A chromosome study in *Asparagus officinalis* L. in Mt. Altai

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ABSTRACT. Wild *Asparagus officinalis* L. grown in Mts. Altai, Altai Republic, Russia had the tetraploid karyotype of $K(2n=44)=28m+14sm+2st$.

KEYWORDS: Altai Mts, *Asparagus officinalis*, Chromosome number of $2n=44$

Asparagus officinalis L., the Liliaceae, seems to be widely distributed from South Europe to Ukraine. It has been cultivated and harvested from the wild for more than thousand years since local farmers found that *Asparagus officinalis* were useful proceeds from agricultural products in the Mediterranean areas to Europe and became currently, economically important agricultural plant.

Some references suggest that this species is distributed from the Mediterranean to Siberia. It is rather commonly found as a native to the Altai Mountains and never be escaped from the farmers' agricultural fields, and sometimes, only in some villages for *sake of decoration bouquets*.

One of our series of the cooperative field researches in plants together with the South Siberian Botanical Garden, Altai State University, Barnaul, Altai Republic, Russian Federation in 2009 was made in a local site of the Altai. We found some plants of *Asparagus officinalis* in wild status collected seeds and brought them to Japan. They were sowed and let's them grow up until those plants reached to be as experimental materials.

The chromosome numbers of *Asparagus officinalis* were recorded as $2n=20$, diploid (Ma *et al.* 1985; Malakhova 1990; Kiehn *et al.* 1991; Deng *et al.* 2012) and $2n=40$, tetraploid (Mgulaev 1976; Krasnikov and Lomonosova 1990; Castro *et al.* 2013).

MATERIALS AND METHODS

Seeds of a wild type of *Asparagus officinalis* were collected during the field trip to Mts. Altai in August 8 to 15, 2009 by the research cooperation between Hiroshima University, Graduate School of Science, Laboratory of Plant Chromosome and Gene Stock, and later, shifted his position to Laboratory of Plant Genetics and Breeding Science, Department of Agriculture, Faculty of Agriculture, Tokyo University of Agriculture by K. Kondo due to his job changed to and South Siberian Botanical Garden, Altai State University, Barnaul, Altai, Republic, Russian Federation (Representative: Katsuhiko Kondo). The seeds

of *A. officinalis* collected (Accession No. 13) were sown and germinated plants were grew up to about 100 cm long and then, their root tips ca 1 cm long were collected and pretreated in 0.002 M hydroxyquinoline for two hours. Then, they were fixed in 45% acetic acid for ca 10 minutes. They were macerated in the mixture of 1N HCl and 45% Acetic acid=2:1 at 60°C. Then, their root-tips 1-2 mm long were cut on the glass slide and stained with 1% Aceto-orcein in 45% acetic acid for ca 30 minutes before tapped and pressed on the cover-slip.

RESULTS AND DISCUSSION

Seeds of the wild form of *Asparagus officinalis* collected in the Altai Mts. Altai Republic, Russian Federation were planted and cultivated in Laboratory of Plant Genetics and Breeding Science, Department of Agriculture, Faculty of Agriculture, Tokyo University of Agriculture. Those plants were analyzed their orthodox karyotype including the chromosome number as the wild strain never cultivated before. In other words, they are the usual native individuals in the Altai. Those *Asparagus officinalis* in Siberia had never been cultivated before for vegetable. Sometimes it is grown only in the villages for the sake of decoration bouquets. Less frequently as the Altai, Tuva meets *Asparagus pallasii* Misch. In the south of the Altai, in the deserts of Mongolia, there are several interesting and rare species of *Asparagus*. (Krasnoborov *et al.* 2003; Smirnov personal communication). Thus, it turns out *A. officinalis* in the Altai is a common species. They were tetraploid ($2n=44=28m+14sm+2st$) plants (Fig. 1). It seemed that both diploid and tetraploid plants of this species are rather popular especially in the cultivated strains but they seemed not grow together in wild conditions and only the tetraploid strain can be found in the Altai Mts.

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Fig. 1. Resting nucleus and a set of the somatic metaphase chromosomes of *Asparagus officinalis* L. A. The resting nucleus of the complex chromocenter-type. B. Mitotic metaphase chromosomes of $2n=44$.

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