

# The Forest Health/Nutrition Experiment: Root Bark Chemistry Results

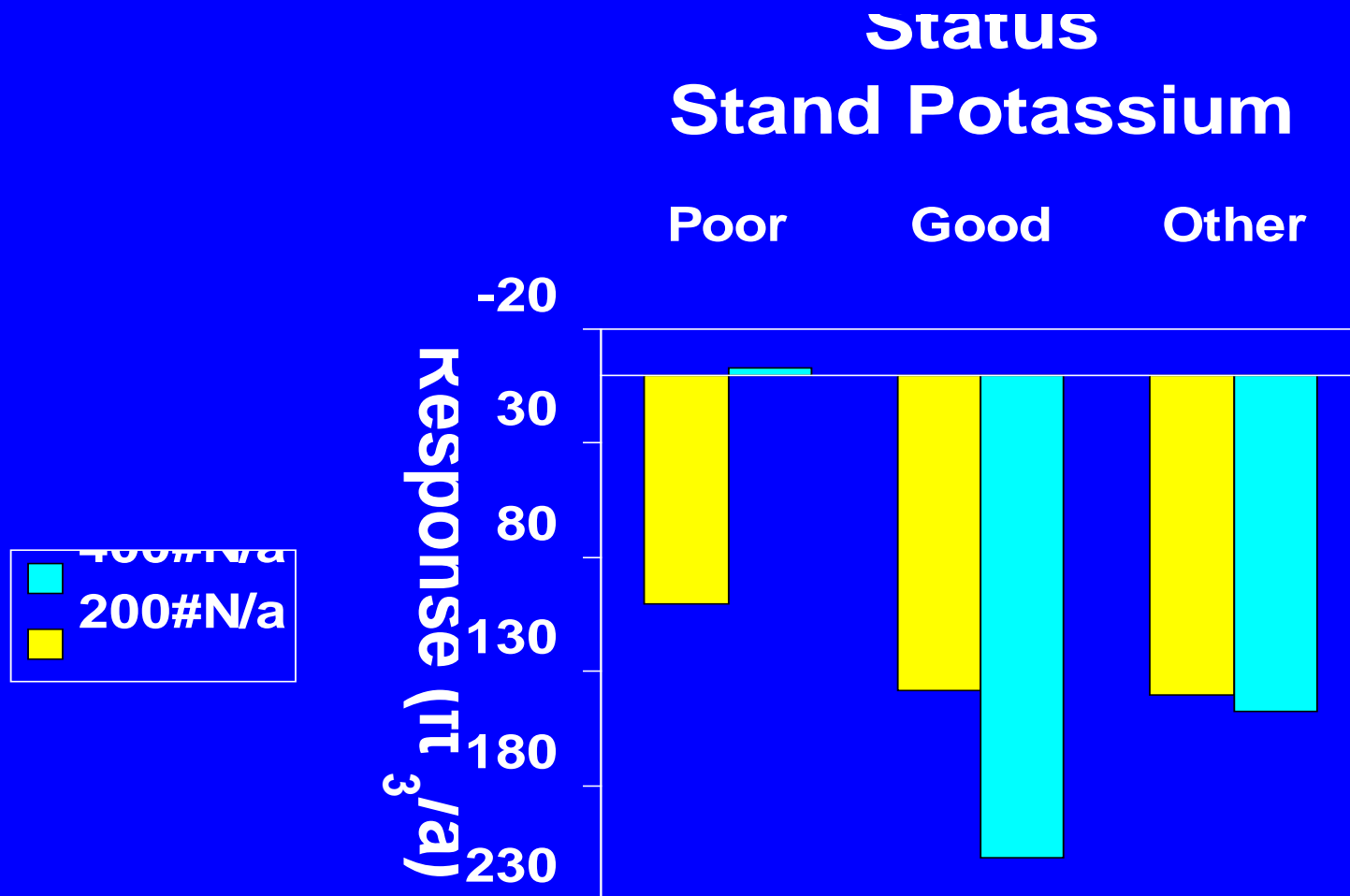


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Mariann Johnston, and Terry Shaw  
2003 IFTNC Annual Meeting

