EXPECTED IMPACT OF SELECTION FOR MILK YIELD ON REPRODUCTIVE PERFORMANCE TRAITS IN HOLSTEIN FRIESIAN COWS UNDER EGYPTIAN CONDITIONS

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Received: 30/9/2019 Accepted: 5/1/2020

SUMMARY

Estimation of genetic and phenotypic parameters of productive (305-day yields of milk, MY305; fat, FY305 and protein, PY305) and reproductive performance traits (days open, DO; calving interval, CI and number of inseminations per conception, NSC) were calculated on 3398 lactation records of 1054 Holstein Friesian cows, daughters of 94 bulls and 691 dams using multi-trait animal model with repeated records. Expected impact of direct selection for MY305, FY305 and PY305 on reproductive performance was calculated. Heritability estimates for productive traits varied from 0.08 to 0.26 and from 0.04 to 0.19 for reproductive traits. The productive traits were highly inter-correlated genetically (0.995 to 0.998) than the reproductive traits (0.241 to 0.786). Cows which producing abundant MY305, FY305 and PY305 tended to show less reproductive efficiency in terms of longer DO (r_G = 0.942 to 0.947), longer CI (r_G =0.587 to 0.673) and more NSC (r_G =0.769 to 0.829). Direct selection, after one round of selection, for MY305, FY305 and PY305 is expected to result in cows with more advantageous productive performance in terms of higher MY305 (+180.22 to 323.27 kg), FY305 (+13.79 to 24.95 kg) and PY305 (+12.41 to 22.48 kg). This enhancement in productive performance is expected to be associated with deterioration in reproductive performance in terms of longer days open (+16.27 to 29.48 days), longer calving interval (+15.26 to 25.22 days) and higher number of inseminations per conception (+.08 to 0.16 services). It could be concluded that the undesirable relationship between productive and reproductive performance traits in Holstein Frisian cows must be taken into consideration when planning breeding programs in dairy cattle (e.g. improving productive traits by genetic selection and reproductive traits by enhancement management or by using restricted selection indices).

Keywords: Holstein-Frisian cows, productive and reproductive performance, genetic parameters, direct selection, correlated response

INTRODUCTION

For most countries, milk production, involving yields of protein and fat, has been the main objective for selection in dairy cattle (Miglior *et al*., 2005). From economic point of view, optimal profitability of the dairy producer can be achieved by obtaining the productive performance, in terms of high yields of milk, protein and fat, at high level while maintaining the reproductive performance, in terms of days open, calving interval and number of inseminations per conception, at acceptable level.

Continuous selection for abundant milk production has been widely related with unfavorable effects on health and fertility of cows (Zink *et al*., 2012; Carthy *et al*., 2016 and Frioni *et al*., 2017).

The impact of longer calving interval are manifested by lower annual yields of milk, protein and fat; lower calf-crop; more number of inseminations per conception and higher costs through longer dry periods with increase in number of veterinary treatments (Zambrano and Echeverri, 2014; Radwan *et al*., 2015 and Ben Zaabza *et al*., 2016).

The aim of the present work was to estimate the impact of direct selection for 305-day milk yield, protein yield and fat yield on reproductive performance traits of Holstein Frisian cows based on records collected from a commercial herd raised under Egyptian conditions using the equations described by Falconer and Mackay (1996).

MATERIALS AND METHODS

Source of data:

Data of the present study were collected from Alexandria-Copenhagen private Dairy Farm (76 km from Alexandria governorate). A total number of 3398 lactation records of productive and reproductive performance traits for 1054 Holstein Friesian cows, daughters of 94 bulls and 691 dams, were used in this study. Data covered the period from 1997 to 2011.

Herd management:

All animals were kept and reared under natural environmental condition supplied with spray cooling system during hot climate to reduce heat stress effect. Holstein cows were fed on commercial ration providing 19.7 crude protein with 2567 kcal/kg containing 16.5% wheat bran, 52.0% yellow corn, 29.5% soybean meal, 1% limestone, 0.7% di-calcium phosphate and 0.3% antitoxin according to cow's body weight, milk yield and stage of lactation with *ad-lib* access to fresh water. At 375 kg body weight, heifers are to artificially inseminated. After birth, cows are machine milked, three times a day. The

newborn calves were suckled artificially up to weaning at 3 months of age.

