Fusarium wilt of lettuce

Michael E. Matheron
Extension Plant Pathologist
Yuma Agricultural Center

THE UNIVERSITY OF ARIZONA®

Fusarium wilt (root rot) of lettuce:

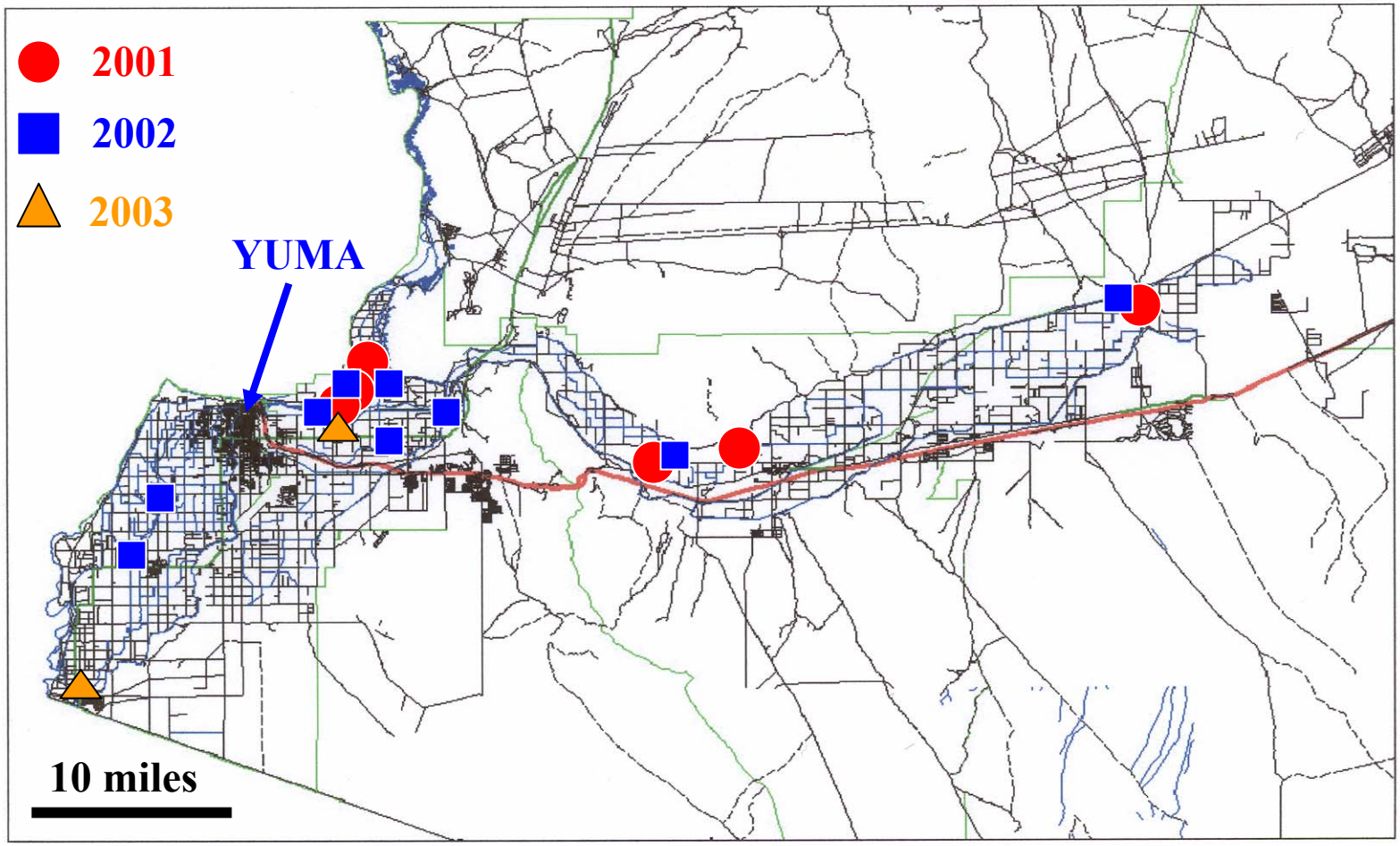
- 1955 - First found on lettuce in Japan
- 1990 - USA; California; Fresno County (Huron)
- 2001 - USA; Arizona; Yuma County

Fusarium wilt of lettuce

Fusarium wilt of lettuce in Yuma

- In 2001, *Fusarium oxysporum* was recovered from lettuce in 6 different fields
- In 2002, the pathogen was recovered from lettuce in 11 additional fields
- In 2003 (to date), 6 new sites have been detected (includes one site in Bard, CA)

Yuma County fields containing *Fusarium oxysporum* f. sp. *lactucae*



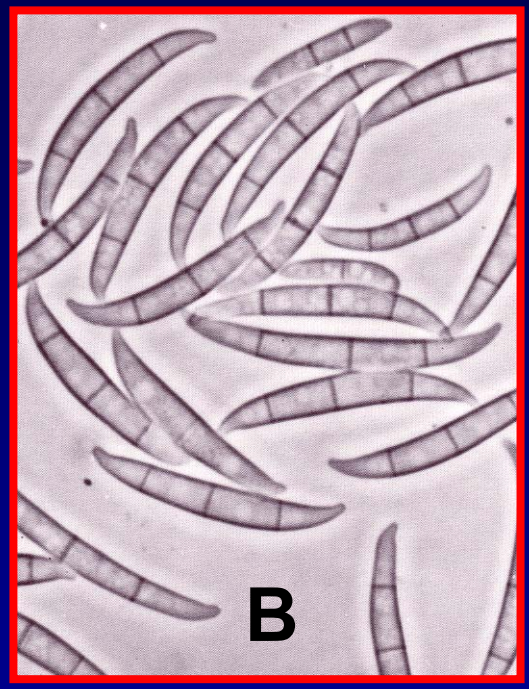
Fusarium oxysporum

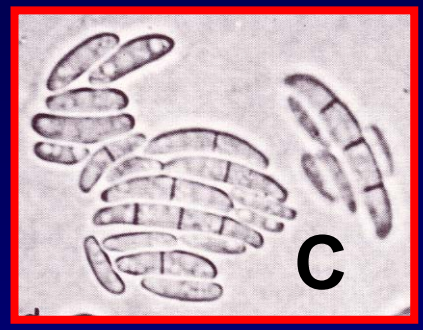
- Comprises 40 to 70% of the total *Fusarium* population in soil
- Very active saprophyte (nonpathogenic phase).
- When pathogenic, it primarily causes symptoms of wilt and sometimes root rot
- There are over 100 different formae speciales of *Fusarium oxysporum*

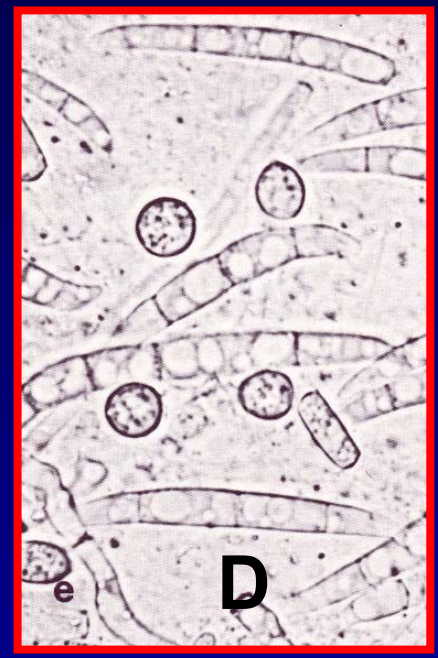
What is a formae specialis?

