Genetic Mapping and Characterization of the Pale Yellow Locus Responsible for Accelerated Senescence in Dark Tobacco

Pramod S, Adams A, Davis G, Frederick J, Lusso M, and Xu D

CORESTA October 14, 2019

Altria

Altria Client Services

Outline

- Background and Application of Pale Yellow (PY) trait
  - Reduced Curing Time
  - Improved Quality

- Mapping of the PY locus

- Genes identified within the Quantitative Trait Locus (QTL) region

Pale Yellow Trait

Found in accession TI1372

Accelerate chlorophyll breakdown

Trait noticeable usually by flowering and after topping

Traditional breeding using phenotypic selection*

Introduced into several dark lines

* Detached Leaf Ethephon Treatment Adapted from the LC Protocol
https://www.uky.edu/Ag/Tobacco/Pdf/LC-Protocol.pdf

Chaplin James F.; 1969; *Inheritance and Possible Use of Pale Yellow Character in Tobacco 1;* Crop Science Society of America; 9 (2) p. 169

Application – Reduce Curing Time

Guidelines for Fire Curing Dark Tobacco*

Yellowing
- Ventilation as needed
- None or low heat
- Temp. not to exceed 100˚F (37˚C)
- 5 – 8 days

Color Setting
- Little or no ventilation
- Temp 100˚F-115˚F (37˚C - 46˚C)
- 7 – 14 days

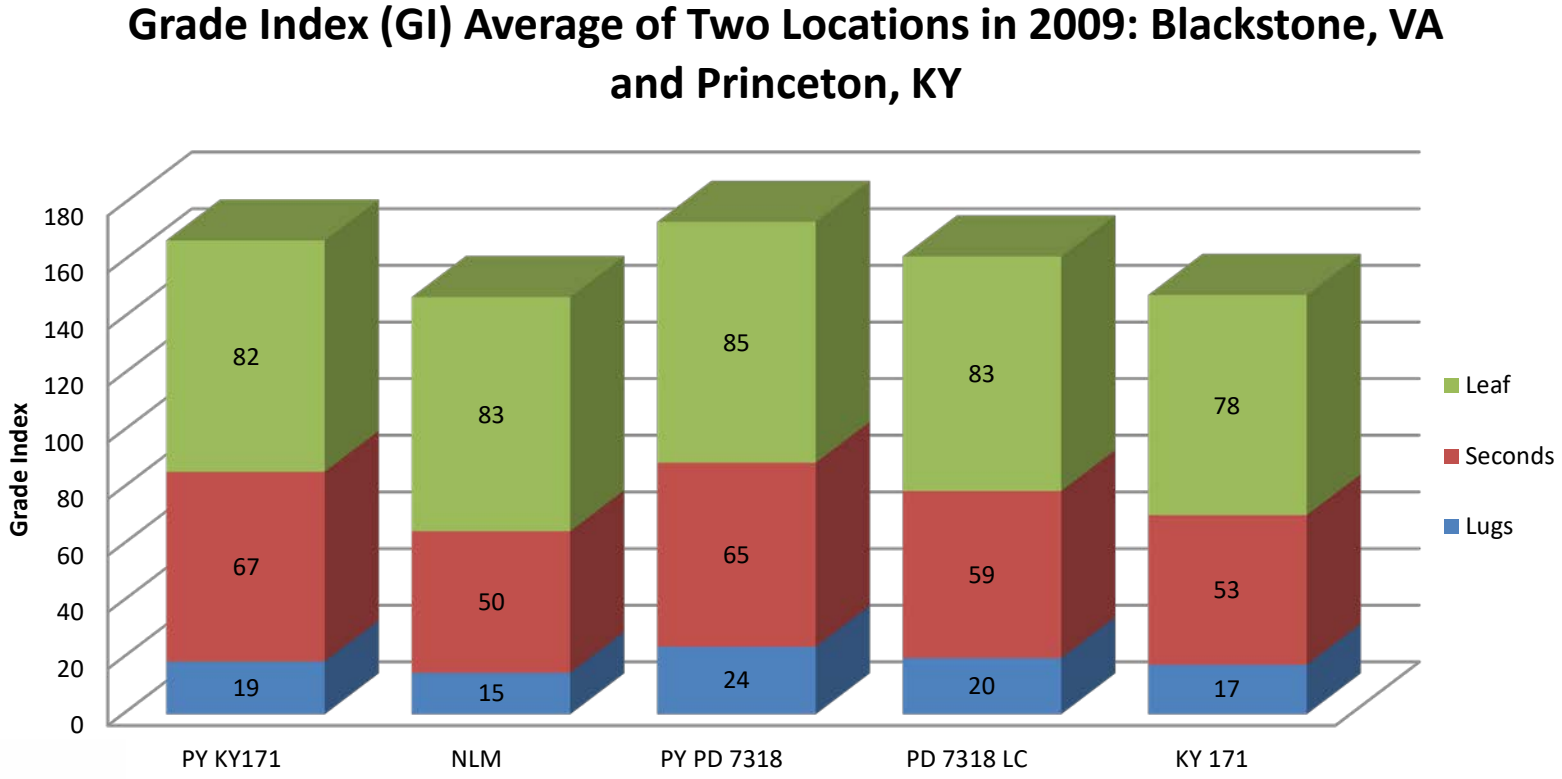
Stem Drying
- Full ventilation
- Temp not to exceed 130˚F (54˚C)
- 4 – 8 days

