A PRELIMINARY REPORT ON MEIOTIC CHROMOSOMES, ESPECIALLY ON PACHYNEMA OF *ORYZA GRANULATA* NEES[1]

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Oryza granulata Nees is a wild rice species found in forests in tropical Asian countries. It belongs to the Section *Granulatae* Roschevicz with its sister species *O. meyeriana* Baill. Cytological study of this species has not yet been reported. Sampath and Rao (1951) suggested that this species must be

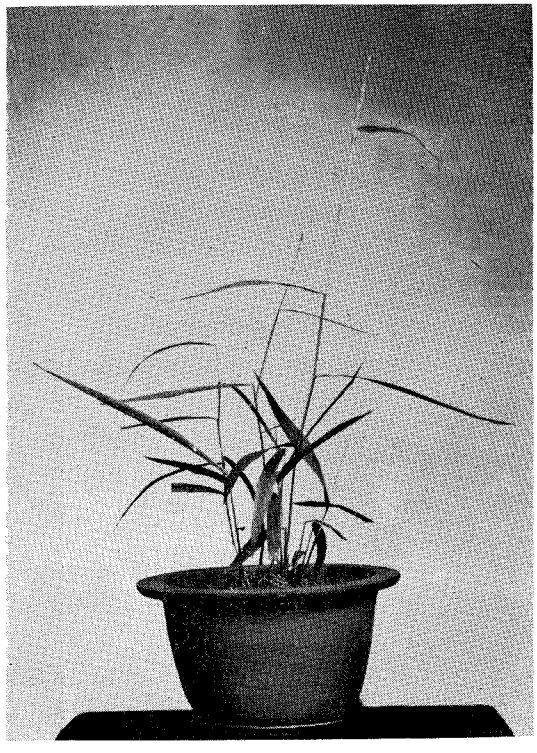

Fig. 1. A plant of *O. granulata* (plant height: 46.5 cm.).

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a tetraploid evolved from *O. meyeriana*. The characteristic features of *O. granulata* are small sized plants, small grain number per panicle, absence of awns, and the peculiar structure of the epidermal tissue of glumes. A strain of this species, collected by Dr. H. I. Oka of the National Institute of Genetics, Japan, from the mountainous suburb of Coimbatore, India, was used for this investigation.

Seeds were germinated in petri-dishes, and seedlings were transplated in a paddy field and to a sandy upland field. The plants in the former condition, however, died, perphaps having too much water, and those in the latter remained alive. A photograph of one of the plants is shown in Fig. 1. Young panicles were fixed in Farmer's fluid (absolute alcohol 3: glacial acetic acid 1) for 48 hours, and were preserved in 75% alcohol. Slides were prepared by the ordinary aceto-carmine smear method.

The chromosome number of the plants observed was n=12 in PMC's, and 2n=24 in root tip cells as well as in young anther cells. The PMC's were smaller in size than those of *O. sativa*, but the chromosomes did not seem to be smaller.

In the early prophase of meiosis, chromatids were stained well. Chromomeres and a satellite attached to the nucleolus could be observed clearly. In the pachytene stage, individual chromosomes could be identified to some extent. As shown in Fig. 2, which is a microphotograph of pachytene chromosomes, the following aspects may be recognized.

1) The nucleolar chromosome is a short one with satellite.
2) A chromosome with remarkable round heads is present.
3) The longest chromosome has a median constriction.
4) The second longer chromosome, about one half as long as the longest, has a secondary constriction.

Comparing with the morphology of chromosomes of *O. sativa* and *O. glaberrima* formerly reported by the writer (Hu, 1960), the nucleolar chromosome of *O. granulata* seems to be corresponding to No. 8 of *O. sativa* or *O. glaberrima*, the one with round heads to No. 11, the longest to No. 1, and the second longer to No. 2, as tentatively numbered in Fig. 2B. Thus, it seems that the karyotype of *O. granulata* might be similar, or at least most of chromosomes were similar, to those of *O. sativa* and *O. glaberrima*.

