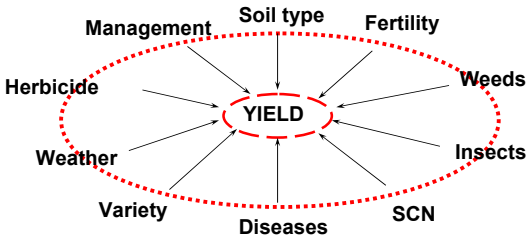
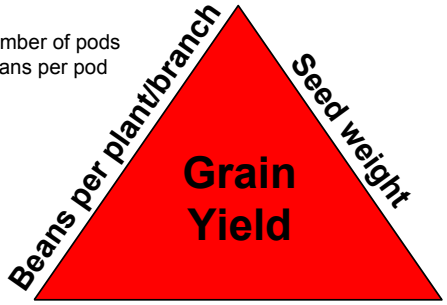
Soybean yield is a complex series of interactions



Yield Components of Soybean

Number of pods
Beans per pod



Soybean Production in Wisconsin 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

Soybean Maturity Zones

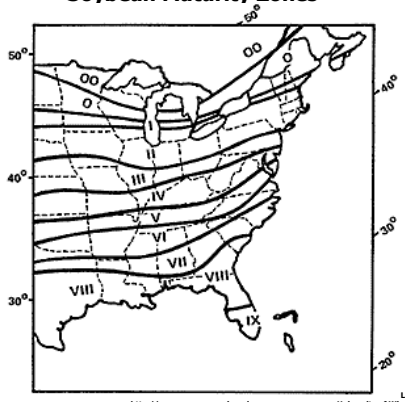


TABLE 3. CENTRAL REGION SOYBEAN TEST (Page 4 of 4)

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	5-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	1.8	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								
Spansey	099-RR	0.9	RR	50	1.3	32	11-Sep	43	55	52	10								
Spansey	141	1.4	CN	58	2.3	31	19-Sep	53	61	59	6								
Spansey	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	1706-6	1.6	CN	* 62	2.0	33	17-Sep	* 56	* 74	56	25								
Stine	1706-4	1.7	RR	58	1.3	32	16-Sep	53	64	56	2								
Stine	2000-7	2.0	CN	* 63	3.0	36	22-Sep	55	65	* 68	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	* 58	* 70	* 61
US Seeds	US E 1501 RR	1.5	RR	57	2.6	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

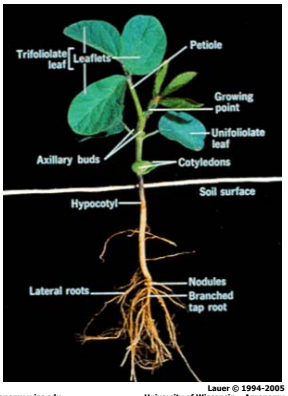
- V-Stages
- VE,VC,V1,V2,V3, Vn

Reproductive Stages

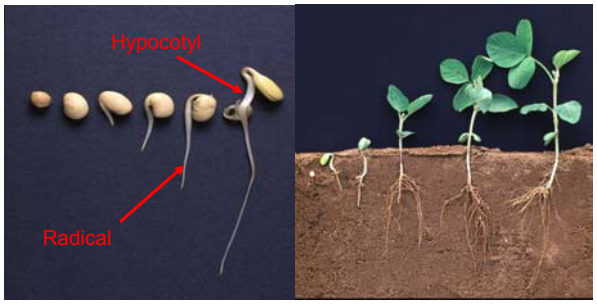
- R-Stages
- R1,R2,R3,…R8
- Starts at Flowering

Soybean Morphology

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



SOYBEAN GERMINATION



Germination and Emergence Problems

Emergence Stage – VE

- 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

Should I replant?