Finishing
- No ventilation
- Temp not to exceed 120˚F (48˚C)
- 10 – 14 days

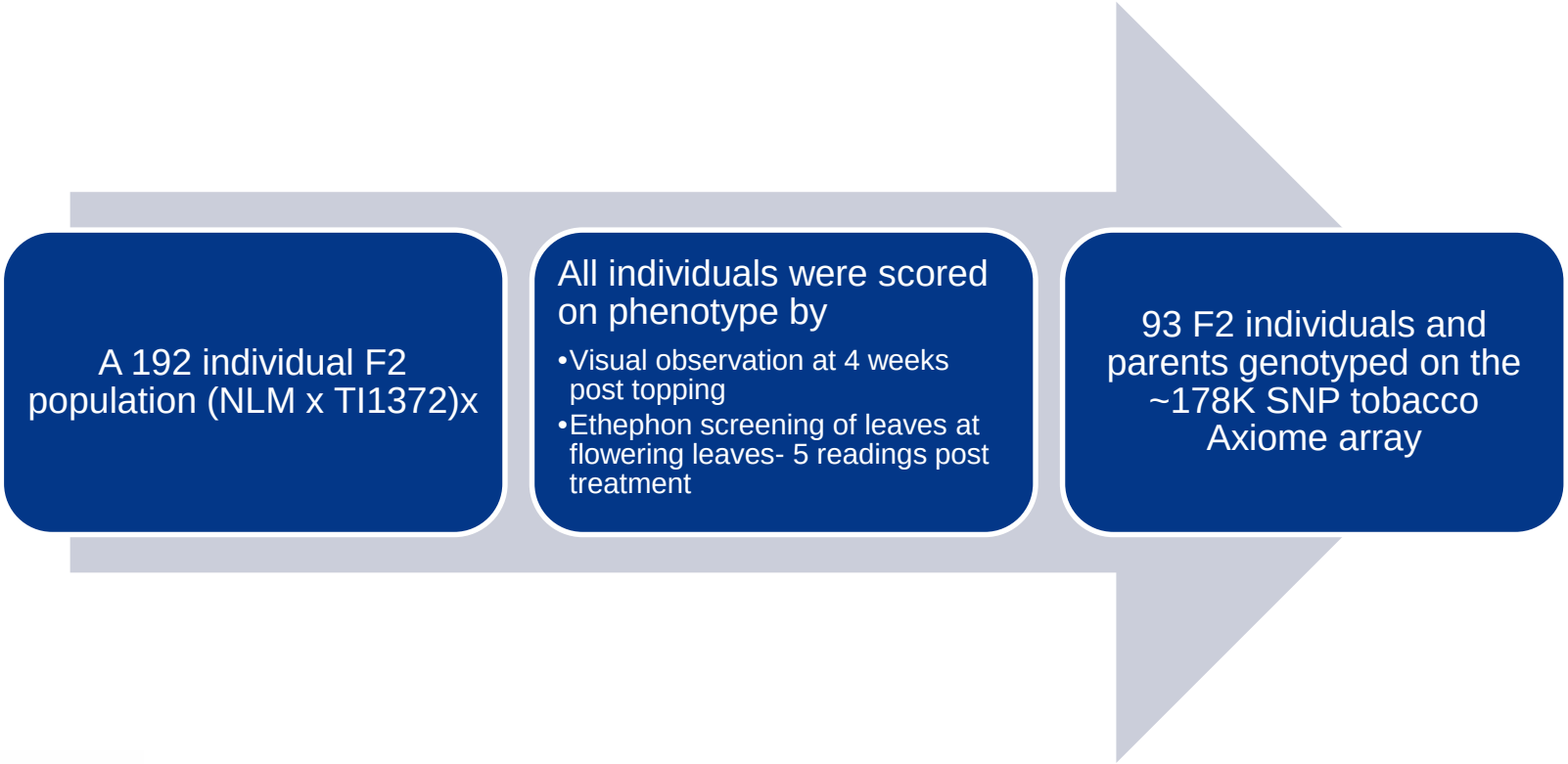
Lusso M., Hayes A., Lion K., Davis G., Hart F., Morris J., 2014; *Methods of Reducing Tobacco-Specific Nitrosamines (TSNAs) And/Or Improving Leaf Quality in Tobacco;* US 2014/0076339 A1

