BULLETIN No. 121. NOVEMBER, 1902.

ALABAMA.

# Agricultural Experiment Station

OF THE

## Agricultural and Mechanical College,

AUBURN.

---

# DAIRY HERD RECORD AND CREAMERY NOTES.

---

By R. W. CLARK.

---

MONTGOMERY, ALA..
THE BROWN PRINTING CO., PRINTERS AND BINDERS.
1902.

COMMITTEE OF TRUSTEES ON EXPERIMENT STATION.

THOS. WILLIAMS.....Wetumpka.

JONATHAN HARALSON.....Selma.

STATION COUNCIL

C. C. THACH.....President.

B. B. ROSS.....Chemist.

C. A. CARY, D. V. M.....Veterinarian.

J. F. DUGGAR.....Agriculturist.

E. M. WILCOX.....Biologist and Horticulturist.

J. T. ANDERSON.....Associate Chemist.

ASSISTANTS.

C. L. HARE.....First Assistant Chemist.

T. BRAGG.....Second Assistant Chemist.

J. C. PHELPS.....Third Assistant Chemist.

T. U. CULVER.....Superintendent of Farm.

R. W. CLARK.....Assistant Agriculturist.

The Bulletins of this Station will be sent free to any citizen of the State on application to the Agricultural Experiment Station, Auburn, Alabama.

## DAIRY HERD RECORD AND CREAMERY NOTES

BY R. W. CLARK.

Can dairying be made profitable in Alabama is a question often asked.

Short, mild winters, long pasture seasons, and a great variety of soiling crops, along with the output of the oil and rice mills, afford a large field from which to select food stuffs. The State is badly in need of such profits as accrue from dairying and live stock growing in general. The appearance of our rural communities, the impoverished condition of our soils, the tremendous growth of the commercial fertilizer trade, and the vast amount of money (the proceeds of our only money crop, cotton) spent every year for hays, grains, meat and dairy products, are convincing arguments against the exclusive growing of corn and cotton and a strong one in favor of diversified farming.

Dairying builds up the soil. From 75 to 90 per cent. of the fertilizing constituents of the food consumed is returned in the manure. Dairying makes the farmer independent by giving him, daily, a salable product. Food consumed one day is turned into cash the next, and much of the risk incident to making a crop of corn or cotton is avoided. No line of farming in the South is so certain of returns as dairying when intelligently pursued. The long growing season makes the dairyman quite independent of drought, a great menace at times in some sections, especially where the summers are short. Our climate is most salubrious. Many of the cattle diseases common in other sections, caused by close

housing are almost unknown. Cattle can be turned out every day so far as temperature is concerned, but they should be housed at night during the winter.

The demand in the South for good dairy products is always strong and especially so at the present time and it is likely to continue so for many years. Cheese sells for 12 to 20 cents per pound, butter 20 to 35 cents per pound, and whole milk for 20 to 40 cents per gallon re-retail.

In calculating the cost of food for each animal in the station herd the value of home-grown stuff was estimated. Bought stuff is figured at its market price.

| | Price per ton for the year 1900-01. | Price per ton for the year 1901-02. |
|---|---|---|
| Hay | $10 00 | $10 00 |
| Ensilage | 2 00 | 2 00 |
| Oat straw | 5 00 | 5 00 |
| Cotton seed hulls | 4 00 | 6 00 |
| Soiling crops (fed green) | 2 00 | 2 00 |
| Wheat bran | 20 00 | 25 00 |
| Cotton seed | 9 00 | 12 00 |
| Cotton seed meal | 20 00 | 22 00 |
| Rice polish | ..... | 20 00 |
| Skim milk | 25c per cwt. | 30c per cwt. |

The value placed on oat straw in the above table is too low. Pasturage is estimated at fifty cents per month for cows and grown animals and thirty cents per month for young animals.

