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PREDICTION OF 305 DAY MILK YIELD USING PART LACTATION RECORDS IN FRIESIAN CATTLE IN EGYPT

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ABSTRACT: D*ata were collected from the records of Friesian herd during the period from year 1997 to 2008 year. Herd were raised in Experimental and Research Unit of Toukh Tanbisha, Faculty of Agriculture, Minufiya University which include 1948 normal first lactation records.*

The aim of the present study was to predict 305 dMY using single and cumulative month records in Friesian cows in Egypt.

Means of milk yield in :305 day, third month, fifth month and sixth month were 3633.66 ± 1672.47 kg, 520.77 ± 221.21 kg, 399.84 ± 223.94 kg and 402.33 ± 205.64 kg respectively , where means of cumulative milk yield in :90 day, 150 day and 180 day were 1475.49 ± 527.49 kg, 2337.08 ± 860.78 and 2931.45 ± 963.42 kg, respectively.

The study illustrated that mixed model which included milk yield in third month, Fifth month and sixth month (305 dMY= 384.417 + 2.083M3 + 2.264 M5 + 3.406 M6) had the best coefficient of determination (*R2 =.819) to predict 305 dmy from single month records.*

Also with respect to cumulative milk yield the best model to predict 305 dmy was the model which included cumulative milk yield in 90, 150 and 180 day (305dMY = -108.21 -.281M90 - 1.994M150 + 3.259 M180) which had the highest coefficient of determination *(R2 =.864).*

It can be concluded that coefficient of determination increased as the duration of partial milk yield records increased. Practically, it can rely on partial records of milk for three months (single - cumulative) to predict 305 day milk yield, where the coefficient of determination being 0.53 and 0.56 respectively. However, this could achieve the goal of an early selection especially with the lack of recording systems for livestock productivity under Egyptian conditions.

Key words: *Prediction, 305-dMY, part lactation, cumulative yields, friesian cattle.*

INTRODUCTION

Incomplete records seem to have an important bearing in dairy cattle selection not only for sire evaluation but also for culling cows from the herd (Vanvleck and Henderson, 1961 and Ashmawy *et al.*, 1985), selection of dairy cattle at early stage of lactation on the basis of part yields is beneficial to the dairy farmer as it cuts down the cost of rearing the animals. The ability to predict the complete lactation of a cow from its part yields would determine the successes of dairy herd culling programs. In dairy cattle, high rate of genetic improvement is only possible through early culling of low producing cows.

So, selection of cows and bulls on the basis of their part records provided that full lactation yield can be accurately predicted from part yields. Predicting total lactation yield on the basis of part lactation records has practical utility (Ranjan, *et al.*, 2005). Part yields (monthly milk yield) or cumulative monthly records have been shown to have very high genetic and phenotypic relationships with full records (Koul, 1973).

The aim of present study was develop prediction equations for 305 days milk yields on the basis of monthly milk yield records, and cumulative monthly yields records for Friesian cows in Egypt.

MATERIALS AND METHODS

First lactation data of Friesian cows were collected from the Experimental and Researches Unit of Animal Production at Tokh Tanbisha, in the middle Delta, which belongs to Faculty of Agriculture, Minoufiya University, Egypt; through 12 years from 1997 to 2008. Data included 305 day milk yield, single and cumulative monthly records in Friesian cows (records of 1948).

Feeding and management:

Cows were fed to meet their requirements of DM according to NRC (1989). Roughage: concentrate ratio in the farm was 40: 60%. Diets consisted mainly from concentrate feed mixture (CFM) and berseem in the cold season. In summer season, berseem was replaced by clover hay or Silage (Corn Silage). Calves were mainly produced through AI (imported frozen semen of Friesian sires). Clean water was available in build basin water and/or automatic drinkers. Cows were milked twice daily at milking parlor at 04:00 and 17:00. Animals were housed in semi open sheds. Milk yield was individually recorded every month.

Statistical analysis:

Data were analyzed according to SPSS (Statistical Package for Social Science) program version 19, (SPSS, 2010) and construct the regression models to predict the estimated of 305- day milk yield via single month and cumulative month records in Friesian cows.