*Bailey, A., 2006. Harvesting, Curing, and Preparing Dark Fire-Cured Tobacco for Market. University of Kentucky – College of Agriculture, AGR152.

Application – Improved Quality

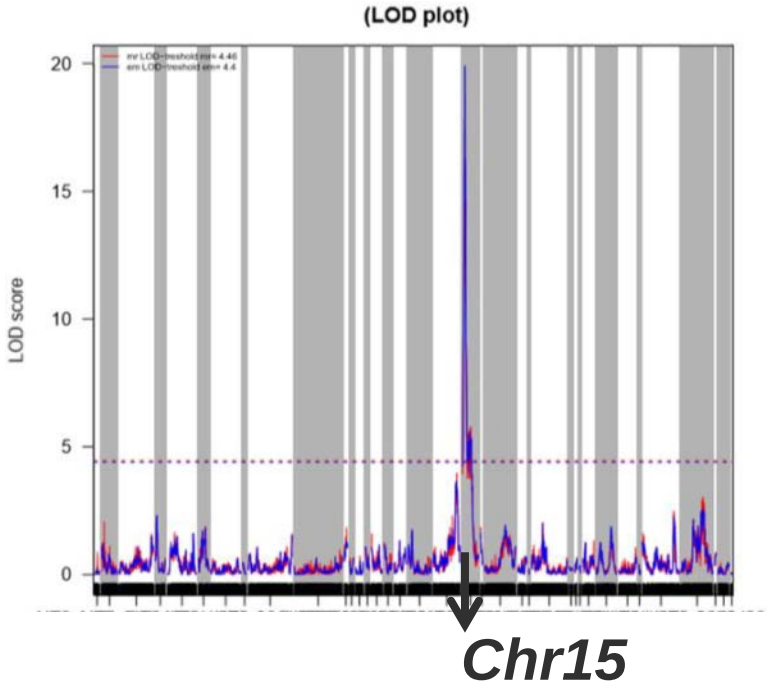


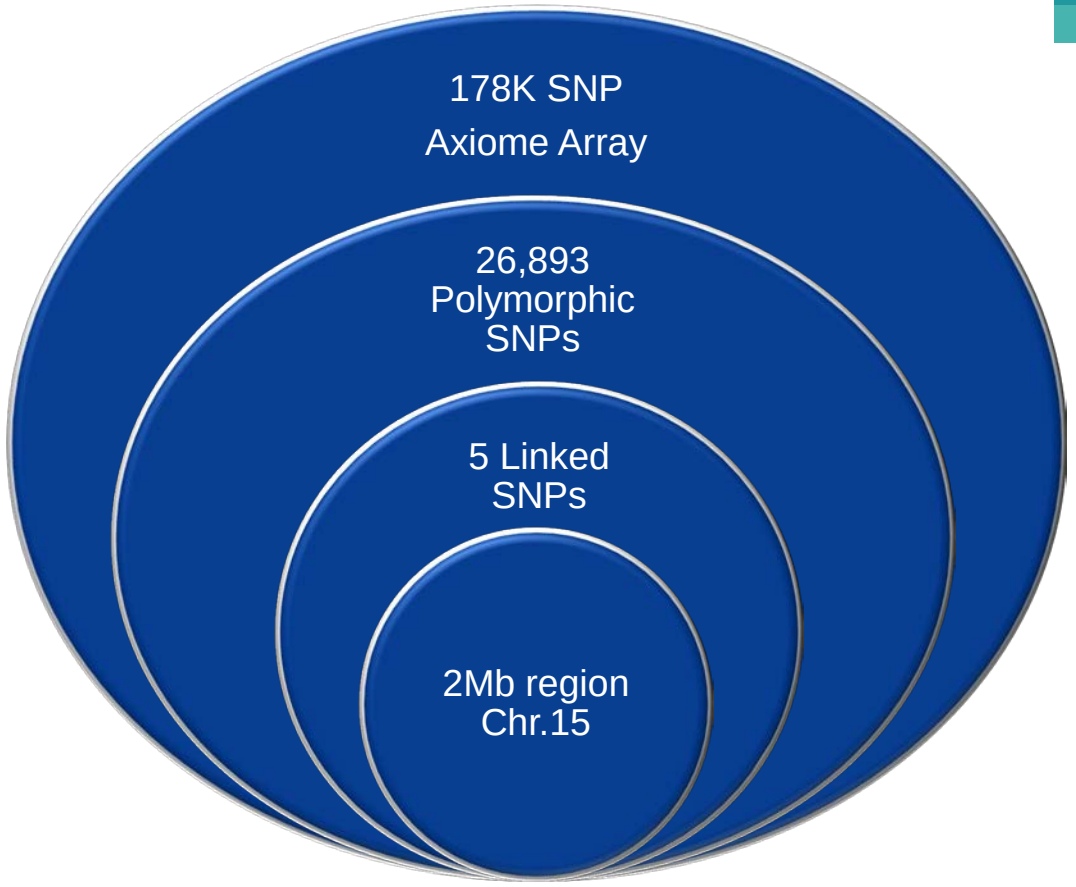
Mapping of Pale Yellow Locus



Altria
Altria Client Services

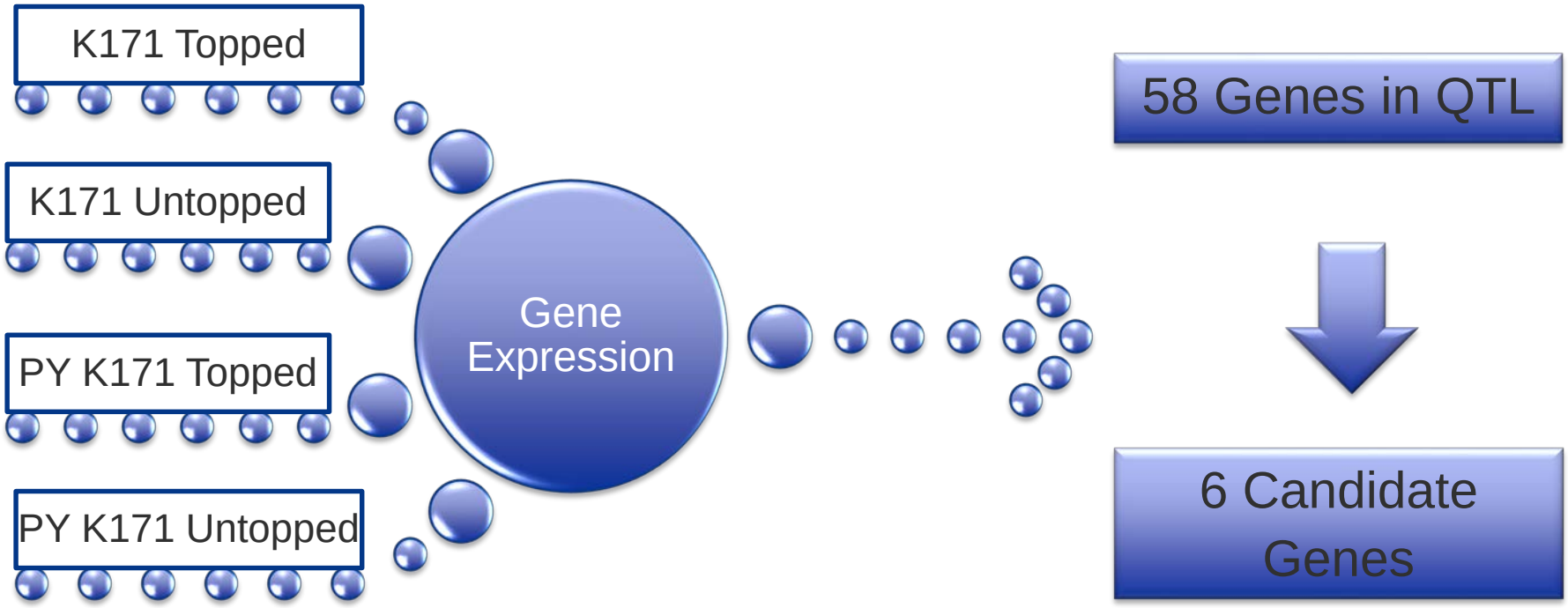