The following record shows what the station herd did for the two years ending September 1, 1902:

SEPTEMBER 1, 1900, TO SEPTEMBER 1, 1901.

| Name of Cow. | Breed. | Age at beginning of milking year. | Average weight—Pounds. | Milk—Pounds. | Butter—Pounds. | Cost of keep, including pasture. | Cost of butter per pound. | Cost of milk per gallon. | Profit on butter at 25c. per poond. |
|---|---|---|---|---|---|---|---|---|---|
| | | Yr Mo | | | | | Cents | Cents | |
| Ada ..... | Jersey.. | 7 | 828 | 3,492.8 | 168.4 | $24.29 | 14.4 | 5.7 | $17.85 |
| Annie .... | Jersey.. | 10- 2 | 804 | 3,740.4 | 205.4 | 21.09 | 10.2 | 4.6 | 30.39 |
| Ida ..... | Jersey.. | 6 | 810 | 4,665.7 | 232.7 | 24.90 | 10.7 | 4.4 | 33.27 |
| Houron ... | Jersey.. | 2 | 649 | 3,095.6 | 216.5 | 20.69 | 9.5 | 5.3 | 33.55 |
| Susan .... | Jersey.. | 2- 6 | 614 | 5,065.8 | 331.7 | 24.28 | 7.3 | 3.8 | 58.71 |
| Queen .... | Holstein | 9- 4 | 1003 | 4,676.3 | 215.3 | 28.15 | 13.0 | 4.9 | 25.83 |
| Hypatia ... | Jersey.. | 5- 1 | 767 | 4,218.6 | 246.0 | 23.56 | 9.5 | 4.6 | 38.13 |
| Average .. | ..... | ..... | 782 | 4,136.4 | 230.8 | $23.85 | 10.6 | 4.7 | ..... |

Average per cent. of fat, 4.7.

SEPTEMBER 1, 1901, TO SEPTEMBER 1, 1902.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Ada ..... | Jersey.. | 7-10 | 805 | 4,581.3 | 234.7 | $30.97 | 13.2 | 5.5 | $27.69 |
| Annie .... | Jersey.. | 11 | 880 | 4,806.6 | 264.8 | 30.21 | 11.4 | 5.1 | 35.99 |
| Ida ..... | Jersey.. | 7- 1 | 847 | 3,519.9 | 193.5 | 22.74 | 11.7 | 5.3 | 25.73 |
| Houron ... | Jersey.. | 3 | 786 | 2,271.2 | 159.1 | 15.43 | 9.6 | 5.5 | 24.50 |
| Susan .... | Jersey.. | 3- 8 | 676 | 4,316.0 | 297.9 | 26.31 | 8.8 | 4.9 | 48.25 |
| Hypatia .. | Jersey.. | 6 | 814 | 4,290.9 | 225.0 | 24.93 | 11.0 | 4.7 | 31.50 |
| Hazena ... | Jersey.. | 2 | 662 | 3,321.5 | 217.7 | 22.49 | 10.3 | 5.5 | 32.00 |
| Lukie .... | Jersey.. | 3- 2 | 692 | 4,586.5 | 286.0 | 24.75 | 8.6 | 4.9 | 47.01 |
| Clementina. | Red Poll | 2-11 | 1131 | 2,262.2 | 113.1 | 20.90 | 18.4 | 7.5 | 7.46 |
| Average .. | ..... | .... | 810.3 | 3,772.9 | 221.3 | $24.30 | 11.4 | 5.4 | ..... |

Average per cent. of fat, 5.00.

The greater profit for the year 1900 and 1901 is due to lower prices of foodstuffs, more copious feeding of ensilage during the winter and a better summer pasture. The amount of grain in the ration usually depended upon the character of the grain, the character of the fodder and the condition of the animals. All things being the same, a well developed cow several months along in lactation received less grain per 1000 pounds live

weight than a cow not so well developed and not so far along in lactation. With cow pea hay and ensilage the grain part of the ration rarely exceeded 6 and 7 lbs. per day, and often dropped to 2 and 3 lbs. per day. Indiscriminate feeding of grain and poor cows are usually the cause of losses and of small profits to the dairyman. Liberal, judicious feeding and kind treatment go hand in hand.

