

Biology and Management of the Insect *Philaenus Spumarius*. Identified as a Carrier of the Pathogen *Xylella Fastidiosa* that Seriously Affects Olive Trees in Europe

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The hemiptera *Philaenus spumarius* is a small-sized "extremely polyphagous" insect with a color ranging from light brown to completely black with dark spots. The hind legs are relatively long and jumpy and bear strong spines. It lays a total of 350-400 eggs and an average of 7 on each host plant. Eggs and larvae of *P. spumarius* are visible on its hosts in the spring from the foam created by the larvae in which they remain until they become adults. It was identified as an enemy of alfalfa in the U.S. and Canada and was subsequently identified to infect olives, grapes, almonds and citrus fruits. It has acquired a particular danger due to being the main European vector of an emerging bacterial phytopathogen of *Xylella fastidiosa* that threatens different crops but mainly the cultivation of olives in Italy and Spain, where it causes the Olive Quick Decline Syndrome (OQDS). It is a disease of olive trees that causes wilting of leaves, twigs and branches, resulting in the trees no longer producing olives. The insect's large host range suggests that it has the potential to spread *X. fastidiosa* between multiple hosts in any environment in which the fungus and the bacterium coexist. Understanding the movement of the vector (*P. spumarius*) is critical for developing effective control measures against the spread of the bacterium *X. fastidiosa*. *P. spumarius* was found to be able to fly $\approx$ 500 m in 30 min with a maximum individual flight of 5.5 km in 5.4 h. The flight potential of females was higher in Spring and Autumn than in Summer, and that of males was higher in Autumn. Furthermore, *P. spumarius* was found to have a greater flight potential in the morning and evening than in the afternoon. The reduction of *X. fastidiosa* is achieved indirectly by reducing the population of *P. spumarius*. In laboratory experiments, the application of pyrethroids (deltamethrin) and neonicotinoids (acetamiprid) resulted in 100% mortality of adult *P. spumarius* after 2 hours, while the effectiveness of natural pyrethrins was relatively low (12.5% after 4 hours). In contrast, the application of spinosad, sulfoxaflor and kaolin had no effect on the mortality of adult *P. spumarius*. Also, in the context of rational management of *P. spumarius*, the application of the push-pull method using *Anthriscus cerefolium* as a ground cover plant resulted in the attraction of females and an increase in egg-laying, however, it was unsuitable for the development of larvae.

Keywords: *Philaenus spumarius*; olive tree diseases; *Xylella fastidiosa* management; Olive Quick Decline Syndrome (OQDS).