Soybean and Wheat Production

Wisconsin CCA Training
December 17, 2003

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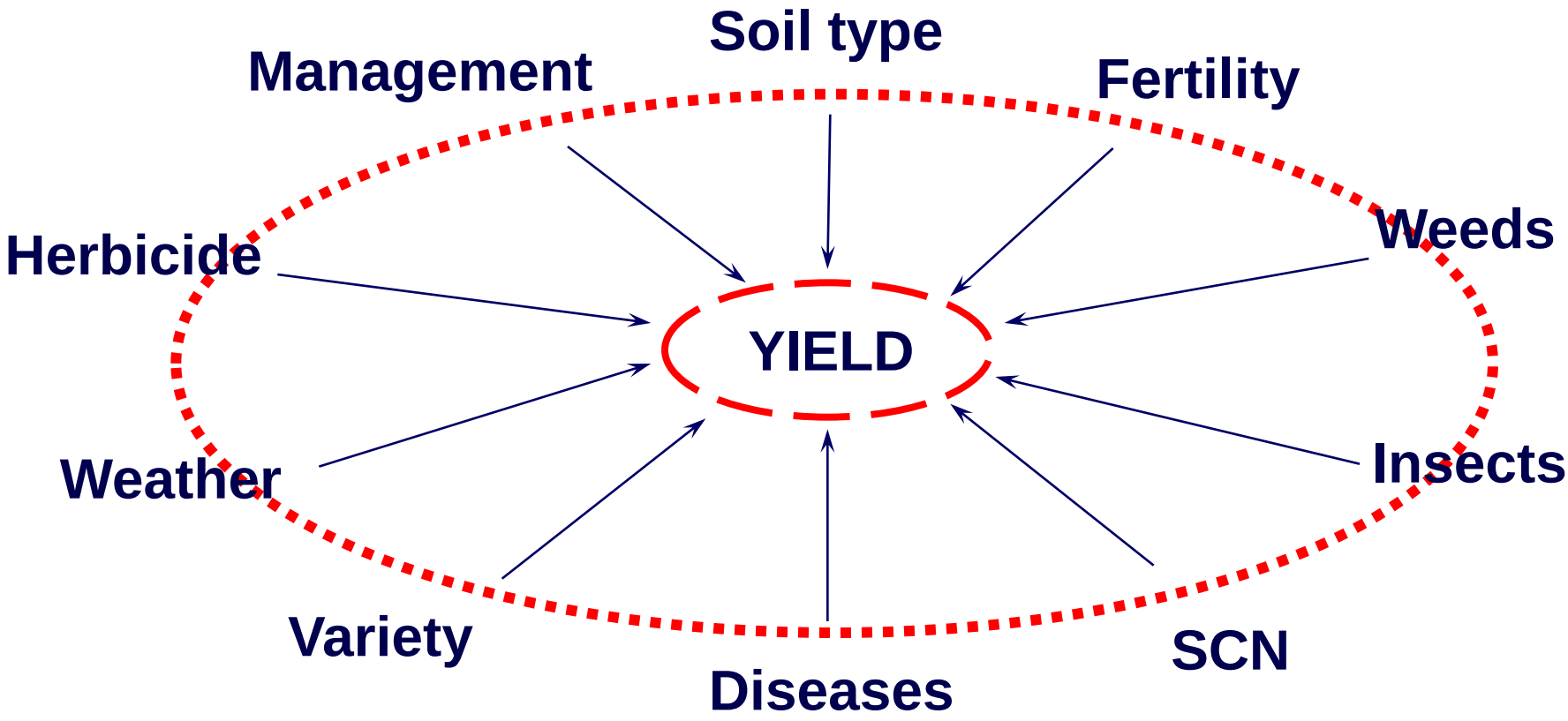
UW - UWEX Soybean and Small Grain

SOYBEAN YIELD IS A COMPLEX SERIES OF INTERACTIONS



WISCONSIN SOYBEAN PRODUCTION KEYS TO SUCCESS

- ✓ Fertilize and lime based on a sound soil testing program
- ✓ Do not till or plant when soils are too wet
- ✓ Plant on dates recommended for your area
- ✓ Select varieties best suited to your area
- ✓ Use seed treatments and inoculate as necessary
- ✓ Use optimum plant populations for your row spacing
- ✓ Don’t plant too deep, 1” to 1.5” is optimum
- ✓ Monitor and control pest populations as necessary
- ✓ Harvest carefully and timely

MANAGEMENT PRACTICES BY STAGE OF GROWTH

Pre-planting

Post planting, early season

Post flowering

Harvest

PREPLANTING DECISIONS

- TILLAGE
- VARIETY SELECTION
- HERBICIDE CHOICES
- FERTILITY PROGRAM

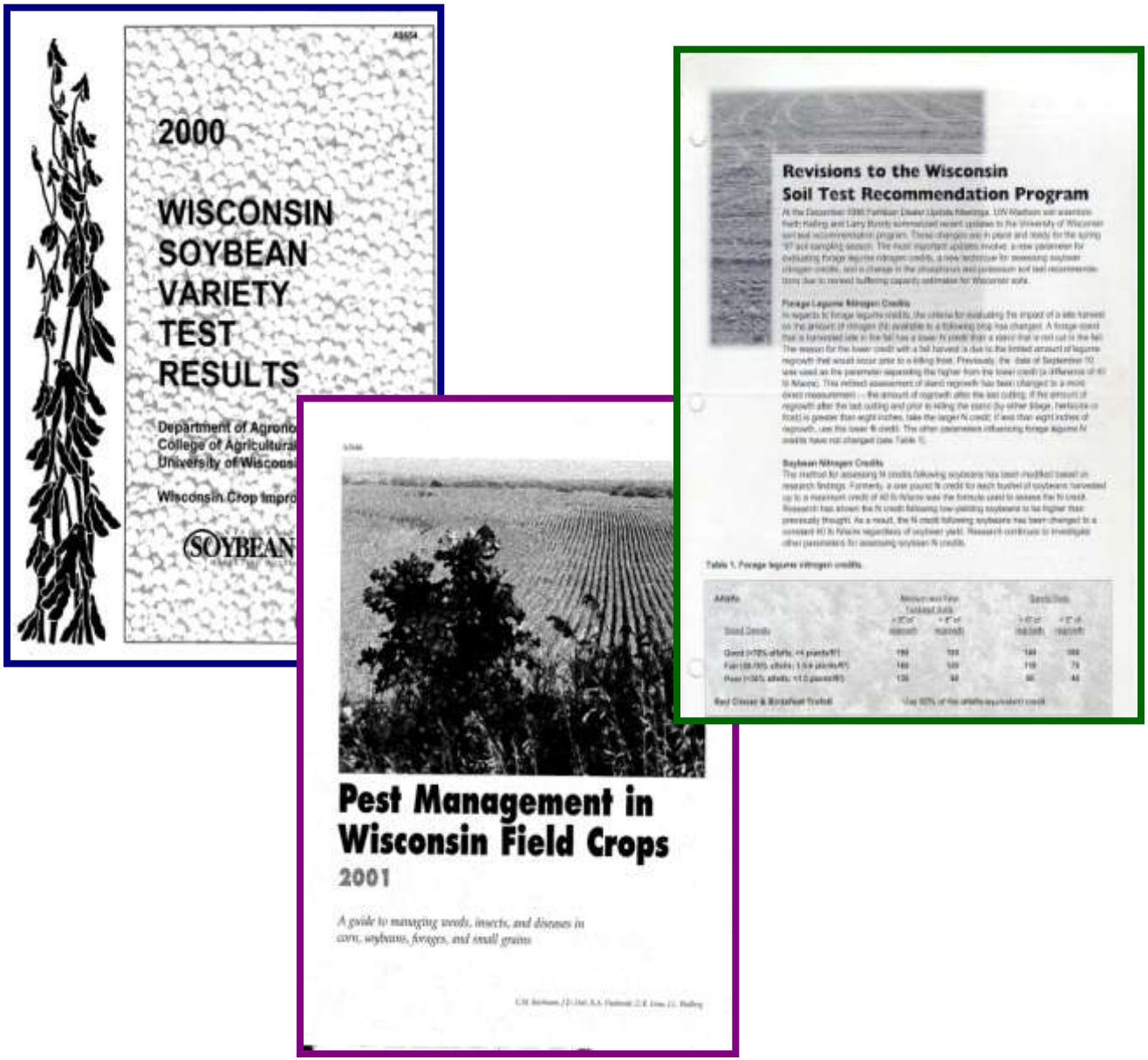


TABLE 3. CENTRAL REGION SOYBEAN TEST (Page 4 of 4)

2000 Performance of Public and Commercial Entries at Three Central Wisconsin Locations.
FON = FOND DU LAC, GAL = GALESVILLE, HAN = HANCOCK

