



An Important Genotype for Sustainable Extensive Goat Production Systems of Turkey: The Gökçeada Goat

Cemil Tölu^{1,a,*}, Türker Savaş^{1,b}

¹Department of Animal Science, Agriculture Faculty, Çanakkale Onsekiz Mart University, 17100 Çanakkale, Turkey

*Corresponding author

ARTICLE INFO	ABSTRACT
<p><i>Research Article</i></p> <p>Received : 27/02/2021 Accepted : 15/04/2021</p> <p>Keywords: Gökçeada (Imbros) Morphology Goat milk Kid Niche product</p>	<p>In this study, it was aimed to report some traits of Gökçeada goats, which raised under the natural conditions of Gökçeada, with respect to their protection within the scope of genetic resources. In this respect the information obtained from the goats supplied from the Island and reared in a semi-intensive system at Çanakkale Onsekiz Mart University and also the information obtained from the literature were collected and the biological and zootechnical identifications of the Gökçeada goat were performed. Gökçeada goats, which are predominantly black, have yellow or red blazes on both sides of their heads including their eyes. It was seen that Gökçeada goats had similar body measurements and lower live weights as compared to those of the same species on the mainland. The birth weight and the mature live weight of Gökçeada goats were found as 2.55 kg and 38 kg, respectively, whereas their mean kid yield per goat at birth was determined as 1.6 to 1.8 kids. Individuals with a milk yield of 591 kg were striking in the Gökçeada genotype, in which the mean lactation length and the mean lactation milk yield were determined as 251 to 259 days and 227 to 245 kg, respectively. Its milk fat (4.92-5.75%) and milk protein (3.29%) resembled those of our other native breeds. It is necessary to reveal, with more elaborate studies, the potential for Gökçeada goat cheese that is greatly demanded on the Island. It was determined that the Gökçeada kids, which were considered as dairy kids, had some small but nonfat carcass and that their meat was soft and of a light color and had a slight smell. One should be careful about the adaptation of the Gökçeada genotype, which successfully maintains itself under the island conditions and which is the source of income for producers, to intensive and extensive goat production systems.</p>

Türk Tarım – Gıda Bilim ve Teknoloji Dergisi, 9(8): 1460-1466, 2021

Türkiye Sürdürülebilir Ekstansif Keçi Üretim Sistemleri İçin Önemli Bir Genotip: Gökçeada Keçisi

MAKALE BİLGİSİ	ÖZ
<p><i>Araştırma Makalesi</i></p> <p>Geliş : 27/02/2021 Kabul : 15/04/2021</p> <p>Anahtar Kelimeler: Gökçeada (Imbros) Morfoloji Keçi sütü Oğlak Niş ürün</p>	<p>Bu çalışmada, Gökçeada doğal koşullarında yetiştirilen Gökçeada keçilerinin gen kaynakları kapsamında korunmasına ilişkin bazı özelliklerinin rapor edilmesi amaçlanmıştır. Bu amaçla, Ada'dan sağlanan ve Çanakkale Onsekiz Mart Üniversitesinde yarı-entansif sistemde yetiştirilen keçilerden elde edilen bilgiler ile yine literatürden elde edilen bilgiler derlenerek Gökçeada keçisinin biyolojik ve zooteknik tanımlaması yapılmıştır. Ağırlıklı olarak siyah renkte olan Gökçeada keçilerinin başlarının iki yanında, gözlerini de içerisine alacak şekilde sarı veya kırmızı akitmaları bulunmaktadır. Gökçeada keçilerinin, anakaradaki türdeşlerine göre benzer vücut ölçüsüne ve daha düşük canlı ağırlığa sahip oldukları görülmüştür. Doğum ağırlıkları 2,55 kg, ergin canlı ağırlıkları 38,0 kg olan Gökçeada keçilerinin doğumda keçi başına ortalama 1,6-1,8 oğlak verimi tespit edilmiştir. 251-259 gün laktasyon süresi ve 227-245 kg laktasyon süt verimi belirlenen Gökçeada genotipinde, 591 kg süt verimine sahip bireyler dikkat çekmiştir. Süt yağı (%4,92-5,75) ve süt proteini (%3,29) yerli ırklarımızla benzerlik göstermektedir. Ada'da büyük ilgi gören Gökçeada keçi peyniri potansiyelinin daha ayrıntılı çalışmalarla ortaya konması gerekmektedir. Süt oğlak olarak ele alınan Gökçeada oğlaklarının karkasının küçük ama yağsız olduğu, etin açık renkte, yumuşak ve az kokulu olduğu belirlenmiştir. Ada koşullarında başarılı bir biçimde kendini idame ettiren ve yetiştiricilerin geçim kaynağı olan Gökçeada genotipinin entansif ve ekstansif üretim sistemlerine uyumu anlamında dikkatli olunmalıdır.</p>

