

## The Effect of Some Environmental Factors To Race Performance of Purebred Arabian Horses

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### ABSTRACT

This study evaluated the relationships between some environmental factors and race performance of purebred Arabian racehorses in the Turkish Jockey Club. For this purpose, the belonging 60 purebred Arabian horses (45 males and 15 females) which registered to Turkish Jockey Club was benefited from 3087 races records. In the research, the effect of gender, age, race distance, dam age, and the city in which the race took place to race performance on the turf and dirt track was investigated. In the environmental factors affecting race speeds of horses were found statistically different. The turf track, dirt track and general average of the race speed were calculated as  $14.45 \pm 0.02$  m/sec,  $13.52 \pm 0.01$  m/sec and  $13.77 \pm 0.01$  m/sec, respectively. The horses's race performance results; it was better than others the turf track, male, short distance, 9-12 dam age, 3 age, and Istanbul, for the race track, gender, race distances, dam age, race age, and race city, respectively. In conclusion, it is thought that performing of similar studies with more horses and more comprehensive studies may be more useful in examining the race performance of horses.

**Keywords:** Arabian horse, environmental factors, race, performance

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### Safkan Arap Atlarının Yarış Performansına Bazı Çevresel Faktörlerin Etkisi

#### ÖZ

Bu çalışma, Türkiye Jokey Kulübü'ndeki Safkan Türk Arap atlarının bazı çevresel faktörler ve yarış performansları arasındaki ilişkilerin belirlenmesi amacıyla gerçekleştirilmiştir. Bu amaçla Türkiye Jokey Kulübü'ne kayıtlı 60 safkan Arap atına ait (45 erkek ve 15 dişi) 3087 yarış kaydından yararlanılmıştır. Araştırmada çim ve kum pistteki koşu performansına cinsiyet, yaş, mesafe, ana yaşı, ve yarışın yapıldığı şehrin etkisi incelenmiştir. Atların yarış hızlarını etkileyen bu çevresel faktörlerde istatistiksel olarak farklılıklar bulunmuştur. Yarış hızının çim pist, kum pist ve genel ortalaması sırasıyla  $14.45 \pm 0.02$  m/sn,  $13.52 \pm 0.01$  m/sn ve  $13.77 \pm 0.01$  m/sn olarak hesaplanmıştır. Atların yarış performans sonuçlarında; çim pist, erkek, kısa mesafe, 9-12 ana yaşı, 3 yaş ve İstanbul verileri diğerlerinden, sırasıyla yarış pisti, cinsiyet, yarış mesafesi, ana yaşı, koşu yaşı ve yarış şehri bakımından daha iyi sonuçlar vermiştir. Sonuç olarak, daha fazla at sayısına sahip ve daha kapsamlı benzer çalışmaların yapılması atların yarış performansının incelenmesinde daha faydalı olabileceği düşünülmektedir.

**Anahtar Kelimeler:** Arap atı, çevresel faktörler, yarış, performans

*To cite this article: Yıldırım F. The Effect of Some Environmental Factors To Race Performance of Purebred Arabian Horses. Kocatepe Vet J. (2019) 12(1):1-6*

Submission: 02.08.2018

Accepted: 13.11.2018

Published Online: 11.12.2018

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## INTRODUCTION

Arabian horses, known as one of the oldest breeds in the world, have been raised in the Arabian Peninsula and surrounding regions since 2000 BC (Glazewska 2010). Because the Arabian horse has a symmetrical body, an elegant, is resistant to various weather conditions, perform well in long-distance races and a high pass down hereditary power, it has played a significant role in hybridization studies for the development of new breeds (Özbeyaz and Akçapınar 2003).

Nowadays, because horse breeding is usually made for racing and sports purposes, the yields in these two breedings are running ability and spring. At races, horses' running ability (speed) can be defined as racing performance. In horses, racing performance is a quantitative character. Therefore, genetic and environmental factors control this feature (Paksoy and Ünal 2010).

