COMPARISON OF PRODUCTION RECORDS OF COWS USING ONE AND TWO MILKING PLANS OF DAIRY HERD IMPROVEMENT TESTING

R. B. Stout[1] and J. D. Stout[2]

Story in Brief

Oklahoma Dairy Herd Improvement Association supervisors are testing as many herds each month as their time or family responsibilities will allow. A greater acceptance of a one-milking testing program by producers would allow supervisors to test current herds in a shorter work month or to add additional herds and only work the same time frame. The one-milking program has not been universally accepted by Oklahoma dairymen due to their lack of confidence in the adjustment factors. This study was undertaken to determine the correlation of production records made on one-milking or two-milking testing plans under Oklahoma conditions. Test day and lactation-to-date pounds of milk, protein, and somatic cell data each met the tolerance levels set by the National Cooperative Dairy Herd Improvement Policy Board having correlations of .96, .98 and .96, respectively. Butterfat content had sufficient variation to indicate additional research is needed to improve alternate one-milking adjustment factors for fat. Oklahoma dairy producers should avail themselves of the alternate one milking testing plans to reduce their personal costs of DHIA testing, improve supervisor scheduling, reduce energy costs and travel time, and reduce on-farm labor connected with the production records program.

(Key Words: Dairy Herd Improvement, Alternate Testing Plans, One Milking Test.)

Introduction

Oklahoma has approximately 1,050 dairies scattered in 74 counties with 300 of these enrolled in the Dairy Herd Improvement Association (DHIA) program. The majority of these herds are using the standard testing plans requiring the weighing and sampling of each consecutive milking in a 24-h period for one day each month. Twenty-five supervisors test the herds with 21

[1]Manager, Oklahoma DHIA [2]Professor

having other part time employment. Travel distance and time, plus the milking schedules, make it difficult for supervisors to test enough herds to make sufficient income to be fully employed.

A testing plan, labeled AM-PM, using one milking per month alternating the sampling between night and morning milkings was developed by the National Cooperative Dairy Herd Improvement Program. With this plan, one milking is sampled in the PM one month and in the AM the following month. Appropriate factors according to length of time between milkings are used to convert data collected at one milking to a 24-h period. Although many states have a large portion of dairies converted to the AM-PM plan, Oklahoma has only 6% of DHIA herds on this plan. Dairymen cite lack of confidence in the accuracy of conversion factors as their main objection to use of AM-PM plans.

The purpose of this study was to test the same cows, under controlled conditions, on both two-milking-two-sampling (DHI) and one-milking-one-sampling (AM-PM) testing plans to determine the correlations among production records made on each plan under controlled Oklahoma conditions.

Materials and Methods

Fifty-one cows in the Oklahoma State University Holstein herd that freshened between September 1 and October 20, 1988 were selected as the test herd. Cows were selected only on date of freshening, therefore a general cross section of age, lactation number, and production levels were represented. Each cow was concurrently tested on DHI and AM-PM so each served as its own control. The Control group was assigned to DHI using the standard two consecutive milkings. Test 1 group was the same cows assigned to AM-PM starting with the first PM milking. Test 2 group was the same cows assigned to AM-PM starting with the first AM milking. All rules of the National Cooperative Dairy Herd Improvement Policy (NCDHIP) appropriate to the testing plans were followed. Management of the test herds was identical to that of the total Holstein herd. Cows were fed a total mixed ration containing alfalfa hay, sorghum silage, grain, and protein supplement in varying amounts to meet their nutritional needs.

Results and Discussion

The Policy Board governing NCDHIP, when adopting the AM-PM testing plan, set the criteria that AM-PM records must be within 5% of DHI record values. The individual records of the 51 cows or the group analysis of milk pounds, protein, and somatic cell fell within the 95 to 105% range. Butterfat on a test-day basis or lactation-to-date basis had variations outside the 5% range.

Listed in Table 1 are the means and correlations for test-day milk weights for each test period as well as the percent Test 1 and Test 2 varied from Control. The correlations of test-day milk weights range from .93 to .99 indicating that there was a significant relationship between test-day milk weights of cows tested on each of the DHIA plans. The high correlation values indicated that as DHI milk weights change up or down, the AM-PM will vary in the same direction.

Prior research indicates that cows in early lactation are most susceptible to stress and management changes and may have more fluctuation in daily milk yield. Correlations in this study were also lower for the test intervals when a higher percentage of the cows were in early lactation. As days in lactation progressed the correlation of DHI to AM-PM approached 1.0. The correlation comparing Test 1 and Test 2 to Control for interval 8 was .99.

The 51 cows listed in Table 2 are divided into High, Medium, and Low groups based on actual milk production. The table is printed in rank order of the Control group. Only three cows of Test 2 and two cows of Test 1 group ranked in different High, Medium and Low thirds when AM-PM was compared to DHI groups. The cows were divided into three groups according to production as this is a typical grouping pattern used by Oklahoma producers when grouping cows for feeding purposes. Individual test day groupings showed similar results having no more than five cows in different groups. The five cows were clustered close to the break line and would have made little difference in feed offered on group basis.

