SPECIFIC OR RANDOM PAIRING IN THE F_1 AND SIMPLEX PLANTS ($AA+E_X$) OF *ORYZA SATIVA×O. AUSTRALIENSIS*[1]

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Introduction

Intergenomic pairing of chromosomes in the F_1 hybrid of *Oryza sativa* and *O. australiensis* was reported by many workers (Shastry *et al.* 1961; Li *et al.* 1963; Wu *et al.* 1964). Since it is impossible to identify chromosomes at metaphase I, specific pairing was not evidently seen identified in the previous studies mentioned.

Recently a series of "Simplex" lines was isolated by currently backcrossing the hybrids of *O. sativa*×*O. australiensis* to *O. sativa.* Each of these lines had a complete set of 24 chromosomes (AA) from diploid *O. sativa* plus one of the chromosomes (E_1, E_2,..., E_{12}) of *O. australiensis.* In the present study, it was intended to clarify whether the chromosome association is spicific or at random in the hybrid. Statistical anslysis is applied on examination of PMC's at MI stage in F_1 and simplex plants.

Materials and Methods

Parents in *O. sativa*×*O. australiensis* cross were Taichung No. 65, a japonica variety of *O. sativa* and W008, a strain of *O. australiensis* of Dr. OKa's collection. Aceto-carmine smear method was used throughout this study.

Results and Discussion

Since the chromosomes of *O. australiensis* were made up mostly of heterochromatic material as compared with the highly euchromatic consistency of *O. sativa* chromosomes when they were stained with carmine the former were stained much darker and the chromosomes were bigger in size at metaphase of meiotic division as compared with those of *O. sativa.* Thus the chromosomes of both parents can be differentiated. In the F_1 hybrid 105 PMC's were examined

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Table 1. *Chromosome association at MI in the hybrid of* ***O. sativa*** (AA)×***O. australiensis*** (EE)

I	II			III			Frequency
A+E	AA	AE	EE	AAA	AAE	AEE	
24							10
22	1						4
22		1					1
20	1	1					10
20	2						1
20	1		1				3
20		2					6
20		1	1				1
19		1			1		1
18		2	1				3
18	2		1				1
18	1	1	1				4
18		3					5
18	1	2					7
18	2	1					2
17	1	1			1		1
16	1	3					3
16	2	1	1				4
16	2	2					2
16		4					3
16	1	2	1				4
15	2	1				1	1
15	1	2			1		1
14	1	4					2
14	1	3	1				5
14	2	3					3
14	3	2					2
14	2	2	1				4
13	1	3				1	1
13	1	2	1	1			2
12	1	2			2		1
12	3	2	1				2
12	1	5					1
11	1	4				1	1
10	1	5	1				1
8	1	6	1				1
8	4	2	2				1
Total 11,836	104	186	37	2	5	3	105
Sub-total		327			10		

at MI and various type of chromosome association were found (Table 1). There were 5 AAE associations (15 chromosomes involved) found. Whereas in the simplex plants, chromosome pairing was invariably found to be between homologous chromosomes of *O. sativa* (AA) and there was not a single AAE association pair found in the 12 simplex plants of 200 PMC's counted for each type. In comparison the frequencies of AAE association in F_1 and simplex plants (Table 2), χ^2 tests showed that the difference was highly significant.

Table 2. *Number of chromosomes involved in* AAE *and other types of association in* F_1 *and simplex plants*

	AAE	not AAE*	Total
F_1	15	2,505	2,520
Simplex	0	5,000	5,000
Total	15	7,505	7,520

* AA, AE, EE, AAA, AEE included
$\chi^2=29.82$ 1df $p<1\%$

This difference can be attributed to the difference in the homology among the chromosomes concerned. In F_1 more frequent associations of chromosomes are between genomes rather than those within genomes (Tabe 3). The χ^2 test for independent association was highly significant. This shows that there exists a certain amount of homology between A and E chromosomes. Based on this fact, it can then be inferred that the pairing is specific rather random. However, this homology between chromosomes of different genomes is not strong enough for E chromosomes to compete for association with its partially homologous A chromosome pairs. As a result, no AAE association was ever found in all the simplex plants as far as our observations went. While in F_1, homology is higher between chromosomes of different genomes than that within genomes. This is indicated by more frequent inter-genomic association seen in Table 3.

Table 3. *Number of chromosomes in between and within genomic association in* F_1

	Association involving A	Involving no A	Total
Association involving E	396	74	470
Involving no E	214	1,836	2,050
Total	610	1,910	2,520

$\chi^2=1,143.10$ 1df $p<1\%$

Conclusion and Summary

In F_1 of *O. sativa*×*O. australiensis*, more frequent chromosome associations were found between genomes than those within genomes. This showed that chromosomes of different genomes had higher homology than homoeologous ones and provided an evidence of specific chromosomes pairing in the hybrid.

In simplex plants, not a single AAE association was found in all the studies. It showed that the E chromosomes failed altogether in competition for association with its partially homologous A chromosome pairs.

栽培稻和澳洲野生稻第一代雜種和十二種外加染色體系 (Simplex) 中染色體的配對

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在栽培稻 (*O. sativa*) 和澳洲野生稻 (*O. australiensis*) 的第一代雜種中，觀察減數分裂中期的花粉母細胞，發現染色體組間的配對多於染色體組內的配對。由此證明這兩個染色體組間有相當的親緣存在。χ^2 測驗的結果顯示這種配對不是逢機 (Random) 發生的。

在各種 Simplex lines 中，同一時期的花粉母細胞，只有同質染色體的配對，沒有發現染色體組間的配對，這是由於染色體在配對時因互相競爭，親緣較遠的不同組染色體被同質染色體排斥所致。

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