# Today's Topic: DF Root Bark Chemistry

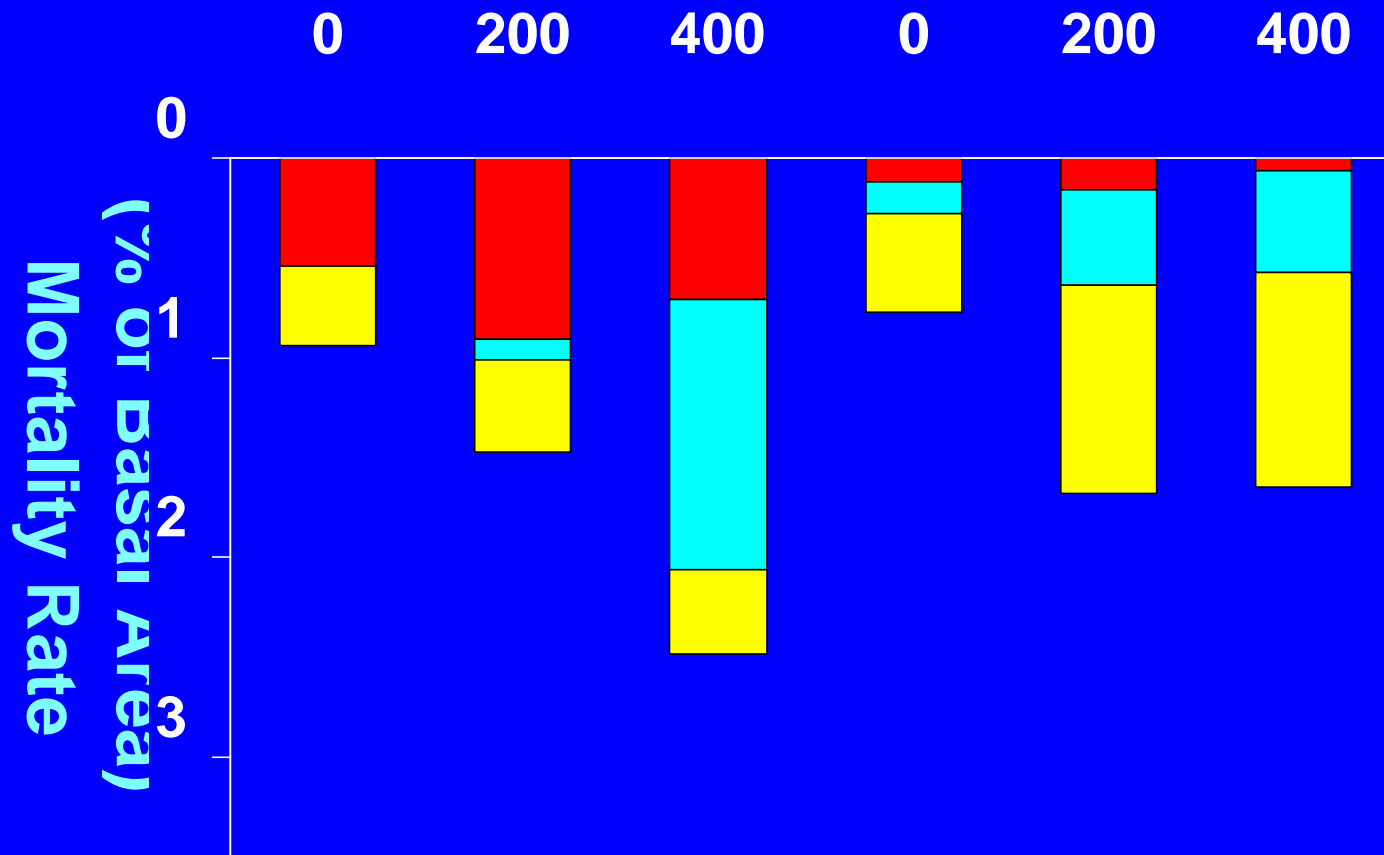
- Background
- Sample Collection and Chemical Analysis
  - Sugars, Starches, Phenols, and Tannins
- Results of Statistical Analysis
  - Fertilizer Treatment Effects
    - Influence of Time Since Treatment
    - Influence of Foliar K Level
  - Influence of Site Conditions:
    - Rock Type
    - Vegetation Series

