Cytotaxonomic Studies of Compositae

2. On Cacalia auriculata var. kamtschatica

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小山博滋：菊科植物の細胞分類学 2. ミミコウモリについて

Cacalia auriculata is distinct among the members of this genus in such characters as auriculated petioles, narrow panicles and kidney-shaped leaves. This variable species distributes widely in northeastern Asia, represented by two varieties in Japan: var. bulbifera is distinct in having a bulbil at the base of petiole, and var. kamtschatica is distinguished from the type variety by the robust body and the range of distribution. There is another variety in Korea: var. matsumurana is characterized by not auriculated petioles.

A. POJAREKOVA (1960) splitted the species in question into three species in her revision of the genus in eastern Siberia, though KITAMURA (1942) classified them in one species with four varieties. In this part of the studies, cytological results are given on the polyploidy of Japanese materials.

Materials and Methods. Many plants of this group are collected by myself from northern Honshu in 1960 and 1962, and from Hokkaido in 1963, and by Mr. N. KITAGAWA from his trip made on Hokkaido in 1961. Almost all of them grow in good condition at Kyoto, and the sufficient materials have been obtained for the cytological investigation.

Chromosomes of Cacalia auriculata var. kamtschatica are studied in accordance with the previous paper of this series.

Cytological accounts. The chromosome numbers observed by me are summarized in the following list, with reference to the specimens preserved in the herbarium of Kyoto University.

<table>
<thead>
<tr>
<th>Locality and specimen</th>
<th>Chromosome number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hokkaido</td>
<td></td>
</tr>
<tr>
<td>Mt. Otobe-dake (900 m. alt.)</td>
<td>2n= 60</td>
</tr>
<tr>
<td>Nupuro-Mappuro (200 m. alt.)</td>
<td>2n=120</td>
</tr>
<tr>
<td>Shibetcha-cho (250 m. alt.)</td>
<td>2n= 60</td>
</tr>
<tr>
<td>Sounkyo (700 m. alt.)</td>
<td>2n=120</td>
</tr>
<tr>
<td>Honshu</td>
<td></td>
</tr>
<tr>
<td>Lake-side of Towada (450 m. alt.)</td>
<td>2n=120</td>
</tr>
<tr>
<td>Mt. Hakkoda-Odake (1500 m. alt.)</td>
<td>2n=120, n=60</td>
</tr>
</tbody>
</table>

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Concerning the materials from the lake-side of Towada and Mt. Hakkoda-Odake, the somatic chromosome numbers in their root tip cells are in both cases exactly 120 (Fig. 1). The normal behavior of chromosomes at the meiosis from the latter materials results in the formation of 60 bivalents in metaphase. I (H. KOYAMA 1961) have already reported that a plant from Lake Towada has 60 chromo-

Fig. 1. Somatic metaphase chromosomes in the root tip cell of Cacalia auriculata var. kamtschatica. (2n=120, from Mt. Hakkoda-Odake). × 1900

somes in its root tip cell. By the studies on some plants of Hokkaido, I have observed that there are two different numbers of chromosomes in C. auriculata var. kamtschatica: one is the somatic number of 60 chromosomes and the other the somatic number of 120 chromosomes. Recently, H. ARANO (1964) reported the somatic number of 60 chromosomes in the materials collected from Mt. Apoi and Mt. Souunkyō in Hokkaido. Thus, we can safely recognize, at present, that C. auriculata var. kamtschatica consists of diploid race with the somatic number of 60 chromosomes and tetraploid race with the somatic number 120 chromosomes.

Morphology and Discussion. Concerning only to the Japanese representatives, C. auriculata var. kamtschatica is distinct enough from the other members of Cacalia auriculata in the current diagnostic features. Four infraspecific taxa are arranged by KITAMURA as mentioned above. To distinguish C. auriculata from C. kamtschatica, he enumerated the following characters: the involucres of C. auriculata are twice as long as the florets which are purpurasant, the stems being usually slender and rarely branching; the involucres of C. kamtschatica are longer and yellow-green, the stems being more robust and branching. Cacalia auriculata and C. auriculata var.
*kamtschatica* occur in northeastern Asia and the former occurs in Saghalien, Manchuria, North Korea and in Siberia, while *C. auriculata* var. *kamtschatica* occurs in northern Japan, Kuril, Korea and Saghalien as well as in Kamchatka.

As shown in Fig. 2, the size of the involucre is fairly variable in *Cacalia auriculata* var. *kamtschatica*. Although individuals marked by the half black point are similar to the type variety concerning the slender stem and small leaf size, they differ distinctly from the type variety in the leaf shape. From this diagram, it seems apparent that the involucres of the plants of Honshu are longer than those of further northern areas. The symbols in Fig. 2 show evidently that the involucres of plants with the somatic number of 60 chromosomes are shorter than those of the plants with 120 chromosomes. This fact is again seen in the size of the florets as shown in Fig. 3. Observing many individuals of *C. auriculata* var. *kamtschatica* as shown in Fig. 2, it becomes clear that there are intermediate forms in size of both involucres and florets.

![Diagram showing the variability of the length of involucres in *Cacalia auriculata* from six localities. Black disks show the individuals determined by the current diagnostic characters as var. *kamtschatica*. Half black disks show the individuals bearing also the slender stems and small leaves like those of var. *auriculata*. Circles show the diploid individuals, and double circles the tetraploid ones. Triangles show the individuals determined as var. *auriculata.*](image)

No conclusive remarks may thus be given only from the classical herbarium work as to the difference between diploid and tetraploid races of the present variety.
Fig. 3. Florets of Cacalia auriculata var. kamtschatica
Left: the florets of the diploid individual.
Right: the florets of the tetraploid individual.

E. Hultén (1930) noted that C. auriculata α. ochotensis* was intermediate between
C. hastata and C. kamtschatica based on the specimens collected from Kamchatka.
Having the same chromosome number**, the latter two species may be able to
hybridize with each other.*** The plants of C. auriculata are smaller than those of
two others. Kitamura (1942) pointed out that C. auriculata can not stand as an
intermediate type between them on the basis of the several characters observed.
Therefore, the conclusive taxonomic account around these spec’ces may better be
given when the continental plants will be investigated cytotaxonomically.

Acknowledgement’s. I am indebted to Mr. Naofumi Kitagawa who has been
helpful to collect the materials from Hokkaido. Thanks are due to Professor Siro
Kitamura and Dr. Motozi Tagawa for their helpful advice and criticism.

Reference


日本産のミミコウモリ Cacalia auriculata var. kamtschatica には 2n=60 の染色体数を持
つ 2 倍体と 2n=120 を持つ 4 倍体のある事がわかった。2 倍体と 4 倍体の各個体については
総苞と小花の大きさに差が認められたが、多数の標本について総苞の長さを測定すると第 2 図に
示すように 2 倍体○と 4 倍体□の間に中間型がでてくるので両者の区別はできない。

* This name is treated by Kitamura (1942) as a synonym of C. auriculata.
** The haploid number of 30 chromosomes is counted by K. Afzelius in the materials of C. hastata
*** There is one hybrid-like plant collected by G. Koidzumi from northern Korea: Prov. Kannan:
Shahaku-ho, Shinko-gun (KYO).