Taxonomy and Chromosome Numbers of African Representatives of the *Oryza officinalis* Complex

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Received February 17, 1965

As stated by some recent authors^{1,2)}, several problems in the taxonomy of the *Oryza officinalis* complex warrant further intensive investigations. Species of this complex are easily separated from all other species of *Oryza* and make part of the section *Oryza* (=section *Sativa*). This species complex is widely distributed in tropical and subtropical regions, but no species are common to the New and the Old Worlds. Some discussions of the taxonomy of the Old World representatives, with special reference to African species, are presented below.

In Africa there are two species in the *officinalis* complex: *O. punctata* Kotschy ex Steud. and *O. eichingeri* A. Peter. Our knowledge of the morphological distinctions between these two species has been rather limited, and it has sometimes been noted that delimitation of these taxa is obscure. The present author therefore made special efforts to examine a number of populations of *O. eichingeri* and *O. punctata* when he visited East Africa in 1964, and studied them from a taxonomic viewpoint. These results have already been reported in a previous paper³⁾. It was found that *O. punctata* and *O. eichingeri* differ in a combination of several morphological characters though a few intermediates are found. In this investigation several living stocks were also used. They had originally been collected in Africa and used as material for cytogenetic studies by many previous authors. Unfortunately, the present author found that some of these living stocks had been incorrectly identified.

In the National Institute of Genetics, Misima, there are two stocks (W0015 and W0043) which have been used for genetic and cytogenetic investigations of *O. eichingeri*. Stock W0015, which was identified as *O. eichingeri* by a previous investigator, was supplied by the Central Rice Research Institute, Cuttack. Stock W0043 was furnished by the United States Department of Agriculture, Beltsville. It is not certain whether W0015 and W0043 were derived from the same parental stock. These stocks were in turn distributed from Misima to various Institutes in Taiwan and the Philippines. Many cytogenetic investigations have been made on these stocks, and it has been repeatedly described that *O. eichingeri* is a tetraploid species with BBCC genomes.

Unfortunately neither W0015 or W0043 can be referred to *O. eichingeri* but are more correctly identified with *O. punctata* in the light of the present author's recent work³⁾. Stocks W0015 and W0043 have the following morphological features: Base of culms spongy and thick; ligules 3-5 mm long, soft, whitish; panicle branches spreading; spikelets 5.0-5.5 mm long, 2.1-2.3 mm broad; sterile lemmas triangular and acute; awns of the lemma almost straight; bristles on the awn rather rigid.

In all of these morphological features, W0015 and W0043 agree completely with the type specimen of *O. punctata* and differ quite significantly from true *O. eichingeri* (see Tateoka³⁾). As a consequence, the results of the many investigations made by previous cytogeneticists on material identified as *O. eichingeri* should not be applied

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to *O. eichingeri* but to *O. punctata*. Misidentification of the material is partly responsible for bringing about this confusion, but the fact that the taxonomy of *Oryza* has been in such unsatisfactory condition for so long has also contributed to these errors.

Other than stocks W0015 and W0043, the present author is not aware of any other strains named as *O. eichingeri* which have been used for cytogenetic investigations. True *O. eichingeri* does not seem to have been examined cytologically so far. The present author therefore studied chromosome numbers of the collections of *O. eichingeri*, as well as those of *O. punctata*, which were obtained in his recent explorations in East Africa. The results are summarized in Table 1.

Table 1. Chromosome numbers of *Oryza eichingeri* and *O. punctata*.

Strain number in NIG ¹⁾	2n	Origin
<i>O. eichingeri</i>		
W1516	24	Mabira forest, Mengo, Uganda ²⁾ .
W1517	24	Mabira forest, Mengo, Uganda ²⁾ .
W1519	24	Budongo forest, Bunyoro, Uganda ²⁾ .
W1520	24	Ntandi forest, Bwamba, Uganda ²⁾ .
W1521	24	Ntandi forest, Bwamba, Uganda ²⁾ .
W1522	24	Ntandi forest, Bwamba, Uganda ²⁾ .
W1524	24	Ntandi forest, Bwamba, Uganda ²⁾ .
<i>O. punctata</i>		
W0015	48 ³⁾	(supplied by the Central Rice Research Institute, Cuttack, India).
W0043	48 ³⁾	(supplied by the United States Department of Agriculture, Beltsville).
W1024	48 ³⁾	Kabokabo, Ghana (collected by Dr. K. Furusato).
W1145	48 ³⁾	(supplied by the Central Rice Research Institute, Cuttack, India).
W1408	48	Lagos, Nigeria (collected by Drs. H. I. Oka and W. T. Chang).
W1512	24	15 miles north of Mariakani Coast Province, Kenya ²⁾ .
W1514	24	5 miles north of Kwale, Coast Province, Kenya ²⁾ .
Intermediates ⁴⁾		
W1525	24	1 mile southwest of Ntandi forest, Bwamba, Uganda ²⁾ .
W1527	24	3 miles southwest of Ntandi forest, Bwamba, Uganda ²⁾ .