# 6-YEAR NET VOLUME RESPONSE By K Status and Treatment



# Douglas-fir in the Intermountain Region

## 6-year Mortality



N Rate:



ROOT ROT



DARK BEETLE



OTHER

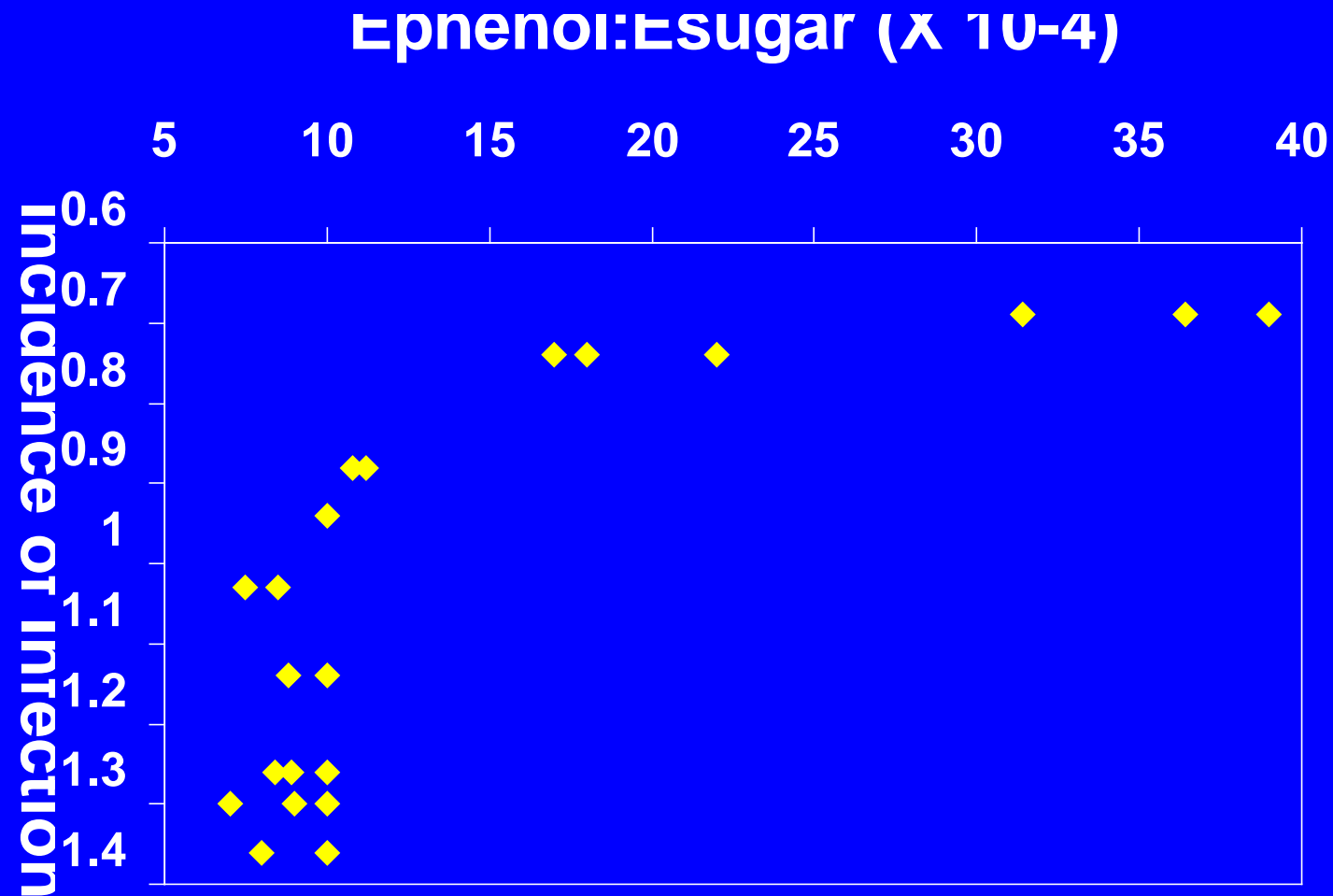
K Status:

