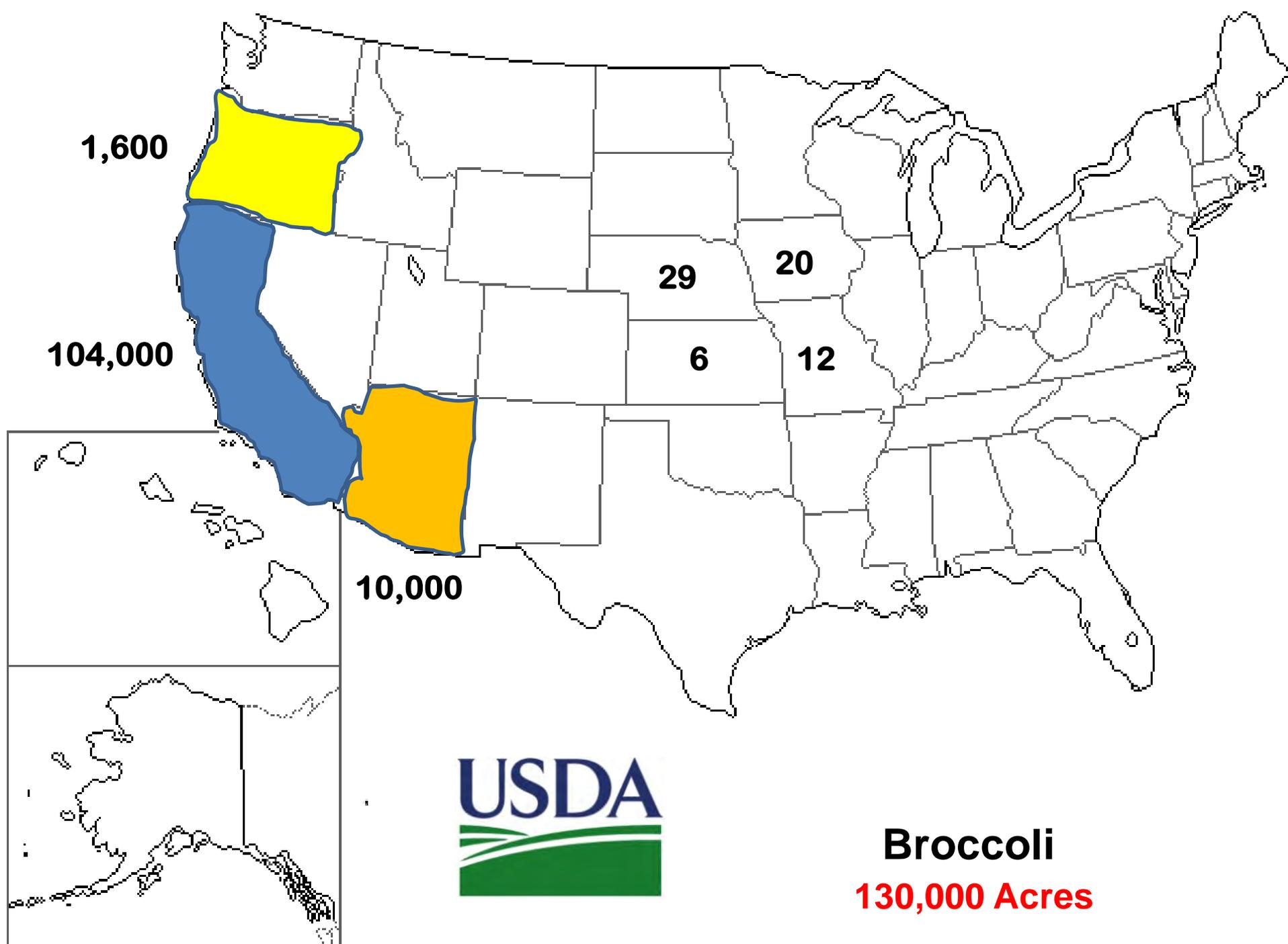


Broccoli Production



Ajay Nair
Department of Horticulture
Iowa State University
Practical Farmers of Iowa 1-17-2020