Studied traits:

The traits describing productive performance were 305-day yields of milk, MY305, fat, FY305, and protein, PY305. While those describing the reproductive performance were number of days open, DO, calving interval, CI, and number of inseminations per conception, NSC.

Statistical analysis:

Genetic and phenotypic parameters were estimated using a multi-traits animal model with repeated records by applying the VCE-6 software program package (Kovač *et al*., 2002) according to the following repeatability model:

$$y = Xb + Za + wp + e,$$

Where:

y = the vector of observations of the studied traits,

B = the vector of fixed effects (overall mean, parity, 2-5 levels, and year-month of calving, 154 levels),

a = the vector of random additive genetic direct effects,

P = the vector of permanent environmental effects, with each level pertaining to a common effect to all observations of each animal,

X, Z and W = known incidence matrices relating observations to the respective fixed, random and permanent environmental effects with Z augmented with columns of zeros for animals with or without records, and

e = the vector of random residual effects.

Estimation of direct and correlated responses:

Direct response for productive performance of a given trait (DR) was calculated as:

$$DR = I * h^2 * \sigma_p,$$

While, the correlated response in reproductive performance of a trait Y (CRY), with direct selection applied on a trait X, was calculated according to the following equation, as described by Falconer and Mackay (1996):

$$CR_Y = I * h_X * h_Y * r_G * \sigma_{P(Y)}$$

Where:

I = intensity of selection on X,

h = square root of the heritability, with subscript X or Y, according to trait,

r_G = genetic correlation between trait X and trait Y, and

$\sigma_{P(Y)}$ = phenotypic standard deviation for the trait Y.

RESULTS AND DISCUSSION

Levels of performance:

Overall means of productive (MY305, FY305 and PY305) and reproductive performance traits (DO, CI and NSC) across all lactations and their phenotypic and genetic coefficients of variability are presented in Table 1. The means of MY305 (8369.72 kg, Table 1; 8805 kg, Rushdi *et al*., 2014; 8550, Samoul, 2015; 8315 kg, Salem and Hammoud, 2016b) were much lower than the estimate of 10369 kg obtained by Radwan and ABO Elfadl (2016) and much higher than the estimate of 6384.95 kg obtained by Faid-Allah (2015). The average of FY305 obtained in present study (266.06 kg, Table 1) was slightly higher than the estimates of 227 and 246.73kg reported under Iranian conditions (Behzadi *et al*., 2013 and Salimi *et al*., 2017, respectively). However, Frioni *et al*. (2017) recorded much lower estimate (187.3 kg) under Uruguay condition. The overall mean of PY305 in present study (219.14 kg) was comparable with the mean of 233.5 kg obtained by Salimi *et al*. (2017) and much higher than the estimate of 182.8 kg recorded by Frioni *et al*. (2017).

Table 1. Overall means, residual genetic and phenotypic coefficients of variation, heritabilities and their standard errors (h^2±SE) for productive and reproductive performance traits considered in the present study

Trait	Mean	Coefficient of variation		h^2±SE
		Genetic	phenotypic	
Productive performance:				
305-day milk yield, MY305, kg	8369.72	7.72	26.91	0.08±0.02
305-day fat yield, FY305, kg	266.06	18.35	38.42	0.23±0.02
305-day protein yield, PY305, kg	219.14	19.96	39.45	0.26±0.03
Reproductive performance:				
Number of days open, DO, day	166.50	37.18	84.13	0.19±0.02
Calving interval, CI, day	427.72	19.55	62.48	0.09±0.02
Number of inseminations per conception, NSC	3.00	12.66	65.30	0.04±0.01

For reproductive performance traits, the overall mean of DO was 166.5 days (Table 1). This estimate was within the range of 113.1 to 219.15 days reported in several Egyptian studies (Radwan and ABO Elfadl, 2016; Salem and Hammoud, 2016b). Calving interval in the present study was calculated

to be 427.72 days, which is comparable to the estimate of 430 days obtained by Abou-Bakr *et al*. (2006) and lower than the estimates of 452 and 484 days given by Safaa (2006) and Ibrahim *et al*. (2009), respectively. The overall mean of NSC (3.0, Table 1) was comparable to the estimate of 3.5 services stated by Samoul (2015). However, this estimate was much higher than the estimate of 1.9 obtained by Salem and Hammoud (2016a). The variations in estimates for productive and reproductive traits between present study and previous results may be due to the differences in herd type, number of lactations and environmental conditions (e.g. feeding, temperature, veterinary care, etc.).