Poor

Good

# ARMILLARIA INFECTION RATE

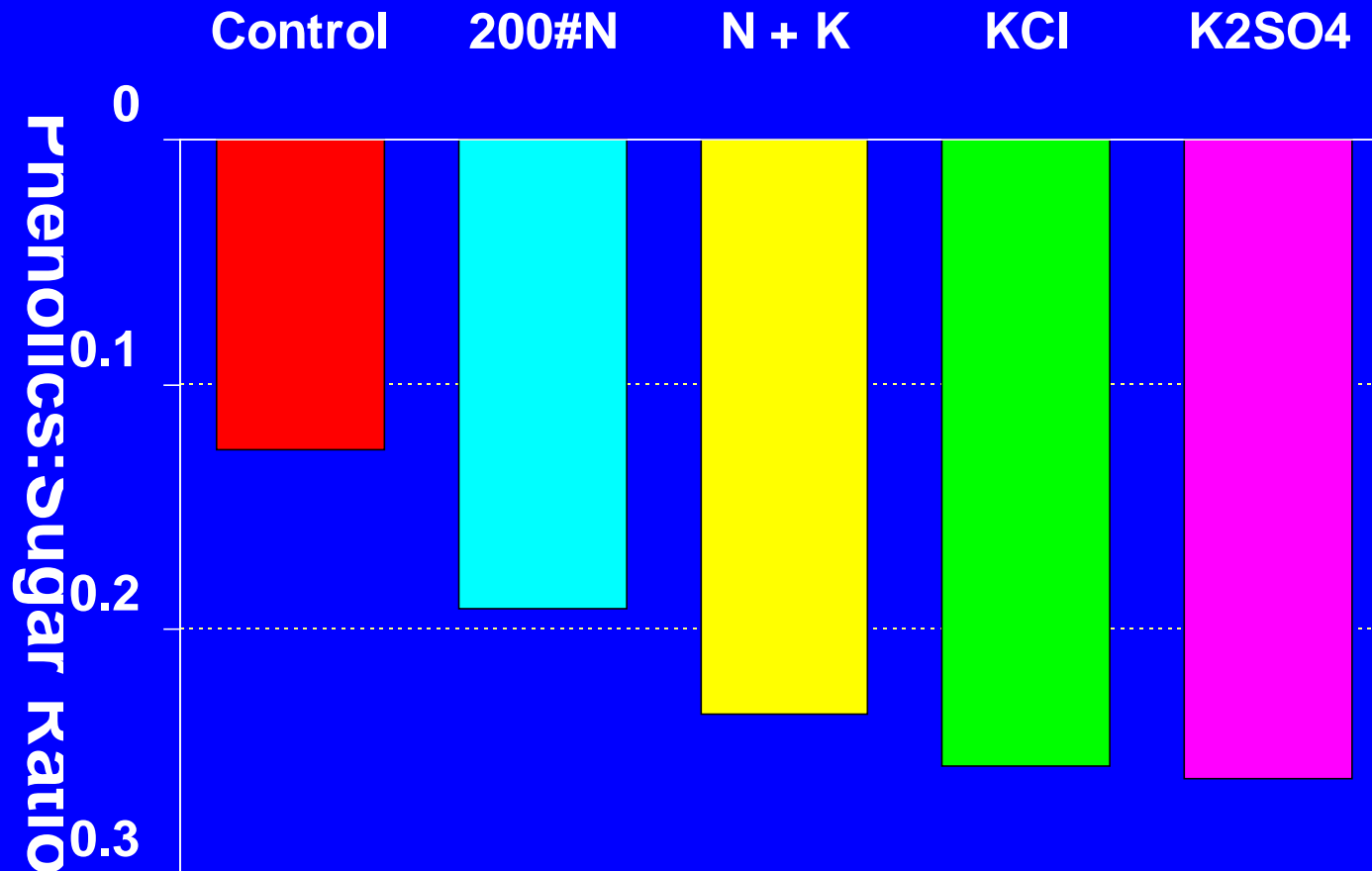
## Relationship to Thermochemical Budget

