The IRA and getting the result you want

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The current ‘quagmire’ of plant defence theories does little to assist the practitioners of classical biological control in the assessment, selection and interpretation of host feeding trials. The plethora of defence theories probably arose from a reductionist experimental approach across a wide variety of plant growth forms. Recent risk assessments of invasive species in forest ecosystems have offered a macroecological explanation of insect–plant interaction that is contrary to accepted plant defence hypotheses. The Island Resource Allocation (IRA) hypothesis provides a strong insight into how ecosystems function and as such can successfully predict the palatability of plants within genera, the metapopulation of species and plant life stages. The IRA offers some predictors for the likely outcome of classical biological control of target species in different ecosystems.

Microclimate effects on biological control: water hyacinth in South Africa

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Low temperatures are repeatedly blamed for limiting the establishment of new biological control agents. Where successful establishment does take place, adequate control is often not achieved because of insufficient thermal accumulation. This scenario prevails in most water hyacinth biological control systems around South Africa. Microclimate was measured at 14 water hyacinth infestations distributed throughout South Africa’s climatic regions. Water temperature, air temperature within the weed canopy and ambient air temperature were recorded at half-hour intervals for 24 months. Correlated with monthly field measures encompassing a variety of plant and insect parameters, this high-data resolution allowed for accurate descriptions of the seasonality and respective population dynamics prevalent in the system. Current literature on the thermal physiology of both Neochetina weevils, however, did not match their developmental pattern recorded in the field. Different climatic regions were found to be distinct in terms of both plant and insect phenology, population size, structure and growth rate, insect damage and therefore the subsequent levels of biological control achieved. Microclimate data provided a more accurate prediction of establishment that is otherwise too coarse when modelled on more broad scale climatic data.