

b. Texas demonstration sites

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Summary

Aphids, Aphids' natural enemies, and weeds data were collected and evaluated for four demonstration sites in the Texas Panhandle during the 2003-2004 growing season. Sampled crops were cotton (one field in Deaf Smith County) sorghum (one field in Hutchinson County), and wheat (three fields: Deaf Smith, Ochiltree, and Swisher Counties). Wheat was not sampled at Swisher County demonstration site from late fall to late spring because of heavy grazing and drought. However, there was sufficient rainfall during the late spring and wheat sprouted and was sampled there after. Wheat at the Ochiltree County demonstration site was wiped out by a hail storm in mid-May and was not sampled there after. Soil and weather data have been collected for all demonstration sites. Densities of aphids, aphids' natural enemies and weeds were summarized as total, maximum, and average for field, Berlese, and sweepnet samples for three wheat fields; and field samples for cotton and sorghum fields throughout this report.

Along with species data collection at areawide IPM demonstration sites in the Texas Panhandle, applicability of remote sensing techniques was evaluated for bird cherry-oat aphid, Russian wheat aphid, and greenbug densities and damage estimations. Aphid and remote sensing data were collected at demonstration sites in Texas, Oklahoma, and Colorado. The major findings of this work are given throughout this report. Three papers from this study were presented at the scientific meetings and at least two papers will be presented in the near future. In addition, at least three publications will be submitted to scientific journals. One manuscript is in preparation and two manuscripts will be written by the summer of 2005.

Deaf Smith County Wheat Demonstration Site: Wheat-fallow-wheat or wheat-fallow-alternative summer crop rotation.

Densities of bird cherry-oat aphid and greenbug started to build up in early fall of 2003, reached the highest amount in January and February of 2004 (Table 1 and 3), and declined during the rest of the growing season. Although there were high amount of bird cherry-oat aphid and greenbug, damage symptoms in wheat were not noticed. Other aphids, in particular rice root aphid, were found from fall 2003 to early spring 2004 but density of rice root aphid never reached a noticeable amount in this field. From early spring to harvesting, Russian wheat aphid infested this field (Table 1 and 3) and patches or hot spots of infestation were noticed by naked eye. In other words, Russian wheat aphid density exceeded the economic threshold value and reduced wheat yield in those patches when compared to un-infested wheat. Remote sensing and Russian wheat aphid data were collected in those infested wheat patches as well as un-infested wheat and briefly discussed in remote sensing section of this report. Natural enemies of aphid (lady

Table 2: Density of beneficial insects in sweepnet samples at the Deaf Smith County wheat demonstration site in 2003-2004, by date.

Sampling Dates	Nabids			Spiders			Convergent Lady Beetles			7-Spotted Lady Beetles			Lady Beetle Immatures			Green Lacewings			Brown Lacewings			Orius		
	T	M	A	T	M	A	T	M	A	T	M	A	T	M	A	T	M	A	T	M	A	T	M	A
03.30.2004	19	5	0.76	5	1	0.20	5	1	0.20	1	1	0.04	.	.	.	9	3	0.36	.	.	.	1	1	0.04
04.19.2004	3	1	0.12	10	1	0.40	5	1	0.20	.	.	.	24	4	0.96	2	1	0.04	.	.	.	.	.	.
05.07.2004	55	8	2.20	31	4	1.24	23	6	0.92	.	.	.	1	1	0.04	.	.	.	1	1	0.04	14	3	0.56
05.17.2004	176	22	7.04	22	3	0.88	33	12	1.32	2	1	0.08	10	8	0.40	.	.	.	1	1	0.04	5	2	0.20
06.02.2004	7	3	0.28	33	7	1.32	4	2	0.16	.	.	.	.	.	.	1	1	0.04	.	.	.	8	3	0.32

T: Total number of beneficial insects collected by 25, 180 degree sweeps distributed throughout the field at the sampling dates. **M:** Maximum number of beneficial insects at one of the 25, 180 degree sweeps at the sampling dates. **A:** Mean number of beneficial insects for the 25, 180 degree sweeps at the sampling dates. **.**: Beneficial insects were not found at the sampling dates.