In horseracing and race performance, breeders use horses' records as well as the records of their offspring, relatives and ancestors (Ricard et al. 2000). Also, racehorse time is one criterion used to quantitatively evaluate horseracing and race performance that is to say the success of the horse according to other horses (Ekiz et al. 2005b, Mota et al. 1998). Race performance of horses is influenced by genotype, body structure, and various environmental factors. These factors include care and feeding, exercise, gender, age of the horse and dam, distance, handicap weight, rider status and previous medical condition of the racehorse illnesses. It is crucial for the success of the breeding programs that these factors are taken into account to improve race performance (Paksoy and Ünal 2010). In another study conducted on Arabian horses, when factors affecting race time were examined, it was found that horse's gender and race track were significant, but the horse's age was significant only at certain race distances (Ekiz et al. 2005a). It is also important for their training in the interaction of horses with the rider (Yıldırım et al. 2017).

Some researchers have studied the age of the racehorse and dam, the year of the race, race distance, racing categories and surface of the race track in order to evaluate possible correlations between these factors and the race performances of horses (Köseman and Özbeyaz 2009). Others have reported that the age of the horse, race distance, structure of the track, amount of the jackpot, running season, number of running horses, handicap weight of the horse and the horse's position on the track were significant factors in race performance (Martin et al. 1996).

In Turkey, official horseracing is organized by the Turkish Jockey Club (Turkish abbreviation: TJK), a member of the World Arabian Horse Organization. Races are held at nine tracks throughout the country. The tracks have either turf or dirt surfaces. Arabian horses are mostly used in endurance racing throughout the world, in Turkey, they are commonly used in flat racing (Özen and Gürcan 2017).

The aim of the present study was to investigate the relationships between some environmental factors and race performance of purebred Arabian horses in the TJK. It is hoped that this research will contribute to a better understanding of the effect of some environmental factors on race performance.

## MATERIALS and METHODS

The racing records of Arabian horses in this study were provided by the TJK and included official races that took place from May 2007 to December 2016. The dataset in this period was comprised of records from 3087 races. These records were taken from 60 purebred Arabian horses (45 males and 15 females) registered by the TJK. Race information included the horses' genders, ages, ages of dams, race track, race distance, race speeds, and cities. The turf and dirt track are composed of structurally different materials, and so affects the running results. For this reason, while the race results are examined, the races made on the turf and dirt track are considered differently and the race performances of the horses are evaluated separately for each track. Therefore, in order to better observe the performances (speed-m/sec) of the horses on the turf and dirt track, horses performances were evaluated both as separate and as a whole. The race speed of the horses was determined according to the distance in each run was calculated individually. The effects of gender, race distance, dam age, horse's age and race city were fitted to model used in analyses for each track type (turf and dirt).

Factors related to the horse race performances were evaluated by the formula:

$$Y_{ijklmn} = \mu + a_i + b_j + c_k + d_l + f_m + e_{ijklmn}$$

where  $Y_{ijklmn}$  = each parameter value discussed,  $\mu$  = population average,  $a_i$  = effect of the horse's gender (male, female),  $b_j$  = effect of the race distance in meters (1200, 1300, 1400, 1500, 1600, 1700, 1800, 1900, 2000, 2100, 2200),  $c_k$  = effect of the age of dam in years (5-8, 9-12, 13-16, 17-20, 21+),  $d_l$  = effect of the age of the horse at the time of the race, in years (3, 4, 5, 6, 7, 8+),  $f_m$  = effect of the city in which the race took place (Istanbul, Izmir,

Bursa, Ankara, Adana, Elazığ, Sanlıurfa, Diyarbakır) and  $e_{ijklmn}$  = random error effect.

While analysing the data, the General Linear Model was used in SPSS Statistic 20. Tukey's multiple comparison test was used to evaluate the significance of the differences among averages of the sub-groups.

