THESIS

On

THE INFLUENCE OF HEREDITY ON THE TRANSMISSION OF THE PERCENTAGE OF FAT IN MILK

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By

John Earl Watt

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APPROVED:

Redacted for privacy

Professor of Dairying, in charge of Major

Redacted for privacy

Head of Department of Dairy Husbandry

---oOo---

Redacted for privacy

Dean of School of Agriculture

Redacted for privacy

Chairman--Committee on Graduate Students &

Advanced Degrees

- INTRODUCTION -

The solution of the problem of inheritance of the percentage of fat in milk is one of great importance to the breeder of dairy cattle. It would very marketly increase the certainty of his results. As it stands today, the breeder has no assurance that the cows he produces will be producers of fat in such quantities that they will be profitable to him. Neither does he know that the young bull that he raises or buys is going to sire offspring that will be good producers of milk with a high percentage of fat. It is a very reasonable assumption that the quantity of milk a cow can give is limited. Quite frequently production records are broken, yet there must be a limit, or at lease so near will the limit be reached that it will no longer be possible or profitable to further increase the limit of production of larger quantities of milk. As the cost of production of milk increases and the margin of profit of milk and its products decreases, the only thing left for the breeder to do is to produce cows that will give a higher percentage of fat and thereby increase the total products that can be derived from the milk. Not only must the cow be able to produce milk containing a high percentage of fat, but she must be able to transmit this character to her offspring. The cows of today must not only produce milk in large quantities, but they must give a high percentage of fat and continue this

character through their offspring, or in a short time the family or breed will sink into obscurity. It may also be reasonably assumed that there is a limit to the quality of milk a cow may be able to produce. The cow that is the most profitable, is the one that has the combined characters of good quantity and high quality. A notable example of a family of dairy cows that were noted at one time for high production of milk, and were eagerly sought after for breeding purposes was the Combination family of Jerseys. At the World's Fair at Chicago, and later at St. Louis, this family stood high in the breed tests. At the time these animals were made famous, but because of the fact that they were unable to produce milk with a high percentage of fat, the Combination family has declined in popularity and is now almost lost in obscurity.

By a study of the market conditions among the dairymen, it is plainly seen that in general the cows that are offered for sale are either the ones that are declining in value, due to age, or if the cow be young, she is generally the cow that produces milk containing a low percentage of fat. This is a condition that might reasonably be expected, especially where milk products are being sold instead of whole milk. The dairyman does not care to feed a cow unless he is getting a profitable return for his labor, neither does he care to keep her offspring, as that is likely to increase his burden and decrease his profits. To the breeder of dairy cattle, the question of production of good sires is equal to, it not

greater, than the production of milk products. It is generally recognized that the surest, quickest, and cheapest way to get the desired results is through the sire. The leading breeders of all dairy breeds are very emphatic upon this point. This has lead to a close study of the ancestors of a sire if he is to be used for breeding purposes. If a sire comes from a dam that has a record showing a low percentage of fat, he is immediately looked upon with suspicion by the progressive breeder. It is often said that, "The sire is half the herd". This is a very true statement, because the bull is the sire of the offspring from the entire herd. As the sire is a very important factor in the breeding of a dairy herd, it is very essential that his ancestors, at least his nearest dams, be animals with good records. If the nearest dams of a sire be producers of milk with a low percentage of fat, it is only reasonable to expect that such a sire will not be able to sire offspring that will give milk containing a high percentage of fat. If a cow cannot produce milk with a high percentage of fat, she cannot be expected to transmit a high percentage of fat to her offspring, so the cow with a low record should have no home with either the breeder or the practical dairyman.

LITERATURE

There is very little literature bearing directly on the subject of Influence of Heredity Upon the Transmission of the Percentage of Fat in Milk. There is, however, considerable literature available bearing upon the transmission or inheritance of other characters in the higher animals, such as the inheritance of coat color in horses, polled character in cattle, color of mice, guinea pigs, pigeons, etc. A study of this literature may throw some light on the problem of the transmission of the percentage of fat in milk.

"The Segregation of Fat Factors in Milk Production" prepared by F. B. Hills and E. N. Boland, on page 197, Vol. 20 of the "Proceedings of the Iowa Academy of Science" for 1913, states the following:

"For a study of fat production as shown by the relation of the production of dams to that of their offspring, 3,700 pairs of varieties were taken from the advanced Registry of the Holstein-Fresion Association. The mean fat production of the offspring was 16.952---.034. The standard deviation and co-efficient of variability of the offspring were also greater than those of the dams, showing the tendency of the individuals of the F. generation to reach the extreme of the parental generations. The correlation co-efficient of .29 would, according to the statistical method of study of Biparent Inheritance, show evidence of prepotency on the part

of the dams as opposed to their sires. This fact may indicate sex-linkage of the factors controlling inheritance of fat production."

In the article just quoted, they have applied the Biometric theory to the production of fat.

In a volume on "The Principles of Stock Breeding" by James Wislon, the author takes up the study of crossing Danish cattle on the Jersey breed. One of the objects of the work was to determine the effect of the quality of milk on the offspring by crossing two breeds of cattle with different characters. Wilson draws the conclusion that "The only way in which characters can be transmitted from one breed to another is by mating the first crosses with each other, as was shown to have been done in the laying of the foundation for the red polled breed of cattle."

In the above case, some of the characters of the breeds that were crossed were such that could be determined from the outward appearance, such as color and size in the Danish cattle, and the color of the Jersey, and the characters transmitted to the offspring were easily determined.

There is little if any actual experimental work that has been done on this problem of the transmission of the percentage of fat in milk. This can be accounted for by the fact that with the higher animals, such as the dairy breeds, when the life of the animal is comparatively long, it would require many years to accomplish much, and the expense of experimental work of this nature would be so great that any

breeder that must gain financial profit from his experiments can hardly afford to undertake to solve the problem. There has been, however, a great deal of actual experimental work done in smaller animals, for the purpose of studying the transmission of other characters, such as color, number of toes, etc. These, in a measure, may give us some light on the transmission of the percentage of fat in milk. Some work has also been done by way of experimental breeding in cattle for the polled characteristic, but in this case the value of the animal was not affected as the beef type was used, and the value of the animal for the block was not impaired.