Model 1: Prediction of 305 day milk yield using single month milk yield.

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$$305dMY = \alpha + \sum_{i=1}^{3} \beta_i M_i + e_i$$

Where:

305dMY = estimated milk yield in 305 day.
M3 = milk yield in third month.
M5 = milk yield in fifth month.
M6 = milk yield in sixth month.
Bi = unknown regression co-efficient.
ei = error term.

This Model was estimated in different forms as:

$305dMY = f(M_3)$ only

$305dMY = f(M_5)$ only

$305dMY = f(M_6)$ only

Then, the model was estimated as follows:

$305dMY = f(M_3, M_5)$

$305dMY = f(M_3, M_6)$

$305dMY = f(M_5, M_6)$

Finally the model was estimated as:

$305dMY = f(M_3, M_5, M_6)$.

Model 2: Prediction of 305 day milk yield using cumulative milk yield.

$$305dMY = \alpha + \sum_{i=1}^{3} \beta_i M_i + e_i$$

Where:

305dMY = estimated milk yield in 305 day.
M90 = cumulative milk yield in 90 day.
M150 = cumulative milk yield in 150 day.
M180 = cumulative milk yield in 180 day.
Bi = unknown regression co-efficient.
ei = error term.

This Model was estimated in different forms as:

$305dMY = f(M_{90})$ only

$305dMY = f(M_{150})$ only

$305dMY = f(M_{180})$ only

Then, the model was estimated as follows:

$305dMY = f(M_{90}, M_{150})$

$305dMY = f(M_{90}, M_{180})$

$305dMY = f(M_{150}, M_{180})$

Finally the model was estimated as:

$305dMY = f(M_{90}, M_{150}, M_{180})$.

RESULTS AND DISCUSSION

Descriptive statistics

Table (1) shows the descriptive statistics of 305-day milk yield, single and cumulative monthly milk records under study. Mean of 305day milk yield was 3633.66 ± 1672.47 kg and coefficient of variation was 46.03%. This mean was low if it compared with results of Salem, *et al.* (2000), El-Arain, *et al.* (2003), Atil, *et al.* (2005 a), Atil, *et al.* (2005 b), Atil (2006), Ghoneim, *et al.* (2011) and Golverdi, *et al.* (2012) which reported 4938, 5021, 4492, 4642, 4030, 8750 and 5662.91 kg, respectively.

Table 1: Descriptive statistics and factors affecting for studied traits.

Traits (Kg)	Mean ± SD	C.V%
305 dMY	3633.66 ± 1672.47	46.03
3th mo. (M_3)	520.77 ± 221.21	42.48
5th mo. (M_5)	399.84 ± 223.94	56.01
6th mo. (M_6)	402.33 ± 205.64	51.11
C90d (M_{90})	1475.49 ± 527.49	35.75
C150d (M_{150})	2337.08 ± 860.78	36.83
C180d (M_{180})	2931.45 ± 963.42	32.86

Also, Table (1) illustrated that mean ± SD and C.V% for single third, fifth and sixth month milk yield trait were 520.77±221.21 and 42.48%; 399.84±223.94 and 56.01%, and 402.33±205.64 and 51.11%, respectively. These results were lower than those reported by Khattab *et al.* (1999) who working on Friesian cattle in Egypt and reported 617±158 and 24%; 569±144 and 25%, and 534±141 and 26%, respectively.

Also, Table (1) revealed that mean ± SD and C.V% for cumulative 90 , 150 and 180 day milk yield were 1475.49±527.49 kg and 35.75%; 2337.08±860.78 kg and 36.83% and 2931.45±963.42 kg and 32.86%, respectively. These results were higher than those reported by Khattab *et al.* (1993) which were 921± 375 kg and 40.72%; 1415 ± 554 kg and 39.15%, and 1637± 637 kg and 38.91%, respectively. On other hand these results were lower than Atil (1999) who reported 1837±512 kg and 28.5%; 3392 ± 744 kg and 26.9% and 3777±902 kg and 27.1%, respectively for cumulative 90, 150 and 180 day milk yield.

