

Harvey's Agricultural Solutions

Intensive Wheat Production

Updated 8/17/2011

Rotation

Wheat following soybeans or dry beans – This rotation would be your optimal choice. The rotation breaks up the disease and insect cycle in each of the crops. Make sure the straw spreader is evenly distributing chaff as poor stands have resulted from areas of heavy chaff. There will be no nitrogen credit given from the soybeans in this rotation. In a recent two-year university trial, wheat following soybeans yielded an average of 11 bushel better than following corn.

Wheat following corn – The same fungus that causes Gibberella stalk rot in corn can cause Fusarium head scab in wheat. If you must follow corn, make sure to plow down the corn stalks prior to seeding. Do not no-till wheat into corn stubble. Though no-tilling into corn harvested for silage is less risky, you can still see increased rates of Fusarium head scab at harvest.

Wheat following wheat, oats or rye – Since each crop shares disease and insect pests, this rotation should never be used. Soil borne diseases such as Take-all can cause a complete crop failure. Volunteer wheat can harbor large populations of Hessian fly. Any volunteer wheat growing near your proposed field should be destroyed two weeks prior to the “fly-free” day to limit the potential of the flies spreading to your new seeding.

Wheat following alfalfa- Allow 25 pounds nitrogen credit for this rotation. Be sure to control volunteer alfalfa and other perennial weeds with a burndown of glyphosate and 2,4-D ester prior to seeding.

Field Selection

Wheat will thrive on most soils as long they are well drained. Best yields will be on soils with good water holding capacity as wheat will use as much as .25 inch of water per day during heading and grain fill. Wheat should not be planted on muck or high organic matter soils as copper and manganese can be limiting factors to high yields.

No-till wheat has been successful on soybean stubble as long as chaff is evenly spread across the field. Whether you no-till, use reduced tillage or conventional tillage, the soil structure needs to be suitable for accurate seed depth placement of .75 to 1.5 inches.

Soil Fertility

Proper pH for raising high yields of wheat should range from 6.0 to 7.0. This range should allow for most micro and secondary nutrients to be available to the plant.

Nitrogen – N should be applied in three different stages. The first is in the fall prior to seeding with your P and K at a rate of 20 – 25 pounds per acre. Two to three pounds of sulfur should be included. This rate will be sufficient to stimulate early growth after seeding and for initial growth in the spring.

The next application occurs soon at spring green-up. The third will be at jointing (Feekes 6). Tillers should be counted prior to the second application and if the count is low (2-3 per plant), 50% of the spring N needs should be applied. If the count is high (5+ per plant) then 33% of the N should be applied. Sulfur should be included in this second application at a 10:1 (N:S) ratio. The balance of the N should be applied at jointing (stem elongation, Feekes 6).

<u>Yield Potential</u>	<u>Total N Rates</u>
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Nitrogen Recommendation

70	75
80	90
90	110
100	120
110	130

Most sources of N will work well for the first application. Urea will be the product of choice for the second application as it can be applied by an air machine quickly, accurately and with little damage. The third application can be made using UAN (28% N) and a narrow-tire sprayer. This will limit the amount of tire traffic. The UAN needs to be diluted or stripped on to limit leaf burn. Sugar can be added to the UAN at 1 pound per acre to lessen burn potential.

High yield goals and high N rates need to be paired with the proper variety. High N rates can promote lodging and disease development. Make sure high N rates are applied to varieties with good standability and resistance to leaf diseases. Be prepared to apply a foliar fungicide if disease pressure warrants.

Phosphorus- This nutrient should only be applied as a fall starter, in combination with the first N application and necessary K.