In an article (1) prepared by W. J. Spillman of the U. S. Department of Agriculture, for the American Breeders Association, on the Subject of Mendel's Law in Relation to Animal Breeding, he gives the following:

"It has not been definitely shown that Mendel's law applies to all kinds of animal characters. It has, however, been found to hold in so many different groups of organisms that we cannot withhold the inference that the law is of a very wide application and, therefore, of very great practical importance." He continues in the same article to show diagrams of the results of his experiments, that the polled characteristic is transmissible when crossed with non-polled cattle, and follows the Mendelian Law.

These characters are "fixed", however, and are such that can readily be seen on the offspring and the results

(1) Vol. I of the American Breeders' Association Pg. 171

foretold before the young animals have reached maturity, in the case of the dairy breed. The percentage of fat is not always invariable, and the results of the offspring of a mating cannot be determined until the offspring has almost reached maturity. In Maine Experiment Station Bulletin No. 205, on the "Mode of Inheritance of Fecundity in Domestic Fowls" by Pearl, the following conclusions are drawn:

1. High Fecundity may be inherited by the sire independent of the dam.

2. High Fecundity is not inherited by daughter from dam.

3. Low Fecundity may be inherited by daughter from sire or dam.

The results of the above experiments are not questioned, but the question does arise whether or not the term "Fecundity" can be applied in the case of inheritence of fat in milk. If we were discussing the probability of the number of offspring of cattle or other animals, we might be able to make a comparison with the results of Pearl's experiments.

OBJECTS OF RESEARCH

The objects sought for in the preparation of this work was to determine:

First, whether the sire influences the test of the daughter more than the dam, or, vice versa.

Second, If the sire influences the test of the daughter more than the dam, does the sire transmit to the daughters the percentages of fat of his sires' dam or of his dam and possibly of his dam's dam.

Third, If the dam influences the test of the daughter more than the sire, then she probably transmits the percentage of fat inherited from her dam.

The only available records we have for the study of this subject is that of the Register of Merit, established by the American Jersey Cattle Club, and other similar records established by breeders' associations of other breeds of dairy cattle. Up to about the year 1899 or 1900, the records were made from churned butter tests, since that time the fat content has been determined by Babcock's method. For the study of the inheritance of the percentage of fat in milk, the records of the Jersey sires with the highest number of daughters in the Register of Merit were taken. Their ancestry was traced for some two or three generations and the percentage of fat of their dams was secured. The percentage of fat of the daughters of these sires and the records of the nearest dams of these daughters were obtained and tables compiled from these records.

In some cases the records of the dams of the sires and of his daughters were not given in the Registers of Merit, where these records were not given, a volume of records entitled "Jersey Sires With Their Tested Daughters" was used. In the latter the records are based on the churned butter tests almost entirely.

The accompaning tables show the results of this data compiled. Table No. I gives the average test of all daughters, of the high and the low testing daughters, of each sire, with the highest number od daughters in the Registers of Merit, and the tests of the nearest dams of these sires. Table No. 2 to No. 17 gives the butter fat tests of high and of low testing daughters of each sire individually, and the tests of the nearest dams of these daughters.

In securing the records for the data from which the accompaning tables were compiled, some difficulty was found in securing complete records, due to the fact that in some cases the dams of the sires and daughters were imported from the Island of Jersey and the records for these were not available, also some few of the dams of these bulls or of their daughters that were not imported had not been entered in the Register of Merit. The basis for division between the high and the low testing daughters was the average percentage of fat of the total number of daughters each individual sire had in the Register of Merit. Those testing five tenths of one per cent higher than the average, were considered as high testing, and those testing five tenths of one percent lower than the average, were considered as low testing. It was

found that when the average per cent of fat for the breed was taken, it did not show the inheritance of the daughter as when the average of all the daughters of an individual sire was considered.

In Table I we find that the sire, Hood Farm Pagis 9th has 67 daughters in the Register of Merit and that 14 per cent of these daughters are high testing and 1.49 per cent are low testing. The remaining 84.51 per cent are near the average.

Hood Farm Tarons has 42 daughters in the Register of Merit and 9.5 per cent are high testers, 4.7 per cent are low testing, and 85.8 are near the average.

Loretta King has 37 daughters in the Register of Merit and 4.5 per cent are high, and 4.5 per cent are low testing, 91 per cent are average testing daughters.

Hector Marigold has 33 daughters in Register of Merit, 30.3 per cent are high, 3.03 per cent are low testing, and 66.67 per cent are average.

Rioters Jersey Lad has 23 daughters in the Register of Merit, 43 per cent are high testing. There are no low testing daughters, and 57 per cent are average testing daughters.

Oonans Count has 19 daughters in Register of Merit, 31.6 per cent are high testing, there are no low testing, and 68.4 per cent are average testing daughters.

King Sappho King has 17 daughters in the Register of Merit, he has no high testing daughters and 11.67 are low

are low testing, leaving 88.33 per cent average testing daughters.

Lady Letty's Victor has 17 daughters in Register of Merit and 23.52 per cent are high testing, 16.6 per cent are low testing and 59.88 per cent are average testing daughters.

Landseers Exile has 6 daughters in Register of Merit, 16.6 per cent are high and an equal number, 16.6 per cent are low testing, leaving 66.8 per cent as average testing daughters.-

Channel King has 7 daughters in Register of Merit, 14.2 per cent are high testing, no low testing, and 85.8 per cent are average.

St. Marves has 10 daughters in Register of Merit, there are no high testing daughters, 10 per cent are low testing, leaving 90 per cent as high testing daughters.

Rosaries Olga Lad has 9 daughters in the Register of Merit. 11.11 per cent are high, 11.11 per cent are low testing, and 77.78 per cent are average testing daughters.

Golden Glows Chief has 5 daughters in the Register of Merit 20 per cent are high testing, 80 per cent are average testing and there are no low testing daughters of this sire recorded.

Stoke Pogis of Prospect has 11 daughters in the Register of Merit, 27 per cent of them are high testing, he has no low testing daughters recorded.

Torone has 17 daughters in the Register of Merit, 11.76 per cent show a high test, he has no low testing daughters recorded.

The range of variation in the percentages of daughters that each sire, having the greatest number of daughters in the Register of Merit has, that has a test of .5 of one per cent above the average of all the daughters of each individual sire, runs from 4.5 per cent in the case of Loretta King to 43 per cent in the case of Rioters Jersey Lad, and the percentage of low testing daughters range from zero in 7 cases to 17.6 per cent that have an average test five tenths of one per cent lower than the average for all the daughters of each individual sire, that has the greatest number of daughters in the Register of Merit.

