



Analysis of Root Carbohydrates in Alfalfa Treated with Four Harvest intervals and Five Potassium Rates in the Southeast

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RATIONALE & OBJECTIVES

- The overall objective of this project was to provide a more complete analysis of above and below ground alfalfa plant material under varied management in the Southeast.
- This project focused on below ground plant responses.

Objectives:

To quantify root carbohydrates in alfalfa harvested at bud, 10%, 30% and 50% bloom and fertilized at 0, 60, 90, 120, and 150 pounds per acre for two years.

To provide a better understanding of root vitality in alfalfa grown in the deep south, and better define harvest and fertilization recommendations to producers considering pure alfalfa stand establishment in the Southeast.

STUDY DESCRIPTION

Study Location:

University of Georgia Tifton Campus (2017–2018).

Experiment Design:

Split plot design with four replications.

Treatments:

Growth stage: bud, 10, 30, and 50% bloom.

Potassium rate: 0, 60, 90, 120, and 150 lbs/acre split applied.

Destructive harvest:

After two years of active growth data collection, below ground roots were collected to determine alfalfa root carbohydrate levels and association to the various treatment combinations.

Analysis:

Roots were analyzed for nonstructural carbohydrates (NSC), ethanol-soluble carbohydrates (ESC), and starch concentrations.

RESULTS

- Root carbohydrate analyses determined that regardless of K fertilization rate, harvest timing affected starch and NSC content of roots (Table 1).
- To optimize both alfalfa yield and persistence, current recommendations for alfalfa harvest timing and K fertilization should be maintained in the southern Coastal Plains.

Table 1. Effect of harvest timing (based on growth stage) on root starch and non-soluble carbohydrates of a three-year old alfalfa stand grown in Tifton, Georgia; data pooled over block.

Growth Stage [†]	Starch [‡]	NSC [‡]
	(g kg ⁻¹)	
Bud	193 ^{as}	316 ^a
10% Bloom	164 ^{ab}	303 ^a
30% Bloom	150 ^{bc}	292 ^a
50% Bloom	113 ^c	242 ^b
SE	14.0	16.2
P-Value	<0.01	<0.01

[†]As defined by Mueller and Fick (1989).

[‡]As described in Hall (2009) and Dubois et al. (1956).

[§]Means within a column followed by the same letter are not significantly different at ($P \leq 0.05$). Source: Thinguldstad et. al. 2020.



CONCLUSIONS

- Producers should maintain current management recommendations for alfalfa in the south which include harvesting on a 28- to 35-day interval once alfalfa plants have reached the 10% bloom stage, fertilizing with at least the minimum amount of potash recommended by annual soil tests, and dividing the fertilizer into at least three applications during the season (Hancock et al., 2009).