Prediction of 305 day milk yield via single month milk yield.

Table (2) and Figure (1, 2 and 3) showed increasing in co-efficient of determination (R2) as a result for increasing lactation period. Model 7 (Table 2) which include single monthly milk yield at 3rd, 5th and 6th month of lactation was the best to predict 305dMY where R2 of that model was the highest value (0.819) comparing with the others models (Table 2), which were model 5 (0.793), model 6 (0.776), model 4 (0.728), model 3 (0.705), model 2 (0.636) and the lowest co-efficient of determination was model 1 which was (0.534) but Khattab *et al.* (1999) and Ranjan *et al.* (2005) reported that fourth month and third month were the best independent variable to predicate 305dMY .

Prediction of 305 day milk yield using cumulative milk yield.

Table (3) and Figure (4,5 and 6) shown increasing in co-efficient of determination (R2) as a result for increasing lactation period. Model 14 Table (3) which include cumulative monthly milk yield at 90, 150 and 180 day milk yield was the best to predict 305dMY because the R2 for this model was the highest (0.864) among the other models. The lowest R2 was in model 8 which was value 0.561. However, Ashmawy *et al.* (1985) reported that the first seven months of lactation are considered sufficient for prediction 305 day milk yield.

Table 2: Estimates of 305dMY using its regression on single monthly milk yield.

№	Model	α	β_1	β_2	β_3	R^2
1	M_3	458.791**	5.547**			.534
2	M_5	959.288**		5.979**		.636
3	M_6	1396.330**			6.373**	.705
4	M_3,M_5	144.685*	2.927**	4.201**		.728
5	M_3,M_6	465.266**	2.732**		4.832**	.793
6	M_5,M_6	944.232**		3.391**	3.692**	.776
7	M_3,M_5,M_6	384.417*	2.083**	2.264**	3.406**	.819

