

Utilizing double haploid populations to fix nitrogen efficiency traits in burley tobacco

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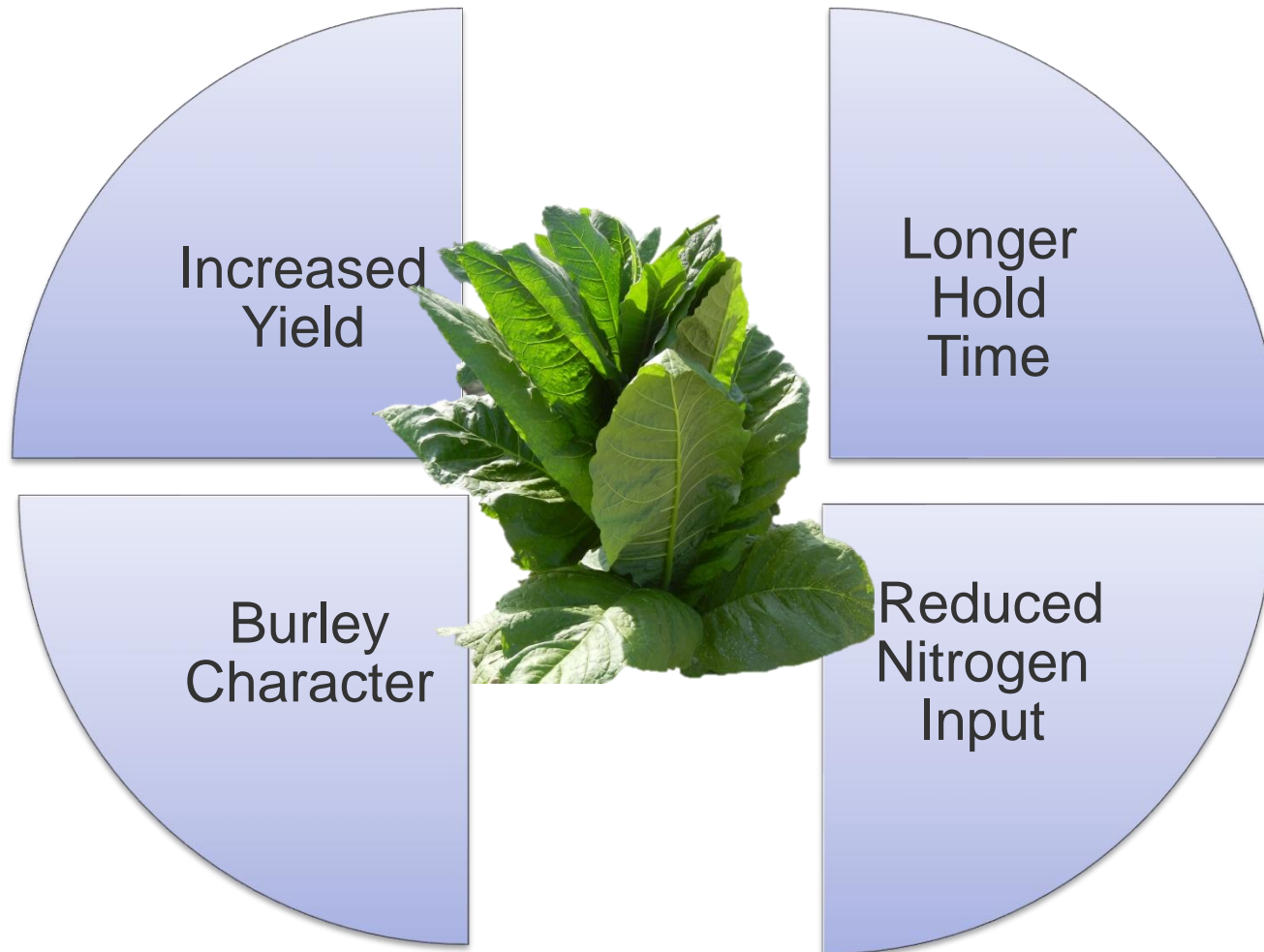
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Outline

- Nitrogen Use Efficiency (NUE)
 - What we know
 - Greenhouse NUE Screening
- Breeding Scheme
 - Inbreeding
 - Backcrossing
 - Double haploid (DH) production
- Evaluation
 - 2018 Field Evaluations (DH and Hybrid lines)
- Conclusions