Originator/Brand	Entry	Maturity Group	Herb. Toler. **	2000 3-Test Average Yield	Lodging	Height	Maturity	2000 Yields FON	GAL	HAN ***	Disease HAN ***	1999 3-Test Average Yield	Lodging	Height	Maturity	1999 Yields FON	GAL	HAN	6-Test Ave. Yield
				Bu/A	1-5	In	Date	Bu/A			%	Bu/A	1-5	In	Date	Bu/A			Bu/A
Ramy	R 900 RR	0.9	RR	52	2.7	38	17-Sep	51	57	48	29								
Ramy	R 1490 RR	1.5	RR	56	2.3	33	16-Sep	52	62	53	24								
Ramy	R 1685 RR	1.6	RR	55	3.3	35	14-Sep	53	55	57	20	58	3.0	41	22-Sep	52	53	* 70	57
Ramy	R 1725 CH	1.7	CN	60	2.7	38	21-Sep	54	66	59	18								
Ramy	R 1605 CN	1.6	CN	56	3.3	33	17-Sep	54	56	57	11								
Renk	RS 1498	1.4	CN	59	2.0	33	15-Sep	* 57	61	60	5	59	1.7	35	22-Sep	54	* 58	66	59
Renk	RS 159 RR	1.5	RR	54	3.7	35	16-Sep	* 56	51	54	23	58	2.7	40	12-Sep	53	54	66	56
Renk	RS 1696	1.6	CN	56	2.0	35	19-Sep	53	64	52	24	59	1.7	36	19-Sep	56	55	66	58
Renk	RS 199 RR	1.9	RR	59	3.0	35	20-Sep	* 59	64	54	9	57	1.7	38	23-Sep	56	55	59	58
Renk	RS 208 RR	2.0	RR	42	3.7	36	26-Sep	50	44	32	70								
Renk	RS 2098	2.1	CN	* 63	3.0	36	22-Sep	53	* 70	* 65	5								
Spansoy	099 RR	0.9	RR	50	1.3	32	11-Sep	43	55	52	10								
Spansoy	141	1.4	CN	58	2.3	31	19-Sep	53	61	59	6								
Spansoy	162	1.6	STS	51	3.3	34	17-Sep	47	55	51	29								
Stine	1506-4	1.2	RR	57	2.0	34	17-Sep	53	60	58	13								
Stine	1700-6	1.6	CN	* 62	2.0	33	17-Sep	* 56	* 74	56	25								
Stine	1700-4	1.7	RR	58	1.3	32	16-Sep	53	64	56	2								
Stine	2500-7	2.0	CN	* 63	3.0	36	22-Sep	55	65	* 66	10	59	1.7	37	22-Sep	53	53	* 70	* 61
Stine	2016-4	2.1	RR	54	3.0	35	22-Sep	* 58	58	45	31								
Trelay	170	1.7	CN	59	2.0	34	16-Sep	54	64	59	5								
Trelay	207	2.0	CN	60	3.0	36	23-Sep	55	60	* 65	9	* 61	2.3	37	24-Sep	* 58	* 56	* 70	* 61
US Seeds	US E 1501 RR	1.5	RR	57	2.0	34	16-Sep	52	61	58	13								
US Seeds	US E 1901RR	1.9	RR	53	2.3	36	22-Sep	51	58	51	16								
US Seeds	US S 199	1.9	CN	* 63	2.7	36	22-Sep	* 58	65	* 65	10	* 61	1.7	37	20-Sep	* 60	51	* 72	* 62
MEAN				56	2.6	35	19-Sep	53	60	55	20	57	2.1	39	20-Sep	55	53	64	57
LSD(0.10)**				3				4	5	5	13	3				5	4	5	2

* Yields preceded by a "*" are not significantly different (0.10 level) than the highest yielding cultivar.

** Herb. Toler. ; Herbicide Tolerance : RR= Tolerance to "Roundup" herbicide , STS = Tolerance to Sulfonylurea herbicides, CN = Conventional herbicide tolerance.

***Hancock site was affected by Sclerotinia disease(White Mold) in 2000. The disease severity are % of plants expressing White Mold Disease and helps explain the lower yields for select varieties.

Results that are shaded provide the best estimate of relative variety performance.

SOYBEAN GROWTH AND DEVELOPMENT

Vegetative Stages

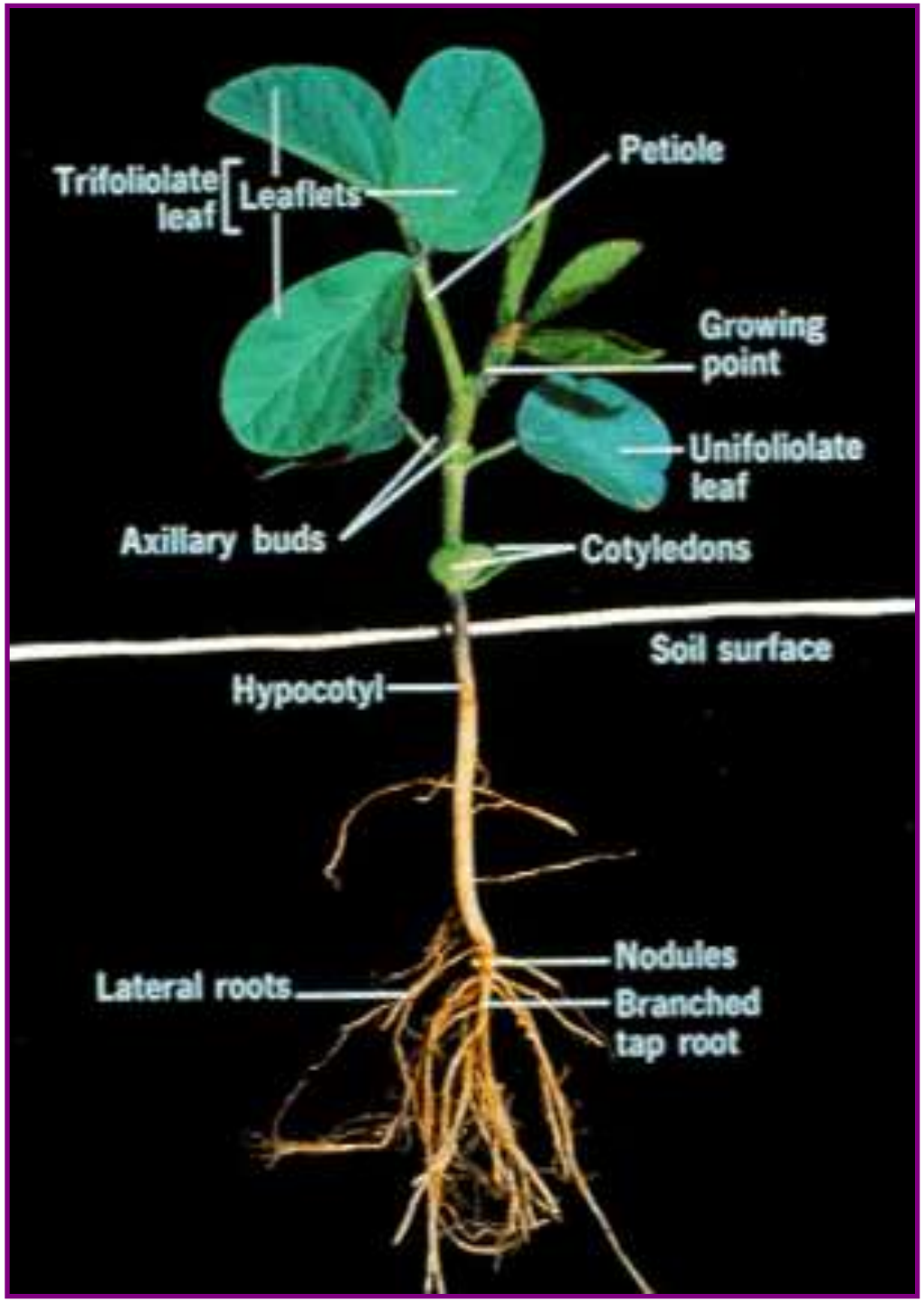
- V-Stages
- VE,VC,V1,V2,V3, Vn

Reproductive Stages

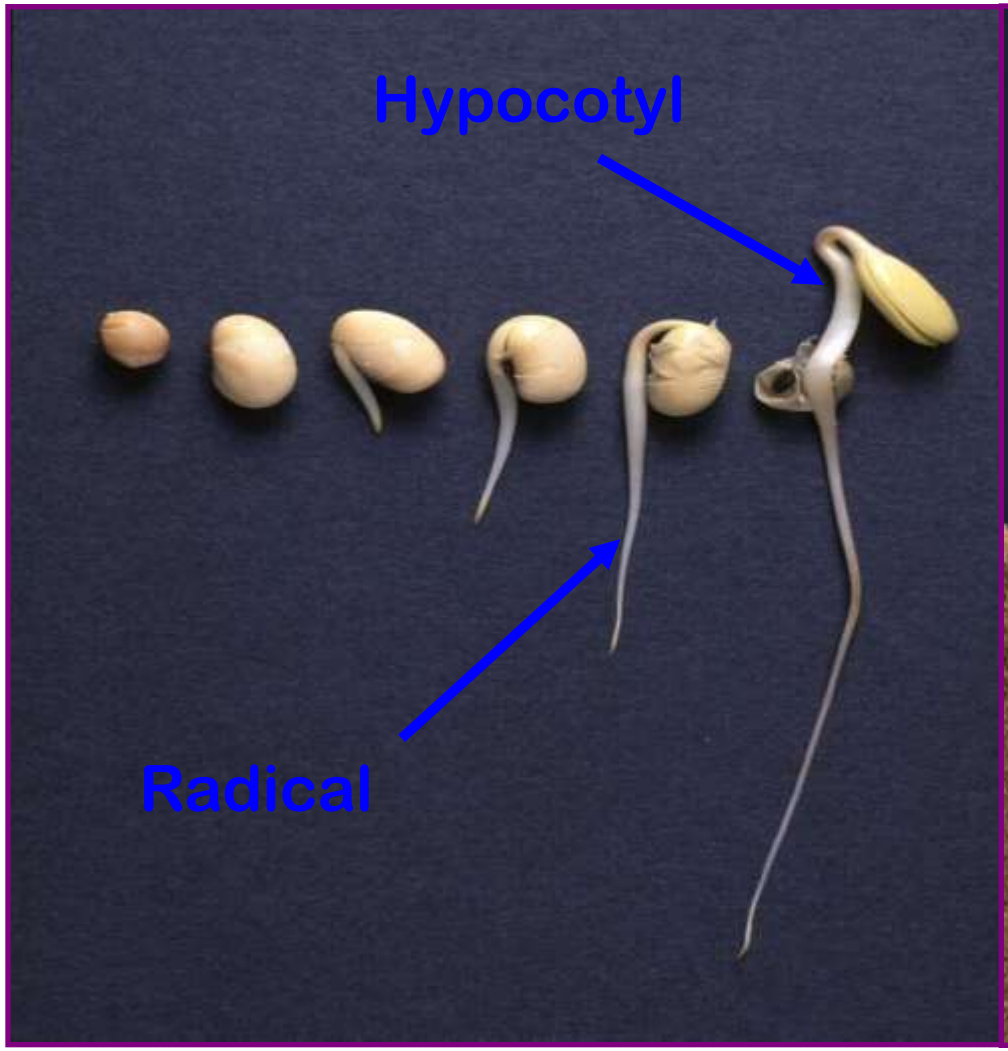
- R-Stages
- R1,R2,R3,…R8
- Starts at Flowering

