THESIS

By-products used as Cattle Foods

Francis E. West

1899

F O R C O V E R.

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T H E S I S

BY-PRODUCTS USED AS CATTLE FOODS

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Senior Agricultural Thesis

on

" BY-PRODUCTS USED AS CATTLE FOODS. "

by

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Class of '99.

Michigan Agricultural College,

Agricultural College, Mich.

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The American, with his eye ever alert for the almighty dollar, is always watching for opportunities to convert, what would ordinarily be waste, into money. As a result, there have been of late, several by-products from the manufacture of the more valuable human foods, placed upon themarkets and sold as feed stuffs for cattle. The object of this thesis is to treat briefly, the origin and composition of some of these food materials.

Samples of feed were obtained from different sources and several of these proved to be the same thing but sold under a different trade name; for example, the sample of "Buffalo Feed" sold by the Hope, Grain & Feed Co. of Detroit, Michigan, is the same thing as the "Chop Feed" manufactured by the Glucose Sugar Refining Co. of Chicago, Ill. The"Gluten Feed" is merely a mixture of "Chop Feed" and"Gluten Meal" ground together.

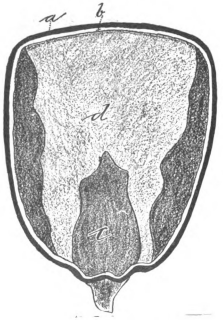
The samples analyzed were from Jacob Beck & Sons of Detroit, Mich. who are manufacturers of oat and corn meal and put out two by-products for cattle feed, viz.: "Oat Bran" and "Oat Hulls". The "Oat Hulls" were not analyzed. This company uses about two thousand bushels, each of oats and corn per day. 50% of this is converted into table foods and the remaining 50% of the two products are mixed together and shipped east to be used as cattle foods, Massachusetts being the principle market.

The Glucose Sugar Refining Co. of Chicago are putting out four different feed stuffs, viz., Gluten Meal, Gluten Feed, Chop Feed and Oil Cake. This company manufactures one hundred tons daily of the Gluten Meal, four hundred tons daily of the Gluten Feed, ninty tons daily of the Chop Feed, and about twenty-five hundred tons montnly of the Corn Oil Cake. In both of the above cases the data as to the amount of feed stuffs manufactured by these different companies was copied from letters received from them.

In order that a better idea may be formed of these corn products and the methods by which they are obtained, we quote the following, which was copied from a small pamphlet sent out by the Glucose Company and entitled "Milk Talk".

" We wish to correct what seems to be a wrong impression or rather a prejudiced opinion, in the minds of a great many, that Gluten Feed is the only substance left of corn after all the nutritious parts have been extracted in the manufacture of glucose. There are four separate and distinct parts to a kernel of corn as here shown:

A Kernel of Corn.



a- The hull or bran.
b- Flinty or gluten part.
c- Germ of the corn.
d- The starchy part.

The first three parts mentioned can only be used in the manufacture of our different grades of feed; the fourth, or starchy part, is the only portion of the kernel used in making starch, from which glucose and grape sugar are manufactured. You will, therefore, see that the parts used in the manufacture of feed cannot be used in making starch. Hence, the different grades of gluten feed are original products manufactured from corn just as much as starch, and the nutritious properties of the feed are not diminished even though the starchy part has been extracted from the corn.

Chop Feed (Buffalo), commonly called corn bran, is the hull of the corn ground fine and contains a small percentage of gluten. It serves as an excellent coarse feed, to be mixed with Gluten Feed, Gluten Meal, and other

concentrated feeds. Gluten Meal is the pure gluten of the corn, thoroughly cooked, kiln dried and makes a very highly concentrated food".

The samples obtained showed a wide variation in composition, even in the same brands. A typical sample was selected from each of the three groups of samples and analyzed with the results as tabulated below.

T A B L E I.

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	Gluten Meal	Buffalo Feed	Oat Bran.
Moisture	11.23 %	11.07 %	9.03 %
Ash	.95	1.32	4.34
Ether Extract	8.75	3.86	8.30
Fiber	1.71	17.56	12.45
Crude Protein	37.62	9.98	12.83
Carbo Hydrates	39.74	56.21	53.05

In order that we may obtain a more exact idea of the value of the above foods for feeding purposes, we give in the table below the average percentages of the various

substances found in corn, oats and bran.

T A B L E II.

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	Corn (Dent)	Oats	Wheat bran
Moisture	13.1 %	11.0 %	11.9 %
Ash	1.4	3.0	5.8
Ether Extract	4.8	5.0	4.0
Fibre	2.3	9.5	9.0
Crude Protein	11.0	11.8	15.4
Carbo-Hydrates	67.4	59.7	53.9

By a comparison of the above tables, it will be seen that the gluten meal gives a much higher per cent of protein than is found in corn, oats, or bran. The gluten meal, also, has much less fiber than corn, oats,or bran, and as fiber is practically worthless in itself as a food material, we should consider this another strong point in favor of the gluten meal. The buffalo feed is less rich in protein than corn, oats,or bran and has a very

high per cent of fiber which would place it among the less valuable feed stuffs.

The oat bran, which is not to be confused with oat hulls, compares favorably with corn, oats and bran in the amount of protein it contains, but nevertheless, it has too large a per cent of fiber to make it as valuable as the above for feeding purposes.

The ordinary farmer or dairyman seldom has trouble in securing a sufficient amount of carbo-hydrates and fiber, for these substances are plentiful in the coarse crops which he raises. Therefore as gluten meal is deficient in the above and rich in protein it is a profitable food for the farmer to buy.

The following methods were used in making the determinations found in TABLE I:

MOISTURE.

Three grams of the substance was dried in an electric oven until the sample remained at a constant weight. The loss in weight equals the moisture.

ASH.

Two grams of the substance was burned to a whiteness at the lowest possible red heat and the weight of the ash determined.

ETHER EXTRACT.

Two grams of the dried substance were placed in a fat extractor, and the fat extracted with ether for sixteen hours. The fat was then removed from the extractor and the ether evaporated off and the amount of fat determined.

CRUDE PROTEIN.

Taree grams of tne substance was put into a digestion flask and .7 gram of mecurie oxide added. To this was added 20 c.c. of 1.84 S.G. of C.P. sulphuric acid. Tne mixture was neated slowly at first and then made to boil until it became colorless. Potassium permanganate was then added in small quantities until tne liquid remained a green or purple color. Tne liquid was tnen transferred to a distilling flask and 200 c.c. water, and 25 c.c. of potassium sulfide solution added. The flask was shaken to mix the ingredients and then 50 c.c. of soda solution added. This was distilled into standard acid, titrated with standard alkali and the amount of ammonia determined.

The amount of nitrogen present in the ammonia multiplied by 6.25 equals the crude protein.

FIBER.

Two grams of the substance was taken and placed in a flask with 200 c.c. of 1.25% sulphuric acid and boiled. A return condenser was used to keep the acid from becoming too concentrated. After boiling thirty minutes with the acid, the substance was removed, filtered and then placed in the flask and boiled for the same length of time with .125% Sol. of sodium hydrate. The substance was then filtered into a weighed Gooch crucible, dried, weighed and then burned and the ash weighed. The total weight of fiber, less the ash, equals the crude fiber.

CARBO-HYDRATES.

The amount of moisture, ash, ether extract, fiber and crude protein taken from one hundred will give the carbo-hydrates.