Benefits of Ideal Nitrogen Use Efficiency



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Yellow Burley and Nitrogen Use Efficiency

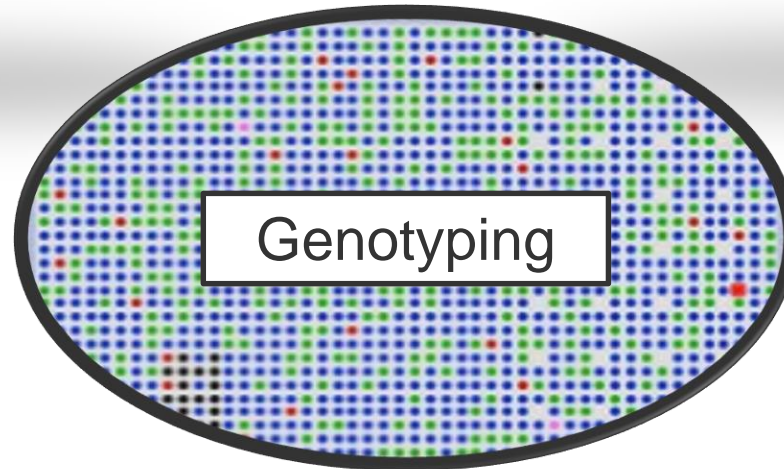
- Yellow Burley Trait
 - Causes White Stem Phenotype
 - Accelerated Senescence
 - Defines Characteristic of American Burley
- Genetics
 - 2 Genes (yb1/yb2)
 - Recessive Trait
 - Gene Truncation in Burley



Burley	Flue - Cured	Maryland 609
yb1yb1/yb2yb2	Yb1Yb1/Yb2Yb2	Yb1Yb1/yb2yb2

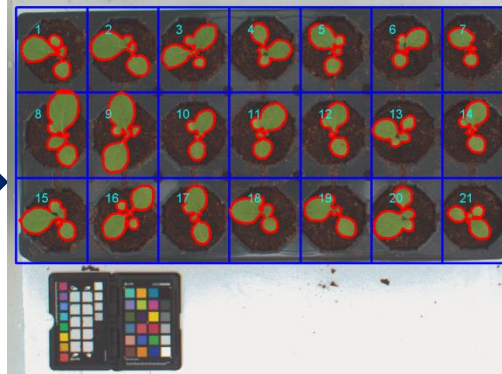
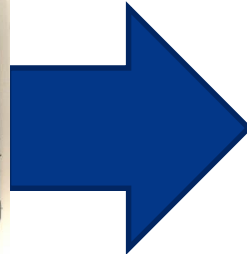