^a cemiltolu@comu.edu.tr

^b <https://orcid.org/0000-0002-6135-4502>

^a tsavas@comu.edu.tr

^b <https://orcid.org/0000-0002-3558-2296>



Introduction

It is known that in every region around the world, different animal species are confronted with the danger of extinction at various rates (Rege, 1999). A similar case is also present in Turkey (Ertuğrul et al., 2005). The most important reasons for this include unlimited and identical cross-breeding and artificial insemination (Ruanne, 2000). Changing conditions and the ongoing pressure of natural selection are essential in the extinction of breeds. However, there are significant reasons for the protection of domestic species and breeds (Savaş, 1995; Basedow, 1998). It might be stated that, the extensive and semi-extensive production systems have gained momentum towards the semi-intensive and even intensive systems for Turkey in the recent years. It is reported that 96% of the goat wealth of Turkey consists of Hair goats (Anonymous, 2007). Apart from Hair and Angora (Mohair) goats, there are Saanen Goats, Maltese Goats, Damascus Goats, Kilis Goats, Georgian Goats, Abkhazian Goats, German White Goats and some local goat breeds in Turkey (Yalçın, 1990; Özder, 2006). Nevertheless, Hair goat is reported to be a general expression in our country and a classification for the genotypes other than some goat breeds and it is expressed that the genotype groups classified as Hair goats should be identified at the soonest time (Ertuğrul et al., 2005). The genotype differences have been revealed more clearly with the banding activities by the sheep/goat producers' unions in Turkey within the last years.

It is seen that there is a considerable number of different goat breeds in many areas all around the world (Bertaglia et al., 2007) and that their yield traits are in good condition (Serradilla, 2001). Furthermore, a contribution is made to the economy by producing special products from these goats that are in small populations (Boyazoglu and Morand-Fehr, 2001). The cheese, which contains goat milk in its composition, and goat kid meat are demanded in Turkey. Besides, it is expressed by ice cream producers that goat milk is highly favorable for ice cream. The scientific studies on the Gökçeada goat are at limited levels.

The team, also including the authors, first of all defined production under the island conditions (Daş et al., 2002) and then formed scientific data about the genotype, through a project and a doctoral project. The biological and zootechnical identifications of the Gökçeada goat, an essential source for sustainable extensive goat production systems of Turkey, were performed in this study.

Gökçeada Island

Geography

Gökçeada, an island affiliated to the province of Çanakkale, has an area of 289 km². Gökçeada is located at a distance of 14 miles (25 km) from the Gelibolu Peninsula to the mainland. There is a town center and nine villages on the Island. Gökçeada has a quite rugged land structure and consisted of volcanic masses. Considerable amounts of oleander, olive, maquis type of shrubs and pine forests are encountered. The pastures excluding the pasture areas protected from animal pressure are heavily covered by thorny burnet (*Sarcopoterium spinosum*) plant and tragacanth plant (*Astragalus sp.*) species (Tölu et al.,

2017). Of the island, 77% is mountainous, 12% consists of rugged land and 11% is plain. Around 27% of the island is covered by maquis and 33% by burnet (Cengiz et al., 2009). Gökçeada has a transitional climate between Marmara and Mediterranean climates. The 32-year mean rainfall is around 740 mm on Gökçeada.

Goat Husbandry on Gökçeada

Gökçeada had hosted a dense Greek population until the 1960s and it is told that the main sources of income on Gökçeada then were viniculture, olive and cheese production. It is known that cheese is produced with sheep and goat milk. Those producers who have reared Gökçeada goats on the mainland praise the milk yields of these animals. It is seen that until the 1970s, there had been a selection for milk yield in the goats concerned. The goats were released into the nature as the Greeks abandoned the Island. These goats have been moving freely at the hills of Gökçeada for about 40 years. In this way, a goat genotype that has adapted to the hard conditions and scarce sources of the Island but partially maintained its milk yield has been formed.

