Biological and Cultural Control
Section V

Biological Control of Two-Spotted Spider Mite on Hops

W. B. Strong and B. A. Croft
Department of Entomology, 2046 Cordley Hall,
Oregon State University, Corvallis, Oregon, 97331.

INTRODUCTION

Biological control of insects on hops is a desirable means of control due to loss of effective pesticides, development of insecticide resistance in pests, and public concern about pesticide residues. This research project was initiated in 1991 to study the potential of and develop biocontrol against Two-Spotted Spider Mites (TSSM), *Tetranychus urticae*, using phytoseiid predatory mites in the Willamette Valley of Oregon.

SURVEYS OF COMMERCIAL AND ESCAPED HOPS

These surveys were conducted in early, mid, and late-season in both 1991 and 1992. Leaves from commercial and escaped (unsprayed) hops were collected and examined for phytoseiids and TSSM. Overall, the phytoseiid incidence in commercial fields was variable; the majority were *Amblyseius fallacis* (Table 1). *Metaseiulus occidentalis*, a warm-weather species, was found only in 1992. In escaped sites phytoseiid numbers were more uniform between samples and years, the most common being *Typhlodromus pyri*, followed by a mixture of several other species. TSSM were found in commercial sites from low to high levels (up to 38 mites/leaf) despite miticide applications, whereas TSSM levels in unsprayed escaped hops rarely exceeded 1/leaf and never exceeded 3/leaf. It seems that biocontrol of TSSM using phytoseiids is possible and indications are that it will work even in commercial fields, if certain cultural and spray modifications are made.

REPLICATED BIOCONTROL STUDIES

A biocontrol experiment was conducted which tested the effect of releases of predators on spider mite numbers in commercial hops. Four species of predator were released: *A. fallacis, M. occidentalis, T. pyri,* and *Amblyseius andersoni*, alone or in combination. The trial was repeated on five farms. On 3 of the farms, biocontrol was deemed successful. Although mites were not controlled to low levels, they were maintained at levels well below the controls (no phytoseiids) (see Figure 1). On the other two farms, we were sprayed out before success could be determined.

Overall, *A. fallacis* had the most potential as a biocontrol agent, followed by *M. occidentalis*.

Table 1. Phytoseiids and TSSM levels found in escaped and commercial hops in the Willamette Valley, Oregon.

	Commercial fields		Escaped sites	
	1991	1992	1991	1992
# leaves	5100	4600	700	1200
Mites/leaf	1.37+-1.43	1.63+-1.70	.24+-.07	.96+-.21
Phytoseiids/sample	1.02+-.67	9.82+-5.48	4.70+-1.28	5.44+-2.14
Total *A. fallacis*	78	791	6	4
M. occidentalis	0	26	2	25
T. pyri	4	9	58	120
A. andersoni	0	0	2	38
Other	0	0	6	7

A mixture of the species may prove beneficial, since *A. fallacis* is a cool, wet-adapted species and *M. occidentalis* is a warm, dry-adapted species. There are strong indications that if released in a different manner (more frequent, smaller releases on the tops of every plant) they can provide control acceptable to a commercial grower. Whether this is feasible and economical remains to be seen.

Figure 1: Spider mite levels from Farm 2