Phosphorus (P₂O₅) Recommendation

Soil Test	Yield Potential				
	70	80	90	100	110
PPM (lb./a)	Pounds of P ₂ O ₅ Per Acre				
15 (30)	95	100	105	110	115
20 (40)	70	75	80	85	90
25-40 (50-80)	45	50	55	60	65
45 (90)	20	25	30	35	40
50 (100)	0	0	0	0	0

Potash

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These recommendations are based upon yield goal, CEC and soil test level. With a high the CEC, potassium has a greater chance to become unavailable to the plant, thus the higher recommendation. These recommendations are for grain removal and will need to be increased if straw is also removed.

Potash Recommendation for Wheat (K₂O)

	Yield Potential				
	70	80	90	100	110
Soil Test	CEC	5 meq./100 gram			
PPM (lb./a)	Pounds of K ₂ O Per Acre				
25 (50)	125	130	130	140	140
50 (100)	95	95	100	100	100
75 (150)	60	65	70	75	80
88-118 (175-235)	45	50	55	60	65
130 (260)	15	15	20	25	30
	CEC	10 meq./100 gram			
	Pounds of K ₂ O Per Acre				
25 (50)	160	160	165	170	170
50 (100)	120	128	130	135	140
75 (150)	85	85	90	90	100
100-130 (200-260)	45	50	55	60	65
140 (280)	25	25	25	25	25
	CEC	20 meq./100 gram			
	Pounds of K ₂ O Per Acre				
50 (100)	195	200	205	210	215
75 (150)	145	180	185	190	195
100 (200)	95	100	105	110	115
125-155 (250-310)	45	50	55	60	65
165 (330)	25	25	25	25	25

Secondary and micronutrients-

Calcium availability should not be a problem if pH is in the proper range and exchangeable Ca level is excess of 200 ppm.

Magnesium exchange level needs to be 50 ppm or greater. High levels of exchangeable K can reduce the uptake of Mg. If the Mg:K ratio is less than 2:1 as a percent of exchangeable bases, then additional Mg may be needed. If lime is needed on a high K soil, use dolomite lime.

Sulfur in the sulfate form and should be added to the fall starter fertilizer program at the rate of 2-3 pounds per acre. In the second N application in the spring, apply sulfur at a ratio to N at 10:1. If sulfur is applied in the elemental form, it needs to be applied two months prior to plant needs as the plant will uptake only in the sulfate form and it takes time for elemental S to be broken down. Wheat grows rapidly at lower soil temperatures when mineralization of sulfur is slow. Soils testing adequate in S may still not provide enough at this time.

Copper response in wheat has been under study recently. There have been many tests showing yield response to copper added to starter fertilizer. The most efficient application of copper is by impregnating liquid copper on dry starter at a rate of .5 pint (8 oz.) per acre. This should be used on high yield potential fields, lower pH or sandy soils.

Manganese is an important micronutrient for wheat. It becomes less available in higher pH soils. A tissue test should be considered in the spring. If no test is taken, consider a foliar application of Mn to be included with other foliar applications such as herbicides, insecticides or fungicides.

Zinc can also become limiting on high pH soils or on soils with high exchangeable K levels. A tissue test can identify problems before they limit yield potential.

Variety Selection

Twenty years ago, Frankenmuth and Augusta soft white winter wheat comprised 90% of the acres planted in Michigan. While white wheat used to dominate, soft red has become the type of choice for most growers today because of sprout resistance and

disease tolerance. Though acres are down, white wheat is still very important to the Michigan millers and most years will command a premium over red. If planting white wheat, keep in consideration how many days it will take to harvest as exposure to rain can induce sprouting and lower the test weight. Consider harvesting at a higher moisture level and drying the crop to preserve quality. Star of the West and many other elevators will accept 20% moisture with no drying charge.

Regardless of the type planted, a grower should plant two or more varieties with different maturities if he has acreage that will take more than one day to harvest. Varieties planted with differing maturity dates will spread out pollination and harvest risk. Varieties should be selected for high yield potential, high test weight, winter hardiness, standability and disease tolerance.

