radius), 6 ft within a patch, 4 ft within a patch, 2 ft within a patch, at the border of the patch and healthy wheat, and 10 ft into healthy wheat (i.e., no bare patch within a 10-ft radius.

Results strongly suggest that wheat roots do not extract soil water from within Rhizoctonia bare patches (Fig. 1). Healthy spring wheat growing 10 ft from the nearest bare patch had used significantly more soil water than wheat on the border of a patch on both June 7 and July 16 measurement dates. Similarly, soil water content at the border of patches was significantly lower than from within the patch. Water content within patches was the same regardless of location of the access tube within the patch. Note that wheat did not extract soil water even from just 2 ft inside the border (Fig. 1). This experiment is being repeated in 2004.

*MAPPING RHIZOCTONIA BARE PATCH DISEASE IN DIRECT-SEEDED CROPPING SYSTEMS

Bill Schillinger, Harry Schafer, Tim Paulitz, and Jim Cook
WSU and USDA-ARS

The soil-borne fungus *Rhizoctonia solani* AG-8 is a major concern for farmers who practice direct seeding (i.e., no-till) in the inland Pacific Northwest. Bare patches caused by Rhizoctonia first appeared in 1999 during year 3 of a long-term direct-seed cropping systems experiment on the Ron Jirava farm near Ritzville, Washington (11.5 inch annual precipitation). The extent and pattern of patches were mapped each year from 1999-2003 at the 20-acre study site with a backpack-mounted global positioning system equipped with mapping software. The average percentage area of bare patches ranged from 7.5% in 1999 to 11.7% in 2002. Comparison of patterns over years show that some patches increased in size, new patches formed, and some patches disappeared. Bare patches appeared each year in winter and spring wheat, spring barley, yellow mustard, and safflower. Crop rotation had no effect on the occurrence of bare patches caused by Rhizoctonia during the first five years of the experiment, but continuous annual spring wheat had significantly greater area with bare patches compared to spring wheat following spring barley in a 2-yr rotation in 2002 and 2003. Research is underway or planned to determine why some bare patches disappear with time and on management practices to help alleviate the severity of the disease.

*HOW CAN I MISS YOU WHEN YOU WON'T GO AWAY? POST-HARVEST MANAGEMENT OF RUSSIAN THISTLE IN SPRING WHEAT

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We have completed four years of research at the WSU Dryland Research Station at Lind on post-harvest management of Russian thistle in continuous annual spring wheat. Our study compares three post-harvest Russian thistle control treatments. These treatments are: 1) Surefire herbicide (paraquat + diuron) at 24 to 32 ounces/acre applied 7-10 days after wheat harvest; 2) tillage with overlapping adjustable-pitch 32-inch-wide V-blade undercutter sweeps on 28-inch centers conducted 7-10 days after wheat harvest, and; 3) check (do nothing, let the Russian thistles grow). Measurements are: Soil water to a depth of six feet at wheat harvest, after killing frost in the fall, and again in early spring; above-ground Russian thistle dry matter, seed production, and germination at wheat harvest and after killing frost in the fall; and spring wheat grain yield. Experimental design is a randomized complete block with four replications.

To date, results show that tillage with a low-disturbance undercutter V-sweep is more effective than herbicide for post-harvest control of Russian thistle. The check (no control) is by far the least desirable of the three treatments. Use of the undercutter V-sweep results in a complete kill of all Russian thistle with absolutely no subsequent seed production (Table 1). With contact herbicide, some Russian thistle grow-back and/or escapes generally occur and seed production averaged over 4 years is more than 300 seeds per square meter (Table 1). The check treatment had a 4-year average of more than 5000 seeds produced per square meter. The check treatment had a significantly greater number of viable Russian thistle seeds (59%) compared to the herbicide treatment (35%) (Table 1).

Table 1. Soil water dynamics, Russian thistle growth and seed production, and subsequent spring wheat grain yield as affected by method of post-harvest Russian thistle control during four years at Lind, Washington.

