

# **Forage varieties for Michigan in 2013**

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Forage crops are essential components of diversified agricultural production systems in Michigan. They provide feed for livestock, fix nitrogen for crop rotations, reduce soil erosion, improve soil structure, fertility and water retention, protect water quality, provide habitat for wildlife, generate biomass for fuel conversion, and create eye appeal to landscapes. As grain prices rise, competition from row crops for land use is squeezing forage production acres while equipment, land, and labor costs continue to increase. The combination of reduction in forage acres and poor growing conditions across much of the country resulted in high hay prices for Michigan growers in 2012, and forage demand is predicted to continue to be greater than supply for the near future. Under these market conditions, the importance of improving yield per acre through use of better forage varieties is an important component of profitability. For example, a one-ton increase in dairy-quality alfalfa hay yield was worth up to \$217/acre in 2012.

## **2012 Conditions**

Forage crops faced a wide spectrum of unfavorable growing conditions during 2012. A mild open winter and early warm spring temperatures encouraged forage growth to begin earlier than normal. In the southern parts of the state, established alfalfa was >12 inches tall by mid-April. A series of hard freezes in April damaged many stands of alfalfa and delayed first cutting while stands recovered. The harvest trigger of 750 growing degree days (GDD), base 42 °F had been reached by May 15 at East Lansing, May 19 at Capac, May 25 at Lake City and June 9 at Chatham. Annual rainfall total (Fig. 1) was below normal at East Lansing and Capac in southern Lower Michigan, above average at Lake City in northern Lower Michigan and slightly below normal at Chatham in the Upper Peninsula. The 2011 seedings of alfalfa and grass trials were irrigated with 4.5 inches immediately after second cutting in early July. The growing conditions allowed for alfalfa to be cut four times at East Lansing and Capac, and three times at Lake City and Chatham. Red clover and grass variety trials, respectively, were cut 2 and 3 times in 2012 at East Lansing. Yields of all species tested were below 2011 yields, with reductions ranging from 20 to 25% for alfalfa, 35% lower for red clover and 50% lower for the average of the grass species at East Lansing. Average yields of the established alfalfa varieties harvested in trials at Lake City and Chatham were slightly lower than in 2011.

## **EVALUATION OF ALFALFA VARIETIES**

Michigan State University has evaluated more than 70 commercially available alfalfa varieties in its alfalfa variety trials since 2007. Plant breeders, developers, and marketers submit alfalfa varieties for evaluation. Varieties seeded in these trials are evaluated for yield and persistence for at least three full years after the seeding year. Testing locations for 2012 Michigan alfalfa variety trials were the Upper Peninsula Experiment Station at Chatham, the Lake City Experiment Station at Lake City, the Lynn Island Farm near Capac, and the Michigan State University Agronomy Farm at East Lansing. Yield is expressed in dry matter tons per acre as an average over years for 46 alfalfa varieties seeded at East Lansing (2007-2010) and single-year yield for the 2011 seeding (Table 1). Yields of 29 varieties seeded at Lake City from 2007-2011 are provided in Table 2. Three year average yields of varieties seeded at North Branch in 2008 and first-year yields of varieties seeded at Capac in 2011 are in Table 3. Table 4 contains yield results from 17 varieties entered in the completed trials established in 2008 and 2009 at Chatham (Alger Co.) in the Upper Peninsula. Vernal (fall dormancy 2), a fifty year old variety with little

disease resistance, is still used as the check variety because it is familiar to many growers and is a good check for yield and persistence in a standard 3 or 4-cut system. A percentage of Vernal is presented in each table as a means for comparison.

### **Potato Leafhopper Resistant Alfalfa Varieties**

Potato leafhopper (PLH) is the most damaging insect to alfalfa yields in Michigan. It does not overwinter in Michigan, but arrives carried by the gulf-stream air currents in mid to late June. It damages alfalfa by injecting a piercing mouthpart into the stem and petiole of alfalfa and injecting toxic saliva that girdles the plant. This results in decreased flow of nutrients within the plant, stunting, and "hopperburn," a distinctive yellowing of leaflet tips. Yield, forage quality, and persistence may be reduced when sufficient numbers of PLH exist. Resistance to PLH does not mean that alfalfa will not also benefit from insecticide applications, especially in the establishment year. Depending on the height of the alfalfa, a scouting economic threshold for PLH-resistant varieties may be two to three times greater than the threshold for non-resistant varieties. Results of PLH-resistant varieties and two commercially available susceptible checks seeded from 2007 to 2011 at East Lansing are listed in Table 5.

### **Alfalfa Cutting Management**

The appropriate cutting management system depends on the location, yield goal, forage quality goal, and desired stand life. Location matters because fewer cuttings are possible in shorter growing seasons. Five-cut systems may be feasible in southern Michigan, but it is rarely possible to get more than three in the Upper Peninsula. Regardless of location, there is a clear tradeoff between number of cuttings and stand persistence. More cuttings per year at shorter intervals will result in greater forage quality and greater cumulative yield for the first three to four years, but will also reduce long-term stand life.

### **Selection of an Alfalfa Variety**

Alfalfa stands may be established with goals of short-term or long-term stand life. Varieties chosen for short-term stands in Michigan (three to four years) should be: 1) at least moderately winterhardy (score 1 to 3), 2) high yielding, and 3) resistant to bacterial wilt (BW) and anthracnose (AN). Resistance to *Phytophthora* root rot (PRR) is desirable when alfalfa is grown on damp, fine-textured soils.

Winterhardiness is of primary importance for long-term stands. Winterhardy varieties may be slower to recover than moderately hardy varieties after a mid-September cutting. Compared to moderately hardy varieties, winterhardy varieties may flower three to five days later in the first cutting. Winterhardy varieties may be lower in yield than moderately hardy varieties in three- to five-year stands, but are usually higher yielding after about five years, especially in northern Michigan. Select high-yielding winterhardy varieties resistant to PRR, AN, and VW for long-lived stands. Varieties in dormancy group 2 are more likely than moderately hardy varieties (dormancy groups 3 and 4) to establish "permanent" cover, but will not yield as well.

