

# ADVOCATES THE FEEDING OF BREWER'S GRAINS

Address of Dr. Wahl at the Ninth annual convention of State Dairy and Food Departments.

The enormous quantity of brewers' grains, over half a million tons yearly, calculated as ordinary dry grains, makes the question of the value of this product as a feed for milch cows highly important one.

That it is a most nutritious material is undeniable. Numerous analyses have shown that in the ordinary state of dryness they contain of albuminoids over 20 per cent, of fat over 10 per cent and of carbohydrates, sugar, starch, etc., 40 to 50 per cent.

Had the brewers grains been used exclusively in the dry state there would probably never have been any objections raised against them as a feed for milch cows. The wet grains, however, containing as they do when they leave the mash tub, about seven per cent of water, are liable to undergo changes in warm weather which are produced by fermentation and putrefaction.

During the mashing of the malt the greater part of the starch is changed into soluble substances, sugars and gumlike substances, contained under the name of dextrines. The albuminoids are brought into solution and enter the wort. The water in 55 to 60 per cent remain in the grains in very much the same state as they existed in the barley previous to the malting. Besides the insoluble albuminoids which enter into solution in the wort at higher temperatures in the beginning of the mashing operation are thrown out again by the higher temperatures at which the mashing is finished. The coagulated albuminoids may be compared with hard-boiled eggs, and add considerably to the weight of the grains.

By the removal of the wort and the subsequent washing of the grains with hot water these soluble carbonates, sugar and dextrin, as well as the soluble albuminoids are eliminated from the grains as completely as practicable. There remains, nevertheless, a certain small percentage of these substances dissolved in the water contained in the wet grains.

It is due to these substances, especially the sugar and the soluble albuminoids, that the wet grains easily undergo fermentation and putrefaction, most readily when exposed to the air at a high summer temperature.

The malt contains various species of bacteria, which at a favorable temperature and with a proper amount of moisture, rapidly increase. Most important of these microorganisms are the lactic acid bacteria. As their name indicates, they produce the organic acid found in milk, (sour) the lactic acid, the presence of the albuminoids, sugar contained in the wet grains is converted by these bacteria into lactic acid. This formation of acid causes souring of the grains. The expansion "souring" is here used solely to indicate the acquisition of a sour or acid taste. If the fermentation is arrested at this stage no bad odor is produced, since the lactic acid is a non-volatile and consequently odorless liquid.

It is a well known fact that the lactic acid has a very beneficial action upon the digestion. Beer as well as buttermilk (sour milk) have their popularity as healthy refreshing drinks to a great extent from the lactic acid contained therein. Both have from time immemorial been the favorite drinks of Teutonic races.

The lactic acid of the wet grains has an equally beneficial action upon the digestive functions. It can be taken for granted, therefore, that the flow of milk is improved if this acid is a belief held by the acid fermentation, if it is allowed to go on will not stop at the lactic stage. When the amount of lactic acid has reached a certain stage it acts as a check on the activity of the lactic acid bacteria. Then another species, the butyric acid bacteria, succeeds the lactic acid bacteria, especially at a high temperature. The butyric acid bacteria are capable of turning not only the sugar, but also the lactic acid into butyric acid, the acid of butter. This acid is a volatile and a disagreeable sour smelling that of sauerkraut.

When we consider that this acid, butyric acid, is a component part of the milk, in which it is found as a normal constituent, it would be unreasonable to suppose that this acid is injurious to the cow at such quantities as are found

in the grains. On the contrary it might be held that such a substance would act beneficially upon the production of milk and butter.

It is therefore not surprising that the practical tests bear out such an opinion. In the report of the New York Agricultural Experiment station about "Brewers' Grains as a Food for Milch Cows" (1884) is found this statement: "We have thus our answer very plainly outlined; the feeding of the brewers' grains was conducive to the flow of milk."

And the official report from Germany testifies to the fact that brewers' grains have a most favorable effect on the secretion of milk; giving a milk of highest quality and that the butter from such milk possessed excellent flavor and keeping qualities.

Both of these fermentations by the lactic and butyric bacteria increase the acidity of the wet grains—they are acid fermentations. The action of both these bacteria are checked by the very acid they produce. And thus it happens that after a certain time a new and different fermentation sets in.