Year Round Evaluation of Breeding Lines



Evaluating NUE in the Greenhouse

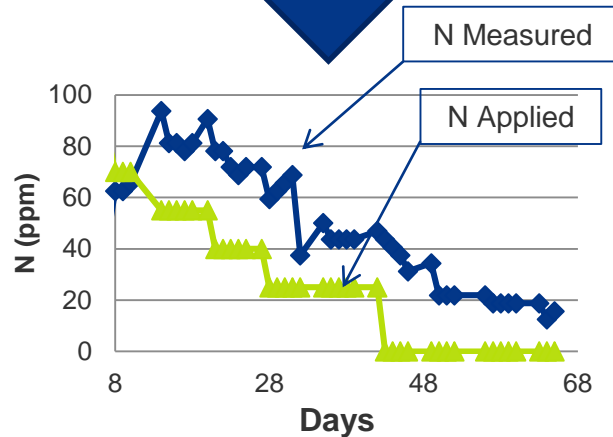
N= 0% Nitrogen



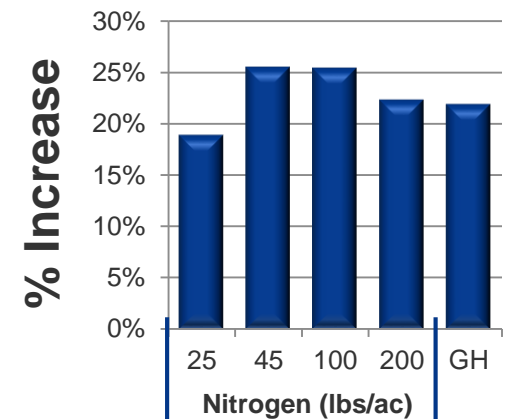
Metrics

- ☐ Seedling Growth
- ☐ Chlorophyll Loss
- ☐ Final Yield

