Marmara Fen Bilimleri Dergisi 2015, 3: 93-96
DOI:10.7240/mufbed.01631

Chromosomal Arrangements of Hybrid Individuals of *Mesocricetus brandti* (Nehring, 1898) (Mammalia: Rodentia)

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ABSTRACT

In this study, *Mesocricetus brandti* specimens collected from different area of Anatolia (Şebinkarahisar, Bolkar Mountain, Aksaray, Ardahan, Van) and Iran- Zanjan were examined. Chromosomal arrangements of these individuals were analyzed by using colchicine-hypotonic citrate karyotype technique. Diploid chromosome numbers of whole specimens were determined to be the same, being 2n=42; however fundamental number of chromosomal arms (FN) of these specimens had two forms; being FN=84 and FN=82. These two forms were mated in laboratory conditions and hybrid individuals (both male and female) obtained from interbreeding specimens of Zanjan (İran) which has 84 FN and Bolkar Mountain (Niğde, Turkey) which has 82 FN. It is determined that, these hybrid individuals have 83 chromosomal arms (FN) and one of homologous chromosomes of the 20th autosomal pair is acrosentric and the other is metacentric.

Keywords: *Mesocricetus brandti*, Turkish hamster, karyology, hybridization

I. INTRODUCTION

The genus *Mesocricetus* is distributed in the palearctic region. Recently 4 - 5 taxa are doubtfully considered as valid species. Of these species *Mesocricetus auratus* and *Mesocricetus brandti* are distributed in Turkey, and *M. brandti* is known as the Turkish Hamster distributing from the West Anatolia steppes to Caucasus and Iran [1].

In Anatolia, Danford and Alston [2] firstly recorded *M. brandti* from Kayseri province. Neuhauser [3] recorded *M.brandti* from Uşak, Kastamonu, Samsun, Konya and Mersin provinces. Also *M. brandti* was recorded from different region in Anatolia by Osborn [4], Steiner and Vauk [5], Lehmann [6], Spitzenberger [7], Sickenberg [8], and Felten *et al.* [9].

Chromosomes can be altered in point of number and form in the evolutionary process. These alternative chromosome forms are determined with karyological techniques. Chromosome analysis is very important in morphological taxonomy [10].

Apart from this, karyotypes of the certain species show geographical variation in the fundamental arm number of the chromosomes as well as the diploid number of chromosomes as in the genera *Mesocricetus*.

Recent karyological studies perform with Turkish specimens *M. brandti* is determined whole specimens have same diploid chromosome number, being 2n= 42 [1], [11]. Although Lyman and O'Brien [12] reported that Ankara (Turkey) specimens of *M.brandti* have 44 chromosomes, they revealed *M.brandti* specimens from Malya (Kırşehir, Turkey) have 42. Apart from this, most karyotypic data indicated that *M. brandti* has geographical variations concerning FN value. Namely, Malya specimens have 82 chromosomal arm number (FN) [12]; on the other hand, Iranian (Hamedan) hamsters have 84 FN [13]. Also, Yigit *et al.* [1] reported Western and Eastern Anatolian subpopulations of *M.brandti* have different chromosome arm number. These two forms of FN are 82 in Western Anatolian subpopulation, and 84 in Eastern subpopulation.

Accordingly, in this study, hybridization process carried out in laboratory for assigned whether hybrid zone exist or not in nature. For this purpose, hybrid *M.brandti* individuals were acquired from interbreeding specimens represented different FN forms. That way, hybridization studies of subpopulations

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Gönderilme/ Submitted: 22.04.2015, **Düzenleme/Revised:** 18.09.2015, **Kabul/Accepted:** 08.10.2015

have varied chromosome arm number clarify that probable-hybrid zone how effect on speciation.

II. MATERIALS AND METHOD

In the field excursion carried out in Turkey and Zanjan province of Iran. *M. brandti* specimens were caught with Sherman live traps, transferred to the laboratory. A male specimen collected from Bolkar Mountain and a female specimen collected from Zanjan were interbreed in laboratory conditions. The map given on Figure 1 shows locality of these breeding specimens.

The karyotypes of specimens *M.brandti* were analysed by using the conventional colchicine hypotonic citrate technique from bone marrow. The conventional stained chromosomes of metaphase cells were analysed under the light microscope, and photographs were taken. By examining the photographs of about 20–30 metaphase cells of each animal, the diploid number of chromosomes (2n), the fundamental number of chromosomal arms (FN) and the number of autosomal arms (FNa) were determined along with metacentrics, submetacentrics, subtelocentrics and acrocentrics with respect to centromere positions. The specimens were skinned and stuffed in standard museum manner. The karyotype preparations and animals examined have been deposited at the department of Biology, Ankara University.