Variability:

Residual phenotypic and genetic coefficients of variability for considered traits are given in Table 1. It seems that reproductive performance traits are more variable phenotypically than the productive traits (CVP = 62.48 to 84.13% vs. 26.91 to 39.45%) which revealed the effect of environmental conditions on these traits. Milk yield was the lowest variable trait genetically (7.72%) and phenotypically (26.91%) among the studied traits. The low estimate for the coefficient of variation in milk yield compared to fat and protein yield indicate a high homogeneous population in this trait as a result to continuous culling of cows with productive and reproductive problems by progressing in parities (Frioni *et al*., 2017). The stability of MY305 across years of study compared to FY305 and PY305 (Figure 1) support this finding.

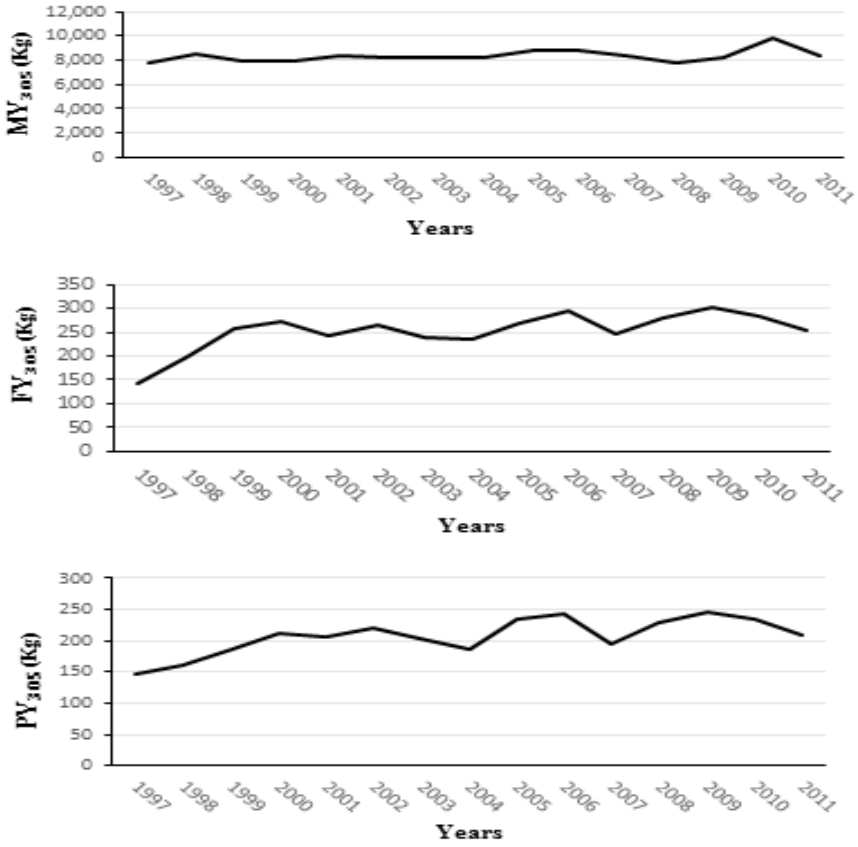

Figure 1. Change in milk production traits over calving year

Heritabilities:

Heritability estimates **(h^2)** for productive and reproductive traits are showed in Table 1. The h^2 estimate obtained in present study for MY305 using the multi-trait repeated animal model was found to be very low (0.08) as compared to the estimates stated in literatures. It has no counterpart in the literature and out the range of the estimates calculated either through the single animal model (0.15 – 0.35: Sahin *et al*., 2012; Salem and Hammoud, 2016a and Ayalew *et al*., 2017) or bivariate animal model (0.16 – 0.26: Toghiani, 2012; Rushdi *et al*., 2014 and Ayalew *et al*., 2017**),** multi-traits animal model (0.15, Ayalew *et al*., 2017; 0.18, Faid-allah, 2015) and multi-traits animal model with repeated records (0.23, Frioni *et al*., 2017). The lower h^2 estimate of MY305 in present study may be due to the differences in days in milk, days open, amount of residual variances and other sources of environmental variances from one lactation to other (Behzadi *et al*., 2013).