### **Winterhardiness and Fall Dormancy Ratings**

Fall dormancy (FD) ratings are determined by the amount of regrowth after a mid-September cutting. In the past, high FD ratings were associated with poor winterhardiness, but new breeding efforts by some companies may have broken the link between FD and winterhardiness. Trials in Wisconsin have shown FD varieties with high FD ratings (4-5) to be as winterhardy as varieties with lower FD

ratings (2-3). Non-winterhardy varieties used in the West have ratings FD of 5, 6, or 7. Non-winterhardy alfalfa varieties are usually not well adapted for Michigan, even for short-term stands. While fall dormancy and winterhardiness ratings are reported by seed companies, Wisconsin is evaluating winter-survival (WSI) of several commercial varieties which is reported in (Table 6).

### **Important Alfalfa Diseases in Michigan**

An alfalfa variety consists of a population of plants which are genetically different from each other. Varieties are described according to the mean response of all plants, such as average yield, and as a frequency of certain types of plants, such as the percentage of plants resistant to some pest or disease. Thus, even in a "resistant" variety, only a portion of the plants will be resistant. Moderate resistance, for example, means that 15 to 30% of the plants are resistant, but 70 to 85% are susceptible. Even a variety classified as resistant may suffer damage from a disease. Moderate resistance is generally considered adequate for good alfalfa production. Even resistant varieties, however, are susceptible to PRR or *Pythium* diseases in the seedling stage. A list of disease resistance for varieties evaluated for yield at MSU is provided in Table 6. A brief description follows and additional information and pictures are can be found at <http://www.alfalfa.org/pdf/AlfalfaAnalyst.pdf>.

*Bacterial Wilt (BW)*. BW is present in all of Michigan. All of the named varieties sold in Michigan are adequately resistant to BW. "Common" alfalfa varieties sold by some seed companies are not recommended since the seed may be from susceptible plants.

*Phytophthora Root Rot (PRR)*. This fungal disease, first found in Michigan in 1972, is now one of the state's most important alfalfa diseases. PRR occurs on heavy or poorly drained soils. Any soil, however, when saturated during a rainy period of seven to ten days may result in severe injury, especially to one- to two-month old seedlings. Seed companies have been treating alfalfa seed with the fungicide *Apron* for several years. Seed treating with *Apron* may be helpful in improving stands of resistant varieties. Treating a susceptible variety, such as Vernal, is probably not helpful. Most of the highest yielding varieties entered in our tests are resistant to PRR.

*Anthracnose (AN)*. This disease, first found in Michigan in 1976, is becoming more severe each year. It occurs during hot, moist summers and is most common in the southern 1/3 of Lower Michigan. The fungus infects stems and crowns and may kill some plants. It is now recommended that only anthracnose resistant varieties be planted in Michigan.

*Verticillium Wilt (VW)*. First detected in Michigan in 1982, VW has not increased in severity as expected. It is generally introduced with infected seed. It usually is not a problem until the third year, and then primarily in the first cutting. Growing alfalfa for three to four years in rotation with corn will help break the disease cycle. Resistance to verticillium is recommended if planting alfalfa after alfalfa.

*Aphanomyces (APH)* *Aphanomyces euteiches* is a soil-borne fungus that is similar to PRR and thrives in cool-moist conditions. It can kill or severely stunt young seedlings and causes a chronic root disease in established plants. Seedlings infected with APH will have yellow leaves (chlorosis) and gray roots and stems. There are two races of APH. Alfalfa resistant to race 2 is also resistant to race 1; however, resistance to race 1 does not infer resistance to race 2. Resistance to APH should be considered when establishing alfalfa in poorly drained areas.

*Stem/bulb nematode* (SN) (*Ditylenchus dipsaci*) is a microscopic pest that can become a problem in areas where alfalfa is grown for many years. Symptoms of nematode damage include stunted plants and club-like stems. Crop rotation is the best method for controlling stem nematode.

## EVALUATION OF OTHER LEGUMES

Eleven varieties of red clover (*Trifolium pratense*) were evaluated in Michigan at Lake City and East Lansing. Red clover is a good species for pasture renovation or works well as a short term hay or haylage crop. Red clover produces greater yield in the seeding year than alfalfa, but usually only persists for two years. Improved varieties under proper management may persist beyond three years. Table 7 contains dry matter yields for trials seeded at East Lansing in 2004, 2009 & 2010, and at Lake City in 2004.

## EVALUATION OF COOL-SEASON GRASS VARIETIES

Perennial cool-season grass trials were established in East Lansing in 2009 and 2011 and evaluated for forage yield and winter injury. Each of the grasses were seeded in a randomized complete block design using four replications. Fifty pounds N as ESN Urea was applied at green-up in early April and after cut 2 in 2012. Dry matter yields (multi-year averages) are presented in Table 8. A brief description of each grass species is provided below.

Bromegrasses (*Bromus spp.*) are rhizomatous, sod-forming grasses that are high in forage quality and yield. Smooth bromegrass is one of the most winter-hardy grasses in Michigan and can be grown on a wide range of soil types. Smooth bromegrass has poor regrowth potential and should not be grazed or cut during stem elongation or early heading to prevent a reduction in tillering. Meadow brome has better regrowth potential and heat tolerance than smooth brome.

Fescues (*Festuca spp.*) are sod-forming grasses known for good fall growth. Tall fescue is persistent under frequent short grazing, heavy traffic, drought, and flooding on many soil types. Most new varieties of tall fescue are endophyte-free or contain novel endophytes that are not toxic to animals like endophytes in older varieties. Meadow fescue has better forage quality, palatability, and cold tolerance than tall fescue.

Festulolium (*Festuca x Lolium spp.*) is a cross between fescue (meadow or tall fescue) and ryegrass (perennial or Italian ryegrass), thus combining the persistence of fescue with the palatability of ryegrass. The large number of possible parent combinations results in much variability among festulolium varieties.

Kentucky bluegrass (*Poa pratensis* L.) is a sod-forming perennial grass that is very palatable when vegetative. It persists under frequent, close grazing and is very winterhardy, but is unpalatable when heading and quickly goes dormant under hot, dry summer conditions.

Orchardgrass (*Dactylis glomerata* L.) is a high-yielding, competitive perennial bunchgrass that grows more rapidly than most other Michigan forages in the early spring. Orchardgrass grows well on a wide range of soil types, but is not suited for wet sites. Unlike many other grasses, tillering occurs throughout the growing season, enabling quick regrowth after harvest or grazing. Orchardgrass has similar nutritive characteristics to timothy and smooth bromegrass. Alfalfa and orchardgrass are often

grown together in Michigan. Because orchardgrass matures earlier than alfalfa, late-maturing varieties of orchardgrass are preferred when the two are grown in mixture.