The existing goat and sheep breeds have been protected from cross-breeding on Gökçeada, which has had a transportation problem with the mainland so far. Moreover, with a regulation that entered into force in 1982, the entry of goats into the Island was prohibited and the regulation caused the goats to become further purified. However, entry of animals into the Island has started in the recent years and the Gökçeada goat has begun to be threatened by cross-breeding, as around the world. 88% of the animal producers on the Island are sheep producers and the rate of goat husbandry among all branches of animal husbandry is 30% (Aktürk et al., 2005). Goats stay outdoors in an unconfined state throughout the year on Gökçeada, the western end of Turkey. In the system applied, no roughage or concentrate feeding is performed at all, the animals stay in the places they themselves determine throughout the year instead of a shelter, and no protective health application is carried out at all. In this system, producers intervene only once a year for marking and to obtain kids. Nevertheless, some producers call some of their herds to the "house" by feeding and they obtain milk.

Gökçeada Goat

Morphological Traits of Gökçeada Goat

Gökçeada goats are generally black. They have yellow or red blazes on both sides of their heads including their eyes. The parts under the tarsal joint of the legs are of the same color with their blazes. Besides, sky blue, brown and multi-colored animals are also encountered in the order of frequency. The hairs covering the body are generally long and the ears are relatively short and upright; however, a slight break as of one-third portion of the ear can be seen in some animals. As required by their "natural lives", both males and females are generally horned, though hornless individuals are also encountered. Even though the udder connection is not very good, not much drooping is observed. While the udder color varies by body color, it is generally black (Figure 1).



Figure 1. Gökçeada goat and kids (by Cemil Tölü; September 2006-November 2008)

Traits of Body Measurement and Live Weight

It is seen that the Gökçeada goats have similar values in terms of body measurements with some goat breeds produced in Anatolia (Table 1). This trait of kids, which had been born with a small size at birth, continued at weaning as well. When the body measurements are generally evaluated, it might be stated that the Gökçeada goat resembles Hair, Kilis and Norduz goats (Soysal et al., 2003; Şimşek and Bayraktar, 2006; Anonymous, 2008a) and has a smaller body size than that of Damascus and Maltese goats (Keskin and Gül, 2006; Tölü, 2009a).

The live weight averages of Gökçeada goats ranged from 33.8 kg to 38.6 kg depending on caring and feeding (Tölü, 2009a). When it is considered that Gökçeada goats live by themselves under “wild conditions” and when the relatively limited conditions on Gökçeada are taken into account, it might be considered natural that they are smaller than those of the same species on the mainland. Likewise, Herre and Röhrs (1973) express that live weight ranges from 30 to 40 kg in the feral goats on the Galapagos Islands. The live weights of Gökçeada goats resemble those of Angora goats (Vatansever and Akcapinar, 2006), while they are lower than those of Hair, Honamli, Norduz and Damascus goats (Bhattacharya, 1980; Keskin and Gül, 2006; Özder, 2006; Vatansever and Akcapinar, 2006; Anonymous, 2008a; Anonymous, 2008b).

Traits of Reproduction and Growth

In the Gökçeada genotype produced at the Goat Husbandry Unit at Çanakkale Onsekiz Mart University, the number of kids per kidding goat was recorded as 1.6 in 2007 and 1.8 in 2008 (Tölü and Savaş, 2012). The offspring yield of the genotype, which was brought as pregnant from Gökçeada, increased with the feeding environment that improved in the second year. The offspring yield of the genotype was higher than that of Hair, Angora and Kilis goats (Şimşek et al., 2006; Güney et al., 1995; Soysal et al., 2003), whereas it was lower than that of Damascus and Maltese goats (Keskin and Gül, 2006; Tölü and Savaş, 2010).

It was seen that although varying by sex and birth type, the kid birth weights regarding the 1- to 6-year-old goats in the Gökçeada genotype ranged from 1.72 to 3.75 kg and that the average of the two years was 2.55 kg (Tölü and Savaş, 2012). The kids of Gökçeada goats, which reached 5.67 to 11.84 kg at 60 days of weaning age on average, displayed a 106-119 g daily increase in live weight in this period. The same values were far higher in Maltese and Turkish Saanen goat genotypes (Tölü and Savaş, 2012). The birth weights reported in the Saanen x Hair cross-breed and pure Hair goat kids ranged from 2.95 to 3.70 kg and from 2.63 to 2.77 kg, respectively (Şengonca et al., 2003; Şimşek and Bayraktar, 2006). The birth weight was reported as 3.1 kg for the Norduz kids (Kırk et al., 2004) and 2.76-2.84 kg for the Angora goat kids (Vatansever and Akcapinar, 2006). The mean birth weights of the American Alpine, French Alpine, Nubian, Saanen and Toggenburg goat genotypes were reported as 3.4 kg, 3.4 kg, 3.3 kg, 3.6 kg and 3.9 kg, respectively (Amoah et al., 1996). As it will be seen, the kids of Gökçeada goats had a lower birth weight than other goat genotypes.