The present h^2 estimate for fat yield (0.23) was comparable to those obtained using a similar model (0.21, Frioni *et al*., 2017) and bivariate animal model (0.21, Zink *et al*., 2012). However, these estimates are much higher than the estimates of 0.11 and 0.16 obtained using the single trait animal model (Stanojević *et al*., 2013; Albarrán-Portillo and Pollott, 2013, respectively).

Heritability estimate of protein yield was found to be moderate (0.26, Table 1). This estimate was slightly higher than the estimate of 0.21 reported by Frioni *et al*. (2017) using similar model.

The h^2 estimates of 0.19, 0.18 and 0.15 obtained for number of days open in present study and by Salem & Hammoud (2016a) and Radwan & ABO Elfadl (2016), respectively, are above the range of 0.03 to 0.15 given in literature (e.g. Ben Zaabza *et al*., 2016; Radwan and ABO Elfadl, 2016 and Ayalew *et al*., 2017).

Heritability estimate of calving interval (0.09, Table 1; 0.09, Zambrano and Echeverri, 2014; 0.11, Ayalew *et al*., 2017) was slightly higher than the estimates ranged from 0.002 to 0.07 reported in previous works (e.g. Toghiani, 2012; El-Bayoumi, 2015; Almeida *et al*., 2017) and much lower than the estimate of 0.28 given by Goshu *et al*. (2014).

The NSC in present study was estimated to be %4 heritable. Comparable estimates have been noticed in the literature (0.03 to 0.07, M'hamdi *et al*., 2010; Zambrano and Echeverri, 2014 and Ben Zaabza *et al*., 2016). However, Radwan *et al*. (2015) reported much higher estimate (0.21) for the same trait.

The low h^2-estimates for reproductive traits revealed that improvement of performances for these traits could be achieved by improving the non-genetic factors (feeding, health and reproductive management), which vary from herd to herd, therefore enhancement of these traits through selection of superior individuals would be very slow.

In general, it is noteworthy that statistical analysis method, animal genetics, parity number, milk record number, and environmental effects may be the most important factors affecting the estimates of heritability estimates from one study to another.

Genetic and phenotypic associations:

Correlations among productive and reproductive traits are presented in Table 2.

Table 2. Genetic (above diagonal) and phenotypic (below diagonal) correlations among productive and reproductive performance traits

Trait	MY305	FY305	PY305	DO	CI	NSC
Productive performance traits						
305-day Milk yield, MY305	…..	0.995	0.995	0.942	0.673	0.769
305-Fat yield, FY305	0.425	…..	0.998	0.947	0.587	0.829
305-Protein yield, PY305	0.448	0.886	…..	0.947	0.617	0.810
Reproductive performance traits						
Days open, DO	0.045	0.389	0.407	……	0.481	0.786
Calving interval, CI	0.272	0.264	0.250	0.378	…..	0.241
Number of inseminations per conception, NSC	0.047	0.180	0.161	0.147	0.025	…..

Associations among productive traits:

It appeared that 305-day milk yield, fat yield and protein yield were strongly inter-correlated genetically (0.995 to 0.998) and phenotypically (0.425 to 0.886). This is in agreement with previous studies (0.69 to 0.91, Amini *et al*., 2011; Zavadilová and Zink, 2013; Frioni *et al*., 2017). Due to the high genetic correlation among productive traits, genetic selection for all traits can be achieved through selection for any of them.

Associations among reproductive traits:

Days open shows a fairly high genetic relationship with calving interval (r_G = 0.481). This estimate was much lower than the estimates ranged 0.85 to 0.99 reported by Ghiasi *et al*. (2011), Guo *et al*. (2014), Zambrano and Echeverri (2014), Radwan *et al*. (2015), El-Bayoumi (2015), Ben Zaabza *et al*. (2016) and Ayalew *et al.* (2017). However, Toghiani (2012) reported low genetic correlation (r_G = 0.11) between the same two traits.

High genetic relationship (r_G= 0.786) was found in the present study between days open and number of inseminations per conception. Similar genetic trend (r_G = 0.72 to 0.99) has been showed in literature between the two traits (Ghiasi *et al*., 2011; Yamazaki *et al*., 2014; Zambrano and Echeverri, 2014).

Moderate relationship (r_G = 0.241) was recorded between CI and NSC in present study. This estimate was much lower than the estimates of 0.49 and 0.42 obtained by Guo *et al*. (2014) and Radwan *et al*. (2015), respectively.

