

Oryza sativaとO.ridleyiおよびO.meyerianaとの節間雑種 について

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SHORT PAPER

Intersectional F₁ hybrids obtained from the crosses, *Oryza minuta* Presl. × *O. ridleyi* Hook. and *O. officinalis* Wall. × *O. ridleyi* Hook.

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ABSTRACT

Cytological and morphological studies were made on the F₁ plants (OF₁141 and OF₁139) obtained from the crosses *Oryza minuta* Presl. (Y22, 2n=48, BBCC) × *O. ridleyi* Hook. (W0001, 2n=48) and *O. officinalis* Wall. (W1281, 2n=24, CC) × *O. ridleyi*. Morphological characteristics of both the F₁ plants resembled their female parents, *O. minuta* and *O. officinalis*, more closely than *O. ridleyi*. Moreover, the F₁ plants were especially characterized by producing runners. In somatic cells of the F₁ plants, 2n=48 chromosomes for the former and 2n=36 for the latter were counted. At meiotic division of the former cross-combination, most chromosomes failed to make pairing. These results suggest that the genome constitutions of *O. ridleyi* differed from the genomes of *O. minuta*, B and C.

Based on the results of the cytogenetical studies of the intersectional hybrids, *O. paraguayensis* Wedd. × *O. brachyantha* A. Chev. et Roehr., *O. sativa* Linn. × *O. brachyantha* and *O. minuta* Presl. × *O. brachyantha*, Li et al. (1961, 1963) first gave the genome symbol "F" for *O. brachyantha*.

In order to decide the genome constitutions of *O. ridleyi*, the authors tried crosses between *O. ridleyi* on the one hand and various species with known genome constitutions (A, BC, CD, E and F) on other. The brief description of the F₁ plants obtained from the reciprocal crosses *O. sativa* × *O. ridleyi* and *O. sativa* × *O. meyeriana* Baill. was reported (Katayama and Onizuka 1979). From the results, the authors concluded that both species, *O. ridleyi* and *O. meyeriana*, did not carry the A genome. In this paper, cytological and morphological observations of the F₁ plants (*O. minuta* × *O. ridleyi* and *O. officinalis* × *O. ridleyi*) were briefly described.

After heading, crossing was made by cripping-method. Seeds developed to various degrees, from perfect to imperfect caryopsis, were sterilized and sown on the agar medium prepared according to the White's formula and kept at

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Table 1. *Results of intersectional crosses*

F ₁ plant no.	Cross-combination	No. of spikelets crossed	No. of seeds cultured	No. of seeds germinated	No. of true F ₁ plants	Chromosome number (2n)
OF ₁ 139	<i>O. officinalis</i> (W1281) × <i>O. ridleyi</i> (W0001)	62	31	29	1	36
OF ₁ 141	<i>O. minuta</i> (Y22) × <i>O. ridleyi</i> (W0001)	58	9	6	1	48

about 25°C.

OF₁ 141 [*O. minuta*(Y22) × *O. ridleyi*(W0001)]

Fifty-eight spikelets of *O. minuta* were crossed with pollen grains of *O. ridleyi*, and one true F₁ plant (OF₁ 141) was obtained as tabulated in Table 1.

The F₁ plant resembled female parent (*O. minuta*) in most morphological characteristics, such as growth habit, leaf and spikelet shapes, deciduousness of spikelet, glume hairiness, awnedness and color of leaf sheath etc. (Table 2 and Fig. 1-e). As shown in Fig. 1-e, the OF₁ 141 was characterized by producing a lot of runners.

In somatic cells of the F₁ plant, OF₁ 141, 48 chromosomes were counted as expected from the parental species (Fig. 1-a). At the MI of pollen mother cells, most chromosomes failed to pair (Table 3 and Fig. 1-c). As shown in Table 3, the number of univalents per cell ranged from 42 to 48 with a mean of 47.61. Various degrees of irregularities in chromosome behaviors, such as laggards, unequal distribution and various size of pollen tetrads etc. were observed. In addition to the irregularities of chromosome behavior, cells with many minor nucleoli were rarely observed (Fig. 1-d). As expected from the chromosome behaviors, both of pollen grain and seed were completely sterile.

OF₁ 139 [*O. officinalis*(W1281) × *O. ridleyi*(W0001)]

From 62 spikelets of *officinalis*(W1281) which were cross-pollinated with pollen grains of *O. ridleyi*, a single F₁ plant (OF₁ 139) was produced (Table 1).

The F₁ plant was similar to female parent, *O. officinalis*, in the growth habit except for runner, leaf shape and color of leaf sheath (Table 2 and Fig. 1-f).

In the root-tip cells of the F₁ plant, 2n=36 chromosomes were observed.

Fig. 1. Appearance of adult plants, somatic chromosome numbers and chromosome configurations at MI of PMCs in OF₁141 and OF₁139.

a : 2n=48 of OF₁141 (*O. minuta* × *O. ridleyi*).

b : 2n=36 of OF₁139 (*O. officinalis* × *O. ridleyi*).

c : MI of OF₁141, showing 48₁.

d : Early diakinesis, showing one major nucleolus and many minor nucleoli of OF₁141.

e : An adult plant of OF₁141, showing runners.

f : An adult plant of OF₁139, showing runners.