It was observed that in the Gökçeada genotype, the live weight average of yearlings in the breeding period was 19.6 kg and that this average corresponded to 48% of the live

weight of goats in the breeding period (Tölü and Savaş, 2012). The similar trait was reported as 55% in the dairy type of goats (Morand-Fehr et al., 2002; Tölü et al., 2009) and 43% in Maltese goats (Tölü and Savaş, 2010).

Milk Traits

In the two-year process of the project, the mean lactation length and lactation milk yield in the Gökçeada genotype were determined as 251 to 259 days and 227 to 245 kg, respectively and the maximum 591 kg of milk yield was striking (Tölü et al., 2010). While the mean lactation length was 150 to 162 days in Hair goats (Sönmez, 1974; Şengonca et al., 2003; Şimsek et al., 2006), it ranged from 201 to 257 days in some of our other native goats (Şengonca et al., 2002; Şengonca et al., 2003; Güler et al., 2007). The lactation milk yield was between 70 and 160 kg in Hair goats (Sönmez, 1974; Bhattacharya, 1980; Şengonca et al., 2003; Şimsek et al., 2006). The lactation milk yield was reported as 226 to 350 kg in Maltese goats (Sönmez et al., 1971; Blundell, 1995; Carnicella et al., 2008; Tölü et al., 2010), 75 kg in Angora goats (Yertürk

and Odabaşıoğlu, 2007), 200 to 300 kg in Kilis goats (Güney et al., 1995; Soysal et al., 2003), 330 to 350 kg in Damascus goats (Keskin et al., 2004; Güler et al., 2007), 135 to 216 kg in Honamli goats (Anonymous, 2008b) and 66 to 222 kg in Norduz goats (Anonymous, 2008a). Gökçeada goats have a higher milk yield than the Hair goats that are widely produced in our country. Therefore, an opportunity should be sought to benefit from the genotype, which stands out with its contentment as well, at higher rates in our goat production (Tölü, 2009a).

In Gökçeada goats, the mean milk fat, milk protein and milk dry matter for the two years were determined as 4.92-5.75%, 3.29% and 13.7-14.7%, respectively (Tölü et al., 2010). The rates of milk fat and milk protein were reported as 5.5% and 4.8% for Hair goats, respectively (Bhattacharya, 1980) and the rate of milk fat was reported as 5 to 5.5% in Hair goats and 4.7% in Kilis goats (Soysal et al., 2003). In Damascus goats, the rates of milk fat and milk protein are 4.3% and 3.5%, respectively (Keskin et al., 2004). In Maltese goats, milk fat ranges from 3.5 to 3.8% and milk protein from 3.3 to 3.4% (Blundell, 1995; Carnicella et al., 2008).

Table 1. Mean (\bar{x}), standard deviation (SD), minimum and maximum values regarding some body measurements of Gökçeada goats (Tölü, 2009a)

Traits (cm)	Birth (0-3 days)			
	\bar{x}	SD	Minimum	Maximum
Body length	27.3	1.4	25.0	31.0
Height of withers	29.2	1.8	26.0	34.0
Heart girth	30.6	2.2	27.0	36.0
Heart depth	11.6	0.8	10.0	13.0
Rump height	28.7	1.8	25.0	33.0
Rump depth	9.6	0.8	8.0	11.0
Rump width	3.4	0.3	3.0	4.7
	Weaning (60 days)			
Body length	42.8	4.1	29.0	49.0
Height of withers	43.8	3.1	38.0	50.0
Heart girth	45.5	3.1	40.0	50.0
Heart depth	18.1	1.4	23.0	26.0
Rump height	43.4	3.2	37.0	50.0
Rump depth	16.3	1.6	14.0	22.0
Rump width	5.3	0.5	4.2	6.2
Ear length	10.6	1.3	6.8	13.4
Ear width	4.9	0.4	4.0	5.8
	Female yearling (14 months)			
Body length	63.5	3.7	55.0	69.0
Height of withers	61.6	3.9	53.0	69.0
Heart girth	65.3	3.6	59.0	70.0
Heart depth	26.1	1.5	24.0	29.0
Rump height	59.7	3.1	53.0	63.0
Rump depth	23.7	1.6	22.0	26.0
Rump width	8.4	0.6	7.2	9.6
Ear length	15.0	1.3	12.0	16.5
Ear width	6.3	0.5	5.5	7.0
	Goat (2-6 years)			
Body length	71.7	3.1	65.0	79.0
Height of withers	66.3	3.0	61.0	73.0
Heart girth	78.1	3.9	67.0	83.0
Heart depth	31.9	2.2	26.0	36.0
Rump height	64.9	2.4	61.0	70.0
Rump depth	28.6	2.5	24.0	34.0
Rump width	10.7	0.8	8.5	12.2
Ear length	15.6	1.1	12.5	17.5
Ear width	7.0	0.4	6.0	8.5