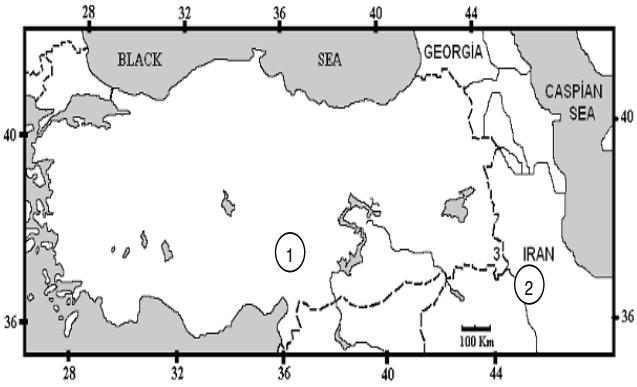

Figure 1. The collecting cites of *M. brandti* specimens were interbred

1.Bolkar Mountain (Turkey). 2. Zanjan province (Iran)

III. RESULT AND DISCUSSION

3.1. Karyology of *M.brandti* located from Bolkar Mountain- Turkey (♂)

A male specimen of *M. brandti* was examined from Bolkar Mountain Province (Turkey). This karyotype has 2n= 42, FNa= 78 and FN= 82. The karyotype consists of 10 metacentric chromosomes, 28 submetacentric chromosomes and 2 acrocentric chromosomes. The X chromosomes are middle-sized metacentric and the Y chromosome is smaller than X chromosome and metacentric (Figure 2).

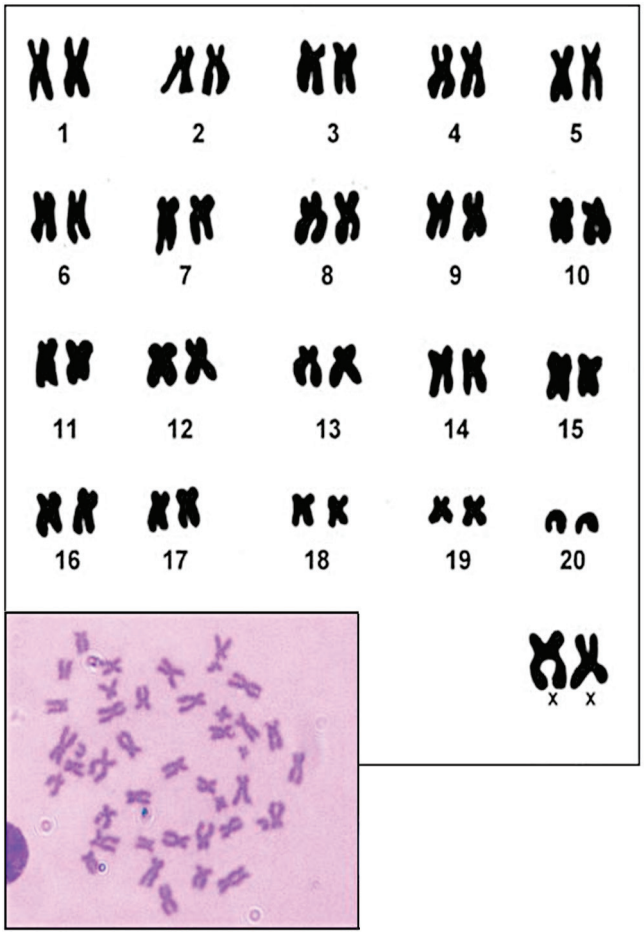

Figure 2. The karyotype of *M. brandti* specimen from Bolkar Mountain (Turkey)

(2n= 42, FNa= 78 and FN= 82)

3.2. Karyology of *M.brandti* located from Zanjan- Iran(♀)

A female specimen of *M. brandti* was examined from Zanjan Province (Iran). This karyotype has 2n= 42, FNa= 80 and FN= 84. The karyotype consists of 16 metacentric chromosomes and 24 submetacentric chromosomes. X chromosomes are middle- sized submetacentric (Figure 3). Yigit *et al.* [1] reported that FNa= 80, FN= 84 for Eastern Anatolia (Ardahan and Van specimens). FNa and FN of Iranian specimens were found similar to the specimens from Eastern Anatolia.