*significant at 0.05 ** significant at 0.01

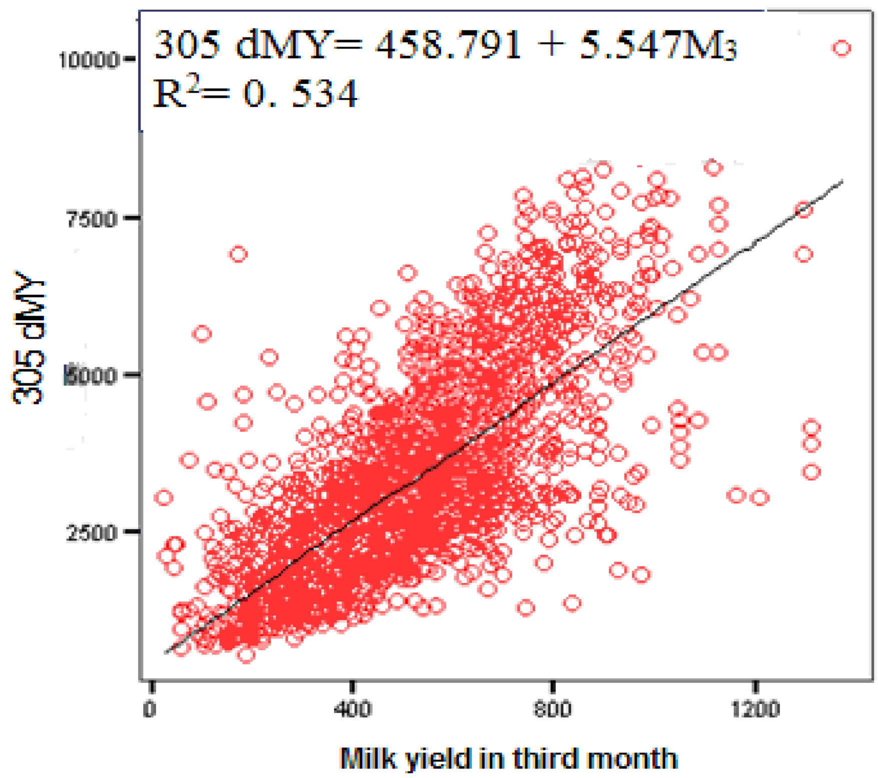

Figure 1: linear regression m3th and 305dMY

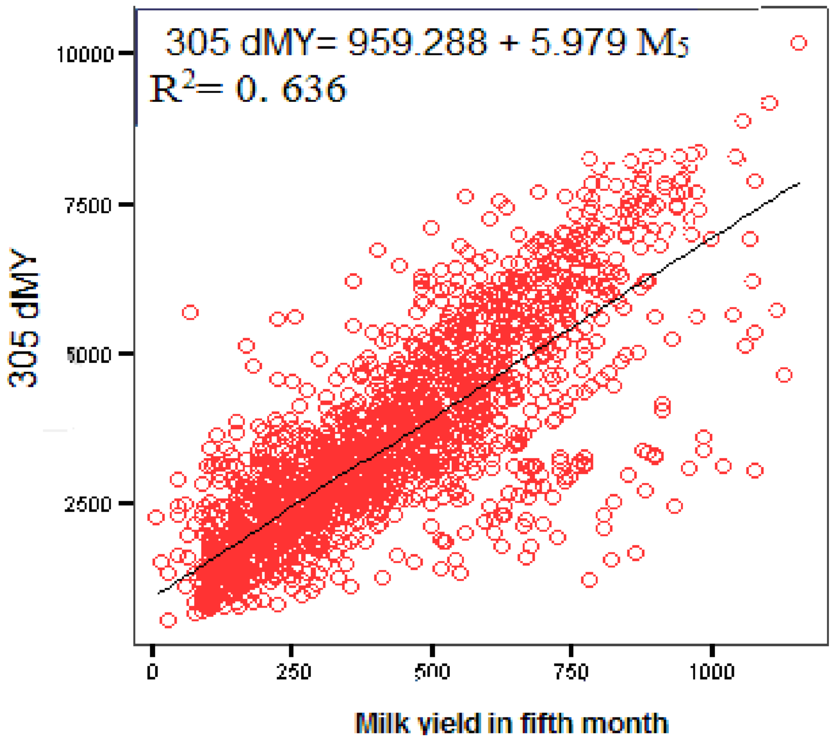

Figure 2: linear regression for m5th and 305dMY.

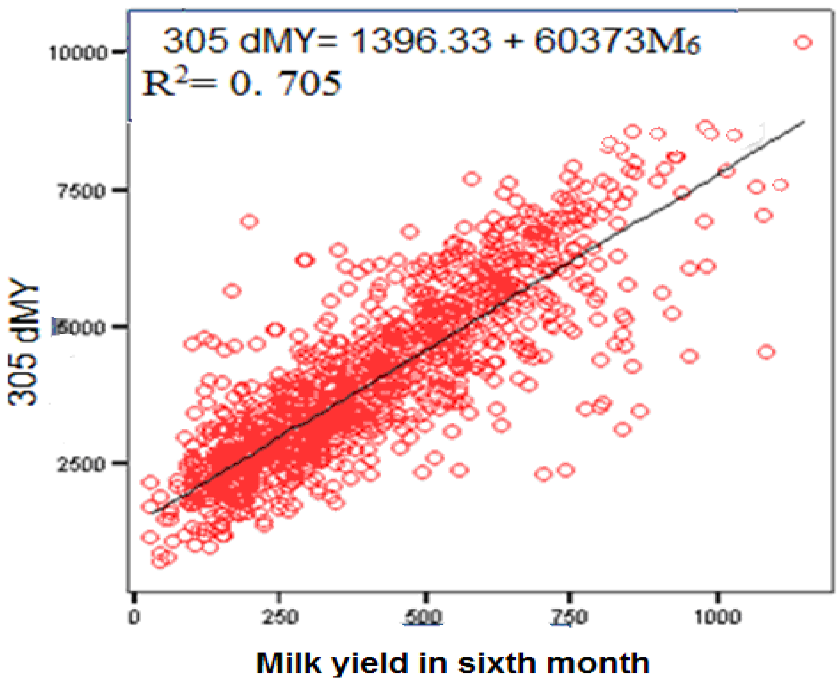

Figure 3: linear regression for m6th and 305dMY.

