MAXIMIZING YIELD of HIGH QUALITY LINT and SEED

Nutrient Management Strategies

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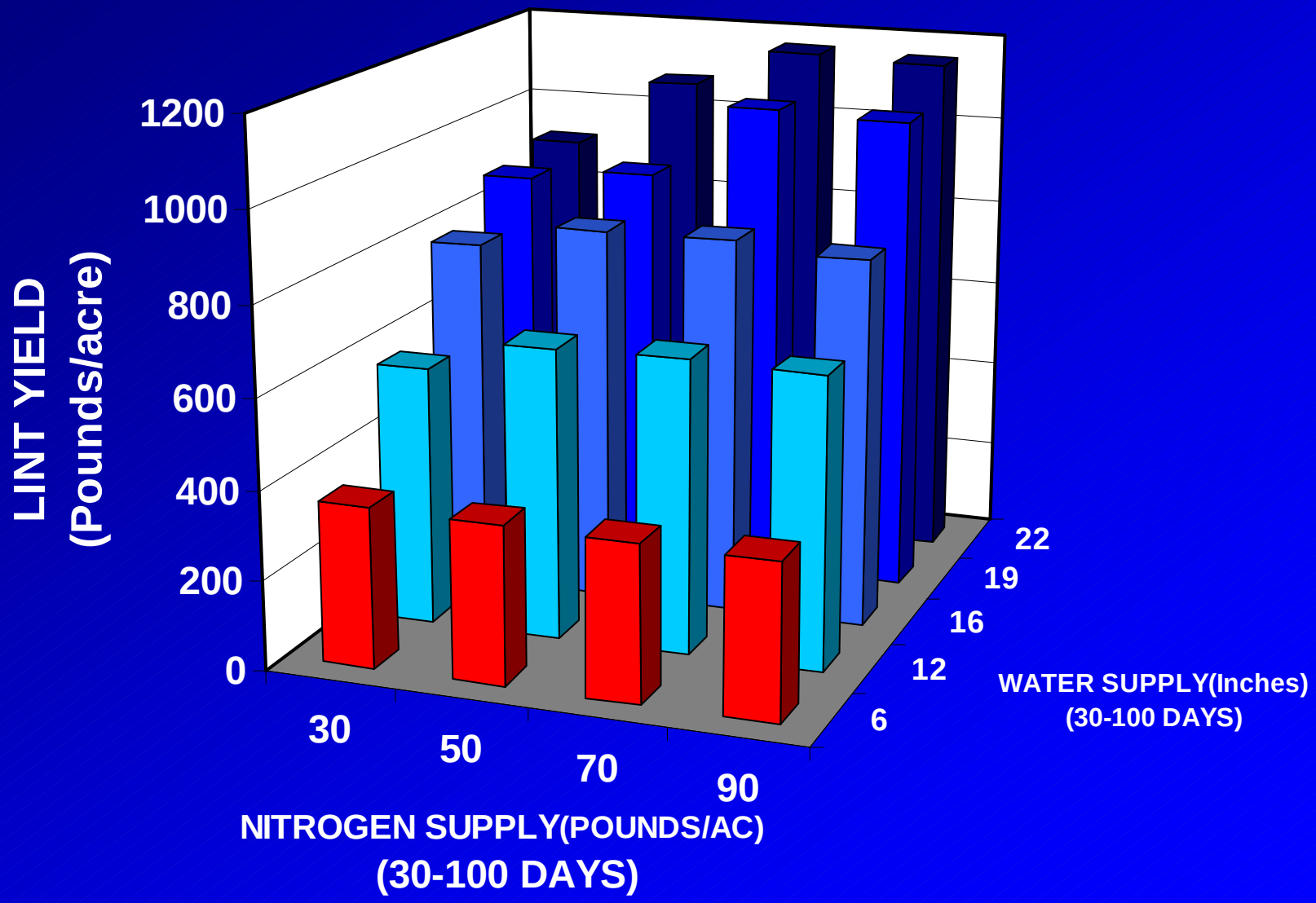
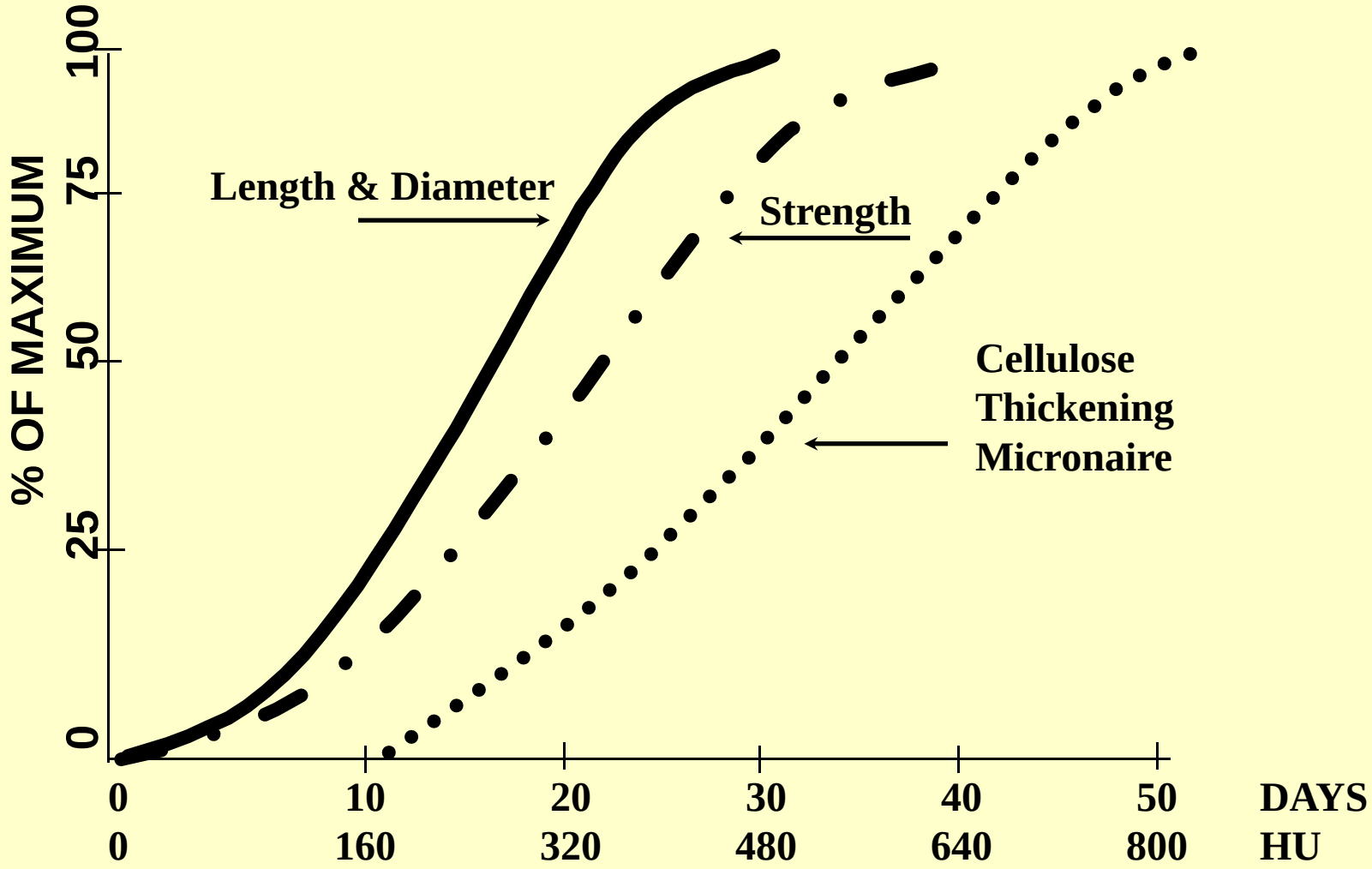
COTTON

