MARYLAND COOPERATIVE EXTENSION
UNIVERSITY OF MARYLAND
COLLEGE PARK•EASTERN SHORE

Fact Sheet

Fact Sheet 446

Managing Wheat for Maximum Economic Yields in Maryland

Maryland grain producers and those in the Middle Atlantic Region need to learn more about Intensive Cereal Management (ICM) systems, and for a good reason. ICM researchers have shown that wheat has an enormous untapped production potential.

Many of the ICM principles are not new. ICM practices include factors that have always been important to effective crop management, such as variety selection, planting date, row spacing, seeding rates, fertilizer management, pest management (diseases, weeds and insects), as well as new factors such as the use of growth regulators. Yet, ICM is not a "cookbook" approach to wheat production. Each of these factors must be assessed individually for its usefulness to each farmer. ICM research is dynamic and as more is learned about managing wheat for maximum productivity, practices will change. However, this fact sheet represents the most current knowledge about intensive wheat management.

Selecting a Variety

One of the keys to a successful ICM system is choosing the right variety. The wheat variety sets the upper limit of the crop's production potential. ICM practices make the most of this potential. *Agronomy Mimeo 19*, published annually in August by The University of Maryland Department of Agronomy, includes results of the state wheat trials and serves as a guide for selecting varieties for use in Maryland. Varieties that perform well under conventional management generally perform well under ICM. However, wheat varieties differ in their response to the use of high fertility, fungicides and growth regulators. They also vary in their level of resistance to plant pathogens and insect pests. Therefore, when planning an ICM program, find out which varieties are the most suitable for high yield management inputs.

In research conducted during the past 5 years, the public wheat varieties that have performed well consistently in ICM systems include: *Massey, Potomac, Saluda, Severn, Tyier* and *Wheeler.* The proprietary varieties that have also performed well in ICM systems research include: *Hybrex Brand HW 3007, Hybrex Brand HW 3021* (Rohm and Haas Seeds), *Pioneer Brand 2550* (Pioneer Hi-Bred International, Inc.), and *Coker Brand 916* (CR Seeds).

Planting the Crop

Seeding

To promote good fall establishment and adequate winter survival, ICM stresses the importance of planting wheat at the right time. In Maryland, the target planting date is the "fly-free" date. This date

varies from county to county, falling between September 20 in extreme Western Maryland and October 11 on the lower Eastern Shore. In addition to ensuring good stand establishment and adequate tiller production, adherence to the target date will also discourage Hessian fly infestations.

Farmers may wonder whether or not varying seeding rates affect crop productivity. The results of ICM research do not demonstrate any consistent advantage to increasing seeding rates beyond currently recommended rates of 1½ to 2 bushels per acre (90 to 120 pounds per acre). For some varieties, preliminary data indicate that a yield advantage may be obtained by calibrating planting equipment to seeds per foot. However, because of insufficient data, there are no specific recommendations for an optimum number of seeds per foot for each variety. Plant on time and at currently recommended seeding rates for maximum yields.

Spacing

There is a consistent 8 to 10 percent yield advantage for wheat planted in narrow (4-inch) rows compared to conventional row spacing of 7 to 8 inches. For those farmers who do not have the equipment to plant in narrow rows, some of this narrow-row yield advantage can be made up by careful fertilizer management. However, because of the consistent advantages realized by narrow-row production throughout the Maryland region, grain producers who intend to become actively involved in ICM systems may want to consider making an important management decision: either redesign an old drill to permit narrow-row planting or purchase a new 4-inch drill.

Managing the Crop

Crop Development

To get the most from ICM inputs, farmers should focus on crop development rather than calendar date when managing their fields. Figure 1 illustrates growth stages of wheat according to the Feekes Scale, a commonly used scale for identifying application time for various management inputs.

References will be made to this development scale throughout the following discussion.