## RESULTS and DISCUSSION

The results of fixed effects of gender, race distance, dam age, race age and race city in which the race took place of horse on race performances or speeds were shown in Table 1. In the evaluation of entire data set, statistically, significant differences were found in all of the fixed effects ( $P < 0.001$ ). The race performance or race speed (m/sec) average of the horses was obtained as  $14.45 \pm 0.02$  m/sec for turf track,  $13.52 \pm 0.01$  m/sec for the dirt track and  $13.77 \pm 0.01$  m/sec for the general average. According to the results obtained, the race speed of the horses running on the turf track was found to be higher than the horses running on the dirt track. Similar to the results of this study, some researchers stated that the speed of horses running on the dirt track is less than the horses running on the turf track (Köseman and Özbeyaz 2009, Paksoy and Ünal 2010, Paksoy et al. 2018). However, as Paksoy and Unal (2010) stated in his studies, there may be a change in the race times of horses according to the wetness and dryness of the turf or dirt track. Therefore, to examine horses's pedigree and race performance records may provide better results.

In horse races organized in Turkey, horses of both genders are organized together, and in some races, separate races are organized for each gender. Therefore, in this study, both together and separate results are examined in terms of gender. According to the analyses results, the effect of gender on the horse's racing speed was not significant in turf and dirt track ( $P > 0.05$ ). However, it was found that male horses running on the turf track run faster than female horses. In general, researchers reported that male horses exhibited better racing performance than female horses in horse races due to both morphological and hormonal reasons (Özbeyaz and Akçapınar 2003). In this study, It was thought that this result may be due to lack of population number of female horses.

Race distances are considered short if they are less than or equal to 1300; middle-distances are 1400 to 1700 m and long-distance races are longer than 1800 m (Anonymous 2018). Racing horses perform better at their own distance. In addition, the well-known horses of the structure and features by the owners are run in proper distance runs, and so the

performances of the horses are well exhibited (Paksoy and Ünal 2010). It is not recommended that horses compete at distances that are not suitable for their body structures (Özen and Gürcan 2016). In Turkey, between 1991-2000 years, running in the open race organized for male Arabian horses, which the race speeds (calculated from the relevant source) were examined at various distances, the race speed increased as the race distance increased (Köseman and Özbeyaz 2009). However, in this study, the horses's speed of the race generally decreased as the race distance increased. In addition, the race speed results for all race distances (1200 to 2200 m) obtained in this study showed a better performance than the race speed results of the Köseman ve Özbeyaz (2009). This result can be considered as a result of the selection and maintenance-feeding operations carried out over the years. In the present study, the effect of race distance on race performance or speed was significant for each track type ( $P < 0.001$ ). Especially, at 1200 and 1500 mt of the turf track, and at 1300 mt of the dirt track, the speed of the horses was better than at other distances. In other words, it was determined that horses performed faster than 1500 mt or less.

In the studies on the effect of the dam age on the horses's racing performance are reported that there is a relationship between the two characteristics (Barron 1995, Köseman and Özbeyaz 2009). In this study, similarly, racing performances were influenced by dam age. And even, the race performances on the turf ( $P < 0.05$ ) and dirt ( $P < 0.001$ ) track were statistically significant. In the UK, the race performance of the foals born from young mothers in the Thoroughbred horses is higher, but those from mothers older than 11 years has been reported that the race performance decreased (Barron 1995). In a study conducted on Arabian horses, the effect of dam age on race time was insignificant, but 9-12 year-old dams had less race time (Köseman and Özbeyaz 2009). In the present study, when the effect of dam age on the race performance was examined, the highest speed on the turf track was 9-12 dam age, and the highest speed on the dirt track was 21+ dam age.

The age of onset for purebred Arabian horses to race in Turkey was determined to be 3 years. In a race time study conducted on Arabian horses (Köseman and Özbeyaz 2009), the differences between the average age of racehorses (3 to 9+ age) at different distances were not statistically insignificant; however, in this study, the horses's race speed (3 to 8 age) was found to be significant. Others have reported that the race performance of horses is significantly affected by the race age of the horse (Chrzanowski and Koeboke 1993, Chrzanowski et al. 1996). In this study, similarly,

race speeds were influenced by race age. The race performances or speeds of the horses according to their age at the races were determined as 3 years for the fastest horses on both turf and dirt tracks. In this study, the speed of the horses running on the turf track at the age of 8+ is remarkable. According to some researchers, there is a proven relationship between the race performance of the horses and the race lives (Sobczynska 2007), and thus, the horses running on the turf track at 8+ age may be seen as the reason for the high speed of racing. Because, it is thought that the best running horses are kept to make more profits by the breeders.

