

## THE EFFECT OF FEEDING ON THE COMPOSITION OF MILK AND BUTTER: DRIED YEAST AND DECORTICATED COTTON MEAL.

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IN continuation of the feeding experiments carried out at the Midland Agricultural and Dairy College during the past few years, one was commenced in October of last year in order to compare the feeding value of dried yeast with that of decorticated cotton meal with regard to milk production. Arrangements were made, as before, to note the effects of the feeding on the composition of milk and butter.

Dried yeast is a by-product of the manufacture of beer. It appears on the market in the form of light brown flakes, and is a very bulky substance. It has a rather bitter taste, due to the presence of a small proportion of hop resin, but this does not appear to be detrimental to its use as a food.

Dried yeast has been used extensively on the Continent—especially in Germany—for many years, but it only appeared on the English market a few months before the commencement of the war. Previous to this only comparatively small quantities of yeast had been used for feeding—in its wet state—for pigs, the remainder being sold for manurial purposes or thrown away.

The dried yeast and decorticated cotton meal used in this experiment gave the following results respectively on analysis:

				Dried Yeast.	Decorticated Cotton Meal.
Moisture	...	...	...	9.51	10.55
Oil	...	...	...	0.75	8.91
"Albuminoids"	...	...	...	49.53	34.65
Soluble carbohydrates	...	...	...	32.02	26.86
Fibre	...	...	...	0.00	13.28
Ash	...	...	...	8.19	5.75
				<hr/> 100.00	<hr/> 100.00
Total food units	...	...	...	157.7	135.8

*Experimental Details.*—Following the details of the previous experiments, two sets of cows were selected, four in each set, particular care being taken in the selection with regard to previous milk production (quantity and quality) and periods of lactation.

*Feeding.*—The experiment commenced on October 12, consequently the cows received the bulk of their food in stall, and were obtaining very little grass.

*First Week (October 12 to 19).*—In order to get accustomed to their food, both sets of cows were started on their full experimental ration (given below), but the results of this week were not included in the averages for the two particular foods.

*Daily Ration per Cow.*

Set A.		Set B.	
Basal ration.	1 lb. Egyptian cotton cake.	Basal ration.	1 lb. Egyptian cotton cake.
	1 lb. bran.		1 lb. bran.
	Hay (chopped and long).		Hay (chopped and long).
	Cabbages.		Cabbages.
	3 lb. dried yeast.		3 lb. decorticated cotton meal.

*Second and Third Weeks.*—Rations were the same as above.

*Fourth Week (Transition Period).*—Set A gradually changed from the dried yeast to the decorticated cotton meal, and Set B *vice versa*.

*Fifth and Sixth Weeks.*—The cows comprising Set A received the basal ration plus 3 lb. decorticated cotton meal, while those in Set B were given the basal ration plus 3 lb. dried yeast.

MILK.

Proportionate samples were taken of successive night's and morning's milk from each set of cows, the percentage of fat being determined by the Gerber method and the proteins from the aldehyde figure.

*Fat.*—The percentage of fat varied from 3·1 to 4·6, and the following data were obtained :

*Weekly Averages per Cent.*

	1st Week.	2nd and 3rd Weeks.	4th Week.	5th and 6th Weeks.
Set A ...	3·70	3·71	3·86	3·85
Set B ...	3·55	3·60	3·86	3·84

*Total Average Percentages.*

Set A.	Set B.	From Dried Yeast.	From Cotton Meal.
3·78	3·72	3·77	3·72

It will be seen from the above figures that there is only a slight difference between the two sets of figures. The dried yeast gave a slightly higher percentage of fat, but the difference was very small (0·05 per cent.).

*Protein.*—The aldehyde figure was determined on each sample of milk obtained from the successive night's and morning's milk of each set of cows, and the percentage of protein calculated by the factor 0·171. The following figures were obtained :

*Weekly Averages per Cent.*

	1st Week.	2nd and 3rd Weeks.	4th Week.	5th and 6th Weeks.
Set A ...	3·62	3·60	3·59	3·40
Set B ...	3·59	3·46	3·51	3·32

*Total Average Percentages.*

Set A.	Set B.	From Dried Yeast.	From Cotton Meal.
3·53	3·44	3·46	3·43

Here again the differences are very small, but still in favour of the dried yeast.

## BUTTER.

On alternate days an aliquot portion of the night's and morning's milk from each set of cows was separated, and the cream ripened with a starter and churned after twenty-four hours.

The following determinations were made on the butter fat :

Reichert-Meissl value.  
Kirschner value.  
Polenské value.  
Refractometer figure.

*Reichert-Meissl Value.*—The following averages were obtained :

	1st Week.	2nd and 3rd Weeks.	4th Week.	5th and 6th Weeks.
Set A ...	27·02	26·87	27·54	26·53
Set B ...	28·60	28·99	27·90	28·61

Set A.	Set B.	From Dried Yeast.	From Cotton Meal.
26·91	28·60	27·74	27·76

We can conclude from the above figures that the feeding exerted no individual influence on this value.

