

Studies on the Chromosomes of *Fossaria truncatula* (Müller) (Gastropoda: Lymnaeidae)

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= 국문요약 =

긴애기물달팽이(*Fossaria truncatula*)의 염색체에 관한 연구

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1996년 8월 춘천 의암호에서 채집한 긴애기물달팽이(*Fossaria truncatula*)를 재료로 공기건 조법을 이용하여 통상적인 방법으로 염색체를 관찰하고 핵형을 분석하였다.

그 결과 긴애기물달팽이의 염색체 수는 $2n=31, 32$ 이었으며 15쌍의 배수체와 1개의 성염색체를 가지고 있었다. 핵형은 3쌍의 metacentric과 13쌍의 submetacentric 염색체로 구성되어 있었다.

INTRODUCTION

Aquatic pulmonate snails (Basommatophora) are of considerable interest not only because of their variation and distribution, but also many are important intermediate hosts of trematode parasites (Burch, 1960).

The chromosome numbers of animal species are, in general, uniform and constant, each species having a characteristic chromosome number. The chromosome numbers of molluscan species are highly related to reliable information on their systematics. But, in spite of the increasing number of studies on molluscan chromosomes in recent

years, chromosome numbers are known for less than 0.5% of the species of molluscs (Patterson and Burch, 1978).

Karyological investigations on the family Lymnaeidae have been studied by many workers. Patterson (1969) reviewed chromosome numbers and karyological data for 40 species of the family Lymnaeidae.

In Korea, some karyological studies on the gastropods have been carried out, such as three species of Bithyniidae (Chung, 1984, Park, 1994), 10 species of Pleuroceridae (Kim *et al.*, 1987; Park, 1994), one species of Viviparidae (Park *et al.*, 1988), one of Physidae (Park, 1994) and one species of Planorbidae (Park, 1994). Park *et al.* (1992) reported the chromosome numbers and karyotypes of two Korean lymnaeid snails.

The present study was aimed to elucidate the chromosome numbers and karyotypes of *Fossaria truncatula*, a Korean lymnaeid.

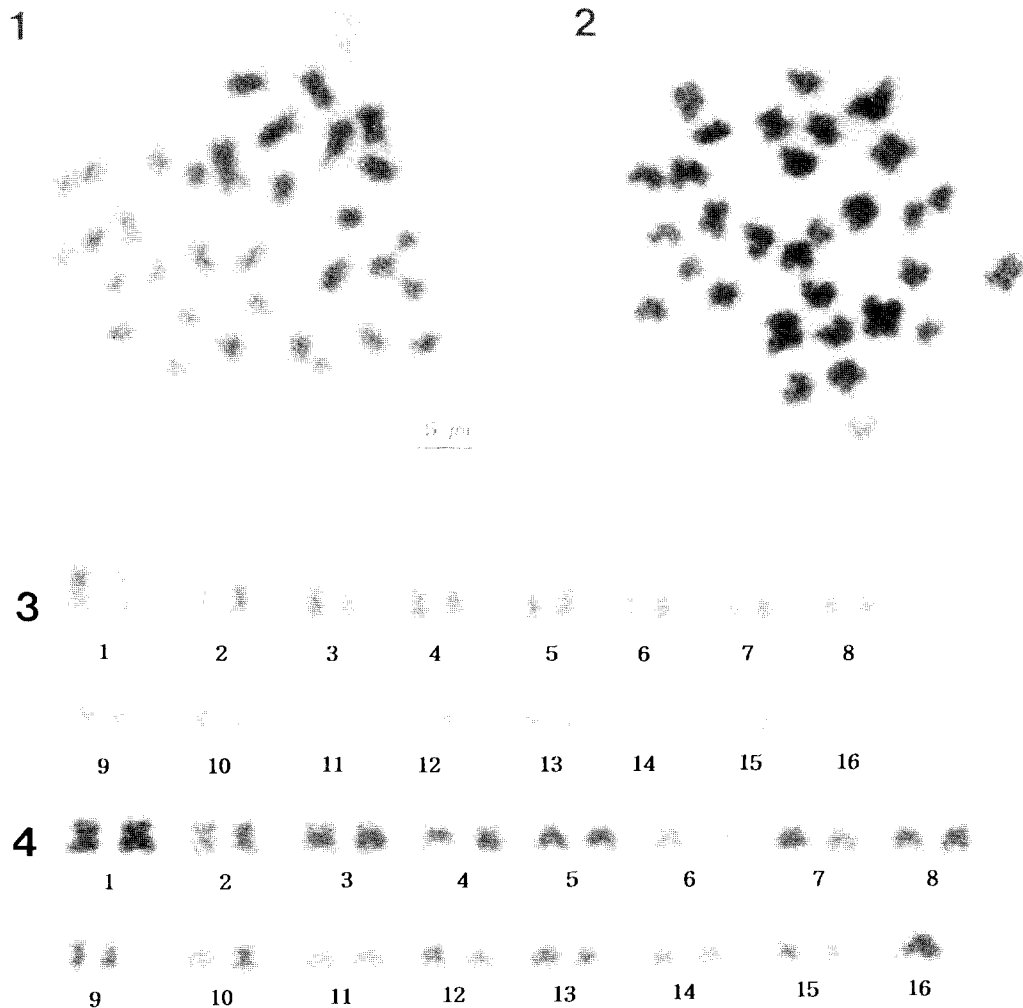
MATERIAL AND METHOD

The specimens were collected on August, 1996, at Uiam Reservoir in Chunchon City, Korea. The 40 specimens of *Fossaria truncatula* were collected and examined shortly after collection. Chromosome

preparations were made from gonadal tissues by the air dry method of Park (1994). The nomenclature of chromosome morphology follows Leven *et al.*, (1964). Voucher specimens of the *F. truncatula* have been placed in the Pai-Chai University, Korea.