Tables No. 2 to 17 give an individual outline for comparison of the percentages of fat of the nearest dams of the sire, and of the nearest dam of the daughters of the sire, and of the daughters individually, and the average percentage of fat in each case.

Table No. 2 is that of Hood Farm Pogis, the 9th, the average per cent of fat of his dams is 4.85, the average test of the high testing daughters is 6.27, the test of the dam of Hood Farm Pogis the 9th, is 5. The tests of the dams of the high testing daughters ranges from 4.7 to 5.8. With the exception of the test of the dam of Figgis 86th of Hood Farm which has a test of 4.7, the test of the dams of the high testing daughters is very near the test of the dam of the sire. These high testing daughters all have an individual test that is above the test of either their dam's test or the test of

the dam of their sire. This seems to indicate that there is an inheritance from somewhere in their line of ancestors for which we have no available record. It is interesting to note that the average test of the 67 daughters is 5.46 the same as the test of the dam of Hood Farm Pogis 9th. The dam of the one low testing daughter of Hood Farm Pogis 9th has test that is almost the same as that of the daughter, 4.86. It is also very nearly the same as the test of the two grandams of the sire, both paternal and maternal. The only lesson to be learned from the study of this bull's projeny, is that the average test of the daughters is the same as that of his dam, but we cannot account for the high testing daughters from the data available for either the sire or dams.

Table No. 3 shows the record of Hood Farm Torono. This sire has 42 daughters in the Register of Merit 9.5 per cent, or four daughters, are five tenths of one per cent higher than the average test of the 42 daughters and 4.7 per cent or two of the daughters, are five tenths of one per cent lower than the average of the 42 daughters. Three of the daughters with a high test show a better test than either the dams of their sire or of their dams, again indicating an inheritance from somewhere in their line of ancestory for which we have no available record. The tests of two of these daughters were evidently raised by the dams, as in the case of Lass 3d of Hood Farm and Lass 64th of Hood Farm. The low testing daughters have a lower test than either their dams or their sire's dam.

Table No. 4 is that of Loretta King. This sire has 37 daughters in the Register of Merit. 4.5 per cent are high testing daughters and an equal percentage of low testing daughters. There are no high testing dams on either side of their ancestory with the exception of Hector's Berta 5.8, whose daughter is one of the low testers. This appears to be a fair example of the blending of the character of the percentage of fat between the dams of the sire of these daughters and the dams of the daughters.

Table No. 5 gives the record of Hector Marigold. This sire has 33 daughters in the Register of Merit, 30.3 per cent are high testing and 3.03 per cent are low testing. Of the 10 high testing daughters, 3 appear to have inherited the high testing character from their sire's dam. The remaining 7 of the high testing daughters have a test intermediate between the tests of the dams of their sires and the test of their dams. Of the one low testing daughter, the test of 4.68 does not follow the test of either the dam or that of the dams of her sire.

Table No. 6 gives the record of Rioters Jersey Lad. This sire has 10 daughters in the Register of Merit and 43 per cent are high testing daughters and there are no low testing daughters recorded. The average test of the high testing daughters is 6.31, and there is not a high testing daughter with a dam recorded that has a test equally high as the daughter. In this case it appears that the dams on the sire's side have been prepotent through the sire to his daughters.

Table No. 7 gives the record of Oonaus Count. This sire has 19 daughters in the Register of Merit, 31.6 per cent are high testers and no low testers are recorded. Of these high testing daughters, only one dam is recorded that has a test equal to that of her daughter, and that is in the case of Oonan's Countess 2nd, dam of Counts Queen, who has a test of 6.17. This again appears to be a case where the dam is prepotent through her son to his daughters.

Table No. 8 gives the record of Valentine's Oonan. This sire has 19 daughters in the Register of Merit and 31.6 per cent are high testers and there are on low testers. In this case the dam of the sire has a lower test than that of the daughters of the sire, but the average test of the nearest dams of the sire is above the average of the dams of the daughters. Considering the averages, the blaance appears to be in favor of the prepotent power on the side of the sire.

Table No. 9 gives the record for the sire King Sappho King. The daughters of this sire do not seem to have inherited the high testing qualities of their sire. He has 17 daughters in the Register of Merit, with no high testers to his credit and 11.76 per cent are low testers. The average for the nearest dams of this sire is 6.18 and the average for the low testing daughters is 4.24. These daughters have not inherited the percentage of fat of either their dams or of their sire's dams.

Table No. 10 gives the record of the sire Lady Letty's Victor. He has 17 daughters in the Register of Merit, 23.23

per cent are high testers and 17. 6 per cent are low testers. In this case the average test of the dams of the sire is 6.27. The average test of the high testing daughters is 6.05. For most of the dams of the daughters the records were not available. For the low testing daughters the record of the dams of only one was available and that was in the case of Victor's Lady Rose. Her test is 4.7. Her dam has a test of 4.9. The low testing character of Victor's Lady Rose seems to have been inherited from he r dam.

Table No. 11 gives a record of Torano. He has 17 daughters in the Register of Merit, 11.76 per cent are high testers and there are no low testers. The average test of the high testing daughters is higher than the test of either their dams or the dams of their sire.

Table No. 13 gives a record of Channel King. He has 7 daughters in the Register of Merit, only one daughter has a high test, and no daughter of this sire is recorded with a low test. In this case the high testing daughters seem to have inherited the high testing quality from her dam or possibly from the dam of her sire on his sire's side.

Table No. 14 gives a record of St. Marves. He has 10 daughters in the Register of Merit. He has no high testing daughter and only one low testing daughter. The test of this daughter is 5.3. Her dam's test is 5.9. The average test of the dams of St. Marves is 4.7, the test of the daughter in this case seems to have been transmitted from her sire.

Table No. 13 gives a record of Landseir's Exile. This sire has six daughters in the Register of Merit. 16.6 are high testing and 16.6 per cent are low testing daughters. No records of any of his dams were available.

Table No. 15 gives the record of Rosaries Olga Lad. This sire has 9 daughters in the Register of Merit and one is high testing and one is low testing. The records of the dams of these daughters could not be obtained. In this case it is hard to determine from which side the daughters inherit their high or their low testing qualities.

Table No. 16 gives the record of Golden Glows Chief. This sire has 5 daughters in the Register of Merit, has one high testing daughter and no low testers. The record of this daughter's dam could not be obtained.

