GENETIC TRENDS FOR TEST DAY MILK YIELD IN WHITE MARITZA AND PATCH-FACED MARITZA SHEEP BREEDS

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White Maritza and Patch-faced Maritza sheep breeds are native to the country and they are subject to conservation and improvement through breeding programs.
They are typical for lowland regions of South Bulgaria. In recent years the two breeds have spread to some semi-mountainous regions. Genealogical and performance recording in these two native sheep breeds started about three decades ago.

In response to sheep farmers' demand for improved dairy sheep, in Breeding association of Maritza sheep breeds were set up new breeding programs aiming improving milk yield potential of the two breeds, through use breeding value estimation procedure. Many years ago, selection in these 2 populations were by the traditional way without use BLUP procedure. This necessitated an evaluation of traditional selection and the genetic progress achieved through the years. For this purpose, the accumulated database of milk yield measurements in the association were used.

The objectives of this study

- The objectives of this study were to determine and analyze genetic trends of milk yield in two native sheep breeds in Bulgaria;
- By analyzing the genetic trends of White Maritza and Patch-faced Maritza sheep breeds, we evaluated the traditional selection based on dam's milk yield from the point of view of achieved genetic progress;
- On the base of the analyze genetic trends in milk yield to make recommendations for increasing the efficiency of breeding programs for improving milk yield in both breeds.

Highlights of the new breeding programs for both breeds (2022)

- Traditionally, the assessment of morphological traits is the first step through which all female and male lambs are selected;
- Procedures have been established for measuring the productivity of sheep of both breeds according to the following main productive traits:
  - Litter size at birth (number of born lambs);
  - Litter weight at weaning;
  - Milk yield.
- Introducing Animal Model for BVEs, first about milk yield.

Material and methods

- The data used for this analysis were provided by the Breeding association of Maritza sheep breeds (White Maritza and Patch-faced Maritza);
- The database includes 9 556 (White Maritza) and 22 029 (Patch-faced Maritza) test day records;
- The analyses entered for the period 1992 – 2022;
- The pedigree files contain 4 687 (White Maritza) and 3 961 (Patch-faced Maritza) records;
- Single univariate repeatability test day model (REP model) was used to calculate the heritability and breeding value estimations for test day milk yield (TDMY), separately for each breed;
- Estimates of variance components were calculated with VCE software version 5.1.2 (Groeneveld et al., 2008);
- Estimation of breeding values were calculated with PEST software version 4.2.5 (Groeneveld, 2012);
- The genetic trends of the two breeds were estimated by the average breeding value estimations of the animals on the year of birth.

Material and methods

Repeatability model

$$y_{ijklmn} = YS_i + DIM3_j + PAR_k + LS_l + b_1(age)^2 + b_2(sp)^2 + fytd_m + a_n + pe_n + e_{ijklmn}$$

where:

y_{ijklmn} is *a* vector of observations on TDMY;

YS_i is fixed year-season of lambing effect, with 67 classes;

$DIM3_j$ is fixed effect of stage of lactation defined in three-day intervals starting from day 30;

PAR_k is fixed parity effect accounting for 7 classes;

LS_l is fixed effect of litter size with 2 classes;

$b_1(age)2$ – fixed quadratic regression for age at lambing;

$b_2(sp)^2$ – duration of suckling period;

$fytd_m$ *is* the random effect of flock-year-test-day*;*

a_n and pe_n are random effects of animal and permanent environment of animal.

Results and Discussions

Table 1. Descriptive statistics for traits: Test day milk yield (TDMY), Suckling period and Litter size for White and Patch-faced Maritza sheep breeds.

Traits/Breeds	n	$\bar{x}$	SD	CV, %	Min	Max
White Maritza sheep						
TDMY, mL	9 556	790.27	436.76	55	100	**3875**
Suckling period, days	2 278	67.84	18.88	28	30	150
Litter size, n	2 278	1.39	0.49	35	1	2,>2
Patch-faced Maritza sheep						
TDMY, mL	22 029	744.67	400.15	54	100	**4000**
Suckling period, days	5 146	66.25	19.60	30	30	149
Litter size, n	5 146	1.34	0.47	35	1	2,>2

Legend: $\bar{x}$- mean; SD – standard deviation; CV – coefficient of variation; Min – minimum value; Max – maximum value.

Results and Discussions

Table 2. Heritability (h^2) and repeatability (r_w) coefficients of test day milk yield using REP model for White and Patch-faced Maritza sheep breeds.