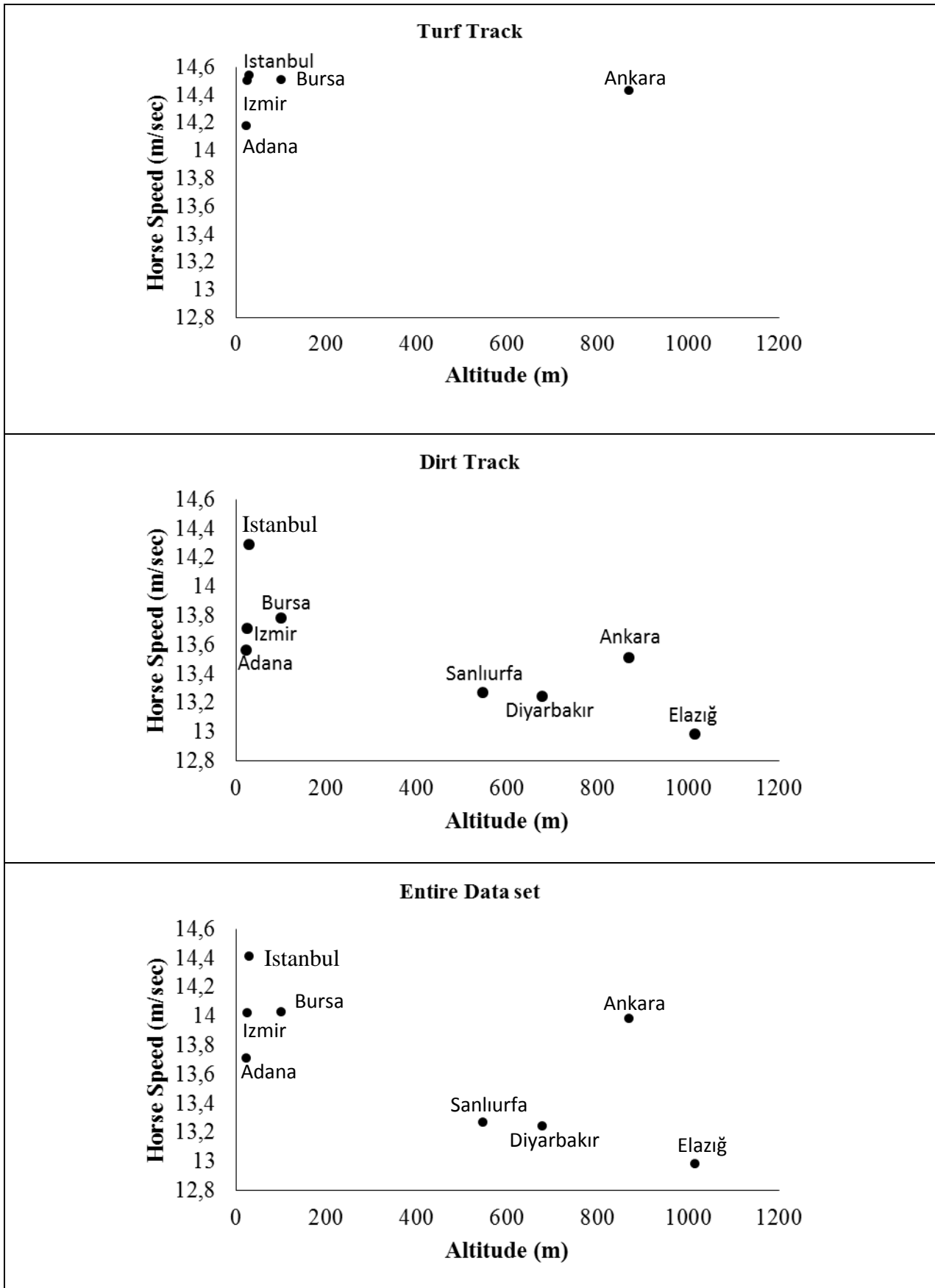
Considering the race city of track, Istanbul, Izmir, Bursa, and Ankara at turf track; Istanbul at dirt track of horses's race performances or speeds were found to be significantly larger than at other race cities. In addition, in regard to the effect of the race city on the horse's performance, the speed of the horses running on both the turf track and the dirt track in Istanbul has the highest values. There are

