The genus *Coniogramme* is mainly distributed in subtropical regions of northern hemisphere. In Japan there have been two species with one variety of the genus, *C. intermedia* Hieron. and *C. japonica* (Thunb.) Diels with var. *Fauriei* (Hieron.) Tagawa. The first cytological studies on *Coniogramme* were made by Manton and Sledge (1954). They reported the chromosome number of two species, *C. sera* Fée (=*C. fraxinea* sensu Bedd.) from Ceylon and *C. japonica* (Thunb.) Diels grown at Kew, whose native origin was unknown. The former's chromosome number is $2n=ca120$ and the latter's is $n=60$. According to their results, they concluded that the basic chromosome number of *Coniogramme* is certainly 30. This conclusion has been confirmed by Mehra and Verma (1960) and Mehra (1961), who studied many species of the genus from Eastern Himalayas.

In the present investigations, I have examined three taxa of Japanese *Coniogramme*. The gametic chromosome numbers were counted at the first meiotic division of spore mother cells, which were fixed in 1:3 acetic-alcohol for about 24 hours or more. Preparations were made after Manton's method (Manton, 1950). While the somatic chromosome numbers were counted at the mitotic divisions of root-tip cells. Root-tips were immersed into the solution of 0.002 mol. 8-Hydroxyquinoline for 12 hours and fixed in 1:3 acetic-alcohol for about 12 hours. The materials were dehydrated in 1/10 N-HCl, keeping 60°C for 3 hours. Their preparations were made by squash method.

*Coniogramme intermedia* Hieron.

Materials were collected at Mitsumine, Saitama Pref., Mt. Amagi and Mt. Ogasa, Shizuoka Pref. Exactly 60 bivalent chromosomes were counted at diakinesis as shown in Pl. IV, 1 and in Fig. 1. Meiosis of the materials are completely normal and 16 spore mother cells in each sporangium give rise to 64 tetrahedral spores (Pl. IV, 3). These spores are normal and
develop into normal gametophytes with both sexual organs, antheridia and archegonia. On the other hand, I found approximately 120 chromosomes at the metaphase of mitosis of root-tip cells (Pl. IV, 2 and Fig. 2). Mehra (1961) studied three species of the C. intermedia complex from Eastern Himalayas, and revealed the basic chromosome number of 30, and confirmed that all of those species are sexual diploid as shown in Tab. 1. I believed, therefore, the present species is a sexual tetraploid.

Fig. 1. C. intermedia, n=60.

Fig. 2. 120 chromosomes in a root-tip cell of C. intermedia.

Conioagramme japonica (Thunb.) Diels.

Examined materials were collected at Mt. Ogasa and Mt. Amagi, Shizuoka Pref. The preparations, from which chromosome number was counted, were made by aceto-carmine squash method. Sixty bivalent chromosomes were undoubtedly observed in late diakinesis (Pl. V, 4 and Fig. 3). According to many observations of various phases of meiotic division, the present species seems to have perfectly normal alternation of nuclear phase. I confirmed also that the present species has 16 spore mother cells in each sporangium containing 64 tetrahedral spores, which develop into normal prothallia. Manton and Sledge (1954) who previously studied this species also reported the gametic chromosome number of 60.

Conioagramme japonica (Thunb.) Diels var. Fauriei (Hieron.) Tagawa.

This variety is somewhat rarer than other two species. Materials which
were used in this study were collected at Ohbora valley, Shizuoka Pref., in summer of 1960 and they were cultivated in my garden. Cytological studies were performed next year and I found that the present species has abnormal process in meiosis as it was evident from a study of sporogenesis, namely the present variety has 16 spore mother cells in each sporangium, but they never produce normal spores. At the first meiotic metaphase, very diversified chromosome numbers have been observed. In some spore mother cells approximately 90 chromosomes were counted, and those consist of capable 30 larger chromosomes and capable 60 smaller chromosomes (Pl. V, 5 and Fig. 4). While in almost all of spore mother cells, approximately 120 chromosomes were observed (Fig. 5). Normal separation of chromosomes at anaphase I and second meiotic division, however, have never occurred so far as the materials examined at the present investigation are concerned. Mostly these chromosomes stick and change into a chromosome clump of irregular form. Ultimately such chromosome clump, or nucleus, die away and show no indications of cytokinesis. Therefore only sixteen spherical and abortive spores are formed (Pl. V, 6). In some cases, however, chromosomes which form equatorial plate separate into 2 or 3 groups, each of which organizes a nucleus (or a micronucleus), and these unclei often fuse with one another and organize one or two chromosome clumps. This fusing process looks like a figure of one stage of amitotic division as shown in (Pl. V, 7). Such spore mother cells give rise to dyads or triads (Pl. V, 8 and 9), all of which are also abortive. Unfortunately, I have no chance to observe the first prophase of meiosis in detail,
therefore I hesitate to affirm either both bivalents (from 0 to 30) and univalents (from 60 to 120) present or not in this species. But the chromosome constitution (karyotype) of (0-30 II + 60-120 I) seems to be almost certain, because approximately 120 chromosomes have been counted in root-tip cells of the present species. This fact suggests that this variety is either a tetraploid hybrid between two different allo-tetraploid species or a tetraploid of structural hybrid. The former case, however, may have much probability.