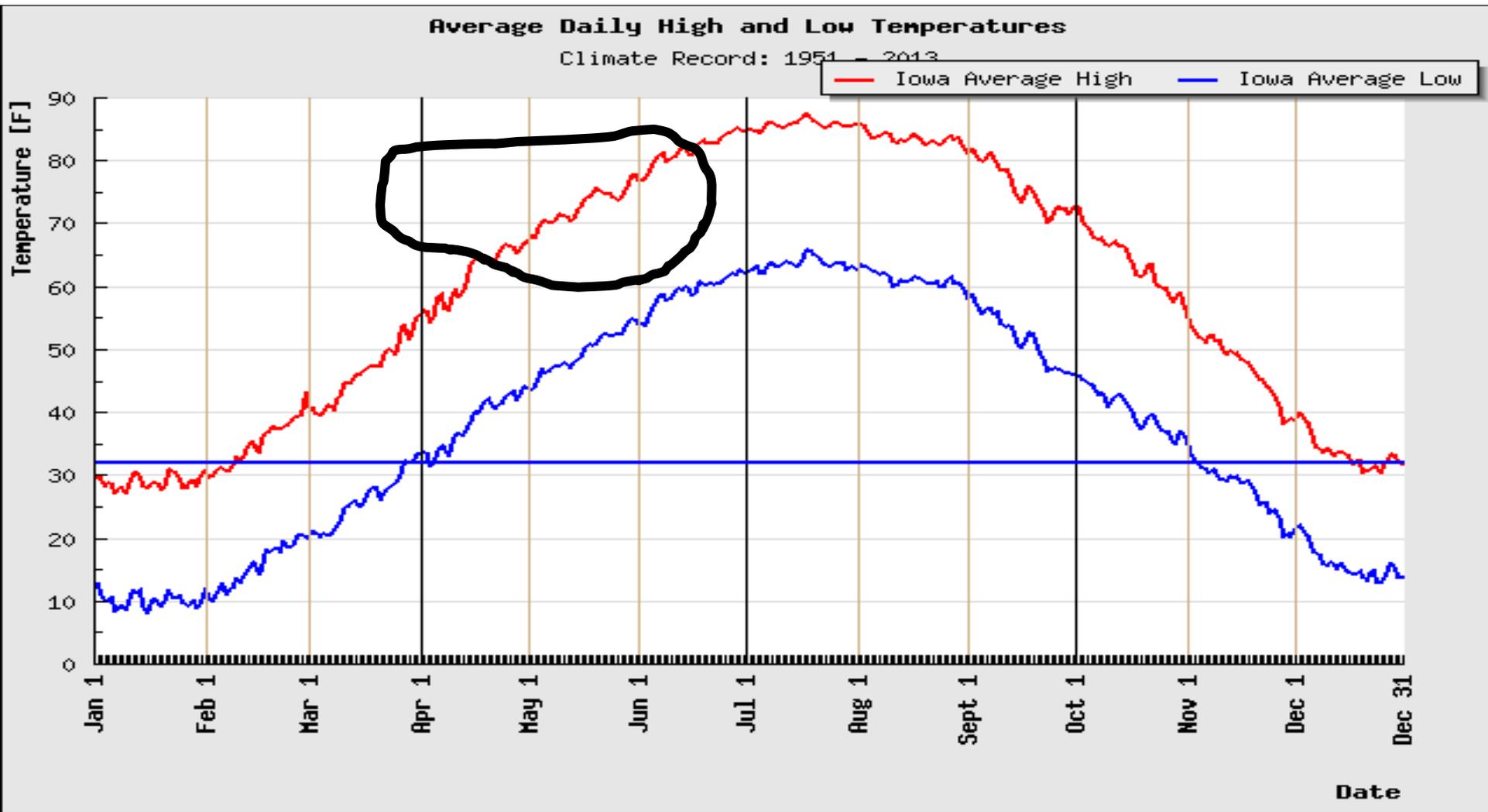
Broccoli had enemies in the past

“I do not like broccoli. And I haven't liked it since I was a little kid and my mother made me eat it. And I'm President of the United States and I'm not going to eat any more broccoli.”