Table No. 17 gives the record of Stoke Pogis of Prospect. This sire has 11 daughters in the Register of Merit, three, or 27 per cent, are high testing and there are no low testing daughters to this sire's credit. These daughters have an average test of 6.37 and in each case the daughter's test is higher than that of her ancestors on either side.

SUMMARY

As before stated, the objects of this work is to determine:

First, Whether the sire influences the test of the daughters more than the dam, or vice verse;

Second, If the sire influences the test of the daughters more than the dam, does the sire transmit to the daughters the percentage of fat of his sire's dam, or of his dam, and possibly of his dam's dam;

Third, If the dam influences the test of the daughters more than the sire, then she probably transmits the percentage of fat inherited from her dam.

My conclusions are: First that the sire influences the test of the daughter more than the dam, as evidenced by the fact of the low testing daughters of Hood Farm Torono are more closely related to the tests of their sire's dam than to the tests of their dams; and as is shown by the average test and the individual test of the high testing daughters of Hector Marigold, Rioters Jersey Lad, Valentine Oonan, and Lady Letty's Victor, being more closely correlated with the average tests of the dams of the sire than to their dams.

Second, that the tests of the daughters are more closely correlated with the sire's paternal dam than with his maternal dam. This is evidenced by the fact that the high tests of the high testing daughters of Hood Farm Torono, Hector Marigold,

Rioters Jersey Lad, Valentine's Oonan, and Lady Letty's Victor are all more closely related to the paternal dam than the maternal dam.

There are, however, a few exceptions to those, but the greater number show that the sire influences the test of the daughters more than their dams, and that the tests of the daughter is more closely related to the test of the paternal dam of the sire than to his maternal dam.

References used in study of inheritance:

Darwin

Davenport

Herbert

Wilson

Marshal

TABLE I

Average test of all daughters, of the high and the low testing daughters, of each sire with the highest number of daughters in the Register of Merit, and the tests of the nearest dams of these sires

Name of Sire	Tests of Nearest dams of sire	No. of daughters in Register of Merit	No. of daughters in Reg. of Mer. High Testing	No. of daughters in Reg. of Mer. Low Testing	No. of high testing daughters in Reg. of Mer.	Av. % of fat of low testing daughters R. of M.	Av. % of fat of all daughters in R. of M.
Rioters Jersey Lad	Dam . . . No. R Dam's dam No. R Sires dam 6.88 Av. 6.88	23	10	0	6.31	0	5.84
Oonan's Count	Dam . . . . 6.30 Dam's dam No R. Sire's dam 6000 Av. 6.15	19	6	0	6.10	0	5.60
St. Mawes	Dam . . . . 4.7 Dam's dam 0.0 Sire's dam 4.7 Av 4.7	10	0	1	0.0	5.03	5.90
Rosaries Olga Lad	Dam . . . . 5.4 # Dam's dam 6.0 # Sire's dam 5.4 Av. 5.45	9	1	1	6.71	4.89	5.63
Golden Glow's Chief	Dam . . . . 8.3 Dam's dam 0.0 Sire's dam 6.1 Av 7.0	5	1	0	6.11	0	5.41

Computed from churned butter records, not from Babcock Test

TABLE NO. I (Continued)

Name of sire	Tests of Nearest dams of sire	No. of daughters in Register of Merit	No. of daughters in Reg. of Mer. High Testing	No. of daughters in Reg. of Mer. Low Testing	No. of high testing daughters in Reg. of Mer.	Av. % of fat of low testing daughters R. of M.	Av.% of fat of all daughters in R. of M.
Stoke Pagis of Prospect	Dam . . 4.8 # Dam's dam 0.0 Sire's dam .0 Av. . . . 4.8	11	3	0	6.37	0	5.46
Torano	Dam . . . 5.66 Dam's dam 0.00 Sire's d. 5.8 Av . . . 5.41	12	2	0	6.03	0	5.40
Valentine's Oonan	Dam . . . 5.66 Dam's dam No.R Sire's dam 7.4 # Av. 6.52	19	6	0	6.31	0	5.71
King's Sappho King	Dam . . . . 7.32 Dam's dam 5.18 Sire's dam 5.98 Av. 6.18	17	0	2	0.0	4.23	4.79
Lady Letty's Victor	Dam. . . . 6.48 Dam's dam 6.07 Sire's dam 6.30 # Av 6.29	17	4	3	6.05	4.10	5.54
Landseers Exile	No record of dam's test	6	1	1	7.28	5.24	6.14
Channel King	Dam . . . . 5.12# Dam's dam . 8.73# Sire's dam 8.73# Av 6.87	7	1	0	6.17	0	5.77

Computed from churned butter records, not from the Babcock Test.

TABLE I (Continued)

Name of Sire	Tests of Nearest dams of Sire	No. of daughters in Register of Merit	No. of daughters in Reg. of Mer. High Testing	No. of daughters in Reg. of Mer. Low Testing	No. of high testing daughters in Reg. of Mer.	Av. % of fat of low testing daughters R. of M.	Av. % of fat of all daughters in R. of M.
Hood Farm Pagis 9th	Dam . . . . 5.4 Dam's dam 4.7 Sire's dam 4.45 Av 4.85	67	10	1	6.27	4.86	5.46
Hood Farm Torano	Dam . . . . 5.34 Dam's dam 0.00 Sire's dam 5.73 Av. 5.24	42	4	2	6.03	4.00	5.53
Loretta King	Dam . . . . 4.9 Dam's dam No.R Sire's dam 4.8 Av. 4.85	37	2	2	5.88	4.12	5.24
Hector Marigold	Dam . . . . 6.12 Dam's dam 6.73 Sire's dam 6.21 Av. . . . 6.45	33	10	1	6.11	4.68	5.29

Computed from churned butter records, not from Babcock test

TABLE NO. II

Butter fat tests of high testing and of low testing daughters of Hood Farm Pagis 9th and the tests of dams of these daughters.

