Chromosome Numbers of Some Species and Hybrids of *Odontoglossum* OrchidHiroshi Uchiyama^{1*}, Ai Hasegawa¹, Kenji Aoki², Kazunari Nomura¹, Kazuo Yoneda¹
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Summary

Chromosome numbers of six species and four hybrids of *Odontoglossum* (*Odm.*), four hybrids of *Odontioda* (*Oda.*), and one hybrid of *Odontonia* (*Odna.*) were counted in root tip cells using the aceto-orcein squash method. The chromosome numbers (2n) are as follows: *Odm. grande*, 44; *Odm. williamsianum*, 44; *Odm. bictoniense*, 56; *Odm. harryanum*, 56; *Odm. nobile*, ca.84; *Odm. crispum*, ca.112; *Odm.* ‘Rawdon Jester’, 44; *Odm.* ‘Augres’, ca.88; *Odm.* ‘Lemonade’, ca.88; *Odm.* ‘Nichirei Strotordo’, 56; *Oda.* ‘Picasso’, 56; *Oda.* ‘Nationhood’, ca.112; *Oda.* ‘Nichirei Sunrise’, ca.112; *Oda.* ‘Peter Timoney’, ca.112; *Odna.* ‘Moliere’, ca.88.

Key Words: chromosome number, *Odontioda*, *Odontoglossum*, *Odontonia*.

Introduction

The genus *Odontoglossum* of the family Orchidaceae consists of more than 200 epiphytic species growing in the mountainous regions from Mexico to tropical South America, with the majority endemic to the Andes. The flowers of most species are showy and variable in color and morphology. Among the most beautiful of cultivated orchids, odontoglossums are extremely worthy of inclusion in collections (Cullen, 1992).

Although the odontoglossums is an orchid which has attracted attention in our country in recent years, improvement of the cultivation method and breeding of new cultivars are needed to solve problems, such as resistance to high temperature (Yoneda and Suzuki, 1998). Because the genus *Odontoglossum* consists of a number of species that are rich in morphological variations, and has many allied genera, such as *Miltonia* with which its intergeneric hybrid has been born, the prospect of developing new cultivars by breeding is good.

Chromosomal information has produced knowledge of considerable practical value so that determining chromosome number is an important tool for breeding orchids (Tanaka and Kamemoto, 1984). Since there is little information about the chromosome counts of *Odontoglossum* species and their hybrids (Bockemühl, 1989), that is the primary purpose of the present research.

Materials and Methods

Six species and four hybrids of *Odontoglossum*

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(*Odm.*), four hybrids of *Odontioda* (*Oda.*) and one hybrid of *Odontonia* (*Odna.*) analyzed in this study (Table 1) include *Odm.* ‘Nichirei Strotordo’ (*Odm.* ‘Stroperry’ × *Odm.* ‘Crutordo’) and *Oda.* ‘Nichirei Sunrise’ (*Oda.* ‘Remembrance’ × *Oda.* ‘Wearside Pattern’) are new cultivars bred in Nichirei Co., Ltd. They are cultivated in a greenhouse of Nichirei Co., Ltd. in Higashimurayama, Tokyo.

Chromosome numbers were counted in root tip cells using the conventional squashing method. The root tips were pretreated with aqueous 0.01% colchicine for 3 hr at room temperature before they were fixed in glacial acetic acid : ethanol (1:3, v/v) for 1 hr at 4 °C. Then they were macerated with 1N HCl : 45% acetic acid (1:1, v/v) at 60 °C for 30 sec, and stained with 1% aceto-orcein for 30 min at room temperature before they were squashed.

Results and Discussion

Photomicrographs of the chromosomes and their numbers in this and previous studies (Table 1, Fig. 1) reveal that the chromosome lengths range from 1.3 to 4.0 μm. Hence, it is difficult to confirm the chromosome numbers of some species or hybrids with many chromosomes.

Species

Chromosome numbers of *Odm. williamsianum* (2n=44) and *Odm. bictoniense* (2n=56) were established here for the first time. Those of *Odm. nobile* (2n=ca.84) and *Odm. crispum* (2n=ca.112) are newly added counts for these species. Two basic chromosome numbers, x=22 and x=28, exist in the genus *Odontoglossum*. Tri- and tetra-ploids have been observed in some species with x=28.

Fig. 1. Photomicrographs of chromosomes of *Odontoglossum* orchid investigated. A, *Odm. grande* ($2n=44$). B, *Odm. williamsianum* ($2n=44$). C, *Odm. bictoniense* ($2n=56$). D, *Odm. harryanum* ($2n=56$). E, *Odm. nobile* ($2n=ca.84$). F, *Odm. crispum* ($2n=ca.112$). G, *Odm.* 'Rawdon Jester' ($2n=44$). H, *Odm.* 'Augres' ($2n=ca.88$). I, *Odm.* 'Lemonade' ($2n=ca.88$). J, *Odm.* 'Nichirei Strotordo' ($2n=56$). K, *Oda.* 'Picasso' ($2n=56$). L, *Oda.* 'Nationhood' ($2n=ca.112$). M, *Oda.* 'Nichirei Sunrise' ($2n=ca.112$). N, *Oda.* 'Peter Timoney' ($2n=ca.112$). O, *Odna.* 'Moliere' ($2n=ca.88$). Bar indicates $10\ \mu\text{m}$.

