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Correlation between results of lamb weaning and milk productivity in the F_1 East Friesian and Polish Merino hybrid milking ewes

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SUMMARY – The research was carried out on 98 F_1 East Friesian x Polish Merino ewes in the 1st to 4th lactation. The ewes were milked mechanically twice a day during a 4-month period, after the weaning of 8-week-old lambs. The influence of the ewes' age on the growth of their offspring before weaning and on their milk production was observed. The production of milk and its basic components was higher in the ewes rearing twins than in those with single lambs. There were higher correlations between the parameters of lambs' growth and development before weaning at the age of 56 days and the quantitative indices of their mothers' milk productivity than between the lambs' growth and the contents of the basic milk components. Litter weight and litter weight gains between birth and the age of 56 days may be an indicator of the ewes' further milking performance.

Key words: Sheep, lamb rearing, milking of ewes, correlations.

RESUME – *"Corrélation entre les résultats de sevrage des agneaux et la productivité laitière chez des brebis laitières, hybrides F_1 Frisonne de l'Est et Mérinos Polonaise". On a examiné 98 brebis F_1 (Frisonne x Mérinos Polonaise) de la première à la quatrième lactation. Les brebis ont été traites de façon mécanique dans la période de 4 mois, deux fois par jour, après le sevrage des agneaux de 8 semaines. On a examiné l'influence de l'âge des brebis sur la croissance de leurs agneaux avant le sevrage ainsi que sur la production du lait. Les brebis ayant des jumeaux donnaient plus de lait dont la composition était plus riche que les brebis ayant un seul agneau. On a observé une plus grande corrélation entre les paramètres de la croissance des agneaux avant le sevrage et l'indice quantitatif de la production de lait par leurs mères qu'entre la croissance des agneaux et la composition de base du lait. Le poids de la portée et sa croissance de la naissance au 56ème jour de leur vie peuvent influencer la production laitière des brebis dans l'avenir.*

Mots-clés : *Brebis, lait, élevage d'agneaux, traite de brebis, corrélations.*

Introduction

Currently the most important issue for Polish sheep-farming is the production of young slaughter lambs for export. However, to improve the economic efficiency of sheep breeding alternative directions of production are also explored, for example milking utility (Gut *et al*., 1998; Borys, 1999). Therefore the question arises as to how reconcile these two somewhat antagonistic directions of production. The present work analyses correlations between parameters of growth of reared lambs (all litters) and the subsequent milking performance of their mothers.

Material and methods

The research was carried out on 98 F_1 East Friesian x Polish Merino ewes (1st to 4th lactation) aged from 1 to 4 years. The ewes were milked mechanically twice a day during a four-month period (May-September 1997 and 1998) after the weaning of 8-week-old lambs. They were kept in fold and fed with forage (green roughage, hay, straw) and dry mash fodder.

Observations were also made of their offspring (whole litters) produced from crossing with meat-breed rams. The lambs' body weights were observed at birth and at the age of 28 and 56 days (suckling period). They were used to calculate the litter weight gains and growth rates for

sub-periods: from birth to 28 days of age; from 28 to 56 days of age; and between birth and 56 days of age.

The ewes' milk performance was characterized using the length of the milking period and the milk production during the whole period (total and daily) and the production of its basic components – protein, fat and lactose. The basic chemical composition of milk was determined by means of Milko-Scan apparatus.

The results were statistically analysed according to the least squares method (SAS, 1995) with successive number of lactation, type of litter and year of observation as experimental factors. Simple correlation coefficients were calculated between the analysed lambs' (litters') growth parameters and traits characterizing their mothers' milk performance.

Results and discussion

A statistically confirmed influence of the ewes' age on the body weight, body weight gains and growth indices of the lambs before weaning was not observed (Table 1). However, it is worth noting lower weights and gains of the offspring in their first reproductive cycle (the average weight of a litter was 7.8% lower at birth and 13.4% lower at 56 days of age, and gains during that period were 15.0% lower than for the offspring of 2- and 4-year-old ewes). Differences like these were not observed for growth rate indices.