Ryegrasses (*Lolium spp.*) are bunchgrasses that are noted for high forage quality. Perennial ryegrass will persist under intensive rotational grazing and multiple harvests for hay or haylage, but it lacks the winterhardiness of other grasses and will go dormant under hot, dry conditions. It requires high fertility and performs best under irrigation. Annual and Italian ryegrasses are short-lived species that differ only in vernalization requirement for flowering. Italian ryegrass requires a cold period before flowering and annual ryegrass does not.

Timothy (*Phleum pratense* L.) is a bunchgrass that forms an open sod and persists well under high moisture conditions. It is best known for its winterhardiness and ability to survive when covered by ice. Long rest periods between harvest and grazing are required for timothy to rebuild carbohydrate reserves, making it undesirable for harvest systems with more than two cuttings.

## **Statistics**

Statistical tests allow separation of effects due to random spatial variation in the field from the real genetic potential of the variety. The LSD (Least Significant Difference) is used to compare values within a column. When the difference in yield between two varieties in the same column is greater than the LSD value for that column, we are 95% certain that the difference is real and not the result of random chance. The precision of a test is determined by the coefficient of variation (CV) value. The lower the CV, the better, because this shows that results were consistent across all replications. Statistical comparison between tests seeded in different years is not provided because differences in sites and weather among years cannot be accounted for using statistics. Check varieties are included in all tests to allow estimation of relative differences among tests conducted in different years or sites. The relative difference is expressed as yield as a percent of the check variety. Choice of varieties used as checks is based on familiarity to most producers across a wide area of the U.S.A..

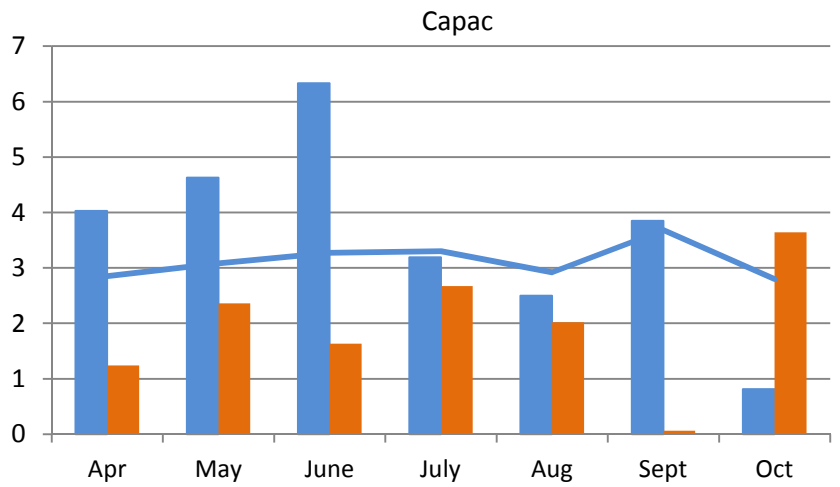
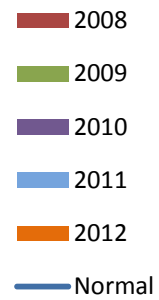
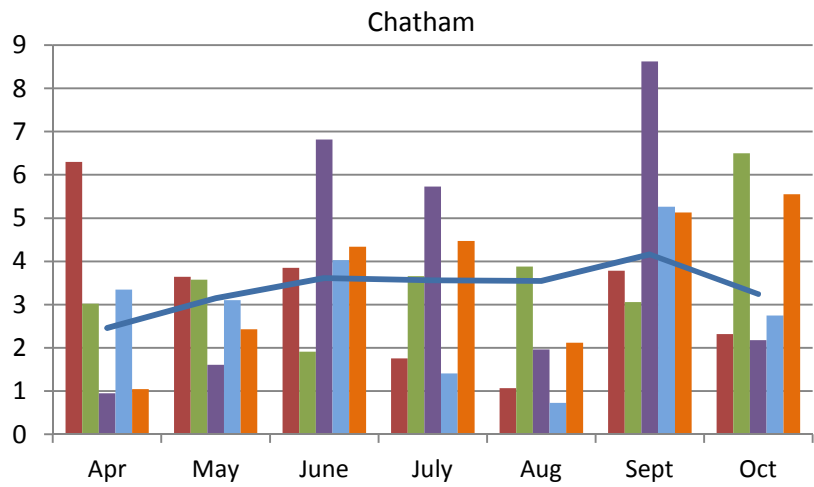
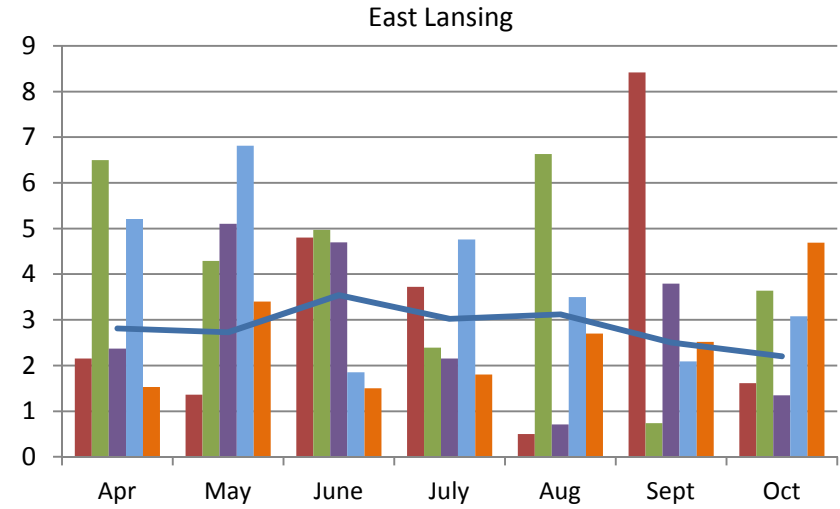
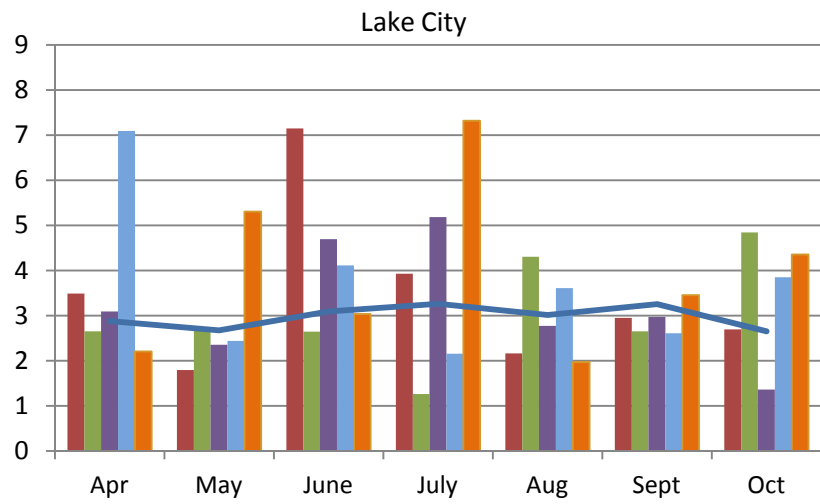


Fig.1 Precipitation (inches) at each of the four locations of the Michigan State University forage variety trials compared to Normal (30-yr avg.).