Nitrogen Depletion

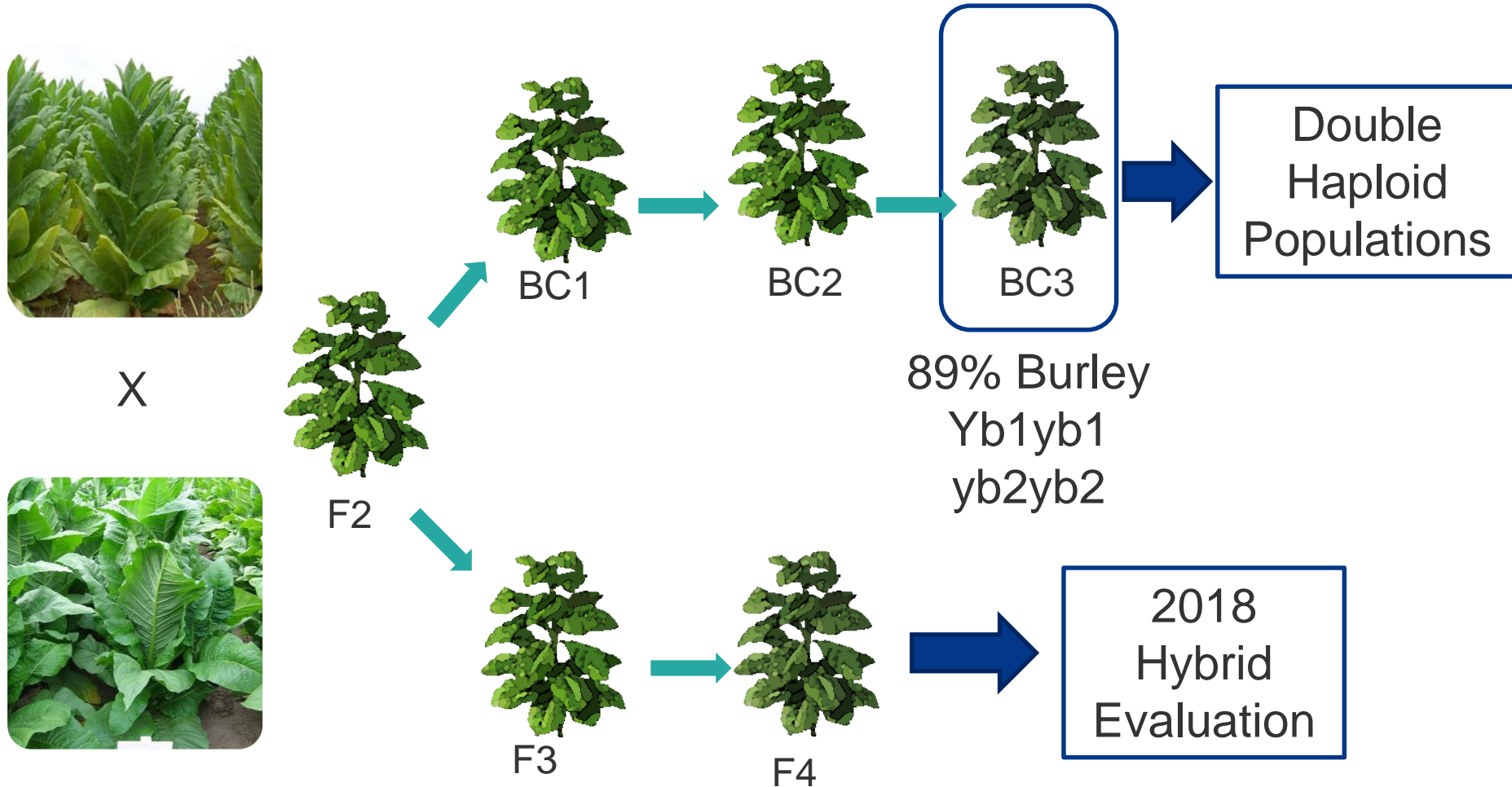


Maryland Yield



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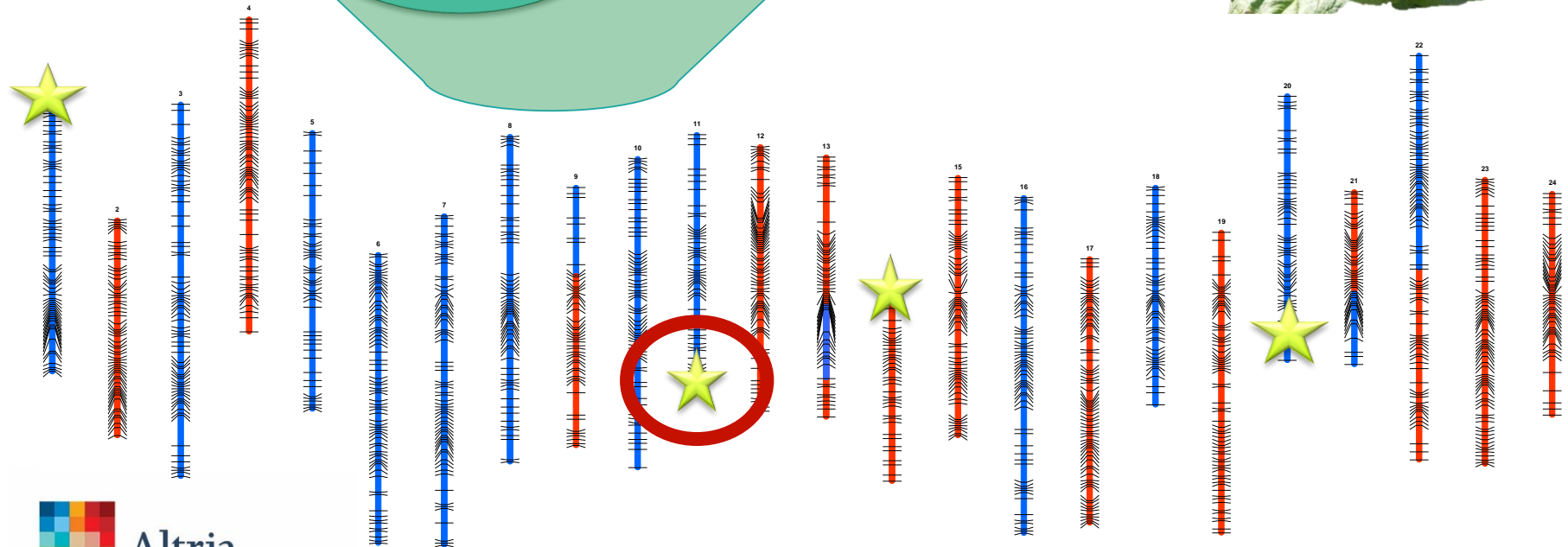
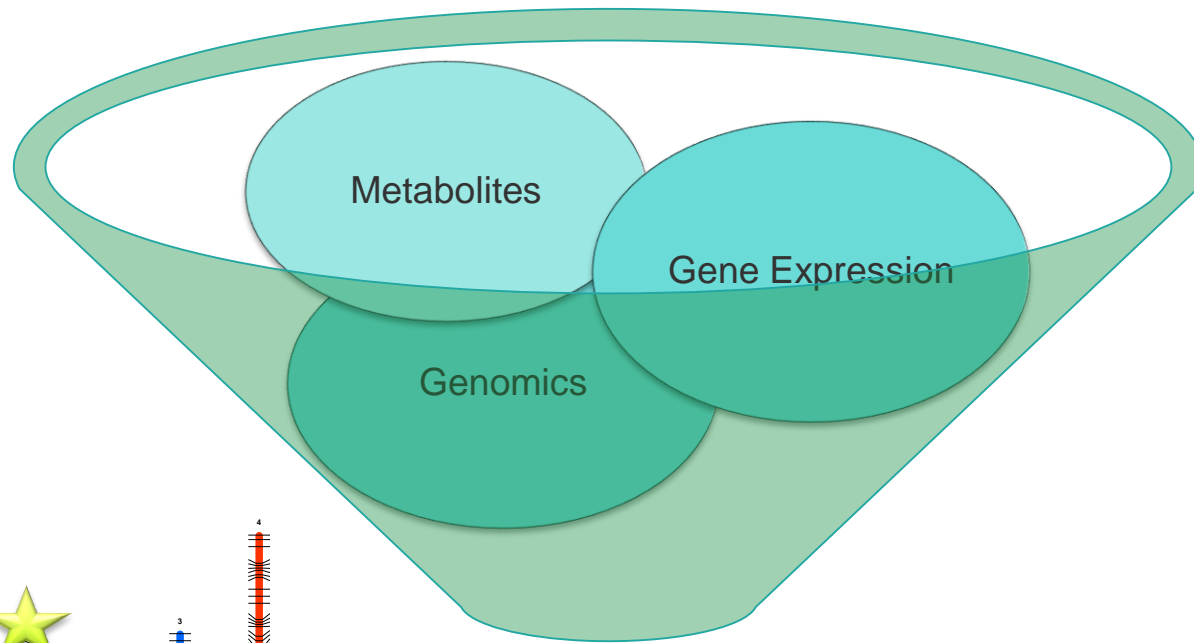
Combining Standard Breeding with Genotyping