Table 1. Test day milk weights and correlations.

Test interval	DHI[a] mean weight, lb	Test 1 mean weight, lb	Test 2 mean weight, lb	r[b] Test 1	r[b] Test 2	Test 1 as % of DHI	Test 2 as % of DHI
Int. 1	79.8	82.3	76.5	.96	.94	103	96
Int. 2	75.4	78.1	73.0	.94	.94	103	97
Int. 3	72.8	79.2	69.1	.98	.96	109	95
Int. 4	63.5	60.3	66.7	.97	.97	095	105
Int. 5	58.6	61.8	56.5	.94	.93	106	97
Int. 6	55.5	56.3	53.6	.97	.97	101	97
Int. 7	44.7	42.9	46.4	.98	.98	96	104
Int. 8	39.2	38.4	39.5	.99	.99	98	101
Int. 9	37.1	33.3	37.8	.98	.98	90	102

[a] DHI is two-milking-two-sampling/month test.
[b] All correlations are significant ($p<.01$).

Table 2. Rank order of cows based on complete lactation milk pounds.

Cow number	DHI[a] milk, lb	Rank on DHI	Test 2 milk, lb	Rank on AM	Test 1 milk, lb	Rank on PM
			High DHI Milk Cows[b]			
617	31590	H1	29660	AH1	33520	PH1
746	24870	H2	24790	AH3	24820	PH4
861	24550	H3	22500	AH9	26420	PH2
704	24540	H4	22900	AH8	26110	PH3
382	24250	H5	24560	AH4	23960	PH7
869	23670	H6	23220	AH5	21880	PH10
410	23660	H7	25100	AH2	21530	PH14
770	23610	H8	23160	AH6	23970	PH5
885	23490	H9	22950	AH7	23970	PH6
298	22740	H10	22470	AH10	23030	PH8
303	22260	H11	21640	AH11	22770	PH9
687	21530	H12	20990	AH13	21800	PH13
819	21420	H13	20850	AH15	21850	PH11
698	21400	H14	21380	AH12	20440	PM2
848	21240	H15	20740	AH16	20810	PH16
738	21140	H16	20320	AH17	21850	PH12
817	20790	H17	20130	AM1	21440	PH15
			Medium DHI Milk Cows[c]			
934	20670	M1	20870	AH14	20130	PM4
951	20070	M2	19610	AM3	18710	PM12
546	19820	M3	19080	AM4	20480	PM1
360	19700	M4	19840	AM2	19490	PM8
955	19270	M5	18990	AM6	17800	PM16
556	19250	M6	18340	AM11	20180	PM3
736	19150	M7	18730	AM9	18780	PM11
737	19070	M8	18410	AM10	19810	PM6
520	19050	M9	17180	AM16	20510	PH17
884	19000	M10	18870	AM7	19100	PM9
638	18880	M11	17870	AM12	19830	PM5
727	18690	M12	17690	AM14	19620	PM7
802	18380	M13	18860	AM8	18120	PM14
966	18340	M14	19040	AM5	18200	PM13
900	18320	M15	17730	AM13	18870	PM10

Table 2. (Continued).

Cow number	DHI[a] milk, lb	Rank on DHI	Test 2 milk, lb	Rank on AM	Test 1 milk, lb	Rank on PM
503	17570	M16	17470	AM15	17680	PM17
766	17300	M17	16550	AL1	17910	PM15
			Low DHI Milk Cows[d]			
340	17180	L1	16800	AM17	17420	PL1
928	16220	L2	15060	AL5	16580	PL3
867	16190	L3	16080	AL2	16200	PL4
571	15780	L4	15150	AL4	16610	PL2
788	14820	L5	14680	AL6	15000	PL6
868	14640	L6	15280	AL3	15630	PL5
971	14140	L7	14400	AL7	13850	PL11
376	14070	L8	14190	AL8	13920	PL10
686	13960	L9	13660	AL9	14160	PL8
840	13800	L10	13170	AL12	14210	PL7
942	13700	L11	13470	AL11	13960	PL9
845	13690	L12	13610	AL10	13720	PL12
941	13160	L13	13000	AL13	13300	PL13
946	11360	L14	10920	AL15	11790	PL15
498	11350	L15	11000	AL14	11810	PL14
958	10520	L16	10390	AL16	10690	PL16
839	8190	L17	8370	AL17	7940	PL17

[a] See text for explanation of symbols.
[b] High DHI milk cows: PH = PM high milk cows AH = AM high milk cows.
[c] Medium DHI milk cows: PM = PM medium milk cows AM = AM medium milk cows.
[d] Low DHI Milk Cows: PL = PM low milk cows AL = AM low milk cows.

Total butterfat pounds is dependent on two factors, lb of milk produced and butterfat percent of that milk. Lactation-to-date fat pounds (Table 3) followed a similar pattern of milk as Table 1. There was more variation during early lactation, 104 to 96 for Interval 1 and more closely related in late lactation, 100 to 99 in Interval 8.