In several pachytene chromosomes, the centromere appeared to be a small chromomere-like body, not resembling that of maize which is an ovoid body. In others, an achromatic region with no particular structure between two deep staining chromomeres, presumably heterochroromatic, was seen at the primary constriction. It has been thought that analysis of the pachytene chromosomes of rice is difficult because of the small size of chromosomes and bad staining

A

B

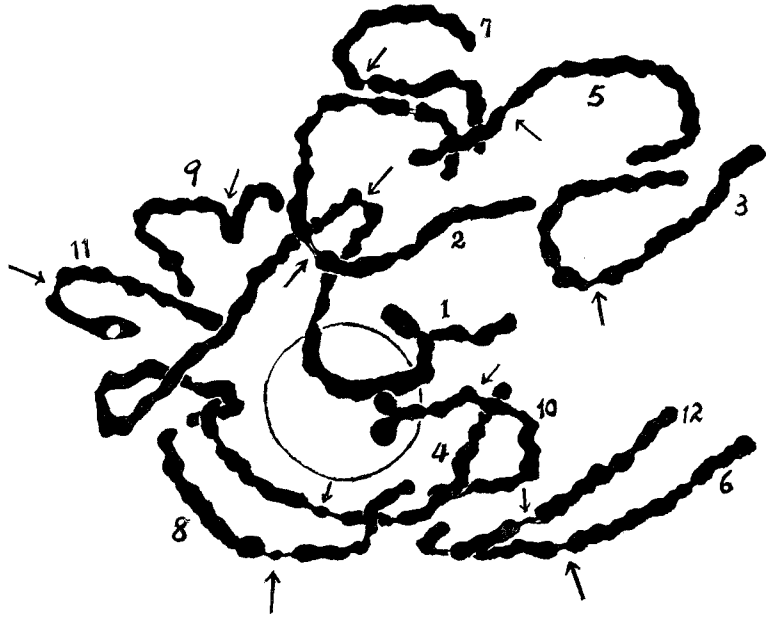

Fig. 2. A PMC at pachytene stage (×3,000).

A: Microphotograph.

B: Camera lucida drawing. The chromosomes were tentatively numbered in the order of length, and the positions of primary constrictions were indicated by arrows.