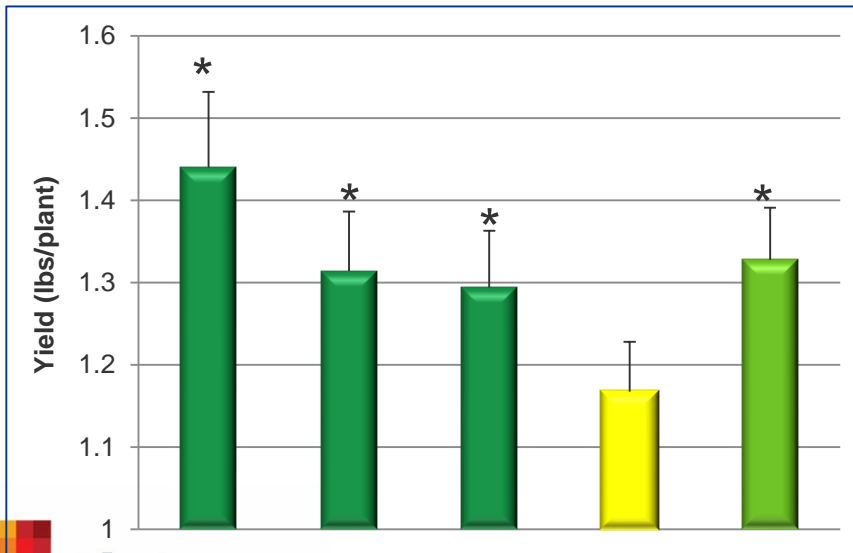
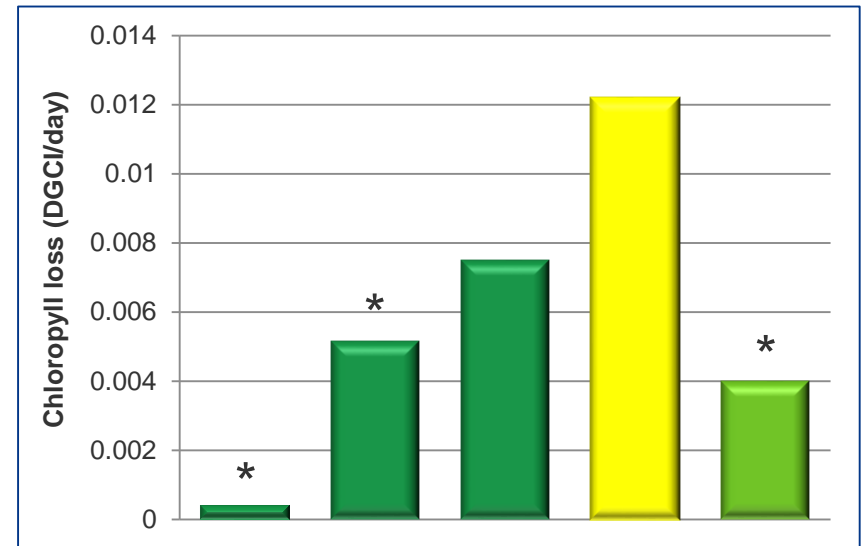
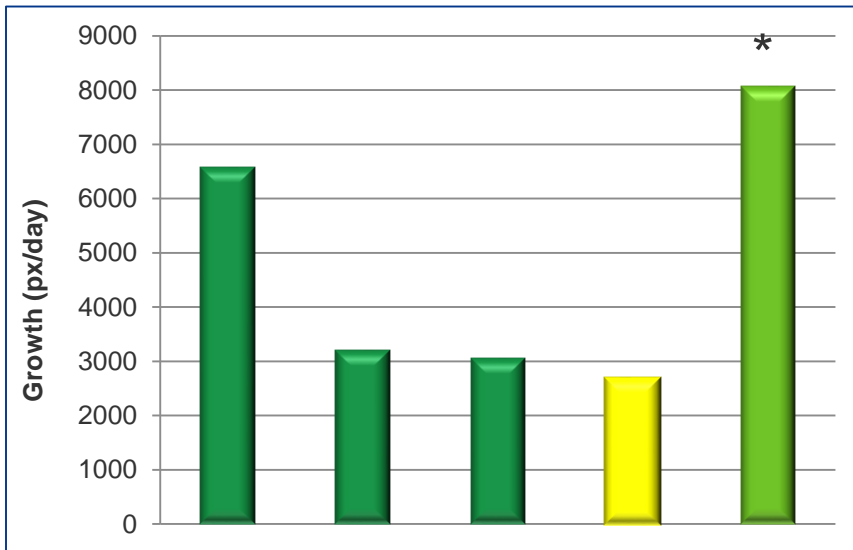
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Previously Identified Loci for NUE Traits