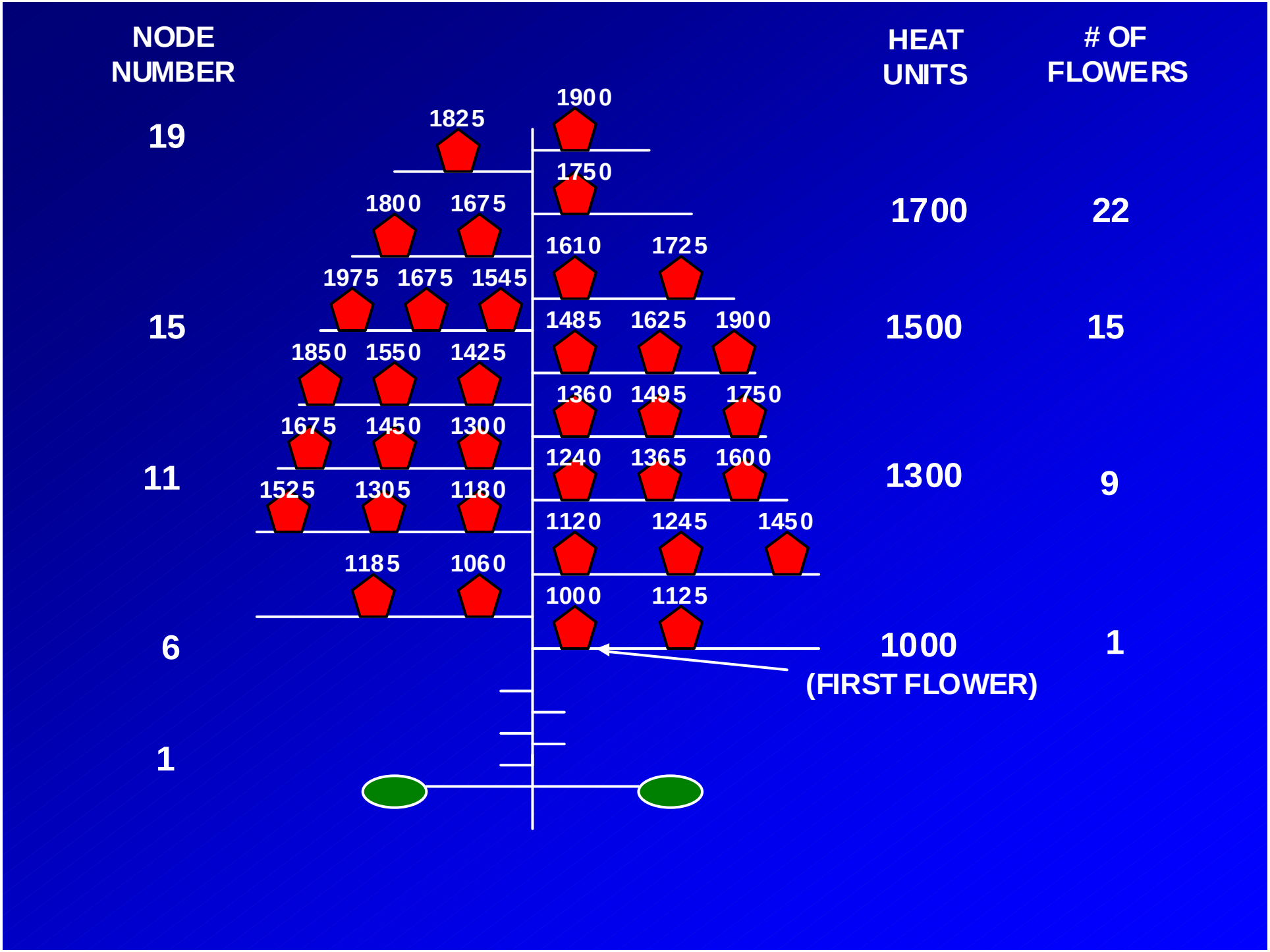

LINT YIELD
(Pounds/acre)
1200
1000
800
600
400
200
0
30
50
70
90
NITROGEN SUPPLY(POUNDS/AC)
(30-100 DAYS)
6
12
16
19
22
WATER SUPPLY(Inches)
(30-100 DAYS)

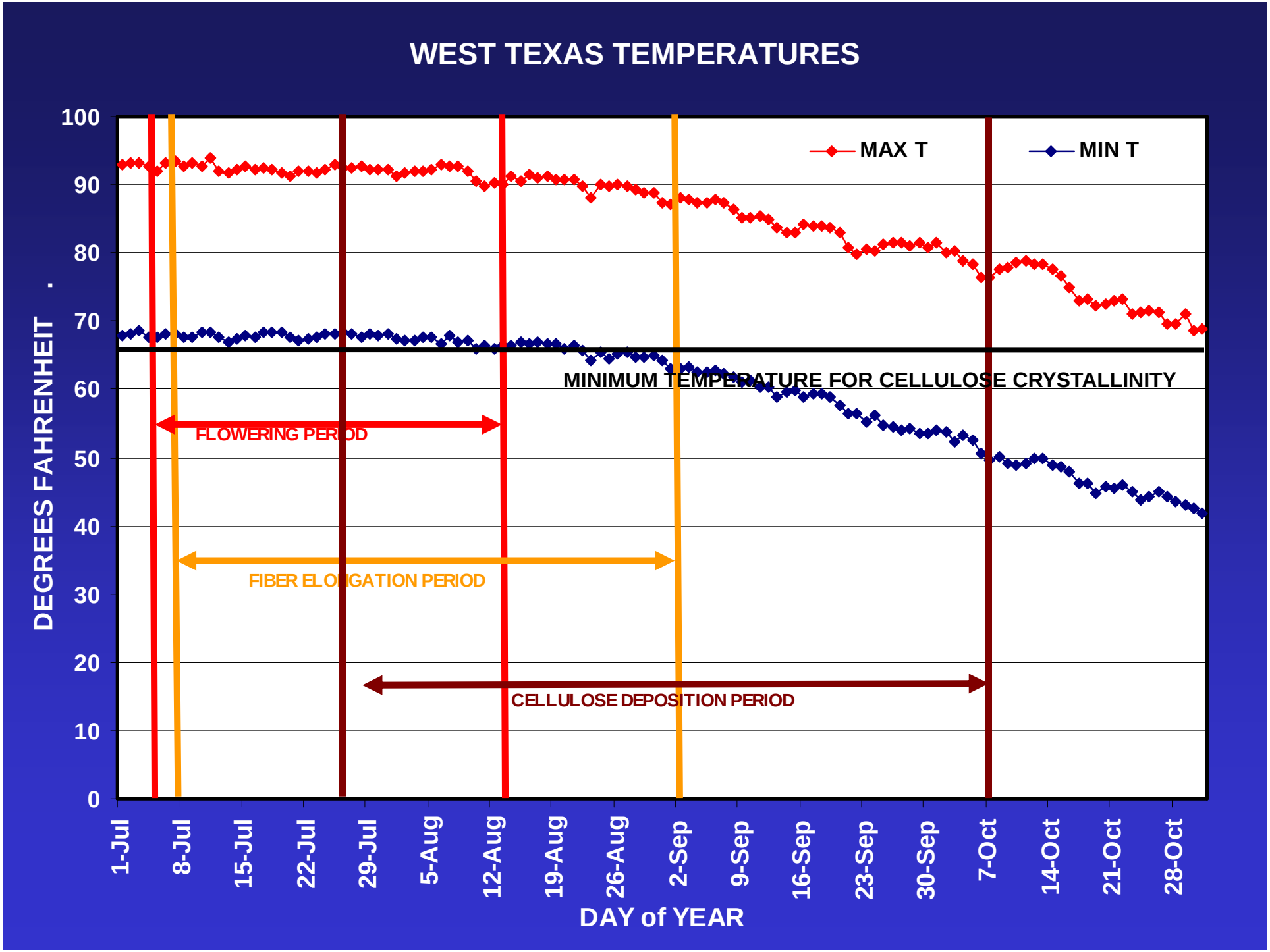
LINT VALUE

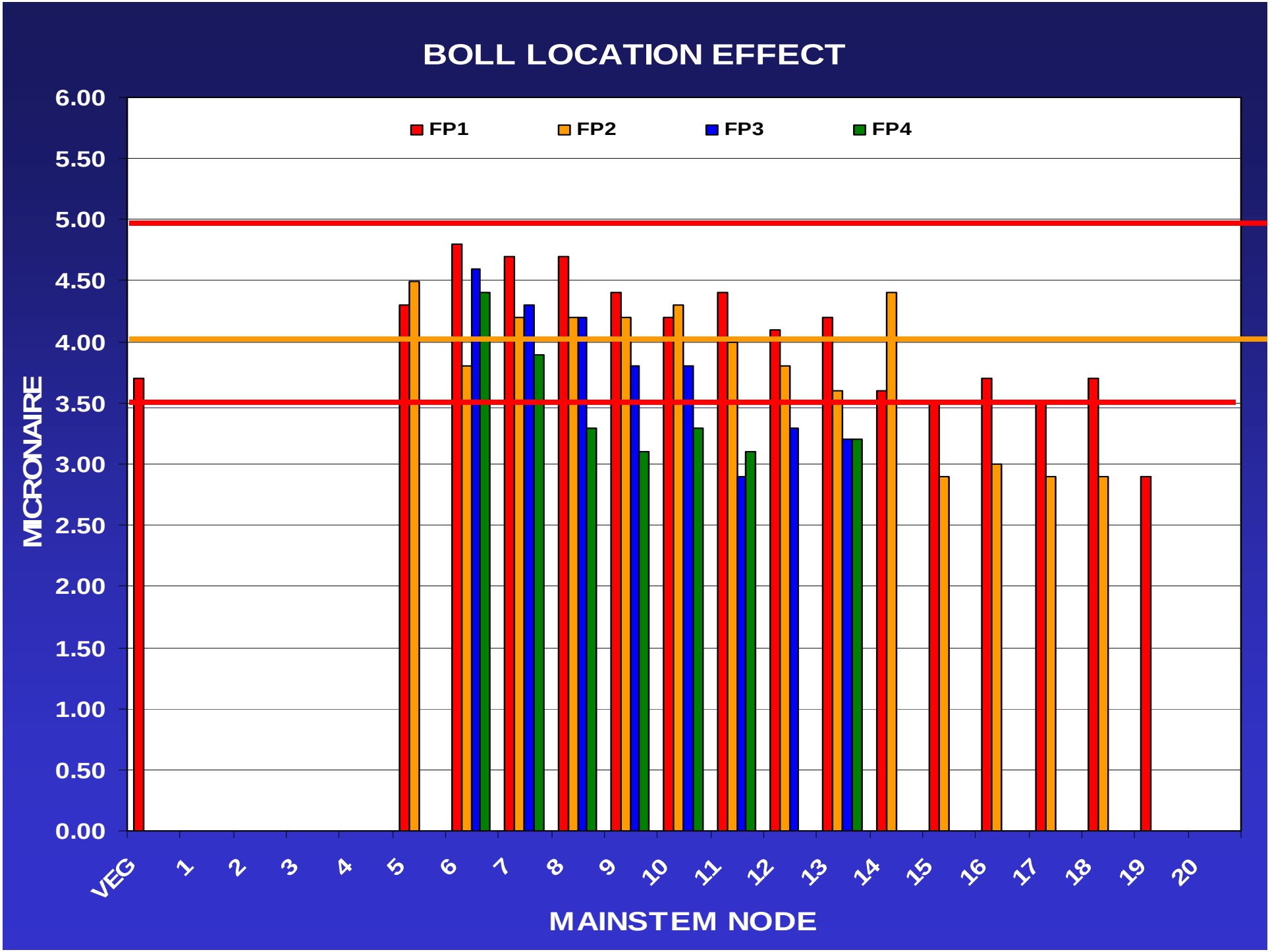
- Fiber Length - 95% Genetic
- Fiber Strength -95% Genetic
- Micronaire – Fiber Diameter (Genetic);
  Fiber Maturity (Environmental)
- Uniformity – Boll Location & Ginning
- Color – Environmental
- Trash – Leaf (Genetic & Environmental)
  - Bark (Environmental & Harvesting)