Variety Characteristics

White varieties

Ambassador (MSU 0028)

- This white has the best five-year average in the MSU trials
- Performs best under high management, takes 120# N
- Early maturity, first to harvest
- Non-bearded with excellent winter hardiness

Aubrey

- It is the best scab tolerant white
- High test weight, great falling numbers
- Excellent winter hardiness and stands well
- Best sprout tolerance of any white wheat
- Early maturity

Linebacker

- This late white variety has high yield potential
- Improved tolerance to sprout and Fusarium head scab
- Tall, excellent winter hardiness and plant health
- Great for sand

Envoy

- Best two-year average in MSU Trials
- Great powdery mildew tolerance
- Excellent tolerance to sprout
- High test weight

Red Varieties

RO45

- This non-bearded red works well Ingham County south
- High yields and high falling numbers
- Short and stands well under irrigation or high N rates and is a great choice for intensive wheat management
- Manage for Septoria and stripe rust
- If planted late, increase fall N rate to 50 pounds

RO55

- This non-bearded red is a work-horse variety
- Works well in no-till
- It has good height for the straw market
- Keep N under 120#
- Medium maturity

RO75

- High yielding, medium height red
- It stands well and tolerates high N rates
- Manage for stripe rust

- Great vomitoxin scores
- Good on heavy soils

Attack

- Medium maturity red
- Moderate resistance to stripe rust
- Good straw producer
- Push N rates

DF 105R

- Early / medium maturity bearded red
- Yields with intensive management
- Great standing
- Tolerance to powdery mildew, rust glume blotch, mosaic virus and head scab

DF 107R

- Medium maturity, medium height
- Tolerance to powdery mildew, Barley Yellow Dwarf Virus, glume blotch and Mosaic Virus
- Manage for head scab
- Also works in 15-inch rows

DF 108R

- Medium maturity bearded
- Racehorse and workhorse
- Very good test weight and tillering
- Tolerance to head scab, powdery mildew, rust, leaf and glume blotch

RO100

- Medium / late
- Excels in Southwest Michigan
- Responds to high management and irrigation

- Good straw

Hopewell – This has been the number one public seller in Michigan. It stands and yields well. One weakness is the wide open flower that makes it susceptible to scab. It will lose test weight if left out so must be harvested early. It has no Hessian fly resistance, so plant late. Manage for powdery mildew also.

Seed Treatments

All wheat should be treated with a fungicide prior to planting, preferably by a commercial treater rather than with a dry hopper treatment. The main disease targets are common bunt, loose smut, Stagonospora nodorum, Fusarium and Pythium. Fusarium controlled by seed treatments is for stand establishment and not for head scab at flowering.

Imidacloprid is now labeled for wheat and can be used to control insects that attack germinating wheat and for fall aphid feeding. There is great interest in controlling aphids as they transmit Barley Yellow Dwarf Virus (BYDV). For imidacloprid to work, the aphid must first feed on the plant. Unfortunately, BYDV can be transmitted by a single feeding of an infected aphid. Imidacloprid will not guarantee the prevention of BYDV, but may be an excellent tool in reducing BYDV in susceptible varieties, early planted wheat or wheat planted in high aphid years.

Efficacy of Seed Treatments

Product	Common Bunt	Loose Smut	Stagonospora nodorum	Fusarium	Pythium
Agrosol T	Good	None	Fair	Good	Fair
Allegiance	None	None	None	None	Excellent
Apron XL	None	None	None	None	Excellent
Dividend XL	Excellent	Excellent	Excellent	Good	Excellent
Raxil Thiram	Excellent	Excellent	Excellent	Good	Excellent
Raxil XT	Excellent	Excellent	Excellent	Good	Excellent
Vitavax RTU	Good	Good	Fair	Good	Fair

Vitavax 200	Good	Good	Fair	Good	Fair
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Planting

The magical date for planting is after the fly-free date, which in Montcalm County is September 15th. In reality, the optimum date is one week before or after the first frost, depending upon weather conditions, soil temperature and tillage system.