- This is a sub-species categorization based on physiological or biochemical characteristics, particularly with respect to pathogenicity and host range
- The full name for the lettuce pathogen is *Fusarium oxysporum* f.sp. *lactucae*

Fusarium oxysporum







A = mycelium growing on agar
B = macroconidia
C = microconidia
D = chlamydospores + macroconidia

Symptoms of Fusarium wilt on lettuce

Symptoms of Fusarium wilt on lettuce

- Seedling stage
  - Death of some plants
  - Red streak through the cortex of the crown and upper root
- Older plants
  - Brown streaks in the vascular system of the crown
  - Reddish brown discoloration of the crown and upper root cortex

In 1993, Hubbard and Gerik published the results of their work with the lettuce *Fusarium* pathogen in California

- The pathogen grows between 46 and 89 F, with optimum growth at 82 F
- Lettuce is not susceptible to any of the Fusarium wilt pathogens from other crops, such as cotton, melon and tomato
- Seedling inoculation tests revealed that several lettuce cultivars were susceptible to the pathogen, with Salinas showing the most disease tolerance

Plant resistance or genetic tolerance is the most effective disease management tool for most wilt diseases caused by *Fusarium oxysporum* on other crops

Lettuce cultivar evaluation trial

- Trial conducted in a field with a history of Fusarium wilt of lettuce
- Lettuce cultivars planted at three different planting dates
- The replicate plot size is two beds 150 ft. in length, with 4 replicate plots per cultivar arranged in a randomized complete block design
- Disease development was monitored from thinning until plant maturity

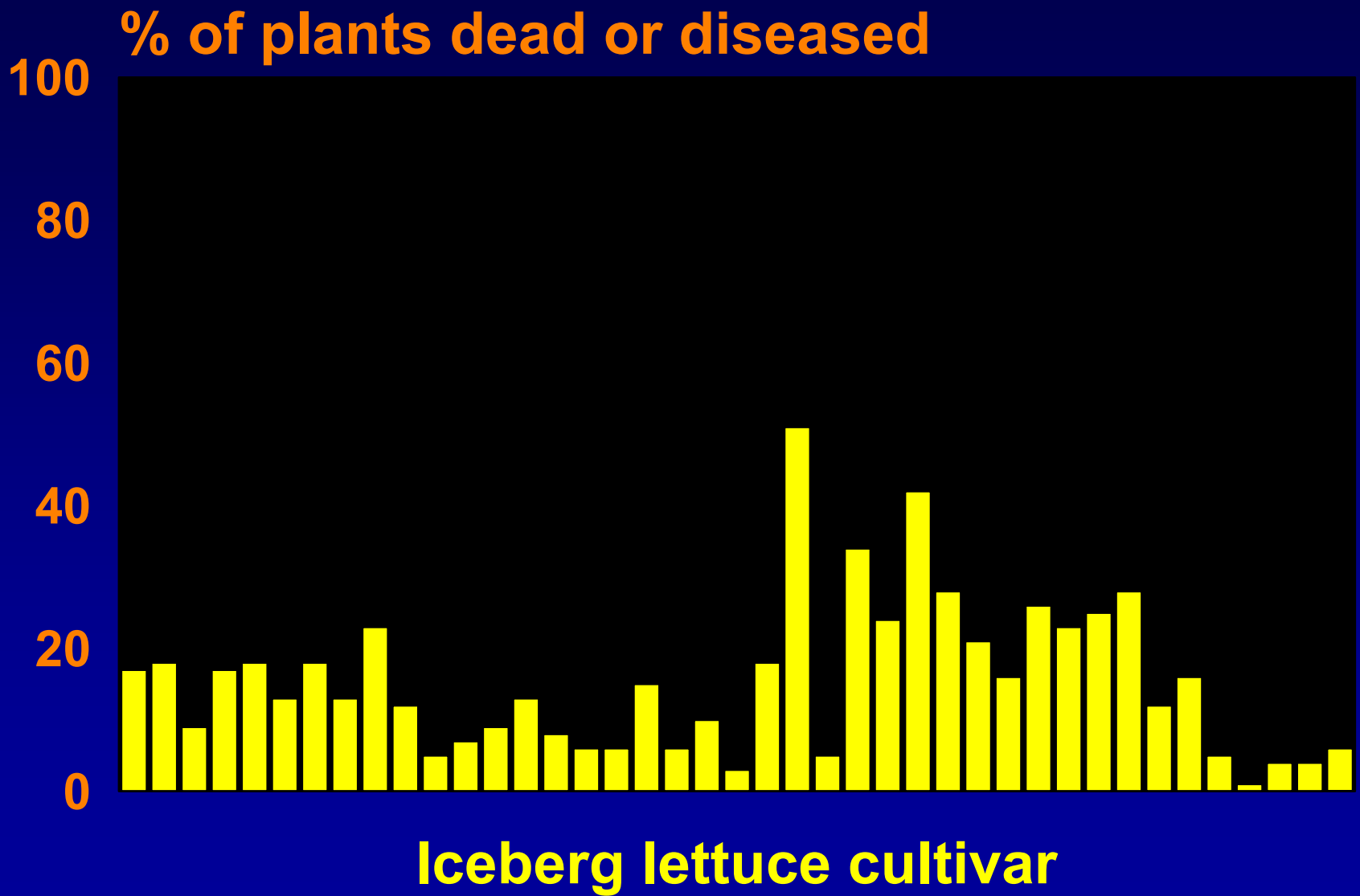
The field site

First planting	Second planting	Third planting
Wet date: Sep. 7 Terminated: Nov. 8 Days to maturity: 62	Wet date: Oct. 17 Terminated: Jan. 11 Days to maturity: 86	Wet date: Dec. 6 Terminated: Mar 22 Days to maturity: 107

