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Estimates of Genetic Trends for 305-Days Milk Yield in Holstein Friesian Cattle

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Abstract: The purpose of this study was to estimate the trends components of 305-days milk yield in Holstein Friesian Cattle Holstein cows raised at the Ceylanpinar state farm in Turkey between 1986 and 2007 years. The phenotypic, genetic and environmental trends for 305-days milk yield were found to be 106.91, 13.42 and 93.49 kg year^{-1}, respectively. Despite, there was a correct decision in selection environmental factors affected yield more. In this respect, continuing the improving environmental factors which is composed of maintenance, feeding, milking practices and barn is recommended.

Key words: Cattle, Holstein, milk yield, genetic trends, Turkey

INTRODUCTION

Determination of genetic capacity of economically important traits and progress in genetic capacity in dairy cattle breeding are measured by genetic trend. The improvements in environmental factors provided by improvements of herd management techniques, maintenance, feeding and in barn conditions are result of increases in yield. One way of the improving breeding programs is analyzing phenotypic trends and dividing it into genetic and environmental components (Herbert and Bhatnagar, 1988a, b; Duzgunes *et al*., 1996; Vanli *et al*., 2005).

Environmental trend is described as a value, common effects of all environmental factors affecting quantitative traits, distributed over years. Genetic trend is described as, effect degree according to over years, changes in breeding studies. These genetic trends measure with cumulative change in the population and are the last indicator for sustainable genetic improvements (Musani and Mayer, 1997; Kumlu, 1999).

In the populations, where no selection studies are performed and great environmental variations are observed, it is very difficult to predict in which way phenotypic variation will be occurred. In such instances phenotypic trend can have a big fluctuations between minus and plus and in some populations either continuously increases or decreases by chance (Akman *et al*., 1991).

Particularly in developed countries, there are done plenty of studies to determine at what degree the increase in animal yield affected from genetic and environmental sources.

The purpose of this study is to estimate genetic and phenotypic trends for 305-days milk yield of Holstein Friesian cattle raised in Ceylanpinar state farm in Sanliurfa province in southern Anatolia of Turkey.

MATERIALS AND METHODS

Milk yield records of Holstein cows raised in Ceylanpinar state farm between 1986-2007 constituted materials of the study. About 305-days milk yield was calculated by Holland method (Cilek and Tekin 2006; Özhan *et al*., 2007). Variance analysis was used to calculate environmental factors, except for calving year, affecting milk yield traits. Analyses were done in SAS (1990) program.

The 305-days milk yields were standardized according to mean using effect shares of factors in the model. Regression over the year of adjusted yearly means was used in calculating phenotypic trend; genetic trend was calculated as regression of calving years' breeding value. Environmental trend was calculated by subtracting genetic trend from phenotypic trend. DFREML program was used for calculating breeding value and variance components (Meyer, 1997).

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RESULTS AND DISCUSSION

In this study, trend components were estimated. Genetic trends were calculated by using regression of cow breeding values' calving years. Irregular increases and decreases in milk yield of breeding values of cows selected according to years were observed. Genetic trend for 305-days milk yield was determined to be 13.42 kg year^{-1}.

Means of 305-days milk yield adjusted according to lactation number and calving season and phenotypic trend over year were given in Table 1. Changes over years were given in Table 1. The phenotypic trends for 305-days milk yield were found as 106.91 kg year^{-1} ($p<0.01$).

The highest milk yield in this farm was determined to be in years 1997, 2005 and 2007. The lowest one was found in 1989. Milk yield fluctuated over years however, except some years, trend was always positive (Table 1). Environmental trend was calculated by subtracting genetic trend components from phenotypic trend. Accordingly, environmental trend was calculated positive and 93.49 kg year^{-1}.

Breeding value of 305-days milk yield were found negative in some years. Whereas, breeding value of 305-days milk yield were found positive in some years (Table 1). It is thought that during the years, where heritability was positive, decision for selection was made correctly whereas other ways it was vice versa.

