

RELATIONSHIP OF EFFICIENCY OF LIFETIME PERFORMANCE TO LIFETIME MILK YIELD AND LONGEVITY IN HOLSTEIN-FRIESIAN COWS OF DIFFERENT BODY TYPES

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INTRODUCTION

Attention of most researchers dealing with lifetime performance and lifetime has been focussed on the udder, feet and legs as type traits in dairy cows. It seems that, in investigations the role of lifetime and lifetime performance has remained in the background in their relation to body types created by body measurements.

The determination of optimum body size from the point of view of efficient milk production and lifetime performance, however, might be an important task as Dohy (1999) stated. Consequently further research is needed in the matter, he emphasised. That is why in dairy cow selection the optimum balance between body size traits and milk production should be found (Gáspárdy *et al.*, 1996 ; Püski *et al.*, 1998 ; 2000 ; 2001) which may result in improvement of efficiency in dairy production. The aim of this study was to find out the effect of different cow types in terms of efficiency of lifetime performance and life span in Holstein-Friesian breed.

MATERIAL AND METHODS

The data set of this research included milk records and official type scores (height at withers, rump width-III) from the Hungarian National Milk Recording Scheme. Data collection covered first lactation and lifetime milk yields of cows from the Holstein-Friesian seedstock herd "Hódmezőgazda Co.", Hódmezővásárhely, Hungary. The cows were divided into three groups based on their lifetime milk yield, as follows : <30,000 kg (Level 1) ; 30,001 - 60,000 kg (Level 2) ; and >60,001 kg (Level 3).

The cows were also assigned into four Type Groups based on their linear type scores for height at withers and rump width-III. Differences between body measurements (height at withers, rump width-III) were taken into account when dividing the cows into the Type Groups such as small and narrow (Type Group A), intermediate and narrow (Type Group B), intermediate and wide (Type Group C) as well as tall and wide ones (Type Group D), respectively. To analyse and evaluate the efficiency of lifetime performance (ELTMP) for the Type Groups an efficiency index has been elaborated according to Gáspárdy *et al.* (1996), as follows:

$$\text{ELTMP} = \text{Lifetime milk production} / \text{Body capacity score}$$

Estimated body capacity of the Type Groups was calculated : the values were 100, 108, 118 and 125 % for Type Group A, B, C and D, respectively. Stayability expresses the percentage of the surviving cows for the subpopulations of different lifetime performance levels (Level 1, 2 and 3).

Data processing and statistical analysis were made by SPSS 9.0 PC Program Package. For comparison of means between Type Groups, least squares differences were calculated at $P < 5\%$ level of probability.

RESULTS AND DISCUSSION

In the categories used for describing lifetime production levels (<30,000, 30,001- 60,000, and >60,001 kg) no difference could be found in lifetime yield between the Type Groups A, B, C and D (Table 1).

Table 1 First lactation yield, lifetime yield, efficiency of lifetime performance, stayability, herd life and lifetime in days for different type groups

Type groups		A	B	C	D
Number of cows		661	1212	700	216
Height at withers		small	intermediate		tall
Rump width-III		narrow	narrow	wide	wide
Level 1. Lifetime production level <30000 kg					
1. lactation milk yield, kg	x	7828	7904	8015	8036
Lifetime production, kg	x	14430	14281	14935	14430
ELTMP	x	209	192	184	168
	%	100	91	87	75
Stayability	x	131	230	192	84
	%	19.8	19.0	27.4	38.9
Level 2. Lifetime production level 30001-6000 kg					
Lifetime production, kg	x	40291	39567	39820	40288
ELTMP	x	586	531	487	469
	%	100	90	80	75
Stayability	x	5	5	11	5
	%	0.8	0.4	1.6	2.3
Level 3. Lifetime production level >60000 kg					
Lifetime production, kg	x	66550	66686	70477	64706
ELTMP	x	959	886	860	745
	%	100	92	88	71
Lifetime production and lifetime by Type Groups					
Actual lifetime yield, kg	x	19634	19322	22242	24928
Herd life in days	x	707	692	792	902
Lifetime in days	x	1688	1677	1774	1917

ELTMP = Efficiency of lifetime milk production

Identical lifetime yield means different loads for the organism in the various type groups at the different levels of lifetime production. This load is determined not only by first lactation yields but also by different efficiencies of lifetime production characteristics across type groups. At the same level of lifetime production, a considerably increasing efficiency decreases the load tolerating ability of small and narrow (Type Group A) or intermediate and narrow cows (Type

Group B) vs. intermediate and wide (Type Group C) or tall and wide (Type Group D) ones under identical environmental conditions. This phenomenon resulted in significantly lower stayability and shorter herd-life in the case of the narrow type cows. At different levels of lifetime production, the differences existing between the constitution of wide and narrow types are reflected indirectly by the differences observed in the stayability ratios (i.e. 27.4%, 38.9%, 19.8%, 19.0% and 1.6%, 2.3%, 0.8%, 0.4%).