SOYBEAN MORPHOLOGY

- Note growing points
- Nodes are counted when the leaflet above that node is opened



SOYBEAN GERMINATION



GERMINATION AND EMERGENCE PROBLEMS

VE - EMERGENCE

- 5 TO 14 DAYS AFTER PLANTING
- CHECK FOR NEED TO ROTARY HOE
- ASSESS HAIL DAMAGE

HAIL DAMAGE

- Assess mortality
- Know the growing points
- Determine remaining stand
- Use calendar date and stand to determine replant options

VC - COTYLEDON

- Unifoliolate leaves have unrolled
- Leaves are opposite

V1 STAGE

- One trifoliolate
- One node above the unifoliolate
- Trifoliolates are produced singularly and alternately

V2 – 2ND NODE

- Two trifoliolates
- Nodules have been established
- Check for proper nodulation
- If absent determine cause and prepare to apply N

SOYBEAN NODULATION

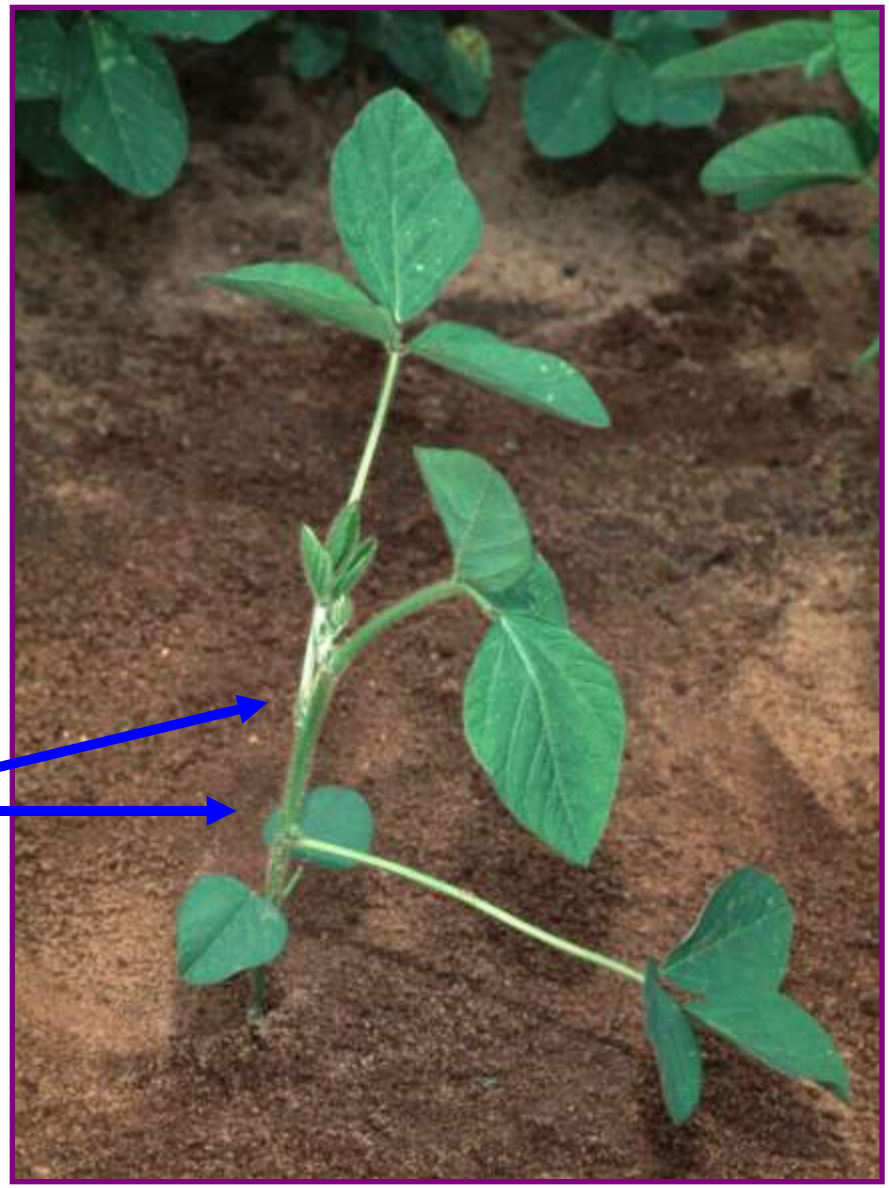
- Symbiotic relationship
- Native and introduced bacteria
- Necessary for high yields
- Chemicals, cold, hot, moisture all affect bacteria health

NITROGEN NEEDS OF THE SOYBEAN CROP

- Protein production requires nitrogen (N)
  N * 6.25= Protein
- A 50 bu/a crop of 38% protein seed requires 180 lbs of N/a for seed protein alone
- About 50% of the N comes from the nodules N fixation
- Soil NO_3 will inhibit N_2 fixation
- A small amount of N <u>may</u> increase yields in certain low N, high yielding environments

V3 – THIRD NODE

- 3 nodes above unifoliolate
- Cotyledons gone
- Axillary buds allow plants to recuperate from damage



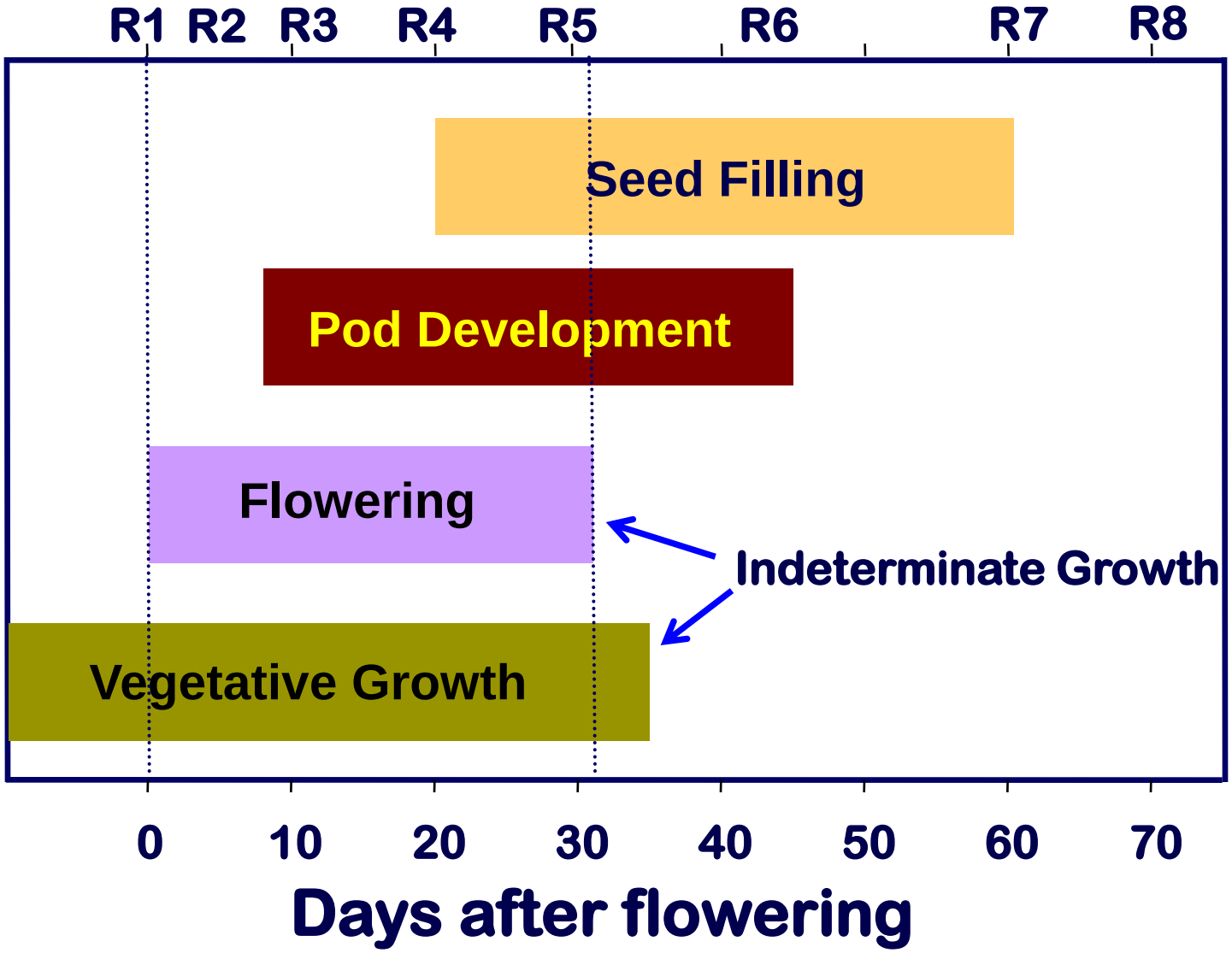
V6 STAGE

- New V stages every 3 days
- 50% leaf loss=3% yield loss

REPRODUCTIVE STAGES AND DEVELOPMENT

R1	Beginning Bloom (flower)
R2	Full Bloom
R3	Beginning Pod
R4	Full Pod
R5	Beginning Seed
R6	Full Seed
R7	Beginning Maturity
R8	Full Maturity