One Locus is Linked to Phenotype



MD Locus Burley lines

Burley Control

MD609 Control

* p<.01

This locus could be used for future breeding efforts



Double Haploid Line Evaluation

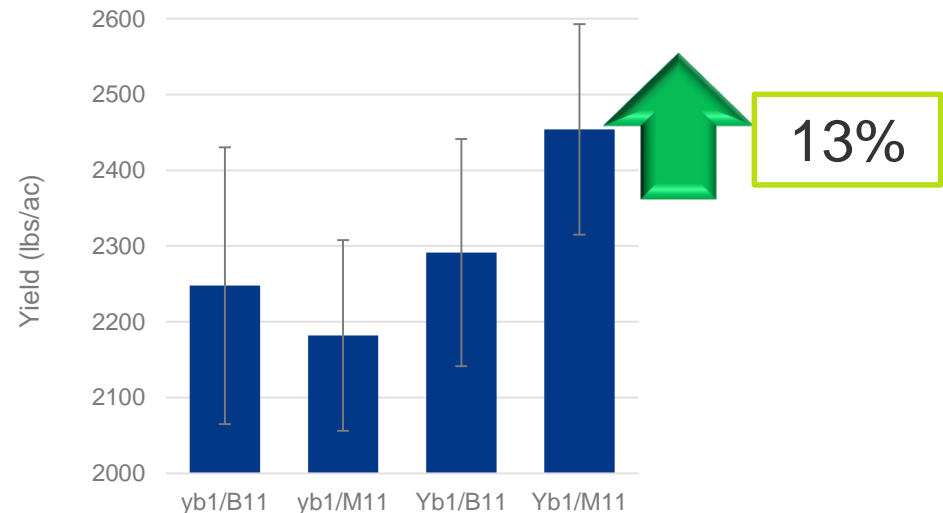
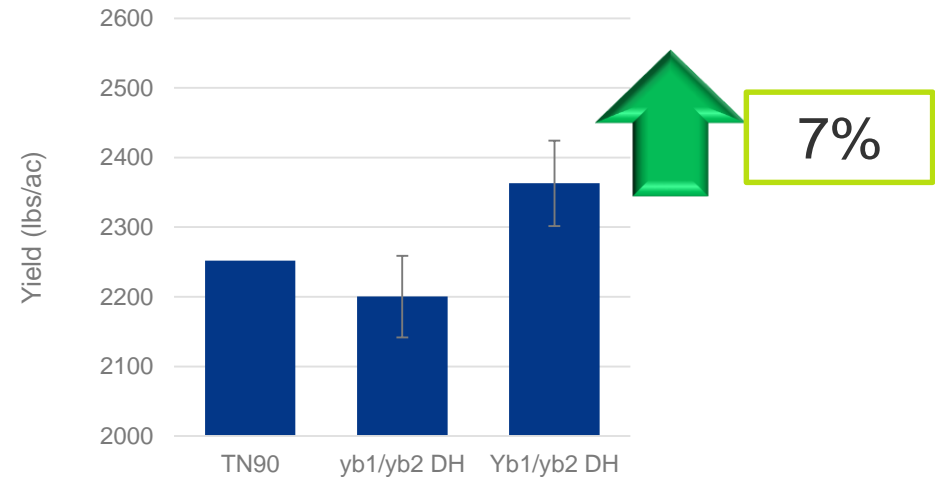