Test of the Dams of Sire	Av. test of all daughters in Register of Merit	Name and test of high and of low testing daughters		Name and test of daughter's dams			Tests of all dams of Daughters.
		Name	Test				
Dam . . . 5.46	5.46	High Testing		Caltharine, 3rd of Hood Farm No. R.		2	5.15
Dam's dam 4.7		Figgis 24th of Hood Farm	6.01				
Sire's dam4.43		Figgis 27th of Hood Farm	6.12	Ooman 4th of # Hood Farm	5.1	3	5.3
Av. . . . 4.85		Figgis 42nd of Hood Farm	6.3	Maquilla of Hood Farm	5.8	2	5.75
		Figgis 54th of Hood Farm	6.14	Hood Farm Venie	No. R	R	0.0
		Figgis 73rd of Hood Farm	6.28	Matilda Louise	No. R	No.R	0.0
		Figgis 86th of Hood Farm	6.22	Hood Farm Clea's Fern	4.7	1	4.7
		Figgis 62nd of Hood Farm	6.13	Hood Farm Siglizzie	No R	No R	0.0
		Figgis 64th of Hood Farm	6.09	Ooman 19th of Hood Farm #	5.29	3	6.81
		Figgis 65th of Hood Farm	6.23	Lasse's Jewell	5.00	1	5.00
		Figgis 66th of	6.37	Golden Lad's Lass			
		LOW TESTING			No R	No R	
		Figgis 18th of Hood Farm	4.86	Ooman 11th of Hood Farm	4.9	3	6.2

Computed from churned butter records, not from Babcock test.

TABLE III

Butter fat tests of high testing and of low testing daughters of Hood Farm Torono, and tests of dams of these daughters

Tests of Dams of Sire	Av. test of all daughters in Register of Merit	Name and test of high and of low testing daughters		Name and test of daughters dams			Tests of all Dams of daughters
			HIGH TESTING				
Dam 5.34		Lass 3rd of Hood Farm	5.92	Sophie 14th of Hood Farm #	6.01	1	6.01
Dam's dam 0.0 Sire's dam 5.73 Av. 5.24	5.53	Lass 47th of Hood Farm	5.97	Figgis 11th of Hood Farm #	5.6	3	5.3
		Lass 51st of Hood Farm	6.19	Hood Farm Dot.	No R	No R of Dams	0.0
		Lass 64th of Hood Farm	6.17	Figgis 27th of Hood Farm	6.12	3	5.6
			LOW TESTING				
		Lass 54th of Hood Farm	4.43	Figgis 31st of Hood Farm	5.53	2	5.4
		Merry Miss	4.58	Merry Maiden's Daughter	5.46	3	6.23

Computed from churned butter records, not from Babcock Test.

TABLE IV

Butter fat tests of high and of low testing daughters of Lorettas King and tests of dams of these daughters.

Tests of Dam of Sire	Av. test of all daughters in Reg. of Merit	Name and test of high and of low testing daughters		Name and test of daughter's dams.		Tests of all dams of daughters	
		HIGH TESTING					
Dam 4.9 Dam's dam 0.0 Sire's dam 4.8 4.85	5.50	Loretta King's Amelia B	5.8	Hector's Adelphia #	5.03	3	4.96
		Loretta King's Beauty	5.91	Brown Lassie's No R Beauty		1	5.6
		LOW TESTING					
		Loretta King's Betty	4.68	Hector's Berta B #	5.8	2	5.76
		Loretta King's Cadora	4.56	Hector's # Cabrera	4.1	2	4.6

Computed from churned butter record, not from Babcock test.

TABLE NO. V

Butter fat tests of high testing and of low testing daughters of Hector Marigold, and tests of dams of these daughters

Tests of Dam of Sire	Av. test of all daughters in Register of Merit	Name and test of high and of low testing daughters		Name and test of daughter's dams	Tests of all dams of daughters		
		HIGH TESTING					
Dam 6.21		Hector's Berta B	5.83	Aarons # Berta	5.1	2	5.35
Dam's dam 6.73		Hector's Cackle B	7.07	Cackle	No R	No R of dam	0.0
Sire's dam 6.21		Hector's Cora B	5.95	Cora Scott#	5.7	1	5.7
Av. . 6.45		Hector's Cherry B	5.95	Cherey Pogis# of B	5.6	1	5.6
		Hector's Daisy B	5.93	Ina Daisy Lee#	N.R.	No R	0.0
		Hector's Fairyana	5.86	Hector's Fairy Belle	5.3	2	5.7
		Hector's L. K. Dossette	5.91	L. K. Dossetts	No R	No R	0.0
		Hector's Majave	6.36	Beadles Majove	No R	1	4.9
		Hector's Miss March	5.92	Miss March #	5.4	1	5.4
		Hector's Mimicry	6.20	Mimicry	No R	No R	0.0
		LOW TESTING					
		Hector's Ella Q.B.	4.68	Ella Q. B.	No R	No R	

Computed from churned butter record, not from Babcock's method.

TABLE NO. VI.

Butter fat tests of high testing daughters of Rioters Jersey Lad, and tests of dams of these daughters

Tests of Dam of Sire	Av. test of all daughters in Reg. of Mer.		Name and test of high and of low testing daughters		Name and test of daughters' dams			Tests of all dams of daughters
Dam			HIGH TESTING					
Dam's dam	0.0		Daisy Griselda	6.06	Phebe Altana	No R	1	6.06
Sire's dam	6.88		Jersey Lads Louise Altama	6.14	Louise Altama	no R	1	
Av.	6.88	5.84	Jersey Lad's Myra	6.09	Martha Altama#	5.36	1	5.35
			Jersey Lads Susan Altama	6.00	Susan Altamer#	5.50	2	5.40
			Lads Tormentress Altama	6.62	Luna Altama	5.195	2	5.91
			R. J. L's Brownie	6.27	Brownie Altama	No R	No R	0.00
			Jersey Lads Rosa	6.05	Rosa of the Desert	No R	No R	0.00
			Jersey Lads Milly	6.20	Luan Altama#	5.19	1	5.19
			Rosa of Shelmar	6.83	Rosa of the Desert	No R	No R	0.00
			Suzzane O	6.24	Tormentress Echo	No R	1	4.87

Computed from churned butter test, not from Babcock's Method.

TABLE VII

Butter fat tests of high and of low testing daughters of Oonan's Count and tests of dams of these daughters.