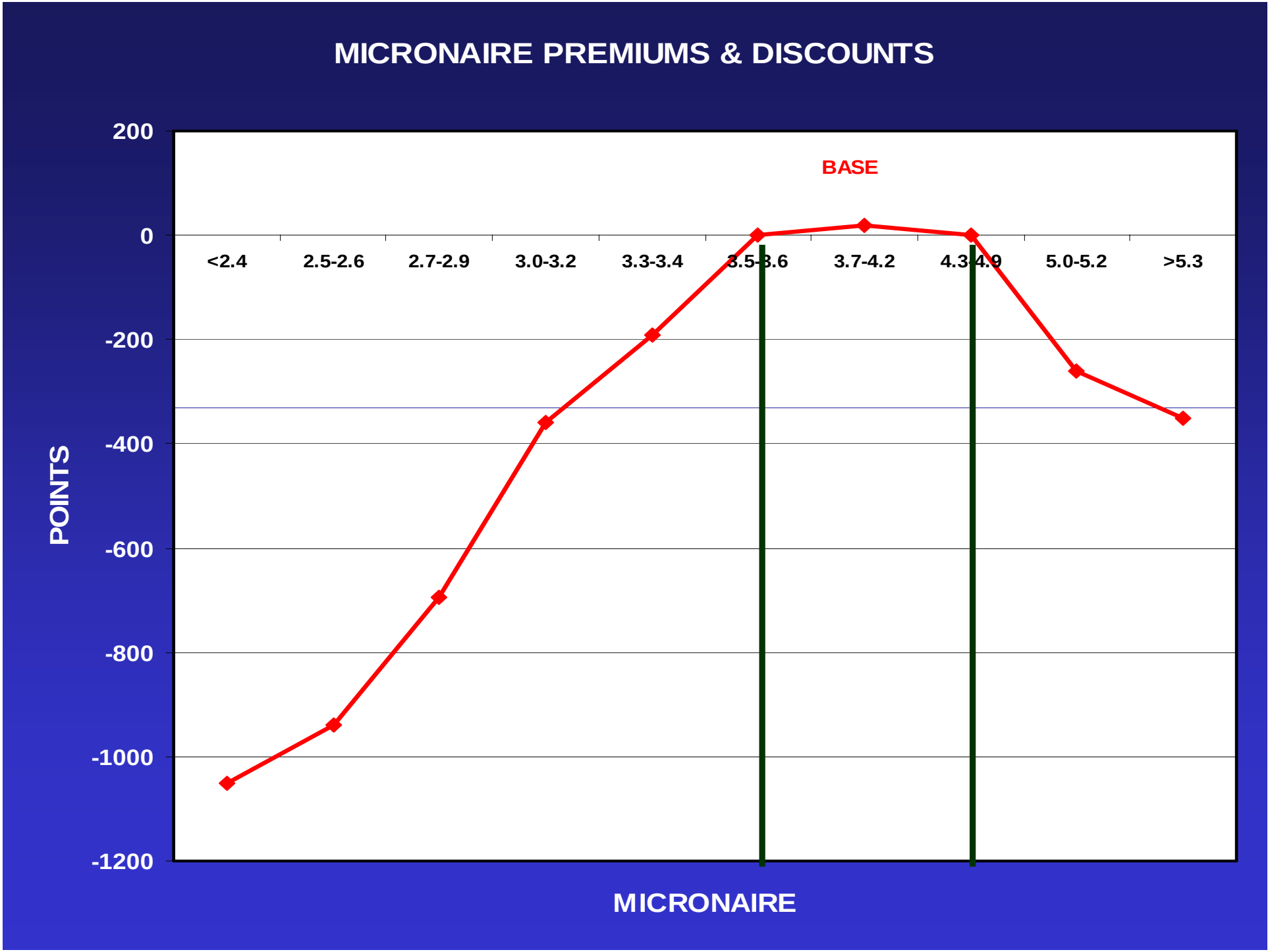
FIBER DEVELOPMENT




NODE NUMBER
HEAT UNITS
OF FLOWERS
19
15
11
6
1
1900
1825
1750
1800
1675
1610
1725
1975
1675
1545
1485
1625
1900
1850
1550
1425
1360
1495
1750
1675
1450
1300
1240
1365
1600
1525
1305
1180
1120
1245
1450
1185
1060
1000
1125
1700
22
1500
15
1300
9
1000
1
(FIRST FLOWER)


WEST TEXAS TEMPERATURES
DEGREES FAHRENHEIT
100
90
80
70
60
50
40
30
20
10
0
MAX T
MIN T
MINIMUM TEMPERATURE FOR CELLULOSE CRYSTALLINITY
FLOWERING PERIOD
FIBER ELONGATION PERIOD
CELLULOSE DEPOSITION PERIOD
1-Jul
8-Jul
15-Jul
22-Jul
29-Jul
5-Aug
12-Aug
19-Aug
26-Aug
2-Sep
9-Sep
16-Sep
23-Sep
30-Sep
7-Oct
14-Oct
21-Oct
28-Oct
DAY of YEAR


BOLL LOCATION EFFECT
FP1
FP2
FP3
FP4
MICRONAIRE
6.00
5.50
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
VEG
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
MAINSTEM NODE


MICRONAIRE PREMIUMS & DISCOUNTS
200
0
-200
-400
-600
-800
-1000
-1200
POINTS
BASE
<2.4
2.5-2.6
2.7-2.9
3.0-3.2
3.3-3.4
3.5-3.6
3.7-4.2
4.3-4.9
5.0-5.2
>5.3
MICRONAIRE

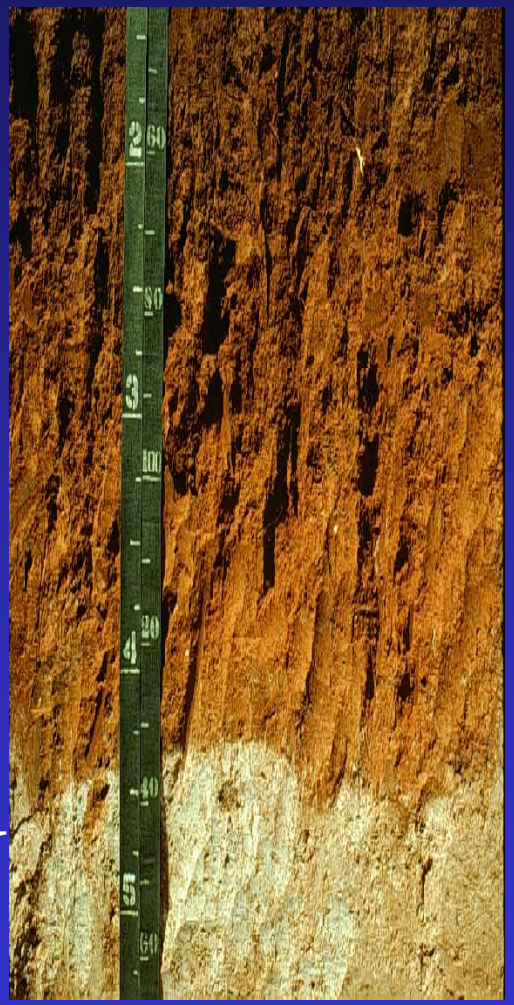
Factors Affecting Seed Development

Nutrients - Particularly P

- **Function of P**
  - Energy storage and transfer
  - Structural component of DNA, RNA, Phosphoproteins and Phospholipds
- **Crucial to formation of reproductive parts and seed development**
  - 50-60% of P at maturity is located in the seed
- **In calcareous soils, maintaining adequate amounts of P in the plant available form is a problem**

PROBLEM

- **CALICHE**
  - parent material of $CaCO_3$ rock
- **FREE $CaCO_3$**
  - calcareous to the surface
- **HIGH pH**
  - above 7.5
- **PHOSPHOROUS AVAILABILITY**
  - formation of insoluble Ca-P