Ada, although possessing good dairy type, carries considerable flesh, and during the year 1900 and 1901 gave a small profit, it being an off year with her. Clementina is the poorest cow. She is of the beef type and is well covered with heavy flesh. The food cost of Houron for the year 1901 and 1902 is light. She milked heavily when fresh, but began to dry off early and then cow pea hay was partially substituted for grain. Her cost of keep ($15.43) for the year 1901 and 1902 is low because she calved in the summer, did her best on grass and was far along in lactation by winter. This allowed light feeding of grain during the winter (2 lbs. per day), cow pea hay, sorgum hay and oat straw forming the greater part of her ration. The advisability of so light a grain ration is questioned. A long pasture season means cheap production.

Young cattle are usually turned to pasture the latter part of March and are not taken up until about the middle of December. Cows are turned to pasture the middle of April, and then receive grain only while in milk. They are soiled in late fall but depend more or less on pasture until the first of December.

On the whole the yearly productions are smaller than they ought to be. A cow should give from 5000 to 7000 lbs. of milk per year and make not less than 300 lbs. of butter.

COST OF RAISING HEIFER CALVES.

Hazena, a registered Jersey was dropped October 22, 1899, and weighed 56 lbs. The first year she consumed 159 lbs. whole milk, 2738 lbs. of skim milk, 66 lbs. bran, 224 lbs. of hay and was on pasture 161 days. When one year old she had cost $12.86 and weighed 435 pounds. The second year she received sorghum hay, ensilage, oat straw, cornstover and a little cotton seed and bran, and was on pasture 224 days. The cost of keep the second year was $9.09 and she weighed 665 lbs. She dropped her first calf when lacking seven days of being two years old. Total cost of keep up to the time of calving was $21.95.

Ella, a registered Jersey, was dropped August 12, 1900, and weighed 50 lbs. The first year she consumed 259.5 pounds of whole milk, 1195 pounds skim milk, 180 pounds bran, 63 pounds of corn meal, 405 pounds hay and was on pasture 112 days. She cost, including pasture, during her first year, $11.65, and weighed when 12 months old 340 pounds.

The second year, aside from pasture, she received cotton seed, cornstover, oat straw and ensilage. She dropped her first calf when 22 months old. The cost of keep the second year up to time of calving was $7.61, making a total cost of $19.26.

Peggy, another Jersey, was dropped July 23, 1900, and weighed 36 pounds. The first year she consumed 287.5 pounds whole milk, 1097 pounds skim milk, 191.6 pounds bran, 67.8 pounds corn meal, 399 pounds hay and was on pasture 91 days. She cost $11.49 and weighed 350 pounds when one year old. The second year she received the same kind of feed as Ella. She dropped her first calf when just two year old. The cost

of keep the second year was $7.99, and the total cost of keep was $19.48.

Jenny, a registered Jersey, was dropped November 24, 1900, and weighed 38 pounds. The first year she consumed 52 pounds whole milk, 1740 pounds skim milk, 45.5 pounds bran, 175 pounds hay and was on pasture 217 days. She cost $9.60 and weighed 295 pounds at one year old.

The second year she received the same kind of food as Ella and Peggy. By reason of an accidental service she dropped her first calf June 24, 1902, at nineteen months of age, and then weighed 445 pounds. The cost of keep for the second year was $7.61, and the total cost of keep for nineteen months was $17.21.

Alamarzena, another registered Jersey, was dropped April 16, 1901, and weighed 50 pounds. She received the same kind of food as the others mentioned above. When one year old she weighed 350 pounds and cost $13.66.

Mabel, Hazena's first calf, was dropped October 15, 1901, and weighed 43 pounds. She consumed 92 pounds whole milk, 1191.2 pounds skim milk, 322.7 pounds hay, 204.2 pounds bran, and was on pasture 165 days. The total cost of keep at one year old was $11.40.

*Summary of Cost of Raising Heifer Calves.*

| NAME. | Cost of keep the first year. | Cost of keep the second year. | Total cost of keep to time of calving. |
|---|---|---|---|
| Hazena | $12 86 | $9 09 | $21 95 |
| Jenny | 9 60 | 7 61 | 17 21 |
| Peggy | 11 49 | 7 99 | 19 48 |
| Ella | 11 65 | 7 61 | 19 26 |
| Alamarzena | 13 66 | ..... | ..... |
| Mable | 11 40 | ..... | ..... |
| Average | $11 77 | $8 07 | $19 47 |

Ella, Peggy and Jenny are undersize and would not have been bred so early as they were had not a neighbor's bull, in an enjoining pasture, broken into the Station herd. They are very small, due mainly to early breeding and to a small consumption of skim milk when very young calves.

