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Why A Gall Former can be a Good Biocontrol Agent: the Gall Wasp *Trichilogaster acaciaelongifoliae* and the Weed *Acacia longifolia* [1]

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Abstract

1. The pteromalid *Trichilogaster acaciaelongifoliae* causes galls to develop in the place of inflorescences during the reproductive phase of its host *Acacia longifolia*. After being introduced to South Africa during 1982 and 1983, this wasp reduced the reproductive potential of *A. longifolia* by >89% when only 50% of the branches on a tree were galled. In addition, vegetative growth of galled branches was reduced by 53% when the vacated galls had desiccated.

2. The wasp is able to manipulate its host so effectively because: (a) the dry mass of developing galls was significantly greater than that of the corresponding reproductive organs, peaking in spring (September) when galls were 25 times the mass of unfertilised inflorescences. (b) The large biomass diverted to gall production is accounted for by a high proportion (66 - 73%) of multiple-chambered galls. The dry mass of multiple-chambered galls was significantly greater than that of both single-chambered galls and pods. (c) The extent of biomass diversion to gall production was relatively greater during the earlier part of the reproductive season, enhancing stress on the host. (d) The wasp sometimes forced the plant to produce up to 200% more galls per branch than the normal quota of inflorescences. This phenomenon, called forced commitment, further increases stress on the host plant. (e) Galls constituted up to 21% and 40% of the dry and wet biomass of above-ground parts of infested trees, respectively. This caused breakage and mortality of large branches and stems. (f) Reproduction in *A. longifolia* has been shown elsewhere to be so energy consuming that vegetative growth is strongly inversely related to pod production. Because the stress from galling by *T. acaciaelongifoliae* coincides with and replaces reproduction with a greater stress, successful reduction of both reproduction and vegetative growth are achieved.

3. This biological control programme is the first in which a gall-forming hymenopteran has been used to control a weed. Since the effects of gall-formers are indirect compared with those of insects attacking vegetative plant parts, their potential as biocontrol agents has been underrated. This research provides ecologically based guidelines for the future selection of such agents.

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