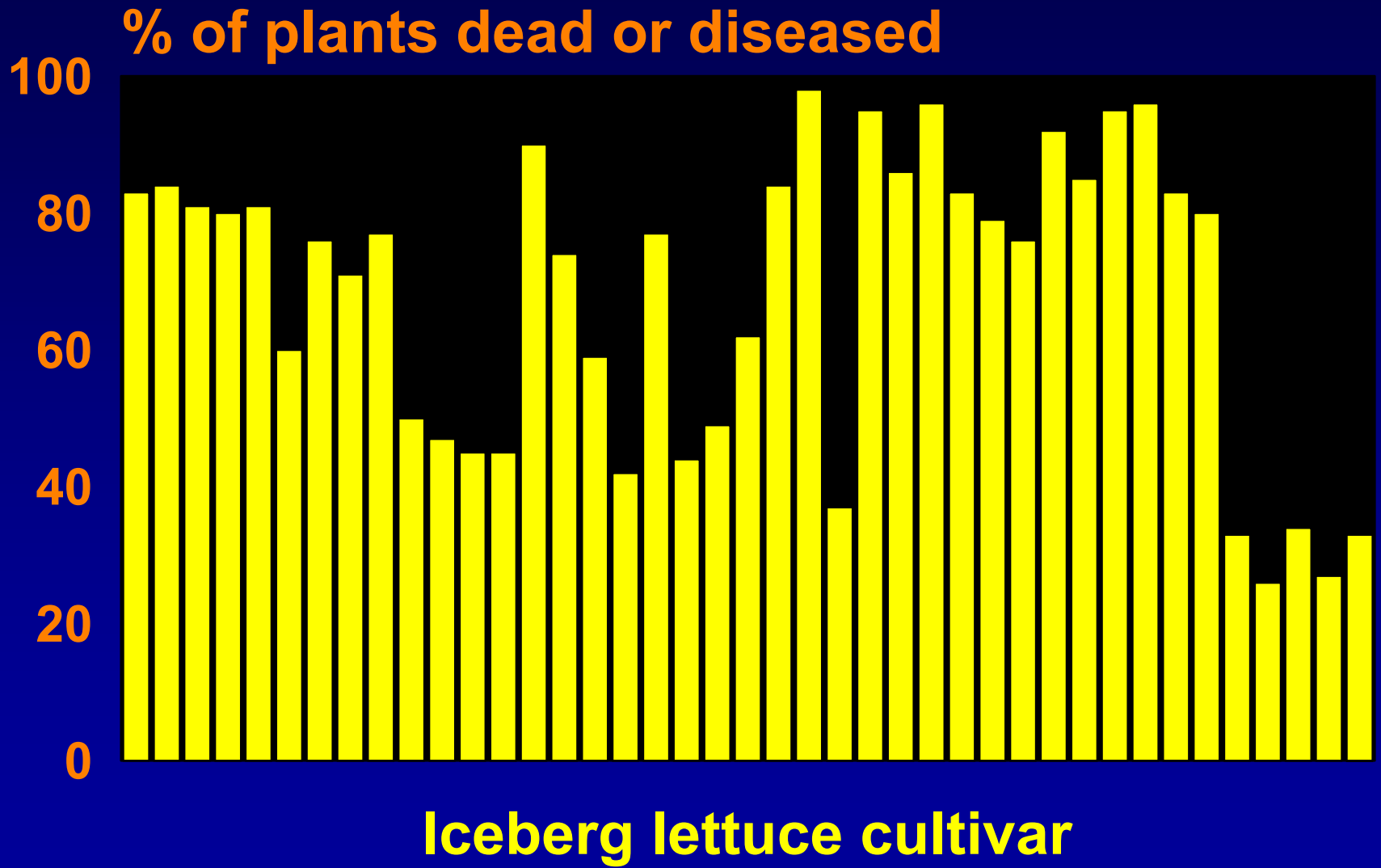
First planting

First planting	Lettuce cultivars tested
Wet date: Sep. 7 Terminated: Nov. 8 Days to maturity: 62	Iceberg 41 Romaine 15 Green leaf 3 Red leaf 4 Butter 2