There can be no set age at which young dairy heifers should be bred. If they are well developed, strong and thrifty they should drop their first calf when 24 to 30 months old.

Heifers should be kept growing from the time they are born until they reach maturity. A shortage of a few dollars worth of feed on the calf will mean a loss of many dollars at the pail when the calf becomes a cow. If material advancement is to be made in animal breeding the pregnant mother must be well fed. The fœtus should be well nourished from the time the dam conceives until it is dropped and has reached the goal to which it is destined.

### REMOVING BITTER WEED TASTE FROM CREAM.

During the last three years considerable effort has been made to find a means by which the odor and taste of wild onion and bitter weed may be removed from milk and cream. In the spring of 1901 the writer was requested to try a patent compound claimed to remove all kinds of weedy taste from milk. It was fed to the Station herd according to the directions of the manufacturer for four weeks, in which time it proved to be an absolute failure. Cooking soda (saleratus) was also given a like trial but failed of the purpose claimed for it by some people. Having failed so far to find anything that when

fed to the cows would remove weedy taste in the milk, the next step was treating the milk and cream.

The following are creamery notes taken in the carrying out of this work:

| *Treatment of cream before running through the separator.* | *Notes on treated cream after coming from the separator; the untreated cream being very bitter* |
|---|---|
| One gallon of cream was thoroughly mixed with 2 gallons of water, at a temperature of 150° F., in which one ounce of saltpeter had been thoroughly dissolved. | Bitterness removed, but flavor of cream not good, rather soapy. |
| Same as above, but no saltpeter used. | Not a trace of bitterness in the washed cream. |
| One gallon of cream was thoroughly mixed with 2 gallons of water at a temperature of 160° F. | Not a trace of bitterness in the cream, and of a fine flavor. |
| One gallon of cream was thoroughly mixed with 2 gallons of water at a temperature of 160° F., and containing 1 oz. of saltpeter. | Bitterness removed, but cream not very good. |
| One gallon of cream was thoroughly mixed with 2 gallons of water at a temperature of 160° F. | Bitterness removed. |
| One gallon of cream was thoroughly mixed with 2 gallons of water at a temperature of 74° F. | Bitterness removed. |
| One gallon of cream was thoroughly mixed with 2 gallons of water at a temperature of 74° F. | Excellent cream, not a trace of bitterness. |
| One gallon of cream was thoroughly mixed with 2 gallons of water at a temperature of 68° F. | A slight trace of bitterness in the cream, but this would not ordinarily be detected. |
| One gallon of cream was thoroughly mixed with 2 gallons of water at a temperature of 69° F. | Slight trace of bitterness in the cream. |

Bitter weed taste was removed entirely from cream by thoroughly mixing it with two or more parts of water at any temperature above 70 deg. Fahrenheit, and then running the whole through the separator.

Saltpeter dissolved in water was tried as an aid in removing the bitterness, but as good results were secured without it as with it.

Rapidly and slowly heating milk and cream to various high temperatures did not remove bitterness but often imparted a cooked taste.

Butter made from washed cream (as above) was pronounced free of all bitterness by the Station customers. Butter made from unwashed cream was decidedly bad and was often rejected by the customers. No means were found to remove the bitter weed taste from whole milk

In the spring of 1902, milk and cream were treated for the wild onion flavor the same as in the previous year for the bitter weed taste.

