ROLE OF INSECTS IN THE DEVELOPMENT OF ERGOT IN KENTUCKY BLUEGRASS GROWN FOR SEED IN THE PACIFIC NORTHWEST, 1997

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Abstract

The relationship of insects to the spread of ergot *(Claviceps purpurea)* is of particular concern since ergot is an important pathogen of Kentucky bluegrass. This is the second year of a survey conducted to evaluate insects active in fields producing Pacific Northwest Kentucky bluegrass *(Poa pratensis)* seed before harvest. Locations included the Rathdrum Prairie near Post Falls, Idaho, the Madras and Culver areas of central Oregon, and the La Grande and Imbler areas of the Grande Ronde Valley in northeast Oregon. Sample methods included use of sweep nets, Schun shaker, and black light collectors. A reference collection of insects by field and location was made for identification, along with a second collection on sticky cards using modified equipment to analyze individuals for the presence of ergot conidia.

Introduction

An understanding of the interactive dynamics of insect populations and their association with ergot, is essential to develop and evaluate control strategies. This is especially true in development of cropping systems where field ecological relationships may vary among production systems, including nonthermal residue management. This is the second year of a 3-year project to understand host insect interaction and other disease vector relationships.

During 1996, the project focused on conducting a survey of insects active in fields producing Pacific Northwest Kentucky bluegrass *(Poa pratensis)* seed from anthesis to harvest. This study provided an important baseline from which to compare future studies, both locally and regionally. This information was an essential prerequisite to understand the role of insects in current production systems in the Pacific Northwest. The effect of alternative management approaches, e.g., nonthermal, on insect population and species abundance was unknown. Of particular concern is the effect of nonthermal management on populations of economically important insects which impact the crop directly, or indirectly as vectors of plant pathogens.

The objective for collection and identification of insects during 1997 was to collect individuals active in Kentucky bluegrass fields in the Pacific Northwest using traditional methods for identification purposes, and to collect a second group of individuals separately on sticky traps using modified equipment to prevent cross-contamination of ergot conidia between insects.

Methods and Materials

Nine Pacific Northwest Kentucky bluegrass fields were sampled to identify insects active in grass seed during flowering and to determine which of these carry ergot conidia. Samples were taken just before harvest from three Kentucky bluegrass seed fields at each of the three locations: Rathdrum Prairie, Central Oregon and the Grande Ronde Valley. Sampling methods included the use of sweep nets, Schun shakers, black light collectors and collection of panicles. Two collections were made at each site using traditional sweep nets, Schun shakers, and black lights, and a modified set of equipment to collect insects on 6 inch x 6 inch sticky cards. Sticky cards were used to prevent cross contamination and enabled individual insects to be evaluated for the presence of ergot conidia by Steven Alderman, plant pathologist with the National Forage Seed Production Research Center.

Samples were collected from three fields (cv. Shamrock, Midnight, and Plush) near Rathdrum Idaho on June 26-27, 1997, from three fields (cv. Sidekick, Nassau, and Ascot) near Imbler, Oregon on July 1-2, 1997, and from three fields (cv. Coventry, Georgetown, and Merit) in central Oregon on July 7-11, 1997.

Insect sweeps were taken with a standard insect net and also with a sticky trap mounted inside a cylinder-shaped 1/4 inch mesh screen. Four replications of 20 sweeps were taken in the four quadrants of each field. Samples were stored in a cooler until being placed in a freezer to kill and preserve the insects. A representative series of each insect type was pinned and identified with the field and date of collection.

Schun shakers with methyl ethyl ketone were used to collect smaller insects from grass heads and foliage. Grass samples, consisting of 2 ft^2 grass, were taken from each of the four quadrants of the fields and placed in a Shun shaker. Insects were collected in a jar at the base of one Shun shaker, then transferred to vials containing ethyl alcohol. A second set of grass samples was placed in a modified Shun shaker with a sticky trap placed at the bottom of the straight-sided shaker. All samples were frozen to kill the insects and preserve them until processing. Insects were identified, and the number of each insect type was recorded.

One hundred panicle samples of grass were collected from each field. After samples were air dried, the number of panicles with honeydew and sclerotia and the total number of sclerotia per sample were recorded.

A black-light moth trap with a pest strip fumigant was placed near the center of each field at dusk to collect night-flying moths. Two sticky straps were hung around the perimeter of each black-light trap. Moths were taken from the black-light traps in the morning and stored in a freezer until mounting. Moth identification was conducted by Paul Hammond, contract researcher associated with Oregon State University, Department of Entomology.

