

Predicting How Fast and Invading Weed Biological Control Agent Will Disperse

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Abstract

We reviewed published dispersal data for 66 arthropod and 11 fungal pathogen weed biological control agents and we tested hypotheses regarding agent characteristics that were predicted to affect dispersal and whether agents that dispersed rapidly were more successful than those which dispersed only slowly. Dispersal rates varied by four orders of magnitude: the fastest agents dispersed several hundred kilometers per year and the slowest by only tens of meters per year. Approximately 30% of the arthropod agents and four of the 11 pathogen agents dispersed less than one kilometers per year, indicating that intensive redistribution is often required for rapid widespread establishment. Successful agents were equally likely to be fast or slow dispersers indicating that effort made redistributing slowly dispersing agents can often be beneficial.

Both pathogen and arthropod dispersal rates were positively correlated with voltinism. Arthropod dispersal also significantly varied according to fecundity, dispersal type (crawling or passive wind dispersal versus flight), taxon, life-style, habitat and the diversity of parasitoids attacking the agent in the native range. We conclude that a few parameters, measured prior to introduction of a biological control agent, could be used to predict how fast it is likely to invade a new environment. This should assist optimization of release strategies by determining the geographic scale at which to release agents, according to the agents' ability to rapidly close the gaps by natural dispersal.

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