Double
Haploid
Populations

89% TN90

- 62 DH lines
- 60 lbs N/ac
- 173K SNPs Genotyped

- Chr11 locus influences yield



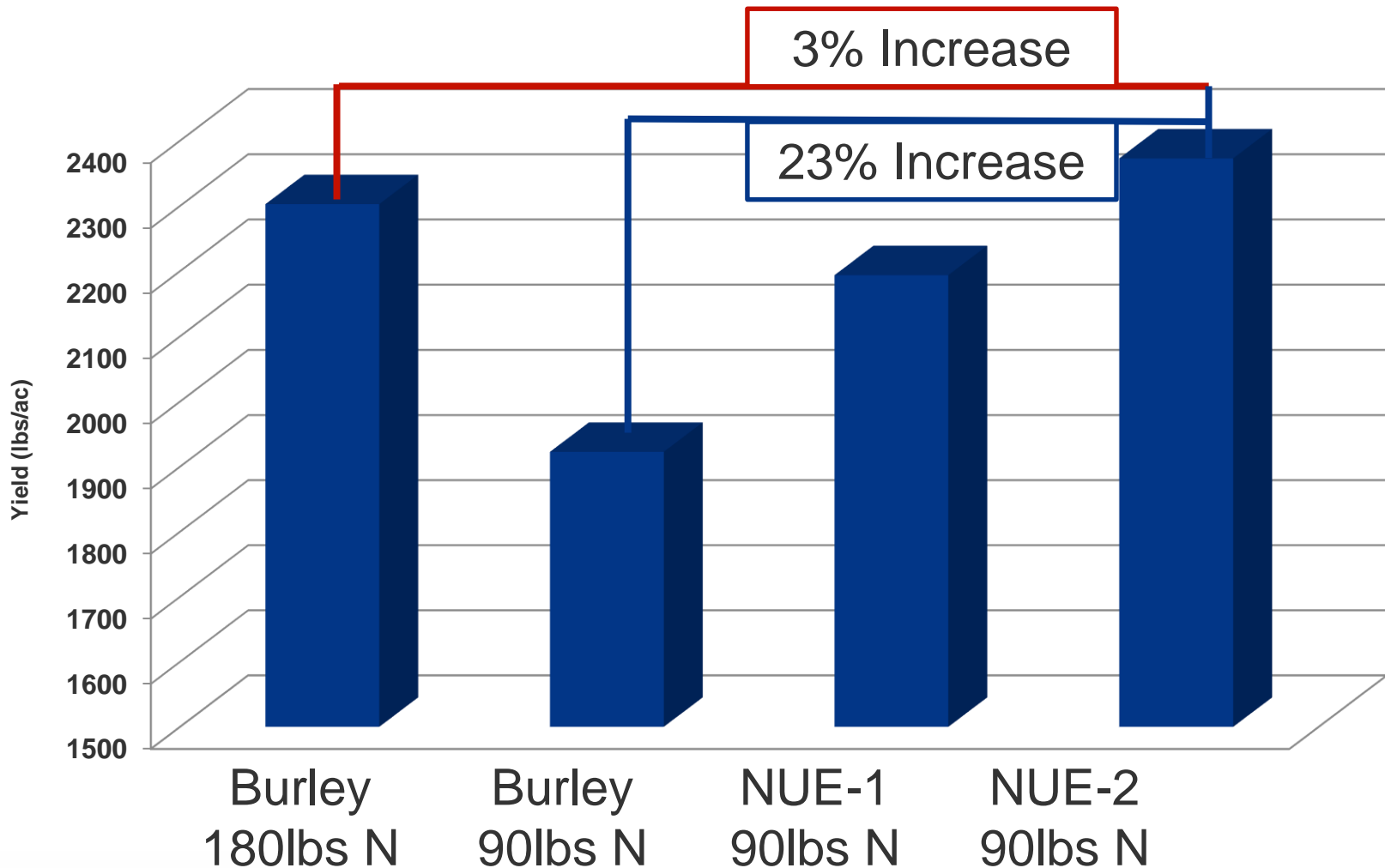
Generation of Hybrids

	Female	Males	
Marker	Breeding line	Banket A1	L8
yb1	Yb1	yb1	yb1
yb2	yb2	yb2	yb2
Chr11	Maryland	Maryland	Burley