SOYBEAN REPRODUCTIVE DEVELOPMENT



BEGINNING FLOWERING

- R1
- One open flower at any node

MIDSEASON MANAGEMENT CONSIDERATIONS

- Soybean Diseases
- Weeds and Herbicides
- Midseason N applications

HARVEST MANAGEMENT

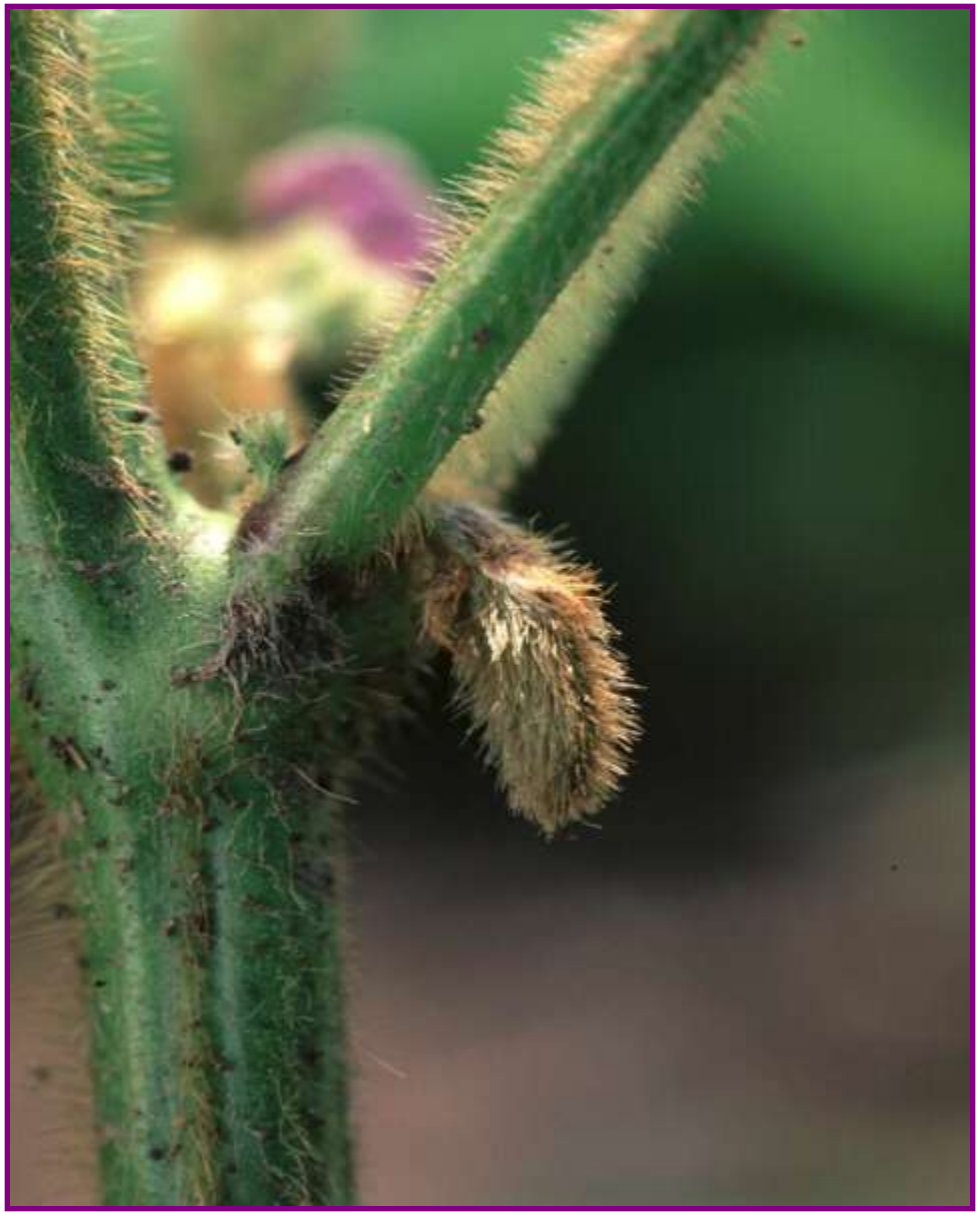
- Harvest timing and storage
- Identity preservation (IP)

FULL FLOWER

- **R2**
- **Open flower at one of the two uppermost nodes**

BEGINNING POD

- R3
- Pod 3/16” long at one of the four uppermost nodes
- 60-75% of flowers abort and never contribute to yield



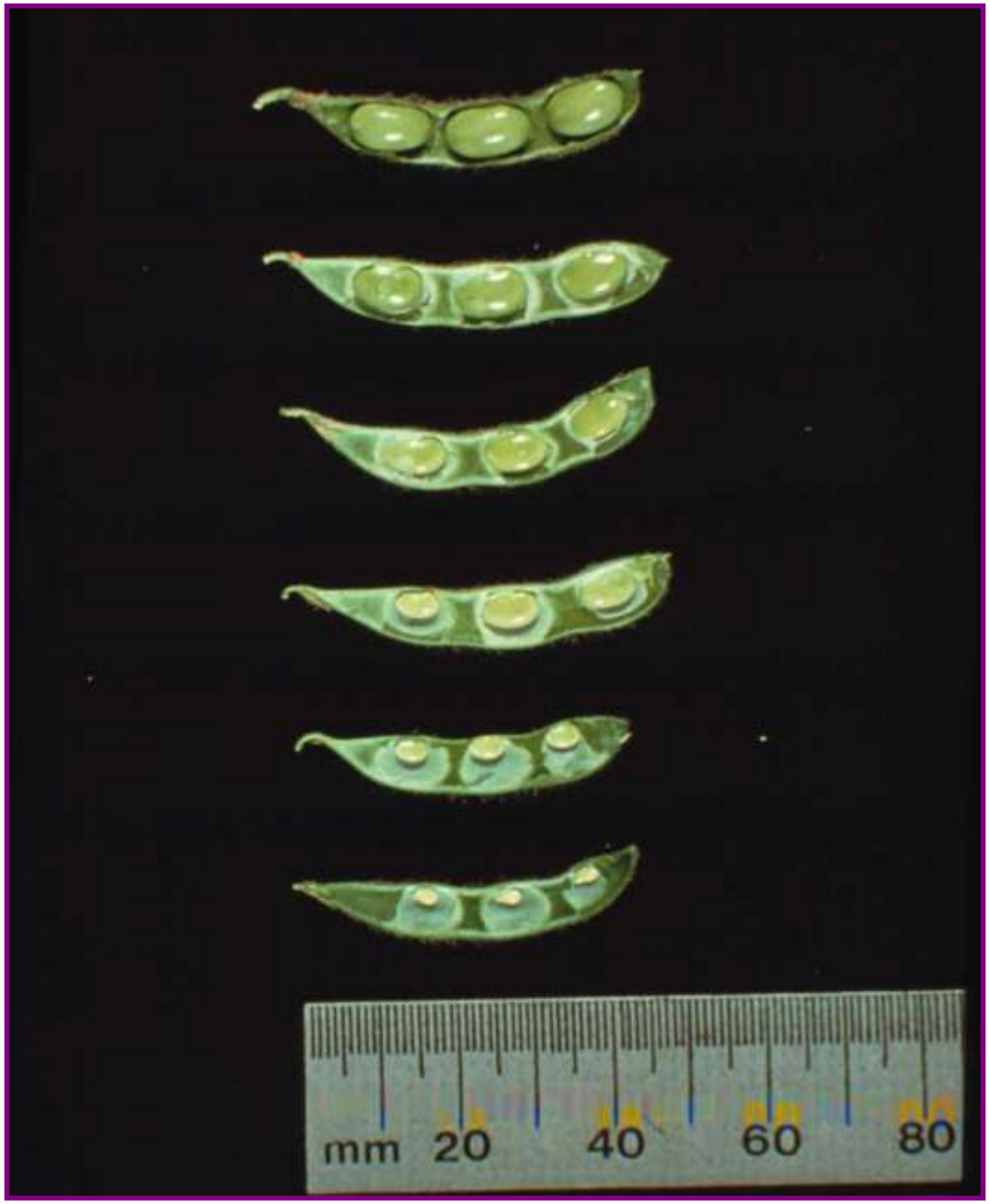
FULL POD

- R4
- Pod is ¾” long at one of the four uppermost nodes
- Beginning of critical yield determining period

BEGINNING SEED

- R5
- Seed is 1/8” long in pod at one of the four uppermost nodes
- Large demand for water and nutrients
- R5.5 is max node #, height and leaf area

Seed and Pod Development Through the R5 Stage



FULL SEED

- R6
- Pod containing a green seed that fills the pod cavity at one of the four uppermost nodes

BEGINNING MATURITY

- R7
- One pod anywhere with its mature color

FULL MATURITY

- 95% of the pods have reached their mature color
- Harvestable 7-10 days after R8
- Plant populations can be assessed