Tests of dam of sire	Av. test of all daughters in Reg. of M.	Name and test of high and of low testing daughters		Name and test of daughter's dams			Tests of all dams of daughters
		HIGH TESTING					
Dam 6.30 Dam's dam 0.0 Sire's dam 6.00# Av. . . 6.15	5.60	Counts Latta	6.12	Countess Matilda 2nd	No r	1	5.3
		Count's Prize	6.05	Oonans Sprite #	5.93	1	5.93
		Count's Queen	6.13	Oonans Countess 2nd#	6.17	2	6.50
		Susie's Countess	6.57	Oonan's Susie	No R		6.57
		Pilot's Lassie 3rd	6.41	Pilot's Lassie	No R	No R	0.0
		Valentine's Daisy Dell 2nd	6.13	Valentine's Daisy Dell	5.21	1	5.20

Computed from churned butter records, not from Babcock's test.

TABLE VIII

Butter fat tests of all high and of all low testing daughters of Valentine's Oonan, and the tests of all dams of those daughters.

Tests of dams of sire	Av. test of daughters in Reg. of Mer.		Name and test of high and of low testing daughters		Name and test of daughter's dames	Tests of all dams of daughters		
Dam	5.64		HIGH TESTING					
Dam's dam	0.0							
Sire's dam	7.4		Oonon's Countess 2nd	6.17	Oonans Countess#	5.84	2	5.4
Av. . . .	6.52	5.71						
			Conon's Countess 4th	6.14	Oonan's Countess#	5.84	2	5.62
			Valentine's Alley	6.05	Count's Alice	No R	No R	0.0
			Valentine's Della	6.15	Count's Belle#	5.29	1	5.29
			Valentine's Dorothey	6.05	Count's Daisy#	5.66	1	5.66
			Countess Daisy Della	6.6	Valentine's Daisy Della	5.20	1	5.21

Computed from churned butter records, not from Babcock's test.

TABLE NO. IX

Butter fat tests of high and of low testing daughters of King's Sappho King, and tests of all dams of these daughters.

Tests of dams of sire	Av. test of daughters in Reg. of Merit	Name and test of high and of low testing daughters		Name and test of daughter's dams.		Tests of all dams of daughters.
		LOW TESTERS				
Dams 7.32	4.79					
Dam's dam 5.18		Melia Ann Pedro King	4.18	Melia Ann Pedro Marigold	No R. No R	0.0
Sire's dam 5.98						
Av. 6.18		Jaunita of Emery Farm 4th	4.38	Jaunita of # Emery Farm	5.36 2	5.23

Compiled from churned butter tests, not from Babcock's test.

TABLE X

Butter fat tests of high testing and of low testing daughters of Lady Letty's Victor, and tests of dams of these daughters.

Tests of dams of sire	Av. test of daughters in Reg. of Merit	Name and test of high and of low testing daughters	Name and test of daughters dams	Tests of all dams of daughters.
		HIGH TESTERS		
Dam 6.38 Dam's dam 6.07# Sire's dam 6.30# Av. . . . 6.27	5.54#	Falling Springs Princess 6.30	Princess Bebe 2nd No R No R 0.0	
		Victor's Lady Lambert 6.12	Squirrel Gray of Hazel No R No R. 0.0	
		Victor's Lady Mary 6.12	Jonnies Bernice 5.84 2 5.64	
		Victor's Lady Tulip 6.06	Lassarohm No R. No R.	
		LOW TESTERS		
		Victor's Lady Kate 4.54	Kate of New England No R No R 0. 0	
		Victor's Lady Lass 4.7	Teacaddy's Lass No R No R 0.0	
		Victor's Lady Rose 4.7	Bonnie's goldie#4.49 1 4.49	

Computed from churned tests, not from Babcock's method.

TABLE NO. XI.

Butter fat tests of the high testing and of the low testing daughters of Torano, and tests of the dams of these daughters.

Tests of dams of sire	Av. test of all daughters in Register of Mer.	Name and test of high and low testing daughter		Name and test of daughter's dams			
							Test of all dams of daughter
		HIGH TESTERS					
Dam 5.73		Tano 3rd of Hood Farm	6. 25	Figgis 7616	5.5	2	5.2
Dam's dam No R	5.40						
Sire's dam 5.8							
		Tano 17th of Hood Farm	5.85	Brown Bessie 24th of Hood Farm #	5.5	2	5.75

Computed from churned butter records, not from Babcock's test.

TABLE XII

Butter fat tests of all high and of all low testing daughters of Channel King, and tests of dams of these daughters.

Tests of Dams of Sire	Av. test of daughters in Register of Merit	Name and test of high and of low testing daughters	Name and test of daughter's dams	Tests of all dams of daughters.
Dam 5.02 #		HIGH TESTERS		
Dam's dam 0.0	5.77	Sadie R of Bleak House 6.17	Royal Marigold# 6.6.	2 6.51
Sire's dam 8.53#				
Av. . . . 6.87				

Computed from churned butter records, not from Babcock's test.

TABLE XIII

Butter fat tests of high and of low testing daughters of Landseer's Exile, and tests of dams of these daughters.

Tests of dams of sire	Av. Test of daughters in Reg. of M.	Name and test of high and of low testing daughters	Name and test of Daughter's dams	Tests of all dams of daughters.
HIGH TESTERS				
Dam No R. Dam's dam No R. Sires dam No R. Av. . . No R.	6.14	Landseer's Pacific Pearl#	7.28 Pacific Pearl	No R No R
LOW TESTERS				
		Landseer's Pearly of St. Lambert #	5.24 Land Pearl	No R No R

Compiled from churned butter tests, not from Babcock's test.

TABLE XIV

Butter fat tests of high and low testing daughters of St. Mawes, the tests of dams of these daughters.

Tests of dams of sire	Av. test of daughters in Register of Merit	Name and test of high and low testing daughters		Name and test of daughter's dams	Tests of all dams of daughter
		LOW TESTERS			
Dam 4.7	5.90	St. Mawes Queen	5.03	- - - - - -	No. R. No. R. 0.0
Dams, dam No R					
Sire's dam 4.8					
Av. 4.7					

Computed from churned butter records, not from Babcock test.

TABLE XV

Butter fat tests of high and of low testing daughters of Rosaries Olga Lad, and tests of dams of these daughters

Tests of dams.		Av. test of all daughters in Reg. of Merit	Name and test of high and of low testing daughters			Tests of all dams of daughter
Dam	5.41#		HIGH TESTING			
Dam's dam	6.0#		St. Mawes Waltz Rosarie	6.71#	No. R.	No R. 0. 0
Sire's dam	5.4#	5.63				
Av.	5.45		LOW TESTING			
			St. Mawes of Tisha 2nd	4.89	No R	No R 0. 0

Computed from churned butter tests, not from Babcock test.