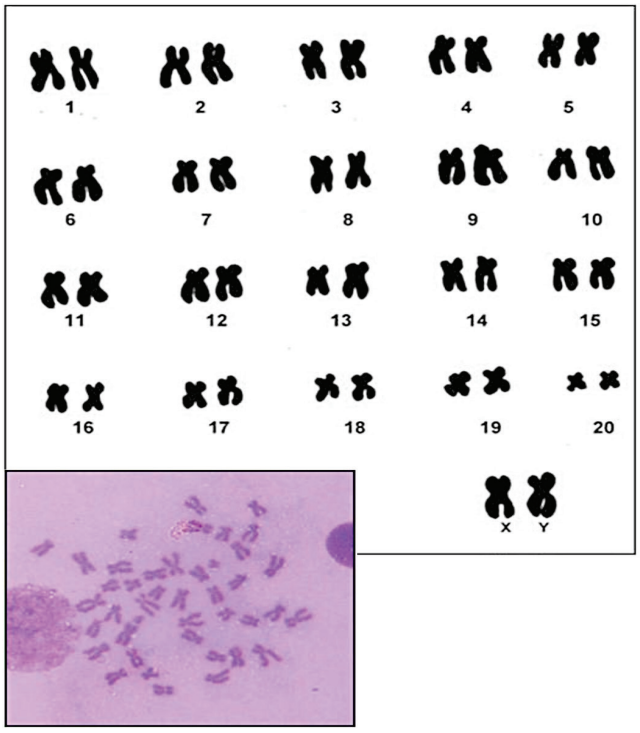

Figure 3. The karyotype of *M. brandti* specimen from Zanjan province (Iran)

(2n= 42, FNa= 80 and FN= 84)

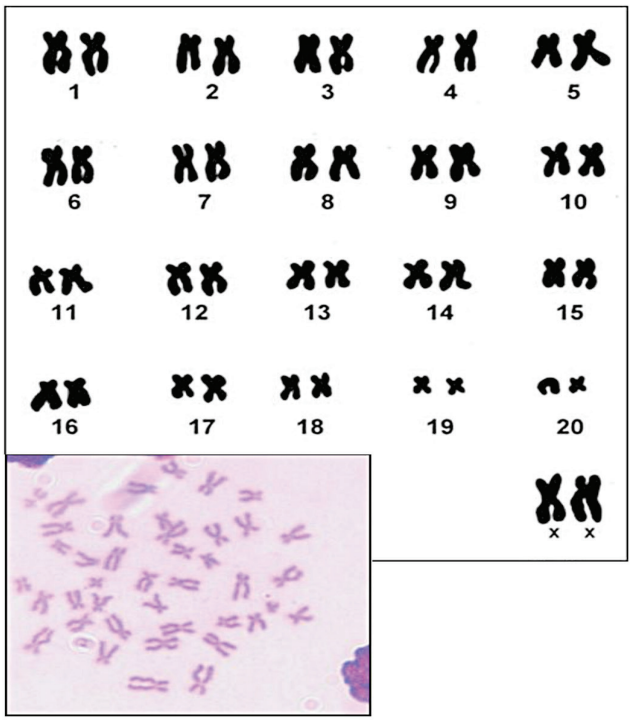

Figure 4. The karyotype of female hybrid individual (2n= 42, FNa= 79 and FN= 83)

3.3. Karyology of Hybrid *M.brandti* Specimens

The hybrid individuals (both male and female), obtained from interbreeding Iran-Zanjan and Bolkar specimens were examined by using karyotype technique. Their karyotypes have 2n=42, FNa= 79 and FN= 83. The karyotypes of female and male hybrid specimens consist of 6 metacentric chromosomes and 32 submetacentric chromosomes. 20th autosomal chromosome of these hybrid specimens have different homologous, one is metacentric and the other is acrocentric. Metacentric homologous arise from female specimen, has FN= 84, collected Zanjan province. Acrocentric homologous arise from male specimen, has FN= 82, collected Bolkar Mountain (Figure 4 and 5).

Diploid chromosome number (2n) of all *M.brandti* specimens we study was similar to the ones previously reported [1], [11]. Karyotypes of *M. brandti* differ in fundamental chromosome arm number (FN) previously published [1]. This is the first report that, specimens have different FN (82 and 84) have could interbred and hybrid individuals, incoming this breeding, have 83 chromosome arm number.

From this finding, it is possible to assume that the hybrid subpopulation probably can exist in nature where intersection zone of two FN forms. Undoubtedly, further studies will be necessary to clarify the status of hybrid individuals on nature.