The lifetime production of small and narrow (Type Group A) and intermediate and narrow (Type Group B) cows was smaller than that of intermediate and wide (Type Group C) and tall and wide cows (Type Group D) by 2608 kg and 2900 kg, 5294 kg and 5606 kg, respectively. The lifetime production of tall and wide cows (Type Group D) exceeded that of intermediate and wide cows (Type Group C) by 2686 kg of milk.

Due to their better stayability, intermediate and wide (Type Group C) and tall and wide cows (Type Group D) completed longer productive life and longer total lifetime (herdlife) than their small and narrow (Type Group A) or intermediate and narrow mates (Type Group B) by 85 and 86 days, 195 and 229 days, 96 and 97 days, 210 and 240 days, respectively.

The relationship of efficiency of lifetime performance to lifetime yield and lifetime is shown on Figure 1.

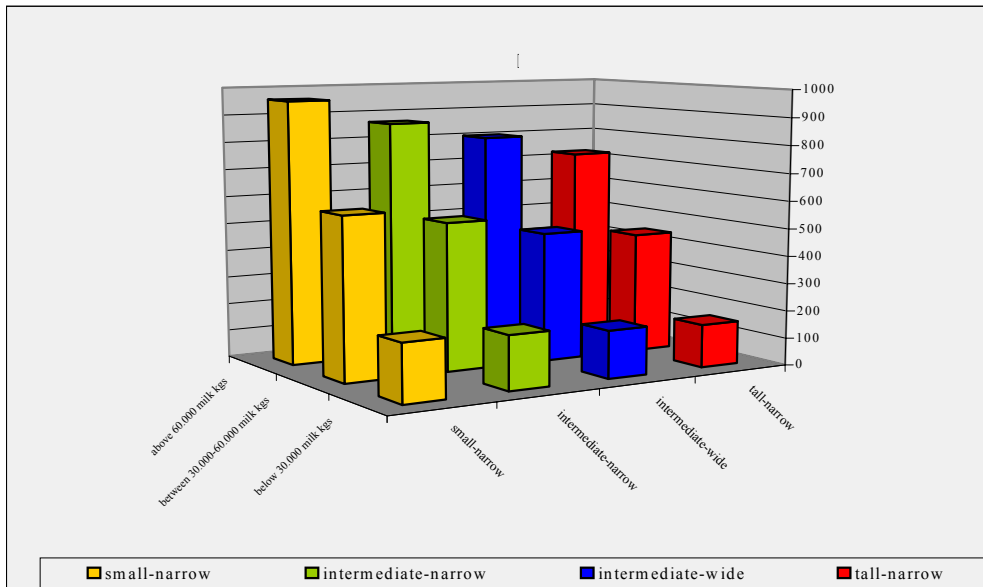


Figure 1. Efficiency of lifetime milk production

Analysis of results reveals decrease in efficiency of lifetime performance at the three lifetime production levels (<30000, 30001-60000, >60001 kg milk) especially in the case of intermediate and wide (Type Group C) and for tall and wide cows (Type Group D) as compared to small and narrow ones (Type Group A). Lifetime production and herdlife of

intermediate and wide (Type Group C) and tall and wide ones (Type Group D) increased by 13% and 27%, 12% and 22%, respectively. In the case of narrow groups the increase of the efficiency of lifetime performance resulted in a decrease of herd life and lifetime production. Examining both cows of wide and narrow body antagonism has been established between their efficiency in lifetime performance and their lifetime yield and lifetime. The antagonism cannot be revealed by traditional research methods the reason of which is that the efficiency of lifetime production is in close positive correlation with lifetime production, herd life and lifetime ($r=0.93-0.99$; Püski, 2001).

CONCLUSION

Summing up the most important findings of these investigations focussing on body form types and lifetime production, the following conclusions can be established: the better the milk production and lifetime production (relative milk production) of the cows per one unit of body capacity, the smaller the chance for survival (lower stayability, poorer constitution, shorter productive life). If we want to increase relative milk production, lactation or yearly production and lifetime production simultaneously, as fundamental factors of profitable milk production, we have to work out a selection programme giving priority to the most accurate determination of the metabolic stability of dairy cows. To elaborate a programme like that, consideration of the remarkable differences concerning the constitution of wide and narrow body form types can be very helpful.

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