

THE CHROMOSOMES OF TWO TORTRICID SPECIES (LEPIDOPTERA), WITH NOTES ON THE CHROMOSOMES OF TWO OTHER ALLIED SPECIES¹⁾

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Tortricid moths are well known as pests of plants. It is widely recognized in Aomori Prefecture that their larvae give damage to apple trees. The survey work of chromosomes in harmful insects may be of some value in view of economic importance. The author (Saitoh 1960) previously carried out cytological researches of two species of tortricid moths, *Archips breviplicana* and *Adoxophyes orana*, inhabiting in Aomori Prefecture, and established the haploid chromosome numbers. The present paper deals with studies on *Archips fuscocupreana* and *Pandemis heparana*, with some reference to karyotypes of the tortricid moths so far reported.

MATERIALS AND METHODS

The insect samples used for this study were furnished through the courtesy of the Aomori Apple Experiment Station, Kuroishi City. Testes derived from mature larvae or prepupae of *Archips fuscocupreana* and *Pandemis heparana*, as well as larval testes of *Archips breviplicana* and *Adoxophyes orana*, were fixed with Allen's P.F.A.-3 mixture. Slides were made according to the usual paraffin method, and stained with Heidenhain's iron haematoxylin. Chromosome counts were carried out with clear-cut metaphase spermatocytes, and the chromosomes were drawn with the aid of an Abbe's drawing apparatus at table level, at a magnification of 100 objective \times K 20 ocular.

RESULTS

1. *Chromosomes of Archips fuscocupreana* Walsingham (*Midare-kakumon-hamaki*) (Figs. 1-8)

Counts were made in 185 primary spermatocytes and in 81 secondary spermatocytes derived from the testes of 15 mature larvae. The dot-shaped chromosomes, 30 in n , were observed in every metaphase plate, showing a circular arrangement common in lepidopterous insects. One of the 30 chromosomes was outstanding because of its strikingly large size at both first and second meiotic metaphases.

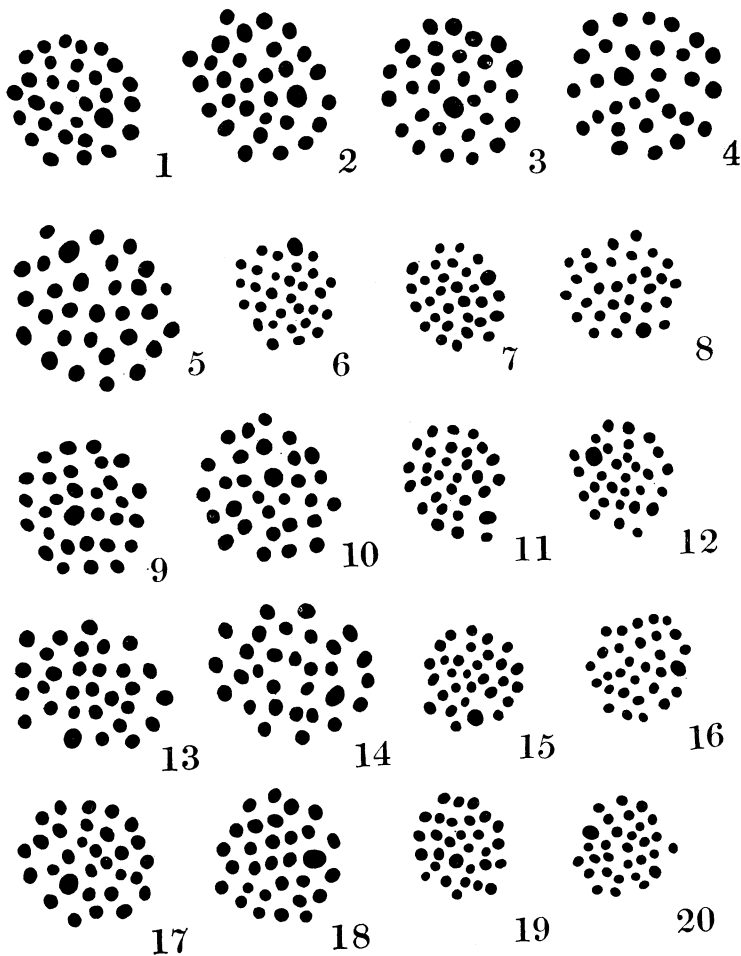
1) This paper is dedicated to Professor Sajiro Makino, Zoological Institute, Hokkaido University, Sapporo, in honor of his sixtieth birthday, June 21, 1966.

