Evolution of Aphid Species due to Host Plant Preference

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Bulrush aphids, Schizaphis scirpi, colonize on leaves of cattail, Typha latifolia, while another Schizaphis species, S. acori, is usually found on leaves of calamus, Acorus calamus. Since the two species are morphologically quite resembling, it is difficult to discriminate each other at a glance. A question arose whether these two were really different morphologically, ecologically and genetically. Food preference tests in the laboratory revealed that aphids of S. scirpi invariably gathered on a cattail leaf, while 70% and 29% of S. acori individuals clustered on calamus and cattail, respectively. S. scirpi successfully proliferated parthenogenetically on cattail leaves, but failed to grow on calamus leaves, whereas S. acori parthenogenetically grew well on both cattail and calamus leaves. Microscopical observations of slide-mounted specimens revealed that the two species had clear differences in numbers of dorsal hairs and in length of the longest hair on the third segment of the antenna, which are generally regarded as morphological traits to distinguish between the two species. However, nucleotide sequences of mitochondrial and nuclear DNA fragments obtained from aphid samples exhibited 99% identity between S. scirpi and S. acori. The molecular phylogenetic analysis using these DNA sequences suggested that the two species were diverged from a common ancestral species. The results suggest that S. scirpi and S. acori are really closely related species or subspecies. It is conceivable that S. acori extended their habitat from T. latifolia to A. calamus in the process of evolution by acquiring tolerance against plant defensive substances contained in A. calamus.

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