This last fermentation is the result of the activity of the putrefaction bacteria or termobacteria, and this change is the cause of the rotting of the grains. What particularly distinguishes this decomposition from the two previously mentioned is the production of ammonia, which gradually neutralizes the acids formed during the two earlier stages, so that the reaction turns alkaline. The color of the grain is darkened and at the same time the odor becomes more offensive. This change commences on the surface and gradually proceeds downward. It does not take place if the air is excluded, and can therefore easily be prevented. If wet grains are stored in an airtight box and a sprinkling of salt added on top of every ten to twelve inch layer of grains, they will keep in good condition over summer.

But even if the grain becomes slightly putrid, they do not seem to be more injurious to the cow than ripe cheese is to the stomach.

In the experiment of the New York Agricultural station quoted above grains were fed that had become rotten, black and maggoty, but no trace of deterioration could be found in the milk as to taste, flavor and keeping quality as a consequence of such feed.

There is, of course, no necessity of allowing the wet grains to become rotten. Even if the grains in such state are not injurious to the cattle, their food value is lessened. The putrefaction bacteria reduce the carbohydrates and albumoids partly into carbon dioxide and ammonia and thus destroy them.

If the wet grains are dried without delay, they contain very little lactic acid. The question may therefore be raised whether the drying process lessens the value of the grains. A comparative test of the feeding value of moist and dried grains was carried out at the New Jersey Agricultural Experiment station and published in their fifth annual report. It was found that a change from dried grains to moist was followed by an increase from 21.4 pounds per cow to 22.5 pounds daily. The conclusion is, therefore, that the digestibility of the food is slightly diminished by the drying process.

The advantage of the dried grains is that they will keep for any length of time without becoming deteriorated. One pound of dried grain contains as much food as three or four pounds of wet, according to the amount of moisture in the wet grains.

A steeping of half an hour in hot water or five to six hours in cold water restores the dried grain to the same conditions as when fresh from the breweries.

Take all in all it can be said both from a theoretical and practical standpoint that brewers' grains are equal to, if not superior, to any other feed in milk producing properties; that they are wholesome and nutritious, and at the same time the cheapest food.

Every year thousands of tons of dried brewers' grains are shipped from the United States to foreign countries, particularly Germany.

During the year 1907 dried brewers' grains were sold for the following prices per ton f. o. b. the cities named:

Baltimore	\$19.00
Chicago	16.50
Milwaukee	16.50
St. Louis	16.50
Cincinnati	16.00
New Orleans	18.00

St. Louis ..... 16.50  
Cincinnati ..... 16.00  
New Orleans ..... 18.00

The German army has learned by experience that it is not advisable to mix any other feed of like character, or of high nutritive value, with brewers' grains. This was found to be especially true in regard to the feeding of the cavalry horses.

Observations of Maercker and Delbruck, German authorities on the brewing and denatured alcohol industries, proved that 75 liters (18 gallons) of distillers refuse was sufficient to produce the maximum flow of milk, and as the brewers' grains contain more nourishment by far than distillers' refuse, not more than ten to twelve gallons per day, of wet brewers' grains should be given.

It has also been proved that warm feed is more conducive to the flow of milk.

On account of the large amount of water contained in the grains it is advisable to reduce the proportion of such grains for young cattle which are growing, or horses who have to do hard work, as the grains are not suitable for producing solid muscular flesh.

Summing up the results of the observations, we find the following to be about the right quantity per day for various animals:

Grown milch cows	10 to 12 gal.
Grown horses	3 gal.
Grown hogs	18 to 20 gal.
Grown sheep	less than horses

Young growing animals should be fed less grains and more of other food proportionately. Other feed sufficient to make the regular amount must be mixed with the brewers' grains.

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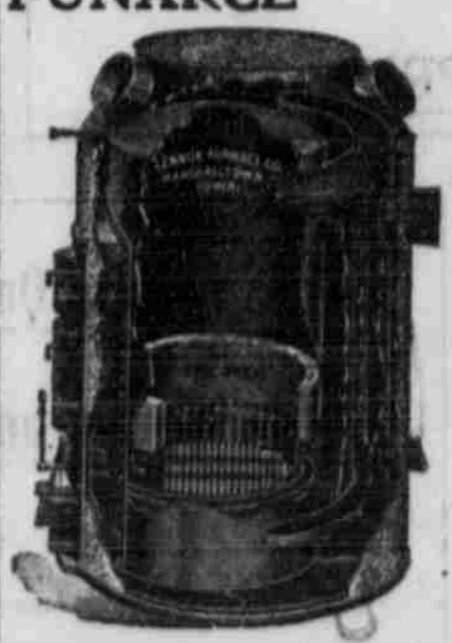
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**Southern Pacific R. R. Time Card**  
Time Card No. 52 Effective Sunday December 20th, 12.01 A. M.  
Toward Portland Passenger.