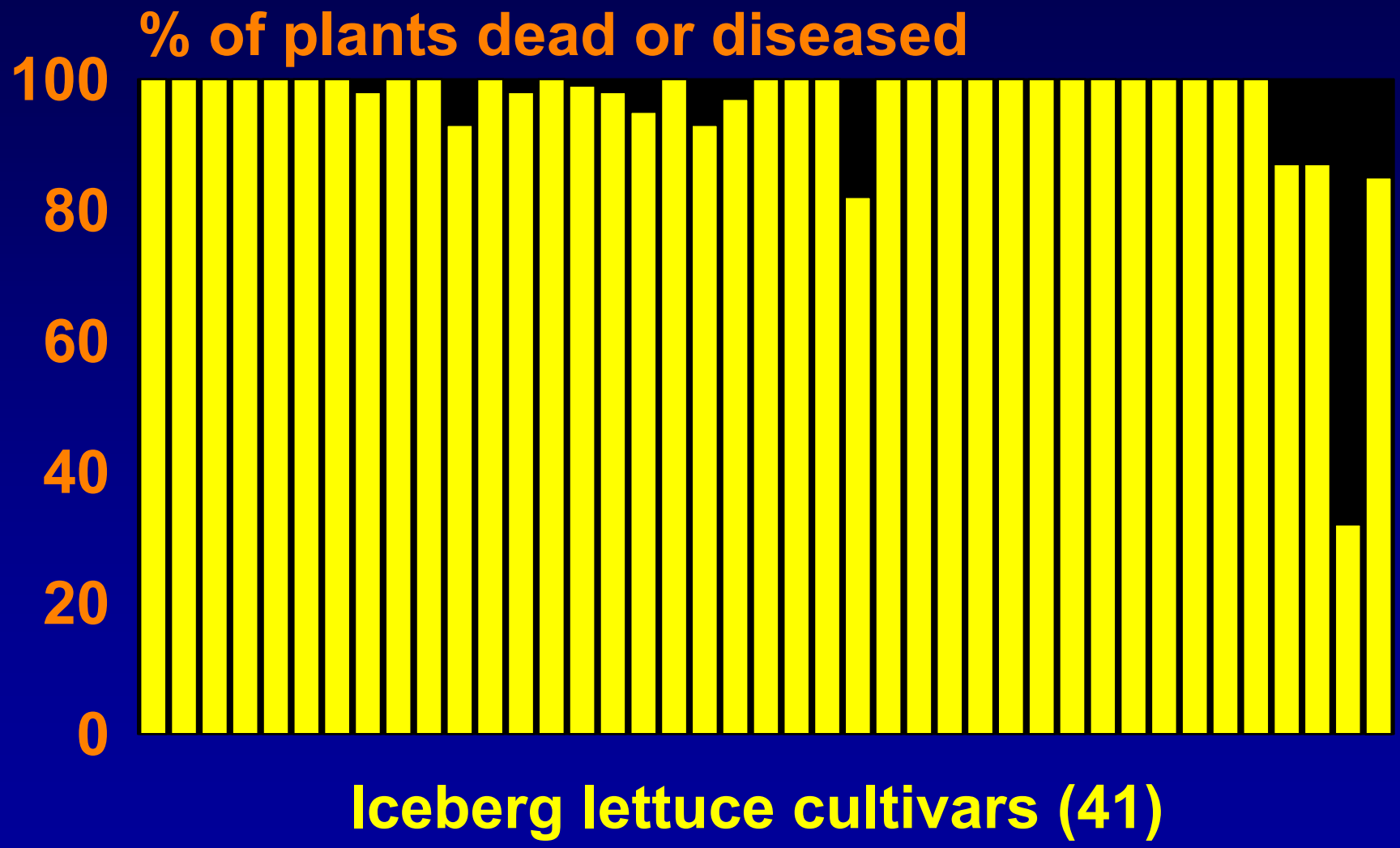
First planting: 25 days after wet date



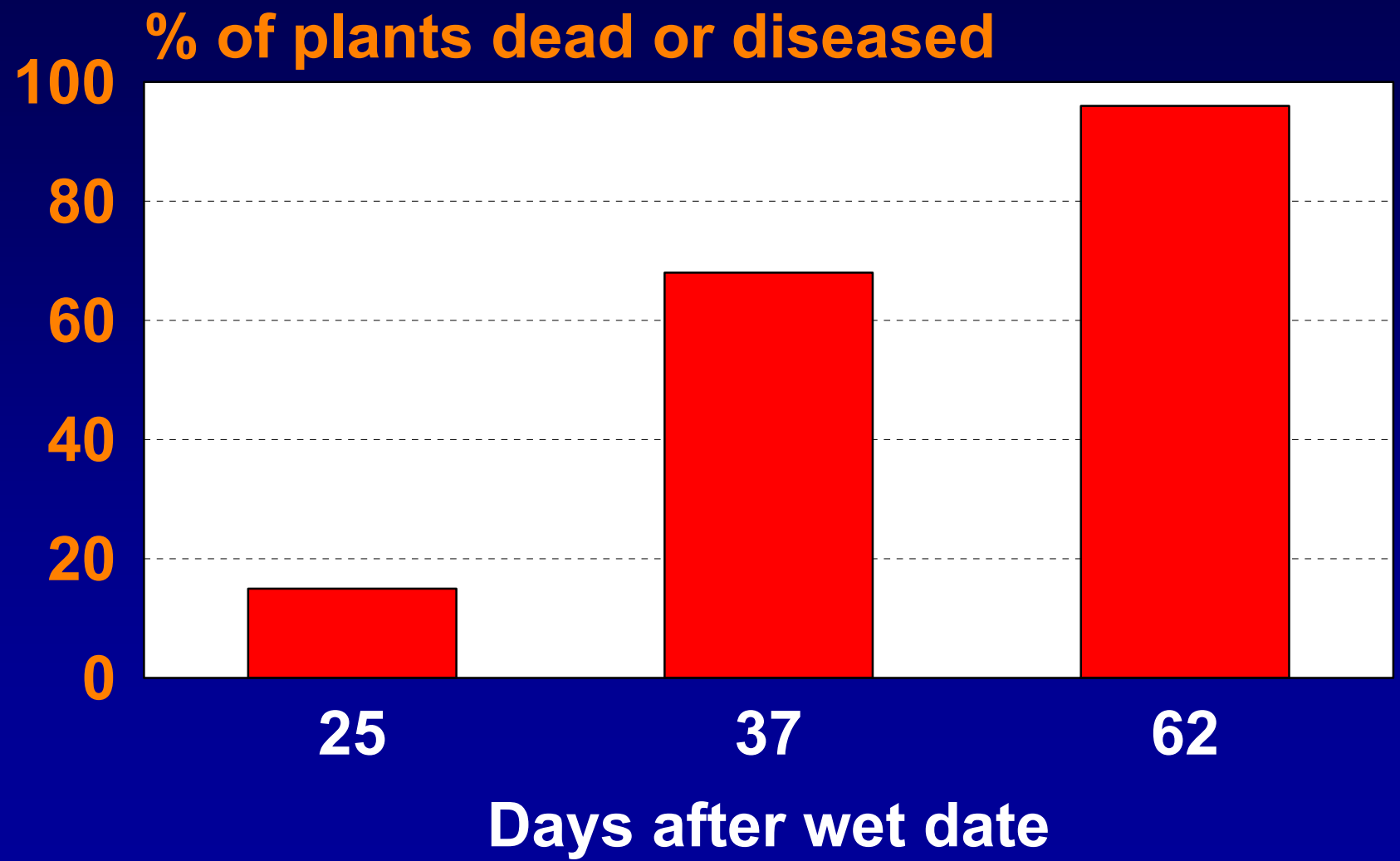
First planting: 37 days after wet date



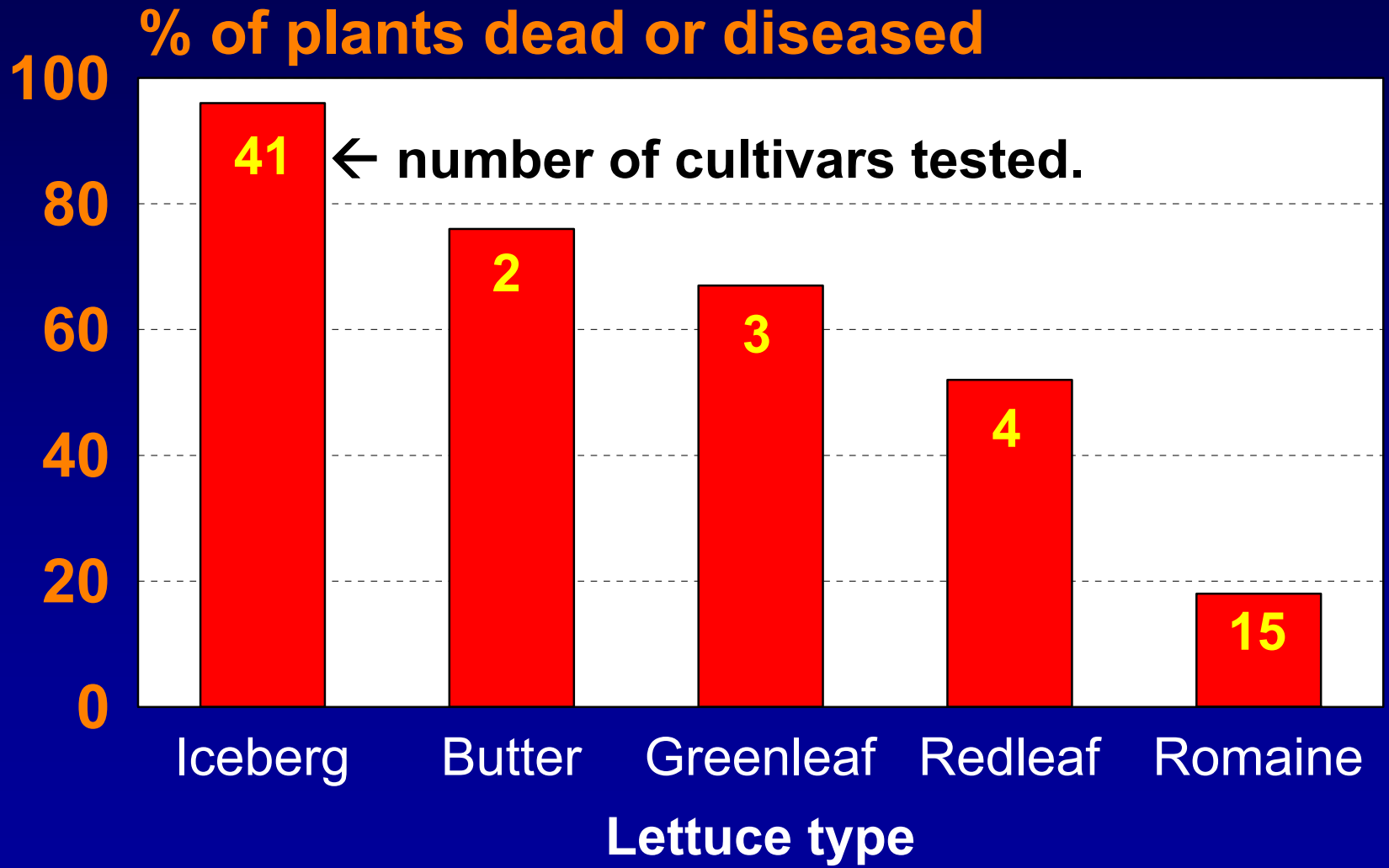
First planting at maturity (62 days after wet date)



