

Project Title: Evaluation of Spring Wheat Varieties for Resistance to the Orange Wheat Blossom Midge (OWBM).

Project Leader: Bob Stougaard

Project personnel: Qingwu Xue, Luther Talbert, and Susan Lanning

Objectives: To evaluate spring wheat varieties for agronomic performance and resistance to damage from the OWBM.

Results:

Twenty commercially available spring wheat varieties were evaluated as a subset within the Advanced Yield Trial to assess resistance to the OWBM. The previous crop was alfalfa and the field was fertilized with 21-30-60-24 lb/A of N-P-K-S, respectively. The soil type was a Creston silt loam (25-50-25) with an organic matter content of 4%, a pH of 7.5, and a CEC of 20 meq/100g. The experimental design was a randomized complete block with three replications. The spring wheat varieties were planted on May 8, 2008 at a rate of 78 lb/A to a depth of 1.5 inches. Each plot was 15 foot long and consisted of 7 rows, spaced 6 inches apart.

Heading and pollination (anthesis) were recorded when 50 percent of the plants in a plot had reached the corresponding growth stage. Exposure duration (ED) was calculated as the difference between the two dates and represents the susceptible period for midge damage to occur. Height measurements were recorded on July 24, 2008. Three randomly selected spikes were collected on August 19. Each spike was dissected and the number of larvae, damaged kernels and healthy kernels were determined. Plots were harvested on September 15, 2008. Grain yield, test weight, and moisture were determined in each plot, while protein and falling numbers were determined from a composite sample of all three replications.

Cool temperatures persisted throughout much of the growing season and delayed plant development. The average Julian heading date for the nursery was 188 (July 7) and varied by six days with Volt heading last on July 12 (Table 1). Anthesis (flowering) began about six days after heading and averaged 195 Julian days. The ED averaged about 6 days, and ranged from a high of 8 days for Choteau and Corbin, to a low of 4 days for Outlook and Volt. While plant developmental rates varied among the varieties, there did not appear to be any relationship between plant phenology and midge infestation.

Midge densities were very high and averaged 85 larvae per spike. Larvae numbers ranged from a low of 13.2 for MT 0415 to a high of 193.7 for MTHW0471, demonstrating that oviposition preference varies widely among spring wheat varieties. Not surprisingly, spring wheat yields were largely determined by damage from the midge (Figure 1). Yields averaged 38 bu/A,

ranging from a low of 17 bu/A for MTHW0471 to a high of 73 bu/A for MT 0415. There was no relationship between larvae per spike and the number collected as dockage.

Test weights averaged 58 lb/bu, and generally declined as larvae numbers increased ($r^2=0.36$). Protein concentrations were very high and averaged 17 percent. Protein ranged from a low of 15.5% for PF906408 to a high of 18.8% for Lillian, but there did not appear to be any relationship with midge density or yield. Likewise, falling numbers varied widely, ranging from a low of 47 for Vida to a high of 260 for Lillian. However, there was no relationship between midge densities and falling number values. Moreover, all varieties had values well below the minimum standard of 330.

Summary:

Yields were strongly affected by midge damage and there appears to great deal of variability with respect to oviposition preference among commercially available spring wheat varieties. Trends are emerging with respect to those entries that are susceptible (MTHW0471) and those which show resistance (MT 0414, Reeder).

Future Plans:

Continue spring wheat evaluations for the purpose of identifying cultivars with resistance to the orange wheat blossom midge.

Figure 1. Impact of OWBM larvae on spring wheat yield during 2008 at Kalispell, MT.