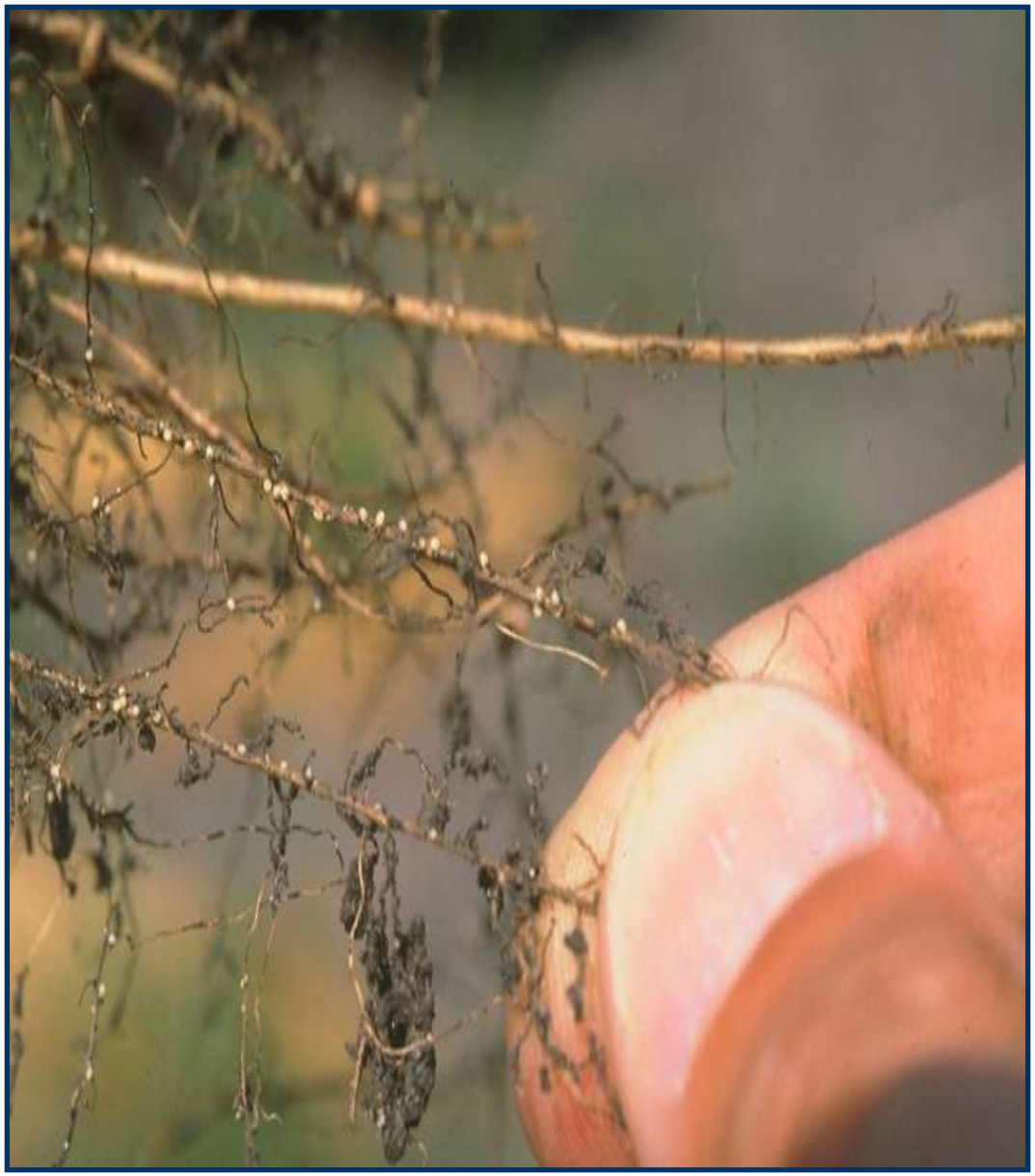
HARVESTING AND STORAGE

- **Manage Moisture**
  - ✓ **13% is optimal for storage and sales**
- **Carefully adjust (and readjust your combine)**
  - ✓ **Header losses can account for 80% of harvest losses**
- **Cut low, 3.5” stubble contains 5% of the crop, 6.5” stubble, 12%**

SHOULD I REPLANT?

SOYBEAN CYST NEMATODE

- widespread distribution
- no obvious symptoms
- quick reproduction
- long-term survival
- substantial yield loss
- look for yellow plants
- look for stunted plants
- look for SCN females on roots
- collect soil samples
- if < 500, alternate growing corn and SCN-resistant soybean varieties
- if > 500, grow several years of corn until egg counts decrease below 500



BROWN STEM ROT

- Risk throughout WI
- BSR can negate good management practices
- Soybean is the only host
- Soybean variety selection is key to control
- Crop rotations can minimize infection
- More severe BSR is observed in no-till

WHITE MOLD

- Wide host range
- Soybean variety selection is key to control
- Crop rotations can minimize infection
- No-till can help by reducing sclerotia numbers
- Canopy management – Row spacing and seeding rate

PHYTOPHTHORA ROOT ROT

- Many races of PRR exist in WI
- Some varieties have specific race resistant genes
- Improve soil drainage
- Rotate crops
- Avoid soil compaction
- Ridge soil during cultivation to stimulate root growth
- Apron or Ridomil seed treatments are effective

WISCONSIN WHEAT PRODUCTION KEYS TO SUCCESS

- Fertilize and lime based on a sound soil testing program
- Do not till or plant when soils are too wet or dry
- Plant on dates recommended for your area
- Make informed variety selections
- Use seed treatments as necessary
- Use optimum plant populations for your date of planting
- Don’t plant too deep, 1” to 1.5” is optimum
- Monitor and control weeds as necessary
- Monitor and control foliar diseases
- Harvest carefully and timely

Management Practices by Stage of Growth

Pre-planting

Planting and fall management

Spring management to heading

Post heading to harvest

PRE-PLANTING DECISIONS

- TILLAGE
- VARIETY SELECTION
- SEED TREATMENTS

A3397

Small grain varieties for grain and forage in Wisconsin 2001

H.F. Kaeppler, J.G. Lauer, R.D. Duerst, M.J. Martinka, and J.M. Gaska

Performance trials for small grain varieties are conducted each year at several locations throughout Wisconsin (table 1). Trials include released varieties, experimental lines from Wisconsin and neighboring states, and lines from private seed companies. The primary objective of these trials is to obtain data on how varieties perform in different locations and years. Growers use these data to help them in their choice of varieties to plant, and breeders use performance data to determine whether or not to release a new variety.

New varieties developed and released in Wisconsin are automatically entered in the Wisconsin Certification Program. These varieties have demonstrated superior production qualities. In addition, superior varieties from other states may be recommended and/or certified in the state. As new varieties are released to the public, older varieties with inferior qualities are removed from the recommended list and eventually dropped from the certified list as seed production declines.

Occasionally, varieties are certified without being recommended to Wisconsin growers. Varieties in this category may include commercial varieties developed by private seed companies or varieties where there is a substantial market for Wisconsin-produced seed. Thus, in Wisconsin, recommendation and certification do not mean the same thing. Recommended varieties are those with superior in-state production performance records, while certification provides the assurance of seed purity and seed quality.

VARIETY SELECTION

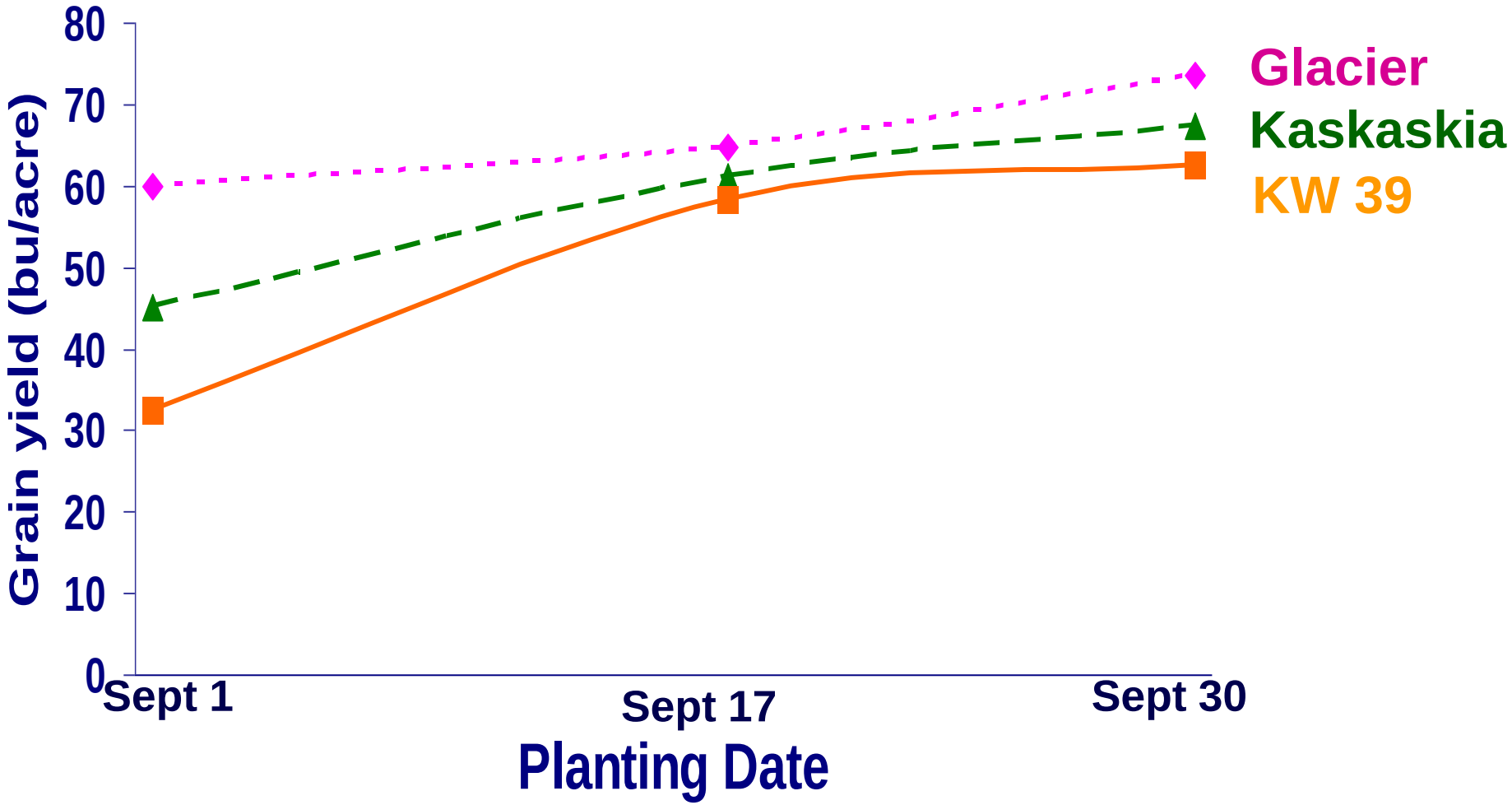
Factors to consider when selecting small grain varieties include grain or forage yield, maturity, straw strength,