The following are the creamery notes taken in the course of this work:

| *Treatment of cream before running it through the separator.* | *Notes on the treated cream after coming from the separator.* |
|---|---|
| One gallon of cream was thoroughly mixed with three gallons of water at a temperature of 90° F. | Flavor not removed; cream still bad. |
| One gallon of cream was mixed with two gallons of water, at a temperature of 90° F., in which was dissolved one ounce of saltpeter. | Flavor bad, and made more so by the use of saltpeter. |
| Same as preceding treatment. | Flavor still bad. |
| Same as preceding treatment, except temperature of water 100° F. | Flavor still bad. |
| Same as preceding treatment. | Flavor bad. |
| One gallon of cream was mixed with two gallons of water at a temperature of 212° F., in which was dissolved one ounce of saltpeter. | Flavor still bad. |
| Same as preceding treatment. | Flavor very bad, and butter from this cream was rejected by the station customers. |
| Same as preceding treatment. | Same result as above. |
| One gallon of cream was mixed with two gallons of water, at a temperature of 95° F. | Cream bad. |

The odor and taste of wild onion was not removed from the milk and cream by any method of treatment employed. Cream was washed as above with and without saltpeter, and at different temperatures, but the onion taste and flavor were not removed. Butter made from the treated cream was rejected by the Station customers. Rapidly and slowly heating milk and cream to various high temperatures did not remove the objectionable qualities imparted by the onion.

Cream was thoroughly mixed with ether and carbon bisulphide and these were then evaporated. The onion flavor was partly removed in both cases, but the cream retained enough of the ether and carbon bisulphide to render it unfit for use.

The compound in the bitter weed which gives milk a bitter taste is held very largely, if not entirely, in the milk serum. The more completely the serum is separated from the fat the less is the degree of bitterness in the cream. The compound in the wild onion which gives milk a bad flavor is held very largely, if not entirely, by the fat, and the more completely the serum is separated from the fat the more concentrated is the onion flavor in the cream.

Washing cream makes it thick and necessitates adding considerable skim milk, which may be a starter, to bring it to a proper consistency before churning. If a large amount of starter is used to thin with, a shorter length of time is required for ripening, therefore the cream should be watched closely until the proper degree of ripeness is reached.

The term starter as used above means sour milk that is used to sour the cream.

Cream containing bad flavors but not sour enough to be clabbered, can often be improved by washing. The thicker the cream the less likely is it to sour and clabber.

## DIFFERENT SYSTEMS OF CREAMING.

The question is often asked, does it pay to run a cream separator for a small amount of milk.

The following table gives the average per cent. of fat left in the skim milk by the different systems of creaming, but at different temperatures. As the use of ice, on the average farm in Alabama, is generally out of the question, it was not used, but conditions were taken as they exist on the average farm, and the results secured are believed to be fairly representative of practical conditions. This work was done in August when the weather was hot, except that one of the deep setting tests was made in April.

SEPARATOR VERSUS DEEP SETTING VERSUS SHALLOW PANS.

| System. | Temperature, Degrees F. | Per cent. of fat in skim milk. | | |
|---|---|---|---|---|
| | | Average. | Min. | Max. |
| Separator | 81.0 | .03 | .01 | .20 |
| Deep setting | 50.0 | .54 | .30 | 1.10 |
| Deep setting | 83.6 | 1.30 | .80 | 1.80 |
| Shallow pans | 85.7 | .60 | .35 | 1.00 |

There is a heavy loss in creaming milk by the gravity system. During hot weather the loss may be one-fourth to one-third of the total butter fat. Shallow pans give better results than deep cans. With the separator the loss of fat in the skim milk was very slight, hardly worth considering. Where facilities for handling cream and butter can be had, and where the skim milk is practically wasted, it will pay, according to the data in the above table, to have a separator for even as small a number as two good cows. These two cows together ought to produce 12,000 pounds of milk per year. One-eighth of the whole milk being cream, there will be 10,500

pounds of skim milk. As the separator leaves only .03 of one per cent. of fat in the skim milk, there will be a loss during the year of 3.1 pounds of butter fat, the equivalent of 3.6 pounds of butter. With deep setting, at a temperature of 83.6 degrees Fahrenheit (a close approximation to our summer temperature), there will be a loss of 159 pounds of butter in the skim milk, between one-third and one-fourth of the total. With shallow pan setting at a temperature of 85.7 degrees Fahrenheit, the loss will be 73.5 pounds of butter in the skim milk. Along with the saving of butter fat a separator gives better cream, a better butter and better skim milk. The cream separator is indispensable to the dairyman of the Gulf States of the South.