Tab. 1. Chromosome numbers of Coniogramme Fée.

<table>
<thead>
<tr>
<th>Species</th>
<th>Chromosome numbers</th>
<th>Worker</th>
<th>Locality</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. sera Fée</td>
<td>2n=120</td>
<td>Manton &amp; Sledge (1954)</td>
<td>Ceylon</td>
</tr>
<tr>
<td>C. affinis Hieron.</td>
<td>n=30</td>
<td>Mehra &amp; Verma (1960)</td>
<td>Eastern Himalayas</td>
</tr>
<tr>
<td>C. caudata (Wall.) Ching</td>
<td>n=30</td>
<td>Verma (1961)</td>
<td>—</td>
</tr>
<tr>
<td>C. fraxinea (Don) Diels</td>
<td>n=30</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>—var. denticuloserrulata Hieron.</td>
<td>n=60</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>—var. denticuloserrulata (hybrid)</td>
<td>3n=90 (90 I)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>C. indica Fée (aff. intermedia) (hybrid)</td>
<td>3n=90 (30 II + 30 I)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>C. intermedia var. glabra Ching f. α and f. β.</td>
<td>n=30</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>—var. villosa Ching (?)</td>
<td>n=30</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>C. procera (Wall.) Fée</td>
<td>n=30</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>C. intermedia Hieron.</td>
<td>n=60, 2n=120</td>
<td>Kurita</td>
<td>Japan</td>
</tr>
<tr>
<td>C. japonica (Thunb.) Diels</td>
<td>n=60</td>
<td>Manton &amp; Sledge (1954)</td>
<td>?</td>
</tr>
<tr>
<td>—</td>
<td>n=60</td>
<td>Kurita</td>
<td>Japan</td>
</tr>
<tr>
<td>—var. Fauriei (Hieron.) 2n= ca 120 (0-30 II + 60-120 I)</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Summary

Chromosome numbers of two species with one variety of the genus Conio-
gramme have been counted. *C. intermedia* and *C. japonica* are sexually reproduct-
ing tetraploids. While *C. japonica* var. *Fauriei* is a tetraploid hybrid or a tetr-
aploid of structural hybrid. The present investigations have reconfirmed
previous data (Manton and Sledge 1954, Mehra and Verma 1960 and Mehra
1961). The results are summarized in Tab. 1.

I am grateful to Dr. M. Nishida, Assist. Prof. of Chiba University, for his
guidance and encouragements. I am also thankful to Dr. H. Ito, Prof. of
Tokyo University of Education, for the identifications of the materials.

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185. 2) Manton, I. 1950. Problems of cytology and evolution of the Pteri-
I-II): 139-164. 5) Tagawa, M. 1959. Coloured Illustrations of the Japanese
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* * * * *

イワガネソウは n=60、イワガネソウマイは n=60, 2n=120 で、両者とも胞子形成
過程は正常である。したがってこの面から両種を区別することは出来ない。しかしこイヌ
イワガネソウは前種と異っている。すなわち、2n=ca 120 ではあるが第 1 減数分裂中
期に於て約 60~120 の二価染色体と 0~30 の二価染色体が現れ胞子母細胞は不規則
に分裂する。その結果形成される胞子は成熟することなく消滅する。このことよりイヌ
イワガネソウは n=60 の染色体数を持つ二種間の雑種か、さもなければ構造雑種であろうと考えられる。

□ Syo Kurokawa: A monograph of the genus *Anaptychia*, 115 pp., 9 pl.,
Beih. zur Nova Hedwigia 6 (1962) ゲジゲジコ属の世界のモノグラフが国立科学
博物館の黒川逝氏の手によって完成し、このたびドイツで出版された。Vainio の
*Cladonia* や Motyka の *Usnea* のモノグラフに比べれば小部ではあるが、世界のモノ
グラフが日本人の手によってでき上がったことは喜ばしい。ゲジゲジコ属地衣について
の認識はいままで極めてあいまいで種の同定にも誤りが多かったが、この論文によっ
て、本属の分類が確立されたといってよい。著者は胞子の形態を重視して、本属を二
つの大きな *Section* に分類し、各 *Section* に更にいくつかの *Series* を設ける分類系
を提案した。採択された種類は 79 種、22 变種、24 品種に達し、このうち 33 種、4
変種、5 品種は著者によって設立されたものである。この他にも多くの新知見が盛られて
いて、多数の学名の変更も見られる。文献の引用法にも配慮が見られ、また、記載文
や各種についての説明も簡潔にまとめられている。モノグラフを手にかざして読む者の
にとってよい指針ともなると考える。J. Cramer (P. O. Box 166, Weinheim / Bergstr.,
West Germany) 発行。定価 $10 (DM 40)。

S. Kurita: Cytotaxonomy of *Coniogramme*
4. Sixty bivalent chromosomes at late diakinesis of *C. japonica*. 5. Approximately 90 chromosomes at metaphase of *C. japonica* var *Fauriei*. The constitution of these chromosomes may be (30 II+90 I). 6. Sixteen abnormal spores of *C. japonica* var. *Fauriei*. 7. Pseudoamitosis between two daughter nuclei in a spore mother cell of *C. japonica* var. *Fauriei*. 8. Abnormal dyad of the same species. 9. A triad of the same species.

S. KURITA: Cytotaxonomy of *Coniogramme*