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Genetic trends for racing performance in Turk Arabian horses raised at Anatolian state farm

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ABSTRACT

The study was conducted to estimate genetic trends on racing performance of Turkish arabian horses raised at Anatolian Agricultural farms. The effects of year on racing time and racing speed were found highly significant.Estimated of phenotypic trends for distances of all, 1400 m and 1600 m to –0.2841 sec, –0.2522 sec, –0.2415 sec, respectively, for racing time and 0.0349 m/sec, 0.0353 m/sec, 0.0305 m/sec, respectively, for racing sec, respectively. All phenotypic trends were highly significant (P<0.01). Estimates of genetic trends for distances of all, 1400 m and 1600 m to –0.00749 sec, –0.00101 sec, –0.00546 sec, respectively, for racing time and –0.000238 m/sec, 0.00009968 m/sec, 0.000564 m/sec, respectively, for racing sec. All genetic trends were insignificant.

Key words: Genetic trends, Phenotypic trends, Racing time, Racing speed, Turkish Arabian horses,

Arabian horse race is one of the most important warm-blooded horse races. Arabian horses have solid bodies and have different good abilities such as ride, freightege and racing (Orhan and Kaygisiz 2010).

Racing time is a direct measure of speed and is regarded as the best method of the evaluation of racing performance of horses (Oki *et al.* 1995, Mota *et al.* 2005, Ekiz and Koçak 2007).

Genetic trend is defined as change in the mean breeding value of a population overtime. That is, genetic trend changes in the mean breeding value of a population over time (Anonymous 2011). The genetic trends in a breeding population depends essentially on its extent and structure, performance testing and breeding value estimation as well as on its breeding programme. Genetic trends of breeding values at year of birth is calculated by taking the regression.

The aim of the current study was to estimate the genetic trends for racing time over various distances, which might be used in a selection program for Arabian horses in Turkiye.

MATERIALS AND METHODS

Open and groups races racing time data from 1200–2400 m races belonging to years at 1996–2010 of the Arabian horses, breeding at Anatolian Agricultural Institution, were obtained from TJK records and used in this study.

The 3480 race records of 487 offsprings of 35 stallions were used in this study. Genetic trends for the entire distance (mixed) and most of the race calculated for 1400 and 1600 m races. Phenotypic trend is defined as change in the mean racing time or racing speed value of a population over time.

The genetic trend for the racing time or racing speed traits was estimated by regression of average breeding values of horses in generations of selection, according to the regression model:

$$Y = a + bX + S_e$$

where, Y is the average breeding value; X, the birth year; a, the equation constant; b, the linear regression coefficient, and S_e, the random residual, NID (0, σ^2).

Variance analysis and regression analysis package program SAS PROC GLM and PROC REG command was carried out using (SAS 2004). Breeding values calculated using the REML technique was compared to MTDFREML package program (Boldman 1993).

RESULTS AND DISCUSSION

Phenotypic trends: Phenotypic trends in the racing time according to the time change are given in Table 1. Effects of racing year on racing time were found statistically significant (P<0.01). Racing time in all distances was shortest in 2009 (115.66±0.42 sec) and longest in 1996 (123.72±0.35 sec). In this study, while phenotypis trends were negative for racing time, but phenotypic trends in terms of race speed was observed.

The racing time has been shortened over the years. Phenotypic trends were estimated as –0.2841 sec, –0.2522

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Table 1. Phenotypic trends to racing time (sec)

