

Harvesting Disrupts Biological Control of Leaf Beetles in Short-Rotation Coppice Willows

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Abstract Disturbances such as harvesting may interfere with the ecological processes that lead to biological control of insect pests. For willows, which are grown as short rotation coppice crops harvested every 3rd to 5th year, it has been suggested that high plant quality in the re-sprouting shoots after harvesting may explain observed high densities of herbivorous insects, especially leaf beetles (Coleoptera: Chrysomelidae), in the plantations. Here we show that generalist predators may be important as regulators of leaf beetle populations. All the three leaf beetle species, studied for five years in twelve plantations showed a negative correlation between the population growth rate from spring to fall and the abundance of the most common generalist predator *Orthotylus marginalis* (Heteroptera: Miridae). For the most abundant leaf beetle, *Phratora vulgatissima*, it was also found a significant positive correlation between its population growth rate and egg survival indicating an overall effect of predation on herbivore population growth. Harvesting, taking place during the winter had a negative effect on the abundance of leaf beetles and predators. However, the first year after harvesting, all three leaf beetle species regained this loss with a high population growth rate. A reason for the better ability of the herbivores to recover from the disturbance may be that they, unlike the predators, mainly overwinter outside the plantations. All three leaf beetle species peaked in density three years after harvesting whereas the density of generalist natural enemies increased or levelled off during the five year period after harvesting. It is concluded that predation by generalist predators is potentially important for population control of leaf beetles in willow coppice, but that the intermediate disturbance regime of around 5 years between harvests, appears to be too short to avoid disruption of biological control. Alternative harvesting regimes resulting in more efficient biological control in short rotation coppice systems may be a longer period between harvests that enables the predators to fully respond numerically, to leave natural enemies refuges at harvest, or to harvest adjacent plantations asynchronously.