Table 1. East Lansing Alfalfa Variety Trials (dry matter tons/acre) from 2007-2011 seeding year

Variety	Marketer	3-year average			2-yr avg	1-yr tot	(Number) †
		2007	2008	2009	2010	2011	% Vernal ††
----- dry matter tons/acre -----							
727	NEXGROW	-	6.74	-	-	-	(1)126
6415	NEXGROW	5.90	6.37	-	-	-	(2)125
6417	NEXGROW	-	7.06	-	6.58	-	(2)124
6431	NEXGROW	-	6.93	-	-	-	(1)130
6552	NEXGROW	-	6.46	-	-	-	(1)121
4S417	Mycogen Seeds	-	7.30	6.36	-	-	(2)134
6422Q	NEXGROW	-	-	7.29	-	4.63	(1)150
AmeriStand 403T	America's Alfalfa	-	-	6.08	-	5.14	(1)125
Ameristand 407TQ	America's Alfalfa	-	-	6.98	-	-	(1)144
Chesapeake	Dahlco Seeds/ AgReliant	-	-	6.79	-	-	(1)140
DG 4210	Crop Production Services	-	-	-	6.71	4.80	(1)118
DK140	check	5.69	-	6.06	-	-	(2)126
DKA43-13	Monsanto	-	6.81	-	6.42	-	(2)120
Everlast II	Legacy Seeds	-	-	6.06	-	-	(1)125
ForageGold	Renk Seed	-	-	6.39	-	-	(1)132
Genoa	NEXGROW	-	6.92	-	-	-	(1)129
Gunner	Croplan Genetics	-	-	-	-	4.42	-
HybriForce 2400	Dairyland Seed Co.	-	7.55	6.68	6.39	-	(3)130
KingFisher 243	Byron Seed	-	-	6.20	-	-	(1)128
KingFisher 4020	Byron Seed	-	-	-	6.62	-	(1)116
L333HD	Legacy Seeds	-	6.30	-	-	-	(1)118
L447HD	Legacy Seeds	-	6.92	-	-	-	(1)129
LegenDairy 5.0	Croplan Genetics	-	-	6.64	-	4.89	(1)137
Oneida VR	public	-	-	5.42	-	4.60	(1)112
PGI 459	Producer's Choice	-	6.45	-	-	-	(1)121
PGI 557	Producers Choice	-	-	-	-	4.97	-
Pioneer 5312	check	5.71	5.79	5.83	6.25	-	(4)116
Pioneer 53H92	Pioneer Hi-breds Int'l	-	-	6.13	-	-	(1)126
Pioneer 5454	check	-	-	6.26	-	-	(1)129
Pioneer 54Q32	Pioneer Hi-breds Int'l	-	-	6.50	-	4.82	(1)134
Pioneer 55V12	Pioneer Hi-breds Int'l	-	-	6.78	-	4.76	(1)140
Pioneer 55V48	Pioneer Hi-breds Int'l	6.42	7.07	7.28	-	-	(3)142
Pioneer 55V50	Pioneer Hi-breds Int'l	-	-	-	-	5.53	-
PLH-resistant check	check	-	-	-	5.87	4.70	(1)103
Prolific II	Hyland Seeds	-	-	-	-	5.36	-
Radiance HD	Legacy Seeds	-	-	6.91	-	-	(1)142
Rebound 6.0	Croplan Genetics	-	-	-	-	4.66	-
Red Falcon BR	Blue River Hybrids	5.95	-	-	-	-	(1)132
SolarGold	Renk Seed	-	-	-	-	4.97	-
Sonic	Nutech Seed	-	-	-	-	5.14	-
SpringGold	Renk Seed	6.12	-	-	-	-	(1)136
Velocity	Nutech Seed	6.57	7.01	6.10	-	-	(3)134
Vernal	public	4.50	5.35	4.85	5.70	4.44	(4)100
WL343HQ	W-L Research	6.47	-	-	5.90	-	(2)124
WL354HQ	W-L Research	-	-	-	-	4.58	-
WL363HQ	W-L Research	-	7.00	6.84	6.46	-	(3)128
Average of the listed varieties:		5.93	6.71	6.38	6.29	4.85	
LSD (0.05)		0.44	0.40	0.53	0.56	0.61	
CV		9.0	7.3	10.2	8.8	8.9	

† Number of 3-year trials with at least 2 years of data after the seeding year

†† Average % Vernal of varieties with more than 2 years yield data

Table 2. Lake City Alfalfa Variety Trial yields (dry matter tons/acre) from the 2007-2011 seeding years.