Table 1. Influence of some factors on the growth of litters

	n	Litter weight† (kg)			Litter weight gain (kg)			Litter growth rate (%)		
		0	28	56	0-28	28-56	0-56	0-28	28-56	0-56
Lactation										
1	29	5.9	12.8	19.4	7.0	6.6	13.6^{a}	75.7	40.3	107.8
2	30	6.1	14.3	22.4	8.2	8.2	16.3^{b}	80.5	43.2	113.5
3	29	6.7	15.0	22.3	8.3	7.3	15.6	76.6	38.9	107.6
4	10	6.4	13.7	22.6	7.3	8.8	16.1	76.2	49.4	114.2
Type of litter (T)										
Single	53	5.0^{A}	11.6^{A}	17.4^{A}	6.6^{A}	5.8^{A}	12.4	80.3^{a}	40.1^{a}	111.1
Twin	45	7.6^{B}	16.3^{B}	26.0^{B}	8.8^{B}	9.6^{B}	18.4	74.2^{b}	45.8^{b}	110.4
Year (Y)										
1997	40	5.8^{a}	12.4^{A}	19.3^{A}	6.6^{A}	6.9^{A}	13.5^{A}	74.4^{a}	43.6	108.8
1998	58	6.7^{b}	15.5^{B}	24.1^{B}	8.8^{B}	8.6^{B}	17.4^{B}	80.1^{b}	42.3	112.7
Interaction		TxY**	TxY**	TxY**	TxY**	TxY**	TxY**	NS	NS	NS

†0: at birth; 28: age of 28 days; 56: age of 56 days.
^{ab}Significant at P 0.05; ^{AB,**}Significant at P 0.01; NS: non significant.

The obvious superiority of twin over single litters in respect of absolute body weight values, its gains and in growth rate indices shows the superiority of single litters at the beginning of rearing (up to the age of 28 days), and their inferiority between 28 and 56 days of age (differences of 6.1 and 5.7 per cent units respectively, significant when P 0.05). The growth rate indices in the suckling period were similar for single and twin litters (Table 1).

As far as traits characteristic of the lambs' growth are concerned, generally better results were obtained in the second year of the experiment. Statistically significant interactions of the litter x year type, concerned with the litters' weight and body weight gains, resulted from different proportions of the traits for single and twin litters in the first and second years of the research (Table 1).

The influence of the ewes' age (lactation) on milk productivity traits turned out to be statistically

non-significant (Table 2), but both the total yield and the contents of the basic components of milk were much higher in the 2nd and 3rd lactations than in the 1st and 4th – the total yield by 22.5%; protein content by 30.0%; fat content by 19.2% and lactose content by 26.3%. The structure of differences in daily milk yield was slightly different – similar in the ewes in their 2nd, 3rd and 4th lactations, and clearly higher than in young ewes (by 16.4% on the average). Lower total milk yield in the group of 4-year-old ewes than in 2- and 3-year-olds was due to the shortest milking period in that group – 24 days, i.e., 20.3% shorter than in 2-year-old ewes, which were milked for the longest period of time (P 0.05).

Table 2. Influence of some factors on milk productivity†

	n	TMP	DMY	MP	TPP	TFP	TLP
Lactation (L)							
1	29	40.4[a]	383	106	1.96[A]	2.60	1.89[a]
2	30	53.5[b]	450	118[a]	2.71[B]	3.33	2.50[b]
3	29	47.6	433	109	2.40	2.92	2.24
4	10	42.1	456	94b	1.95	2.62	1.98
Type of litter (T)							
Single	53	42.9	430	100[a]	2.22	2.68	2.04
Twin	45	48.9	431	113[b]	2.30	3.06	2.26
Year (Y)							
1997	40	43.6	410	108	2.09	2.82	2.03
1998	58	48.2	451	106	2.42	2.92	2.27
Interaction		NS	NS	LxT**	TxY*	NS	NS

†TMP: total milk production; DMY: daily milk yield; MP: milking period; TPP: total protein production; TFP: total fat production; TLP: total lactose production.
[ab,*]Significant at P 0.05; [AB,**]Significant at P 0.01; NS: non-significant.

The values of the coefficients of correlation between the analysed parameters of the lambs' growth and the results of the milking utilization of their mothers were rather diverse both in respect of the quantity and the sign (Table 3). Correlation coefficients between litter weights and gains and the ewes' milk productivity parameters (the r values ranging from 0.29* to 0.43*) were distinctly higher and in most cases statistically confirmed, while those between the analysed growth rate indices and the ewes' milk productivity were low and in most cases statistically insignificant.

The interdependency between the results of litter growth and the contents of basic components in milk was chiefly negative and statistically non-significant, except the fat content, which was significantly and negatively correlated with litter weight at birth and at the age of 56 days, as well as with body weight gains between 28 and 56 days, and between birth and 56 days of age (P 0.05, Table 3).