Table 3: Density of aphids in Berlese samples at the Deaf Smith County wheat demonstration site in 2003-2004, by date.

Sampling Dates	Number of Tillers			Bird Cherry-oat Aphids			Greenbugs			Russian Wheat Aphids		
	T	M	A	T	M	A	T	M	A	T	M	A
10.27.2003	550	63	22	.	.	.	22	5	0.88	.	.	.
12.02.2003	1699	105	67.96	300	44	12.50	44	19	4	.	.	.
01.13.2004	1856	131	74.24	699	53	28	1194	148	51.91	.	.	.
02.06.2004	2845	176	113.80	377	67	15.08	3262	265	130.48	.	.	.
03.30.2004	2990	170	119.60	400	56	16	1608	187	64.32	.	.	.
03.30.2004	1845	113	73.80	14	14	0.56	32	32	1.28	.	.	.
04.19.2004	2483	426	99.32	27	7	1.08	81	12	3	7	1	0.30
05.07.2004	1427	89	57.08	2	1	0.08	27	5	1.08	84	26	3.40
05.17.2004	1333	94	53.32	11	3	0.44	.	.	.	537	132	21
06.02.2004	1588	89	63.52	28	7	1.12	27	7	1.08	476	76	18.96

T: Total number of individual aphids collected from 25, 1-row-foot wheat samples distributed throughout the field at the sampling dates. **M:** Maximum number of individual aphids at one of the 25, 1-row-foot wheat samples at the sampling dates. **A:** Mean number of individual aphids for the 25, 1-row-foot wheat samples. **.**: Aphids were not found at the sampling dates.

Deaf Smith County Cotton Demonstration Site: Wheat-fallow-wheat or wheat-fallow-alternative summer crop rotation.

Low numbers of cotton aphid and beneficial insects were found in cotton field (Table 4). These low numbers of insects in cotton might be related to the weather conditions because the Texas Panhandle had an unusually wet summer in 2004. Field bindweed and pigweed patches were found in the field and Johnsongrass, crested wheatgrass, and jointed goatgrass were common at the field borders.

Table 4: Densities of aphids, beneficial insects, and weeds collected by leaves, plants or square meter sampling at the Deaf Smith County cotton demonstration site in 2004, by date.

Sampling Dates	Growth Stages	Cotton Aphids			Cotton Fleahoppers			Grasshoppers			Thrips			Spiders			Convergent Lady Beetles			Cotton Bollworms			Green Lacewings			Field Bindweed			Pigweeds		
		T	M	A	T	M	A	T	M	A	T	M	A	T	M	A	T	M	A	T	M	A	T	M	A	T	M	A			
06.22.2004	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6	2	0.24	.	.	.	.	.	.	.	8	8	0.32	45	7	12
07.05.2004	4	.	.	.	.	.	.	.	.	.	.	.	.	5	2	0.72	20	2	0.80	.	.	.	.	.	.	10	10	0.40	50	10	2
08.03.2004	4	26	12	1.04	.	.	.	.	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6	6	0.24	26	10	1	
08.23.2004	4	117	19	4.68	3	3	0.12	25	6	1	67	15	2.68	2	1	0.08	13	3	0.52	.	.	.	7	3	0.28	.	.	.	17	6	.68
09.17.2004	5	16	7	0.64	15	12	0.60	105	11	4.12	.	.	.	1	1	0.04	2	1	0.08	30	3	0.12	3	1	0.12	.	.	.	18	6	.72

T: Total number of individual insects and weeds for 25 samples at the sampling dates. **M:** Maximum number of individual insects and weed at one of the 25 sampling points at the sampling dates. **A:** Mean number of individual insects and weed for the 25 sampling points. **.**: Species were not found at the sampling dates.

Ochiltree County Wheat Demonstration Site: Wheat-fallow-wheat rotation.

Sampling dates, growth stages, population dynamics of species found in this field are presented in Tables 6-8. Greenbug and bird cherry-oat aphid were found at all growth stages. Rice root aphid was another common species with low density in this field. Beneficial insects were found in low numbers in this field. Brome spp. were found in the field and field border as well. Other weed species found at the field borders were crested wheatgrass, jointed goatgrass, and Johnsongrass.