Table 2. Mean (\bar{x}) and standard deviation (SD) values regarding the live weights of Gökçeada goats according to ages (Tölü, 2009a)

Age (year)	\bar{x}	SD
1	24.59	3.65
2	35.31	2.49
3	36.24	5.25
4	38.26	4.29
5	40.31	4.92
6	42.87	4.82

Traits of Product Quality

Meat traits

When all carcass and meat quality traits of Gökçeada kids sent for slaughtering as “dairy kids” at a live weight of around 10 kg were evaluated as a whole, it was determined that small amounts of consumable products were obtained, that their carcass structure was small but nonfat and that they had soft meat with a light color and a slight smell. Furthermore, it is expressed that their meat color is good and their meat quality is good with their soft and slightly fatty structure (Özcan et al., 2010; Ekiz et al., 2010). It might be stated that the carcass yield of Gökçeada kids is at the lower limits as compared to that of some of our native breeds (Koşum et al., 2003; Daşkıran et al., 2006; Koyuncu et al., 2007), but they have significant potential with slight fat covering and a light-bright meat color (Özcan et al., 2010; Ekiz et al., 2010).

Cheese Traits

37.73% dry matter, 15.30% protein and 17.84% oil content were detected in the cheese made of Gökçeada goat milk under island conditions (Tölü et al., 2011a). In their study, the researchers classified the cheese yield of the Gökçeada genotype as good. The sensory analyses made in the same project with unpublished results showed that the Gökçeada goat cheese was liked at a higher rate by the panelists. On the other hand, an 18.97% protein rate on average was recorded in the goat cheese produced with the traditional method under Gökçeada conditions (Hayaloglu et al., 2013a). It has been determined that different cheeses made using Gökçeada goat's milk are better than the cheeses produced from the milk of other goat breeds in terms of different characteristics (Hayaloglu et al., 2013b, c). It is expressed that goat cheese is considerably demanded and liked by local people and domestic tourists on Gökçeada. More information should be produced with studies to be carried out on Gökçeada goat milk and products (Hayaloglu et al., 2013a).

Animal Health

It was seen that problems in the sense of adaptation of the genotype, which had long adapted to island conditions, to the semi-intensive system on the mainland might be encountered particularly in kid growing (Tölü, 2009a). The health practice per animal performed on the genotype and the observations as regards goat kid diarrhea and Ecthyma (*Ecthyma contagiosum*) disease revealed that with some of its traits, the genotype resembled the Turkish Saanen goat genotype, an intensive breeding genotype (Tölü, 2009b; Tölü et al., 2011b). Thus, it is necessary to carefully approach the production of the genotype on the mainland.

In addition, it is necessary to produce more information about the health characteristics of the genotype with comparative studies to be carried out under island and mainland conditions.

Conclusion

The body measurements of Gökçeada goats are close to those of our other native breeds. However, their live weights are lower. When Gökçeada goats are compared with many of our native goat breeds on the mainland, it is understood that they have significant potential for milk and kid yields and that they might become far more productive provided that their production conditions are improved. Nevertheless, one should particularly pay attention to the organization of the kid growing stage in their adaptation to different production conditions. It might be stated that Gökçeada goats are a value that should also be utilized in terms of goat kid meat and goat cheese. New approaches are needed about the animal products on Gökçeada in the sense of “special products” that have been dwelled upon in goat production around the world in the recent years. Some traits of the genotype, which successfully maintains itself under the hard conditions of Gökçeada, constitute the reason for its preservation as a genetic resource. However, more research on the genotype is required.

