

Abstract

The following report is of attempts to elucidate the symbiotic relationships between the leaf-cutting ants, Atta cephalotes L. and Acromyrmex octospinosus Reich. and their fungus gardens. Apart from conventional energy studies, subsidiary experiments concerned with the characteristics of the populations, especially feeding and colony organisation, were also included. Methods used successfully on temperate ant species were found to be unsuitable in this study, and this led to the introduction of various original techniques which were not all fully exploited, and might be useful as a basis for future study.

Difficulties were experienced in a) estimating the populations of large field colonies, b) repeated sampling of these colonies, c) estimating the dry weight of the fungus gardens, d) the active respiration rates of the workers, and, e) the respiration of the fungus. The Atta cephalotes colonies were especially vulnerable in the laboratory, where the organisation of the colonies tended to break down more easily than those of Acromyrmex octospinosus.

Basically, two methods were used to obtain data :

- a) a general study of the activities and development of three laboratory colonies from each species, and
- b) a controlled experiment on eight Acromyrmex octospinosus cultures in which the total input and output from each culture was assessed as accurately as possible, in order to construct complete energy budgets.

Energy flow diagrams were constructed from the accumulated data, and it is clear from these that the fungus gardens account for a large proportion of the energy entering the nests. It is postulated that this large and fluctuating source of energy provides a buffer between the ant population and variations in the external environment which allows growth of the population, and development of the sexuals to continue at a uniform, steady, but generally low rate throughout the year. However, the fungus both dictates and complicates the methods of investigation, and it is the extremely close association between it and the population which is the main reason for differences in the studies of these species, and the studies of other kinds of ants.