Table 3: Estimates of 305dMY using its regression on cumulative milk production in 90,150,180 day milk yield.

№	Model	A	$_1\beta$	$_2\beta$	$_3\beta$	R^2
8	M_{90}	-171.51*	2.386**			.561
9	M_{150}	-595.27**		1.690**		.750
10	M_{180}	-360.19**			1.475**	.828
11	M_{90} ,M_{150}	-386.72**	-1.479**	2.535**		.778
12	M_{90} ,M_{180}	-134.161*	-1.114**		1.993**	.852
13	M_{150},M_{180}	-129.75*		-2.357**	3.429**	.863
14	M_{90}, M_{150} ,M_{180}	-108.21*	-.281*	-1.994**	3.259**	.864

*significant at 0.05 ** significant at 0.01

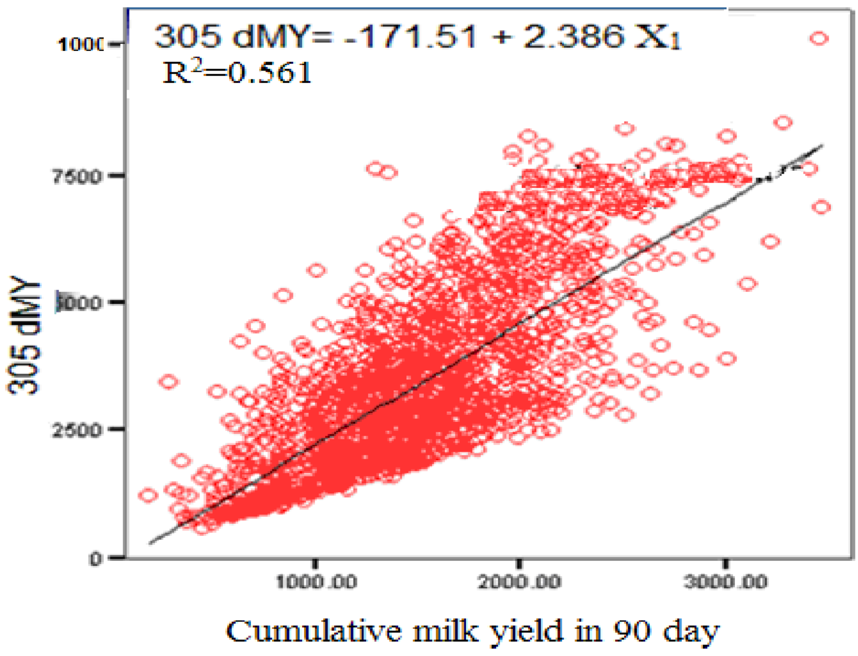

Figure 4: linear regression for 90 and 305dMY.