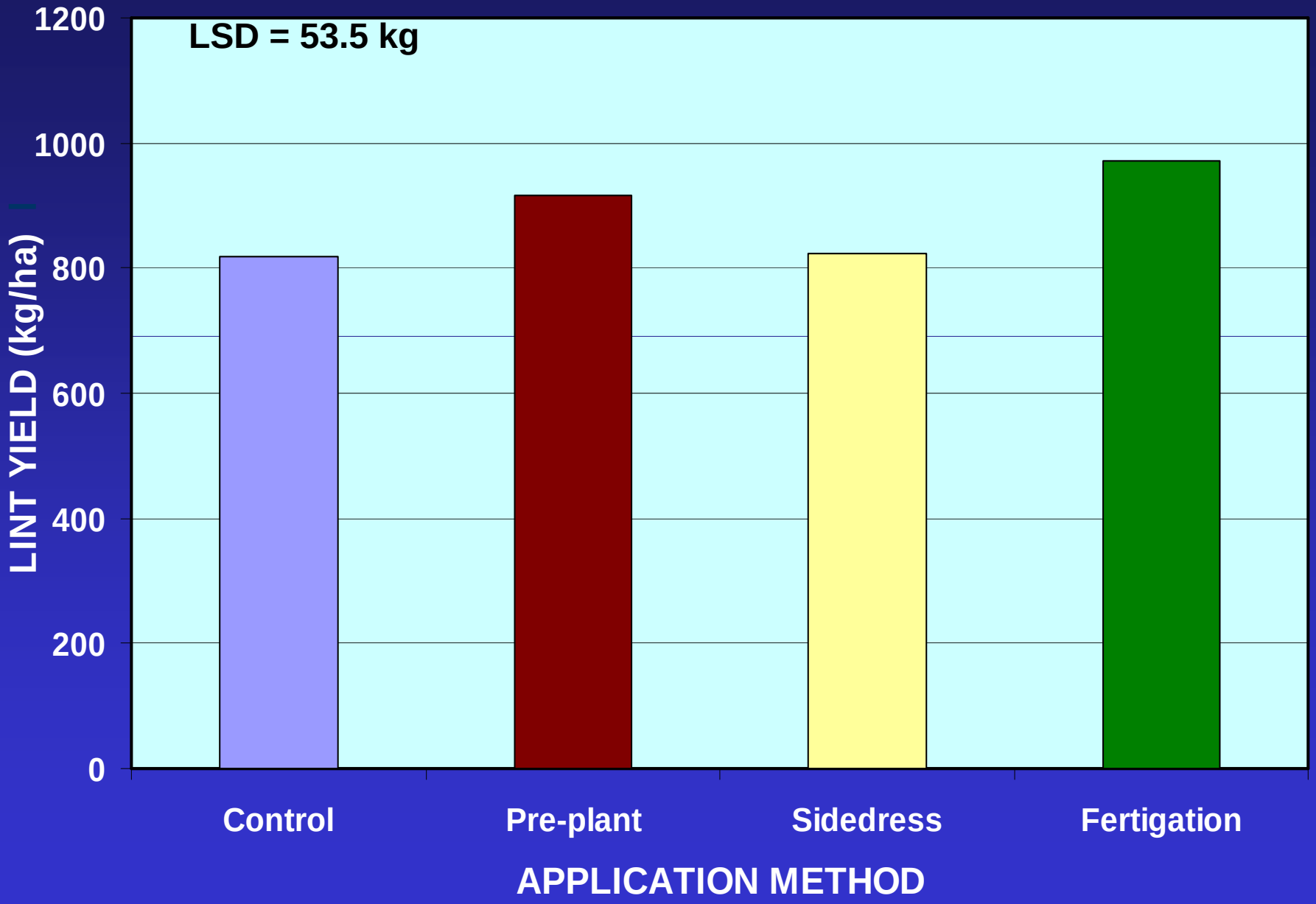


Can Cotton Seed and Fiber Yield and Quality Can Be Enhanced by Multiple Applications of P During Fruiting?

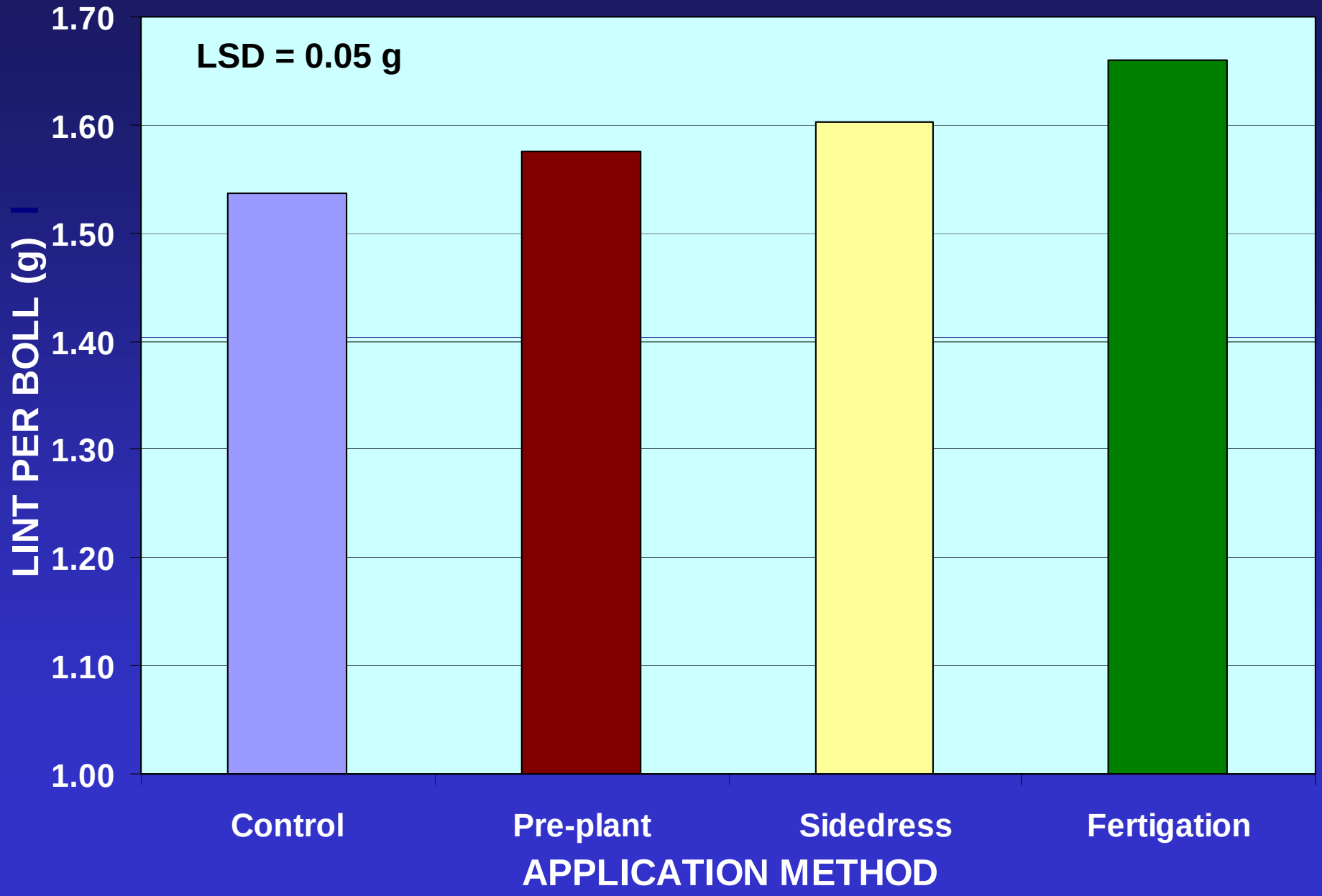
Specifically:

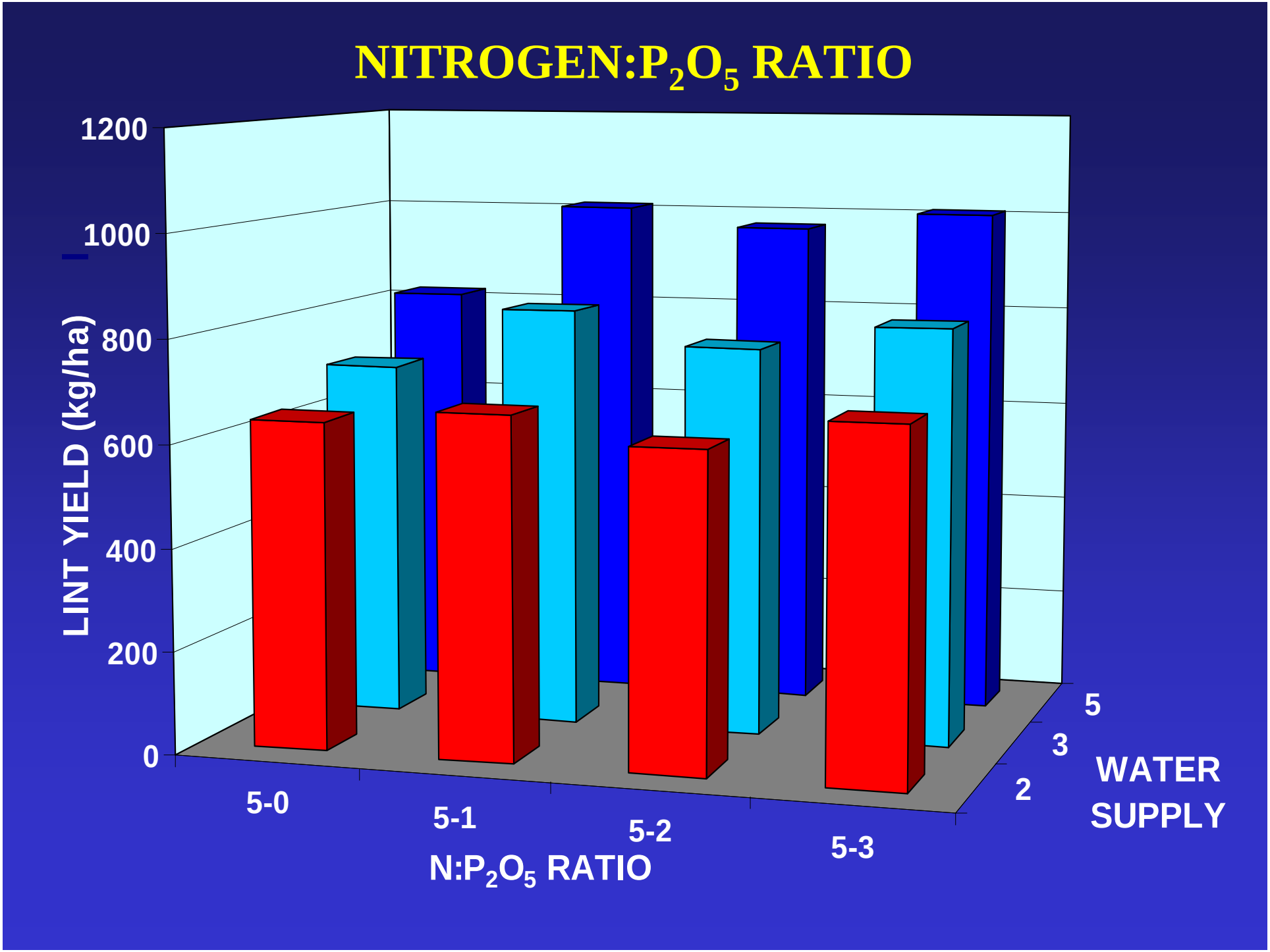
1. **Evaluate P Application Method upon Yield and Quality**
2. **Determine Optimum N: P Ratio for Maximum Yield and Quality**