Associations between productive and reproductive traits:

Undesirable relationship between 305-day milk yield and reproductive performance traits was noticed. This is represented in number of days open (r_G= 0.942, Table 2; 0.99, Salem and Hammoud, 2016a; 0.69, Frioni *et al*., 2017; 0.65, Zavadilová and Zink, 2013), calving interval (r_G= 0.673, Table 3; 0.63, Albarrán-Portillo and Pollott, 2013; 0.59, Toghiani, 2012) and number of inseminations per conception (r_G= 0.769, Table 2; 0.99, Salem and Hammoud, 2016b).

From the genetic point of view, DO, CI and NSC are strongly correlated positively with FY305 (0.587 to 0.947) and PY305 (0.617 to 0.947). Generally, the

high undesirable positive genetic correlation between productive and reproductive traits of Holstein Frisian cows, indicate that any genetic improvement in productive performance would adversely affect the reproductive performance of cows included in present study.

Expected direct and correlated responses to selection:

Expected genetic responses to direct selection for productive traits on reproductive performance are given in Table 3. At each round of selection, with intensity equal 1.0, individual direct selection for yields of milk, protein and fat is expected to develop Holstein Frisian cows with better milk production performance in terms of higher milk yield (+180.22 to 323.27 kg), fat yield (+13.79 to 24.95 kg) and protein yield (+12.41 to 22.48 kg). However, direct selection for productive traits is expected to deteriorate the reproductive performance in terms of longer number of days open (+16.27 to 29.48 days), longer calving interval (+15.26 to 25.22 days) and higher number of inseminations per conception (+0.08 to 0.16 service).

Based on the results obtained in present study, it is notable that, the correlated response in MY305 when direct selection for each of FY305 and PY305 is applied, would be higher than the direct response for MY305 itself (304.05 and 323.27 kg, respectively vs 180.22 kg). This is due to the higher heritability estimates for yields of fat and protein (0.23 and 0.26, respectively) than that of milk yield (0.08) and the perfect genetic correlation among the three traits (0.995 to 0.998).

Table 3. Expected direct and correlated responses to selection for productive and reproductive traits

Response to selection	unit	Selection criterion		
		MY305	**FY305**	**PY305**
Direct response:				
MY305	Kg	**180.22**	….	….
FY305	Kg	….	**23.51**	….
PY305	Kg	….	….	**22.48**
Correlated response in:				
MY305	Kg	….	304.05	323.27
FY305	Kg	13.79	….	24.95
PY305	Kg	12.41	21.09	….
DO	Day	16.27	27.73	29.48
CI	Day	15.26	22.57	25.22
NSC	Service	0.08	0.16	0.16

As compared to selection for milk yield, the size of deterioration in DO, CI and NSC (9.77, 3.57 and 2.67%, respectively) are expected to be higher when selection for yields of protein (17.70, 5.89 and 5.33%, respectively) and fat (16.65, 5.27 and 5.33%, respectively) is applied (Fig. 2).