Disease development in first planting: Head lettuce cultivars

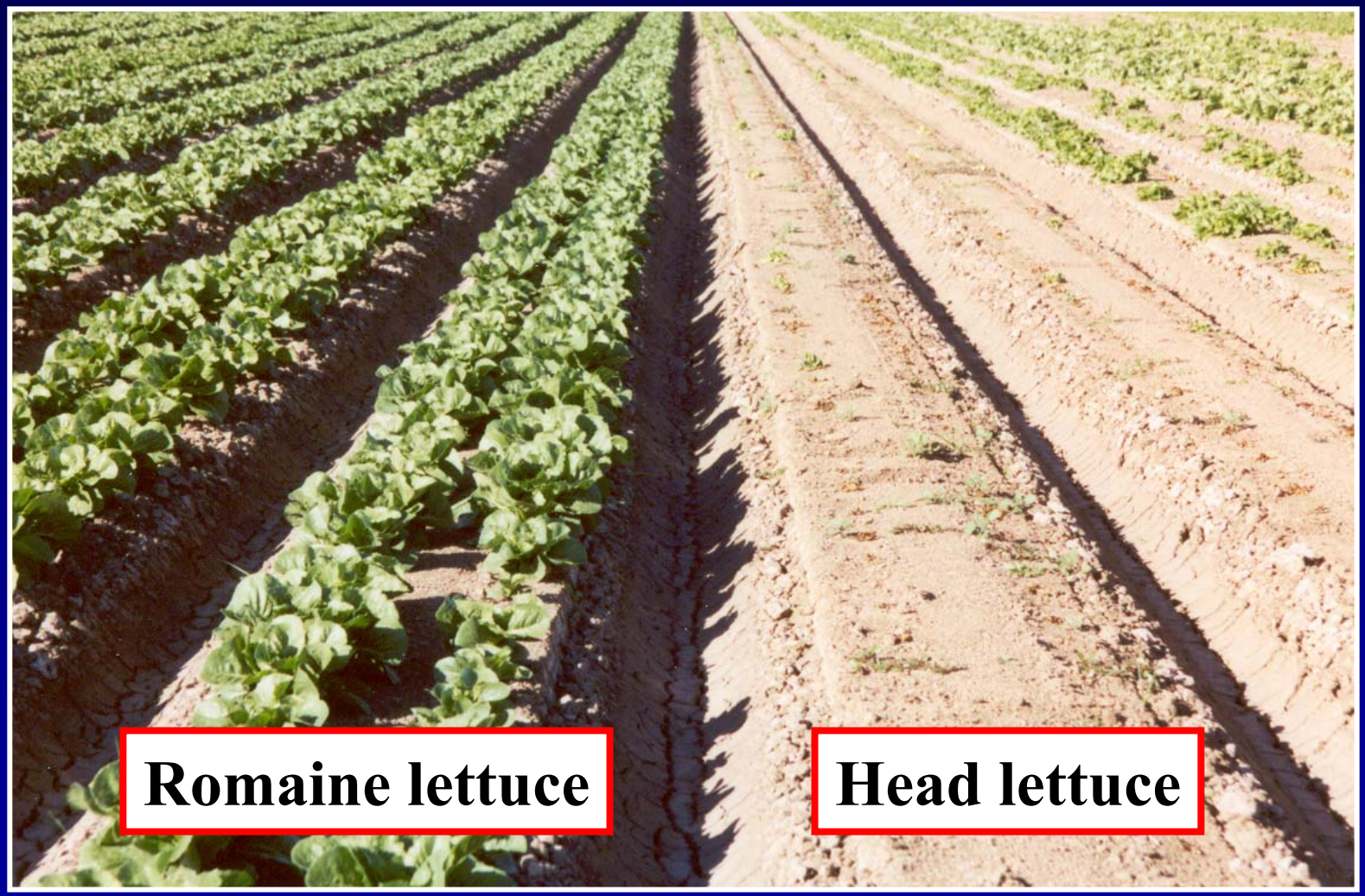


Disease development in first planting: Various lettuce types



Lettuce cultivar evaluation trial: Head lettuce: first planting

Lettuce cultivar evaluation trial: Romaine vs. head lettuce



Green leaf **Red leaf** **Head**

Second planting

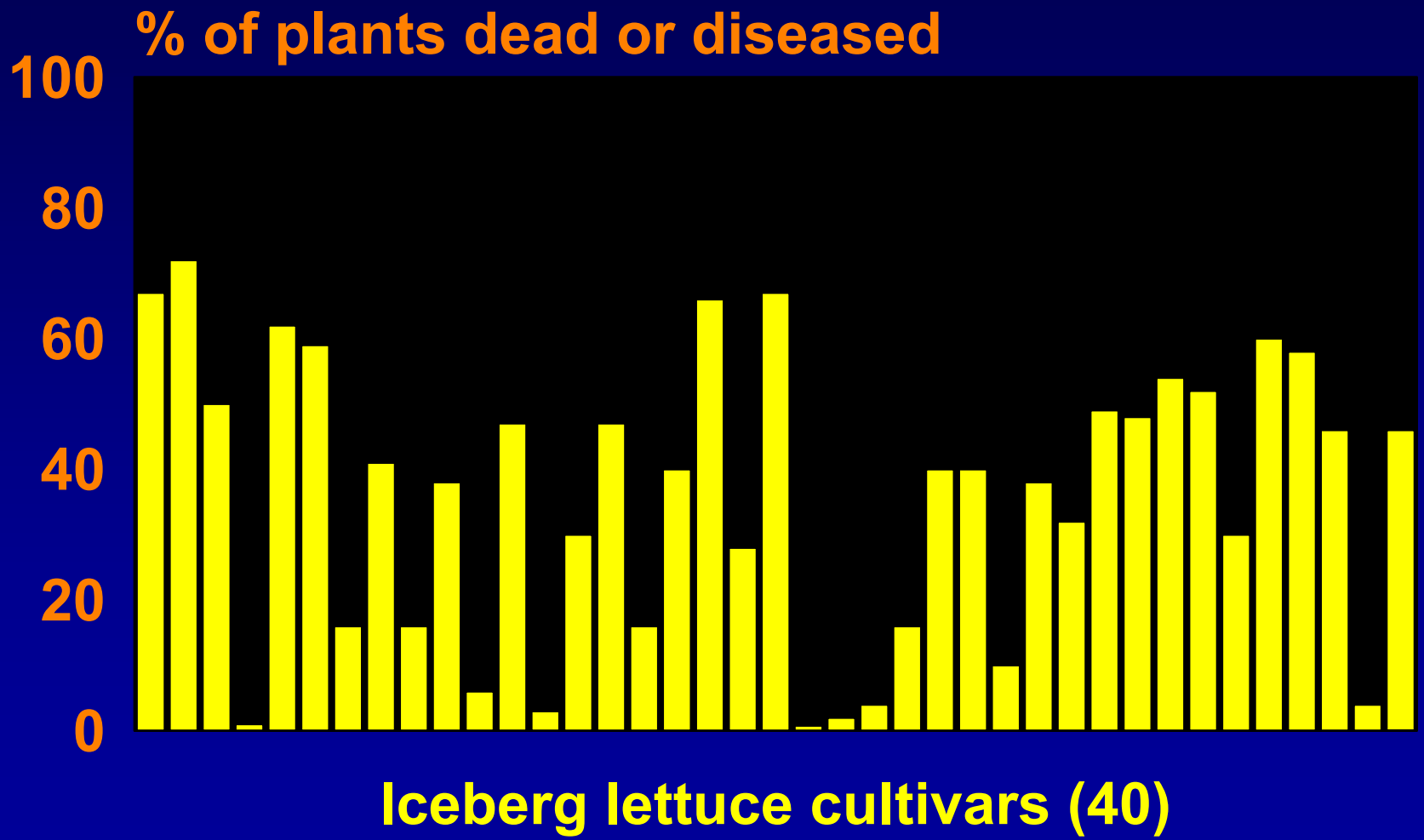
Second planting

Wet date: Oct. 17
Terminated: Jan 11
Days to maturity: 86

Lettuce cultivars tested

Iceberg 40
Romaine 9
Green leaf 4
Red leaf 3
Butter 1

Second planting at maturity (86 days after wet date)



