

Soybean Growth and Development



Outline

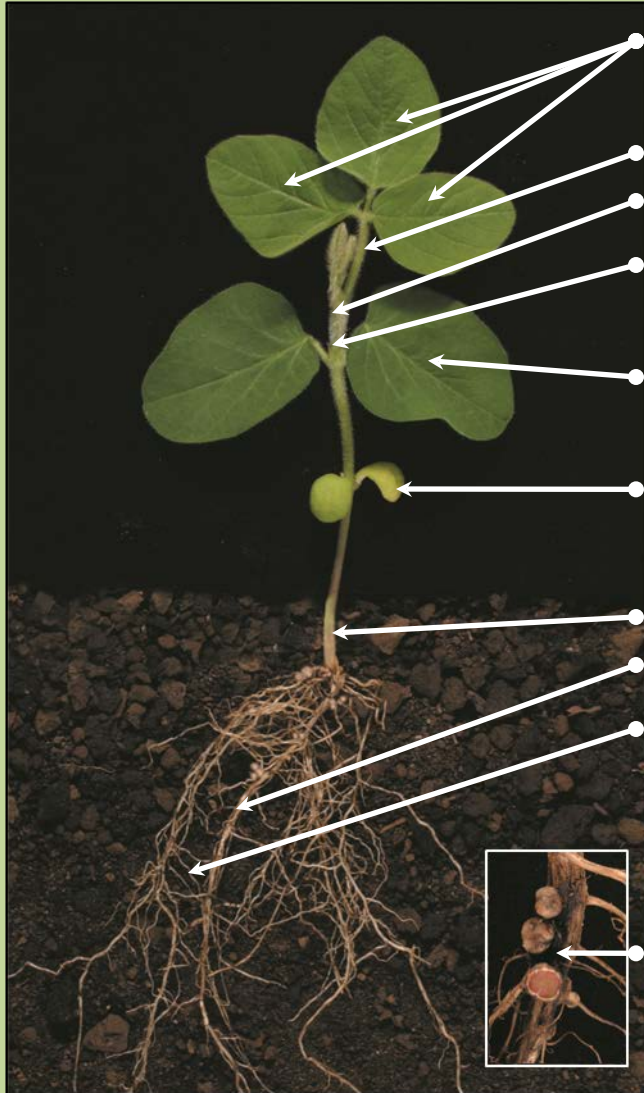
- The soybean plant
- Growth staging
- Vegetative stages
- Reproductive stages
 - Bloom
 - Pod development
 - Seed development
 - Maturity
- Conclusions



The soybean plant

- Domesticated about 4,500 years ago in China
- The U.S. grows the most soybeans in the world
- North central states grow majority of soybeans
- Nine different maturity groups: 00 (in the north) to IX (in the south)
- Group II and III grown in Iowa
- Symbiotic relationship exists between soybean and nitrogen fixing bacteria

Soybean plant parts



Trifoliate leaf- a compound leaf made of three leaflets

Petiole- connects the stem and leaf

Growing point- where active growth takes place

Axillary bud- bud found where petiole and stem meet

Unifoliate leaf- single leaf, not compound

Cotyledons- first leaves of newly emerging plant

Hypocotyl- the seedling's stem below the cotyledons

Branched tap root- main root of the plant

Lateral roots- roots growing laterally into the soil

Nodules (enlarged)- where nitrogen fixing bacteria live

Stress and crop yield loss

- At each growth stage of soybean, certain aspects of management must be considered.
- Various problems are associated with each stage and can interfere with growth at that stage.
- Problems include adverse soil conditions, weeds, insects, diseases, and other disorders.
- Problems that occur early in the season may contribute to the yield loss experienced at the end of the season during harvest.
- We will examine various problems for the stages of soybean throughout the growing season.

Growth staging

- Growth stages may overlap in a field.
- A growth stage for a field begins when at least 50 percent of the plants have reached or are beyond a certain stage.
- The Soybean Field Guide 2nd Edition provides disease scouting information by growth stage.