Table 6: Densities of aphids, beneficial insects, and weeds collected by tiller, row or square meter sampling at the Ochiltree County wheat demonstration site in 2003-2004, by date.

Sampling Dates	Growth Stages (Zadoks Scale)	Bird Cherry-oat Aphids			Greenbugs			Russian Wheat Aphids			Other Aphids			Gold Mummies			Spiders			Convergent Lady Beetles			7-Spotted Lady Beetles			Brome spp.		
		T	M	A	T	M	A	T	M	A	T	M	A	T	M	A	T	M	A	T	M	A	T	M	A	T	M	A
11.24.2003	24	217	32	2.17	52	15	0.52	.	.	.	65	21	0.65	.	.	.	.	.	.	1	1	0.01	.	.	.	.	.	.
01.12.2004	26	672	25	6.72	993	58	9.93	.	.	.	98	10	0.98	4	1	0.04	.	.	.	.	.	.	1	1	0.01	.	.	.
01.30.2004	28	391	23	3.91	749	46	7.49	.	.	.	29	10	0.29	8	2	0.08	.	.	.	.	.	.	.	.	.	.	.	.
02.20.2004	30	146	14	1.46	828	54	8.28	.	.	.	1	1	0.01	.	.	.	.	.	.	9	3	0.09	1	1	0.01	.	.	.
03.12.2004	30	295	30	2.95	458	32	4.58	.	.	.	14	3	0.14	167	13	1.67	3	1	0.03	36	3	0.36	13	2	0.13	1	1	0.01
03.26.2004	31	264	30	2.64	373	32	3.73	29	15	0.29	3	1	0.03	157	13	1.57	2	1	0.02	26	3	0.26	10	2	0.10	.	.	.
04.16.2004	45	.	.	.	1	1	0.01	.	.	.	.	.	.	82	5	0.82	13	2	0.13	3	1	0.03	.	.	.	14	7	0.14
05.05.2004	N/A	.	.	.	16	16	0.16	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	0.01

T: Total number of individual aphids, beneficial insects, and weeds from 100 tillers, 25, 1-row-foot, and 100 square meter samples, respectively at the sampling dates. **M:** Maximum number of individual aphids counted on one of the 100 tillers, beneficial insects collected in one of the 25, 2-ft wheat row, and weed in one of the 100, 1 m² areas at the sampling dates. **A:** Mean number of individual aphids, beneficial insects, and weed from the 100 tillers, 25, 1-row-foot, and 100 square meter samples, respectively at the sampling dates. **.**: Species were not found at the sampling dates. **N/A:** Not applicable because wheat was destroyed by a hail storm.

Table 7: Density of beneficial insects in sweepnet samples at the Ochiltree County wheat demonstration site in 2003-2004, by date.

Sampling Dates	Nabids			Spiders			Lady Beetle Immatures			Green Lacewings			Lacewing Larvae			Orius		
	T	M	A	T	M	A	T	M	A	T	M	A	T	M	A	T	M	A
04.16.2004	6	2	0.24	8	1	0.32	144	12	5.76	1	1	0.04	.	.	.	4	1	0.16
05.05.2004	20	5	0.48	22	4	0.88	.	.	.	1	1	0.04	4	1	0.16	8	3	0.32

T: Total number of beneficial insects collected by 25, 180 degree sweeps distributed throughout the field at the sampling dates. **M:** Maximum number of beneficial insects at one of the 25, 180 degree sweeps at the sampling dates. **A:** Mean number of beneficial insects for the 25, 180 degree sweeps at the sampling dates. **..:** Beneficial insects were not found at the sampling dates.

Table 8: Density of aphids in Berlese samples at the Ochiltree County wheat demonstration site in 2003-2004, by date.

