2011 SPRING WHEAT WEED CONTROL STRATEGIES

Many organic grain growers in the northeast struggle with weed issues especially in spring wrseu0es [(w)5(he)-2(a)-2(t)-5(

Location	Borderview Farm - Alburgh, VT
Soil type	Benson rocky silt loam
Previous crop	Organic corn
Spring tillage operations	Chisel plow, disk, spike-toothed harrow
Seeding rates	135 lbs ac^{-1}, 200 lbs ac^{-1}
Wheat variety	AC Superb
Weed seed	Ida Gold mustard, 50 lbs ac^{-1}
Replicates	4
Planting date	12-May
Harvest date	17-August
Harvest area	5'x25'

Table 2. Treatments in the weed control study, 2011, Alburgh, VT.

Treatment	Row spacing inches	Seeding rate lbs ac^{-1}	Tineweeding date	Inter-row cultivation
Standard	6.0	135	-	-
Standard +	6.0	135	5/23 and 6/3	-
Standard HD +	6.0	200	5/23 and 6/3	-
Standard 2/3 & Broadcast 1/3 +	6.0	135	5/23 and 6/3	-
Narrow HD+	4.5	200	5/23 and 6/3	-
Wide +	9.0	135	5/23 and 6/3	6/24

Each plot, with the exception of the "Standard" plots, was cultivated with a tineweeder at 11 and 22 days after planting (DAP). This type of cultivation is designed to disturb and uproot weed seedlings in their "white thread root" stage, causing desiccation and death. At each tineweeding event, wheat and mustard plants, as well as annual and perennial grasses and broadleaf plants, were tallied in a specific area before and after tineweeding. This allowed for calculations of wheat mortality as well as reduction in mustard, as well as annual grasses and broadleaf plants. At the time of both tineweeding events, few to no perennial weeds were found; the reductions in perennial weeds are therefore not reported.

In addition, the plots with nine-inch row spacing were cultivated with a Schmotzer inter-row hoe on 24-June. The Schmotzer hoe, imported from Germany, is a manually-guided, rear-mounted implement that can be used to cultivate in between wide rows of wheat (Fig. 1). This allows weed control to take place later in the enzymatic activity and poor quality wheat. Analysis of deoxynivalenol (DON), which is produced by mycotoxins, was conducted with a Veratox DON 5/5 Quantitative Test from the NEOGEN Corporation. This test has a detection range of 0.5-5.0 ppm. Samples with DON levels greater than 1.0 ppm are considered unsuitable for human consumption.

Variations in yield and quality can occur because of variations in genetics, soil, weather, and other growing conditions. Statistical analysis makes it possible to determine whether a difference among treatments is real or whether it might have occurred due to other variations in the field. All data was analyzed using a mixed model analysis where replicates were considered random effects. At the bottom of each table a Least Significant Difference (LSD) value is presented for each variable (e.g. yield). LSDs at the 10% level (0.10) of probability are shown. Where the difference b-5())7(e)-2(c)9(a002 Tc -.79-.79-.1 t)8(ab)2(l)8(e

RESULTS

There was no significant difference in the reduction of mustard, annual grass or broadleaf weeds in the study. Tineweeding reduced weeds on average between 42.4 and 55.8% (Table 4). Annual grasses identified included foxtails (*Setaria* spp.), crabgrass (*Digitaria* spp.), barnyardgrass (*Echinochloa crus-galli* (L.) Beauv.), and witchgrass (*Panicum capillary* L.). Annual broadleaf plants identified in the trial included redroot pigweed (*Amaranthus retroflexus* L.; Figure 2), common lambsquarters (*Chenopodium album* L.), common ragweed (*Ambrosia artemisiifolia* L.), three-seeded mercury (*Acalypha virginica* L.), and Pennsylvania smartweed (*Polygonum pensylvanicum* L.).

The timing of post-emergence tineweeding did have a significant difference on wheat mortality and the effectiveness of weed control (Table 5). The average wheat mortality was significantly lowest when tineweeding occurred 22 DAP. Tineweeding 11 DAP removed more mustard and annual grass weeds than the 22 DAP tineweed event. There was no significant difference in the reduction of annual broadleaf weeds by tineweed timing.

Table 5. Effect of the timing of tineweed events on wheat mortality and weed reduction.

Tineweed timing	Wheat mortality	Mustard weed reduction	Annual grass weed reduction	Annual broadleaf weed reduction
	# plants	%	%	%
5-May (11 DAP)	4.2	**68.1**	**69.9**	**64.0**
3-June (22 DAP)	**0.0**	16.6	33.1	47.6
LSD (0.10)	2.3	10.6	14.3	NS
Trial Mean	2.1	42.4	51.5	55.8

Treatments indicated in **bold** had the top observed performance in a particular column.
NS – No significant difference was determined between treatments.

34 t5.08 Tm (42.4)Tj ET Q q 275.64 350.4 79.439 15 re W n BT /TT0 1 /P <</M3(o)154 t5.0CID CID C4

Table 6. Impact of weed control strategy on spring wheat yield and quality, 2011.

Treatment	Mustard yield	Wheat yield at 13% moisture	Crude protein at 12% moisture	Falling number	DON
	lbs/acre	lbs/acre	%	seconds	ppm
Standard	183	454	13.9	397	0.30*
Standard +	296	315	**15.3**	399	0.33
Standard HD +	227	594*	14.1	391	0.43
Standard 2/3 & Broadcast 1/3 +	296	539	15.0	401	0.28*
Narrow HD +	392	**874***	14.3	402	**0.18***
Wide +	**148**	838*	14.4	**417**	0.20*
LSD (0.10)	NS	282	NS	NS	0.13
Trial Mean	257	602	14.5	401	0.28

Treatments indicated in **bold** had the top observed performance in a particular column.
* Treatments indicated with an asterisk did not perform significantly lower than the top-performing treatment in a particular column.
NS – No significant difference was determined between treatments.

The treatment with the lowest mustard yield was “Wide +”, with 9” row spacing, (148 lbs per acre), though this was not statistically lower than any of the other five treatments (Table 6; Fig. 5). There was a statistical difference in wheat yields across treatments, with the highest yield generated with “Narrow HD +”, with 4.5” row spacing and an elevated seeding rate. This was not significantly higher than the wheat yields of “Wide +” or “Standard HD +”.

Figure 5. Impact of weed control strategies on mustard and wheat yields. Treatments with the same letter did not differ in wheat yield (p=0.10). There was no significant difference in mustard yield by treatment.

There were few wheat quality differences observed among treatments in this study. There was no significant difference in tineweeding soon after emergence; so that weeds are eliminated in their “white thread root” stage and wheat can become more established early in the season.

Overall the spring wheat yields of this trial were very poor compared to past years. The trial yield average was 602 lbs per ac^{-1} approximately 40% of normal yields. This was likely due to the poor weather conditions of this growing season resulting in a late planting, but the overall low yield was also due to the interseeded mustard, which caused heavy weed competition, as expected. Wheat yields were significantly