Ideally, wheat will be planted with enough warm weather left in the fall that it can go into dormancy with 3-4 tillers for best winter survival. This will give the plant the best chance to survive. But wheat should be planted late enough to avoid the Hessian fly, limit aphid attacks, and limit growth as to not encourage powdery mildew, rust and leaf blotch.

The best row spacing for wheat is 6 to 8-inches. Planting depth should be 1 to 1.5-inches. Planting depth should be controlled to assure even emergence.

Optimum seeding rate ranges from 1.6 to 2.1 million seeds per acre. The lower rate is for wheat planted near the fly-free day. The higher rate is for later plantings.

Seeds per Pound - Seeding Rates

Millions of Seeds Per Acre at 90% Germination						
Seeds / lb.	1.2	1.4	1.6	1.8	2.0	2.1
10,000	133	155	178	200	222	233
11,000	121	141	161	182	202	212
12,000	111	129	148	167	185	194
13,000	102	120	137	153	171	179
14,000	94	111	127	143	159	167
15,000	89	103	119	133	148	156
16,000	83	98	111	126	139	146

Seeds per Foot of Row

Seed Rate	Row Spacing in Inches			
	7	7.5	8	10
1.2	16	17	18	23
1.4	19	20	21	27
1.6	21	23	25	31*
1.8	24	26	28	35*
2.0	27	29	31*	38*
2.1	30	32*	34*	41*

Disease

The first line to know what wheat

resistant to change

practices to supplant deficiencies. No variety has all diseases covered. Know the weaknesses and plan accordingly.

Control

of defense is diseases your varieties are and then cultural

*Seeding rates should never exceed 30 per foot of row

Early plantings with lush growth should be scouted in the fall for powdery mildew, rust and aphids that transmit BYDV. If disease is present, scout very early in the spring as disease may over-winter.

The upper two leaves and the glumes on heads are the most important parts to protect for grain fill. It is essential to keep these areas free of disease for top yields.

Wheat Disease Thresholds

Wheat Growth Stage	Disease	Leaf	Disease Level
Flag leaf emergence (GS8) to Boot (GS10)	Powdery mildew	2	2 to 3 lesions
	Stagonospora leaf blotch		1 to 2 lesions
	Septoria leaf spot		2 to 3 lesions
Head emergence (GS10.1) to end of flowering (GS10.54)	Leaf rust	1	5 to 10 pustules
Flowering (GS10.5)	Fusarium head scab	Head	Rain

Leaf 1 is the flag leaf. Leaf 2 is just below the flag leaf.

Fusarium head scab is caused by the same fungus that causes Gibberella in corn. Avoid rotations with corn. The infection period for head scab occurs when wheat is subjected to rain, fog and morning dew during flowering. Never use a strobilin product during flowering as it will increase the development of mycotoxins.

Wheat Fungicides

2011

March

Product	Disease	Timing	Rate	Cost	Cost Per Acre
Proline 480 SC	Scab	Feekes 10.4 to 10.52	4.4-5.7 oz.	\$ 510.08	\$21.32 - \$27.62
Tilt EC	Scab	before 10.5	4 oz.	\$ 118.31	\$11.46
	Powdery mildew	Feekes 10	2-4 oz.		\$5.73 - \$11.46
	Septoria	Feekes 10	2-4 oz.		\$5.73 - \$11.46
	Rust	Feekes 10	4 oz.		\$11.46
Quilt	Powdery mildew	up to 10	7-14 oz.	\$ 112.15*	\$9.58 - \$19.16
	Septoria	up to 10.5	7-14 oz.		\$9.58 - \$19.16
	Rust	up to 10.5	10.5-14 oz.		\$14.37 - \$19.16
Headline	Powdery mildew	Feekes 10	6-9 oz.	\$ 212.91*	\$23.43 - \$35.01
	Septoria	Feekes 10	6-9 oz.		\$23.43 - \$35.01
	Rust	Feekes 10	6-9 oz.		\$23.43 - \$35.01
Prosaro	Scab	Feekes 10.52	8.2 oz.	\$ 198.49*	\$19.90
	Powdery mildew	Up to Feekes 10.52	6.5 - 8.2 oz.		\$15.78 -
	Septoria, rust				\$19.90
Caramba	Head Scab (suppression)	Up to Feekes 10.52	17 oz.	\$145.88	\$19.37
Stratego	Glume blotch,	Feekes 10	10 oz.	\$160.83	\$12.56