		Soil Water (inches)			Russian Thistle				
Crop Year	Post-harvest control method	After harvest	After frost	Early spring	After harvest biomass (g/m^2)	After frost biomass (g/m^2)	Seeds (per m^2)	Germination (%)	Grain yield (bu./ac.)
1999-2000	Check	2.76	2.37 b	4.91	77	135 a	8857 a	56.0 a	17.2
	Herbicide	3.09	3.06 a	5.04	32	7 b	0 b	0 b	21.5
	Tillage	3.06	3.06 a	4.90	21	5 b	0 b	0 b	19.0
2000-2001	Check	2.35 b	2.50 b	3.32 b	161	174	1548 a	76.7 a	2.8 b
	Herbicide	3.40 a	3.20 a	3.20 b	243	189	148 b	55.2 a	7.8 a
	Tillage	3.66 a	3.16 a	4.50 a	244	180	0 b	0 b	12.0 a
2001-2002	Check	2.83 ab	2.28 b	5.54	102	---	---	---	8.6
	Herbicide	2.52 b	2.30 b	5.11	75	---	---	---	9.7
	Tillage	2.98 a	2.97 a	6.02	58	---	---	---	9.1
2002-2003	Check	2.18 c	2.23 c	6.84	133 a	162 a	5662 a	45.3 a	11.1 b
	Herbicide	2.47 b	2.64 b	6.93	124 a	108 b	785 b	49.5 a	11.6 b
	Tillage	2.89 a	3.09 a	7.20	71 b	43 c	0 b	0 b	14.8 a
Average	Check	2.53 c	2.35 c	5.15 b	118	157 a	5356 a	59 a	9.9 b
	Herbicide	2.87 b	2.80 b	5.07 b	119	101 b	311 b	35 b	12.6 a
	Tillage	3.17 a	3.07 a	5.66 a	99	76 b	0 b	0 c	13.7 a

Method of post-harvest Russian thistle control has had a significant effect on soil water status. Use of the undercutter V-sweep resulted in significantly more water in the 6-ft soil profile at time of wheat harvest, after killing frost in October, and in mid-March compared to the herbicide and check treatments (Table 1). Spring wheat grain yield averaged over 4 years was significantly less in the check (9.9 bu/ac) compared to the herbicide (12.6 bu/ac) and undercutter V-sweep (13.7 bu/ac) treatments (Table 1). This study will continue for at least two more years.

GREENHOUSE STUDIES OF RHIZOCTONIA BARE PATCH DISEASE IN SOILCORES FROM DIRECT-SEEDED FIELDS

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USDA-ARS and WSU

Rhizoctonia bare patch, caused by the soilborne fungus *Rhizoctonia solani* AG-8, can be a problem in direct-seeded small grains in rainfed areas of the inland Pacific Northwest. Plants within patches are extremely stunted. The purpose of this work was to 1) compare *Rhizoctonia* populations at different positions within the patch and at different soil depths and 2) to see if patches would be maintained in the *R. solani*-infested cores over successive plantings in the greenhouse. Eight patches were sampled at two locations near Ritzville and Starbuck, WA. Soil cores (6 x 10 inches) were removed from the four positions within each patch- center, inside edge of the patch boundary, outside edge, and outside (healthy plants). Cores were planted with

HOW CAN I MISS YOU WHEN YOU WON'T GO AWAY? POST-HARVEST MANAGEMENT OF RUSSIAN THISTLE IN SPRING WHEAT

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We have completed four years of research at the WSU Dryland Research Station at Lind on post-harvest management of Russian thistle in continuous annual spring wheat. Our study compares three post-harvest Russian thistle control treatments. These treatments are: 1) Surefire herbicide (paraquat + diuron) at 24 to 32 ounces/acre applied 7-10 days after wheat harvest; 2) tillage with overlapping adjustable-pitch 32-inch-wide V-blade undercutter sweeps on 28-inch centers conducted 7-10 days after wheat harvest, and; 3) check (do nothing, let the Russian thistles grow). Measurements are: Soil water to a depth of six feet at wheat harvest, after killing frost in the fall, and again in early spring; above-ground Russian thistle dry matter, seed production, and germination at wheat harvest and after killing frost in the fall; and spring wheat grain yield. Experimental design is a randomized complete block with four replications.

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