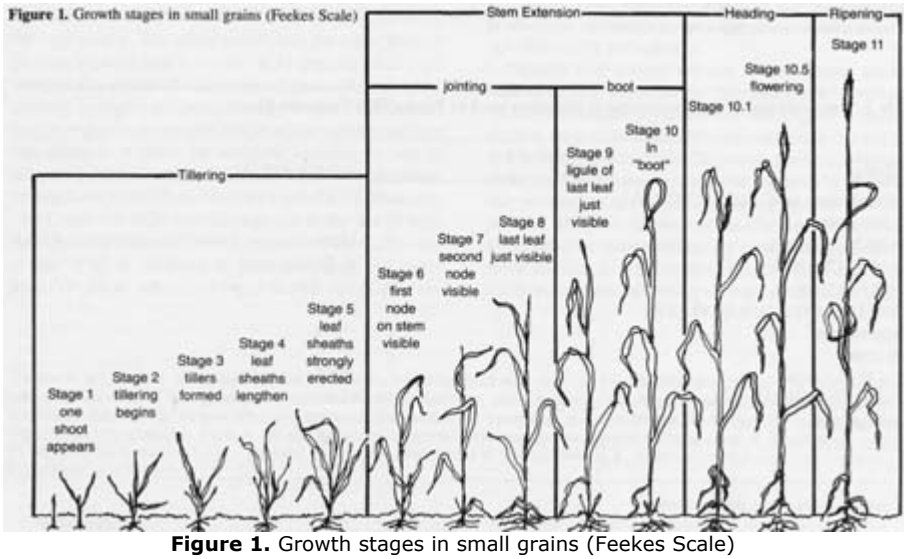

Figure 1. Growth stages in small grains (Feekes Scale)

Fertilization

Fertilization begins with a soil test. Based on the results, the soil pH and fertilizer application can be adjusted. A productive soil with a pH greater than 5.8 is a prerequisite for ICM. A pH of 6.2 to 6.5 is optimal for wheat production on most soils. However, the pH should not exceed 6.2 on light sandy soils

or 5.6 on black high organic matter soils. If the pH is too high, the soil may be deficient of certain micronutrients such as manganese or zinc.

To determine the correct application of phosphorus and potassium (P and K), farmers should seek assistance from their county Extension agents who will provide guidance after reviewing soil test results. In general, P and K management aims to move P and K levels in a wheat producer's soil into the medium- to high-test range.

The management of nitrogen is somewhat more complicated than P and K management. ICM research indicates that the amount of fall nitrogen used in ICM systems is about the same as it is for conventional wheat management (10 to 20 pounds per acre at planting). Two spring applications totaling no more than 120 pounds of nitrogen per acre is sufficient for most producers. This amount can and should be reduced in certain circumstances. Farmers should limit the total nitrogen application based on the probability of lodging, particularly if a history of lodging problems is known. Lodging is usually a function of variety, nitrogen rate and nitrogen from other sources including the soil, previous legume crops, manure and nitrogen carryover.

ICM researchers recommend that the two spring applications be split equally (60 + 60) with the first application at green-up when spring tillering begins and the second at Feekes growth stage 6 when the first node on the stem is visible. Recent data suggest that the total nitrogen application can be reduced by as much as 30 percent when the application is delayed until growth stage 5; it has been observed that a single 80-pound application of nitrogen per acre at growth stage 5 (when leaf sheaths are erect) results in yields equal to those under the 60 + 60 split outlined above. This delayed N treatment seems to improve nitrogen use efficiency. In addition, they find that residual carryover nitrogen, especially when a dry year precedes wheat, can reduce the total nitrogen requirement in wheat. Eventually, tissue analysis or improved soil nitrogen tests may serve as a guide for nitrogen applications, but data are inadequate at present.

Controlling Pests

Diseases, weeds and insects threaten wheat grown in ICM systems. The threat from some pests increases under ICM because they thrive in the lush growth typical of wheat grown under this system. Scouting the fields is the single, most important guideline for ICM pest management. Next, the problem must be identified before a remedy can be found. Consult Cooperative Extension Bulletin 237, "Pest Control Recommendations For Field Crops" for detailed pest management information. The major pest problems that occur in ICM systems are discussed below.

Diseases

The best available seed treatment at this time is Vitavax 200--a cheap insurance against seedling blights in the fall, and loose smut. Baytan, a new seed treatment, shows great promise, especially in ICM systems and may soon be registered. In experimental trials, Baytan has provided excellent control of loose smut and early season control of powdery mildew. It has no seedling blight activity and will likely be marketed in combination with captan or thiram to provide the seedling blight control.