George H.W. Bush, 1989

Average monthly temp



Project Objectives



1. Identify appropriate broccoli cultivars
2. Identify appropriate netting material
3. Reduce the occurrence of heat-related challenges
4. Collaborate with growers for on-farm trials
5. Provide growers with research-based information

Research Site: ISU Horticulture Research Station

6 miles north of Ames
Established in 1967
230 Acres



Soil fertility



Relatively heavy feeders

N often 100-150lbs/a, but too much can cause splitting (cabbage) or hollow stem (broccoli)

Brassica crops are sensitive to several micro-nutrient deficiencies

pH 6.5 – 7.0 best



Pest management



Looper

Brassica pests – Lepidoptera moths and butterflies



Imported
cabbage
worm

Cabbage
looper

Diamondback
moth

Larvae
“worms”



Effects of non-crop species on brassica insect pests

- Purslane diamondback moth¹;
imported cabbageworm¹
- Redroot pigweed imported cabbageworm¹
- Red clover aphids²; flea beetles⁴;
imported cabbageworm⁵
- Mustard flea beetles³; aphids³
- Red Fescue flea beetles⁴
- White clover flea beetles⁴

Sources: 1 Costello 2 Costello 3 Kloen and Altieri 4 Andow et al 5 Dempster and Coaker

Black Rot

Xanthomanas campestris



Credit: David B. Langston, University of Georgia, Bugwood.org

- Leaves wilt, turn yellow and eventually turn brown and die
- Yellow V-shaped lesions develop on margin of leaves
- Black veins can be seen in infected leaves, petioles and stems
- Sticky yellowish liquid bacterial ooze may be seen if infected veins are cut
- Disease favored by hot, humid conditions

APPROACH

**Cover
treatment**



- No-cover
- ProTek Net
- Row cover

Varieties



- Asteroid
- Emerald Star
- Green Gold
- Green Magic
- Gypsy
- Luna

Types of Covers

1. Floating type
2. Supported by hoops
3. Supported on conduits

Material used

1. Polyethylene plastic
2. Spun-bound polyester fabric
3. Mesh-like



Row covers

1. Lighter material (Agribon 19): Light frost protection, more as an insect barrier: \$52
2. Heavier material (Agribon 30): Higher frost protection \$100-\$140

7' x 500'