The results show that litter weights and gains may be used to predict further levels of milk production, while growth rate indices cannot be used for this purpose.

The correlation coefficients show that the interdependency between the lambs' body weights and the quantitative indexes of the ewes' milk productivity is higher than that between the lambs' body weights and the chemical composition of milk, which is in agreement with other authors (Kalinowska, 1976; Mroczkowski, 1988; Sü *et al.,* 1997).

Conclusions

(i) Quite characteristic, although statistically unconfirmed influence of the age (lactation count) of F_1 Friesian x Polish Merino crossbred ewes on the growth of their offspring before weaning at the age of 56 days was observed. The ewes' age also affected their milk yield during a 4-month period of milking after weaning the lambs.

(ii) The type of lambing (single or twin) caused significant differences in the lambs' growth rates in the sub-periods of the suckling period (higher for single litters up to 28 days and for twin litters between 28 and 56 days), although it did not cause any differences during the whole suckling period.

(iii) The production of milk and its basic components was significantly higher (by 16.2%) in the ewes which reared twins than in those which reared single lambs.

(iv) There were higher interdependencies between the estimators of lambs' growth and development before weaning at the age of 56 days and the quantitative indices of their mothers' milk productivity than between the lambs' growth and the contents of the basic milk components. The body weights and body weight gains between birth and the age of 56 days may roughly indicate the ewes' further milking performance.

Table 3. Correlation between parameters of litters' growth and ewes' milk productivity†

	TMP	DMY	TPP	TFP	TLP	PP	FP	LP	DMP
Litter weight††									
0	0.41***	0.32**	0.31**	0.32**	0.40***	-0.15	-0.23*	-0.00	-0.15
28	0.38***	0.34**	0.32**	0.30**	0.37***	-0.10	0.20	-0.01	-0.20
56	0.43***	0.38***	0.33**	0.33**	0.42***	-0.14	-0.25*	-0.03	-0.19
Litter weight gain									
0-28	0.29**	0.31**	0.29**	0.23*	0.28**	-0.05	-0.15	-0.01	-0.21*
28-56	0.42***	0.36***	0.27**	0.31**	0.42***	-0.16	-0.26*	-0.05	-0.15
0-56	0.41***	0.37***	0.31**	0.31**	0.40***	-0.13	-0.24*	-0.04	-0.20
Litter growth rate									
0-28	-0.21*	-0.05	-0.07	-0.16	-0.19	0.11	0.16	0.04	-0.01
28-56	0.23*	0.20	0.08	0.16	0.22*	-0.12	-0.13	-0.10	-0.03
0-56	-0.02	0.10	-0.01	-0.03	-0.01	0.00	0.04	-0.04	-0.03

†TMP: total milk production; DMY: daily milk yield; TPP: total protein production; TFP: total fat production; TLP: total lactose production; PP: % of protein; FP: % of fat; LP: % of lactose; DMP: % of dry matter.

††0: at birth; 28: age of 28 days; 56: age of 56 days.

*,**,***Significant at P 0.05, P 0.01 and P 0.001 respectively; NS: non-significant.

References

Borys, B. (1999). *Produkcyjno__ oraz niektóre aspekty efektywno_ci ekonomicznej przy mi_sno-mlecznym u_ytkowaniu owiec miesza_ców merynosa polskiego z rasami plennymi.* Habilitation Theses, Instytut Zootechniki, Kraków.

Gut, A., Wójtowski, J., Kozal, E. and Wa_na, E. (1998). Mleczne u_ytkowanie owiec jako alternatywny kierunek produkcji owczarskiej w Wielkopolsce. Wie_ i rolnictwo w procesie integracji Polski z Uni_ Europejsk_. *Akademia Rolnicza Pozna_,* 2: 457-464.

Kalinowska, C. (1976). Wspó_zale_no__ mi_dzy mleczno_ci_ matek a wzrostem jagni_t jako czynnik selekcyjny. *Ann. UMCS, s.E,* 31: 455-467.

Mroczkowski, S. (1988). Mleczno__ merynosa polskiego w _wietle bada_ pog_owia w Sobiejuchach. *Rozprawy nr 28*, ATR Bydgoszcz.

SAS (1995). *User's Guide.*

Sü , R., Fahr, R.D., Wahlther, R. and Lengerken, G. (1997). Untersuchungen zum Einfluß der Aufzuchtleistung auf Milchleistung und –qualitätsparameter bei Ostfriesischen Milchschafen. *Zeszyty Naukowe* 34, *PTZ*, Warszawa, pp. 89-100.