Sampling Dates	Number of Tillers			Bird cherry-oat Aphids			Greenbugs			Russian Wheat Aphids		
	T	M	A	T	M	A	T	M	A	T	M	A
11.24.2003	1222	87	48.88	92	14	3.68	10	2	0.40	.	.	.
01.12.2004	2034	146	81.36	1081	107	43.24	744	81	29.76	.	.	.
01.30.2004	2384	154	95.36	763	105	30.52	2807	245	112.28	.	.	.
02.20.2004	2889	184	115.56	291	35	11.64	1681	163	67.24	.	.	.
03.12.2004	1961	122	78.44	610	83	24.40	1045	212	41.80	.	.	.
03.26.2004	2324	175	92.96	399	49	16	654	61	26.16	41	7	1.60
04.16.2004	2180	116	87.20	62	43	2.48	9	3	0.36	45	12	1.80
05.05.2004	2180	116	87.20	62	43	2.48	9	3	0.36	.	.	.

T: Total number of individual aphids collected from 25, 1-row-foot wheat samples distributed throughout the field at the sampling dates. **M:** Maximum number of individual aphids at one of the 25, 1-row-foot wheat samples at the sampling dates. **A:** Mean number of individual aphids for the 25, 1-row-foot wheat samples. **..:** Aphids were not found at the sampling dates.

Swisher County Wheat Demonstration Site: Continuous wheat and grazing.

Greenbug and bird cherry-oat aphid were found in low numbers in fall 2003 but were not in the field in late spring and early summer of 2004 when high densities of Russian wheat aphid occurred (Tables 9-11). Densities of beneficial insects found in this field were low. Common weed species found in this field were field bindweed and lamb’s-quarter. At the field borders, Johnsongrass, crested wheatgrass, and jointed goatgrass were found.

Table 10: Density of beneficial insects in sweepnet samples at the Swisher County wheat demonstration site in 2003-2004, by date.

Sampling Dates	Nabids			Spiders			Convergent Lady Beetles			7-Spotted Lady Beetles			Lady Beetle Immatures			Orius		
	T	M	A	T	M	A	T	M	A	T	M	A	T	M	A	T	M	A
05.06.2004	24	5	0.96	17	3	0.68	6	2	0.24	1	1	0.04	7	2	0.28	2	2	0.08
05.27.2004	12	3	0.48	8	2	0.32	45	6	1.8	8	2	0.32	33	7	1.32	.	.	.
06.07.2004	29	5	1.16	10	3	0.4	51	8	2.04	3	1	0.12	62	7	2.48	3	1	0.12

T: Total number of beneficial insects collected by 25, 180 degree sweeps distributed throughout the field at the sampling dates. **M:** Maximum number of beneficial insects at one of the 25, 180 degree sweeps at the sampling dates. **A:** Mean number of beneficial insects for the 25, 180 degree sweeps at the sampling dates. **∴** Beneficial insects were not found at the sampling dates.

Table 11: Density of aphids in Berlese samples at the Swisher County wheat demonstration site in 2003-2004, by date.

Sampling Dates	Number of Tillers			Bird Cherry-oat Aphids			Greenbugs			Russian Wheat Aphids		
	T	M	A	T	M	A	T	M	A	T	M	A
10.20.2003	885	71	35.4	.	.	.	68	12	2.72	.	.	.
11.09.2003	1273	90	50.92	23	4	0.92	3	2	0.12	.	.	.
05.06.2004	579	34	23.16	7	3	0.28	.	.	.	191	36	7.64
05.27.2004	774	68	30.96	.	.	.	.	.	.	5205	450	208.20
06.07.2004	420	27	16.8	.	.	.	.	.	.	1012	109	40.48

T: Total number of individual aphids collected from 25, 1-row-foot wheat samples distributed throughout the field at the sampling dates. **M:** Maximum number of individual aphids at one of the 25, 1-row-foot wheat samples at the sampling dates.

A: Mean number of individual aphids for the 25, 1-row-foot wheat samples.

∴ Aphids were not found at the sampling dates.

Acknowledgements

Our thanks to Roxanne Bowling, Vanessa Carney, Lana Castleberry, Johnny Bible, Bob Villarreal, Joy Newton, and Daniel Jimenez for their technical support and data collection.