Systematic Entomology (1980) 5, 7–25

Chromosome numbers in the Aphididae and their taxonomic significance

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ABSTRACT. Diploid female chromosome numbers are listed for 180 aphid species not previously karyotyped. The list includes the first chromosome records for several aphid tribes (Tramini, Greenideini, Anomalaphidini, Nipponaphidini). Variation in chromosome number at different systematic levels is discussed. Usually the karyotype is particularly stable within a genus, but there are notable exceptions (e.g. *Amphorophora*) where considerable evolutionary increase in chromosome number has occurred by autosome dissociation with little accompanying morphological change. In several genera differences in gross chromosome morphology can be useful to the taxonomist. Within-species karyotype variation is relatively common in aphids, and instances of structural heterozygosity are particularly numerous in species and groups which have partially or completely abandoned the sexual phase of the life cycle in favour of permanent thelytoky.

Introduction

Chromosome numbers have been published for 328 species of Aphidoidea (Kuznetsova & Shaposhnikov, 1973; Gut, 1976), and in this paper an additional 180 are listed, bringing the total to 508, which is about 14% of the known species of aphid. Assessments of the evolutionary implications of aphid chromosome numbers have been based on information about far fewer species (Shinji, 1931; Steffan, 1968a). It therefore seems opportune to review the variations now known to occur in chromosome number at each systematic level within the Aphididae, and to discuss to what extent such information (a) contributes to an understanding of phylogenetic relationships within this family, and (b) is of use in practical taxonomy. Adelgidae and Phylloxeridae are not included here as the knowledge of these two families has not been significantly added to since Steffan (1968b).

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Methods

Chromosome squash preparations were made from young embryos removed from either fresh or pre-fixed material. Embryos were dissected from fresh material in hypotonic (0.75%) potassium chloride solution and fixed in a fresh mixture of 3 parts of absolute methanol to 1 part of glacial acetic acid. After 20 min and two changes of fixative the smallest embryos were transferred on the point of a pin to a small drop of 45% propionic acid on a clean microslide and squashed under a coverslip. Embryos dissected out of specimens pre-fixed in 3:1 methanol/acetic acid were transferred to 75% methanol (5 min), then to 1 N hydrochloric acid (5 min at 68°C), before squashing in 45% propionic acid. After examination under phase contrast, the best preparations were stained and made permanent. The coverslips were removed by flicking off with a sharp, pointed scalpel blade after the slides had stood, coverslips uppermost, on a flat block of solid carbon dioxide. The preparations were left to stand for 1 week at room temperature, then stained in 5% Giemsa

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