Vegetative stages

- Vegetative Stages
 - VE: Emergence
 - VC: Unrolled unifoliate leaves
 - V1: First unrolled trifoliate leaf
 - V2: Second unrolled trifoliate leaf
 - V(n): Each successive unrolled trifoliate leaf

Vegetative stages VE-V1

- VE: emergence (7-14 days after planting)
- VC: unifoliate leaves unroll
- V1: 1st trifoliate leaf unrolls (7-10 days after VE)



VE

VC



V1

Vegetative stages VE-V1

- Problems to watch for:
 - Soil temperature, crusting
 - Flooding, frost, hail
 - Bean leaf beetle feeding
 - Pythium root rot, Phytophthora root and stem rot
 - Common early season pathogens like Fusarium, Rhizoctonia, Phomopsis, and a few other early season root “rots”
 - Weed competition



Vegetative stage V2

- V2: 2nd trifoliate leaf unrolls
 - 6 to 8 inches tall
 - Nitrogen fixation can begin
- Problems to watch for:
 - Bacterial blight
 - Septoria brown spot
 - Rhizoctonia root rot
 - Flooding
 - Some problems may appear anytime during the season



V2

Vegetative stage V(n)

- V(n): successive vegetative stages
 - As the plant continues to develop trifoliolate leaves, V stage increases accordingly
 - Vegetative growth continues for a time after reproductive stages start, but plants are then known by reproductive characteristics
- Problems to watch for during V(n) stages:
 - Begin scouting for soybean cyst nematodes in later V stages, early R stages
 - Soybean aphid scouting in mid-June
 - Grasshoppers, potential for spider mites
 - Many problems mentioned on previous slides
 - Herbicide injury

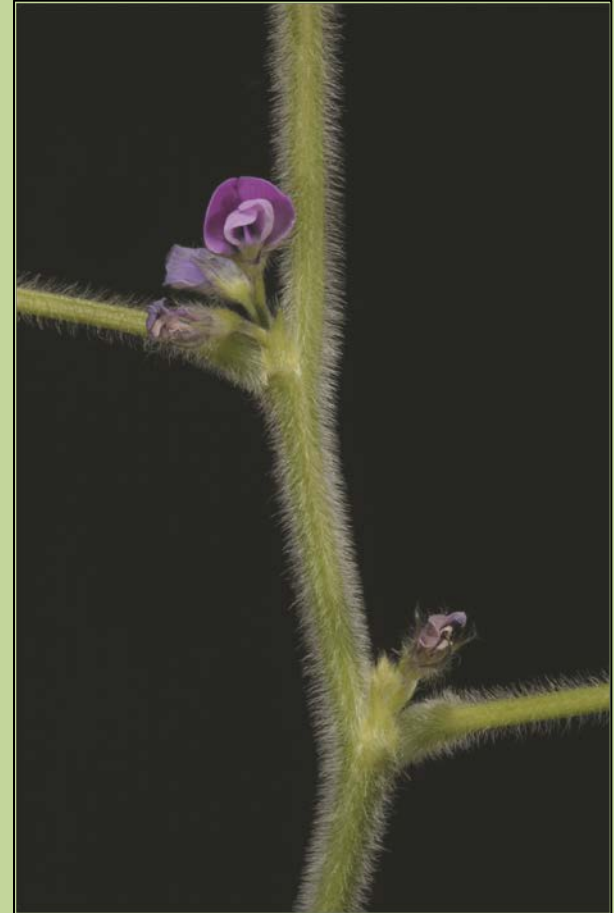
Reproductive stages

- Reproductive Stages
 - R1: Beginning bloom
 - R2: Full bloom
 - R3: Beginning pod development
 - R4: Full pod
 - R5: Beginning seed
 - R6: Full seed
 - R7: Beginning maturity
 - R8: Full Maturity

Reproductive stages: R1 & R2

Beginning and full bloom

- R1: Beginning bloom occurs when at least 1 flower is open at any node
- R2: Full bloom occurs when either of the two top nodes have an open flower