Table 1. Location and agronomics of small grain variety trials in Wisconsin

Location	Cooperators	Soil type	Row spacing (inches)	Average nitrogen applied (lb/a)	Planting date	Harvest date
Arlington (wheat)	M. Martinka, J. Gaska	silt loam	7.5	100	Sept. 14	July 14
Arlington (barley, oat)	P. Ehrhardt, J. Albertson	silt loam	6.0	30	April 15	Aug. 2
Ashland	M. Mlynarek	red clay	8.0	60	April 21	Aug. 7
Chilton (wheat)	Kolbe Seeds, M. Glewen	red clay	7.5	75	Sept. 21	(hailed)
Chilton (barley, oat)	Kolbe Seeds, M. Glewen	red clay	12.0	75	May 3	Aug. 8
Janesville	Rock Co. Farm, D. Nehring	silt loam	7.5	100	Sept. 17	July 19
Lancaster	T. Wood	silt loam	7.5	*	April 6	July 27
Madison	R. Duerst	silt loam	6.0	*	April 6	July 21
Marshfield	D. Wiersma	silt loam	6.0	54	April 12	Aug. 7
Racine	Henderson Seeds	silt loam	7.5	66	Sept. 23	July 18
Spooner	M. Bertram	sandy loam	8.0	92	April 26	Aug. 3
Sturgeon Bay	R. Weidman	silt loam	12.0	30	April 25	Aug. 7

*Nitrogen credited from previous alfalfa or soybean.

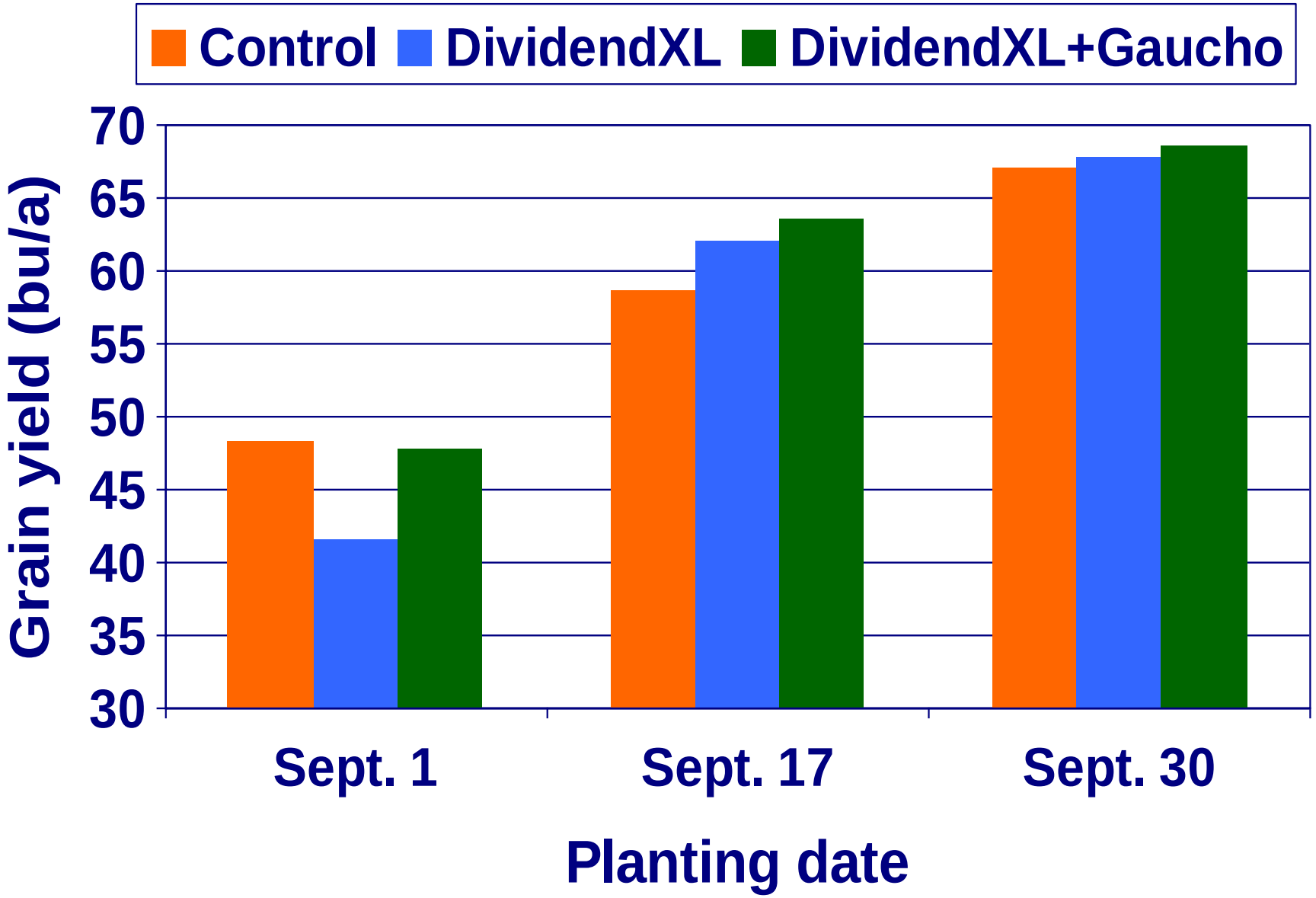
EFFECT OF PLANTING DATE ON WINTER WHEAT YIELD ARLINGTON, WI 2000



USES OF SEED TREATMENTS

- Manage seed and soil borne pathogens
- A single fungicide will not control all of the pathogens present
- Disease conditions vary from year to year
- In Wisconsin, to control bunt, smuts, and seedling blight (seedling phase of scab)

EFFECT OF SEED TREATMENT ON WINTER WHEAT YIELD ARLINGTON, WI 2000



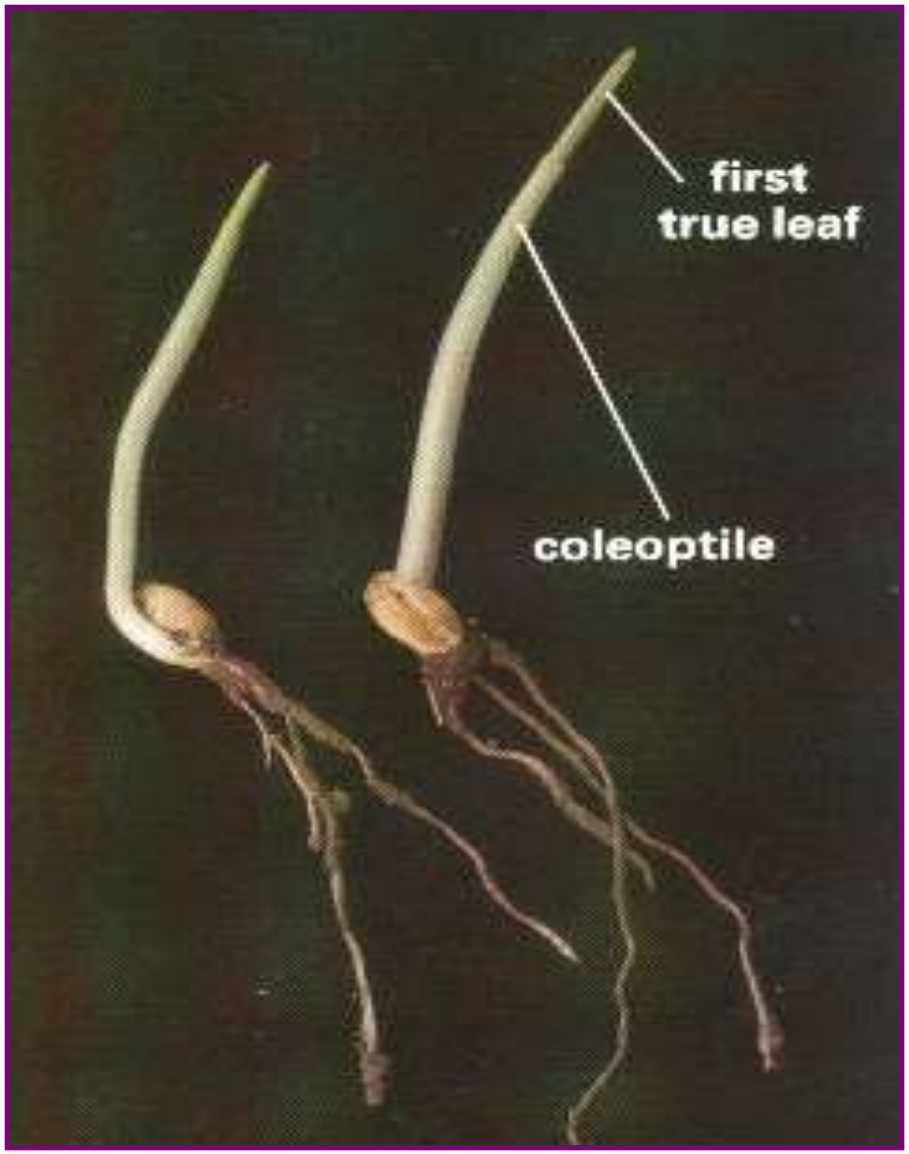
GROWTH STAGES OF WHEAT

- At least five scales used to describe stages of wheat
- Most widely used is Zadoks, others are Feekes and Haun
- Understanding growth stages is important to match management decisions to plant development