References

- Aktürk D, Savran F, Hakyemez H, Daş G, Savaş T. 2005. Gökçeada'da ekstansif koşullarda hayvancılık yapan işletmelerin sosyo-ekonomik açıdan incelenmesi. Tarım Bilimleri Dergisi, 11 (3): 229-235.
- Amoah EA, Gelaye S, Guthrie P, Rexroad Jr CE. 1996. Breeding Season and Aspects of Reproduction of Female Goats. Journal of Animal Science, 74: 723-728.
- Anonymous, 2007. Türkiye İstatistik Kurumu (TUİK) www.tuik.gov.tr (20 Kasım 2007).
- Anonymous, 2008a. Norduz Keçisi. http://www.tagem.gov.tr/hgk/milli_irk_tescil_listesi_taslagi_keci_norduzkecisi.htm (05 Haziran 2011).
- Anonymous, 2008b. Honamlı Keçisi. <http://marmarahae.gov.tr/irklar/honamli.pdf> (05 Haziran 2011)
- Basedow M. 1998. Die genetische Diversität deutscher Rinderrassen dargestellt durch molekulargenetische Markersysteme. Schriftenreihe des Instituts für Tierzucht und Tierhaltung der Christian-Albrechts-Universität zu Kiel.
- Bertaglia M, Stephane J, Roosen J, Consortium E. 2007. Identifying European marginal areas in the context of local sheep and goat breeds conservation: A geographic information system approach. Agricultural Systems, 94: 657-670.