## THE EFFECT OF FOOD ON THE MELTING POINT AND VOLATILE ACIDS OF BUTTER.

In the year 1901 feeding experiments were carried on to ascertain the effect of different amounts of cotton seed, cotton seed meal and cotton seed hulls, in combination with bran and sorghum hay, on the composition of butter, and for this purpose six cows were divided into two lots of three each. They were fed in the barn all that they would eat up clean twice a day, and were confined to stalls during the night. One week of preparatory feeding preceded the experiment proper, which lasted for four weeks.

*FOOD AND AVERAGE COMPOSITION OF BUTTER FROM EACH KIND OF FOOD.*

| Group. | Ration. | Melting point of butter degrees centigrade. | C. C. of alkali required to neutralize the volatile acid in 2.5 grains of fat. |
|---|---|---|---|
| I | 9 pounds cotton seed<br>3 pounds bran<br>10 pounds sorgum hay | 41.1 | 13.2 |
| II | 5¼ pounds cotton seed meal<br>3 pounds bran<br>10 pounds cotton seed hulls | 40.7 | 13.47 |

There is practically no difference in the melting point and volatile acids of the butter made from the above rations.

Analysis of a sample of Northern butter, made at the same time, in which no cotton seed products were fed, gave a melting point of 24.5 degrees (centigrade), and required 13.5 c. c. of alkali to neutralize the volatile acids in 2.5 grams of fat.

During April and May nine cows were divided into four lots of two cows each and one lot of one cow. They were fed grain night and morning and confined to the barn only while eating their grain and being milked. Pasture was the only forage received and consequently all received of it alike. The feeding period proper lasted three weeks.

*FOOD AND AVERAGE COMPOSITION OF BUTTER FROM EACH KIND OF FOOD.*

| Group. | Ration. | Melting point of butter degrees centigrade. | C. C. of alkali required to neutralize the volatile acid in 2.5 grams of fat. |
|---|---|---|---|
| I | 3 pounds cotton seed<br>1 pound bran | 41.76 | 10.6 |
| II | 3 pounds cotton seed meal<br>1 pound bran | 41.92 | 9.6 |
| III | 5 pounds cotton seed meal<br>1 pound bran | 39.6 | 10.37 |
| IV | 8 pounds cotton seed meal<br>1 pound bran | 40.84 | 10.1 |
| V | 4 pounds bran | 38.6 | 9.65 |

Feeding cotton seed and cotton seed meal to cows on pasture, had a slight effect in hardening the butter, increasing the melting point from 1 to 3 degrees centigrade. Three pounds of cotton seed meal and one pound of bran gave as hard a butter as eight pounds of cotton seed meal and one pound of bran.

The volatile acids in the butter were not materially affected by the different rations.

## MILK PRESERVATIVES.

A study of milk preservatives for composite testing, was made in order to ascertain the one best suited to our conditions. Potassium bichromate, mercuric chloride and formalin were used. Each cow's milk was sampled as soon as drawn, and the sample taken was put into a

glass jar. At the end of the week these composite samples of milk were tested for butter fat and notes taken, which are herewith presented.

| Potassium bichromate, grains used for one pint of milk. | Mercuric chloride, grains used for one pint of milk. | Formalin. | Season. | Remarks. |
|---|---|---|---|---|
| 3.08 | ..... | ..... | Winter... | Test very good. |
| 3.82 | ..... | ..... | Winter... | Test fairly good. |
| 4.62 | ..... | ..... | Winter... | Test fairly good. |
| 5.35 | ..... | ..... | Winter... | Test fairly good. |
| ..... | 3.85 | ..... | Winter... | Test very poor. |
| ..... | 4.62 | ..... | Winter... | Test not satisfactory |
| ..... | 6.16 | ..... | Winter... | Test not satisfactory |
| ..... | 7.7 | ..... | Winter... | Test not satisfactory |
| 3.08 | ..... | ..... | Summer.. | Test not satisfactory |
| 3.82 | ..... | ..... | Summer.. | Test not satisfactory |
| 4.62 | ..... | ..... | Summer.. | Test not satisfactory |
| 5.35 | ..... | ..... | Summer.. | Test not satisfactory |
| ..... | 3.85 | ..... | Summer.. | Test not satisfactory |
| ..... | 4.62 | ..... | Summer.. | Test not satisfactory |
| ..... | 6.16 | ..... | Summer.. | Test not satisfactory |
| ..... | 7.7 | ..... | Summer.. | Test not satisfactory |
| ..... | ..... | ½%mixture | Summer.. | Very satisfactory test, clear, no sediment below fat line. |