TABLE XVI

Butter fat tests of high and of low testing daughters of Golden Glows Chief, and tests of daughters of these dams.

Tests of dams of sire	Av. test of daughters in Reg. of Merit	Name and test of high and of low testing daughters			Name and test of daughter's dams	Tests of all dams of daughters.
Dam	8.30 #	Morrow's Select #	6.11	Silky H	No R	No R 0. 0
Dam's dam	0.00					
Sire's dam	6.10#					
Av	7.00		5.41			

Computed from churned butter record, not from Babcock's test.

TABLE XVII

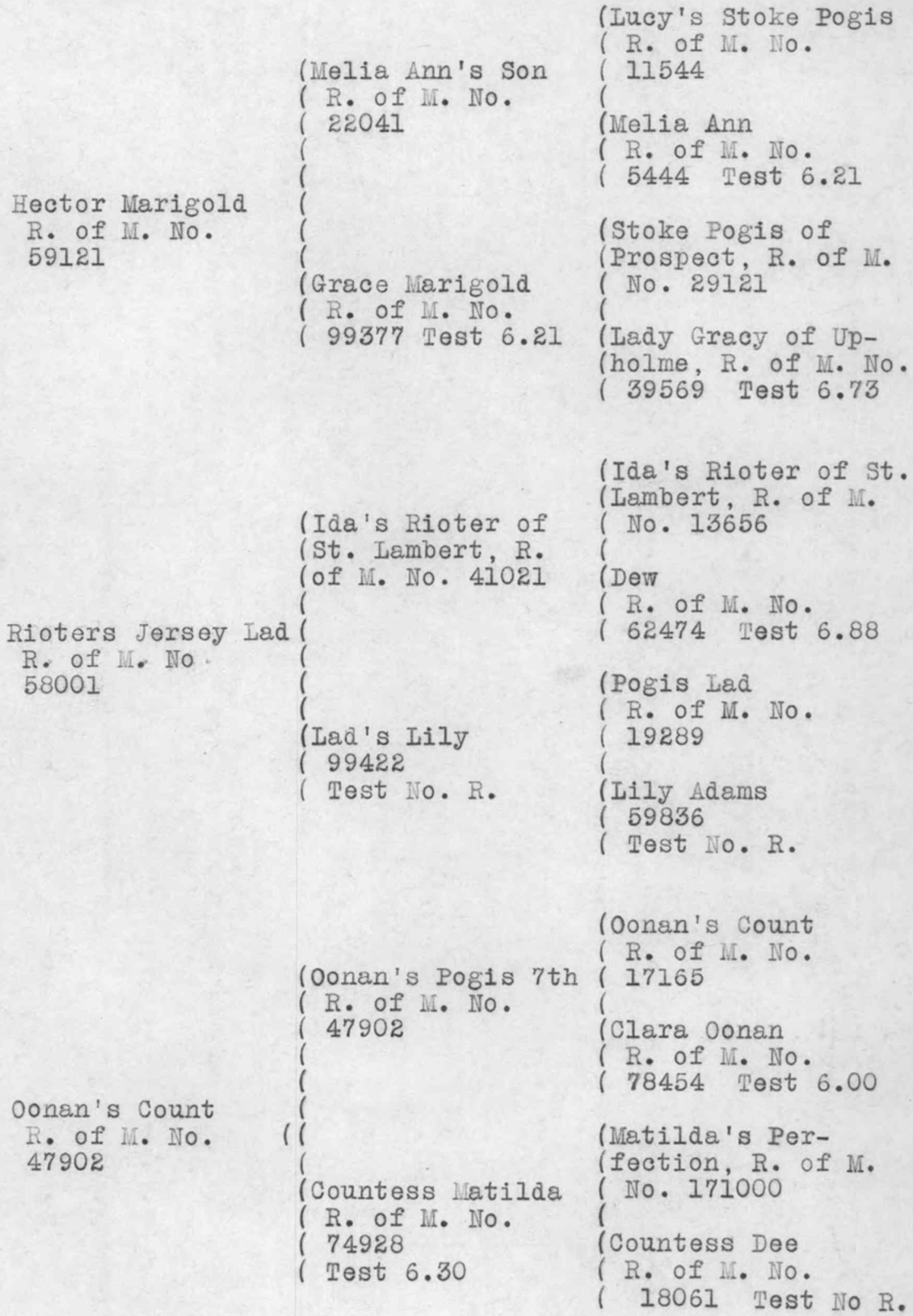
Butter fat tests of high testing and of low testing daughters of Stoke Pogis of Prospect, and tests of dams of these daughters.

Tests of dam of sire	Av. test of daughters in Reg. of Merit		Name and test of high and of low testing daughters		Name and test of daughter's dams.			Tests of all dams of daughters.
			HIGH TESTING					
Dam	4.8#		Adeliaad Marigold	6.46	Adeliade's Daughter#	5.2	1.	5.2
Dam's dam	0.0							
Sire's dam	8.73		Olga 3rd. Marigold	6.45	Prides Olga" 3rd	5.9	2	6.7
Av.	6.	5.46	Susan of Beechland	6.2	Gerty of Beechland	4.79	1	4.79

Computed from churned butter record, not from Babcock's test.

The following are the pedigrees of the sires whose records appear in the foregoing tables:

			(Oonan Pogis
			(R. of M. No.
			(171165
		(Hood Farm Pogis	(
		(R. of M. No.	(
		(40884	(Kathleta's Fancy
		(	(R. of M. No.
		(	(60738
Hood Farm Pogis		(	
9th, R. of M.		(	(Sophies Tormentor
No. 55552		(	(R. of M. No.
		(	(20883
		(Figgis	(
		(R. of M. No.	(
		(76106 Test 5.4	(Birdseye's Surprise
			(R. of M. No.
			(48326
			(Sophies Tormentor
			(R. of M. No.
			(20883
		(Torano	(
		(25204	(
		(	(Rhoda Hudson
		(	(R. of M. No.
		(	(48732 Test 5.73
Hood Farm Torono		(	
R. of M. No.		(	(Tormentor
60326		(	(R. of M. No.
		(	(3533
		(Tormentor's Lass	(
		(R. of M. 59832	(
		(Test 5.34	(Addie P.
			(R. of M. No.
			(41428 Test No. R.
			(King of St. Lambert's
			(King, R. of M. No.
		(Lorna's King of	(30752
		(St. Lambert, R. of	(
		(M. No. 57389	(Lorna of Maple Glen
		(	(R. of M. No. 48094
Loretta King		(	(Test 4.8
R. of M. No.		(	
65050		(	(Ida's Rioter of St.
		(	(Lambert, 9th, R. of
		(Loretta D.	(M. 41010
		(141708	(
		(Test 4.9	(Cicero's Chemical
			(Test, R. of M. No.
			(101087