PHOSPHORUS APPLICATION METHOD

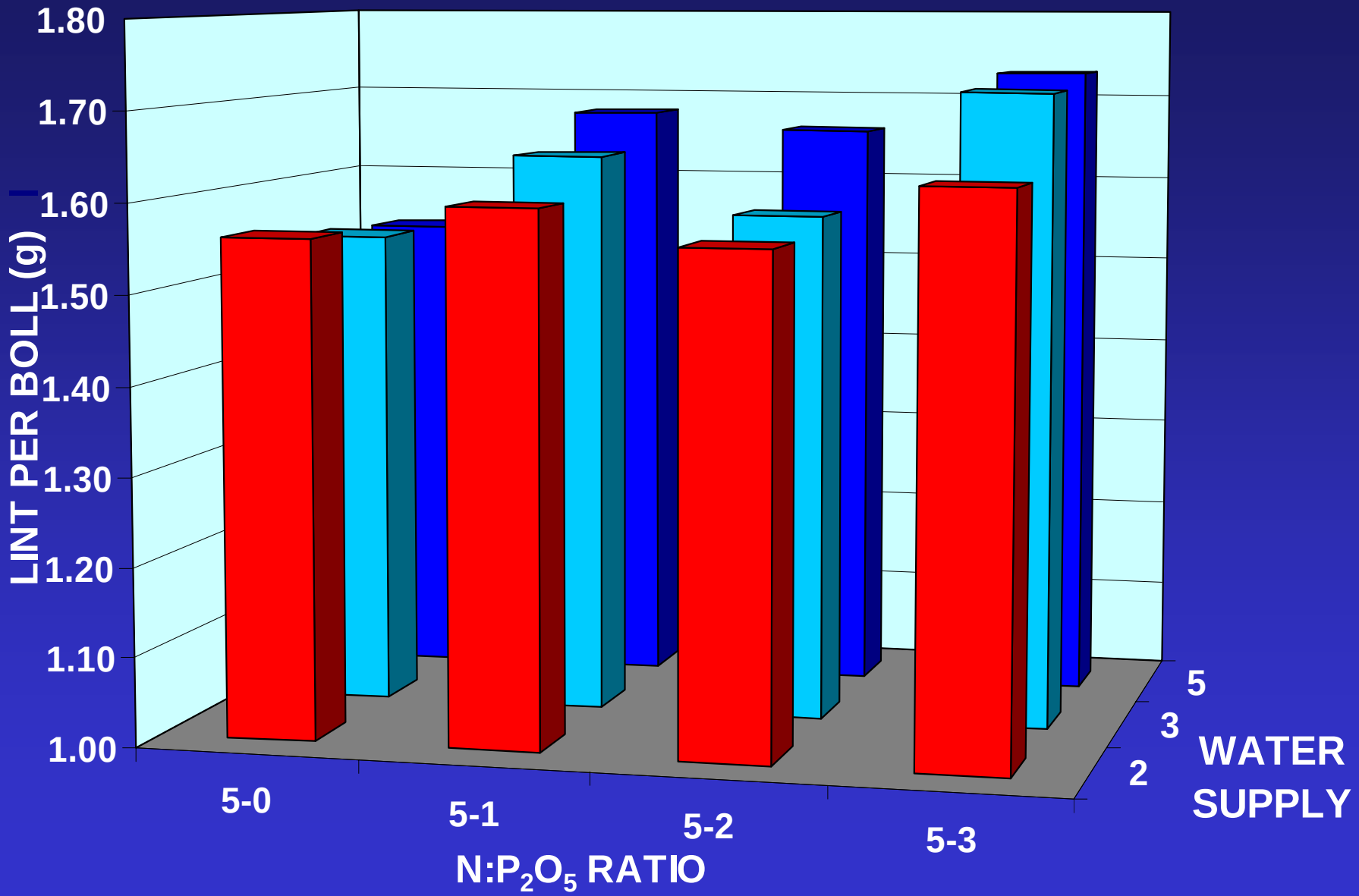


PHOSPHORUS APPLICATION METHOD

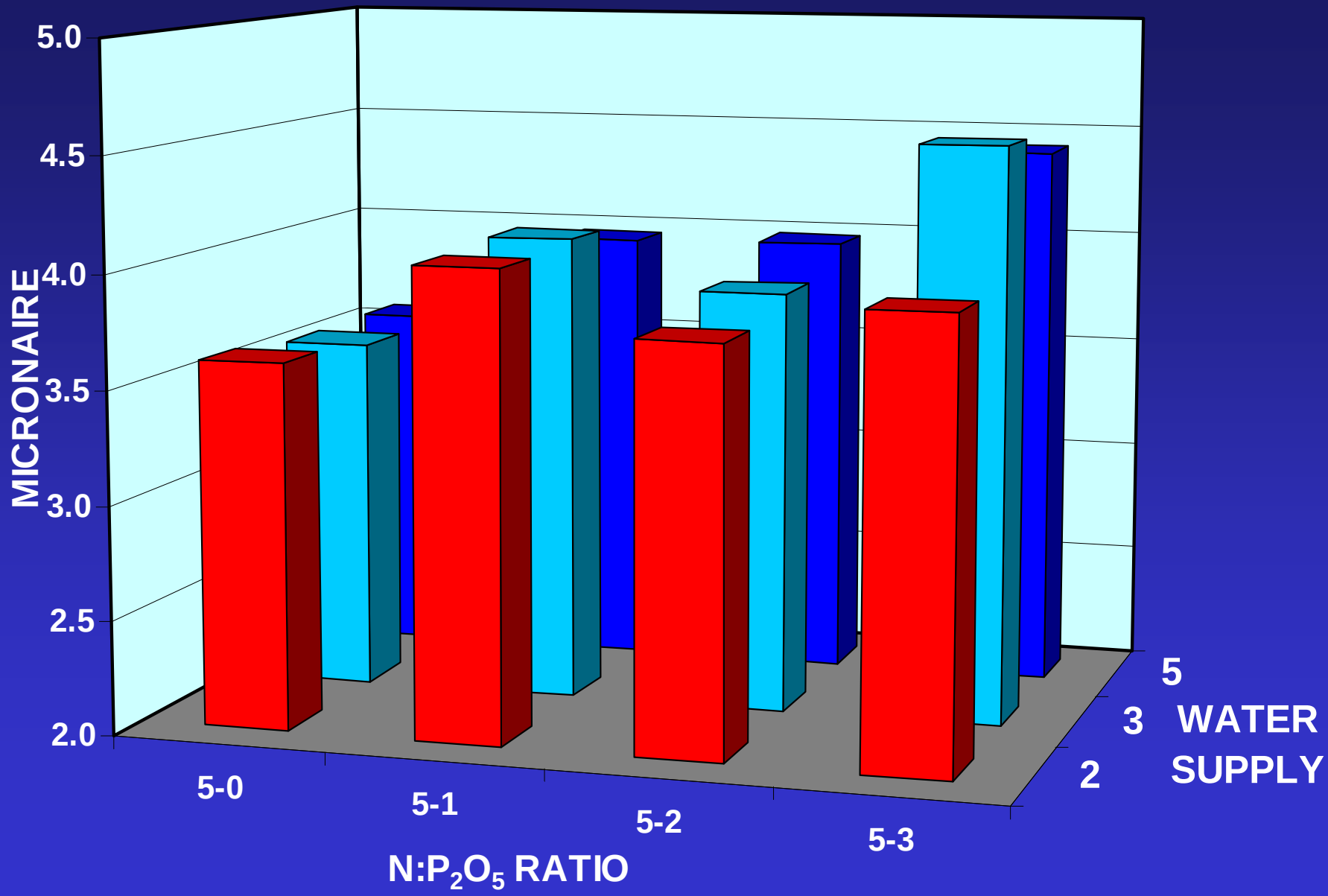



NITROGEN:P2O5 RATIO
1200
1000
800
600
400
200
0
LINT YIELD (kg/ha)
5-0
5-1
5-2
5-3
N:P2O5 RATIO
5
3
2
WATER SUPPLY

NITROGEN:P_2O_5 RATIO



NITROGEN:P_2O_5 RATIO



COTTONSEED QUALITY

- **Over 90% of the cotton planted in the US today is Transgenic Varieties**

- **Over 50% of the cottonseed production for sale by commercial seed companies is produced on the Texas High Plains (350-450,000 acres & 200-300,000 tons of fuzzy seed with an on-farm value of $40-60 Million)**

- **Approximately 25-35% of the fuzzy seed is lost due to delinting (~7-8%) and immature seed (17-28%)**