Variety	Marketer	3-yr. avg.			2-yr. avg.		1-yr. tot.	(Number) †
		2007	2008	2009	2010	2011	% Vernal ††	
----- dry matter tons/acre -----								
6417	NEXGROW	-	-	-	4.87	-	(1)106	
6431	NEXGROW	-	3.17	-	-	-	(1)133	
4A415	Mycogen Seeds	-	-	-	5.31	-	(1)116	
4S417	Mycogen Seeds	-	-	3.84	5.34	-	(2)115	
6200HT	NEXGROW	3.43	-	-	-	-	(1)115	
6305Q	NEXGROW	-	-	-	4.92	-	(1)107	
6422Q	NEXGROW	-	-	3.99	-	-	(1)119	
AmeriStand 403T plus	America's Alfalfa	-	-	3.48	-	-	(1)104	
AmeriStand 407TQ	America's Alfalfa	-	-	3.81	-	4.97	(1)113	
Ascend	Hyland Seed	3.21	-	-	-	-	(1)108	
Chesapeake	Dahlco Seeds/AgReliant	-	-	3.81	-	-	(1)113	
Cimarron VL410	Spink/Cimarron Seed	3.12	-	-	-	-	(1)105	
DG 3210	Crop Production Services	-	-	-	4.68	-	(1)102	
DG 4210	Crop Production Services	-	-	-	4.82	4.84	(1)105	
DK140	check	3.20	-	3.46	-	-	(2)105	
DKA43-13	Monsanto	-	-	3.73	-	-	(1)111	
FSG 329	Standish Milling/Allied Seed	-	-	4.09	-	-	(1)122	
HybriForce 2400	Dairyland Seed	-	-	-	5.01	-	(1)109	
LegenDairy 5.0	Croplan Genetics	-	-	4.11	-	-	(1)122	
Pioneer 5312	check	2.96	-	-	4.78	5.05	(2)102	
Pioneer 53Q32	Pioneer Hi-breds Int'l	-	-	3.99	-	4.85	(1)119	
Pioneer 55H94	Pioneer Hi-breds Int'l	-	-	-	-	4.57	-	
Pioneer 55V12	Pioneer Hi-breds Int'l	-	-	3.52	-	4.26	(1)105	
Pioneer 55V48	Pioneer Hi-breds Int'l	2.98	2.84	3.52	-	-	(3)108	
Pioneer 55V50	Pioneer Hi-breds Int'l	-	-	-	-	4.97	-	
PLH-resistant check	check	-	2.56	3.68	4.61	4.59	(3)106	
Sonic	Nutech Seed	-	-	-	-	4.72	-	
Velocity	Nutech Seed	2.84	2.97	3.95	-	-	(3)112	
Vernal	public	2.97	2.39	3.36	4.58	4.60	(4)100	
Average of the listed varieties		3.09	2.79	3.76	4.89	4.74		
LSD (0.05)		0.36	0.28	0.43	0.45	0.40		
CV		14.2	12.5	14.0	9.8	5.9		

† Number of 3-year trials with at least 2 years of data after the seeding year.

†† Average % Vernal of varieties with at least 2 years of yield data



Table 3. Yield data of Alfalfa varieties entered in trials seeded at North Branch in 2008 (3-yr average) and Capac in 2011 (1-yr total)

Variety	Marketer	North Branch	Capac	% Vernal †
		3-yr. avg. 2008 seeding	1-yr total 2011 Seeding	
---- dry matter tons/acre -----				
6417	NEXGROW	7.28	-	117
6552	NEXGROW	7.64	-	123
Ameristand 407TQ	America's Alfalfa	7.84	-	126
Ascend	Hyland Seeds	7.53	-	121
DG 4210	Crop Production Services	-	4.97	-
DK140	check	7.16	-	115
DKA43-13	Monsanto	7.19	-	115
FSG351	Standish Milling/Allied Seed	7.28	-	117
FSG406	Standish Milling/Allied Seed	7.44	-	119
FSG408DP	Standish Milling/Allied Seed	7.14	-	115
FSG505	Standish Milling/Allied Seed	7.89	-	127
FSG528SF	Standish Milling/Allied Seed	7.18	-	115
Genoa	NEXGROW	7.47	-	120
Gunner	Croplan Genetics	-	4.95	-
HybriForce 2400	Dairyland Seed Co.	-	5.32	-
LegenDairy 5.0	Croplan Genetics	-	5.12	-
PGI 459	Producer's Choice	7.71	-	124
Pioneer 5312	check	6.79	5.27	109
Pioneer 54Q32	Pioneer Hi-bred Int'l	-	5.42	-
Pioneer 55V12	Pioneer Hi-bred Int'l	-	4.73	-
Pioneer 55V48	Pioneer Hi-bred Int'l	7.90	-	127
Pioneer 55V50	Pioneer Hi-bred Int'l	-	5.22	-
PLH-resistant check 1	check	6.39	-	103
PLH-resistant check 2	check	-	4.34	-
Prolific II	Hyland Seeds	-	5.50	-
Rebound 6.0	Crolan Genetics	-	4.97	-
Sonic	Nutech Seed	-	5.34	-
Velocity	Nutech Seed	7.24	-	116
Vernal	public	6.23	4.97	100
WL354HQ	W-L Research	-	5.06	-
WL343HQ	W-L Research	7.63	-	122
WL363HQ	W-L Research	7.62	4.86	122
Average of the listed varieties		7.33	5.07	
LSD (0.05)		0.40	0.40	
CV		8.6	5.6	

† Percent Vernal of varieties entered in the completed 3-year trial at North Branch

Table 4. Upper Peninsula Alfalfa Variety Trial 3-year average yields (dry matter tons/acre) for the trials seeded in 2008 and 2009 at Chatham.

Variety	Marketer	3-yr average		(Number) †
		2008	2009	% Vernal ††
--- dry matter tons/acre ---				
6417	NEXGROW	3.73	-	(1)107
6431	NEXGROW	3.64	-	(1)104
4A421	Mycogen Seeds	-	3.10	(1)107
Ameristand 403T Plus	America's Alfalfa	-	3.07	(1)106
Ameristand 407TQ	America's Alfalfa	3.45	2.96	(2)100
DK140	check	3.40	3.01	(2)100
DKA 33-16	Monsanto	3.70	-	(1)106
DKA 43-13	Monsanto	-	3.23	(1)111
Evergreen 3	NEXGROW	3.23	-	(1)92
Pioneer 5312	Pioneer Hi-breds Int'l	-	3.27	(1)113
Pioneer 53H92	Pioneer Hi-breds Int'l	-	2.88	(1)99
Pioneer 54Q32	Pioneer Hi-breds Int'l	-	3.28	(1)113
Pioneer 55V12	Pioneer Hi-breds Int'l	-	3.25	(1)112
Pioneer 55V48	Pioneer Hi-breds Int'l	3.42	2.96	(2)100
Velocity	Nutech Seed	3.55	3.05	(2)103
Vernal	Public	3.50	2.90	(2)100
WL343HQ	W-L Research	3.55	-	(1)101
Average of the listed varieties		3.52	3.08	
LSD (0.05)		0.36	0.31	
CV		12.5	12.3	

† Number of 3-year trials

†† Average % Vernal

Table 5. Three-year average yields (dm tons/acre) of Potato leafhopper resistant alfalfa varieties seeded in 2007, 2008, and 2009, 2-year average yields seeded in 2010 and the 1-yr total yields of alfalfa varieties seeded in 2011 at East Lansing.