Cotyledon stage – VC

- Unifoliolate leaves have unrolled
- Leaves are opposite

First Trifoliate stage – V1

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

Second Trifoliate Stage – V2

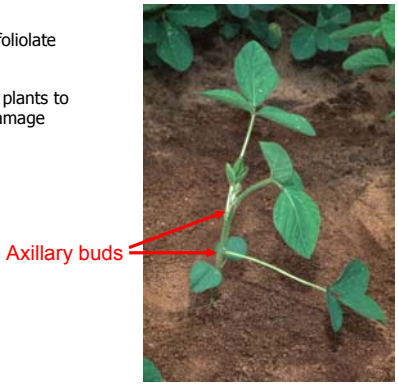
- Two trifoliolates
- Nodules have been established
- Check for proper nodulation
- If absent determine cause and prepare to apply N

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 NO3 will inhibit N2 fixation
- A small amount of N may 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



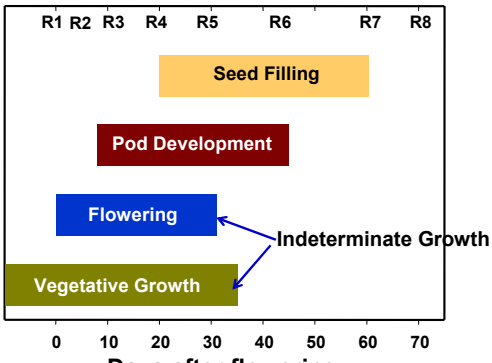
V6 Stage

- 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

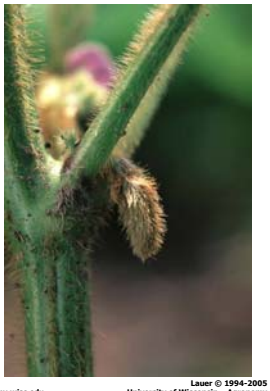
- Soybean Diseases
- Weeds and Herbicides
- Midseason N applications

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



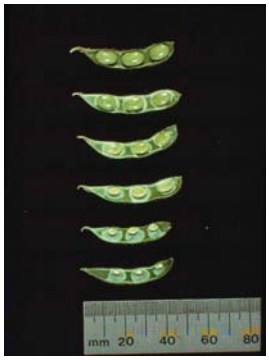
Full Pod – R4

- 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

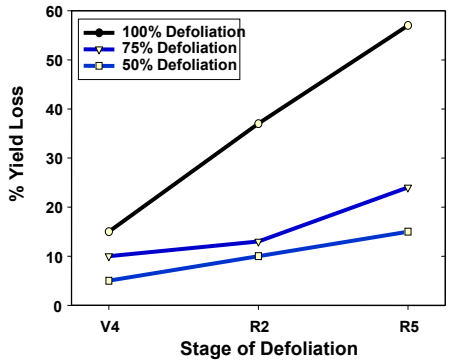
Full Maturity – R8

- 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%
- Identity preservation (IP)

Yield Loss from Defoliation



Soybean Cyst Nematode

- widespread distribution
- substantial yield loss
- no obvious symptoms
  - ✓ quick reproduction
  - ✓ long-term survival
- 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

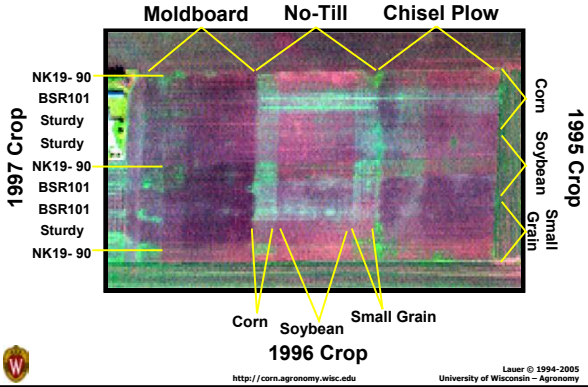
- Risk throughout WI
- BSR can negate good management practices
- Soybean is the only host
- Soybean variety selection is key to control
- Crop rotations can minimize infection
- More severe BSR is observed in no-till

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

Management effects on disease

Wisconsin rotation/tillage/variety experiment



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

Managing Soybean Disease

Pathogen	Management	Yield Loss
BSR	Variety selection, Rotation	32%/10% loss of leaf
White mold	Variety selection, Canopy mgmt.	6% loss/10% incidence
SDS	Variety selection	Variable 0 to 20-50%
Phytophthora root rot	Variety selection Seed treatment	Variable, 0-20%
Virus complex	Seed selection, Variety selection, Insect control	??