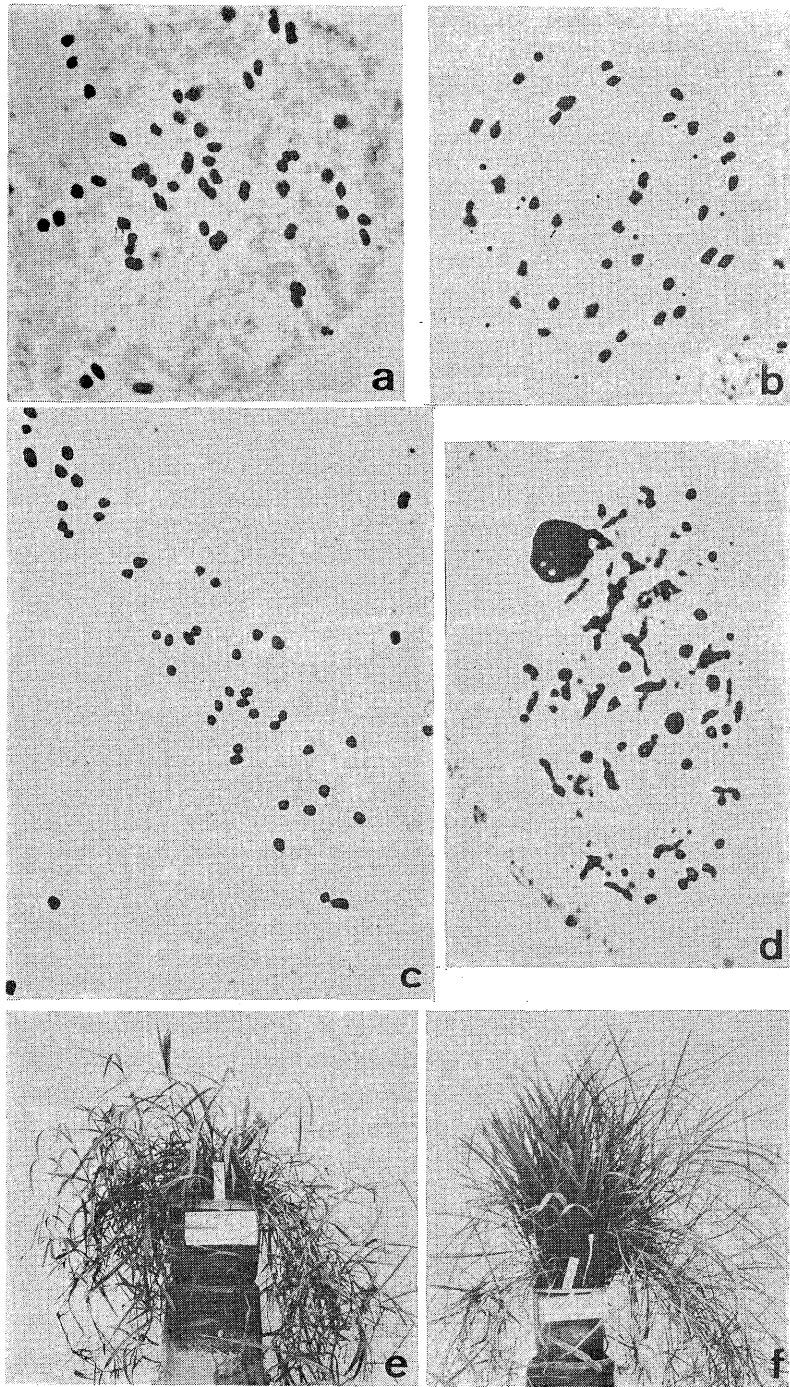


Fig. 1.

Table 2. *Morphological characteristics of the F₁ plants and their parents*

Characteristics	Parents			F ₁ plants	
	<i>O. ridleyi</i> (W0001)	<i>O. minuta</i> (Y22)	<i>O. officinalis</i> (W1231)	OF ₁ 141	OF ₁ 139
Growth habit	normal	spreading	normal	spreading, runner	normal, runner
Leaf shape	narrow	linear- lanceolate	linear- lanceolate	linear- lanceolate	linear- lanceolate
Spikelet shape	slender	orbiculate	orbiculate	orbiculate, oblong	none**
Deciduousness of spikelet	deciduous	deciduous	deciduous	deciduous	none
Glume hairiness	pubescent	pubescent	pubescent	pubescent	none
Awn	short	short	short	short	none
Color of apiculus	—*	—	—	—	none
leaf sheath	light brown	—	—	—	—
stigma	black-purple	black-purple	black-purple	black-purple	none
awn	light pink	—	—	—	none

Note: * shows green.

** shows no observation, because of no heading.

Table 3. *Chromosome configurations of OF₁141 and its parents*

Parents and F ₁ plant	No. of PMCs observed	Chromosome configuration						Fertility (%)	
		IV		II		I		Pollen	Seed
		Range	Mean	Range	Mean	Range	Mean		
<i>O. minuta</i> (Y22)	30			24	24			Normal	Normal
<i>O. ridleyi</i> (W0001)	30	0-4	2.54	16-24	18.53				34.88
OF ₁ 141	51			0-3	0.39	42-48	47.61	0.0	0.0

From the cross combination and morphological characteristics of OF₁ 139, the authors assumed that the F₁ plant is allotriploidy. The meiotic division of the F₁ plant, however, was impossible to observe, because of no heading for three years, from 1977 to 1979, in spite of short-day treatment of 8h.

Based on the results described above, the authors proposed that *O. ridleyi* has different genomes from *O. minuta*, B and C.

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