In this state farm, phenotypic trend, genetic trend and environmental trend were determined to be 106.91 kg year^{-1} ($p<0.01$), 13.42 and 93.49 kg year^{-1}, respectively. Accordingly, it is concluded that phenotypic trend was influenced from environmental factors at the large extent.

Although, milk yield fluctuated with years, the trend was usually positive. Value of phenotypic trend for milk yield was higher than that of -88 kg year^{-1} reported for Holstein Frisian (Catillo *et al*., 1995) but lower than values reported for same breeds and other breeds (Polastre *et al*., 1990; Barri *et al*., 1995; Aydin *et al*., 1996; Kaygisiz, 1997a; Aydin *et al*., 1998; Bakir and Kaygisiz, 2003, 2004).

In this study, observed positive trend is an indication that decision for selection was made correctly. However, it is thought that the fluctuation in milk yield seen over years could be a result of variations in environmental factors.

Although, the effect of environmental factors on milk yield was positive sometimes it affected milk yield more positively and sometimes this positive effect was limited. Khalid *et al*. (2007) reported a positive effect of genetic trend on milk yield.

Table 1: The changes in phenotypic trends and estimated breeding value over years

Years	Phenotypic trends	Years	Breeding value
1989	3645.63	1986	0.00
1990	3731.44	1987	299.80
1991	4274.35	1988	345.36
1992	4318.71	1989	266.20
1993	4917.60	1990	197.05
1994	5467.85	1991	221.16
1995	5957.17	1992	111.30
1996	5769.14	1993	375.60
1997	6232.01	1994	297.88
1998	5866.32	1995	135.86
1999	5651.05	1996	-0.95
2000	5107.84	1997	250.28
2001	5269.36	1998	371.82
2002	5304.52	1999	366.97
2003	5325.87	2000	505.85
2004	5102.32	2001	408.37
2005	6342.87	2002	630.86
2006	6265.20	2003	864.77
2007	6319.87	2004	563.64
-	-	2005	-292.42

Genetic trend value (13.42 kg year^{-1}) determined in the present study was lower than values changed between 25.0 and 249.7 kg year^{-1} reported for same breed maintained in Kazova farm (Kaygisiz, 1997b), Ankara Sugar farm (Bakir and Kaygisiz, 2004), agriculture faculty farm (Aydin *et al*., 1996) and 10.0 and 204.0 kg year^{-1} reported for in abroad farms (Kunaka and Makuza, 2005; Catillo *et al*., 1995; Barri *et al*., 1995) however, it was higher than that -80.77 and 8.72 kg year^{-1} observed in Poland (Zuc *et al*., 1994) and Zimbabwe (Kunaka and Makuza, 2005).

Also, genetic trend was reported as 128.0, 139.0 and 94.0 kg/earl in Parana (Teixeira *et al*., 1994), 73.2, 88.1 and 82.1 kg year^{-1} in Japan (Tsuruta *et al*., 1990) and 101.0 and 74.0 kg year^{-1} in Meksiko (Avandano *et al*., 1992). The values determined in the present study were higher than previous researches.

Environmental trend was 93.49 kg year^{-1} in the present study. This value is lower than 50.18 and 136.8 kg year^{-1} values reported for the same bred (Zuc *et al*., 1994; Barri *et al*., 1995; Teixeira *et al*., 1994; Tsuruta *et al*., 1990; Avandano *et al*., 1992; Kaygisiz, 1993; Polastre *et al*., 1990). Bakir and Kaygisiz (2004) reported a lower value (-177.0 kg year^{-1}) for Ankara Sugar farm.

CONCLUSION

In this study, 13.42 kg year^{-1} genetic and 93.49 kg year^{-1} environmental trend comprised the

106.91 kg year^{-1} phenotypic trend for 305 days milk yield. This finding indicated that maintenance feeding, environmental factors and management practices affected milk yield more than other factors. Stock farms have to do selection continuously no matter what the genetic and phenotypic trend is.

Farms can get a chance to measure their practices with such kind of evaluations. Despite there was a correct decision in selection environmental factors affected yield more. In this respect, continuing the improving environmental factors which is composed of maintenance, feeding, milking practices and barn is recommended.

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