	Powdery Mildew Rust				
Kocide 3000	Hel. Spot Blotch	Feekes 6 - 11	.5 -.75 lb.	\$ 8.64	\$4.32 -
	Septoria Blotch				\$6.48

*These prices include maximum rebates to net to the lowest possible cost.

Weed Control

Winter annuals- Scout field in the fall. If winter annuals such as chickweed, purple deadnettle, shepherdspurse and field pennycress are evident, a fall application of an herbicide is needed prior to wheat going dormant. Often the weeds are small and susceptible to low herbicide rates.

Wild garlic- This weed contaminates wheat at harvest and needs to be controlled in the spring after garlic has several inches of growth.

Perennials- Canada thistle, quackgrass, sow thistle and other perennials need to be controlled prior to wheat being planted.

Annual broadleaves- A healthy wheat crop can suppress many broadleaf weeds such as ragweed, lambsquarters and pigweed. But usually an herbicide application is worth while.

Proper stage of growth needs to be monitored and the label needs to be followed in a conservative fashion to avoid any yield reduction. Be especially careful with growth regulators such as 2,4-D. Never use Banvel on wheat.

Insect Control

Hessian fly- This insect has two generations per year. The maggots hatch on leaves and feed on stems in the fall in the first generation. The second generation hits in the

late spring and usually the wheat will outgrow the stress. The best control option is to plant 10 days after fly-free day. If planting near fly-free day, make sure there are no fields of volunteer wheat near by that can serve as a breeding ground.

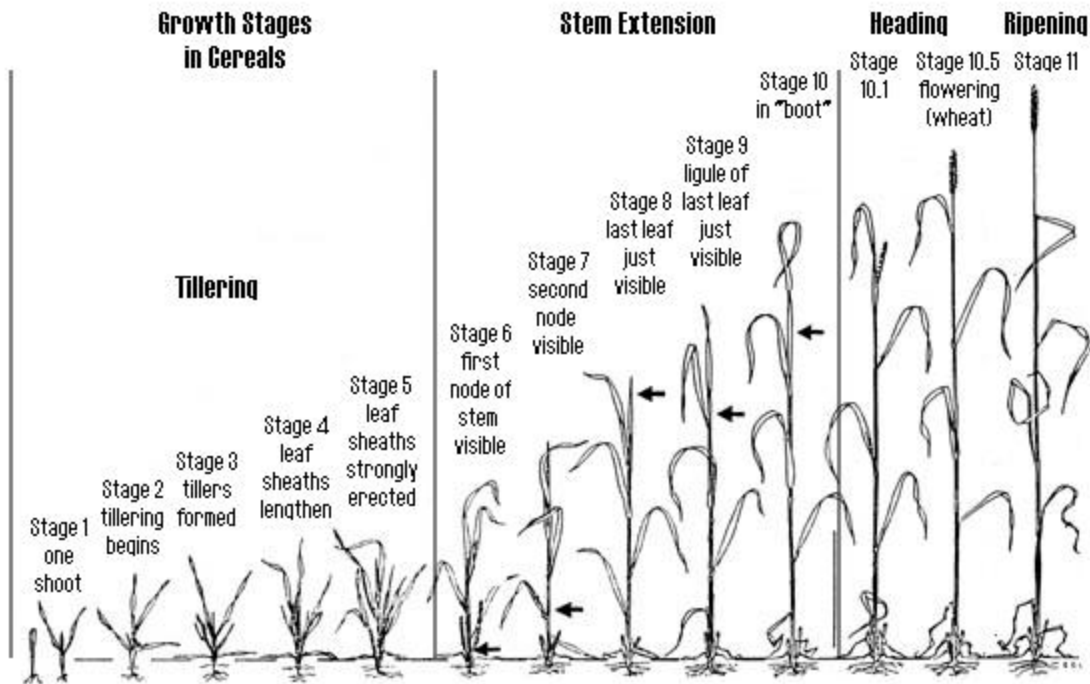
Aphids- English grain aphid and the cherry oat aphid can cause feeding damage.