Variety	Marketer	3-yr. avg.			2-yr avg	1-yr total	(Number) †
		2007	2008	2009	2010	2011	% Vernal ††
----- dry matter tons/acre -----							
6426	NEXGROW	6.24	5.95	-	6.11	-	(3)136
4P424	Mycogen Seeds	6.13	-	-	-	-	(1)121
6475H	NEXGROW	-	-	-	6.00	4.61	(1)116
Ameristand 409LH	America's Alfalfa	-	-	-	-	4.91	-
Evergreen 3	NEXGROW	-	5.78	-	-	-	(1)161
FSG420LH	Standish Milling/Allied	-	-	5.86	-	-	(1)118
non-resistant check 1 ‡	currently marketed	-	6.40	-	-	-	(1)179
non-resistant check 2 ‡	currently marketed	-	-	6.28	6.75	5.25	(2)128
Pioneer 5312	check	5.76	-	-	-	-	(1)113
Pioneer 53H92	Pioneer Hi-bred	6.60	6.01	5.77	6.00	-	(4)132
Pioneer 5454	check	-	-	5.54	-	-	(1)111
Pioneer 55H94	Pioneer Hi-bred	-	-	-	-	4.82	-
Vernal	Public	5.08	3.58	4.97	5.17	4.60	(4)100
WL353LH	W-L Research	-	-	5.88	-	5.05	(1)118
Average of the listed varieties:		5.96	5.54	5.71	6.01	4.87	
LSD (0.05)		0.54	0.55	0.33	0.37	0.41	
CV		10.9	11.7	7.1	6.0	5.8	

† Number of 3-year trials with at least 2 years of data after the seeding year.

†† Average % Vernal of varieties with at least 2 years of yield data

‡ Non-PLH resistant checks - currently marketed

Table 6. Fall dormancy (FD) and resistance ratings for alfalfa cultivars in MSU variety trials  
 (BW = Bacterial Wilt, PRR = Phytophthora Root Rot, AN = Anthracnose, VW = Verticillium Wilt, FW = Fusarium Wilt,  
 APH<sup>1</sup>=Aphanomyces race one unless <sup>2</sup> present for race two, SN=Stem nematode) †

Variety	FD	BW	PRR	AN	VW	FW	APH <sup>1</sup>	SN	WSI††	Found in Table
4A415	2	HR	HR	HR	HR	HR	HR, R <sup>2</sup>	HR	2	2
6200HT	2	HR	HR	HR	HR	HR	HR	MR	2.5	2
Vernal	2	R	S	S	S	MR	S	S	2	1,2,3,4,5
6305Q	3	HR	HR	HR	HR	HR	HR	-	1	2
Ascend	3	HR	HR	HR	HR	HR	-	-	-	2,3
Chesapeake	3	HR	HR	HR	HR	HR	HR,HR <sup>2</sup>	R	2	1,2
DG 3210	3	HR	HR	HR	HR	HR	HR	R	1	2
DKA33-16	3	HR	HR	HR	HR	HR	HR	-	-	4
FSG 329	3	HR	HR	HR	HR	HR	HR	HR	2	2
FSG 351	3	HR	HR	R	R	HR	R	R	2	3
L333HD	3	HR	HR	HR	HR	HR	HR	-	2	1
LegendDairy 5.0	3	HR	HR	HR	HR	HR	R	MR	3	1,2,3
Oneida VR	3	R	MR	MR	HR	HR	-	-	-	1
Pioneer var. 5312	3	HR	HR	HR	HR	HR	-	-	-	1,2,3,4,5
Pioneer var. 53H92	3	HR	HR	HR	R	HR	HR	-	-	1,4,5
Prolific II	3	HR	HR	HR	HR	HR	HR,R <sup>2</sup>	-	2	1,3
727	4	HR	HR	HR	HR	HR	HR	R	2	1
6415	4	HR	HR	HR	HR	HR	HR	-	2	1
6417	4	HR	HR	HR	HR	HR	HR	-	2	1,2,3,4
6426	4	HR	HR	HR	HR	HR	HR	HR	2	5
6431	4	HR	HR	HR	HR	HR	-	-	2	1,2,4
4A421	4	HR	HR	HR	HR	HR	HR	-	2.5	4
4P424	4	HR	HR	HR	HR	HR	-	-	-	5
4S417	4	HR	HR	HR	HR	HR	HR	-	2	1,2
6422Q	4	HR	HR	HR	HR	HR	HR	-	1	1,2
6475H	4	HR	HR	HR	HR	HR	HR	-	2	5
Ameristand 403T Plus	4	HR	HR	HR	HR	HR	HR	MR	2	1,2,4
Ameristand 407TQ	4	HR	HR	HR	HR	HR	HR,R <sup>2</sup>	MR	2	1,2,3,4
AmeriStand 409LH	4	HR	HR	HR	HR	HR	HR	R	2	5
Cimarron VL410	4	HR	HR	R	R	HR	MR	R	-	2
DG 4210	4	HR	HR	HR	HR	HR	HR	R	1	1,2,3
DK140	4	HR	HR	HR	HR	HR	HR	-	2	1,2,3,4
DKA43-13	4	HR	HR	HR	HR	HR	HR	-	2	1,2,3
Evergreen 3	4	HR	HR	HR	HR	HR	HR	R	2	4,5
Everlast II	4	HR	HR	HR	HR	HR	HR	-	2	1
ForageGold	4	HR	HR	HR	HR	HR	HR	-	2	1
FSG 400 LH	4	HR	HR	HR	HR	HR	HR	-	-	5
FSG 406	4	HR	HR	HR	HR	HR	HR	R	1	3
FSG 408DP	4	HR	HR	HR	R	HR	R	R	2	3
FSG 420 LH	4	HR	HR	HR	HR	HR	HR	-	2	5
Genoa	4	HR	HR	HR	HR	HR	-	R	2	1,3
HybriForce 2400	4	HR	HR	HR	HR	HR	HR	-	1.8	1,2,3
KingFisher 4020	4	HR	HR	HR	HR	HR	HR	-	-	1
L447HD	4	HR	HR	HR	R	HR	HR	-	2	1
Magnitude	4	HR	HR	HR	HR	HR	HR	HR	1	-
Mariner IV	4	HR	HR	HR	HR	HR	HR,R <sup>2</sup>	HR	2	-
PGI 459	4	HR	HR	HR	HR	HR	R	-	-	1,3
Pioneer var. 5454	4	R	HR	HR	HR	HR	LR	MR	-	1,5
Pioneer var. 54Q32	4	HR	HR	HR	HR	HR	HR	LR	-	1,2,3,4
Radiance HD	4	HR	HR	HR	R	HR	HR	-	2	1
Rebound 6.0	4	HR	HR	HR	HR	HR	HR,HR <sup>2</sup>	R	1	1,3
Red Falcon BR	4	HR	HR	HR	HR	HR	HR	-	2	1
SolarGold	4	HR	HR	HR	HR	HR	HR	MR	2	1
Sonic	4	HR	HR	HR	HR	HR	HR,HR <sup>2</sup>	-	1	1,2,3
Velocity	4	HR	HR	HR	HR	HR	HR	-	2	1,2,3,4
WL 343 HQ	4	HR	HR	HR	HR	HR	HR	MR	1.5	1,3,4
WL 353 LH	4	HR	HR	HR	HR	HR	HR	R	2	5
WL 354 HQ	4	HR	HR	HR	HR	HR	HR,HR <sup>2</sup>	R	1	1,3
6552	5	HR	HR	HR	HR	HR	HR	-	-	1,3
Contender	5	HR	HR	HR	HR	HR	HR	R	2	-
FSG 505	5	HR	HR	HR	HR	HR	HR	R	2	3
FSG 528 SF	5	HR	R	HR	HR	R	R	-	2	3
Gunner	5	HR	HR	HR	HR	HR	HR	R	1	1,3
KingFisher 243	5	HR	HR	HR	HR	HR	HR	-	2	1
PGI 557	5	HR	HR	HR	HR	HR	HR	HR	2	1
Pioneer 55V50	5	HR	HR	HR	HR	R	HR,HR <sup>2</sup>	R	-	1,2,3
Pioneer var. 55H94	5	HR	HR	HR	HR	HR	HR	HR	-	2,5
Pioneer var. 55V12	5	R	HR	HR	HR	HR	HR	R	-	1,2,3,4
Pioneer var. 55V48	5	HR	HR	HR	R	HR	HR	-	-	1,2,3,4
SpringGold	5	HR	HR	HR	R	HR	HR	R	-	1
WL 363 HQ	5	HR	HR	HR	HR	HR	HR	HR	2	1,3