QTL Analysis



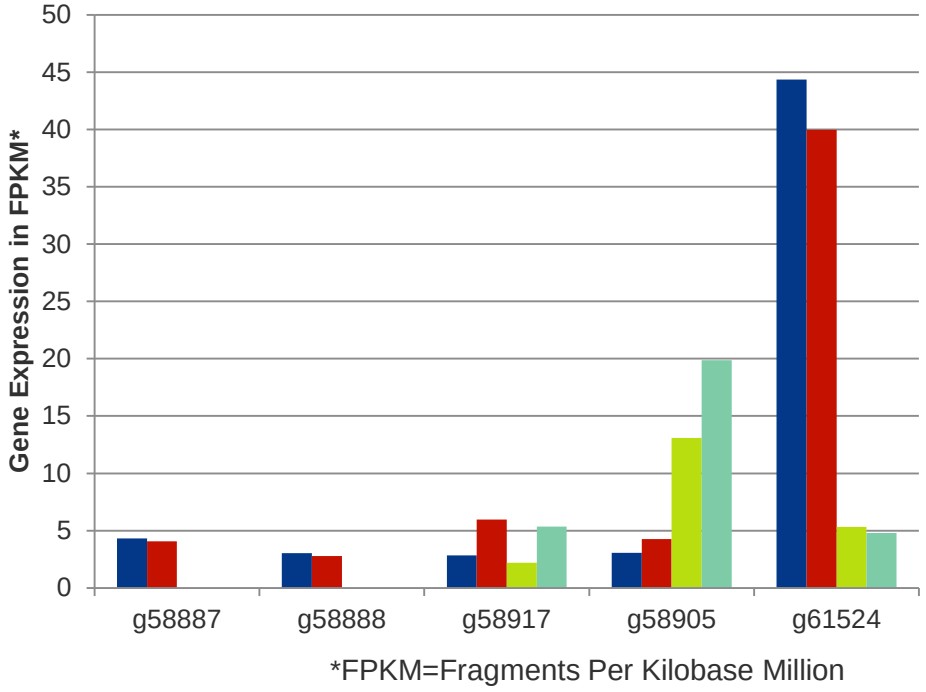


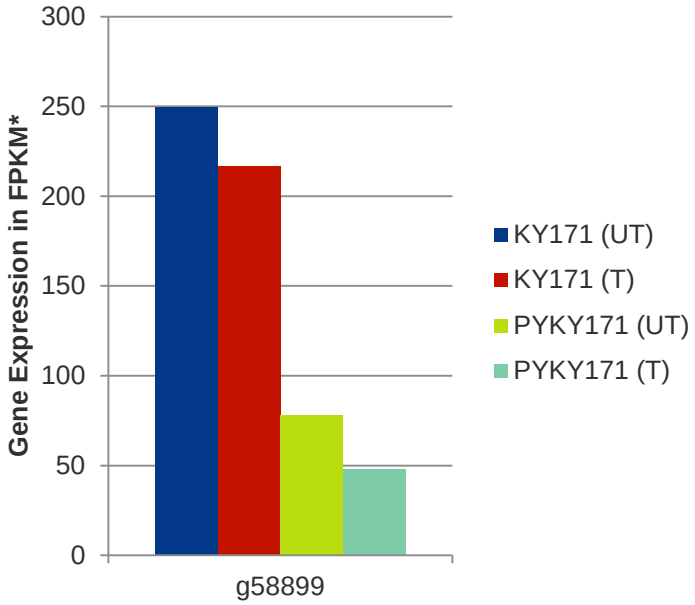
Altria
Altria Client Services

Identification of Gene Candidates



Expression Profile of Candidate Genes





Altria
Altria Client Services

Conclusions and Future Directions

Markers

- Five SNP markers for PY trait breeding
- Six functional gene candidates
- Further screening for functional gene marker

Gene Validation

- Allele sequencing
- Gene knockdown / overexpression
- Loss of function mutants from EMS populations

Altria
Altria Client Services

Thank You

QUESTIONS

For copies of this presentation visit the Altria's Science Website at www.altria.com/alcs-science

Altria
Altria Client Services