Second planting – Head lettuce

Susceptible cultivar

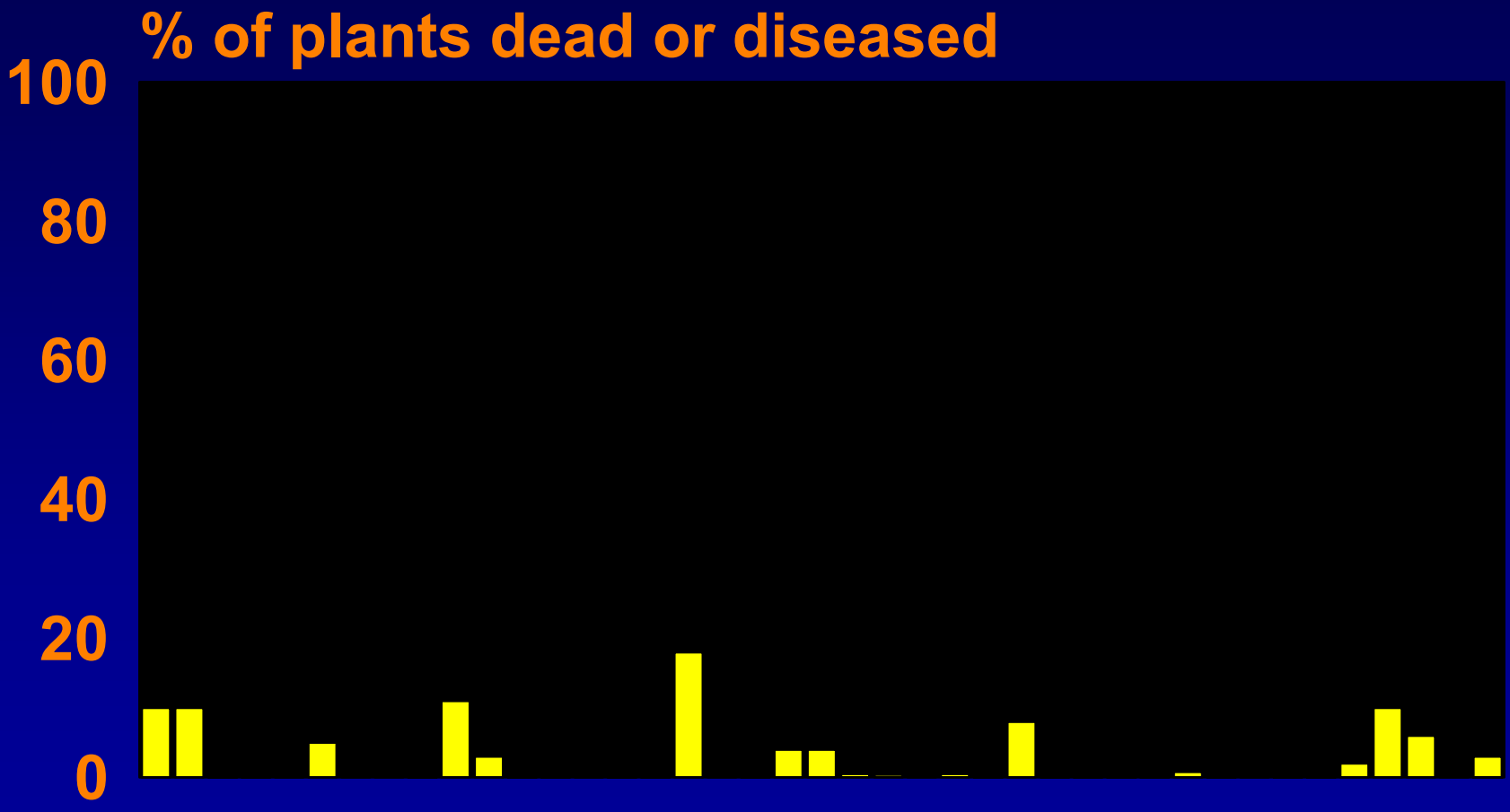
Tolerant cultivar


Second planting – romaine, leaf lettuce

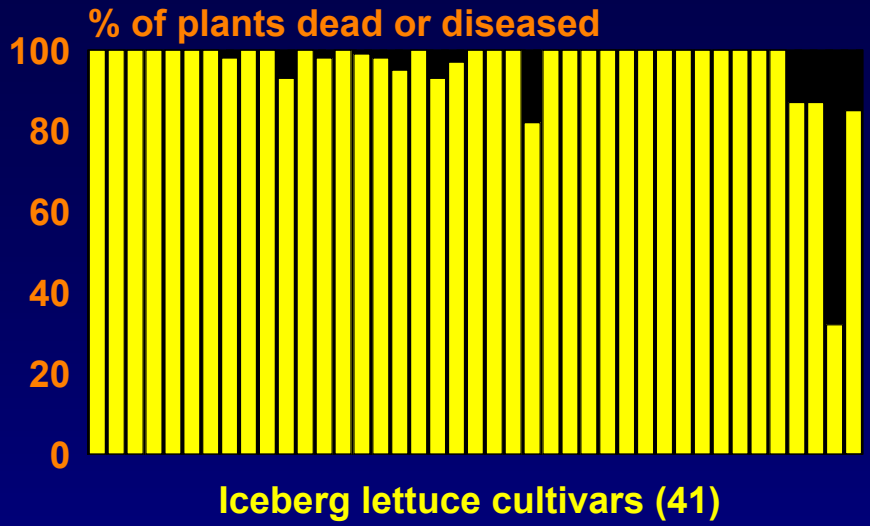
Third planting

Third planting	Lettuce cultivars tested
Wet date: Dec 6 Terminated: Mar 22 Days to maturity: 107	Iceberg 40 Romaine 4 Green leaf 1 Red leaf 1 Butter 1

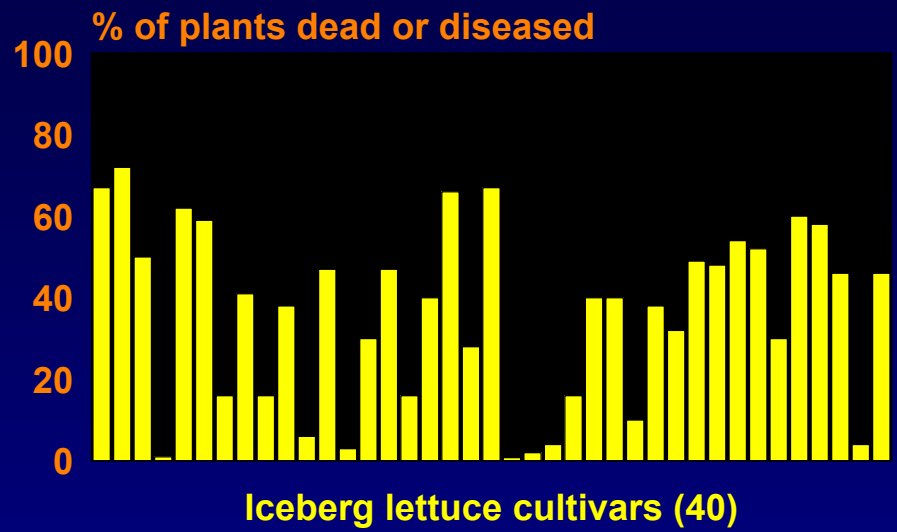
Third planting at maturity (107 days after wet date)



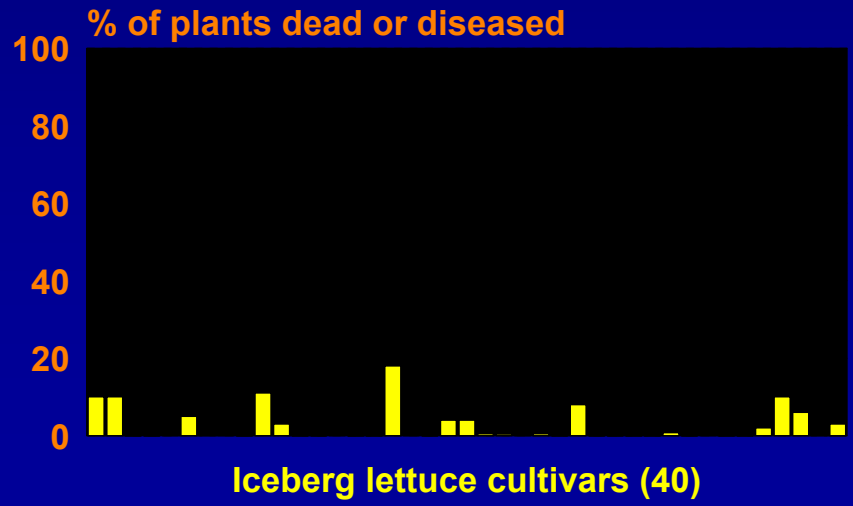
First planting at maturity (62 days after wet date)