Reproductive stages: R1 & R2

Beginning and full bloom

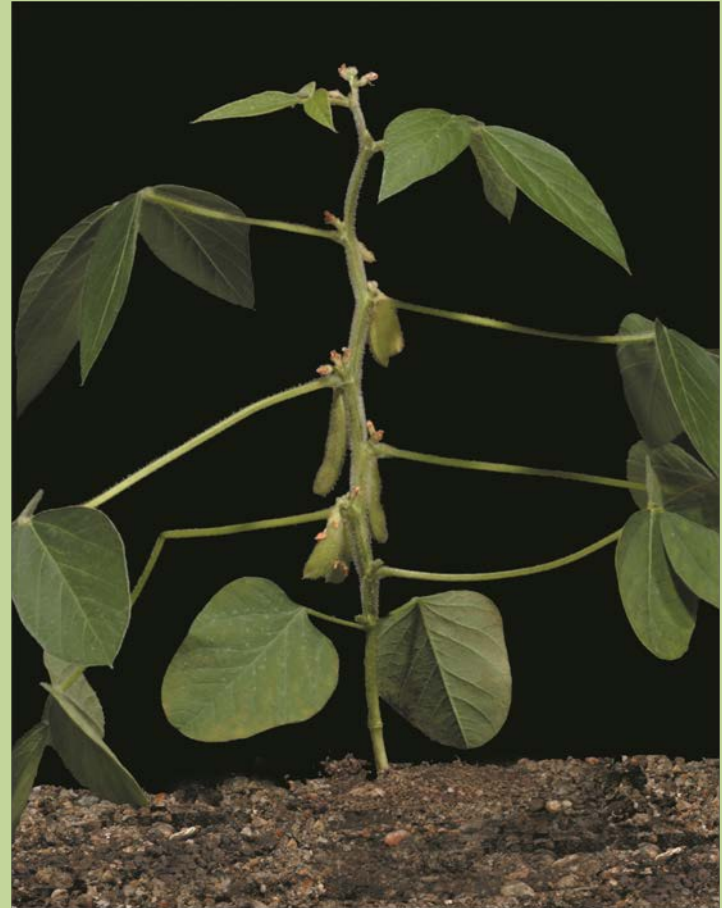
- Problems to watch for:
 - Bacterial pustule, Fusarium wilt, powdery mildew, Septoria brown spot
 - Sudden death syndrome
 - Grasshoppers, spider mites, soybean aphid
 - Flooding, Drought



Reproductive stage: R3 & R4

Beginning and full pod

- R3: Beginning pod is when pods are $\frac{3}{16}$ inch long at 1 of the top 4 nodes on the main stem with a fully developed leaf
- R4: Full pod is when pods are $\frac{3}{4}$ inch long in the same location as above