The primary foliar diseases that are yield reducing threats to susceptible varieties are powdery mildew and rust. If scouting detects either of these diseases on the upper leaves between growth stages 6 and 10, weather is forecast to be favorable for disease development, and the yield potential of the crop is at least 60 to 70 bushels per acre, then foliar fungicides should be considered. The foliar fungicides Bayleton and Tilt, have provided excellent protection against powdery mildew and leaf rust when applied according to label rates and restrictions. Note that each material has different restrictions on timing of applications and subsequent crops. At the time of this writing. Tilt cannot be used in a double-crop system (for example, soybeans planted following wheat) until residue tolerances are determined. Consult the label for details on this and other restrictions for both materials. The mancozeb compounds (Dithane

M-45 and Manzate 200) are also registered for use on wheat. These fungicides are useful in disease management, when used in a tank mix with Bayleton or Tilt. The tank mix improves control of leaf and glume blotch diseases and reduces the chance of mildew and rust developing resistance to Bayleton or Tilt.

Weeds

Conventional weed control, using a combination of 2,4-D and Banvel, is also successful in ICM systems. Use bromoxynil as an alternative for fall weed control, but be aware that bromoxynil is relatively expensive, and while it controls some winter annuals effectively, it does not provide control of all target weed species, especially garlic.

Insects

Before grain producers make any treatment decisions, they should scout their fields for pests. The dense canopy produced in ICM systems provides an ideal environment for insects. Some insect pest populations can grow to potentially damaging levels quickly. Regular scouting helps farmers detect and control insect populations before they become a problem. Additional information about pest control can be found in Cooperative Extension pest management aids 12 and 13, "Small Grain Insect Pests, I and II".

Using Growth Regulators

Use growth regulators in ICM programs where the threat of severe lodging pressure exists. A growth regulator such as Cerone, however, will not increase yield. It functions by shortening the plants, and stiffening the straw, thus reducing lodging and protecting yield. Growth regulators are advisable if grain producers have experienced lodging under conventional management systems or have reason to believe that lodging may be a problem under high fertility. Do not use growth regulators when the wheat crop is under any sort of stress and lodging is not an anticipated problem. In these instances, growth regulators have occasionally decreased yields. Some wheat varieties (such as Tyler) are more sensitive to damage by Cerone than others.

Using Tram Lines

Because of the importance of timely, precise and uniform application of chemical materials in ICM systems, using tram lines can be helpful. A tram line is a pair of skip rows at intervals calibrated to your tractor wheel base and the spray equipment intended for use. Tram lines are established at planting time by blocking seed openings on the drill. ICM research indicates that each tram line track (tire track) should be no wider than 12 inches. Tram lines should be spaced a minimum of 40- to 60-feet apart on-center. Wider tram line tracks or closer spacing may reduce yield and are not recommended.

Estimating Costs

Table 1 lists the costs of the ICM program. are in addition to the costs incurred by conventional management (Table 2).

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Table 1. Intensive cereal management (ICM)--extra costs to consider[a]

Treatment	Costs per acre ($)
Additional N (60 lb/A @ $0.18 lb)	10.80
Application of N	3.50
1st Application (growth stages 6-8)	
Bayleton (2 oz/A)	5.55
Dithane M-45 (2 lb/A)	3.50
Cerone (12 oz/A) (if required)	6.60
Custom Applicator Cost	3.50
(Cerone, if applied separately, additional $3.50/A)	
2nd Application (growth stages 9-10.1)	
Bayleton (2 oz/A)	5.55
Dithane M-45 (2 lb/A)	3.50
Custom Applicator Cost	3.50
Insecticide (cost depends on chemical)	6.00
Custom Applicator Cost ($4.50 if applied by air)	3.50
Total (above conventional costs)	$55.50

[a] Your actual costs should be compared to these estimates when considering ICM. Required increase in wheat production (bushels per acre) to cover ICM costs (with wheat at $2.50 per bushel)--15 to 20 bushels per acre increase needed to cover costs of extra nitrogen, Bayleton and Dithane M-45 fungicides, 20 to 25 bushels per acre increase needed to cover costs of extra nitrogen, pesticides and growth regulator.

Table 2. Conventional wheat management practices used at Poplar Hill Research Farm

Treatment	Costs per acre ($)
Certified wheat seed, Saluda (100 lb/A)	13.25
Fall Fertilizer	
0-20-20 (300 lb/A)	18.00
5-10-10 (250 lb/A)	15.25
Spring Fertilizer	
30% UAN (60 lb N/A @ $0.18/lb)	10.80
Application	3.50
Herbicides	
2,4-D (0.5 lb/A)	0.87
Banvel(0.125lb/A)	1.64
Application	3.50
Fuel ($1/gal)[a]	6.00
Total	$72.81

[a] Fuel needed for plowing, disking, planting and harvesting.

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