Test day fat percentages were evaluated in the same manner as milk weights. The average fat percentages for test day and correlations are presented in Table 4. The weighted means of test interval fat percentages of the 51 cows on Test 1 and Test 2 matched the Control in only four intervals. Test 1 was equal to Control on interval 6, varied .1 on two intervals, .2 on three intervals and had one interval each at .3 and .6 difference.

Test 2 cows had three intervals with the fat percentage equal to Control. Test 2 also had the most single variation with interval 3 averaging 4.5% fat, .8 more than the 3.7% of the Control. Test 2 also had three intervals with .2 difference and one with .3. The average fat percentage for the eight test intervals was 3.76, 3.65 and 3.79 for the Control, Test 1 and Test 2, respectively.

Examination of individual fat tests of the same cow between groups indicate a wide range of variation. Correlation values listed in Table 5 range from .43 to .95. Test 1 and Test 2 as a percent of DHI values range from 85 to 122 which is also more than the acceptable variation by NCDHIP standards.

Somatic cell data collected in this study indicates that somatic cell counts (SCC) do vary on a milking to milking basis. Somatic cell counts for each cow

Table 3. Lactation to date fat pound means and correlations for DHI[a] and DHI-AM-PM.

Test interval	DHI mean lb	Test 1 mean lb	Test 2 mean lb	r^b Test 1	r^b Test 2	Test 2 as % of DHI	Test 2 as % of DHI
Int. 1	98	102	94	.92	.95	104	96
Int. 2	241	244	233	.90	.91	101	97
Int. 3	333	337	329	.91	.92	101	99
Int. 4	434	421	426	.91	.92	97	98
Int. 5	478	481	475	.91	.91	101	99
Int. 6	570	583	559	.92	.92	102	98
Int. 7	633	650	617	.93	.93	102	97
Int. 8	701	704	693	.93	.95	100	99

[a] See text for explanation of symbols.

b All correlations are significant ($p<.01$).

Table 4. Test day fat percentage means and correlation for DHI[a] and DHI-AM-PM herds.

Test interval	DHI mean fat, %	Test 1 mean fat, %	Test 2 mean fat, %	r Test 1	r Test 2	Test 1 as % of DHI	Test 2 as % of DHI
Int. 1	3.9	3.8	3.9	.68	.95	97	100
Int. 2	4.1	3.5	3.8	.77	.70	85	93
Int. 3	3.7	3.6	4.5	.65	.88	97	122
Int. 4	3.8	4.0	3.8	.87	.43	105	100
Int. 5	3.6	3.8	3.4	.76	.77	106	94
Int. 6	3.5	3.5	3.5	.75	.62	100	100
Int. 7	3.7	3.9	3.5	.78	.72	105	95
Int. 8	3.8	3.5	3.9	.94	.90	92	103

[a] See text for explanation of symbols.

Table 5. Somatic cell raw score and linear score of herds on DHI[a] and DHI-AM-PM test plans.

	Raw score[b]			Linear scores		
Test interval	DHI	Test 1	Test 2	DHI	Test 1	Test 2
Int. 1	183	167	144	3.4	3.3	3.2
Int. 2	175	189	184	3.4	3.4	3.5
Int. 3	149	155	141	3.2	3.2	3.3
Int. 4	158	163	136	3.3	3.3	3.0
Int. 5	241	381	213	3.3	3.1	3.6
Int. 6	269	272	286	4.0	4.1	4.1
Int. 7	189	209	202	3.9	3.9	3.9

[a] See text for explanation of symbols.
[b] Raw score is expressed in 1000 cell units. For example: 50, is 50,000 somatic cells.

provides an evaluation as to the udder condition of the cow and response she was giving at the time of test. The data in Table 5 are the raw scores and linear score averages for each test period. The data received from any of the three testing plans would allow a dairyman to evaluate his cows and herd to make any management decisions needed. No correlation values were calculated as a condition causing an increase in SCC can be sudden and a low SCC on one milking would have no relationship to the SCC of the same cow the following milking if problems occured.

Protein is one of the least variable components analyzed by DHIA. Most cows, regardless of the type of testing program, have very little change in protein tests from night to morning or day to day. This allows for correlation values to be near 1.0 for the complete research project. Each month the r values were at least .97 comparing Test 2 or Test 1 to DHI. The lactation-to-date means and correlations are listed in Table 6.

Table 6. Lactation to date protein pounds, means and correlations for DHI[a] and DHI-AM-PM herds.

Test interval	DHI mean lb	Test 1 mean lb	Test 2 mean lb	r[b] Test 1	r[b] Test 2	Test 1 as % of DHI	Test 2 as % of DHI
Int. 1	86	88	82	.98	.97	102	95
Int. 2	206	208	195	.97	.97	101	95
Int. 3	284	290	274	.97	.97	102	96
Int. 4	362	371	350	.97	.91	103	97
Int. 5	409	415	398	.98	.98	102	97
Int. 6	501	513	484	.98	.98	102	97
Int. 7	548	560	532	.98	.98	102	97
Int. 8	607	614	593	.98	.97	101	98
Int. 9	765	625	658	.98	.97	82	86

[a] See text for explanation of symbols.
[b] All r values indicate significant relationship ($p < .01$)