2. *Chromosomes of Pandemis heparana* Schiffermüller (*Tobi-hamaki*) (Figs. 9-12)

Two males of this species were available for the present study. Chromosome counts were made in 30 primary spermatocytes, as well as in 15 secondary spermatocytes in the testes of a single mature larva. In addition, 13 primary spermatocytes and 12 secondary spermatocytes in the testes from a prepupa were studied. Both the primary and secondary spermatocytes showed 30 chromosomes of dot-like nature. Every metaphase plate contained one apparently large chromosome, similar in general feature to that observed in the former species.

3. *Chromosomes of Archips breviplicana* and *Adoxophyes orana* (Figs. 13-16, 17-20)

The results of the previous work performed for these two tortricid moths by the



Figs. 1-20. Spermatocyte chromosomes of four species of Tortricidae. ca. 3000 \times . *n*, 30 in each. 1-8; *Archips fuscocupreana*, 9-12; *Pandemis heparana*, 13-16; *Archips breviplicana*, 17-20; *Adoxophyes orana*. 1-5, 9, 10, 13, 14, 17, 18; First division. 6-8, 11, 12, 15, 16, 19, 20; Second division.

squash method (Saitoh 1960) were compared with those derived from the present study with fixed materials. Five larvae of *A. breviplicana* and ten of *A. orana* provided testicular materials and were studied.

Both species were found to possess 30 dot-like chromosomes in the spermatocytes showing a characteristic circular arrangement at metaphase in both the first and second divisions. One of the 30 elements was remarkably large in size. These results were well in accordance with those of the previous investigation.

REMARKS

The Makino's (1956) comprehensive review book of the chromosome numbers in animals mentioned that the two species of tortricid moths, *Homona magnanima* and *Cacoecia cerasivorana*, have ever been studied and given the haploid number of n , 30.

It was noted by careful examination that the haploid complements of the four species of the Tortricidae here dealt with were identical with each other, and they were found to possess 30 chromosomes in n . Thus, the similarity in the haploid chromosome number was generalized for all six species of the family Tortricidae so far studied.

Shibata (1930) noted the occurrence of one large chromosome in the haploid set of *Homona magnanima* from Formosa. The results of the present study supplemented the fact with additional data from *Archips*, *Adoxophyes*, and *Pandemis*.

SUMMARY

The chromosomes of *Archips fuscocupreana* and *Pandemis heparana* (Tortricidae, Lepidoptera) were studied in spermatocytes. In addition, the chromosomes of *Archips breviplicana* and *Adoxophyes orana* of the same family were investigated. The chromosome numbers (n) of the four tortricid species here considered were presented in Table 1, together with those already reported.

Table 1. Chromosome numbers of the tortricid moths under study and so far reported

Species	Chromosome number (n)	
	In the present study	By previous authors
<i>Archips fuscocupreana</i>	30 ♂ (I, II)	
<i>Archips breviplicana</i>	30 ♂ (I, II)	30 ♂ (I, II) ; Saitoh 1960
<i>Pandemis heparana</i>	30 ♂ (I, II)	
<i>Adoxophyes orana</i>	30 ♂ (I, II)	30 ♂ (I, II) ; Saitoh 1960
<i>Homona magnanima</i>		30 ♂ (Spermatocyte) ; Shibata 1930
<i>Cacoecia cerasivorana</i>		30 ♂ (I, II) ; Stevens 1906

I : Primary spermatocyte.

II : Secondary spermatocyte.

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1) Not accessible to the present author