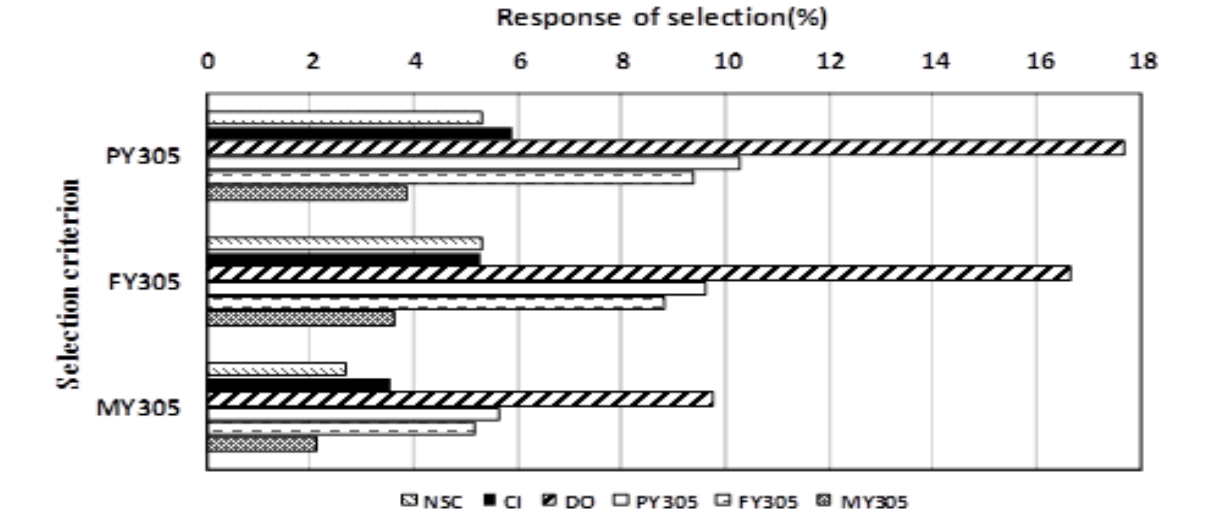

Figure 2. Expected response to selection for productive performance traits expressed as a percentage of the initial means

CONCLUSION

It could be concluded that the genetic undesirable relationship between productive and reproductive performance traits in Holstein Frisian cows must be taken into consideration when planning breeding programs in dairy cattle.

REFERENCES

Abou-Bakr, S., H.O.A. Alhammad, R.R. Sadek and A. A. Nigm, 2006. Productive and reproductive characteristics of Holstein cows raised under intensive farming system in Egypt. Egyptian Journal of Animal Production, 43(2): 91-98.

Albarrán-Portillo, B. and G.E. Pollott, 2013. The relationship between fertility and lactation characteristics in Holstein cows on United Kingdom commercial dairy farms. Journal of dairy Science, 96(1): 635-646.

Almeida, T.P., E.L. Kern, D.D.S. J. Daltro, Braccini Neto, C. McManus, A. Thaler Neto and J.A. Cobuci, 2017. Genetic associations between reproductive and linear-type traits of Holstein cows in Brazil. Revista Brasileira de Zootecnia, 46(2): 91-98.

Amini, A., A.A. Aslmeninejad and M. Tahmuraspor, 2011. Estimation of genetic parameters for production traits of Holstein cattle in Khorasan Razavi province. Iranian Journal of Animal Science research, 3(2): 171-178.

Ayalew, W., M. Aliy, and E. Negussie, 2017. Estimation of genetic parameters of the productive and reproductive traits in Ethiopian Holstein using multi-trait models. Asian-Australasian Journal of Animal Science, 30(11):1550-1556.

Behzadi, M.B., A. Amini, A.A. Aslaminejad, and M. Tahmoorespour, 2013. Estimation of genetic parameters for production traits of Iranian Holstein dairy cattle. Livestock Research Rural Development, 25(9), uploaded from http://www.lrrd.org/lrrd25/9/bahr25156.htm.

Ben Zaabza, H., A. Ben Gara, H. Hammami, B. Jemmali, M.A. Ferchichi, and B. Rekik, 2016. Genetic parameters of reproductive traits in Tunisian Holsteins. Archives Animal Breeding, 59(2): 209-213.

Carthy, T.R., D.P. Ryan, A.M. Fitzgerald, R.D. Evans, and D.P. Berry, 2016. Genetic relationships between detailed reproductive traits and performance traits in Holstein-Friesian dairy cattle. Journal of Dairy Science, 99(2): 1286-1297.

El-Bayoumi, K.M., M.S. El-Tarabany, T.M. Abdel-Hamid, and O.M. Mikaeil, 2015. Heritability, genetic correlation and breeding value for some productive and reproductive traits in Holstein cows. Research Opinions in Animal and Veterinary Sciences, 5(2): 65-70.

Falconer, D.S. and T.F.C. Mackay, 1996. Introduction to quantitate genetic .4th Edition, Longman.

Faid-Allah, E. 2015. Genetic and non-genetic analysis for milk production and reproductive traits in Holstein cattle in Egypt. Indonesian Journal of Animal and Veterinary Sciences, 20(1):10-17.

Frioni, N., G. Rovere, I. Aguilar, and J.I. Urioste, 2017. Genetic parameters and correlations between days open and production traits across lactations in pasture based dairy production systems. Livestock Science, 204: 104-109.

Ghiasi, H., A. Pakdel, A. Nejati-Javaremi, H. Mehrabani-Yeganeh, M. Honarvar, O. González-Recio, M.J. Carabaño, and R. Alenda, 2011. Genetic variance components for female fertility in Iranian Holstein cows. Livestock Science, 139(3): 277-280.