*Kirschner Value.*—The following average figures were obtained :

	1st Week.	2nd and 3rd Weeks.	4th Week.	5th and 6th Weeks.
Set A ...	19·50	20·39	20·83	20·20
Set B ...	21·00	22·84	22·45	21·60

Set A.	Set B.	From Dried Yeast.	From Cotton Meal.
20·29	22·09	20·99	21·62

There is a slight increase (0·63) in this figure in favour of the cotton meal. It is, however, too small to indicate any appreciable difference in the composition of the butter fats.

*Polenské Value.*—The following average figures were obtained :

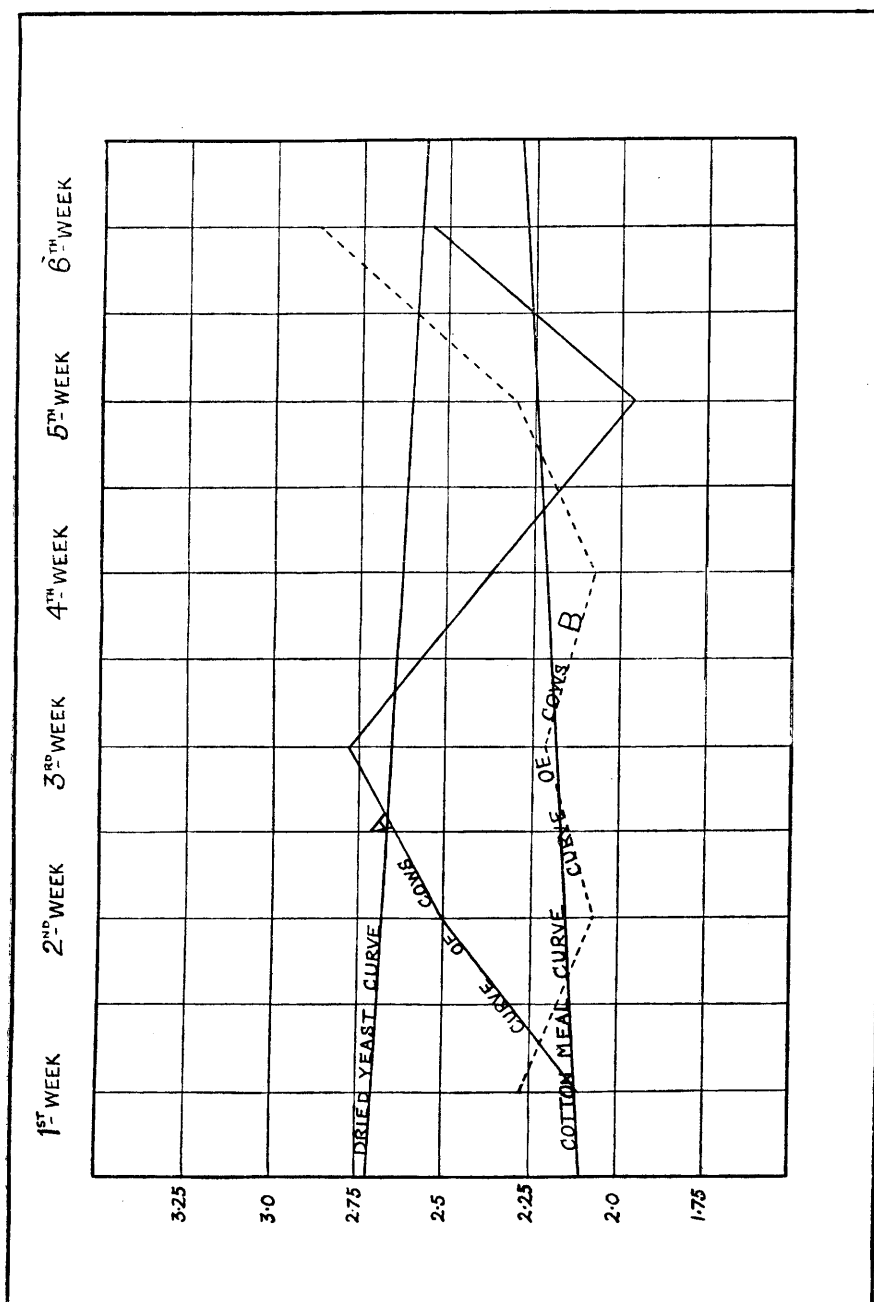
	1st Week.	2nd and 3rd Weeks.	4th Week.	5th and 6th Weeks.
Set A ...	2·10	2·66	2·37	2·26
Set B ...	2·27	2·16	2·07	2·59

Set A.	Set B.	From Dried Yeast.	From Cotton Meal.
2·39	2·30	2·62	2·21

We find here a considerable variation due to the feeding, the dried yeast causing an

increase of 0.41 in the averages of this number. A graphical representation of these figures is shown in the following diagram :



POLSKENSKÉ VALUES.