- a. Reemay
- b. Gintec
- c. Agribon

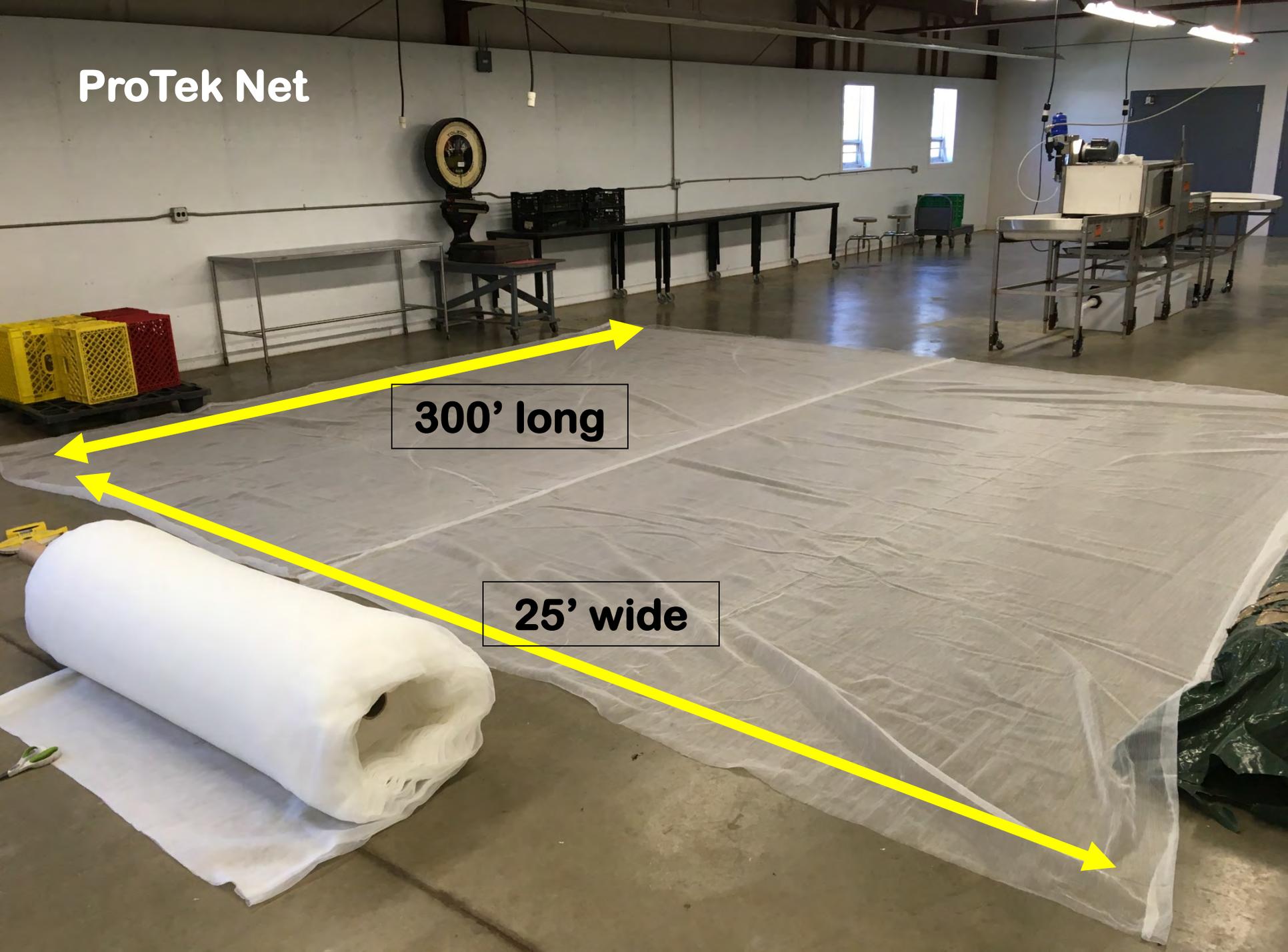
**Reduce costs by
reusing the
material**



ProTek Net

300' long

25' wide



60 g material
25 ft x 300 ft : \$900



Plot overview: Planting date 4-25-2018



Weed management using switch grass mulch



1" electrical conduit; 10 ft long



How to bend the hoops

Hoop bender from Johnnys

Video: Courtesy Dr. Mark Williams



There is a purple discoloration on plants and which is mainly due to phosphorus. Cool springs limit phosphorus availability to plants. Things get better as the soil warms.



No Cover
treatment



Plot on 5-26-18





Asteroid



Emerald Star



Green Gold



Green Magic



Gypsy



Luna

Cover	Air Temperature (°F)					
	May			June		
	Avg temp	Min	Max	Avg temp	Min	Max
No-cover	74.4	54.3	102.7	78.2	61.3	105.2
Protek net	75.5	54.5	108.1	75.7	61.8	98.1
Row cover	78.6	53.6	120.3	76.4	61.3	100.2

Cover	Average light intensity (lux)	
	May	June
No-cover	48,957	37,895
Protek net 11.7%	↓ 43,225	20,823
Row cover 27.9%	↓ 35,259	18,715

First harvest 6-16-2018.
A total of four harvests





Marketable yield

Each plot is 12 ft long and has a total of 20 plants

Cultivar	Marketable	
	Number	Weight (kg)
Asteroid	11.4 b	3.34 b
Emerald Star	13.9 ab	3.80 b
Green Gold	14.1 a	5.67 a
Green Magic	1.6 d	0.42 d
Gypsy	8.1 c	2.38 bc
Luna	4.1 d	1.07 cd