Three to four grains of potassium bichromate in a pint of milk served fairly well as a preservative, this material being best in the winter but requiring too frequent duplication of test in the summer when the weather is hot. It causes a more or less leathery condition of the cream which is difficult to re-emulsify, and in hot weather the milk often undergoes a fermentation which causes a loss of butter fat. The milk should not be over one week old before being tested.

Mercuric chloride proved unsatisfactory in nearly

every test with composite samples. The tests were very ashy.

One-half per cent. formalin (40 per cent. formaldehyde) proved the most satisfactory of the three preservatives tried and is now being used entirely at the Station. Half a teaspoonful of formalin to one pint of milk makes a one-half per cent. mixture.

Potassium bichromate, mercuric chloride and formaline are poisonous when taken internally and should be handled with care.

One-half teaspoonful of formalin will keep a pint of milk in good condition for testing for one month in any season.

## CHURNING EXPERIMENTS.

During the winter of 1900 and 1901 experiments were carried on to ascertain the degree to which cream should ripen before being churned. It has usually been assumed that a fairly high per cent. of acid and a high temperature are necessary in churning the cream of milk from cows receiving cotton seed or cotton seed meal.

*Moderate acidity and high temperature compared with low acidity and low temperature.*

| No. of trials. | Pounds of cream churned. | Per cent. fat in cream. | Per cent. acid in cream. | Temperture of churning. | Minutes churning. | Per cent. fat in Buttermilk. | Melting point of butter. Degrees centigrade. |
|---|---|---|---|---|---|---|---|
| 14 | 18 | 33 | .37 | 70 | 16.7 | .56 | 37.4 |
| 10 | 18 | 33 | .25 | 63 | 33.4 | .19 | 39.6 |

In the 14 trials with an acidity of .37 per cent. and a temperature of 70 degrees Farenheit, the minimum and maximum per cent. of fat in the buttermilk was .1 and 2.5 per cent. respectively. In the ten trials with an acidity of .25 per cent. and a temperature of 63 deg. Fahrenheit, the minimum and maximum per cent. of fat in buttermilk was .05 and .5 per cent. respectively. The most exhaustive churning was made in 40 minutes at a temperature of 67 deg. Fahrenheit, with an acidity of .49 per cent. A ten gallon churn was used in this work. All of the cream was from cows receiving a heavy ration of uncooked cotton seed. The tests were made during the time when cows were on dry food.

In connection with this work notes were taken on the churnability of cream containing high and low percentages of fat. Cream containing 50 per cent. fat or more stuck to the sides of the churn and usually had to be thinned with water before the churning was complete. The best churnings were made with cream containing 33 per cent. fat. Cream containing less than 25 or 30 per cent. fat did not churn well, it being too thin. The cream containing 50 or 60 per cent. fat had better keeping qualities than the cream containing 25 or 30 per cent. fat, because a large per cent. of the bacteria that cause trouble in the latter was eliminated in the skim milk. In ripening thick cream a large quantity of a weak starter should be used. This will give good consistency to the cream and consequently a better churning will be secured.

*Churning whole milk with dash and barrel churns.* As nearly all of the butter made in Alabama is made from whole milk by the use of the dash churn a few trials of comparing the dash churn with the barrel churn were considered expedient.

DASH CHURN VS. BARREL CHURN.