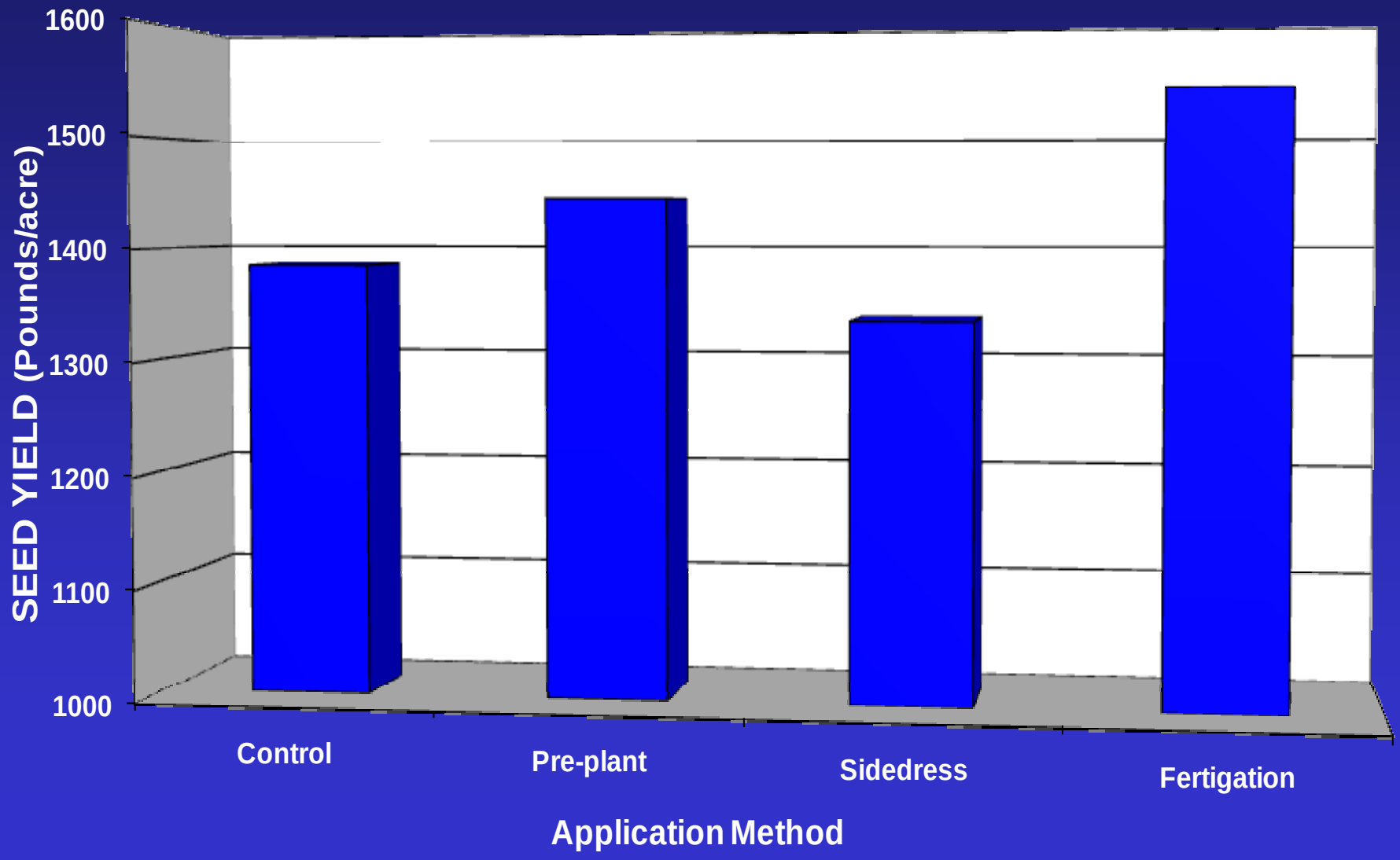
- **One ton of fuzzy seed costs the seed company ~ $200.00 and results in 1200-1600 pounds of salable seed with a market value of $250/cwt ($500-750 Million) and a technology value of $300-450/cwt (~ 1.0 Billion)**

- **Improving cottonseed quality has both economic value and agronomic value.**

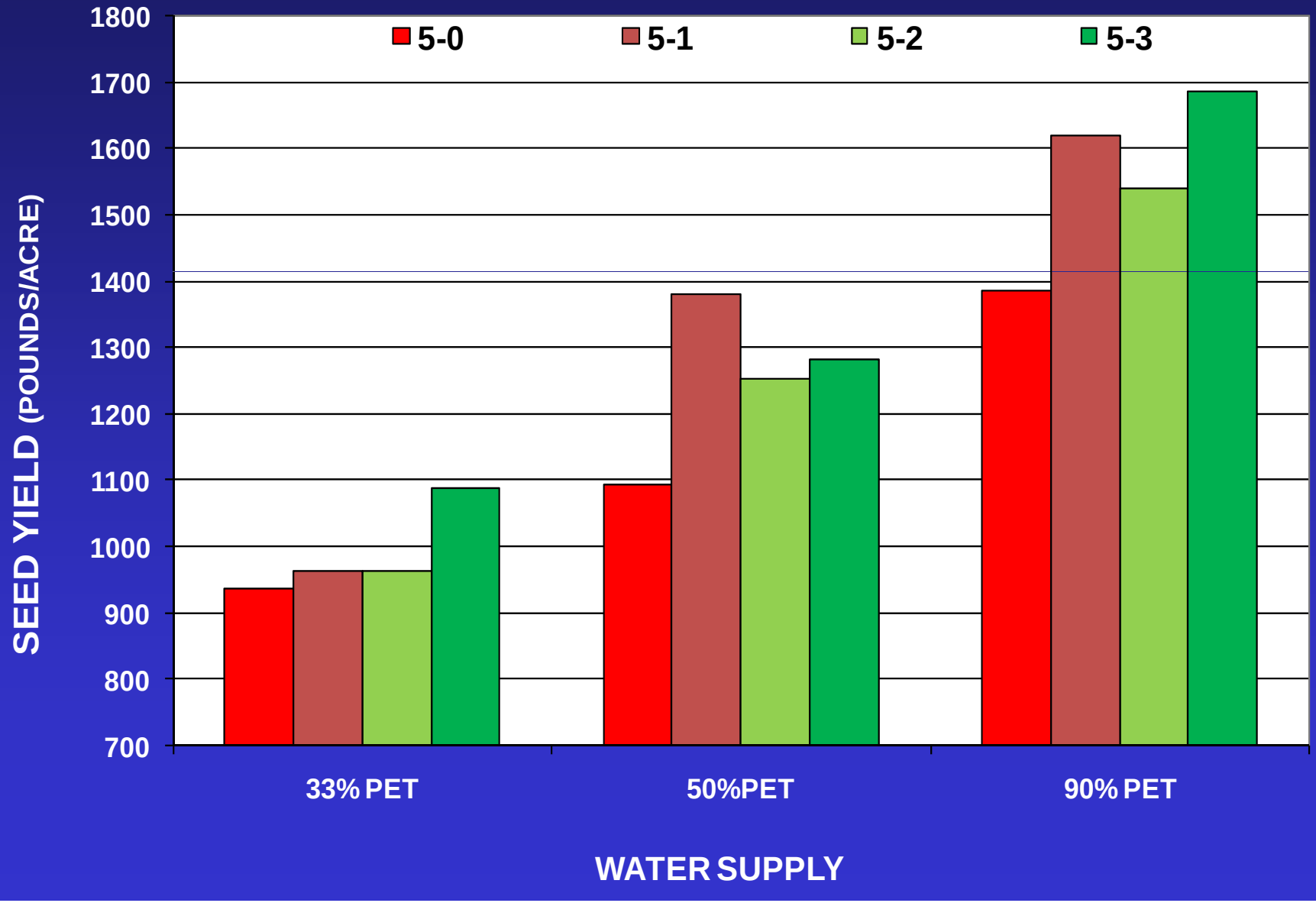
HIGH QUALITY PLANTING SEED

- **SEED PRODUCER PERSPECTIVE**
  - **Reduce acres and risk**
  - **Increase salable seed per ton of purchased seed**
  - **Provide better product**
- **COTTON PRODUCER PERSPECTIVE**
  - **Major input cost**
  - **Reduced seeding rates**
  - **Importance of rapid, uniform emergence of seedlings**

SEED YIELD


1600
1500
1400
1300
1200
1100
1000
SEED YIELD (Pounds/acre)
Control
Pre-plant
Sidedress
Fertigation
Application Method

