true and false bottoms a filling which shall be light, which shall rapidly absorb water and which, in the absorption, shall swell and fill any holes made by shot and shell and so shut out the incoming flood. Such a material, of almost perfect character, has been found in the cellulose of corn-stalk pith and large quantities of stover from Illinois, Indiana and Kentucky fields are now disposed of in this manufacture. Only a small part, by weight, of the stalk is used in this way, however, as the leaves, the tough outer shell, the fibers and the joints are useless and are rejected. These refuse portions are dried, ground very fine and have been extensively advertised and sold as "Marsden's Stock Food" or "New Corn Product," the claim being made that this material is much more digestible than the whole or shredded corn stover, more nutritious than timothy hay and altogether a most valuable addition to the coarse fodders.

Investigations made at this Station tend to prove that the material, in composition and nutritive worth, is only *finely ground corn-stalks* and that the value of this part of the new

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\*This is a brief review of Bulletin No. 141 of this Station on Digestion and Feeding Experiments, by W. H. Jordan and C. G. Jenter. Any one specially interested in the detailed account of the investigations will be furnished, on application, with a copy of the complete Bulletin.

discovery, which is indeed great, lies only in the utilization of what would otherwise be a waste product on the immense fields of the corn belt, not, except in small degree, in the enhanced value of the food product itself.

**Merits claimed.** The advocates of this new feed claim that its fine division makes it most convenient of the coarse fodders for the formation of "mixed feeds" and renders the amount of mastication less; which will readily be conceded; but they also maintain that the removal of the pith takes out a large amount of comparatively valueless material and so makes a richer food and that the cellulose of the pith in untreated stalks absorbs more than its share of the digestive juices and thus interferes with the digestion of the more valuable nutrients; and consequently the removal of this cellulose in the preparation of the New Corn Product renders the other ingredients more perfectly digestible and more valuable.

**Station tests.** To ascertain the correctness of these assertions the Station has made comparative chemical analyses and feeding trials of finely ground whole corn stover and of ground stover, from the same lot of corn, the pith of which had been removed by specially devised instruments. The latter product was a very close approximation to the New Corn Product although not ground quite so fine.

**Composition.** In the separation of the parts of the fodder it was found that the pith was about one-tenth, by weight, of the entire stover, and chemical analysis showed that "The pith of this particular lot of stover, at least, did not differ in composition to a remarkable degree from the remaining portion of the plant." It contained about two-thirds as much of the valuable nitrogenous materials, nearly twice as much of the fats, about the same amounts of the starches, sugars and other carbohydrates and but little more of the fiber or cellulose upon whose removal the advocates of the New Corn Product lay so much stress. The pith is by no means pure cellulose, but at least two-thirds something else. The carbohydrates of

the pith, too, proved of equal value, so far as chemical tests show, with those of other parts of the plant; so that the analysis revealed no reason why the pith itself, or at least the whole stover including the pith, was not of equal digestibility with the pith-free stover.

**Actual digestion.** Four healthy young wethers were fed for several days upon this ground whole stover and for the same length of time upon the ground pith-free stover and the percentages of the various ingredients of each which the sheep digested were determined by careful weighing and analysis of food and feces. One sheep digested more from the stover containing the pith and two digested less, the difference in amount being very small and the digestibility of the organic matter, the true measure of nutritive value, was only one-half of one per cent in favor of the stover without the pith, a difference so slight as to fall within the limits of error in making digestion experiments.

**Conclusion.** Both chemical analysis and digestion experiments prove that the New Corn Product has no materially increased value over well-cured, well-prepared corn fodder.

#### FEEDING STANDARDS AND ACTUAL FEEDING.

**Feeding standards.** For many years agricultural chemists and scientific feeders have been striving to ascertain the actual feeding value of the different farm and commercial feeds and to tabulate these values so that the feeder could combine the materials he had at hand into rations which would produce the best results in keeping his animals while at rest or work, giving milk, raising young or fattening; or could purchase supplementary foods with due regard to their proper use and relative economy. Thousands of analyses and digestion experiments have been made and the averages of the results attained combined in feeding standards, tables of composition and tables of nutritive value. These figures the farmer has been urged to use in his feeding with the assurance that he

would find in them a safer guide than any "rule of thumb" or the experience of any one man.