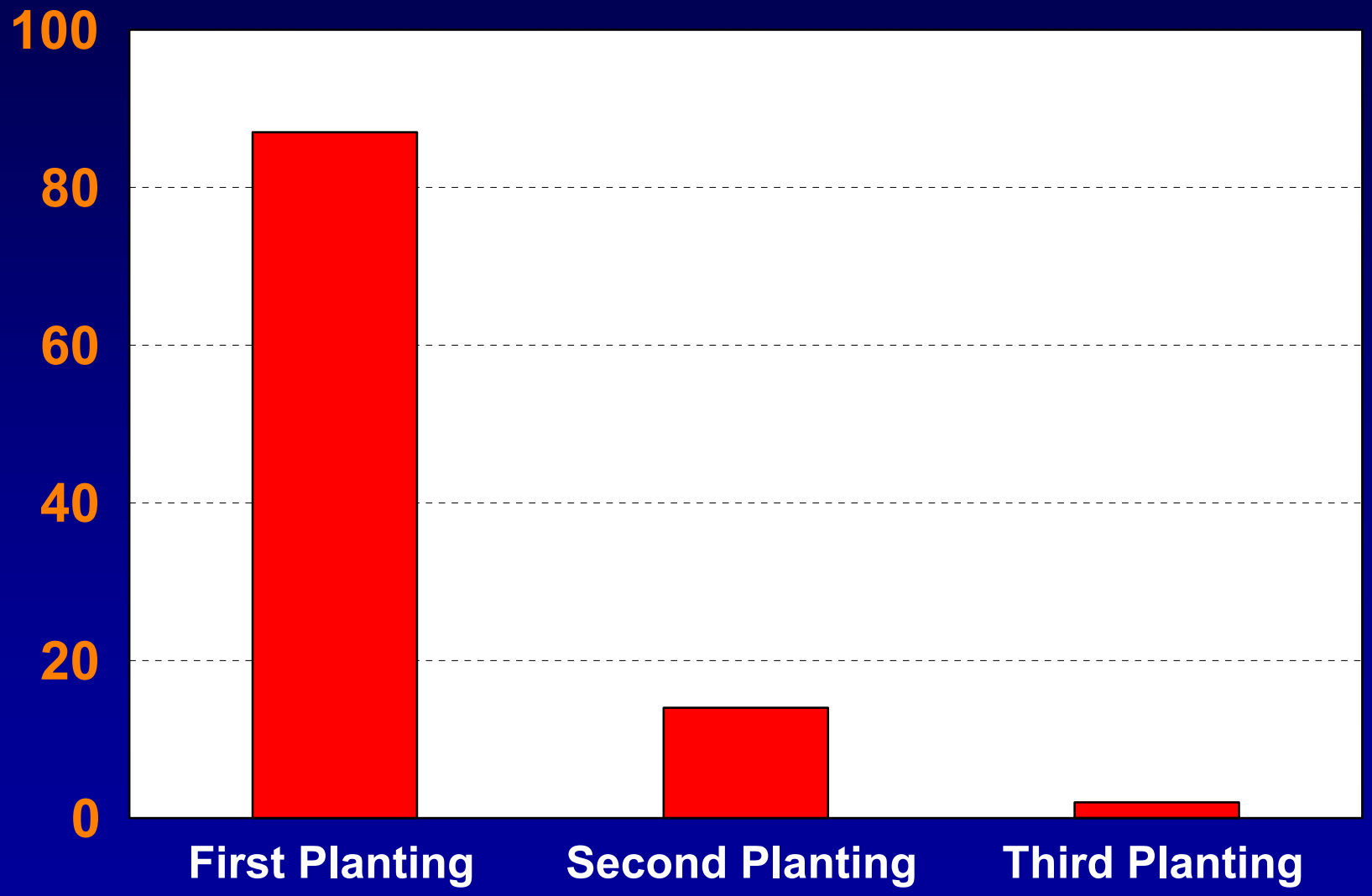
Second planting at maturity (86 days after wet date)



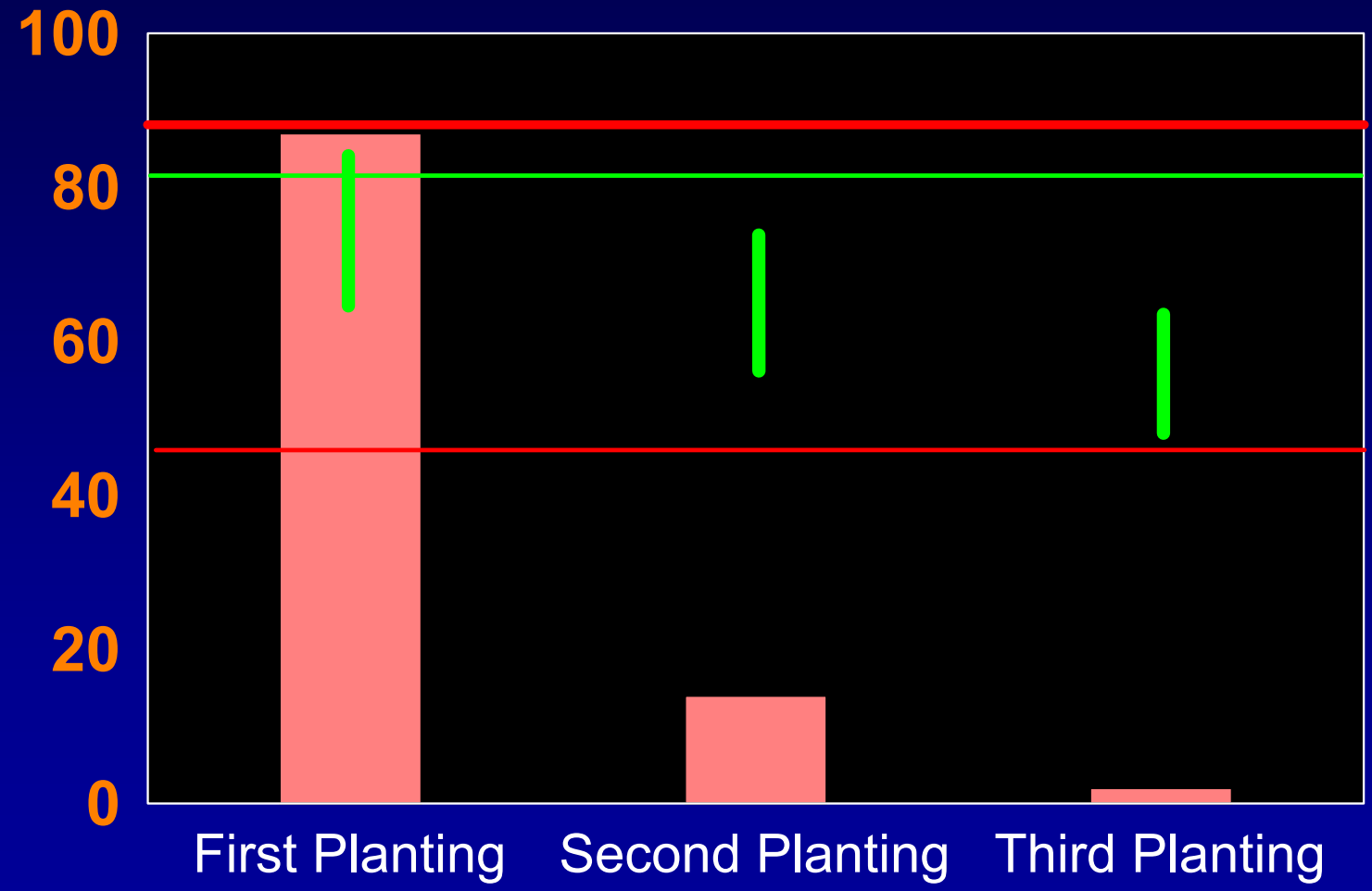
Third planting at maturity (107 days after wet date)