Years	All distances N	All distances $\bar{X} \pm S_x$	1400 m Racing N	1400 m Racing $\bar{X} \pm S_x$	1600 m Racing N	1600 m Racing $\bar{X} \pm S_x$
1996	264	123.72±0.35^{a}	46	99.95±0.56^{b}	96	115.18±0.54^{ab}
1997	252	120.72±0.35^{b}	48	101.74±0.53^{ab}	64	115.74±0.65^{a}
1998	268	116.98±0.34^{g}	75	101.50±0.43^{a}	49	113.69±0.69^{bc}
1999	298	119.90±0.33^{cd}	64	101.11±0.46^{ab}	56	113.66±0.66^{bc}
2000	285	120.38±0.33^{bc}	62	101.72±0.47^{a}	52	115.01±0.68^{ab}
2001	330	120.97±0.30^{b}	67	101.82±0.45^{a}	50	114.91±0.65^{ab}
2002	217	117.45±0.36^{fg}	49	101.86±0.53^{a}	26	113.05±0.84^{cd}
2003	237	115.77±0.35^{h}	60	95.37±0.48^{de}	51	110.87±0.68^{ef}
2004	368	117.00±0.31^{g}	107	94.40±0.37^{e}	91	109.87±0.59^{f}
2005	194	119.19±0.37^{d}	40	96.62±0.59^{cd}	60	111.73±0.63^{de}
2006	198	120.93±0.37^{b}	45	96.39±0.55^{cd}	50	111.54±0.68^{def}
2007	168	117.55±0.39^{efg}	38	96.34±0.60^{cd}	19	110.18±0.96^{ef}
2008	129	118.33±0.43^{e}	36	97.14±0.61^{c}	21	113.11±0.92^{cd}
2009	135	115.66±0.42^{h}	45	97.62±0.55^{c}	25	111.89±0.86^{de}
2010	137	117.98±0.43^{ef}	46	95.65±0.55^{de}	23	113.07±0.90^{cd}
	Y = 218.27 – 0.2841** X ±0.0182		Y = 101.37 – 0.2522**X ±0.0308		Y = 129.62 – 0.2415** X±0.0351	

Figures bearing different superscripts within a column differs significantly ** P<0.01.

Table 2. Phenotypic trends to racing speed (m/sec)

Years	All distances N	All distances $\bar{X} \pm S_x$	1400 m Racing N	1400 m Racing $\bar{X} \pm S_x$	1600 m Racing N	1600 m Racing $\bar{X} \pm S_x$
1996	264	13.80±0.04^{gh}	46	14.02±0.08^{e}	96	13.56±0.07^{fg}
1997	252	13.75±0.04^{gh}	48	13.91±0.07^{ef}	64	13.51±0.08^{g}
1998	268	13.84±0.04^{fg}	75	13.83±0.06^{f}	49	13.86±0.08^{ef}
1999	298	13.90±0.04^{f}	64	13.87±0.06^{ef}	56	13.80±0.08^{ef}
2000	285	13.77±0.04^{gh}	62	13.78±0.06^{f}	52	13.77±0.08^{fg}
2001	330	13.71±0.03^{h}	67	13.77±0.06^{f}	50	13.89±0.08^{efg}
2002	217	13.81±0.04^{g}	49	13.77±0.07^{f}	26	13.86±0.10^{de}
2003	237	14.39±0.04^{b}	60	14.69±0.07^{ab}	51	14.07±0.08^{abc}
2004	368	14.50±0.04^{a}	107	14.84±0.05^{a}	91	14.19±0.07^{abc}
2005	194	14.33±0.04^{bc}	40	14.52±0.08^{bcd}	60	14.06±0.08^{bcd}
2006	198	14.24±0.04^{de}	45	14.54±0.07^{bc}	50	14.04±0.08^{bcd}
2007	168	14.30±0.04^{cd}	38	14.55±0.08^{bc}	19	14.32±0.12^{ab}
2008	129	14.20±0.05^{e}	36	14.43±0.08^{cd}	21	13.97±0.11^{de}
2009	135	14.28±0.05^{cde}	45	14.36±0.07^{d}	25	14.03±0.11^{cd}
2010	137	14.33±0.05^{bc}	46	14.65±0.08^{b}	23	13.77±0.11
	Y = 11.99+0.0349** X±0.0020		Y = 13.82 + 0.0353** X±0.0413		Y = 12.33 + 0.0305** X±0.0043	

Figures bearing different superscripts within a column differs significantly ** P<0.01.

sec and –0.2415 sec, for all distances, 1400 m and 1600 m respectively. All phenotypic trends were highly significant (P<0.01). Similarly, for all distances in the literature have already (Park *et al.* 2008, SeungYoon Oh *et al.* 2008), both 1400 m and 1700 m race time ≥ care (Park *et al.* 2008) negative phenotypic trends were observed.