*Refractometer Figure.*—Readings were taken at 35° C., using a Zeiss butyro refractometer. The average figures are as follows :

		1st Week.	2nd and 3rd Weeks.	4th Week.	5th and 6th Weeks.
Set A	...	47·25	46·68	46·37	46·29
Set B	...	46·67	46·36	46·37	45·82
	Set A.	Set B.	From Dried Yeast.	From Cotton Meal.	
	46·57	46·23	46·25	46·32	

There will be noticed a slight increase in favour of the cotton meal, but the variation (0·07) is too small to warrant further comment.

*Quality of the Butter.*—Practically no differences were noticeable between the two sets of samples of butter. Both were equally good as regards flavour and texture. The cotton meal butters gave, as a rule, a rather better colour than the dried yeast butters. No trace of a bitter flavour was noticed in the dried yeast samples.

#### CONCLUSIONS.

From these results it is evident that dried yeast is an excellent food for dairy cows as regards the quality of milk and butter. In spite of this substance being very low in oil content, the deficiency of oil in the ration does not appear to have influenced the quality of the milk or butter fat.

The only considerable variation in the composition of the fat occurred in the Polenské value, where the dried yeast feeding gave the higher figures.

We desire to tender our thanks to Miss B. Manners, N.D.D., for superintending the churning of the butter samples ; and to Mr. John Dunlop, B.Sc., for facilities in the collection of the samples of milk.

#### YIELD OF MILK.

It has been suggested to us that it would be of interest to publish, in conjunction with this paper, the yields of milk obtained in this experiment. We have therefore approached Mr. John Dunlop, head of the Agricultural Department of Kingston College, and he has very kindly placed the necessary data at our disposal.

#### *Weekly Milk Yields (in Pounds):*

		SET A.					
		1st Week.	2nd Week.	3rd Week.	4th Week.	5th Week.	6th Week.
Cow No. 1	...	187 $\frac{3}{4}$	198 $\frac{1}{2}$	194 $\frac{1}{4}$	187	165 $\frac{1}{4}$	156 $\frac{3}{4}$
„ No. 2	...	177 $\frac{3}{4}$	176 $\frac{3}{4}$	160 $\frac{1}{4}$	146 $\frac{1}{4}$	136	114
„ No. 3	...	193	195 $\frac{1}{2}$	195 $\frac{1}{2}$	170	179 $\frac{1}{2}$	153 $\frac{1}{2}$
„ No. 4	...	245 $\frac{1}{2}$	250 $\frac{1}{4}$	231 $\frac{1}{2}$	211 $\frac{1}{2}$	190	176
Total weight of milk		804	821	781 $\frac{1}{2}$	714 $\frac{3}{4}$	670 $\frac{3}{4}$	600 $\frac{1}{4}$
			Dried Yeast.			Decorticated Cotton Meal.	

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SET B.						
	1st Week.	2nd Week.	3rd Week.	4th Week.	5th Week.	6th Week.
Cow No. 5 ... ..	168 $\frac{3}{4}$	169 $\frac{1}{4}$	175 $\frac{3}{4}$	162 $\frac{3}{4}$	164 $\frac{3}{4}$	143
„ No. 6 ... ..	238 $\frac{1}{2}$	228 $\frac{1}{4}$	205 $\frac{1}{2}$	204 $\frac{1}{4}$	198 $\frac{3}{4}$	178 $\frac{1}{4}$
„ No. 7 ... ..	178 $\frac{1}{4}$	183 $\frac{1}{4}$	151 $\frac{3}{4}$	101	126 $\frac{1}{4}$	125
„ No. 8 ... ..	265 $\frac{1}{4}$	271 $\frac{1}{4}$	257 $\frac{1}{2}$	234 $\frac{1}{4}$	216	200 $\frac{1}{4}$
Total weight of milk	850 $\frac{3}{4}$	852	790 $\frac{1}{2}$	702 $\frac{1}{4}$	705 $\frac{3}{4}$	646 $\frac{1}{2}$
		Decorticated Cotton Meal.			Dried Yeast.	

*Total Weight of Milk.*

	From Dried Yeast.	From Decorticated Cotton Meal.
Cow No. 1 ... ..	392 $\frac{3}{4}$	322
„ No. 2 ... ..	337	250
„ No. 3 ... ..	391	333
„ No. 4 ... ..	481 $\frac{3}{4}$	366
„ No. 5 ... ..	307 $\frac{3}{4}$	345
„ No. 6 ... ..	377	433 $\frac{3}{4}$
„ No. 7 ... ..	251 $\frac{1}{4}$	335
„ No. 8 ... ..	416 $\frac{1}{4}$	528 $\frac{3}{4}$
	2954 $\frac{3}{4}$	2913 $\frac{1}{2}$

This indicates an increase of 41 $\frac{1}{4}$  lb. of milk in favour of feeding with dried yeast.

Since the average percentage of milk fat was 3·77 for the dried yeast, and 3·72 for the decorticated cotton meal, we get the following data :

*Total Weight of Milk Fat.*

From Dried Yeast.	From Decorticated Cotton Meal.
111·4 lb.	108·4 lb.

This shows an increase of 3 pounds of milk fat from feeding with dried yeast during the four weeks.

THE MIDLAND AGRICULTURAL AND DAIRY COLLEGE.