Loose heads

Each plot is 12 ft long and has a total of 20 plants

Cultivar	Loose headed	
	Number	Weight (kg)
Asteroid	2.75 ab	0.80 ab
Emerald Star	1.08 b	0.30 b
Green Gold	2.20 b	0.64 b
Green Magic	1.25 b	0.31 b
Gypsy	4.69 a	1.38 a
Luna	0.91 b	0.26 b

Beaded heads



Beaded heads

Each plot is 12 ft long and has a total of 20 plants

Cultivar	Beaded	
	Number	Weight (kg)
Asteroid	0.16 c	0.02 c
Emerald Star	0.33 c	0.07 c
Green Gold	0.58 c	0.20c
Green Magic	4.5 b	1.21 b
Gypsy	0.33 c	0.10 c
Luna	11.1 a	3.25 a

Brown discoloration



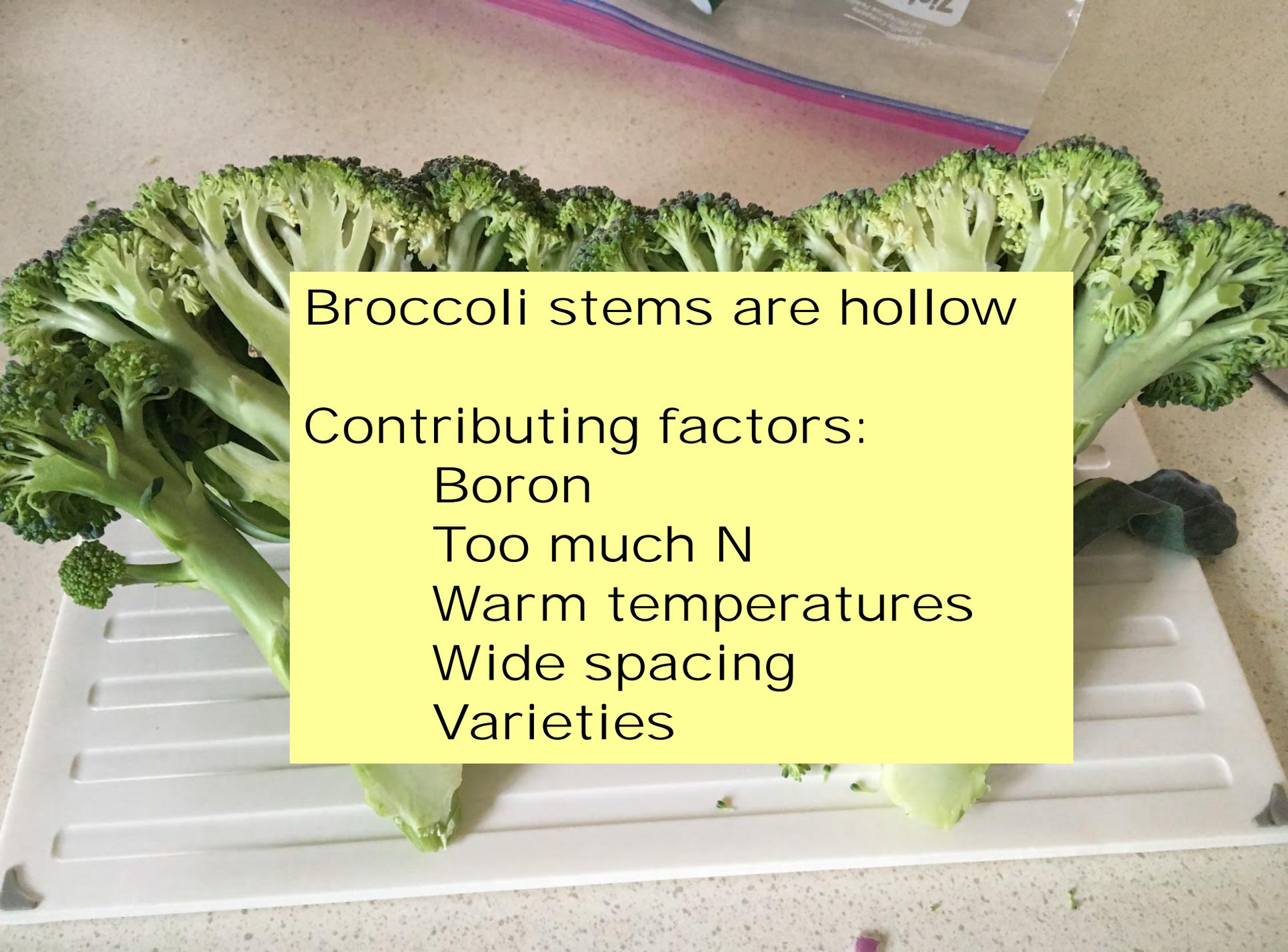
Brown discoloration

Each plot is 12 ft long and has a total of 20 plants

Cultivar	Brown discoloration	
	Number	Weight (kg)
Asteroid	0.58 b	0.12 b
Emerald Star	1.16 b	0.36 b
Green Gold	0.20 b	0.09 b
Green Magic	9.66 a	3.02 a
Gypsy	0.13 b	0.04 b
Luna	0.58 b	0.22 b

Physiological disorder: Hollow Stem





Broccoli stems are hollow

Contributing factors:

- Boron

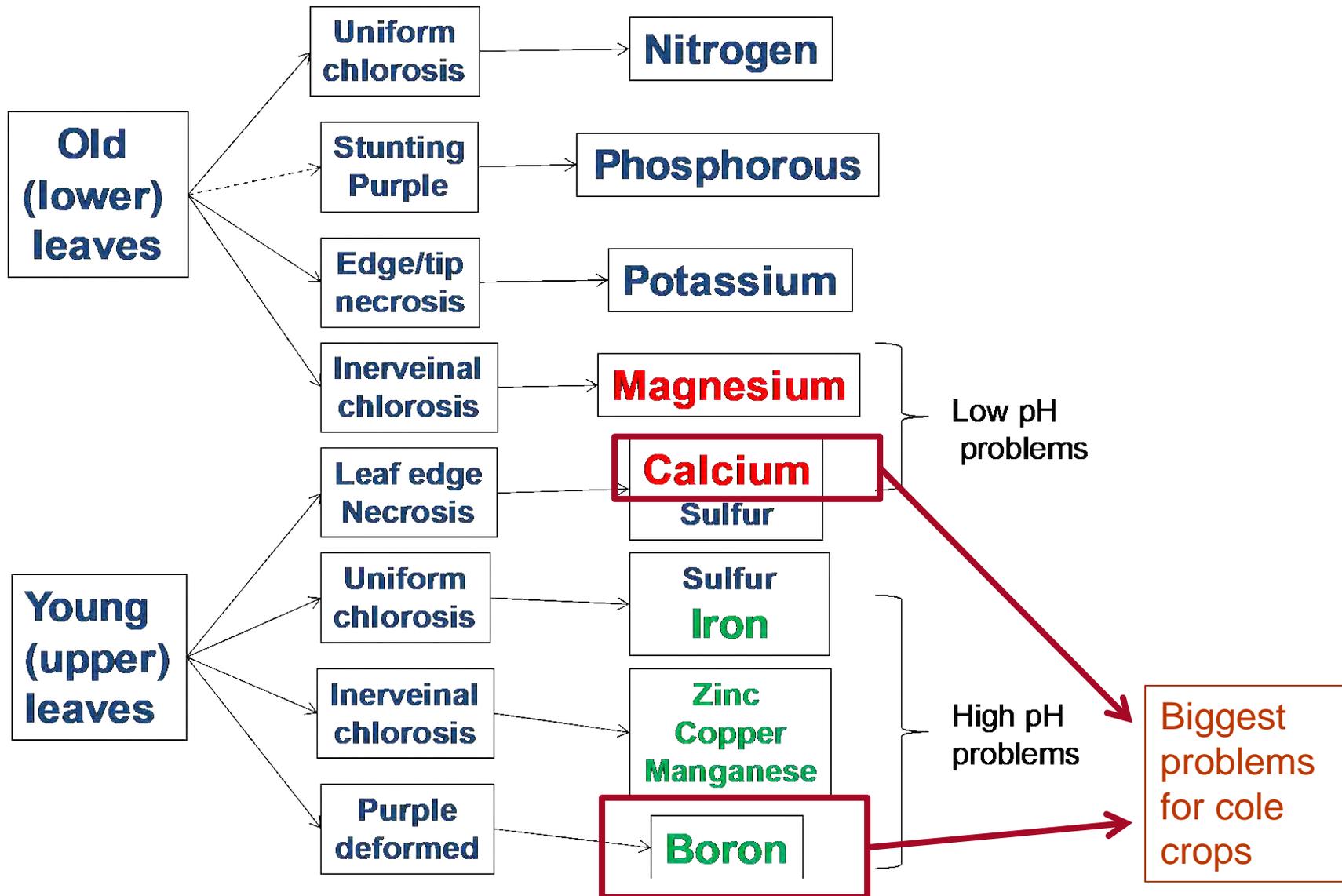
- Too much N

- Warm temperatures

- Wide spacing

- Varieties

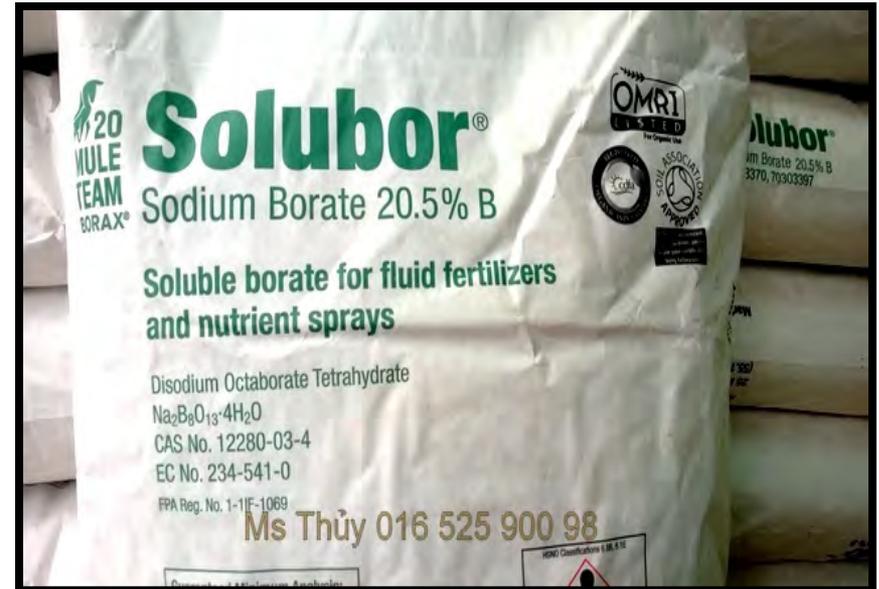
Nutrient Deficiency Review

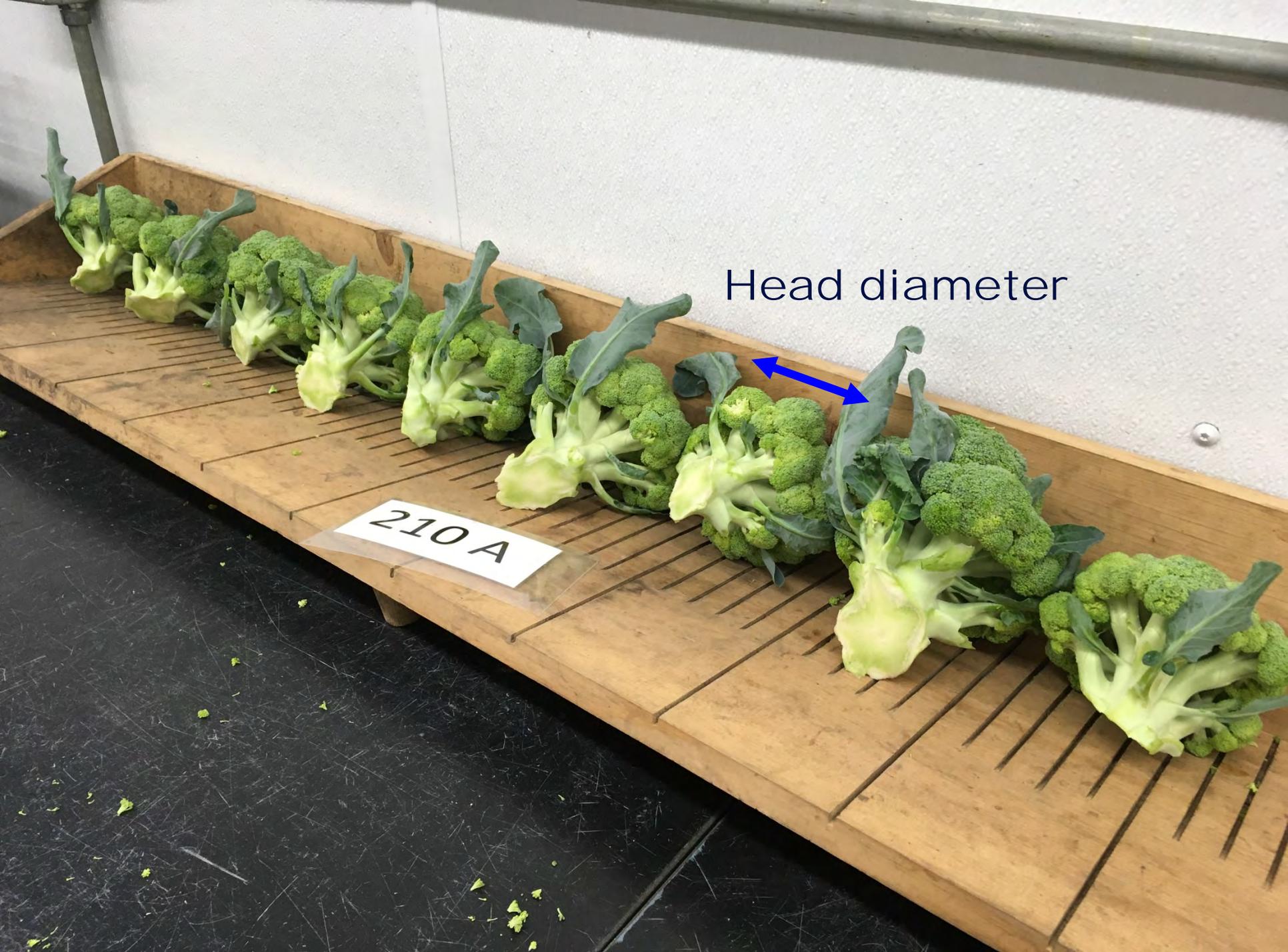


Boron application is critical

Average soil concentration of Boron is between 9 to 85 ppm, however, in vegetable production B is sufficient if soil test shows 0.7 ppm

But if concentration is below that then apply between 0.5-3.0 lb B/acre





210 A

Head diameter



Average head diameter and hollow stem

Treatment	Average Head diameter (cm)	Hollow stem numbers
Cover		
No-cover	13.03	3.4 b
ProTek Net	13.18	7.3 ab
Row cover	11.94	9.1 a
<i>Significance</i>	0.3303	0.0217
Cultivar		
Asteroid	14.4 a	8.6 ab
Emerald Star	13.1 a	3.3 c
Green Gold	13.5 a	3.4 c
Green Magic	10.3 b	7.0 b
Gypsy	12.1 ab	11.9 a
Luna	12.9 a	5.3 bc
<i>Significance</i>	0.0448	0.0002

On-farm trial
Titus Bontrager,
Kalona, IA

April 26, 2018



June 20, 2018





**Aphids; finer type of
Protek net should be
used for aphids**

Partnerships



LEOPOLD CENTER
FOR SUSTAINABLE AGRICULTURE

Ajay Nair

nairajay@iastate.edu

www.extension.iastate.edu/vegetablelab



**SUSTAINABLE
VEGETABLE
PRODUCTION**



Oh yes ! We are ready !