Breeds	h^2 ± SE	r_w± SE
White Maritza sheep	0.293±0.045	0.364±0.041
Patch-faced Maritza sheep	0.195±0.024	0.311±0.022

Results and Discussions

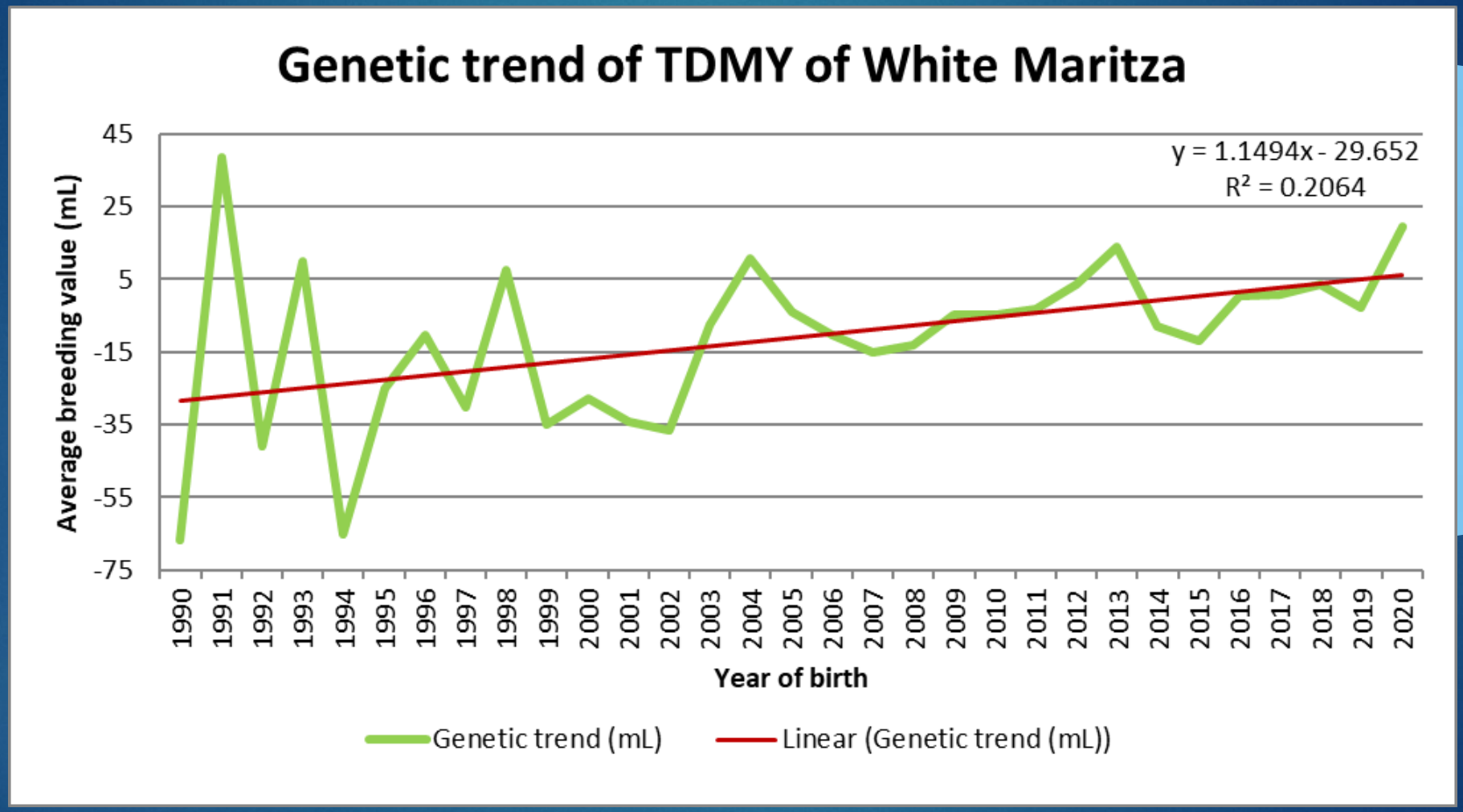

Fig.1 Genetic trend for TDMY of White Maritza sheep breed.