The greenbug is not known in Michigan yet. It is a severe pest out west as it injects a toxin into the wheat as it feeds. Other aphids may feed on wheat, but do little feeding damage. All aphids can transmit barley yellow dwarf virus within six hours of landing on a plant when they feed. Thus controlling aphids to stop BYDV with a spray is very difficult. There is some interest in using imidacloprid seed treatment to limit the spread of aphids. This will have application when wheat is planted early or in years when aphid populations are high.

Cereal leaf beetle- Larvae hatch in the spring and appear as black slugs on the wheat leaves. Scouting for cereal leaf beetle is easy. Simply walk through a wheat field. If your pants have black stains, you have cereal leaf beetle. Usually CLB are controlled by parasitic wasps. CLB usually gets out of control on oats before we see it in wheat. If CLB is present at 2 per stem or are feeding on the flag leaf, treat.

Armyworm- Adults lay eggs in grass in early May. Larvae become active in late May and early June, feeding on leaves. The most serious damage occurs when they clip seed heads. Treatment is warranted when three larvae per foot row are found and their size is less than 1-inch long.

Feekes Scale



The short list to top wheat yields

1. Plant wheat after soybeans or dry beans.
2. Plant on a well drained mineral soil type with good water holding capacity.
3. Plant seed 1 to 1.5-inches deep.
4. Soil pH should be 6 to 7 prior to planting.
5. Starter P and K should be applied in the fall with 20 – 25 pounds of N and 2 – 3 pounds of sulfur in the sulfate form. Impregnate 8 ounces of CopFlo on the starter fertilizer. P and K should be based upon soil test recommendations.
6. Plant certified seed of a good standing, high yielding variety that can take high rates of N.
7. Have seed treated with Dividend or Raxil / Thiram fungicides and imidacloprid insecticide.
8. Plant at least 10 days after the fly-free day.
9. Plant 1.6 million seeds per acre. Up this rate 30% if planting towards the end of October.

10. Scout field for winter annuals and spray if necessary in the fall.
11. At spring green-up, count the average number of tillers. If the number is low (2-3 per plant), 50% of the total N should be applied now. If the count is high (5+ per plant), apply 33% of the total N. Include sulfur in the sulfate form at a 10:1 ratio N:S.
12. Scout for weeds prior to Feekes 6. Usually the time to spray weeds is after the first N application and before the second. Do not use Banval. Try to stay away from 2,4-D also.
13. At Feekes 6, apply the balance of the N with sulfate sulfur at a 10:1 ratio. Apply the N as a dribble, stream or watered down broadcast to limit leaf burn.
14. Tissue test for Mn, Mg and Zn. This will be a greater issue for soils with a high pH and high levels of exchangeable K. These nutrients may be foliar applied with an herbicide or fungicide. Check the label for compatibility concerns.
15. Scout after green-up for powdery mildew and rust. Protect the flag leaf. Use the Penn State scab model and apply a scab fungicide if predictive levels are above "low".
16. Scout for cereal leaf beetle and armyworm prior to heading.
17. If producing white wheat, harvest at higher moisture and dry. This will help preserve test weight and sprout damage.