

Cytologic observations of sterility in interspecific F₁ hybrid from *Leymus chinensis* and *Leymus cinereus*

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Introduction *Leymus chinensis* and *Leymus cinereus* belong to *Leymus* genus of Trib. triticeais, both are allotetraploid (2n=28) rhizomegrass. Cross between two species is known as Geographically distant and the complement of advantages and disadvantages. But the interspecific F₁ hybrid is totally sterile. In order to understand the cytologic mechanism of hybrid F₁ sterility and fertility restoration further, in this study, the meiosis of PMCs and the development of pollen and embryo sac of *L. chinensis*, *L. cinereus* and their F₁ hybrid were observed.

Materials and methods *L. chinensis* was collected from north China, *L. cinereus* was collected from north America. Spikes of *L. chinensis* served as female parent were covered with parchment paper sleeves following emasculation. Pollination was achieved by shaking pollen-bearing spike of *L. cinereus* in the top of the sleeve. Seedlings were established from germinated seed without the aid of embryo culture. Spikes for cytological analysis were fixed in Carnoy's solution for 24h and then stored in 70% ethanol in a refrigerator. Pollen grains were stained with 2% acetocarmine solution to estimate their viability. Florets for analysis of embryo sac development were fixed in FAA and then were dehydrated, embedded, sectioned, stained using standard methods.

Results Data on pairing at metaphase-I of PMCs in the parents and their F₁ hybrid are listed in Table 1. Chromosome pairing, pollen stainability and seed set under open pollination in the parents were very high and univalents were occasionally observed. Chromosome pairing was also relative high in *L. chinensis* × *L. cinereus*.

And the Chromosome configuration at M I was 2.29 I + 12.39 II. Furthermore, most associations was 2 I + 13 II, and majority of bivalents were rings. Multivalents were not observed. Pollen stainability were 86.8, 12.0 and 0.9% at 1-nucleated pollen stage, 2-nucleated pollen stage and 3-nucleated pollen stage, respectively. The F₁ hybrids did not set seed under open pollination. The development stages of embryo sac in *L. chinensis* and *L. cinereus* were observed. But abortive embryo sac observed at meiosis I in F₁ hybrid turned into trace which was stained darkly (Figure 1) following the megaspore mother cells developing dichod.

Table 1 Meiotic behavior in the *L. chinensis*, *L. cinereus* and their hybrid.

Materials	No. of chrom.	No. of cells	Chromosome pairing at MI				stainable pollen(%)			Seed sets (%)
			I	II		Total	1-nucleated pollen	2-nucleated pollen	3-nucleated pollen	
				Rod	Ring					
<i>L. chinensis</i>	28	147	0.24 (0-4)	2.73 (0-13)	11.12 (1-14)	13.85	97.3	86.7	81.9	51.2
<i>L. cinereus</i>	28	100	0.14 (0-2)	0.20 (0-1)	13.70 (13-14)	13.90	97.9	89.3	84.8	64.9
F ₁ hybrid	28	151	2.29 (0-10)	0.21 (0-4)	12.18 (8-14)	12.39	86.8	12.0	0.9	0

Conclusions The lack of stained pollen, absence of seed set under open pollination, and high frequency bivalents in F₁ hybrid indicated that its sterility was genic rather than genomic. Pollen abortion was mainly occurred between late 1-nucleated pollen and early 2-nucleated pollen in F₁ hybrid. Embryo sac abortion in F₁ hybrid initiated after the megaspore mother cell developing dichod.

References

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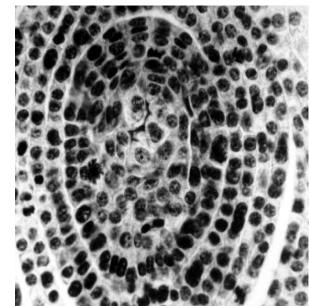


Figure 1 The abortive embryo sac (indicated by arrow) of F₁ hybrid.