- Bhattacharya AN. 1980. Research on goat nutrition and management in Mediterranean middle east and edjacent Arab countries. *Journal of Dairy Science*, 63: 1681-1700.
- Blundell R. 1995. Reintroduction of the local breeds of sheep and goats in Malta. Gabina D. (ed.) In: "Strategies for Sheep and Goat Breeding: CIHEAM-IAMZ, (231p). Meeting of the Joint FAO/ CIHEAM Network on Sheep and Goats, 26-28 March 1995, Sidi-Thabet, Tunisia, pp. 97-100.
- Boyazoglu J, Morand-Fehr P. 2001. Mediterranean dairy sheep and goat products and their quality A critical review. *Small Ruminant Research*, 40: 1-11.
- Carnicella D, Dario M, Ayres MCC, Laudadio V, Dario C. 2008. The effect of diet, parity, year and number of kids on milk yield and milk composition in Maltese goat. *Small Ruminant Research*, 77: 71-74.
- Cengiz T, Özcan H, Baytekin H, Altınoluk Ü, Kelkit A, Akbulak C, Özkök F, Kaptan Ayhan Ç. 2009. Gökçeada Arazi Kullanım Planlaması. TÜBİTAK 107Y337 nolu proje sonuç raporu.
- Daş G, Hakyemez BH, Savaş T. 2002. Gökçeada'da "Yabancı Koşullarda" koyun ve keçi Yetiştiriciliği. *Ekin Dergisi*, 22: 66-70.
- Daşkıran I, Kor A, Bingöl M. 2006. Slaughter and carcass characteristics of Norduz male kids raised in either intensive and pasture conditions. *Pakistan Journal of Nutrition*, 5(3): 274-277.
- Ekiz B, Özcan M, Yılmaz A, Tölü C, Savaş T, 2010. Carcass measurements and meat quality characteristics of dairy suckling kids compared to an indigenous genotype. *Meat Science*, 85: 245-249.
- Ertuğrul M, Dellal G, Elmacı C, Akın O, Karaca O, Altın T, Cemal İ. 2005. Hayvansal gen kaynaklarının koruma ve kullanımı. Türkiye Ziraat Mühendisliği VI. Teknik Kongresi, 3-7 Mart 2005, Ankara, s.1-18.
- Güler Z, Keskin M, Masatçıoğlu T, Gül S, Biçer O. 2007. Effects of breed and lactation period on some characteristics and free fatty acid composition of raw milk from Damascus goats and German Fawn x Hair goat B₁ crossbreds. *Turkish Journal of Veterinary and Animal Sciences*, 31: 347-354.
- Güney O, Cebeci Z, Torun O, Biçer O. 1995. Country report of Turkey on small ruminant production with special reference to the selection programme for increasing milk production in dairy goat flock of University of Çukurova." *Gabina D. (ed.) In: "Strategies for sheep and goat breeding: CIHEAM-IAMZ, 1995. (231p). Meeting of joint FAO/CIHEAM Network on Sheep and Goats, 26-28 March 1995. Sidi-Thabet, Tunisia, pp.185-192.*
- Hayaloğlu A, Yaşar K, Tölü C, Şahingil D. 2013a. Characterizing volatile compounds and proteolysis in Gokceada artisanal goat cheese. *Small Ruminant Research*, 113: 187-194.
- Hayaloğlu A, Tölü C, Yaşar K. 2013b. Influence of goat breeds and starter culture systems on gross composition and proteolysis in Gokceada goat cheese during ripening. *Small Ruminant Research*, 113: 231-238.
- Hayaloğlu A, Tölü C, Yaşar K, Şahingil D. 2013c. Volatiles and sensory evaluation of goat milk cheese Gokceada as affected by goat breeds (Gokceada and Turkish Saanen) and starter culture systems during ripening. *Journal of Dairy Science*, 96: 32765-2780.
- Herre W, Röhrs M. 1973. *Haustiere-zoologisch gesehen*. Gustav Fischer Verlag pp. 240.
- Keskin M, Yaşar YK, Biçer O, Güler MB. 2004. Comparative study on the milk yield and milk composition of two different goat genotypes under the climate of the eastern Mediterranean. *Turkish Journal of Veterinary and Animal Sciences*, 28: 531-536.
- Keskin M, Gül S. 2006. Hatay ili keçi yetiştiriciliğinde Şam keçisi ve Türkiye için önemi. *Hasad Hayvancılık*, 255: 46-49.
- Kırk A, Aşkın Y, Cengiz F. 2004. Norduz keçilerinin yapay tohumlama ile döl verim karakteristiklerinin belirlenmesi. IV. Ulusal Zootečni Kongresi, 1-3 Eylül 2004, Isparta, s. 272-279.
- Koşum N, Alçiçek A, Taşkın T, Önenç A, 2003. Fattening performance and carcass characteristics of Saanen and Bornova male kids under an intensive management system. *Czech Journal Animal Science*, 48(9): 379-386.
- Koyuncu M, Duru S, Kara Uzun Ş, Öziş Ş, Tuncel E. 2007. Effect of castration on growth and carcass traits in Hair goat kids under a semi-intensive system in the South Marmara region of Turkey. *Small Ruminant Research*, 72: 38-44.
- Morand-Fehr P, Richard A, Tessier J, Hervieu J. 2002. Effects of decoquinate on the growth and milk performance of young female goats. *Small Ruminant Research*, 45(2):109-114.
- Özcan M, Yılmaz A, Ekiz B, Tölü C, Savaş T. 2010. Slaughter and carcass characteristics of Gökçeada, Maltese and Turkish Saanen suckling kids. *Archiv Tierzucht*, 53: 318-327.
- Özder M. 2006. Keçi Irkları, Keçi Yetiştiriciliği. ed: Kaymakçı M., İzmir İli Damızlık Koyun-Keçi Yetiştiricileri Birliği Yayınları No: 2, Bornova, İzmir. s: 29-63.
- Rege JEO. 1999. The state of African Cattle Genetic Resources: I. Classification Framework and Identification of Threatened and Extinct Breeds. *Animal Genetic Resources Inf*. 25: 1.
- Ruanne J. 2000. A Framework for Prioritizing Domestic Animal Breeds for Conservation Purposes at the National Level. *Conservation Biology*, 14: 1385-1393.
- Savaş T. 1995. Yerli ırk hayvanlarımızın korunması konusunda bir tartışma. *Animal Enformasyon*, 10: 11.
- Serradilla JM. 2001. Use of high yielding goat breeds for milk production. *Livestock Production Science*, 71: 59-73.
- Soysal Mİ, Özkan E, Gürcan EK. 2003. The status of native farm animal genetic diversity in Türkiye and in the world. *Trakia Journal of Sciences*, 1(3): 1-12.
- Sönmez R. 1974. Melezleme yolu ile yerli keçilerin süt keçisine çevrilme olanakları. *Ege Ü.Z.F.Yayınları No: 226, E.Ü. Matbaası, Bornova, İzmir.*
- Sönmez R, Şengonca M, Alpbaz AG. 1971. Ege Üniversitesi Ziraat Fakültesinde yetiştirilen Malta keçilerinin çeşitli özellikleri ve verimleri üzerinde bir araştırma. *Ege Üniversitesi Ziraat Fakültesi Dergisi* 8: 57-71.
- Şengonca M, Kaymakçı M, Koşum N, Taşkın T, Steinbach J. 2002. Batı Anadolu için bir Süt Keçisi: "Bornova Keçisi". *Hayvansal Üretim*, 43: 79-85.
- Şengonca M, Taşkın T, Koşum N. 2003. Saanen x Kıl keçi melezlerinin ve saf kıl keçilerinin kimi verim özelliklerinin belirlenmesi üzerine eş zamanlı bir araştırma. *Turkish Journal of Veterinary and Animal Sciences*, 27: 1319-1325.
- Şimşek ÜG, Bayraktar M. 2006. Kıl keçisi ve Saanen x Kıl keçisi (F1) melezlerine ait büyüme ve yaşama gücü özelliklerinin araştırılması. *F.Ü. Sağlık Bilimleri Dergisi*, 20: 229-238.
- Şimşek ÜG, Bayraktar M, Gürses M. 2006. Çiftlik koşullarında kıl keçilerine ait bazı verim özelliklerinin araştırılması. *F.Ü. Sağlık Bilimleri Dergisi*, 20: 221-227.
- Tölü C. 2009a. Farklı keçi genotiplerinde davranış, sağlık ve performans özellikleri üzerine araştırmalar. Doktora tezi. Çanakkale Onsekiz Mart Üniversitesi, Fen bilimleri Enstitüsü, Çanakkale, Türkiye.
- Tölü C. 2009b. Oğlak ishal sıklığının genotip, yıl ve aylara göre değişimi. *Hasad Hayvancılık*, 295: 50-52.
- Tölü C, Yurtman İY, Savaş T. 2009. Türk Saanen keçilerinde canlı ağırlık ve değişimi üzerinde değerlendirmeler. *Hayvansal Üretim*, 50(1): 9-17.
- Tölü C, Yurtman İY, Savaş T. 2010. Gökçeada, Malta ve Türk Saanen keçi genotiplerinin süt verim özellikleri bakımından karşılaştırılması. *Hayvansal Üretim*, 51(1): 8-15.
- Tölü C, Savaş T. 2010. Gökçeada, Malta ve Türk Saanen Keçi Genotiplerinin Döl Verim Özellikleri Bakımından Karşılaştırılması. *T.Z.F. Derg.*, 7 (2): 113-121.
- Tölü C, Yaşar K, Hayaloğlu AA, Savaş T. 2011a. Gökçeada'da üretilen keçi sütlerinden yapılan peynirlerin bazı özellikleri. 7. Ulusal Zootečni Bilim Kongresi, 14-16 Eylül, Adana/Türkiye. s.202-207.