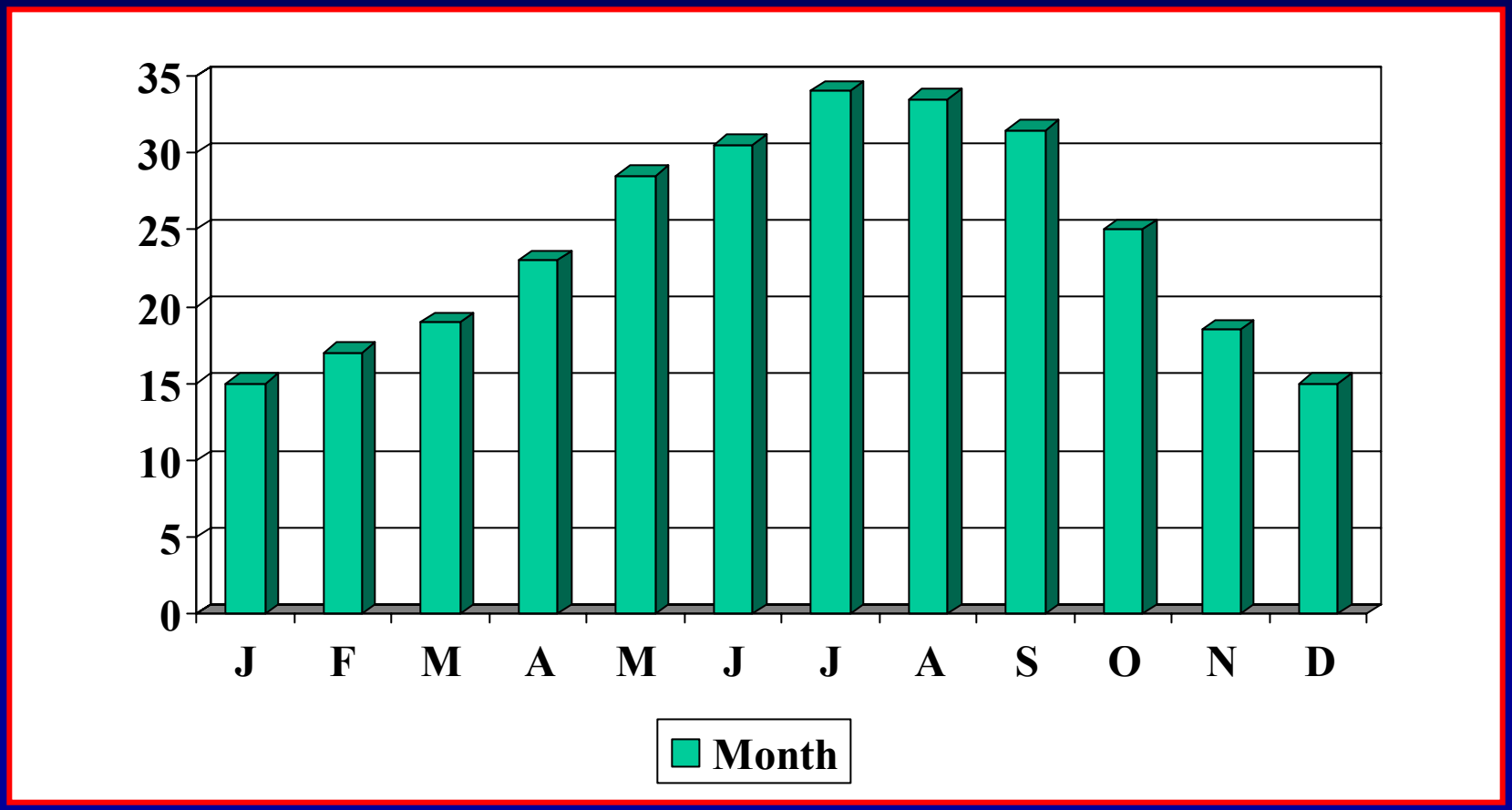
Disease development for seven iceberg lettuce cultivars in all three plantings



Disease development compared with soil temperature range at the 4-inch depth



Mean monthly soil temperature (C)
Yuma, Arizona

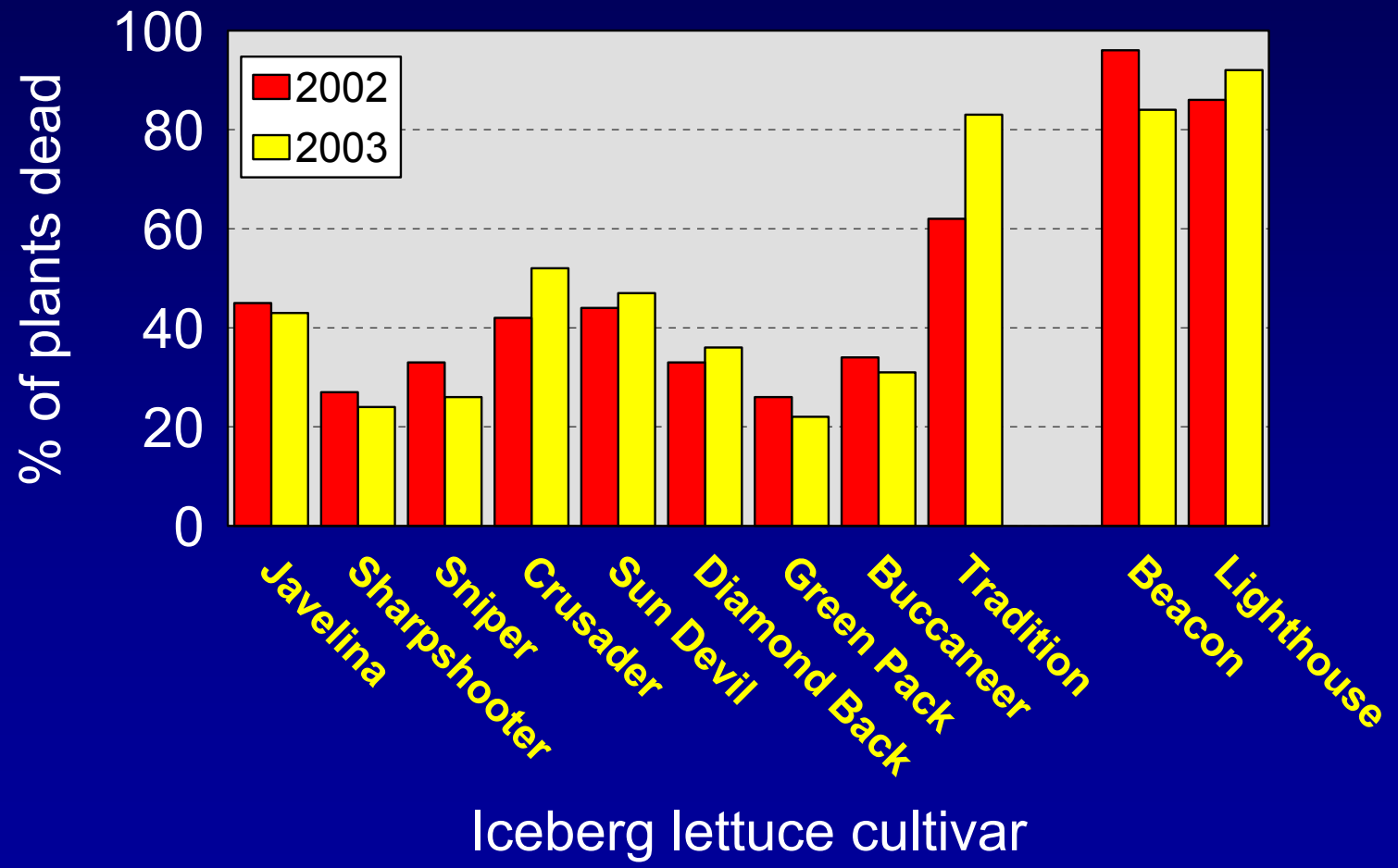


This lettuce cultivar evaluation study is being repeated this year to confirm the preliminary findings from the 2002 trial

Comparison of disease progress In lettuce cultivar evaluation trial: First planting 2002, 2003

Percentage of plants diseased or dead per cultivar 5-6 weeks after wet date

First planting



Management considerations for fields infested with *Fusarium*

- Prevent the spread of soil from contaminated to "clean" fields by workers and equipment
  - This may be especially difficult when crops other than lettuce are grown
- Selection of appropriate planting time and lettuce cultivar

Management considerations for fields not infested with *Fusarium*

- The vast majority of lettuce production fields (99%) in Yuma County are not yet known to contain the lettuce *Fusarium* pathogen
  - In these fields, take every precaution to prevent the introduction of the pathogen
  - Use normal criteria for selection of planting time and lettuce cultivar