† Refer to Important Alfalfa Diseases in Michigan found in the summary for more information

†† Winter survival index : 1=superior winter survival 2=very good 3=good 4=adequate 5=low 6=no winter survival.

Table 7. Average yields (dry matter tons per acre), including the seeding year, of Red Clover varieties seeded in 2004 at Lake City, and in 2004, 2009, and 2010 at East Lansing.

Variety	Marketer	Lake City	East Lansing			(Number) †
		2004 3y-r avg.	2004 4-yr avg.	2009 4-yr avg.	2010 3-yr avg.	% Check ††
----- dry matter tons per acre -----						
Amos	DLF International	2.17	-	-	-	(1)82
Arlington	public	-	-	3.83	-	(1)118
Cardinal	Seed Research of OR	2.54	3.86	4.11	-	(3)112
Cinnamon plus	FFR Cooperative	-	-	-	4.24	(1)142
Michigan common	public	2.64	3.39	3.25	2.99	(4)100
Dominion	Seed Research of OR	2.50	3.94	4.17	-	(3)113
Emerald	Byron Seeds	-	-	4.63	-	(1)143
FSG9601	Allied Seed	2.77	3.96	-	-	(2)111
Marathon	public	-	-	-	3.95	(1)132
Starfire	Ampac Seed Company	2.21	3.83	-	-	(2)98
Starfire II	Ampac Seed Company	-	-	4.44	-	(1)137
Average		2.47	3.80	4.07	3.73	
LSD (0.05)		0.37	0.19	0.27	0.29	
CV		17.4	7.3	9.3	9.3	

† Number of trials entered

†† Average % yield of the check variety (common).

Table 8. Three-year average yields (dry matter tons/acre) of forage grasses seeded in 2006 at East Lansing and Lake City, 2007 and 2009 at East Lansing and 1-yr total yields from the 2011 seeding at East Lansing.

Sp †	Variety (ploidy)	Marketer	Three-year average yields			1-yr tot EL 2011
			Lake City 2006	East Lansing 2006	East Lansing 2007	
----- Dry matter tons/acre -----						
B	AC Knowles	Agriculture Canada	-	-	2.83	-
B	Macbeth	CISCO Seed	-	-	-	3.24
B	Montana	Seed Research of OR	-	-	4.19	3.07
Fest	SpringGreen organic	Rose Agri-Seed Inc.	-	-	2.68	-
Fest	Gain	Allied Seed	-	-	2.34	-
KB	Ginger	check	-	-	-	3.18
KB	Lato	Allied Seed	-	-	2.19	-
KB	Thorough Blue	ProSeeds Marketing	-	-	1.86	-
KB	BigBlue	Rose Agri-Seed Inc.	-	-	-	2.48
OR	Ambrosia	Amer. Grass Seed Prod	3.36	4.13	-	-
OR	Bounty	Standish Milling	3.61	4.22	-	-
OR	Elsie	Rose Agri-Seed Inc.	-	-	3.75	-
OR	Extend	Standish Milling	3.37	4.46	-	-
OR	Harvestar	Seed Research of OR	3.18	4.22	-	-
OR	Intensive	Barenbrug Seed	-	-	-	3.61
OR	ISOG-39	DLF International Seed	-	4.23	-	-
OR	Megabyte	Rose Agri-Seed Inc.	-	-	4.09	-
OR	OG0203G	Seed Research of OR	-	-	3.96	-
OR	OG0204G	Seed Research of OR	-	-	4.07	-
OR	Persist	Smith Seed	-	-	-	3.58
OR	Potomac	check	-	-	4.15	3.49
OR	Warrior II	ProSeeds Marketing	-	-	3.95	-
PR	BarSprinter (2n)	Barenbrug Seed	-	-	2.08	-
PR	BG34 (blend)	Barenbrug Seed	-	-	1.87	-
PR	Boost (2n)	Standish Milling	-	2.94	-	-
PR	Calibra (4n)	check	-	-	-	1.92
PR	Eurostar (2n)	Seed Research of OR	2.05	2.83	-	-
PR	Fennema (2n)	Amer. Grass Seed Prod	-	-	-	2.51
PR	Kentaur (4n)	DLF International Seed	-	-	-	3.00
PR	Korok (4n)	Czech Republic	-	-	2.12	-
PR	Linn (2n)	check	-	-	-	1.84
PR	Mathilda (4n)	DLF International Seed	-	-	-	2.60
PR	Quartermaster (4n)	Lewis Seed	-	3.05	-	-
PR	Remington (4n)	Barenbrug Seed	-	-	2.78	3.06
PR	Verano (4n)	Columbia Seeds	2.01	2.59	-	-
RC	Chiefton	check	2.25	3.61	-	-
RC	Marathon	Standish Milling	2.76	3.89	-	-
TF	BarElite	Barenbrug Seed	-	-	4.15	-
TF	Cowgirl	Rose Agri-Seed Inc.	-	-	4.84	-
TF	Enhance	Standish Milling	2.44	4.31	-	-
TF	Fawn	Seed Research of OR	-	4.10	-	-
TF	Goliath	CISCO Seed	-	-	-	4.06
TF	Hymark	Fraser Seeds	-	-	-	4.01
TF	KY31E+	check	-	-	-	3.96
TF	Noria	ProSeeds Marketing	-	-	4.75	-
TF	Select	check	-	-	-	4.32
TF	STF 43	Barenbrug Seed	-	-	-	3.64
TF	TF0203G	Seed Research of OR	-	-	4.42	-
TF	Verdant	Amer. Grass Seed Prod	2.44	3.87	-	-
MF	Pradel	check	-	-	-	3.15
MF	Preval	Ampac Seed Company	-	-	-	2.78
Tim	BarFleo	Barenbrug Seed	-	-	1.11	-
Tim	BarPenta	Barenbrug Seed	-	-	3.94	-
Tim	Climax	check	2.14	4.03	3.84	-
Tim	Crest	Allied Seed	2.44	4.94	-	-
Tim	Summit	Allied Seed	2.55	4.87	-	-