- Tölu C, Topalođlu N, Savař T. 2011b. Gökçeada, Malta ve Türk Saanen çebiçlerinde ağır bir ektima (*Ecthyma contagiosum*) olgusu üzerine gözlemler. Hayvansal Üretim, 52(1): 39-43.
- Tölu C, Savař T. 2012. Gökçeada, Malta ve Türk Saanen keçi genotiplerinin doğum ve ođlak büyümesi açısından karşılaştırılması. Hayvansal Üretim, 53 (2): 17-25.
- Tölu C, Alatürk F, Özaslan-Parlak A, Gökkuř A. 2017. Behaviour of sheep freely grazed on Gökçeada Island (Turkey) rangeland reclaimed by different methods. Journal of Agricultural Science, 41(5): 635-642.
- Vatansever H, Akçapınar H. 2006. Lalahan Hayvancılık Merkez Arařtırma Enstitüsü'nde yetiřtirilen farklı kökenli Ankara keçilerinde büyüme, döl verimi ve tiftik özellikleri. Lalahan Hayvancılık Arařtırma Enstitüsü Dergisi, 46 (2): 1-11.
- Yalçın BC. 1990. Keçi Yetiřtiriciliđi, Koyun-Keçi Hastalıkları ve Yetiřtiriciliđi." ed: Aytuđ, C. N., TÜM VET Hayvancılık Hizmetleri Yayını No:2, İstanbul s: 453-458.
- Yertürk M, Odabařıođlu F. 2007. Dođu ve Güneydođu Anadolu bölgesinde yetiřtirilen renkli Tiftik keçilerinin yarı entansif şartlarda verim özelliklerinin arařtırılması. Y.Y.Ü. Veteriner Fakültesi Dergisi, 18(2): 45-50.