Zadoks 0 to 9

Germination and coleoptile emerged

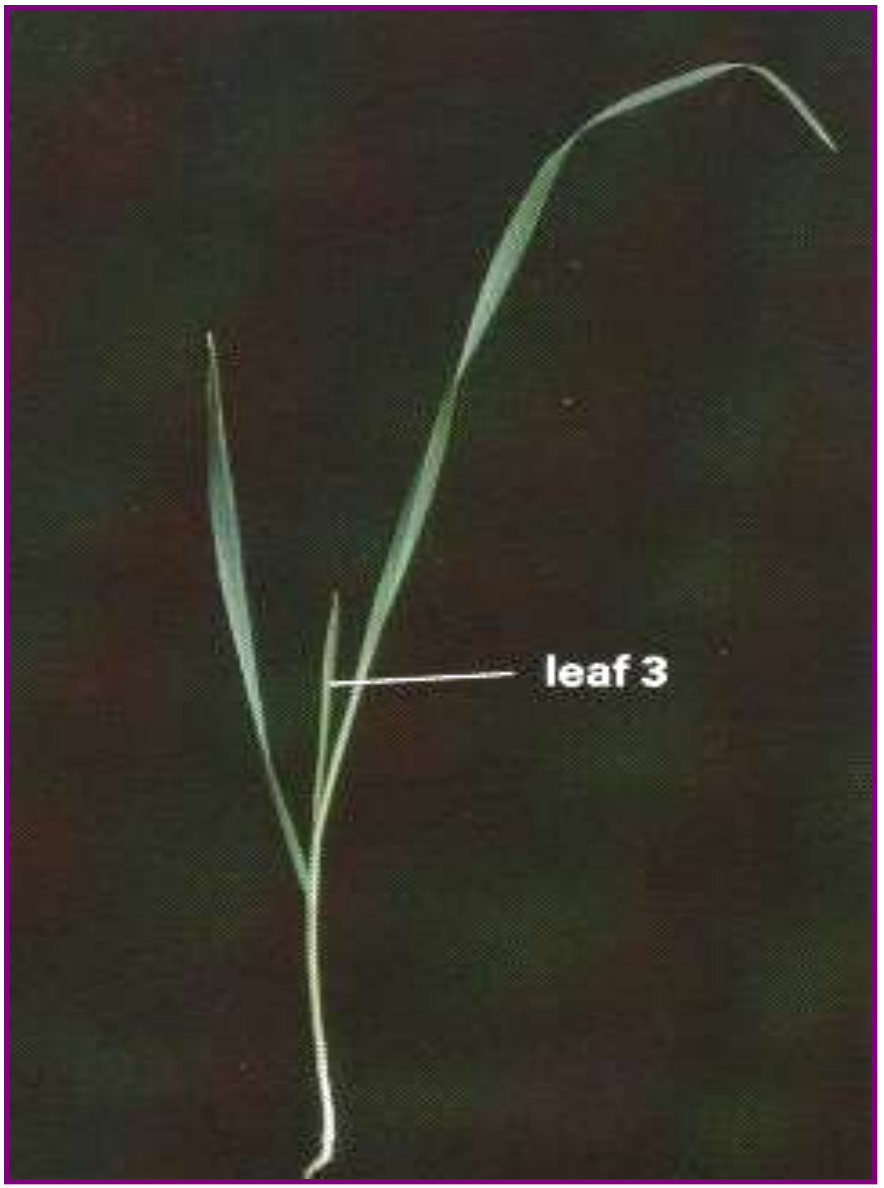
- Planting depth and soil temp influences the length of this stage
- First leaf just emerging



Zadoks 10 to 15

Seedling Development

- Seedling emergence
- GS 13 = single shoot with three leaves
- GS 15 = single shoot with five leaves



Zadoks 20 to 25

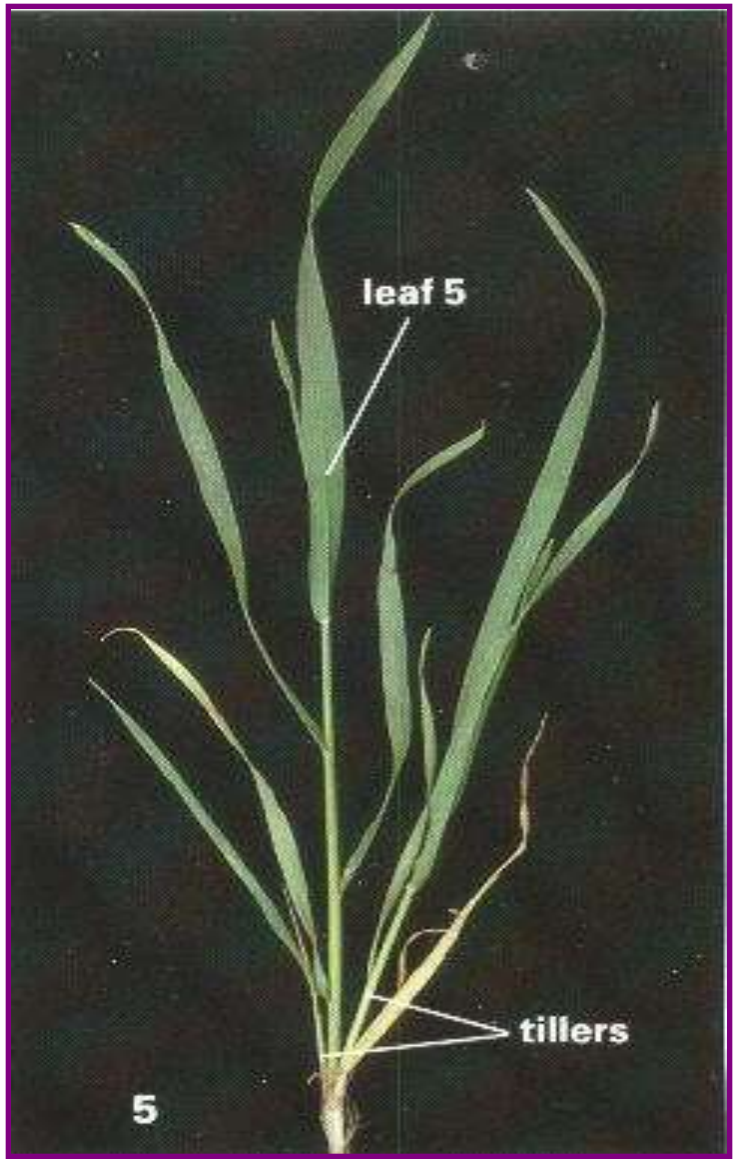
Tillering

- Fall or Spring
- GS 20 = main shoot
- GS 25=main shoot plus 5 tillers

Zadoks 30 to 39

Stem Elongation

- GS31 = 1st node detectable
- GS 37 = flag leaf just visible
- GS 39 = flag leaf collar just visible
- Many foliar fungicides are applied now