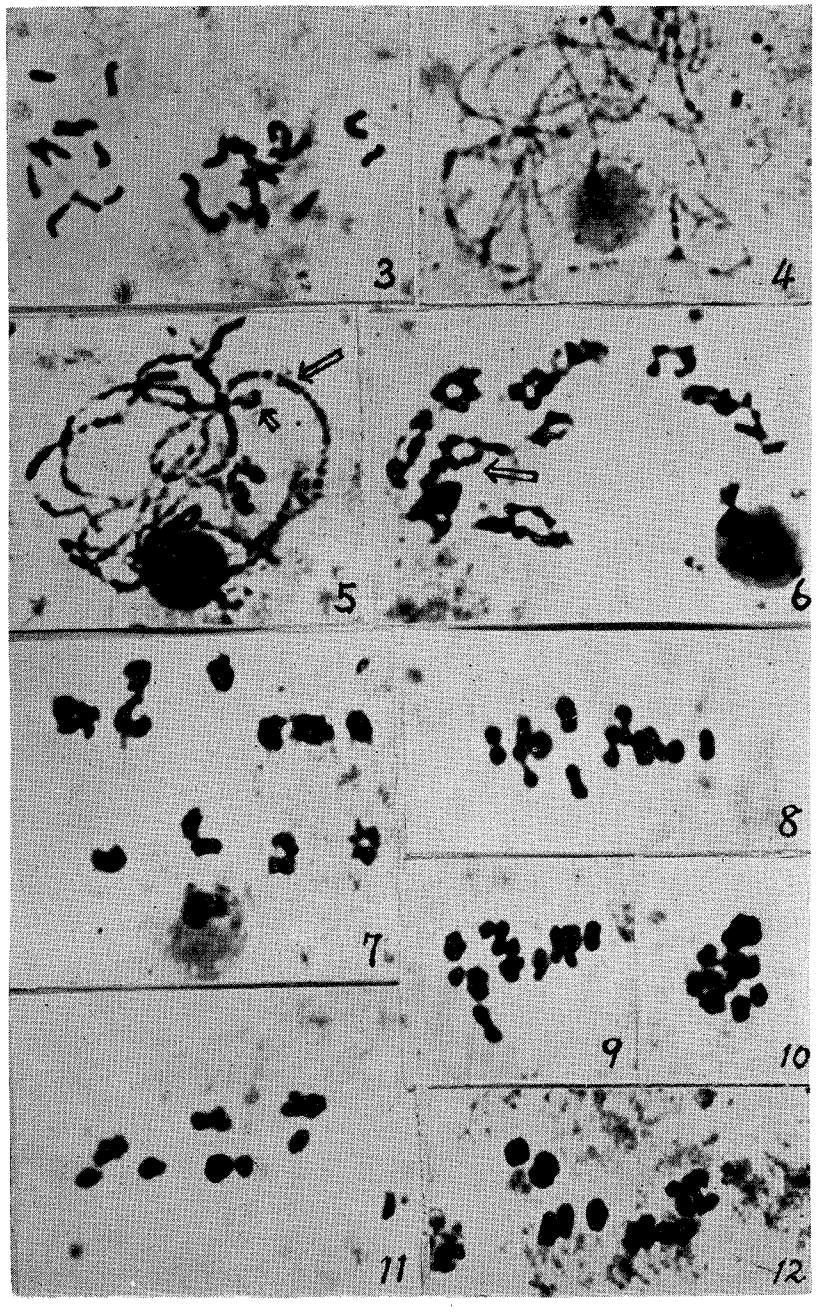

Fig. 3. Chromosomes in a young anther cell. (×1,500).

4-12. PMC's at different stages. (×1,500).

Fig. 4. Early prophase. Showing the chromatid with a satellite attached to nucleolus.

Fig. 5. Pachytene. Chromomeres arranged on chromatids are seen. The chromosome indicated by a short arrow is the one with round heads, and by a long arrow is the longest one.

Fig. 6. Diplotene. The chromosome indicated by an arrow is the longest one.

Fig. 7. Diakinesis. Several terminally paired bivalents are seen.

Fig. 8. Metaphase-I. 12 bivalents are seen.

Fig. 9. Metaphase-I. 11 bivalents and 2 univalents are seen.

Fig. 10. A polar view of metaphase-I, with 9 bivalents and one hexavalent.

Fig. 11. Metaphase-I. A quadrivalent and two secondarily associating bivalents are seen.

Fig. 12. Metaphase-I. A pattern of secondary associations of bivalents. 1 (3)+4(2)+1 is shown.

(c. f. Yao, Henderson and Jodon 1958). The writer's relatively successful results in *O. granulata* may be due to the good staining reaction of chromosomes which might be characteristic of the species.

Table 1. Chromosome configurations and their frequency at Metaphase-I in the PMCs of *O. granulata*.

Configuration	Frequency
12Ⅱ	67
12Ⅱ + f *	3
11Ⅱ +2Ⅰ	22
10Ⅱ +4Ⅰ	2
10Ⅱ +1Ⅳ	4
9Ⅱ +1Ⅵ	1
8Ⅱ +1Ⅳ +4Ⅰ	1
Total of observed cells	100

* Chromosome fragment.

Regarding the behavior of chromosomes in diakinesis, metaphase-I and later stages, nothing particular was found. However, of one hundred first-metaphasic cells observed, univalents, quadrivalents as well as hexavalent are found The chromosome configurations and their frequency are shown in Table 1, and typical appearance of chromosomes is shown in Fig. 8 to 12. The bivalent chromosomes in first-metaphase were mostly rod-shaped, and two to three appeared to be of loose pairing. Secondary associations of bivalents were also found in metaphase-I, as shown in Fig. 12. The plants observed had a low fertility, percentage of good pollen being 62.5%.

ORYZA GRANULATA NEES 之減數分裂特別於合絲期染色體之研究

胡　兆　華

Oryza granulata Nees 原產於東南亞，爲野生稻種之一。其特徵爲植株矮小，一穗穀粒少，無芒，穀粒表皮組織之特殊構造等。本種與 *O. meyeriana* Baill. 共二種組成 Granulatae Section (Rochevicz)。本種細胞學的研究尚無正式報告，Sampath and Rao (1951) 曾推定其爲四元體。本研究指出 *O. granulata* 實係二元體 (染色體數 n=12, 2n=24)。又本種減數分裂前期染色良好，從合絲期染色體之形態分析，發現若干具有特徵之染色體與筆者於前報告之 *O. sativa* L. 及 *O. glaberrima* Steud. 的染色體組構造相似。(摘要)

Literature Cited

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