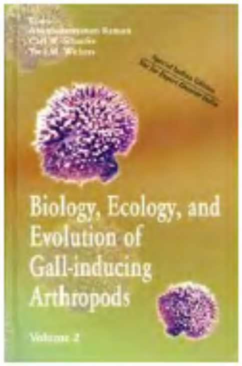

Biology, Ecology, and Evolution of Gall-inducing Arthropods. Vols 1 and 2. Ananthanarayanan Raman, Carl W. Schaefer and Toni M. Withers (eds). 2004. Price: Rs 1450/set (special Indian Edition).

Galls are adaptations of plants in response to the attack by galling arthropods. Interest in studying galls and their arthropod inducers has been growing rapidly ever since M. S. Mani published his classic *Ecology of Plant Galls* in 1964.

In the opening chapter, Raman and his co-editors state that a chemical stimulus from the arthropods initiates the gall by isolating and insulating some of the meristematic cells of the host plant from their normal course of differentiation. They consider that a particular gene probably triggers or plays a role in gall induction. In the second chapter, Oldfield states that as a group, eriophyoids are highly host-specific and those that induce galls are usually highly site-specific, typically inducing galls of a specific form on a specific part of the plants.

Mound and Morris discuss and conclude that the relationship between the thrips and the galls that they induce requires study at many levels. Wool reviews the literature on the biology and ecology of gall-inducing aphids, adelgids, and phylloxerids published between 1980 and 2002. Byrne states that only a small number of species of whiteflies forms galls on plants. The galls of some species can be found on adaxial leaf surfaces, others on abaxial surfaces. According to Burckhardt, compared to the species number, the diversity of psyllid galls is surprisingly large. In some cases, the type and shape of galls is relatively constant within a genus, while in others it varies considerably. Gullan *et al.* state that just over 50% of gall-inducing scale insects induce covering galls.

A detailed treatment on the gall-inducing heteropterans is provided by Schaefer. According to Korotyaev *et al.*, the extensive distribution of species of case-bearing Lepidoptera and Chrysomelidae and a variety of habits involving diverse morphological adaptations, suggest that the holometabolous insects with chewing larval mouthparts use their own facilities for purposes of mechanical defence and food. Yukawa and Rohfritsch point out an interesting phenomenon that the synchronization of adult emergence with host plant phenology is a critical event for survival of gall midges. Roskam gives a review on recent insights into the phylogenetic arrangement of the Cecidomyiidae and some lower categories within Diptera.

Korneyev *et al.* reveal that about 5% of the 4300 described species of Tephritidae is cecidogenous, thus making tephritids the second most important gall-inducing dipteran family after Cecidomyiidae. According to Bruyn, the basic pattern of gall development seems to be rather uniform in Chloropidae. Dempewolf gives an account on the dipteran leaf miners and states that the ability of vigorous feeding can thwart gall development, except for plants that respond with extraordinary activity.

Miller states that the definition of lepidopteran galling needs refinement to enable distinct separation of galling from wounding. Gall induction in Lepidoptera appears to have evolved independently many times. Roininen *et al.* deal with the biology, ecology and evolution of gall-inducing sawflies and state that the ability to induce galls has apparently evolved 6–10 times in sawflies. According to Wharton and Hanson (chapter 17), phytophagy in Braconidae is a recently documented phenomenon and the few species known to be phytophagous are all gall-inducers. LaSalle provides a synopsis of the gall inducers in Chalcidoidea and states that two main evolutionary trends can be seen. First, gall induction arose on many different occasions in the Chalcidoidea. Second, at least three evolutionary pathways have led to gall induction. The Ficus–agaonid wasp association is a classic example of mutualism and co-evolution state (Kjellberg *et al.*, chapter 19 on fig-pollinating wasps (Agaonidae)).

Csoka *et al.* state that cynipid gall wasps are derived from parasitoid ancestors, and initially induced galls on herbs. A unique, little known mutualistic association between gall flies of the family Fergusoninidae (Diptera) on Myrtaceae is described by Taylor *et al.* Within the mutualism, the nematodes appear responsible for induction of galls on which the developing fly larvae feed, and the fly allows dispersal of the nematodes.

Hanson and Laurito explain that there are 290 cecidomyiid species/1000 sq. km in Costa Rica versus 66–143 in the north temperate latitudes, and the average ratio of cecidomyiid species to plant species may be slightly greater in certain warm, temperate regions than in the wet tropics. Fernandes *et al.* found a strongly positive correlation between gall richness and habitat hygrothermal and nutritional stress, independent of latitude and altitude. According to Muniappan and McFadyen, high degree of host specificity of gall inducers is frequently advantages, but in some cases it contributed to the failure of establishment due to genotypic differences in host plants.

Beiderbeck deals with the dual aseptic culture of gall-inducing arthropods and their host plants, and concludes that the results suggest that the arthropod-induced gall formation is not linked to gene transfer from arthropods to plant tissues. In the last chapter (chapter 26), Schaefer *et al.* state that although galls occur in great abundance and variety, the ability to induce galls has arisen relatively rarely among the major phyletic lines of arthropods.

All the chapters are well illustrated with photographs and figures. These two volumes are authentic reference books. It reflects the rich experience of the authors in the studies of galls and the galling arthropods. Each chapter is written by competent experts and it is a real pleasure to go through these interesting chapters. All those interested in galls and their associated arthropods will find this book useful. This compendium of scientific chapters would be a valuable addition to any plant or animal science library.

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