Goshu, G., S. Harpal, K. Johan Petersson and L. Lundeheim, 2014. Heritability and correlation among first lactation traits in Holstein Friesian cows at Holeta Bull Dam Station, Ethiopia. International Journal of Livestock Production, 5(3): 47-53.

Guo, G., X. Guo, Y. Wang, X. Zhang, S. Zhang, X. Li, L. Liu, W. Shi, T. Usman, X. Wang, and L. Du, 2014. Estimation of genetic parameters of fertility traits in Chinese Holstein cattle. Canadian Journal of Animal Science, 94(2): 281-285.

Ibrahim, M.A.M., H.E. Rushdi, S.A.M. Abdel-Salam and S. Abou-Bakr, 2009. Genetic and phenotypic trends of calving interval and age at first calving in a commercial Holstein herd. Egyptian Journal of Animal Production, 46(2):103-112.

Kovač, M., E. Groeneveld and L.A. Garcia Cortes, 2002. VCE-5 User's a package for the estimation of dispersion parameters. 7th World Congr. Genet. Appl. Livest. Prod., Montpellier, France. Commun. no. 28–06, 19-23 Aug.

M'hamdi, N., R. Aloulou, S.K. Brar, M. Bouallegue and B.M. Hamouda, 2010. Phenotypic and genetic parameters of reproductive traits in Tunisian Holstein cows. Biotechnology in Animal Husbandry, 26(5-6): 297-307.

Miglior, F., B.L. Muir, and B.J. Van Doormaal, 2005. Selection Indices in Holstein Cattle of Various Countries. Journal of Dairy Science, 88(3): 1255–1263.

Radwan, H.A. and E.A. ABO Elfadl, 2016. Test day milk yield as a selection criterion to improve milk yield based on measures of somatic cells in Holstein cow's milk. Asian Journal of Animal and Veterinary Advances, 11(9): 516-523.

Radwan, H.A., E.A. Abo Elfadl and A.M. Fardos, 2015. Estimates of population parameters for some economic traits in Holstein Friesian cows by using statistical program. Global Veterinaria, 14(1): 129-135.

Rushdi, H.E., M.A.M. Ibrahim, N.Q. Shaddad, and A.A. Nigm, 2014. Estimation of genetic

parameters for milk production traits in a herd of Holstein Friesian cattle in Egypt. Mansoura Journal of Animal and Poultry Production, 5(5): 267-278.

Safaa, S.S.I. 2006. Genetic analyses for some productive and reproductive traits in dairy cattle. Ph. D. Thesis, Faculty of Agriculture at Moshtohor, Banha University, Egypt.

Sahin, A., Z. Ulutas, A.Y. Adkinson, and R.W. Adkinson, 2012. Genetic and environmental parameters and trends for milk production of Holstein cattle in Turkey. Italian Journal of Animal Science, 11(3): 242-248.

Salem, M.M.I. and M.H. Hammoud, 2016a. Genetic parameters of first lactation traits of Holstein cows in Egypt. Egyptian Journal of Animal Production, 53(2): 75-80.

Salem, M.M.I. and M. H Hammoud, 2016b. Estimates of heritability, repeatability and breeding value of some performance traits of Holstein cows in Egypt using repeatability animal model. Journal of Animal Production, 53(3):147-152.

Salimi, M.H., N.G. Hossein-Zadeh, A.A. Shadparvar and A.R. Eghbal, 2017. Genetic evaluation of dystocia and its relationship with productive and reproductive traits in Holstein cows. Revista Colombiana de Ciencias Pecuarias, 30(2):126-137.

Samoul, A. 2015. Productive and reproductive performance of Holstein cows under different managerial conditions. Ph.D. Thesis, Faculty of Agriculture, Cairo University, Egypt.

Stanojević, D., R. Đedović, V. Bogdanović, R. Beskorovajni, P. Perišić, M. Popovac, and N. Popović, 2013. Heritability and repeatability estimation of milk yield traits of black and white cows. In 10th International Symposium (p. 1397).

Toghiani, S. 2012. Genetic relationships between production traits and reproductive performance in Holstein dairy cows. Archiv Tierzucht, 55(5): 458-468.