very few studies on the effect of racing cities on horses's race speeds in Turkey. In the studies conducted, the average speed for Arabian horses was reported to be 13.70 m/sec in Elazığ and 14.41 m/sec in Istanbul (Duru 2017). In this study, 12.98 m/sec racing speed found for Elazığ was higher than the racing speed found by Duru (2017), but 14.41 m/sec racing speed for Istanbul was similar to the findings of the same researcher. In conducting the research, the relationship between the altitude levels of cities and the horses's race speeds was remarkable. Therefore, this relationship was presented in Graph 1 as separate data. When the Graph 1 was examined, it was observed that the horses's race speeds in the provinces with altitude above 500 m are generally lower than the provinces with less than 500 mt. As a result, it was concluded that the altitude levels of the racing places may be an impact on the horses's race speeds. However, this relationship (between racing speed and altitude) can be examined in more detail.

**Table 1.** The averages (m/sec), significant and comparison test results relevant to the turf and dirt track of the horses's race speeds examined as the gender, race distance, dam age, race age, and race city.

Parameters	Turf			Dirt			Entire Dataset			
	n	$\bar{X} \pm S\bar{X}$	Sig	n	$\bar{X} \pm S\bar{X}$	Sig	n	$\bar{X} \pm S\bar{X}$	Sig	
Gender	Male	529	14.46±0.02	NS	1815	13.52±0.02	NS	2344	13.73±0.02	***
	Female	318	14.42±0.03		425	13.52±0.03		743	13.91±0.03	
Race Distance (m)	1200	147	14.71±0.04 <sup>a</sup>	333	13.83±0.03 <sup>ab</sup>	480	14.10±0.03 <sup>ab</sup>	***		
	1300	69	14.41±0.06 <sup>bc</sup>	95	13.94±0.06 <sup>a</sup>	164	14.14±0.05 <sup>a</sup>			
	1400	152	14.57±0.04 <sup>ab</sup>	404	13.82±0.03 <sup>ab</sup>	556	14.02±0.03 <sup>ab</sup>			
	1500	20	14.70±0.11 <sup>a</sup>	194	13.69±0.04 <sup>b</sup>	214	13.79±0.05 <sup>cd</sup>			
	1600	84	14.56±0.05 <sup>ab</sup>	98	13.36±0.06 <sup>cd</sup>	182	13.92±0.05 <sup>bc</sup>			
	1700	95	14.34±0.05 <sup>bc</sup>	***	142	13.13±0.05 <sup>d</sup>	***		237	13.62±0.05 <sup>de</sup>
	1800	51	14.31±0.07 <sup>bc</sup>	210	13.33±0.04 <sup>cd</sup>	261	13.52±0.04 <sup>e</sup>			
	1900	85	14.25±0.05 <sup>c</sup>	314	13.17±0.03 <sup>cd</sup>	399	13.40±0.04 <sup>e</sup>			
	2000	61	14.24±0.06 <sup>c</sup>	271	13.33±0.04 <sup>cd</sup>	332	13.50±0.04 <sup>e</sup>			
	2100	45	14.12±0.07 <sup>c</sup>	138	13.32±0.05 <sup>cd</sup>	183	13.52±0.05 <sup>e</sup>			
Dam Age (years)	2200	38	14.23±0.08 <sup>c</sup>	41	13.38±0.09 <sup>c</sup>	79	13.79±0.08 <sup>cd</sup>	***		
	5-8	191	14.39±0.04 <sup>ab</sup>	770	13.40±0.02 <sup>b</sup>	961	13.60±0.02 <sup>c</sup>			