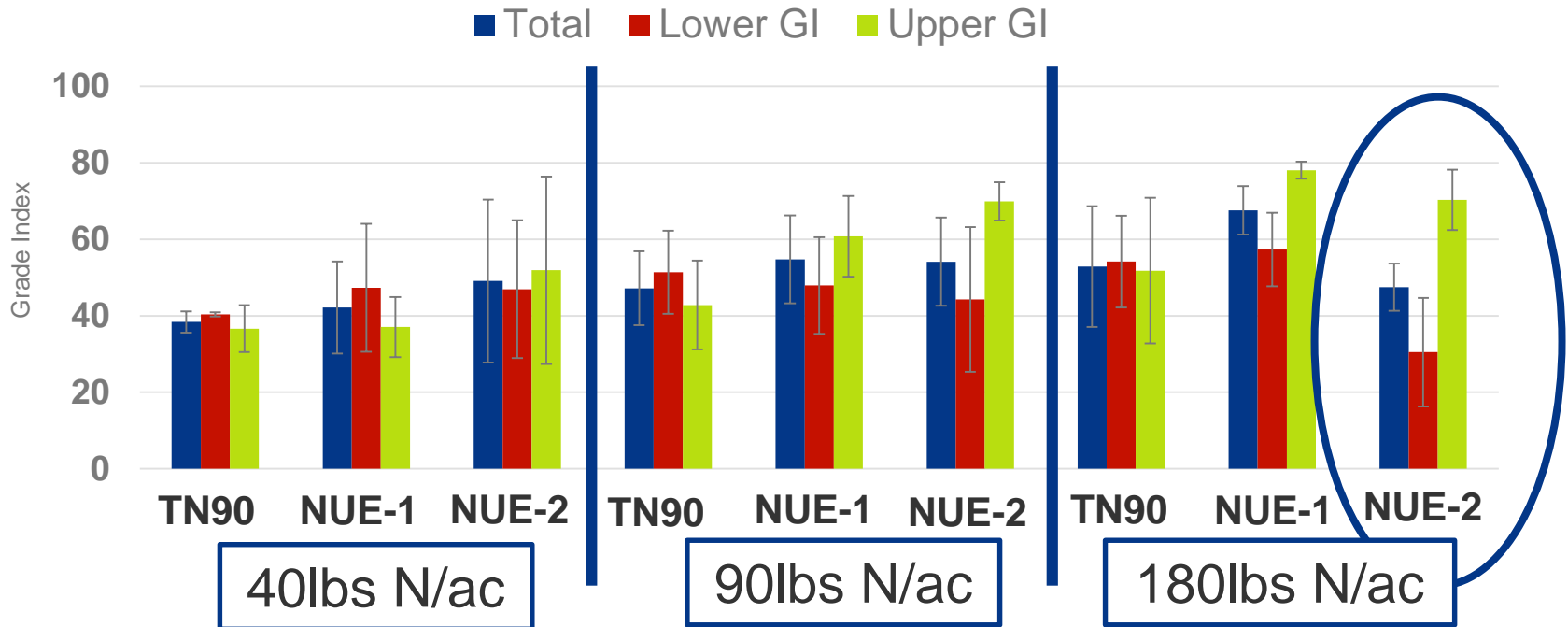
	Hybrids	
Marker	NUE-1	NUE-2
yb1	Het	Het
yb2	yb2	yb2
Chr11	Maryland	Het



2018 Hybrid Evaluation – Blackstone VA



Higher Nitrogen Application = Quality Loss



- ❑ Application of high nitrogen rates can lower overall quality
- ❑ Loss of quality more prevalent in lower stalk
- ❑ Recommendation of 75-90lbs/ac nitrogen



Conclusions and future directions

- Burley tobacco with the NUE trait can match the yields obtained with standard burley nitrogen application even when grown with 90 lbs/ac nitrogen.
- High nitrogen application can lead to quality loss in lower stalk leaves in some hybrid combinations.
- The Chromosome 11 locus in functions in a dominant manner with the Yb1 allele to maximize nitrogen efficiency.
- Optimal agronomic practices to maximize yield and leaf quality under reduced fertilization are ongoing.

Thank You

Questions?

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