12-GALLON BARREL CHURN.

| Pounds of milk churned. | Temp. of milk when churned, Degrees Fah. | Minutes churning. | Per cent. of fat in Buttermilk. |
|---|---|---|---|
| 16.2 | 66 | 55 | .55 |
| 14. | 85 | 23 | .42 |
| 12. | 85 | 13 | 1. |
| 25. | 70 | 60 | 1. |
| 27. | 75 | 16 | .5 |
| Ave. 18.8 | 76.2 | 33.4 | .69 |
| | 3-GALLON DASH CHURN. | | |
| 11. | 75 | 16 | .5 |
| 11. | 80 | 15 | .5 |
| 8. | 85 | 15 | 1. |
| 11. | 85 | 40 | .4 |
| 11. | 66 | 10 1 | .55 |
| Ave. 10.4 | 78.2 | 37.4 | .59 |

According to the above reported trials, with their wide variations, the dash churn gives practically the same results as the barrel churn, and vise versa. In the tests reported above the milk, when churned, was in good condition, and was well clabbered.

With the barrel churn the buttermilk can be drawn off from the bottom, and the butter washed better and more easily than with the dash churn. This is the only advantage that the author can see of the barrel churn over the dash churn for churning whole milk.

The method of churning whole milk is practicable and advisable in the South during the summer months when the weather is hot and ice can not be had, and when all of the buttermilk is consumed by the family. Fairly good butter for local and immediate consumption can be made if the milk is cooled as much as possible when drawn, and sour milk (starter) of good quality added immediately. When the temperature can not be controlled to any extent the ripening (souring) should begin at once.

Modern dairy methods must be adopted by the South if it receives the full benefit of its natural dairy advantages.

---

## SUMMARY.

1. The average yearly production per cow in the Station herd, for the two years ending September 1, 1902, was 3954.6 pounds of milk and 226 pounds of butter. The average yearly cost of keep per cow was $24.07; the average cost of butter per pound was 11 cents, and the average cost of milk per gallon was 5.5 cents.

2. The average cost of raising a heifer calf the first year was $11.77, the second year $8.07 and the total cost to time of calving was $19.47.

3. Bitter weed taste was removed from cream by mixing it with two or more parts of water at any temperature above 70 deg. Fahrenheit and then running it through a cream separator. No means were found by which bitter weed taste could be removed from milk. The compound in the bitter weed which gives milk a bitter taste is held very largely, if not entirely, in the milk serum. The more completely the serum is separated from the fat the less is the degree of bitterness in the cream.

.4 Wild onion flavor was not removed from cream by mixing it with water and then running it through the cream separator. Saltpeter dissolved in the water thus used was of no value. No method was found by which the onion flavor could be removed from either milk or cream. The compound in the wild onion which gives milk a bad flavor is held very largely, if not entirely, by the fat, and the more completely the serum is separated

from the fat the more concentrated is the onion flavor in the cream.

5. The average percentages of fat left in the skim milk by the separator, deep cans and shallow pans were .03, 1.3 and .6 respectively. Shallow pans gave decidedly better results than deep cans. The separator is indispensable to the dairymen of the South.

6. A ration consisting of 9 lbs. cotton seed, 3 lbs. wheat bran and 10 lbs. sorghum hay gave a butter practically equal in firmness and volatile acids to a butter from a ration consisting of 5¼ lbs. cotton seed meal, 3 lbs. wheat bran, and 10 lbs. of cotton seed hulls. Feeding cotton seed and cotton seed meal to cows on pasture increased the melting point of the butter 1 to 3 degrees centigrade. Three pounds of cotton seed meal and one pound of wheat bran gave as hard a butter as eight pounds of cotton seed meal and one pound of bran. The volatile acids in the butter were not materially affected by the different rations.

7. Potassium bichromate, mercuric chloride and formalin were tried as preservatives for composite sampling. One-half per cent. mixture of formalin (40 per cent. formaldehyde) gave the best results. One-half teaspoonful of formalin will keep a pint of milk in good condition for testing for one month.

8. In churning cream from cows receiving cotton seed and cotton seed meal .25 of 1 per cent. lactic acid in the cream, with a temperature of 63 deg. Fahrenheit, gave a more exhaustive churning than .37 of one per cent. of lactic acid with a temperature of 70 degrees Fahrenheit.

9. In a churning experiment of five trials, the dash churn proved as satisfactory as the barrel churn for churning whole milk.