No. 16.—5:53 A. M. Oregon Express.  
No. 18.—8:40 A. M. Cottage Grove Passenger.  
No. 12.—2:45 P. M. Roseburg Passenger.  
No. 14.—9:13 P. M. Portland Express.  
Toward Portland Freight.  
No. 222.—5:00 P. M. Portland Fast Freight.  
No. 226.—10:40 a. m., way freight arrives.  
No. 225.—11:28 a. m., way freight departs.  
Toward San Francisco Passenger.  
No. 11.—11.03 A. M. Roseburg Passenger.  
No. 17.—6:45 P. M. Cottage Grove Passenger.  
No. 15.—9:56 P. M. California Express.  
No. 13.—2:01 A. M. San Francisco Express.  
Toward San Francisco Freight.  
No. 221.—2:43 A. M. Portland Fast Freight.  
No. 225.—11:28 A. M. Way-Freight

**Oregon Electric Railway Company**  
TIME CARD  
Leaving Salem.

Portland and intermediate stations, local ..... 6:15 a. m.  
Portland and intermediate stations, local ..... 8:05 a. m.  
West Woodburn, Wilsonville, Tualatin, Portland, limited 9:30 a. m.  
Portland and intermediate stations, local ..... 11:03 a. m.  
Portland and intermediate stations, local ..... 2:30 p. m.  
West Woodburn, Wilsonville, Tualatin, Portland, limited 4:02 p. m.  
Portland and intermediate stations, local ..... 5:35 p. m.  
Arriving Salem.  
Portland and intermediate stations, local ..... 8:35 a. m.  
Portland and intermediate stations, local ..... 10:45 a. m.  
Portland, Tualatin, Wilsonville, West Woodburn, limited .. 11:15 a. m.  
Portland and intermediate stations, local ..... 1:25 p. m.  
Portland and intermediate stations, local ..... 4:50 p. m.  
Portland, Tualatin, Wilsonville, West Woodburn, limited .. 5:47 p. m.  
Portland and intermediate stations, local ..... 7:50 p. m.

**CORVALLIS & EASTERN R. R. TIME TABLE**

No. 4—  
Leaves Detroit ..... 1:00 p. m. follows, commencing Jan. 16, 1908; Trains for Corvallis.

No. 8—  
Leaves Albany ..... 7:55 a. m. Arrives at Corvallis ... 8:35 a. m.

No. 10—  
Leaves Albany ..... 8:55 p. m. Arrives at Corvallis ... 4:35 p. m.

No. 6—  
Leaves Albany ..... 7:45 p. m. Arrives at Corvallis ... 8:25 p. m. Trains for Albany.

No. 5—  
Leaves Corvallis ..... 6:30 a. m. Arrives at Albany ..... 7:10 a. m.

No. 9—  
Leaves Corvallis ..... 2:15 p. m. Arrives at Albany ..... 2:55 p. m.

No. 7—  
Leaves Corvallis ..... 6:00 p. m. Arrives at Albany ..... 6:40 p. m.

No. 11 (Sunday only)—  
Leaves Corvallis ..... 11:15 a. m. Arrives at Albany ..... 11:55 a. m.

No. 12 (Sunday only)—  
Leaves Albany ..... 12:35 p. m. Arrives at Corvallis ... 1:18 p. m. For further information apply to WM. McMURRAY, Gen. Pass. Agt., Portland, Oregon. Jno. M. Scott, Asst. G. P. A. Trains from and to Yaquina.

No. 1—  
Arrives at Corvallis ..... 11:00 a. m. Arrive at Albany ..... 5:55 p. m.  
Leaves Yaquina ..... 6:45 a. m. Arrives at Albany ..... 11:58 a. m.

No. 2—  
Leaves Albany ..... 12:35 p. m. Arrives at Yaquina ... 6:15 p. m. Trains to and from Detroit.  
Leaves Corvallis ..... 1:40 p. m.

No. 3—  
Leaves Albany ..... 7:30 a. m. A. M.—6:00, 7:05, 8:05, 10:05.

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