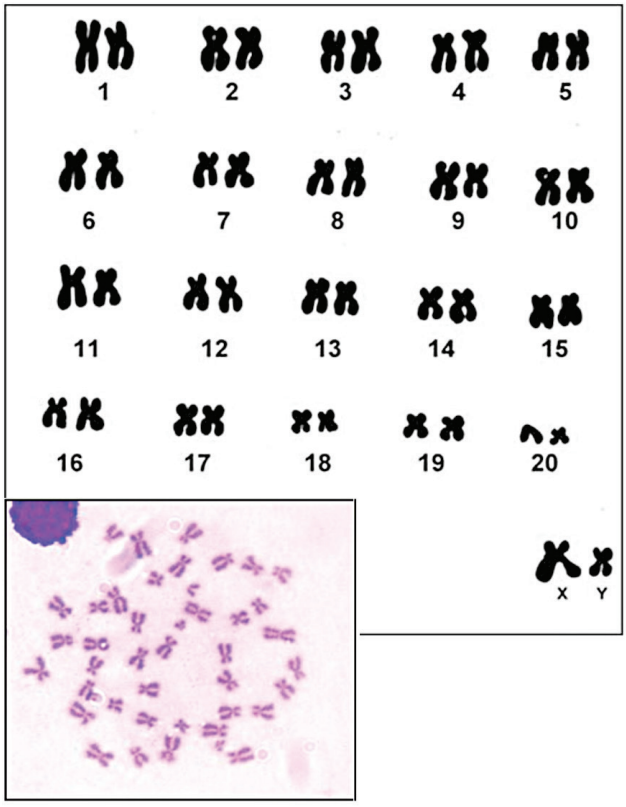

Figure 5. The karyotype of male hybrid individual (2n= 42, FNa= 79 and FN= 83)

REFERENCES

[1] Yigit, N., Colak, E., Sozen, M., Ozkurt, S., Verimli, R. (2000). The distribution, morphology and karyology of the genus *Mesocricetus* (Mammalia: Rodentia) in Turkey. *Folia Zoologica*, 49, 167- 174.

[2] Danford, C., Alston, E. (1877). On The Mammals of Asia Minor. *Proceedings of the Zoological Society of London*, 270- 281.

[3] Neuhauser, G. (1936). Die Muriden von Kleinasien. *Zeitschrift für Säugetierkunde*, 11,161- 236.

[4] Osborn, D. J. (1964). Rodents of the Subfamilies Murinae. Gerbilinae and Cricetinae from Turkey. *The Journal of the Egyptian Public Health Association,* 40, 401- 424.

[5] Steiner, H., Vauk, G. (1966). Saugetiere aus dem Beyşehir Gebiet (vil. Konya, Kleinasien). *Zoologischer Anzeiger,* 176, 97- 102.

[6] Lehmann, E. (1969). Eine neue Säugetieraufsammlung aus der Türkei im Museum Koenig. *Bonner Zoologischer Beiträge*, 15, 299 - 327.

[7] Spitzenberger, F. (1972). Der Hamster *Mesocricetus brandti* (Nehring, 1898) in Zentralanatolien. *Zeitschrift für Säugetierkunde*, 37, 229- 231.

[8] Sickenberg, O. (1972). Über das Vorkemmen des Gold Hamster (*Mesocricetus auratus brandti* Nehring, 1898) in Zentralanatolien. *Säugetierkundliche Mitteilungen*, 19, 362- 362.

[9] Felten, H., Spitzenberger, F., Storch, G. (1971). Zur Kleinsaugerfauna West Anatoliens. *Teil I. Senckenbergiana Biologica*, 52 (6), 393- 424.

[10] Gibson, L. J. (1986). A creationist view of chromosomal banding and evolution. *Origins*, 13, 9-35.

[11] Dogramaci, S., Kefelioglu, H., Gunduz., I. (1994). Karyological analysis of Anatolian *Mesocricetus* (Mammalia: Rodentia) species. *Turkish Journal of Zoology*, 18, 41- 46.

[12] Lyman, C., O'Brien, R. A. (1977). Laboratory study of the Turkish Hamster *Mesocricetus brandti. Breviora* (Cambridge, Mass), 442, 1- 27.

[13] Lehman, L. M., Macpherson, I. (1967). The karyotype of the Kurdistan Hamster. *Journal of Heredity*, 58, 29 - 31.

Abbreviations

2n: diploid chromosome number

F_1: first offspring generation

FN: fundamental number of chromosomal arms

FN_a: fundamental number of autosomal chromosomal arms