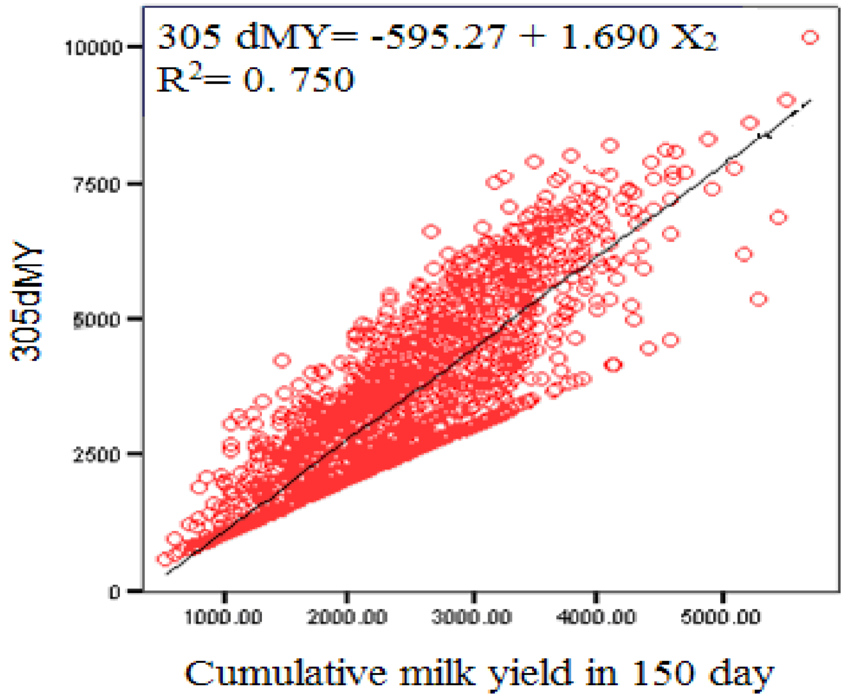

Figure 5: linear regression for 150 and 305dMY

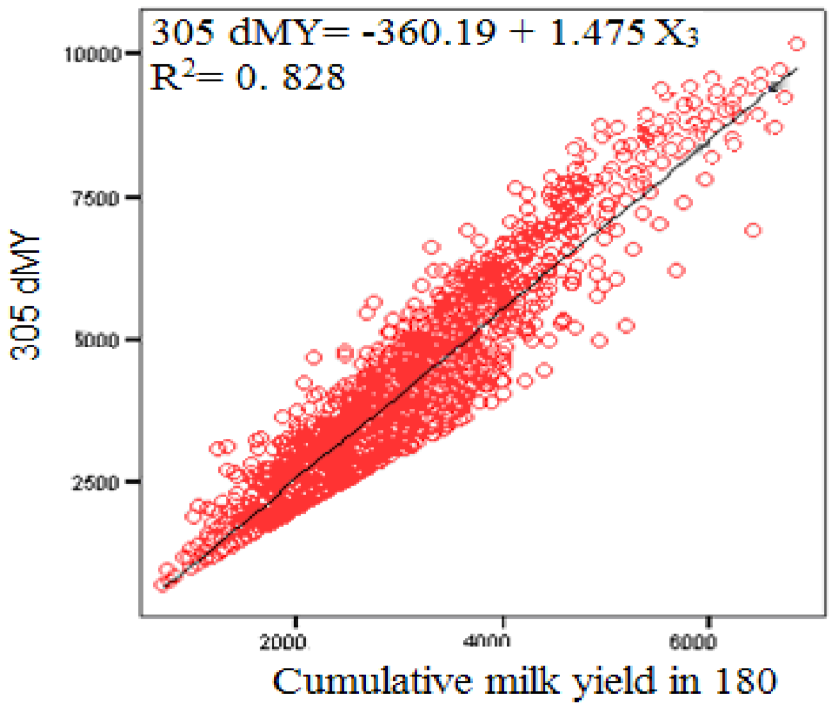

Figure 6: linear regression for 180 and 305dMY

Also Ranjan *et al.* (2005) recommend 90 day milk yield to predict 300 day milk yield, but Yanara (1997) recommended using 120 and 150 day milk yield to predict 305 day milk yield.

CONCLUSION

It can be concluded that coefficient of determination increased as the duration of partial milk yield records increased. Practically, it can rely on partial records of milk for three months (single - cumulative) to predict 305 day milk yield, where the coefficient of determination being 0.53 and 0.56 respectively. However, this could achieve the goal of an early selection especially with the lack of recording systems for livestock productivity under Egyptian conditions.

REFERENCES

Ashmawy, A.A., A. Khattab and M.K. Hamed (1985). Ratio and regression factors, for predicting 305-day production from part-lactation milk records in Friesian cattle in Egypt. Bull. Fac. of Agric. Univ. of Cairo, 36: 789.

Atil, H. (1999). Ratio and regression factors for prediction 305 day production from part lactation milk records in a herd of Holstein Friesian cattle. Pakistan Journal of Biological Science, 2 (1): 31.

Atil, H. (2006). A comparison of different selection indices for genetic improvement for milk traits in Holstein Friesian cattle in Turkey by using one standard deviation as relative economic weight. Pakistan Journal of Biological Science, 9 (2): 285.

