

Root traits to enhance nutrient and water use in alfalfa (NIFA-AFRP-2014-08358)

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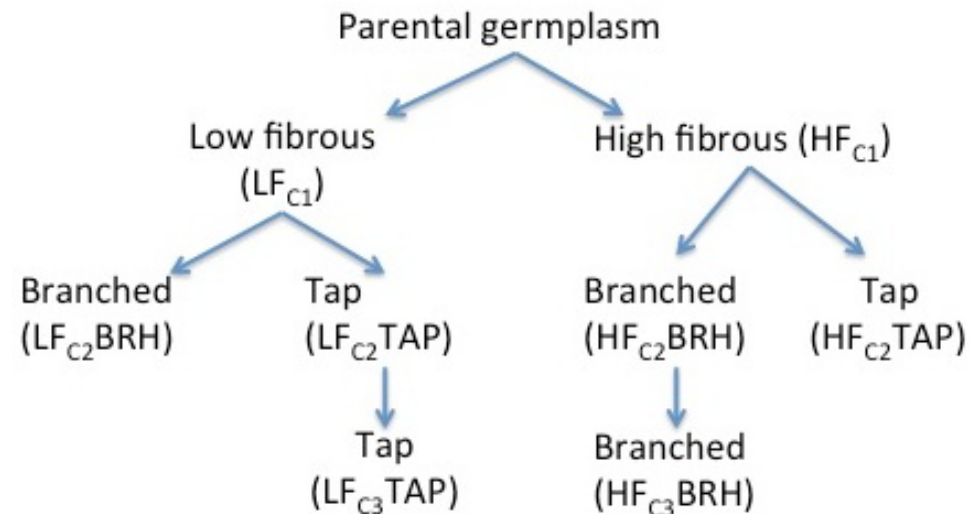
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Objectives

1. Utilize 2D and 3D imaging systems to characterize root system architecture traits in alfalfa
2. Identify genetic loci associated with root system architecture traits in alfalfa
3. Develop and implement education and outreach programs to transfer information from the research to alfalfa producers, the alfalfa seed industry, crop consultants, and state forage educators.



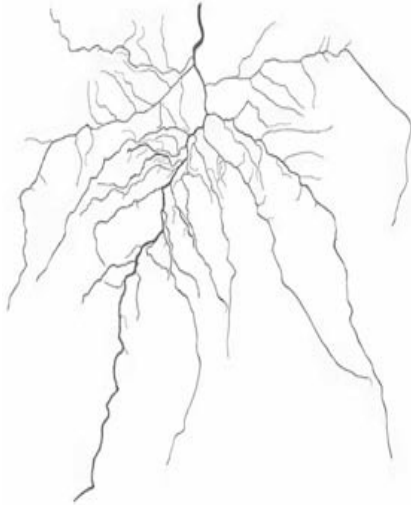
Root traits enhance forage yields



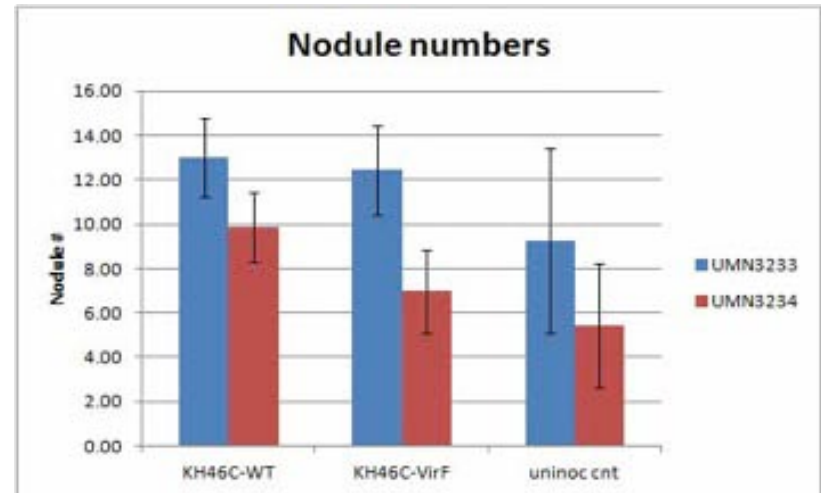
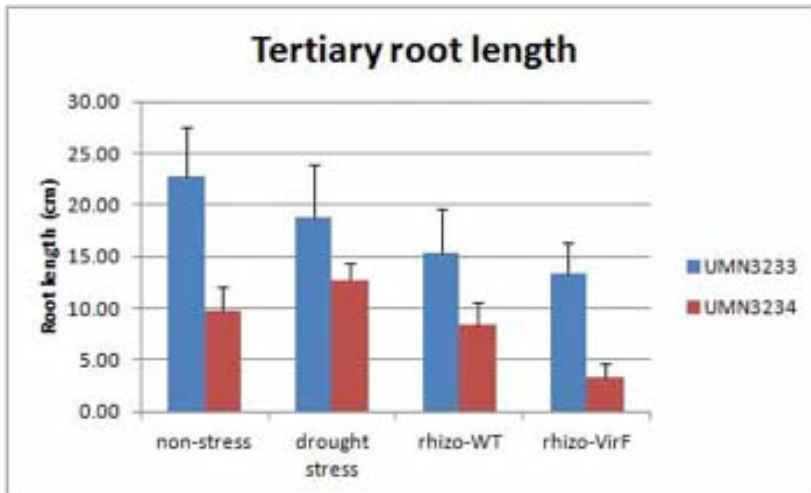
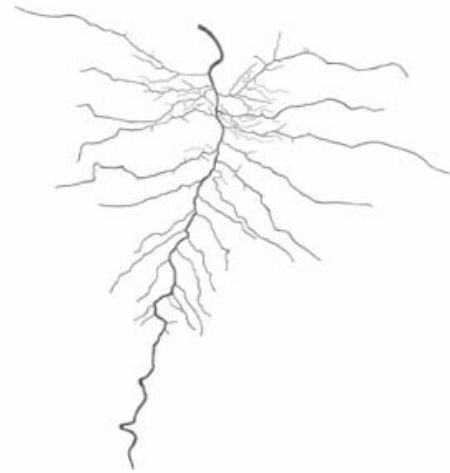
	DM (g/m ²)	Lateral rt score	Tap diameter	Root DW (g/m ²)
HF C2 Branched	819	2.29	6.2	314
Parent	377	1.67	5.3	154
LF C2 Tap	733	1.75	6.0	303
LSD	60	0.12	0.3	26