The genus *Odontoglossum* is sometimes divided into different genera based on their morphological features. *Odm. grande*, *Odm. williamsianum* and its allied species are treated as the genus *Rossioglossum* (Garay and Kennedy, 1976). Cytological observations that establish the basic chromosome number as $x=22$ support this treatment.

Hybrids

Few studies on chromosome number of *Odontoglossum* hybrids have been reported; our data on chromosome numbers of all the hybrids are reported here for the first time.

Odm. 'Rawdon Jester' has $2n=44$ chromosomes; all parental species of this hybrid, likewise, exhibit $2n=44$, i.e., *Odm. grande*, *Odm. schlieperianum* and *Odm. williamsianum* (Dodson, 1958; The Royal Horticultural Society, 1997).

In other hybrids, excluding *Odm.* 'Rawdon Jester', chromosome numbers of $2n=56$, $ca.88$ and $ca.112$ were observed (Table 1). All species of *Odontoglossum* used as parents of the hybrids possess the basic chromosome number of $x=28$. No hybrid between $x=22$ and $x=28$

species has been registered (The Royal Horticultural Society, 1997). On the other hand, chromosome numbers of *Cochlioda* species are still unknown, while those of *Miltonia roezlii* and *M. vexillaria* which are used for the mating parents of *Odna.* 'Moliere' are $2n=56$ or 60 , and $2n=60$, respectively (Sinoto, 1962; 1969). Furthermore, species with intraspecific polyploidy, such as *Odm. crispum* ($2n=56$ and 112), *Odm. harryanum* ($2n=56$ and 84) and *Odm. nobile* ($2n=56$ and 84), were frequently used as parental material, and the contribution rates of *Odm. crispum* were very high as antecedent parents, for example, 80.4% in 'Augres', 65.0% in 'Lemonade', and 64.9% in 'Moliere' (The Royal Horticultural Society, 1997). Thus, it is possible that these polyploids with $x=28$ have been used in breeding of hybrids with $2n=ca.88$ and $2n=ca.112$.

As noted above, the chromosome number of species and hybrids of *Odontoglossum* varies much, so that the information should be effectively used in the breeding of *Odontoglossum* orchid.

Table 1. Chromosome numbers of some species and hybrids of *Odontoglossum* orchid.

Species and hybrid cultivar	Chromosome number (2n)		
	Present Count	Previous Count	Reference
<i>Odontoglossum grande</i>	44	44 60?	Dodson, 1958; Charnasri et al., 1973 Sinoto, 1962; 1969
<i>williamsianum</i>	44		
<i>bictoniense</i>	56		
<i>harryanum</i>	56	56, 84	Bockemühl, 1989
<i>nobile</i>	ca.84	56	Bockemühl, 1989
<i>crispum</i>	ca.112	56	Hoffmann, 1930; Bockemühl, 1989
'Rawdon Jester'	44		
'Augres'	ca.88		
'Lemonade'	ca.88		
'Nichirei Strotordo'	56		
<i>Odontioda</i> (<i>Odontoglossum</i> × <i>Cochlioda</i>)			
'Picasso'	56		
'Nationhood'	ca.112		
'Nichirei Sunrise'	ca.112		
'Peter Timoney'	ca.112		
<i>Odontonia</i> (<i>Odontoglossum</i> × <i>Miltonia</i>)			
'Moliere'	ca.88		

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オドントグロッサム類数種の染色体数

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摘 要

オドントグロッサム *Odontoglossum* の原種 6 種と交配種 4 種, オドントグロッサムの属間雑種であるオドンチオダ *Odontioda* の 4 種とオドンティア *Odontonia* の 1 種の染色体数を根端分裂組織を用いて酢酸オルセイン染色おしつぶし法により調べた。染色体数 (2n) は次のとおりであった: *Odm. grande*, 44; *Odm. willamsianum*, 44; *Odm. bictoniense*, 56; *Odm. harryanum*, 56; *Odm. nobile*, ca.84; *Odm. crispum*, ca.112; *Odm.* 'Rawdon Jester', 44; *Odm.* 'Augres', ca.88; *Odm.* 'Lemonade', ca.88; *Odm.* 'Nichirei Strotordo', 56; *Oda.* 'Picasso', 56; *Oda.* 'Nationhood', ca.112; *Oda.* 'Nichirei Sunrise', ca.112; *Oda.* 'Peter Timoney', ca.112; *Odtina.* 'Moliere', ca.88.