Atil, H. and Adel Salah Khattab (2005b). Use of Multiple traits Animal Model for genetic evaluation of milk yield and age at first calving of Holstein Friesian cattle in Turkey. Pakistan Journal of Biological Sciences, 8 (1): 114.

Atil, H., Adel Salah Khattab and Yakut Gevrekci (2005a). A comparison of different selection indices for genetic improvement of some dairy milk traits in Holstein Friesian cows in Turkey. J. Apple. Anim. Res., 27: 117.

El-Arian, M.N., H.G. El-Awady and A.S. Khattab (2003). Genetic analysis for some productive traits of Holstein Friesian cows in Egypt through MTDFREML program. Egyptian J. Anim. Prod., 40 (2): 99.

Ghoneim Elham, M. Abd-Elatifa, Hanaa Abdelherith and M. Abd Elhamid (2011). Genetic parameters for age at first calving and lifetime milk yield traits in Friesian cattle in Egypt. Minufiya J. Agric. Res., 36 (4): 913.

Golverdi Ali Yousefi, Hasan Hafezian, Yadolah Chashnidel and Ayoub Farhadi (2012). Genetic parameters and trends of production traits in Iranian Holstein population. African Journal of Biotechnology, 11(10): 2429.

Khattab, A.S., H. Aul and L. Badawy (1999). Inheritance of lactation curve in a herd of Holstein Friesian cattle in Egypt. Uluslararasi Hayvancihk 99 Kongresi 21.

Khattab, A.S., Z.A. Sultan, M.S. Kassab and A.Y. Salem (1993). Inheritance of part lactation records in Friesian cows in Egypt. J. Agric. Res. Tanta Univ., 19 (4) 747.

Koul, G.L. (1973). Comparative efficiency of selection indices using part and whole lactation records in Hariana Cattle. Ph.D. Thesis Agra University, Agra, India.

NRC, (1989). Nutrient Requirements of Domestic Animals. No.9- National Research Council Washington, D.C.

Ranjan, S.K., M.L. Lakhera and M. Singh (2005). Development of Prediction Equations for 300 Days Milk Yield from Part Yields, Cumulative part and Sequential monthly Records in Sahiwal Cows. Int. J. Agri. Biol., 7 (4): 574.

Salem, A.Y., Manal S. Kassab, A.S. Khattab and A.M. Hussien (2000). Age correction factors for milk yield traits in a commercial herd of Friesian cattle in Egypt. J. Agric. Sci. Mansoura Univ., 25 (7): 3945.

SPSS, (2010). SPSS base 19 for windows, User's Guide; SPSS Inc.

Van Vleck, L.D and C.R. Henderson (1961). Regression factors for extending part lactation milk records. Journal of Dairy Science, 44:1085.

Yanara Mete (1997). Prediction of 305- day milk production from partial milk yields in Brown Swiss cattle reared in the research farm of Ataturk University. Atatürk Üni. Zir. Fak. Der., 28 (2): 206.

التنبؤ بإنتاج اللبن في ٣٠٥ يوم باستخدام سجلات اللبن الجزيئية لماشية الفريزيان في مصر

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الملخص العربى

أجريت هذه الدراسة في وحدة تجارب وبحوث الإنتاج الحيواني بطوخ طنبشا في دلتا النيل بمصر والتابعة لكلية الزراعة، جامعة المنوفية . وقد تم تجميع البيانات من سجلات قطيع الفريزيان بالوحدة خلال الفترة من ١٩٩٧–٢٠٠٨ حيث شملت عدد ١٩٤٨ سجل. وكان الهدف من هذه الدراسة هو اشتقاق نماذج مختلفة للتنبؤ بإنتاج اللبن فى ٣٠٥ يوم باستخدام محصول اللبن الجزئى (فردى أو تراكمى) في ماشية الفريزيان في مصر.