† B=Brome,Fest=Festulium, KB=Kent. bluegrass, OR=Orchardgrass, PR=Perennial ryegrass, RC=reed canary, TF= Tall fescue, MF= Meadow fescue, Tim=Timothy

Marketers	Phone	Web Addresses
AgResearch Ltd	828-645-3872	<a href="http://www.agresearchusa.com">www.agresearchusa.com</a> <a href="http://www.grasslanz.com">www.grasslanz.com</a>
Allied Seed	866-325-6671	<a href="http://www.alliedseed.com">www.alliedseed.com</a>
Amer. Grass Seed Prod.	800-247-7815	<a href="http://www.agsp.us">www.agsp.us</a>
America's Alfalfa	800-873-2532	<a href="http://www.americasalfalfa.com">www.americasalfalfa.com</a>
Ampac Seed Co.	866-530-7333	<a href="http://www.ampacseed.com">www.ampacseed.com</a>
Barenbrug USA	800-547-4101	<a href="http://www.barusa.com">www.barusa.com</a>
Blue River Hybrids	800-370-7979	<a href="http://www.blueriverorgseed.com">www.blueriverorgseed.com</a>
Byron Seed	888-836-3697	<a href="http://www.bestforage.com">www.bestforage.com</a>
Cimarron USA	800-874-7945	<a href="http://www.cimarronusa.com">www.cimarronusa.com</a>
CISCO Seed	800-888-2986	<a href="http://www.ciscoseeds.com">www.ciscoseeds.com</a>
Columbia Seed	541-757-1468	<a href="http://www.columbiaseeds.com">www.columbiaseeds.com</a>
Crop Production Services	970-685-3300	<a href="http://www.cpsagu.com">www.cpsagu.com</a>
Croplan Genetics	888-295-3011	<a href="http://www.croplangenetics.com">www.croplangenetics.com</a>
Cropmark Seeds (New Zealand)	+64-3-347-7950	<a href="http://www.cropmarkseeds.com">www.cropmarkseeds.com</a>
Dahlco Seeds	888-324-5261	<a href="http://www.agreliantgenetics.com">www.agreliantgenetics.com</a>
Dairyland Seed Co.	800-236-0163	<a href="http://www.dairylandseed.com/">www.dairylandseed.com/</a>
DLF-International Seeds	800-445-2251	<a href="http://www.dlfis.com">www.dlfis.com</a>
FFR Cooperative	765-589-3123	<a href="http://www.ffrcoop.org">www.ffrcoop.org</a>
Hyland Seed	800-265-7403	<a href="http://www.hylandseeds.com">www.hylandseeds.com</a>
Lacrosse Forage and Turf	800-647-8873	<a href="http://www.lftseed.com">www.lftseed.com</a>
Legacy Seed	866-791-6390	<a href="http://www.legacyseeds.com">www.legacyseeds.com</a>
Lewis Seed Co.	541-491-3700	<a href="http://www.lewisseed.com">www.lewisseed.com</a>
Midvalley Ag Prod.	541-752-2408	
Monsanto	800-768-6387	<a href="http://www.monsanto.com">www.monsanto.com</a>
Mycogen Seeds	800-692-6432	<a href="http://www.mycogen.com">www.mycogen.com</a>
NEXGROW	855-463-9476	<a href="http://www.plantnexgrow.com">www.plantnexgrow.com</a>
Nutech Seed	800-942-6748	<a href="http://www.nutechseed.com">www.nutechseed.com</a>
Pioneer Hi-bred Int'l	800-247-6803	<a href="http://www.pioneer.com">www.pioneer.com</a>
Producers Choice	877-560-5181	<a href="http://www.producerschoiceseed.com">www.producerschoiceseed.com</a>
ProSeeds Marketing	541-928-9999	<a href="http://www.proseedsmarketing.com">www.proseedsmarketing.com</a>
Renk Seed	800-289-7365	<a href="http://www.renkseed.com">www.renkseed.com</a>
Rose Agri-Seed	503-651-2130	<a href="http://www.roseagriseed.com">www.roseagriseed.com</a>
Seed Research of Oregon	800-253-5766	<a href="http://www.sroseed.com">www.sroseed.com</a>
Smith Seed Services	888-550-2930	<a href="http://www.smithseed.com">www.smithseed.com</a>
Spink Seed Co.	517-745-5804	
Standish Milling	989-846-6911	
Winfield Solutions	989-845-2093	
W-L Research	800-406-7662	<a href="http://www.wlresearch.com">www.wlresearch.com</a>