**Are the standards correct?** Feeding materials differ in composition and the averages will not give the composition of any selected sample, but it is believed that the figures are sufficiently accurate for all practical purposes. An experiment made at the Station reveals a surprising agreement between the calculated and the actual amount digested in two rations of very different character.

**Station tests.** One of these rations contained a large proportion of Station-grown timothy hay, a limited amount of corn silage and a grain mixture made up wholly of by-products, (malt sprouts, brewer's grains and Buffalo gluten feed); while in the other rations corn silage furnished more of the rough forage and was supplemented by ground oats and peas. Feeding tables were consulted for the composition and digestibility of these materials and the amounts of digestible nutrients in the rations were calculated.

Samples were then taken of each material and chemical analyses made to determine the real composition; and at the same time digestion experiments with four sheep were carried on and the actual amounts of digestible protein, carbohydrates and fat in each ration found. On comparison of the two sets of figures showing the digestible nutrients as calculated from the tables and as determined by careful analysis and actual digestion, it was found that the agreement was practically perfect, there being only one-tenth of one per cent difference in amount of organic matter digested in the first ration and still less difference with the other ration. This indicates that the use of the averages found in feeding tables will insure greater accuracy and certainty than can be secured by any other method.

**Half and full rations.** In making the digestion experiments half the amount of the rations was fed for a time, and it was found that the nutrients in the small ration were better digested than those in the

full ration. This disagrees with the results elsewhere obtained, for it has been thought that the size of the ration within reasonable limits, had nothing to do with its digestibility; but the differences in this experiment seem too large and too uniform to be due to error.

**Rations  
from  
unlike  
sources.**

Agricultural chemists have long known that the terms carbohydrates and protein might in the case of one feeding stuff refer to combinations of chemical compounds which would differ very decidedly from the combinations found in other feeds. These terms may be said to correspond, with the chemist, to the expressions "mixed feed" or "grain mixture" used by the feeder; for the "carbohydrates" may consist of starches, sugars, pentosans, gums and other chemical compounds of more or less definite or understood character, and "protein" does not indicate a chemical compound of definite character, but a combination which may vary widely in number and proportions of the chemical compounds which form it. Now, it is a question whether the "protein" or the "carbohydrates" in different foods have the same nutritive value; whether, for instance, the digestible pentosans found in coarse fodders have equal worth with the same quantity of starch in the grains, or whether the protein of wheat, which is mostly albuminous, is not of more value than that of the beet root which contains nitrogen compounds of a different character, which we call amids.

The two rations just referred to in the digestion experiment were selected for a feeding experiment because they illustrate well the differences which may exist in combinations of chemical compounds of quite different character yet contain the same amount of carbohydrates. Starch and sugar are readily and perfectly digested, the sugar being absorbed with slight chemical changes into the blood and the starch requiring only one simple transformation to become sugar; but the pentosans and cellulose are only partially digested and we do not know that the portion digested is as nutritious as the starch and sugar. In Ration 1, consist-

ing of hay and ground grain, chemical analysis showed that 64 per cent of the digested "carbohydrates" consisted of starch and sugar; while in the silage and by-product ration only 42 per cent of the carbohydrates was of this easily digested character. Thus the two rations seemed well adapted to show a difference in nutritive effect and to prove the inaccuracy, if any exists, in the use of but one factor for calculating the value of carbohydrates from different sources.

**Feeding tests.** The two rations were fed for periods of 30 and 33 days to two lots of five cows each, the rations being changed for the two lots in the two periods, so that the influence of individual characteristics and change in length of milking were eliminated. Each of the cows was fed what she would eat readily of the rations, the proportions of the ingredients being maintained.

The results of the experiment show no advantage in milk producing power for Ration 1, the one containing most of the easily soluble starch and sugar, for almost exactly the same amount of milk solids was produced from Ration 2. Indeed, the advantage, if there is any, is on the side of the supposedly less efficient ration, for it took a little more of the other ration to produce the same amount of milk solids. If any class of carbohydrates possess any superior nutritive value, it is too small to be brought out by feeding experiments of this character and the feeder is perfectly safe in using the factor given in the recent tables for calculating the value of the carbohydrates.

**By-products.** One interesting and valuable fact was brought out by the experiment, and that is that the commercial by-products can be substituted for such rich grains as oats and peas. Their use seem to allow of a larger proportion of the ration being made up of coarse fodder, hay and silage. The feeder may count on utilizing his home grown forage with a small expenditure for supplementary foods of this character.