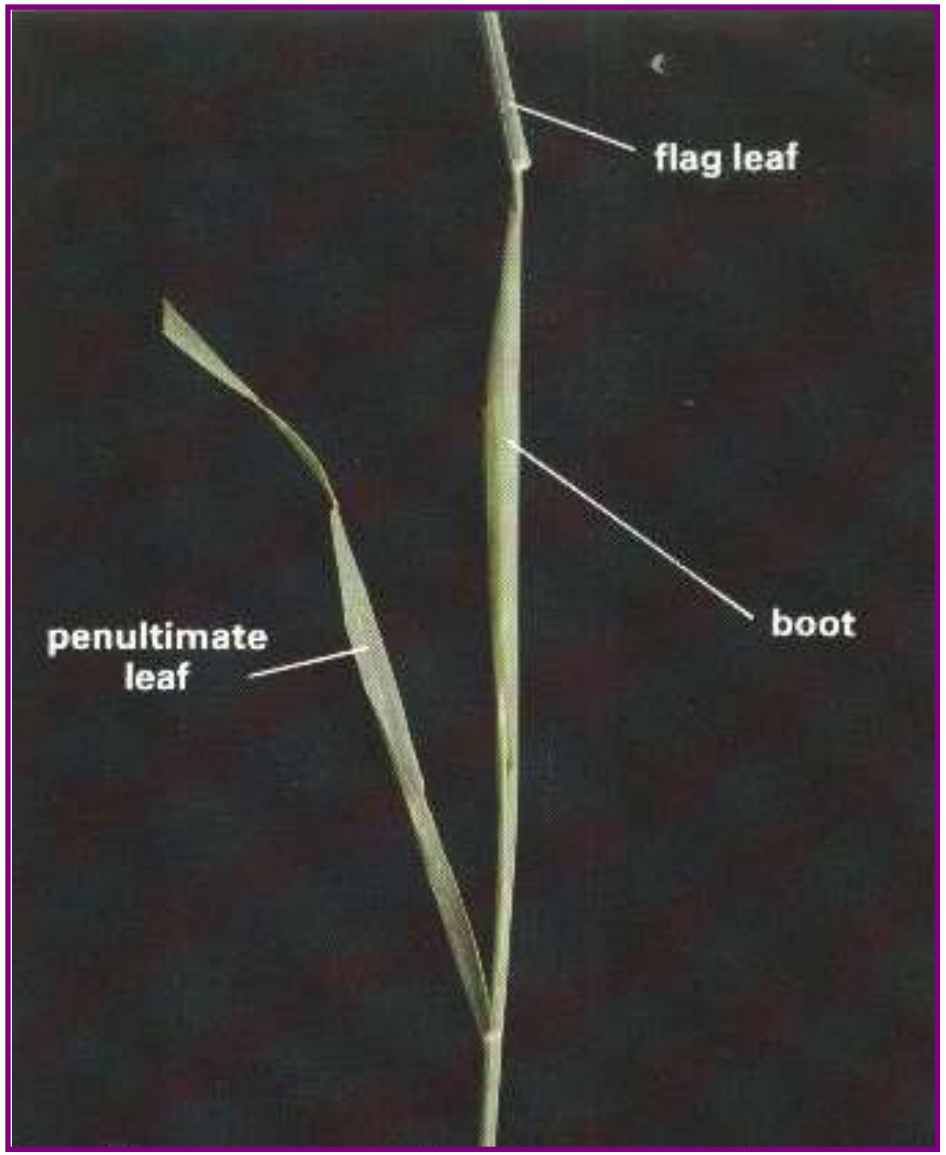


Flag Leaf is the leaf that contribute the most carbohydrates for grain filling

Zadoks 40 to 49

Boot Stage

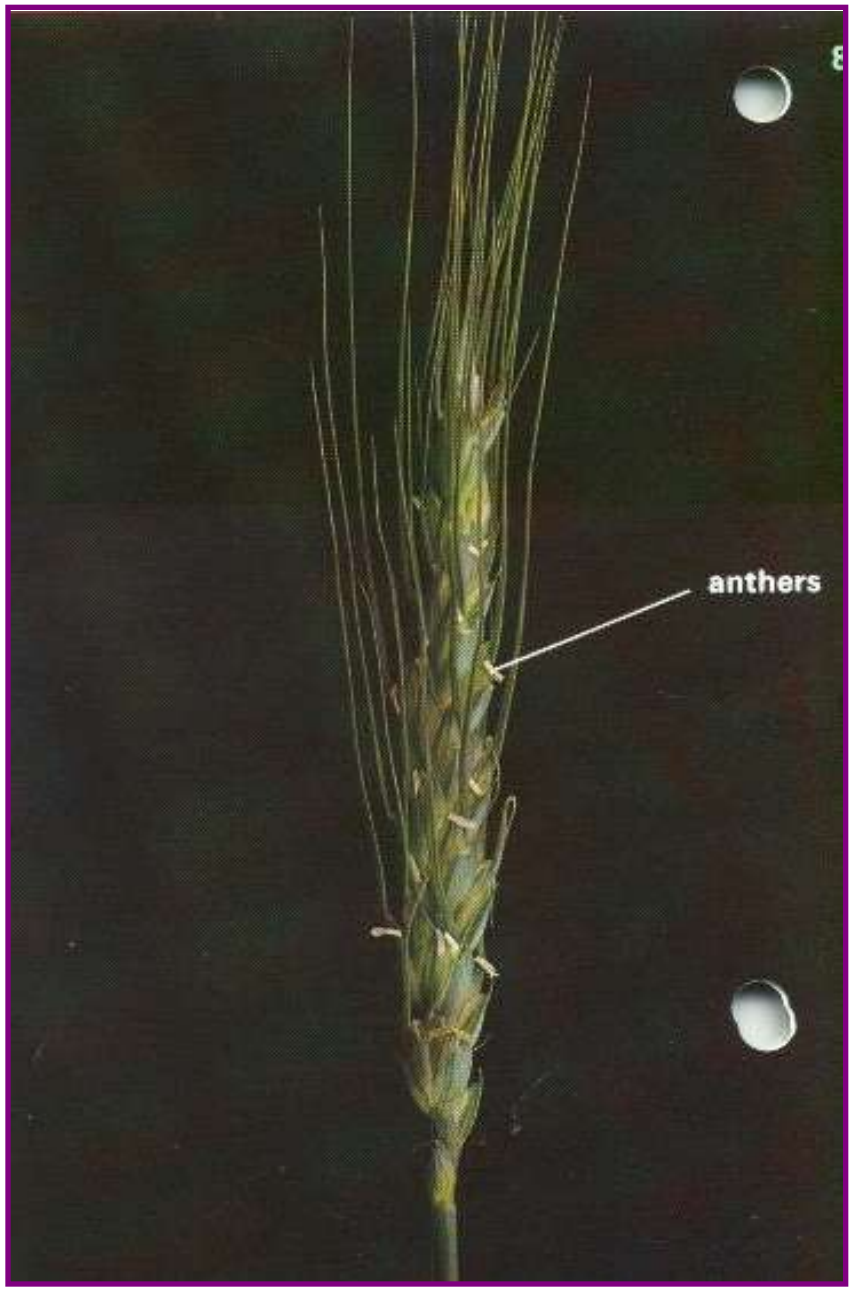
- GS 43 = boot swelling
- GS 49 = first awns visible



Zadoks 50 to 59

Head Emergence

- GS 50 = first spikelets of head
- GS 59 = head emergence complete



Zadoks 60 to 69

Flowering

- GS 60 = beginning of flowering
- GS 69 = flowering complete

Zadoks 70 to 79

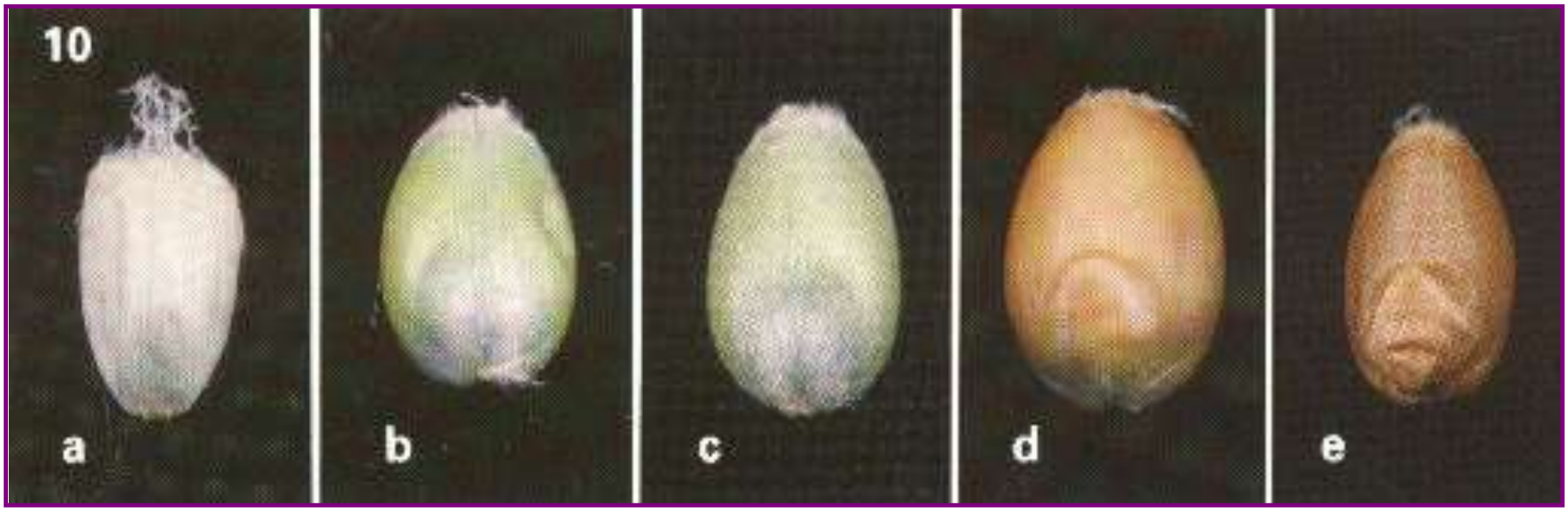
Milk Stage

- GS 71 = watery (a)
- GS 77 = late milk (b)

Zadoks 80 to 89

Dough Stage

- GS 85 = soft dough (c)
- GS 87 = hard dough (d)
- GS 92 = ripe kernel (e)
  harvest time



BARLEY YELLOW DWARF IN WHEAT

BARLEY YELLOW DWARF

- Caused by Barley Yellow Dwarf Virus
- Symptoms
  - ✓ Yellow leaves
  - ✓ Yellow flag leaf
  - ✓ Stunting
  - ✓ Shows up in spring
  - ✓ Mistaken for nutrient deficiency
  - ✓ Mistaken by environmental problem
- Diagnosis
  - ✓ Lab serological (antibody) only real test
  - ✓ >= 5 strains