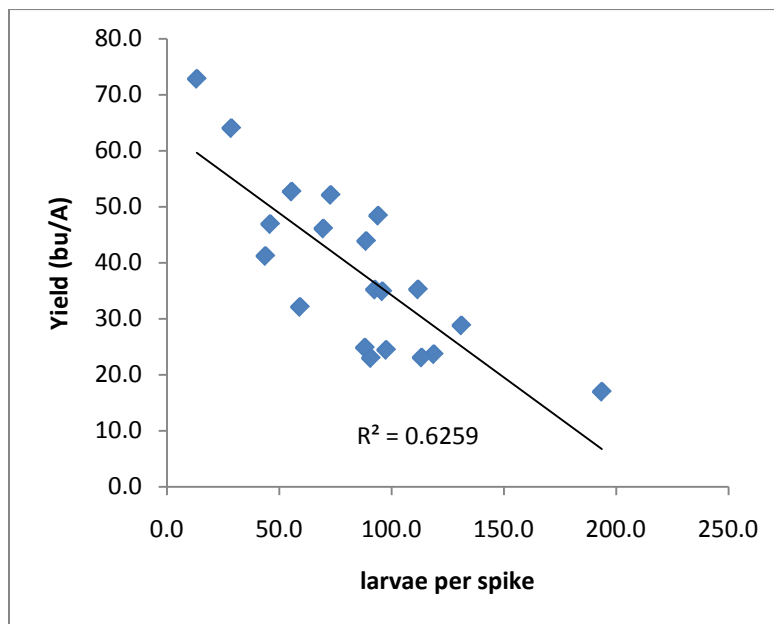


Table 1. Agronomic performance and attributes of OWBM midge resistance among spring wheat varieties grown at Kalispell, MT.

Planted: May 8, 2008									Harvested: September 15, 2008				
Cultivar	Yield	Test weight	Falling No.	Protein	Heading	Anthesis	ED ^a	Plant height	Midge larvae		Total kernels	Damaged kernels	
	bu/ac	lb/bu	sec.	%	Julian	days	in	No./dock ^b	No./spike	No./spike	No./spike	%	
MT 0415	72.8	60.7	206	17.0	188	193	5	37.1	1.7	13.2	33.2	7.6	21.9
REEDER	64.0	60.6	----	16.3	188	193	5	36.4	6.0	28.6	35.0	11.6	32.7
JEDD	52.7	61.1	78	16.0	187	193	6	26.2	8.3	55.5	39.1	18.6	45.9
PF906408	52.1	58.3	143	15.5	188	195	7	28.6	3.3	72.9	41.1	22.1	54.4
VOLT	48.4	58.8	109	15.6	193	197	4	32.3	2.7	94.0	45.2	30.2	66.2
KELBY	46.9	58.4	95	16.6	187	193	6	28.9	3.7	45.9	36.3	15.7	42.3
HANK	46.1	58.4	124	16.6	187	194	6	28.9	6.7	69.6	43.0	20.7	48.6
ONEAL	43.9	59.4	140	17.3	188	194	7	32.8	5.3	88.7	45.0	29.0	63.4
CORBIN	41.2	60.0	158	16.9	187	195	8	33.9	8.3	43.8	33.3	17.2	53.0
MCNEAL	35.2	54.4	----	18.1	188	195	7	32.4	4.7	111.8	38.6	27.4	71.4
FREYR	35.2	57.8	91	16.7	188	195	7	34.1	5.0	92.6	40.7	26.7	66.0
NORPRO	34.9	57.3	50	17.6	188	194	6	31.6	15.0	95.9	36.0	26.5	74.0
KUNTZ	32.1	59.0	138	16.8	189	196	7	29.4	10.1	59.2	35.9	19.2	49.4
LILLIAN	28.8	55.8	260	18.8	191	196	5	37.7	2.7	131.1	36.7	29.8	81.2
VIDA	24.8	57.3	47	18.1	189	196	7	32.5	9.0	88.1	39.6	27.2	68.4
FORTUNA	24.4	56.7	256	17.8	187	194	7	42.0	7.7	97.6	29.7	23.2	78.7
CHOTEAU	23.7	55.9	172	17.9	187	195	8	32.3	38.3	118.8	37.5	28.1	74.4
CONAN	23.1	58.1	237	17.3	188	194	6	29.9	7.0	113.4	37.4	24.0	64.9
OUTLOOK	23.0	53.7	----	18.2	190	195	4	33.7	3.3	90.8	31.1	20.5	66.5
MTHW0471	17.0	57.7	153	17.9	191	197	5	37.7	14.7	193.7	52.9	42.2	79.5
Mean	38.5	58.0	144	17	188	195	6	32.9	8.2	85.2	38.4	23.4	60.1
C.V. (%)	15.5	0.9			0.4	0.5	14.4	5.1	49.7	32.3	11.7	25.2	17.3
LSD (0.05)	10.0	0.9			1.3	1.5	1.5	2.8	6.8	46.4	7.6	9.9	17.5

^a Exposure duration is the time difference between heading and anthesis. ^b The number of midge collected as dockage.