وقد تمت دراسة العلاقة بين إنتاج اللبن فى ٣٠٥ يوم وإنتاج اللبن الجزئى فى الشهر الثالث والخامس والسادس، كما تم تقدير العلاقة بين إنتاج اللبن فى ٣٠٥ وإنتاج اللبن التراكمي في ٩٠ و ١٥٠ و ١٨٠ يوم حليب، وكانت اهم النتائج التى تم التوصل إليها على النحو التالى:

١– قدر متوسط إنتاج اللبن فى ٣٠٥ يوم بنحو ٣٦٣٣.٦٦ كجم ± ١٦٧٢.٤٧ كجم ومعامل اختلاف ٤٦ ٪ .

٢– قدر متوسط إنتاج اللبن فى الشهر الثالث بمقدار ٥٢٠ كجم ± ٧٧ كجم ومعامل اختلاف يقدر بنحو ٤٢.٤٨٪.

٣– قدر متوسط إنتاج اللبن فى الشهر الخامس بنحو ٣٩٩ كجم ± ٨٤ كجم ومعامل اختلاف يقدر بنحو ٥٦٪.

٤– قدر متوسط إنتاج اللبن فى الشهر السادس بنحو ٤٠٢.٣٣ كجم ±٢٠٥.٦٤ كجم ومعامل اختلاف يقدر بنحو ٥١.١١٪.

٥– قدر متوسط الإنتاج التراكمي حتى الشهر الثالث (٩٠ يوم) بنحو١٤٧٥.٤٩ كجم ± ٥٢٧.٤٩ كجم ومعامل اختلاف يقدر بنحو ٣٥.٧٥٪.

٦– قدر متوسط الإنتاج التراكمي حتى الشهر الخامس (١٥٠ يوم) بنحو٢٣٣٧.١ كجم ± ٨٦٠.٧٨ كجم ومعامل اختلاف يقدر بنحو ٣٦.٨٣ ٪.

٧– قدر متوسط الإنتاج التراكمي حتى الشهر السادس (١٨٠ يوم) بمقدار٢٩٣١.٤٥ كجم ± ٩٦٣.٤٢ كجم ومعامل اختلاف يقدر بنحو ٣٢.٨٦٪.

٨– كانت أعلى قيمة لمعامل التحديد فى حالة التنبؤ بإنتاج اللبن فى ٣٠٥ يوم باستخدام محصول اللبن الشهرى للنموذج رقم ٧ ، حيث بلغت قيمة معامل التحديد حوالى ٠.٨٢ مما يعنى أن التغيرات فى الإنتاج الشهرى للشهور الثالث والخامس والسادس تفسر حوالى ٨٢% من التغيرات الحادثة فى محصول اللبن فى ٣٠٥ يوم.

٩– كانت أعلى قيمة لمعامل التحديد فى حالة التنبؤ بإنتاج اللبن فى ٣٠٥ يوم باستخدام محصول اللبن التراكمي للنموذج رقم ١٤ ، حيث بلغت قيمة معامل التحديد حوالى ٠.٨٦ مما يعنى أن التغيرات فى الإنتاج التراكمى للبن فى ٩٠ و ١٥٠ و ١٨٠ يوم حليب تفسر حوالى ٨٦% من التغيرات الحادثة فى محصول اللبن فى ٣٠٥ يوم.

وقد خلص البحث إلى أن معامل التحديد يزداد بازدياد مدة تسجيل اللبن فى سجلات إنتاج اللبن الجزئية. وعمليا فأنه يمكن الإعتماد على سجلات الحليب الجزئية لمدة ٣ شهور (فرديه– تراكمية) فى التنبؤ بانتاج اللبن فى ٣٠٥ يوم حيث يكون معامل التحديد٠.٥٣ و ٠.٥٦ على التوالى مما يعنى أن ٠.٥٣ و٠.٥٤ من التغير فى إنتاج اللبن فى ٣٠٥ يوم يعزى إلى إنتاج اللبن الجزئى فى مده ٣ شهور (فردى أو تراكمى). وبناءً على ذلك فإنه يمكن التوصية بإستخدام معدلات التنبؤ المبكر للإنتاج بهدف الإنتخاب المبكر فى هذه المدة وخاصة مع عدم وجود نظام تسجيل لإنتاجية الماشية تحت الظروف المصرية .