1) National Institute of Genetics, Misima.

2) These strains were collected by the present author in 1964.

3) These counts were made by Dr. T. C. Katayama, National Institute of Genetics.

4) For details of the taxonomy and morphology of these intermediates, see Tateoka³⁾.

It is clear from Table 1 that *O. eichingeri* is a diploid and that both diploid and tetraploid forms occur in *O. punctata*. The diploid species *O. eichingeri* differ significantly in morphology from the diploids and the tetraploids of *O. punctata*, but the present author was not able to find clear-cut morphological differences between the diploids and the tetraploids of *O. punctata* (see Tateoka³⁾). It is quite unfortunate that only a few living strains of *O. punctata* are now available for study. The taxonomic relationships between the diploids and tetraploids of *O. punctata* should apparently be further studied. It is also not known at all whether the diploids and the tetraploids have different geographical distributions. *O. punctata* is known to occur widely in Africa, from the Ivory Coast to Kenya and southwards to Southern

Rhodesia and Madagascar. *O. eichingeri* is more limited in geographical distribution, known only from Kenya, Uganda, Tanganyika and the northeastern parts of the Congo.

As stated in various articles (e.g., Sampath⁴⁾), both *O. eichingeri* and *O. punctata* have close relatives in Asia. *O. minuta* J. S. Presl ex C. B. Presl and *O. officinalis*

Fig. 1. Spikelet length and breadth of the four species of *Oryza*. One circle represents one collection. Measurements on *O. minuta* and *O. officinalis* were cited from Tateoka and Pancho⁵⁾, and those on *O. punctata* and *O. eichingeri* from Tateoka³⁾.

Wall. ex Watt are the two well known species of this complex in Asia (see Tateoka and Pancho⁵⁾). *O. officinalis* is a diploid species with CC genome and *O. minuta* is a tetraploid with BBCC genomes (see Chang⁶⁾). In Fig. 1, which was prepared on the basis of results reported in previous papers by the present author (Tateoka and Pancho⁵⁾; Tateoka³⁾), spikelet length and breadth of the four species (*O. punctata*, *O. eichingeri*, *O. minuta*, *O. officinalis*) are diagrammatically shown. This figure indicates that the four species differ from each other in spikelet characters. Tateoka⁷⁾ has also described some other morphological differences between them based on herbarium studies. Nevertheless, there is no doubt that these African and Asiatic species are very closely related, since they share so many common features in morphology and are also cytogenetically inter-related.

There are two other taxa in Asia which may or may not be morphologically separated from the African species. One of them is a form found in Ceylon, which is very similar to *O. eichingeri* in morphological features and is likewise a diploid plant (this count was reported by Sampath²⁾). Another Asiatic taxon, which also needs further study in relation to the African species, is a tetraploid form in Coimbatore, India. This taxon is generally called *O. malampuzhaensis* Krishnasw. et Chandrasek. It clearly differs from *O. eichingeri* but is similar to *O. punctata*. Further taxonomic investigations of these little known taxa should increase our understanding of the differentiation of the *officinalis* complex in the Old World.

Summary

It was shown that the strains, identified as *Oryza eichingeri* and used for cytogenetic investigations in various countries, are actually not true *O. eichingeri* but must be identified as *O. punctata*. Chromosome numbers of *O. eichingeri* and *O. punctata* were determined from 16 strains, the majority of which were collected in East Africa in 1964. All collections of *O. eichingeri* showed $2n=24$. In *O. punctata* both $2n=24$ and $2n=48$ were counted. The relationships between these African species and some Asiatic species were discussed, and several taxonomic problems in this complex were pointed out.

References

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摘 要

館岡亜緒: *Oryza officinalis* complex のアフリカ産の種類の分類学と染色体数

国立遺伝学研究所で *Oryza eichingeri* として栽培されている2系統は、インドおよびアメリカ合衆国の研究機関からゆずられたものであるが、これら2系統は *O. eichingeri* ではなく、*O. punctata* であることが明らかにされた。これら2系統についてすでに沢山の細胞遺伝学的研究がおこなわれ、*O. eichingeri* は4倍体 ($2n=48$) でBBCCゲノムをもつものであると、多くの論説にのべられているが、そのような研究結果は *O. punctata* にきせられるもので、*O. eichingeri* にきせられるものではない。筆者は東アフリカで採集された真の *O. eichingeri* の7系統の染色体数を調査したが、すべて2倍体 ($2n=24$) であった。一方、同様にアフリカ産の種類である *O. punctata* のなかには2倍体と4倍体がある。旧大陸産の *O. officinalis* complex の分類学において、今後の研究をとくに要するものとして、1) *O. punctata* の2倍体と4倍体の関係、2) *O. eichingeri* とセイロンにみられる2倍体の型との関係、3) *O. malampuzhaensis* の種としての独自性の3点があげられる。(国立科学博物館第一研究部)