Results and Discussion

Table 1 lists the order, family, common name and characteristics of insects collected by sweeps across the sampling area. Insects from twenty-one insect groups were collected during the 1997 season, compared to 32 during the 1996 season. In part this may be accounted for by having two sampling dates during 1996 (at the beginning of anthesis and just before harvest), compared to a single sampling date (just before harvest) in 1997. Insects considered economic pests on crops in collection areas included lygus (Hemiptera, Miridae), aphids (Homoptera, Aphididae), leafhoppers (Homoptera, Cicadellidae), thrips (Thysanoptera, Thripidae), cutworm moths (Lepidoptera, Noctuidae), and pyralid moths (Lepidoptera, Pyralidae). None of the collected insects were generally considered to be economically important on Kentucky bluegrass during flowering. Thrips have been an isolated problem during flowering, aphids numbers can build during the spring, and there are some isolated concerns about sod webworm.

Beneficial insects collected were ladybird beetles (Coleoptera, Coccinellidae) minute pirate bugs (Hemiptera, Anthocoridae), big-eyed bugs (Hemiptera, Lygaeidae), damsel bugs (Hemiptera, Nabidae), parisitic wasps (Hymenoptera, Ichneumonidae), and damsel flies (Odonata, Coenagrionidae). With changes in management practices in Kentucky bluegrass, there is potential for changes in the spectrum of pests and insect ecology found in the Pacific Northwest.

Insects collected from sweeps are identified by location and field cultivar (Table 2). Insect found at all locations were flies (Diptera), leafhoppers (Homoptera, Cicadellidae), and beneficial parasitic wasps (Hymenoptera, Ichneumonidae). Predatory big-eyed bugs (Hemiptera, Lygaeidae) were found at six locations across the three areas but more commonly in Oregon than Idaho. Plant bugs (Hemiptera, Miridae, Monosynamma and Stenodema) were found at five of six locations across the Rathdrum Prairie and Grand Ronde Valley, but not in central Oregon. Aphids (Homoptera, Aphididae) were concentrated an the Rathdrum Prairie, but none were collected in the Grande Ronde Valley. The predaceous minute pirate bugs (Hemiptera, Anthocoridae) were found only on the Rathdrum Prairie, while predatory damsel bugs (Hemiptera, Nabidae) were collected only in central Oregon and the Grande Ronde Valley.

Insects collected with the Schun shaker were identified by location and field cultivar (Tables 3). Thrips were the dominant insect group in central Oregon and the Grande Ronde Valley. Leafhoppers were dominant in the Shamrock and Plush fields on the Rathdrum Prairie, with thrips dominant in the Midnight field. Aphid numbers were relatively low across all areas, with the largest number at the Georgetown field in Central Oregon.

Moths collected by black light were identified by location and field cultivar (Table 4). Six of the seven moths captured were functional grass-feeders. The herb-feeders were likely straying from other crops or weedy areas surrounding the grass field. The species ***Protagrotis obscura*** is a generalized cutworm that feeds on both grasses and herbs; it was present at all locations. ***P. obsura*** is often extremely abundant in agricultural lands throughout central and eastern Oregon,

but it is scarce or absent in natural habitats. Along with *Agroperina dubitans,* these were the only two species found at the three locations on the Rathdrum Prairie. The two Oregon locations had greater diversity in moth species. The species, *Xestia sinigram,* was only found at the Nassau location of the Grande Ronde Valley, while *Leucania farcta* only occurred in the Coventry field of central Oregon.

The number of egot sclerotia and honeydew per 100 panicle samples for each field was provided (Table 5). The highest levels of ergot were found in central Oregon, followed by those in the Rathdrum Prairie and the Grande Ronde Valley.

Table 1. Orders, families, common names, and characteristics of insects collected by sweeps, Schun shaker collection, and black lights in Kentucky bluegrass seed fields on the Rathdrum Prairie, in central Oregon, and in the Grande Ronde Valley, 1997.