	9-12	294	14.50±0.03 <sup>a</sup>	523	13.63±0.03 <sup>a</sup>	817	13.94±0.03 <sup>a</sup>			
	13-16	190	14.47±0.04 <sup>a</sup>	*	492	13.56±0.03 <sup>a</sup>	***		682	13.82±0.03 <sup>b</sup>
	17-20	47	14.26±0.07 <sup>b</sup>	260	13.42±0.04 <sup>b</sup>	307	13.55±0.04 <sup>c</sup>			
Race Age (years)	21+	125	14.43±0.05 <sup>ab</sup>	195	13.69±0.05 <sup>a</sup>	320	13.98±0.04 <sup>a</sup>	***		
	3	108	14.61±0.05 <sup>a</sup>	90	13.78±0.07 <sup>a</sup>	198	14.23±0.05 <sup>a</sup>			
	4	275	14.39±0.03 <sup>b</sup>	532	13.62±0.03 <sup>b</sup>	807	13.88±0.03 <sup>b</sup>			
	5	190	14.40±0.04 <sup>b</sup>	**	504	13.57±0.03 <sup>b</sup>	***		694	13.80±0.03 <sup>bc</sup>
Race City	6	125	14.50±0.05 <sup>ab</sup>	399	13.52±0.03 <sup>b</sup>	524	13.76±0.03 <sup>bc</sup>	***		
	7	78	14.38±0.06 <sup>b</sup>	326	13.53±0.04 <sup>b</sup>	404	13.70±0.04 <sup>c</sup>			
	8+	71	14.49±0.06 <sup>ab</sup>	389	13.24±0.03 <sup>c</sup>	460	13.43±0.03 <sup>d</sup>			
	Istanbul	122	14.54±0.05 <sup>a</sup>	146	14.29±0.05 <sup>a</sup>	268	14.41±0.04 <sup>a</sup>			
	Izmir	179	14.50±0.04 <sup>a</sup>	274	13.71±0.03 <sup>bc</sup>	453	14.02±0.03 <sup>b</sup>			
	Bursa	212	14.51±0.03 <sup>a</sup>	411	13.78±0.03 <sup>b</sup>	623	14.03±0.03 <sup>b</sup>			
	Ankara	218	14.43±0.03 <sup>a</sup>	***	204	13.51±0.04 <sup>d</sup>	***		422	13.98±0.03 <sup>b</sup>
	Adana	116	14.18±0.05 <sup>b</sup>	361	13.56±0.03 <sup>cd</sup>	477	13.71±0.03 <sup>c</sup>			
	Elazığ	-	-	265	12.98±0.04 <sup>f</sup>	265	12.98±0.04 <sup>c</sup>			
	Sanlıurfa	-	-	457	13.27±0.03 <sup>e</sup>	457	13.27±0.03 <sup>d</sup>			
Diyarbakır	-	-	122	13.24±0.05 <sup>e</sup>	122	13.24±0.06 <sup>d</sup>				
General Average	847	14.45±0.02	2240	13.52±0.01	3087	13.77±0.01				

a-f: Differences among groups indicated with different letters in the same column are significant, \*\*\*: P < 0.01, \*\*: P < 0.01, \*: P < 0.05, NS: P > 0.05.



Graph 1. Average speed according to altitude levels of horse's race cities

## CONCLUSION

Racing performances or speeds of horses was impressed by the horse's gender, race distance, dam age, race age, and city in which the race took place.

The horses's race performance results; it was better than others the turf track, male, short distance, 9-12 dam age, 3 race age, Istanbul, for race track, gender, race distances, dam age, race age, race city, respectively. When the race performances of horses are examined, it is thought that performing of similar studies with more horses and more comprehensive studies may be more useful. In addition, it is recommended that more detailed research is carried out on the effect of the race places altitude to the horses's race performance.

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