Hector Marigold
R. of M. No.
59121
Melia Ann's Son
R. of M. No.
22041
Grace Marigold
R. of M. No.
99377 Test 6.21
Lucy's Stoke Pogis
R. of M. No.
11544
Melia Ann
R. of M. No.
5444 Test 6.21
Stoke Pogis of
Prospect, R. of M.
No. 29121
Lady Gracy of Up-
holme, R. of M. No.
39569 Test 6.73
Rioters Jersey Lad
R. of M. No.
58001
Ida's Rioter of
St. Lambert, R.
of M. No. 41021
Lad's Lily
99422
Test No. R.
Ida's Rioter of St.
Lambert, R. of M.
No. 13656
Dew
R. of M. No.
62474 Test 6.88
Pogis Lad
R. of M. No.
19289
Lily Adams
59836
Test No. R.
Oonan's Count
R. of M. No.
47902
Oonan's Pogis 7th
R. of M. No.
47902
Countess Matilda
R. of M. No.
74928
Test 6.30
Oonan's Count
R. of M. No.
17165
Clara Oonan
R. of M. No.
78454 Test 6.00
Matilda's Per-
fection, R. of M.
No. 171000
Countess Dee
R. of M. No.
18061 Test No R.

			(Rioter of St.
			(Lambert, R. of M.
		(Rioter of St.	(No. 16501
		(Lambert, Junior	(
		(R. of M. No. 56580	(Phillies of St.
		(	(Lambert, R. of M.
Lady Letty's		(	(No. 78867 Test 6.30 *
Victor, R. of M.		(	
No. 65020		(	(St. Lambert Boy
		(	(R. of M. No.
		(Lady Letty's	(17408
		(Lambert, R. of M.	(
		(No. 124201	(Letty Cole's 2nd
		(Test 6.48	(R. of M. No.
			(48128 Test 6.07
			(Tormentor
			(R. of M. No.
		(Sophies Tormentor	(3533
		(R. of M. No.	(
		(20883	(Baron's Sophie
		(	(17615
Torono		(	(Test 5.8
R. of M. No.		(	
25204		(	(Catono
		(	(R. of M. No.
		(Rhoda Hudson	(3761
		(R. of M. No.	(
		(48723 Test 5.73	(Rosabel Hudson
			(R. of M. No.
			(5704 Test No R.

*Computed from churned butter record, not from Babcocks test.

			(Oonan Pogis
			(R. of M. No.
		(Sir Donald	(17165
		(R. of M. No.	(
		(39047	(Moyane C.
		(	(R. of M. No.
Valentines Oonan		(	(86492 Test 7.4 *
R. of M. No.		(	
58076		(	(Oonan's Tormentor
		(	(Pogis, R. of M. No.
		(Dollies Valentine	(30505
		(R. of M. No.	(
		(105049 Test 5.66	(Dollie Fay
			(R. of M. No. 105047
			(Test No R.

*Computed from churned butter record, not from Babcocks test.

			(King of St. Lam-
			(bert, R. of M. No.
		(King of St. Lam-	(15175
		(berts King, R. of	(
		(M. No. 30752	(Elsie Bonner
		(	(R. of M. No.
Kings Sappho		(	(13657 Test 5.98
King, R. of M.		(	
No. 65262		(	(Exile of St. Lam-
		(	(bert, R. of M. No.
		(Exiles Sappho	(13657
		(R. of M. No.	(
		(114262 Test 7.32 *	(Valie of Sennet
			(R. of M. No. 78638
			(Test 5.18
			(Stoke Pogis 5th
			(R. of M. No.
		(Stoke Pogis of	(5987
		(Prospect, R. of	(
		(M. No. 29121	(Ida Marigold
		(	(R. of M. No.
Channel King		((	(32615 Test 4.8
R. of M. No.		(	
62762		(	(Sir June
		((Channel Queen	((Imported)
		(R. of M. No.	(
		(138791 Test 5.12 *	(Marie
			((Imported)
			(Melia Ann's Stoke
			(Pogis 2nd, R. of M.
		(Melia Ann's Golden	(No. 154166
		(Wolsey, R. of M.	(
		(No. 62598	(Gwavas
		(	(R. of M. No.
St. Mawes		(	(154156 Test 4.7 *
		(	
		(Gelatine 3rd	(Henry Hudson
		(R. of M. No.	(R. of M. No.
		(114531 Test 4.7 *	(2790
			(
			(Gelatine
			(R. of M. No.
* Computed from churned butter record, not from Babcocks test.			(61404 Test No R.

		(Brown Bessie's
		(Deploma
		(R. of M. No. 39344
	(Chief Engineer	(
	(	(Sulphide
	(	(R. of M. No.
Golden Glow's	(	(88038
Chief	(	
	(	(Reminder
	(	((Imported)
	(Golden Glow	(
	(Test 8.3 *	(
		(Lady Jane Grey 2nd
		((Imported)
		(Gertie's Son
	(Pride's Olga's	(R. of M. No. 66463
	(4th son, R. of M.	(
	(No. 78574	(Pride's Olga 4th
	(	(R.of M. No.
Rosaires Olgo	(	(96870 Test 5.4
Lad, R. of M.	(	
No. 87498	(	(Rosaire's Golden Lad
	(	(R. of M. No. 64554
	(Anna Rosaire	(Test 5.4 *
	(R. of M. No.	(
	(194379 Test 5.3 *	(Gertie's Melia Ann
		(R. of M. No.
		(151596 Test 6.0
		(Stoke Pogis
		(R. of M. No.
	(Stoke Pogis 5th	(1359
	(R. of M. No.	(
	(5987	(Marjoram
	(	(R. of M. No.
	(	(13657
	(	
	(	(Ida's Rioter of St.
	(	(Lambert, R. of M. No.
	(Ida Marigold	(13656
	(R. of M. No. 32615	(
	(Test 4.8 *	(Arawana Marigold
		(R. of M. No. 9380

* Computed from churned butter record, not from Babcocks test.