

**Expression of the Beet Curly Top Geminivirus L4 Gene Produces Viruslike Symptoms in Transgenic Arabidopsis**

**Hwang, Hyunsik, Park, Jongbum<sup>1</sup>, Lee, Taek-Kyun<sup>2</sup> and Lee, Sukchan**

Dept. Genetic Engineering, Sungkyunkwan Univ. Suwon, 440-746; Dept. Biology, Silla Univ. Pusan. 309-5176<sup>1</sup>; Harmful Algal Research Unit. Korea Ocean Research & Development Institute, Koje, 656-830<sup>2</sup>

Transgenic Arabidopsis expressing the L4 gene from beet curly top geminivirus (BCTV), under the control of cauliflower mosaic virus 35S promoter, developed virus-disease-like phenotypes. Plants transformed with 35S::L4 and 35S::L4::myc gene constructs both produce viruslike symptoms but 35S::L4::myc induces more severe and typical virus symptoms. And the produced levels of L4 gene transcripts were similar to transgenic plants expressing the L4 gene. Thus, the abnormal plant phenotypes result from the translation of the L4 gene. These results support the hypothesis that L4 open reading frame of BCTV encodes a protein involved in the development of disease symptoms during viral infection. Here, we show the internal and external structures of transgenic plants, and we also report the BCTV L4 protein expression in cellular and subcellular levels by cellular and molecular approaches.

**C204**

**Ultrastructure and Cytochemistry of Spermatial Development and Fertilization in Ceramiales (Rhodophyta)**

**Ok-Kyong Chah<sup>\*</sup>, In Kyu Lee and Gwang Hoon Kim<sup>1</sup>**

School of Biological Sciences, Seoul National University, Seoul 151-742; Department of Biology,

Kongju National University, Kongjushi, Chungnam 314-701<sup>1</sup>

Spermatial development and fertilization process of ceramiales were investigated by electron microscopy. The spermatium consists of two parts, an ovoidal head and two appendages projecting from each distal end of long axis. The appendages originate from spermatangial vesicles (SVs) and follow a developmental sequence beginning as amorphous material and ending as fully formed fibrous structure compressed within the SVs. SV formation is due to contributions initially from endoplasmic reticulum and later from Golgi apparatus-derived vesicles. Chemical differentiation of the spermatial wall occurs early in its development. Calcofluor white does not label spermatial wall, indicating an absence of cellulose polysaccharides, which are abundant in vegetative cell wall. Liberated spermatia have an arrested prophase nucleus with a pair of polar rings. The cytoplasm of trichogyne is connected with that of spermatia at the fertilization canal, and is empty when the nuclear fusion between spermatium and carpogonium occurs.

**C401**

**The Ultrastructure of Spermatozoa of the Ussurian Bullhead, *Leiocassis ussuriensis* (Teleostei, Siluriformes, Bagridae) with Phylogenetic Considerations.**

**Kyu-Hwan Kim<sup>\*</sup>, Ae-Sook Kwon<sup>1</sup>, Jung-Ho Moon and Young-Hwan Lee**

Biology Education, Division of Science Education, Taegu University, Kyungsan 712-714; Dept. of Food and Nutrition, Taegu Science College, Taegu 702-760<sup>1</sup>

The fine structure of spermatozoa of *Leiocassis ussuriensis* was examined with scanning and transmission electron

microscopies. The spermatozoon of *L. ussuriensis* is approximately 68.8  $\mu\text{m}$  in length and a relatively simple cell with a spherical nucleus, a short midpiece and a tail. The ultrastructure of spermatozoa of *L. ussuriensis* is characterized by the following features. The nuclear fossa, the length of which is about two-thirds of the nuclear diameter, contains two centrioles. The centrioles are orientated approximately 180° to each other. The mitochondria are arranged in two layers and their number is 12 or more. The axoneme is of the 9+2 microtubular pattern and has inner but no outer dynein arms as in other bagrids. The two axonemal fins are in the same plane with the two central microtubules, the doublets 3 and 8. The axonemal fins and the inner dynein arm are shared in Bagridae and the deep nuclear fossa is shared in Siluriformes. The axonemal fins observed in Bagridae and Amblycipitidae of Siluriformes might be the apomorphic character in Ostariophysi. They are not reported in Cyprinidae and Characiformes.

#### C402

### 다묵장어, *Lampetra reissneri* (두갑강, 칠성장어목, 칠성장어과) 정자의 미세구조

이병찬\*, 김구환, 이영환

대구대학교 사범대학 과학교육학부 생물교육전공

다묵장어 *Lampetra reissneri* 정자의 미세구조를 투과 및 주사전자현미경적 방법에 의해 검토하였다. *L. reissneri*의 정자는 신장된 두부, 중편 및 편모로 구성되어 있었다. 두부에는 과립물질로 채워진 첨체소포가 있으며 첨체와 핵사이의 첨체하공간에는 전자밀도가 높은 물질로 구성된 postacrosomal ring이 첨체 아랫면에 인접해 있었다. Endonuclear canal은 그 길이가 35 $\mu\text{m}$  이상으로 핵의 중심부를 관통하여 꼬리의 중편부까지 세포의 장축방향으로 신장되어 있었다. Perforatorium은 첨체하공간에서부터 postacrosomal ring의 중심부를

관통하여 endonuclear canal의 내부를 달리고 있으며, 핵 내에서는 파상 구조이나 꼬리에서는 펼쳐져 나타났다. 미토콘드리아는 2개로 융합되어 길이로 나란히 배열되어 있으며 꼬리를 따라 대칭적 구조를 이루고 있었다. 두 중심립은 서로 나란히 배열되어있으며 중심립의 삼중미세소관은 전자밀도가 높은 물질로 둘러싸여 있었다. 꼬리에는 2개의 축사를 가지고 하나의 원형질막으로 둘러싸여져 있으며 각 이중미세소관 바깥면에는 부속섬유(accessory fibers)가 부착되어 나타났다. 이 물질은 파충류, 조류, 포유류 등의 체내수정을 하는 종에서 알려져 있어 본 종이 이 물질을 가진다는 것은 그 이전에 체내수정 하였음을 뒷받침하는 것으로 여겨진다. *L. reissneri* 정자의 특징적 구조로 2개의 축사와 융합된 미토콘드리아는 *Lampetra* 속의 3종, *L. japonica*, *L. planeri*, *L. fluviatilis*에서 나타나는 1개의 축사와 꼬리 기부에 융합되지 않은 미토콘드리아와 구조적 차이를 나타내었다.