RESULT

Eighteen mitotic cells were observed at spermatogonial metaphase. Table 1 gives the



Figs 1-2. Metaphase chromosome of *Fossaria truncatula*.

Figs. 3-4. Karyotype of metaphase chromosomes of *F. truncatula*.

Table 1. Total lengths (μm) and type of chromosome of *Fossaria truncatula*

Chromosome Pair	2n=32*		2n=31**		Type
	Total length	Relative length	Total length	Relative length	
1	4.90 ± 0.08	12.39 ± 0.08	4.02 ± 0.18	9.88 ± 0.15	M
2	3.43 ± 0.11	8.67 ± 0.03	3.92 ± 0.14	9.63 ± 0.01	M
3	3.33 ± 0.04	8.42 ± 0.35	3.53 ± 0.06	8.67 ± 0.05	SM
4	3.04 ± 0.10	7.68 ± 0.28	3.19 ± 0.10	7.84 ± 0.01	SM
5	2.94 ± 0.03	7.43 ± 0.12	2.60 ± 0.08	6.39 ± 0.04	SM
6	2.70 ± 0.18	6.83 ± 0.18	2.45 ± 0.04	6.02 ± 0.07	SM
7	2.55 ± 0.06	6.45 ± 0.16	2.30 ± 0.06	5.65 ± 0.11	SM
8	2.35 ± 0.12	5.94 ± 0.33	2.21 ± 0.12	5.43 ± 0.14	SM
9	2.21 ± 0.01	5.59 ± 0.09	2.11 ± 0.01	5.18 ± 0.04	M
10	2.06 ± 0.07	5.21 ± 0.27	1.96 ± 0.07	4.82 ± 0.13	SM
11	1.96 ± 0.05	4.95 ± 0.05	1.86 ± 0.05	4.57 ± 0.10	SM
12	1.86 ± 0.10	4.70 ± 0.10	1.72 ± 0.10	4.23 ± 0.05	SM
13	1.72 ± 0.08	4.35 ± 0.18	1.62 ± 0.08	3.98 ± 0.34	SM
14	1.57 ± 0.02	3.97 ± 0.12	1.57 ± 0.02	3.86 ± 0.22	SM
15	1.47 ± 0.10	3.72 ± 0.16	1.47 ± 0.10	3.61 ± 0.13	SM
16	1.47 ± 0.02	3.72 ± 0.09	4.17 ± 0.12	10.24 ± 0.06	SM

Remarks: M: Metacentric SM: submetacentric; Based on measurements of three* and two** karyotyped cells.

chromosome measurements. Metaphase chromosomes of *F. truncatula* were observed in the gonadal tissues, and the diploid chromosome numbers were 32 or 31. (Figs. 1-2). There were 15 pairs and one non-paired submetacentric sex determining chromosome (Fig. 4). The X chromosome was the largest in the diploid and it was a submetacentric complement. Fig. 3 and 4 show the karyotype of *F. truncatula* arranged by decreasing chromosome size. It consists of three pairs of metacentric chromosome and thirteen pairs of submetacentric or subtelocentric chromosome. Mitotic metaphase chromosomes ranged from 4.9 μm to 1.47 μm in length.

DISCUSSION

Cytotaxonomical data may contribute important information supplementary to the morphological, biochemical and other characters used for systematic analyses. Burch (1960) first studied the chromosomes of *Fossaria* in USA. He reported *Fossaria modicella* to have haploid chromosome numbers of 18 in primary spermatocytes. The range in haploid chromosome numbers among non-polyplod members of the subfamily Lymnaeinae is n=16-19. Burch *et al* (1964) reported n=18 the chromosome number in *Fossaria truncatula* from Japan, which differs

with the present observation that haploid number is $n=16$. Heterochromatic chromosomes have been incidentally reported in several cytological studies of molluscs. The detection of a non-homologous pair of chromosomes in the heterogametic sex, provided that there are homologous pairs in the homogametic sex, is considered adequate for the description of sex chromosomes (Vorontsov, 1973). Therefore this non-paired chromosome is thought to be a sex-determining chromosome. Fig. 1 show metaphase chromosome plates, one cell contains 32 chromosomes and other 31 chromosomes. Considering the odd number of chromosomes in the diploid, this species is expected to have at least one non paired X-chromosome. Burch (1960) and Patterson (1963) reported heteromorphic chromosomes, presumably related to sex determination, in two species of *Pomatiopsis*. In *Pomatiopsis lapidaria*, the male chromosome number is $2n=33$ ($n=17$), apparently with a male XO sex-determining mechanism. The X chromosome is the largest of the complement; it is subterminally constricted and usually negatively heteropyknotic. One is submedianly constricted from in this study. It is concluded from the observation that morphologically distinguishable sex chromosomes do exist in at least some monosexual Lymnaeidae species.

Summary

Forty specimens of *F. truncatula* were collected from Uiam Reservoir in Chunchon City. Eighteen mitotic cells were observed at spermatogonial metaphase. Metaphase chromosomes of *F. truncatula* were observed in the gonadal tissues, and the diploid chromosome numbers were 32 or 31. There were 15 pairs and one non-paired submetacentric sex-determining chromosome. The X chromosome was the largest in the diploid and it was a submetacentric complement. It consists of three pairs of metacentric chromosome and thirteen pairs of submetacentric or subtelocentric chromosome.

Mitotic metaphase chromosomes ranged from $4.9 \mu\text{m}$ to $1.47 \mu\text{m}$ in length.

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