Order	Family/Genus	Common Name	Characteristics
		Leaf beetles	
Coleoptera	Chrysomelidae		Many are serious pests
	Coccinellidae	Ladybird beetles	Adults, larvae are predaceous
Diptera		Flies	Mix of beneficials and pests
Hemiptera	Anthocoridae	Minute pirate bugs	Predaceous beneficials
	Lygaeidae	Seed bugs (big-eyed bugs)	Both predators and pests
	Miridae	Leaf or plant bug	Feed on plants, some serious pests
	Hoplomachus		
	Lygus	Tarnish Plant Bug	Pest on seed crops
	Megaloceroea		
	Monosynamma		
	Stenodema		
	Nabidae	Damsel bugs	Predators
	Scutelleridae	Shield bugs	Plant feeders
Homoptera	Aphididae	Aphids	Most serious pests, some vectors
	Cercopidae	Froghopper, Spittlebug	Can be pest on some crops
	Cicadellidae	Leafhoppers	Many serious pests, some vectors
	Delphacidae	Delphacid Planthoppers	Plant feeders
Hymenoptera	Ichneumonithe	Ichneumon wasps	Parasitic on many noxious insects
Lepidoptera	Pyralidae	Pyralid moths	Many pests of cultivated plants
	Noctuidae	Cutworms	Common pests of many crops
Odonata	Coenagrionidae	Damselflies	Predators
Thysanoptera	Thripidae	Thrips	Most economic pests

Table 2. Insects collected from sweeps of Kentucky bluegrass seed fields by location and field cultivar, 1997.

Order	Rathdrum Prairie, ID			Central OR			Grande Ronde Valley, OR		
Family	Shamrock	Plush	Midnight	Coventry	Merrit	Georgetown	Nassau	Ascot	Sidekick
Genus	6-26	6-26	6-27	7-7	7-11	7-8	7-1	7-2	7-2
Coleoptera									
Chrysomelidae			x				x		x
Coccinellidae		x	x	x			x		
Diptera	x	x	x	x	x	x	x	x	x
Hemiptera									
Anthocoridae	x	x							
Lygaeidae			x		x	x	x	x	x
Miridae									
Hoplomachus	x	x	x						
Lygus				x			x		
Megaloceroea	x	x	x						
Monosynamma	x	x	x				x	x	
Stenodema	x		x				x	x	x
Nabidae				x	x	x	x		x
Scutelleridae	x	x					x		x
Homoptera									
Aphididae	x	x	x			x			
Cercopidae			x	x					
Cicadellidae	x	x	x	x	x	x	x	x	x
Delphacidae				x	x				x
Hymenoptera									
Ichneumonidae	x	x	x	x	x	x	x	x	x
Lepidoptera									
Pyralidae	x	x	x			x		x	
Odonata									
Coenagrionidae								x	

Table3. Average number of insects collected from Schun shaker samples in seed fields of Kentucky bluegrass by location and field cultivar, 1997.

	Rathdrum Prairie, ID			Central OR			Grande Ronde Valley, OR		
Order	Shamrock	Plush	Midnight	Coventry	Merrit	Georgetown	Ascot	Nassau	Sidekick
Family	6-26	6-26	6-27	7-7	7-11	7-8	7-1	7-2	7-2
Diptera	1	1	1	2	1	1	1	1	1
Homoptera									
Aphididae	3	2	0	2	2	11	1	1	1
Cicadellidae	71	38	4	3	4	6	39	25	9
Thysanoptera									
Thripidae	17	21	39	23	14	85	62	72	11

Table 4. Noctuid moths collected from black light traps in Kentucky bluegrass seed fields by location and field cultivar during the 1997 season.

Genus species	Characteristic	Rathdrum Prairie, ID			Central OR			Grande Ronde Valley, OR		
		Shamrock	Plush	Midnight	Coventry	Merrit	Georgetown	Ascot	Nassau	Sidekick
		6-26	6-26	6-27	7-7	7-11	7-8	7-1	7-2	7-2
Agroperina dubitans	grass feeder	x	x	x						
Aletia oxygala	grass feeder								x	x
Apamea amputatrix	grass feeder									x
Crymodes devastator	grass feeder				x		x		x	
Leucania farcta	grass feeder				x					
Protagrotis obscura	grass feeder	x	x	x	x	x	x	x	x	x
Xestia dolsa	herb feeder								x	

Table 5. The number of ergot sclerotia and panicles with ergot and honeydew per 100 panicle samples from each of the collection sites, 1997.

	Total sclerotia per sample		Total panicles per sample			
	Ergot		Ergot		Honeydew	
Rathdrum Prairie, Idaho						
Shamrock	20	a	12	b	7	b
Plush	65	a	26	ab	32	b
Midnight	151	a	55	a	0	b
Central Oregon						
Coventry	212	a	51	a	54	a
Merrit	122	a	49	a	64	a
Georgetown	3	a	1	b	0	b
Grande Ronde Valley, Oregon						
Ascot	42	a	21	ab	1	b
Nassau	82	a	31	ab	22	b
Sidekick	4	a	2	b	0	b