Yamazaki, T., K. Hagiya, H. Takeda, S. Yamaguchi, T. Osawa, and Y. Nagamine, 2014. Genetic correlations among female fertility, 305-day milk yield and persistency during the first three lactations of Japanese Holstein cows. Livestock Science, 168: 26-31.

Zambrano, J.C. and J. Echeverri, 2014. Genetic and environmental variance and covariance parameters for some reproductive traits of Holstein and Jersey cattle in Antioquia (Colombia). Revista Brasileira de Zootecnia, 43(3): 132-139.

Zavadilová, L. and V. Zink, 2013. Genetic relationship of functional longevity with female fertility and milk production traits in Czech Holsteins. Czech Journal of Animal Science, 58(12): 554-565.

Zink, V., J. Lassen and M. Štipkova, 2012. Genetic parameters for female fertility and milk production traits in first-parity Czech Holstein cows. Czech Journal of Animal Science, 57(3): 108-114.

الإستجابة المتوقعة للانتخاب لمحصول اللبن على صفات الأداء التناسلي لأبقار الهولشتين فريزيان تحت الظروف المصرية

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تم تقدير المعالم الوراثية والمظهرية لصفات الأداء الانتاجي والتناسلي من 3398سجل حليب لـ 1054بقرة هولشتين فريزيان بنات 94 طلوقة و 691 أم باستخدام نموذج الحيوان متعدد الصفات مع وجود قياسات متكررة .وقد استخدم محصول 305يوم لكل من اللبن (MY305) والدهن (FY305) والبروتين (PY305) كمقاييس للأداء الانتاجي، بينما استخدمت صفات طول الفترة المفتوحة (DO) وطول الفترة بين الولادتين (CI) وعدد التلقيحات اللازمة للإخصاب (NSC) كمقاييس للأداء التناسلي .وقد كانت تقديرات المكافئ الوراثي 0.08 لصفة MY305، 0.23 لصفة FY305، 0.26 لصفة PY305، 0.19 لصفة DO، 0.09 لصفة CI و 0.04 لصفة NSC. كانت تقديرات الارتباط الوراثي ما بين الصفات الإنتاجية الثلاث عال جداً حيث تراوحت قيمته ما بين 0.994 و 0.998 مما يدل على أن الصفات الثلاث يتحكم فيها نفس الجينات .وكانت الصفات التناسلية أقل ارتباطاً فيما بينها حيث تراوحت قيم معامل الارتباط الوراثي بين 0.241 و 0.786 والمظهري من 0.025 الى .0.378 وقد أوضحت الدراسة أن الارتباطات الوراثية بين الصفات الإنتاجية والتناسلية مرتفعة (0.587 إلى 0.947) مما يدل على أن الابقار التي تنتج كمية وفيرة من محصول الحليب والدهن والبروتين يتوقع ان تكون أقل في الكفاءة التناسلية من حيث طول الفترة المفتوحة، طول الفترة بين الولادات وعدد التلقيحات اللازمة للإخصاب .وقد تبين من هذه الدراسة أن الانتخاب لأي من محصول الحليب أو محصول الدهن أو محصول البروتين، مع كل جولة انتخابية بشدة انتخاب مقدارها 1.0، يتوقع أن يسفر عنه انتاج أبقار هولشتين فريزيان تتميز بأداء إنتاجي أكثر ربحية من خلال زيادة في كمية اللبن (180.22 الى 323.27 كجم)، كمية الدهن (13.79 الى 23.51 كجم) وكمية البروتين (12.41 الى 22.48 كجم).هذا التحسن في الأداء الإنتاجي متوقع ان يكون مصحوباً بتدهور في الأداء التناسلي متمثلاً في زيادة عدد أيام الفترة المفتوحة (16.27 الى 29.48 يوم)، زيادة طول الفترة بين الولادات (15.26 الى 25.22 يوم) وعدد التلقيحات اللازمة للإخصاب (0.08 الى 0.16 تلقيحه) . وقد خلصت الدراسة الى أن العلاقات الوراثية غير المرغوبة بين الصفات التناسلية والإنتاجية في أبقار الهولشتين فريزيان يجب أن تؤخذ في الاعتبار عند وضع برامج التحسين الوراثي لأبقار اللبن (على سبيل المثال : تحسين الصفات الانتاجية بالانتخاب الوراثى وتحسين الصفات التناسلية بتحسين الرعاية أو استخدام أدلة الانتخاب المقيدة).