EFFECT OF N:P RATIO ON SEED YIELD



PHYSICAL PROPERTIES of SEED RELATED to VIABILITY and SEEDLING VIGOR

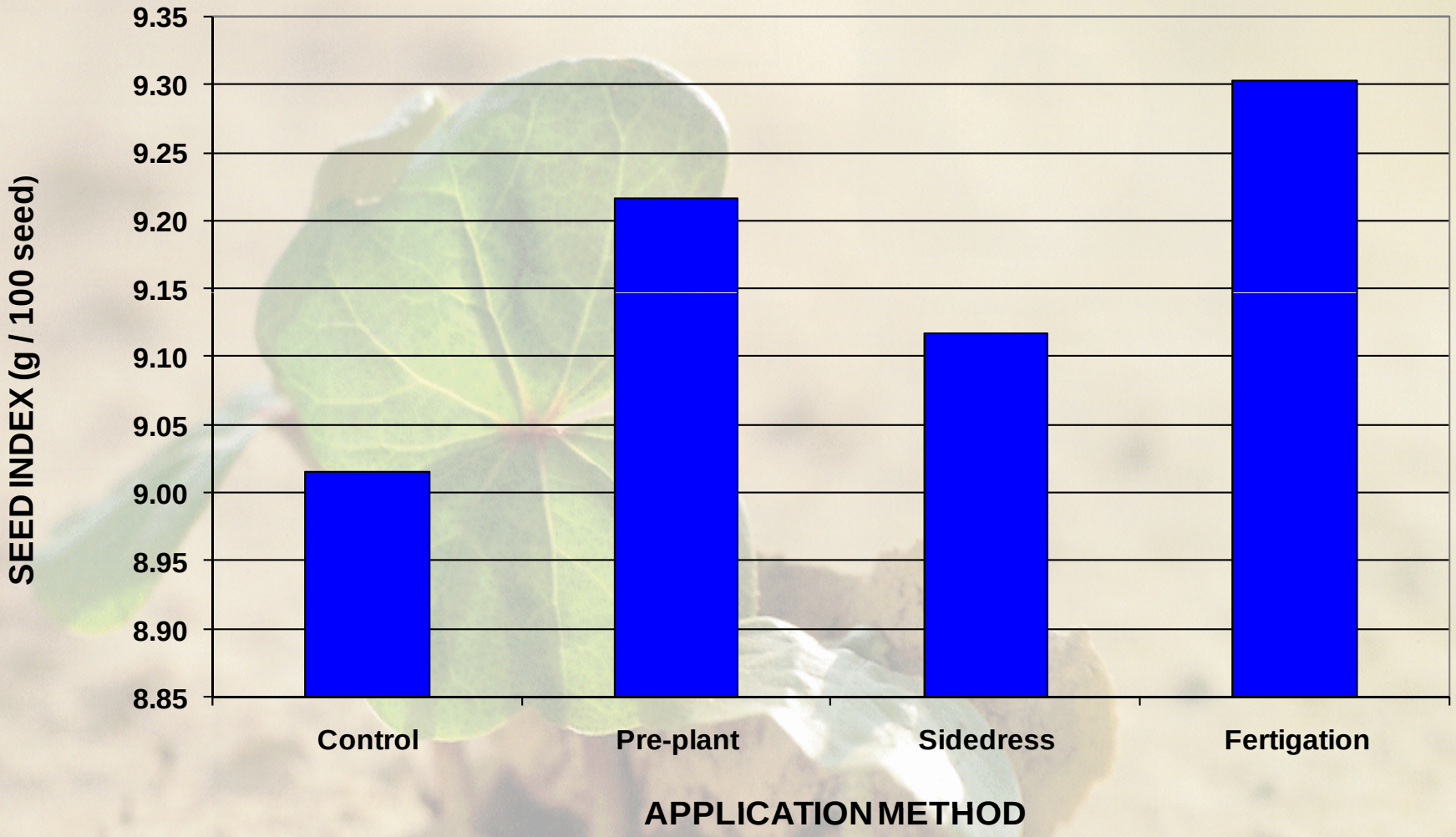
SEED WEIGHT

- Genetic component
- Greatest influence on seedling growth under cold conditions

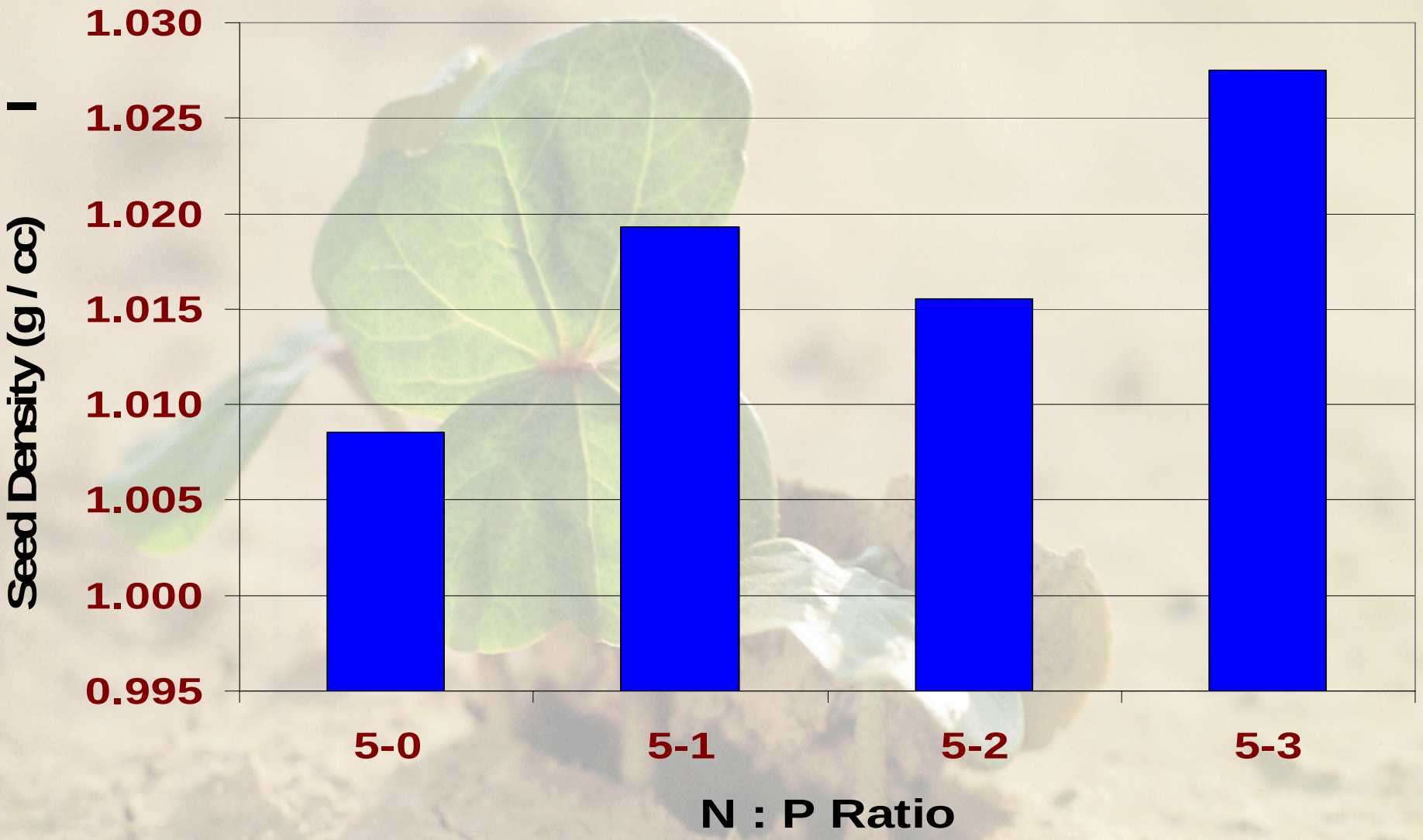
SEED DENSITY

- Measure of seed maturity
- Greatest influence on percent germination and seedling growth across temperatures

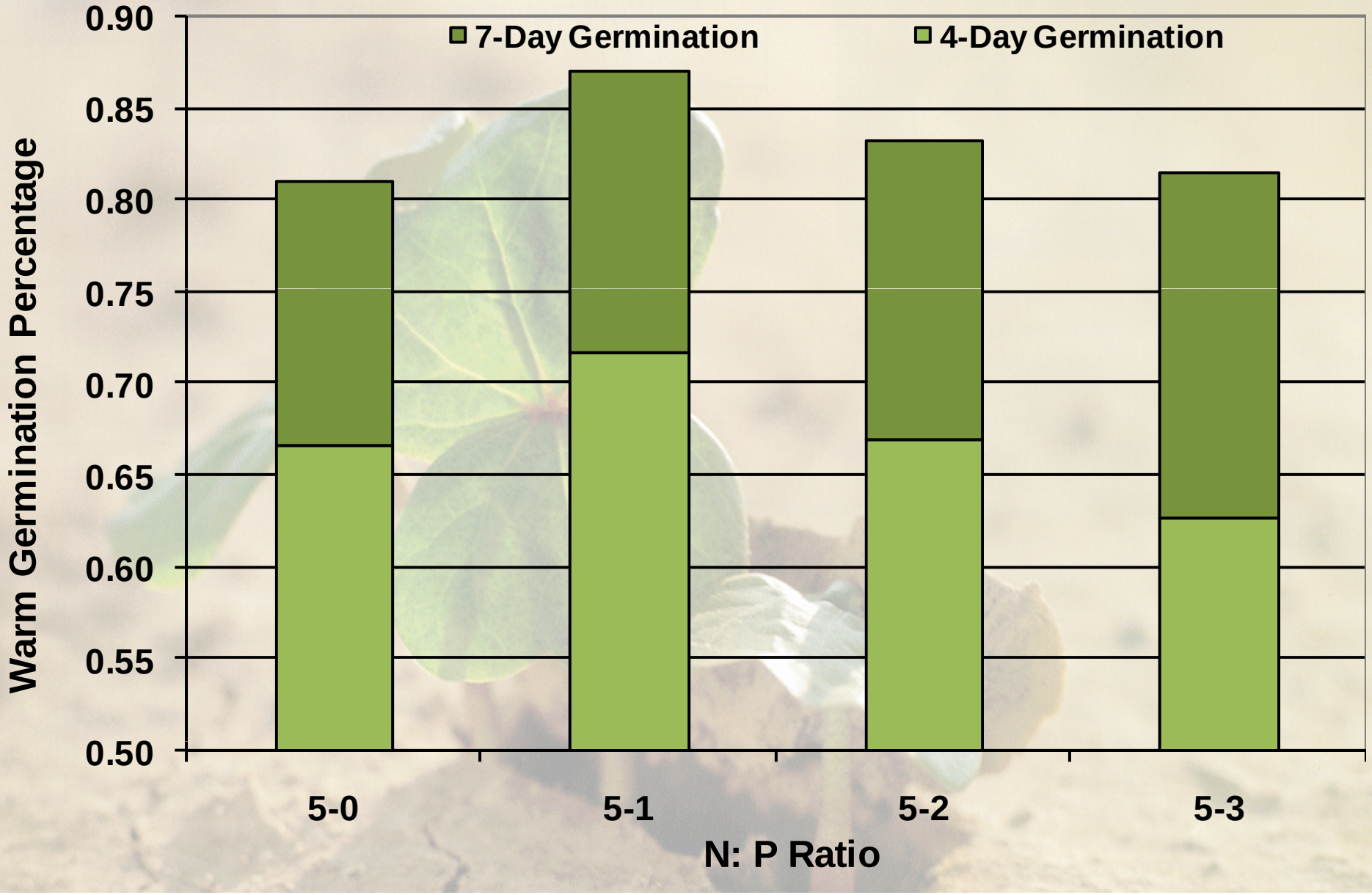
SEED WEIGHT


9.35
9.30
9.25
9.20
9.15
9.10
9.05
9.00
8.95
8.90
8.85
SEED INDEX (g / 100 seed)
Control
Pre-plant
Sidedress
Fertigation
APPLICATION METHOD