Results and Discussions

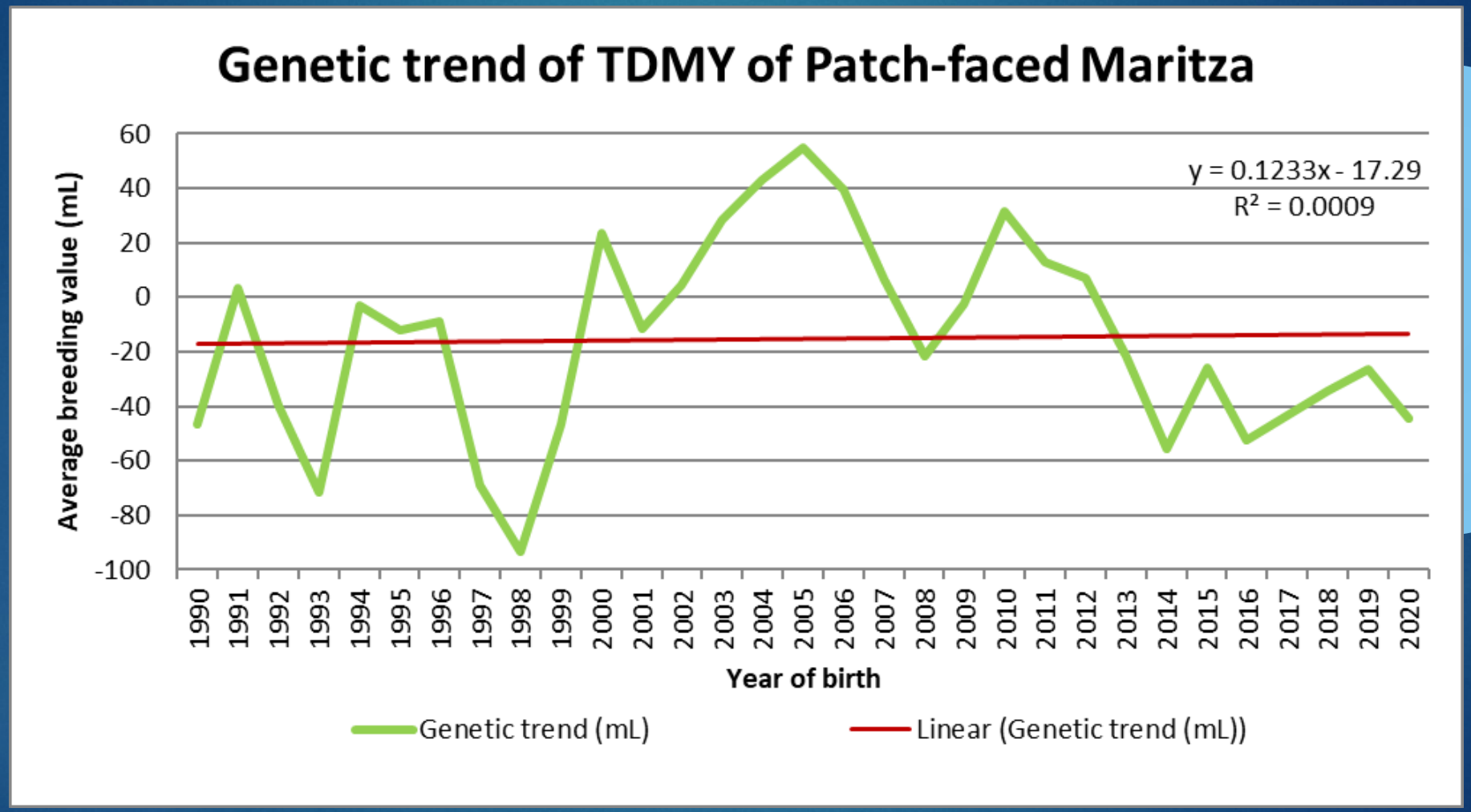

Fig.2 Genetic trend for TDMY of Patch-faced Maritza sheep breed.

Conclusions

- Calculations of genetic trends of milk yields in the populations of White Maritza and Patch-faced Maritza sheep breeds is an important tool to evaluate formerly applied selection based on dam's milk yield appeared to be of low efficiency across the generations.
- Although the genetic trend of milk yield in White Maritza sheep breed indicated a slight improvement in the population of Patch-faced Maritza sheep breed no improvement.
- In order to achieve a sustainable trend of genetic improvement in milk yield, first of all, different ways should be found for motivated and long-term participation of sheep breeders in the milk yield recording.
- The future selection should be based on breeding value estimations which requires implementation of BLUP procedure and suitable Animal model.
- The calculation of the genetic trend for the milk yield should find a real practical application in the breeding programs of both breeds and become an important tool for monitoring past selection practices and be applied in new breeding programs.