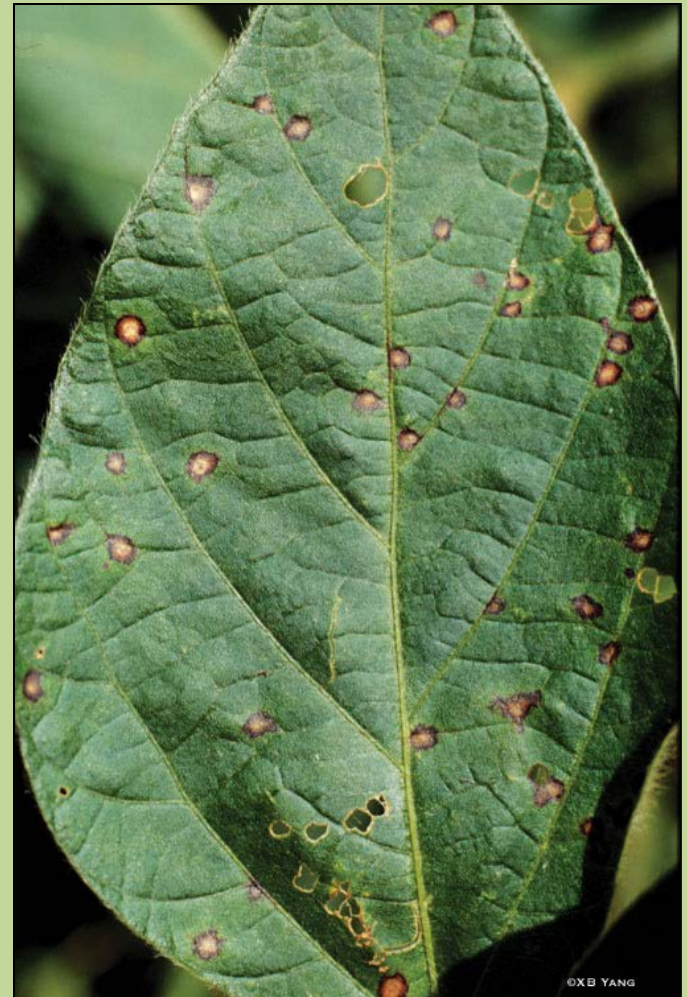


R4

Reproductive stage: R3 & R4

Beginning and full pod

- Problems to watch for:
 - Cercospora leaf blight, brown stem rot, stem canker
 - White mold, downy mildew, frog-eye leaf spot
 - Green cloverworm, soybean looper, soybean aphid
 - Japanese beetle, spider mite
 - Nutrient deficiencies



Reproductive stage: R5 & R6

Beginning and full seed

- R5: Beginning seed is when seeds are 1/8 inch long in the pod at 1 of the 4 top nodes on the main stem
- R6: Full seed is when green seeds fill pod capacity at the same location as above



Pod of an R5 plant



Pod of an R6 plant

Reproductive stage: R5 & R6

Beginning and full seed

- Problems to watch for:
 - Anthracnose, charcoal rot, pod and stem blight
 - Sudden death syndrome, brown stem rot, white mold
 - Grasshoppers, Japanese beetles, bean leaf beetles, stink bugs
 - Hail
 - Drought



PHOTO BY XB YANG

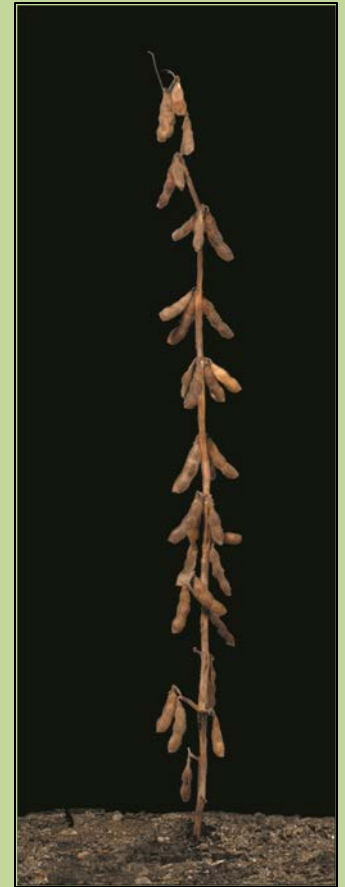
Reproductive stage: R7 & R8

Beginning and full maturity

- R7: Beginning maturity occurs when 1 pod on the main stem reaches mature color
- R8: Full maturity occurs when 95 percent of pods reach mature color



R7



R8

Reproductive stage: R7 & R8

Beginning and full maturity

- Problems to watch for:

- Green stem
- Stem diseases (pod and stem blight, charcoal rot, Anthracnose)
- Seed diseases (Phomopsis, white mold, purple seed stain, etc.)
- Grasshoppers, bean leaf beetles, stink bugs
- Lodging



Glen Hartman

Conclusions

- Certain management considerations must be taken into account during the various stages of soybean growth.
- Each stage has its own set of problems.
- Many insects, diseases, and disorders are problems during multiple soybean stages.
- This knowledge can help growers to be aware of the potential problems soybeans are facing during the growing season.