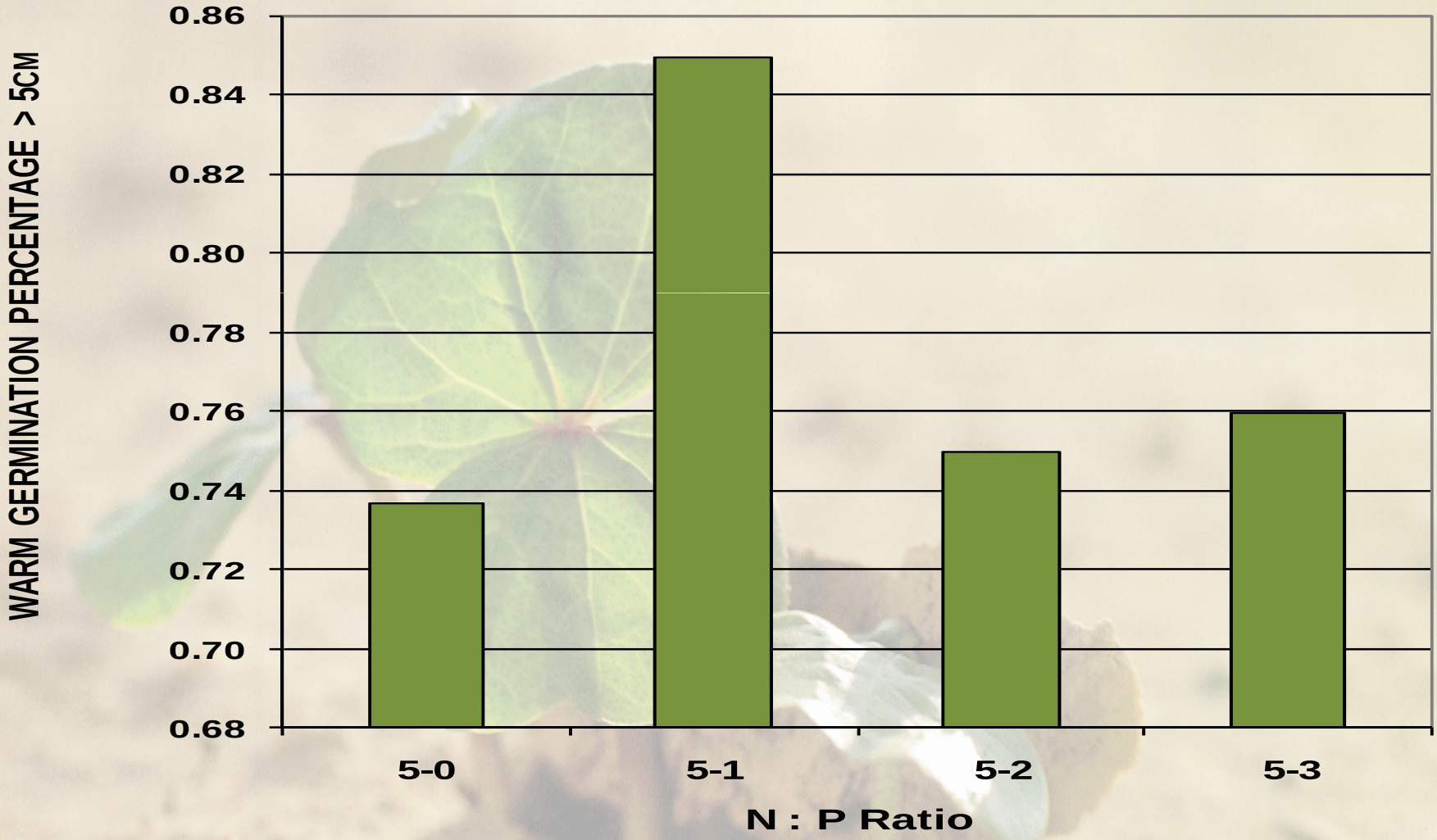
N:P RATIO EFFECT ON SEED DENSITY



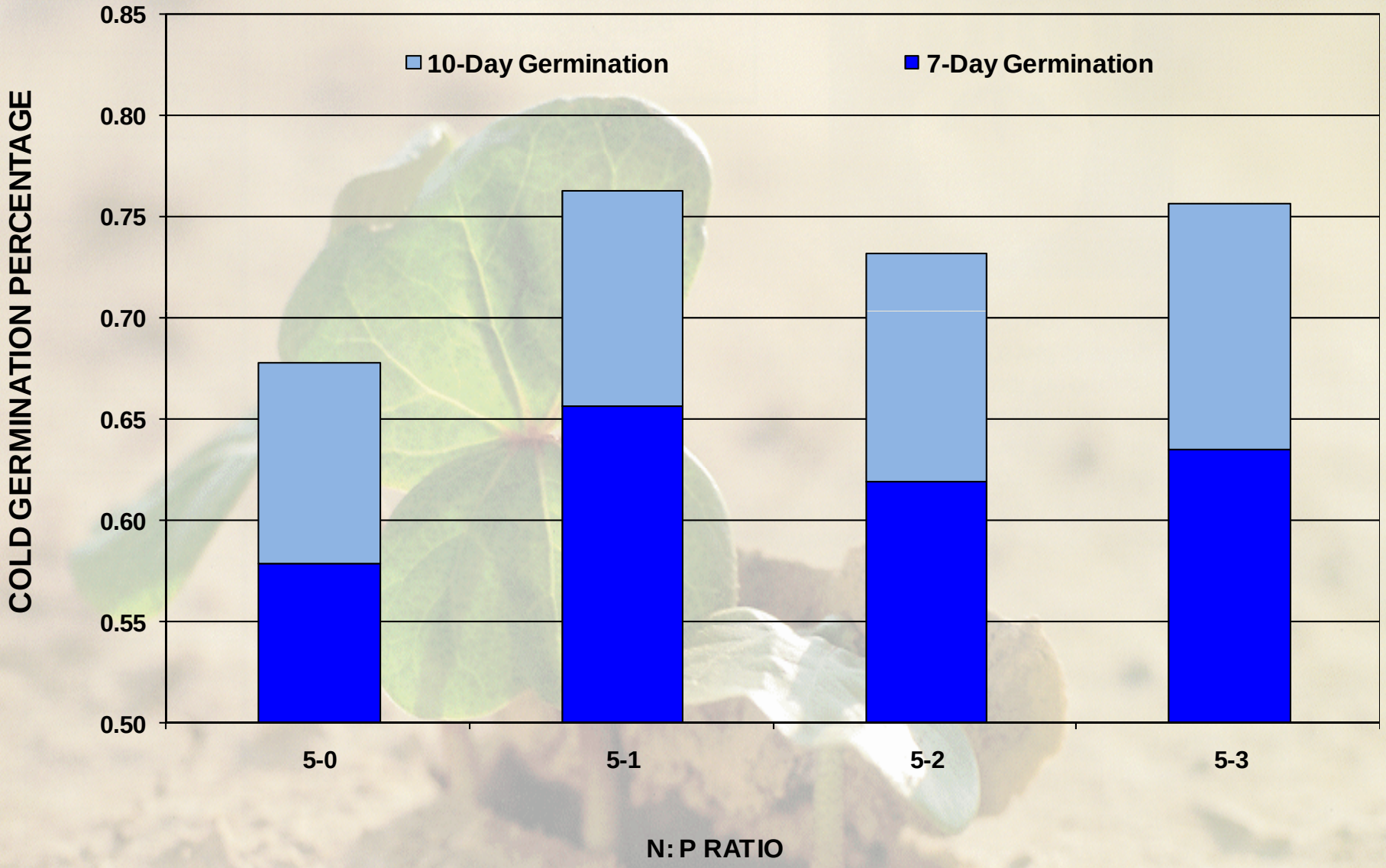
N:P RATIO EFFECT ON VIABILITY



N:P RATIO EFFECT ON VIGOR



N:P RATIO EFFECT ON VIGOR



SUMMARY

I. SEED & FIBER YIELD

A. Application Method of P

1. Fertigation and Pre-plant applications produced the greatest quantity of seed & fiber
2. The increase in seed & fiber yield was attributed to an increase in the number of bolls m^{-2} & boll size

B. Effect of N: P ratio

1. With low volumes of irrigation, ~ 0.1 day^{-1}, the addition of P did not affect seed & fiber yield
2. Increased water supplies to ~0.2 and 0.3 in day^{-1} increased yield and indicated that the N:P ratio of 5-1 provided enough P to maximize seed & fiber production

SUMMARY

II. Seed & Fiber Quality

A. Application Method of P

- Both fiber quality (micronaire) and seed quality (seed index and seed density) were improved by pre-plant and fertigation applications of Phosphorus

B. Effect of N: P ratio

- Increasing N:P ratio to 5-3 produced the highest fiber micronaire and seed density; however the N:P ratio of 5:1 produced the highest percentage of viable and vigorous seed

  Comparing seed density to viability and vigor implied that a seed density near 1.02 g/cc produced the highest quality seed