Phenotypic trends in the racing speeds according to the time change is given in Table 2. Effects of racing year on racing speeds were found statistically significant (P<0.01). Racing speeds in all distances was shortest in 2001 (13.71±0.35 m/sec) and longest in 2004 (14.50±0.04 m/sec).

The racing speeds has been increased for years. Phenotypic trends were estimated as 0.0349 m/sec, 0.0353 m/sec and 0.0305 m/sec for all distances, 1400 m and 1600 m respectively. All phenotypic trends were highly significant (P <0.01). According to this case, as of years, shorter races and race speed has increased.

Genetic trends: Genetic trends in racing time and racing speed are given in Table 3 and Figs 1–2. Genetic trends for racing time were negative, for racing speeds were positive.

Table 3. Estimates of genetic trend for racing time and racing speed

Distances	Racing time	Racing speed
All distances	Y = 0.01164-0.00749$^{n.s}$ X±0.0098	Y = 0.00712 + 0.000238 $^{n.s}$ X±0.00119
1400 meters	Y=-0.01871-0.00101 $^{n.s}$ X±0.01274	Y = 0.00364 + 0.00009968 $^{n.s}$ X±0.00172
1600 meters	Y = -0.09694-0.00546 $^{n.s}$ X±0.02587	Y = 0.01264 + 0.000564 $^{n.s}$ X±0.00329

n.s, nonsignificant.

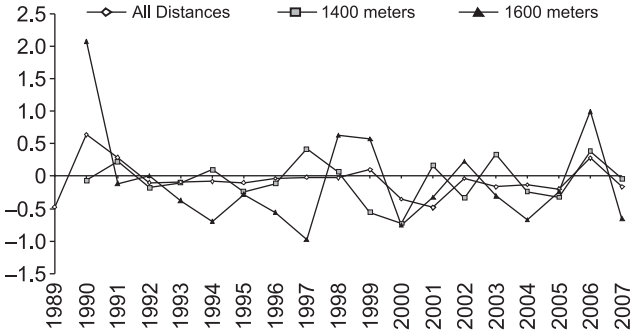

Fig. 1. Change of racing time breeding values by birth year.

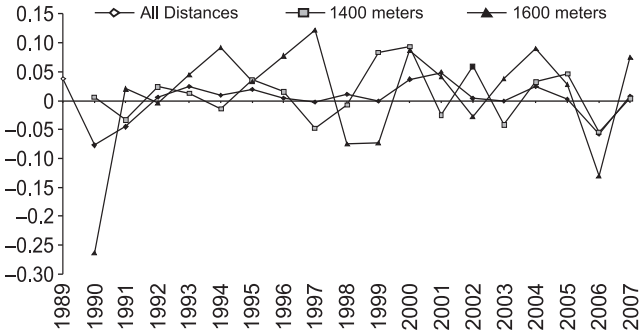

Fig. 2. Change of racing speed breeding values by birth year.

But, each year, more quickly than population average will finish and/or horse can run faster have been selected for breeding. However, according to the year chosen for the breeding of horses from the difference statistically insignificant treatment (P>0.05) were found.

All distances in terms of duration of the race as an sn – 0.00749 genetic tendencies observed value, Bokor *et al.* (2007), Wilson *et al.* (1988), Park and Lee (1999), Moritsu *et al.* (1992) reported the higher values, but SeungYoon *et al.* (2008), Park *et al.* (2008), Mota *et al.* (2002), Taveira *et al.* (2004) reported by lower values. According to these results, years increased duration and race progress in terms of environmental conditions that occur in the phenotypic result.

Phenotypic trend is adequate because nutrition, training methods, veterinary procedures, and track conditions have been improved. The genetic trend is inadequate because of inefficient selection program.

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