14 day phenotyping

HF c3 BRH UMN3233



LF C3 Tap UMN 3234



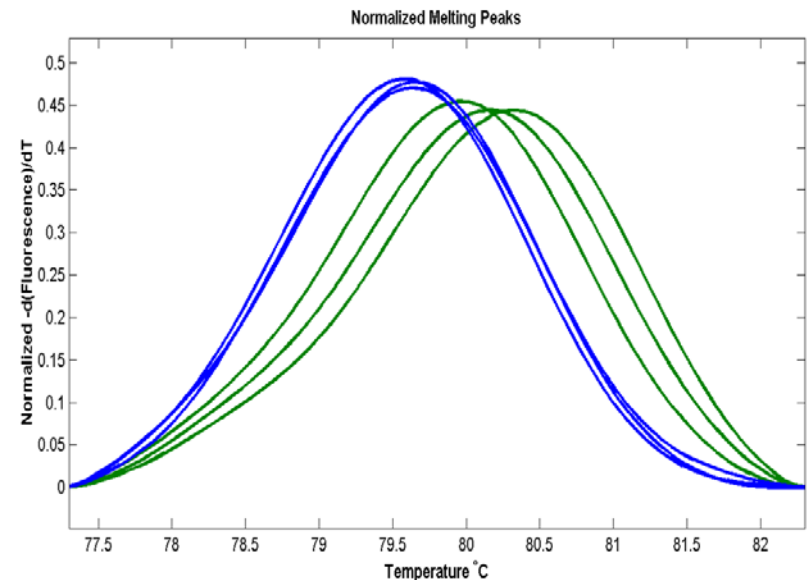
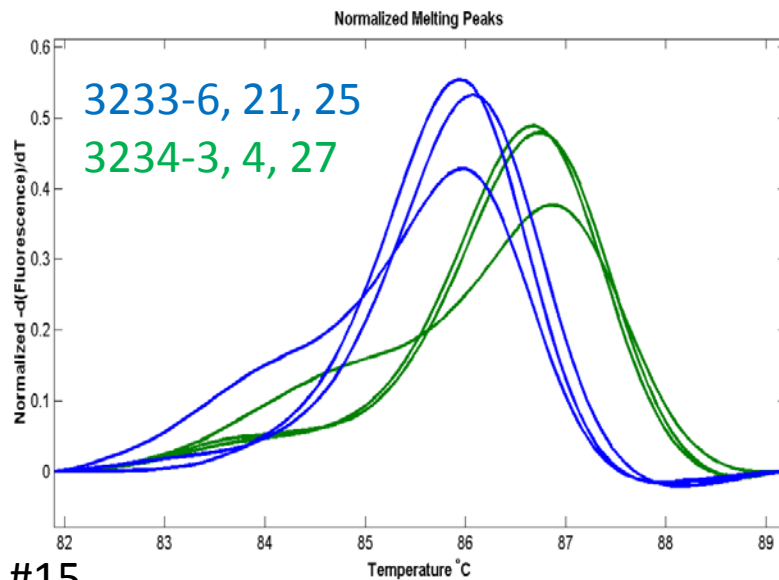
Candidate gene expression

Gene/Protein	Signaling Context	Root trait affected	Primers designed	Primers run
TAA1	Water/auxin	Root branching	4	2
SLR	Auxin	Root branching	3	2
MYB93	Auxin	Root branching	4	2
MYB77	Auxin/ABA	Root branching	4	2

Satbhai et al, 2015. Journal of Experimental Botany; Gamuyao et al. 2012. Nature.

Gene/Protein	Signaling Context	Root trait affected
MYB77	Auxin/ABA	Root Branching

Gene/Protein	Signaling Context	Root trait affected
MYB93	Auxin	Root Branching



Continuing research

- Genotyping by sequencing selected tap and branched
- Digital phenotyping C4 populations
- Genotyping and phenotyping of F1 mapping populations