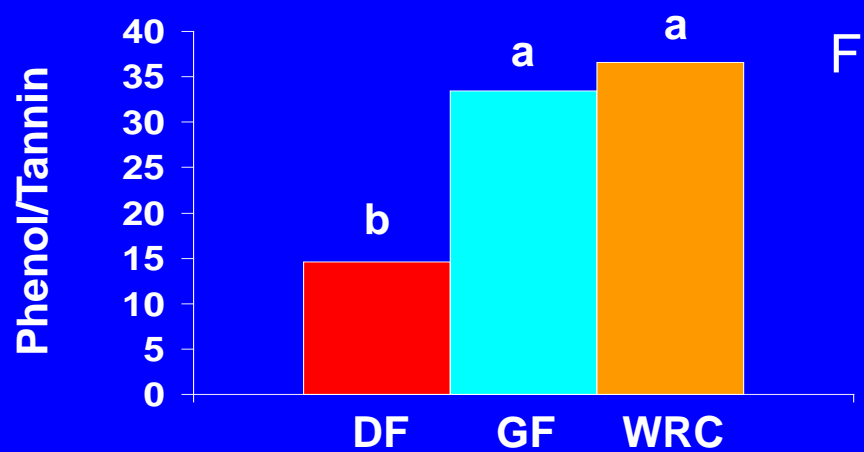
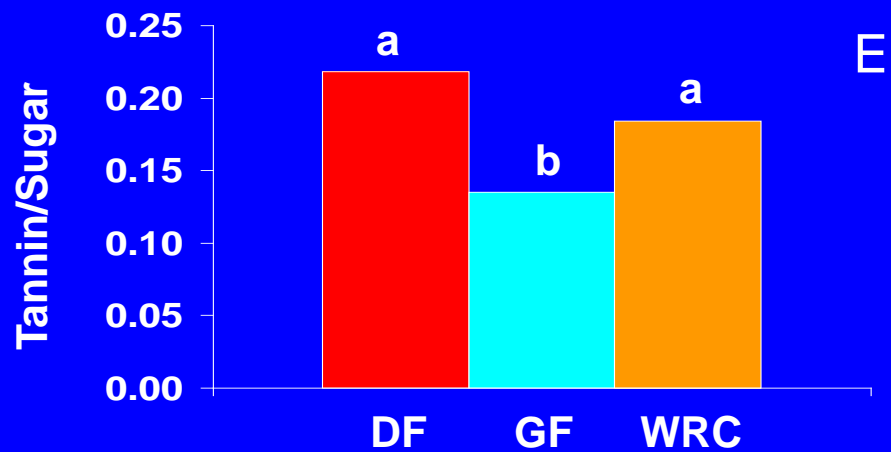
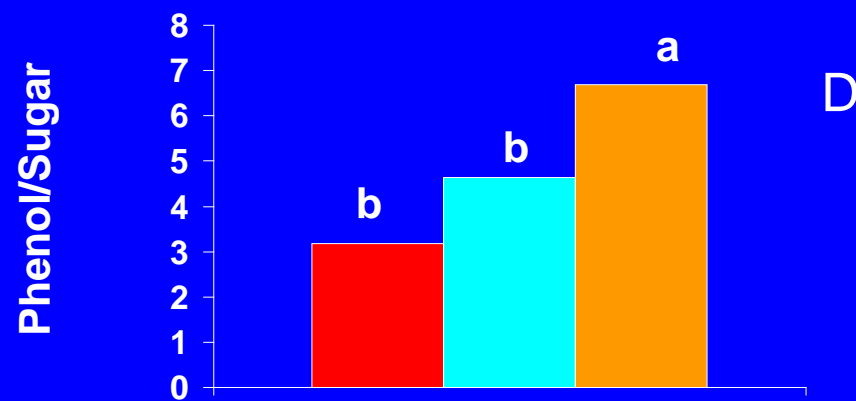
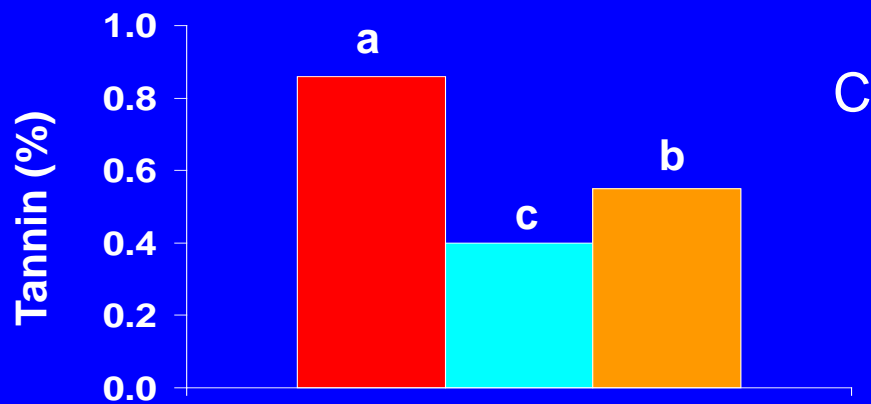
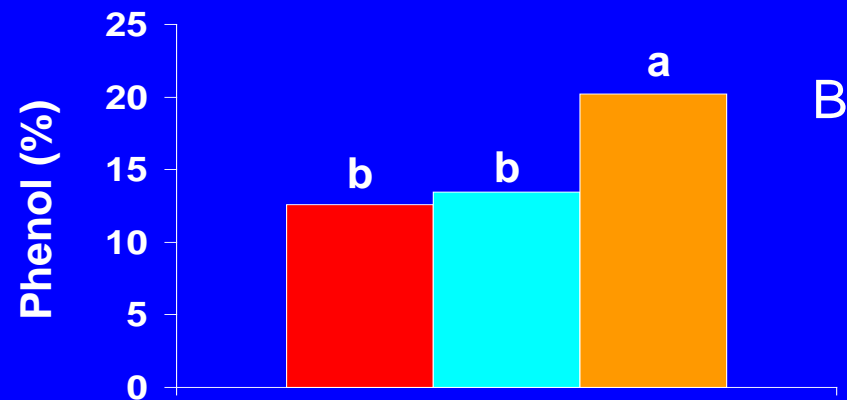
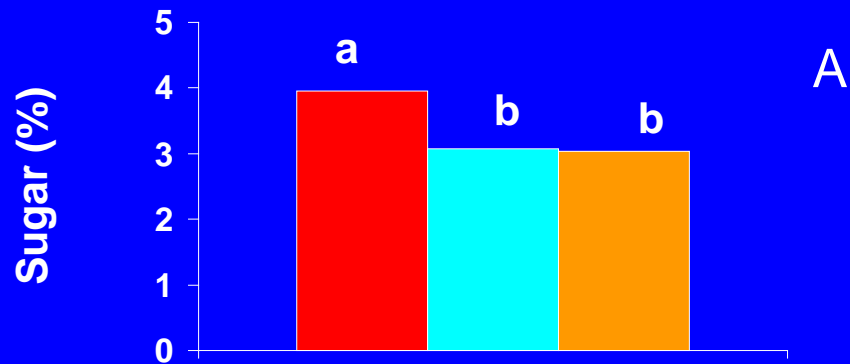


# ROOT PHENOLICS:SUGAR RATIOS

## Grangemont Root Rot Study

I reatment





Habitat Type Series

# Core Design

0#N/a  
0#K/a

300#N/a  
0#K/a

0#N/a  
170#K/a

300#N/a  
170#K/a











VACUUM 250 10<sup>-3</sup> Torr  
COLLECTOR 40 °C



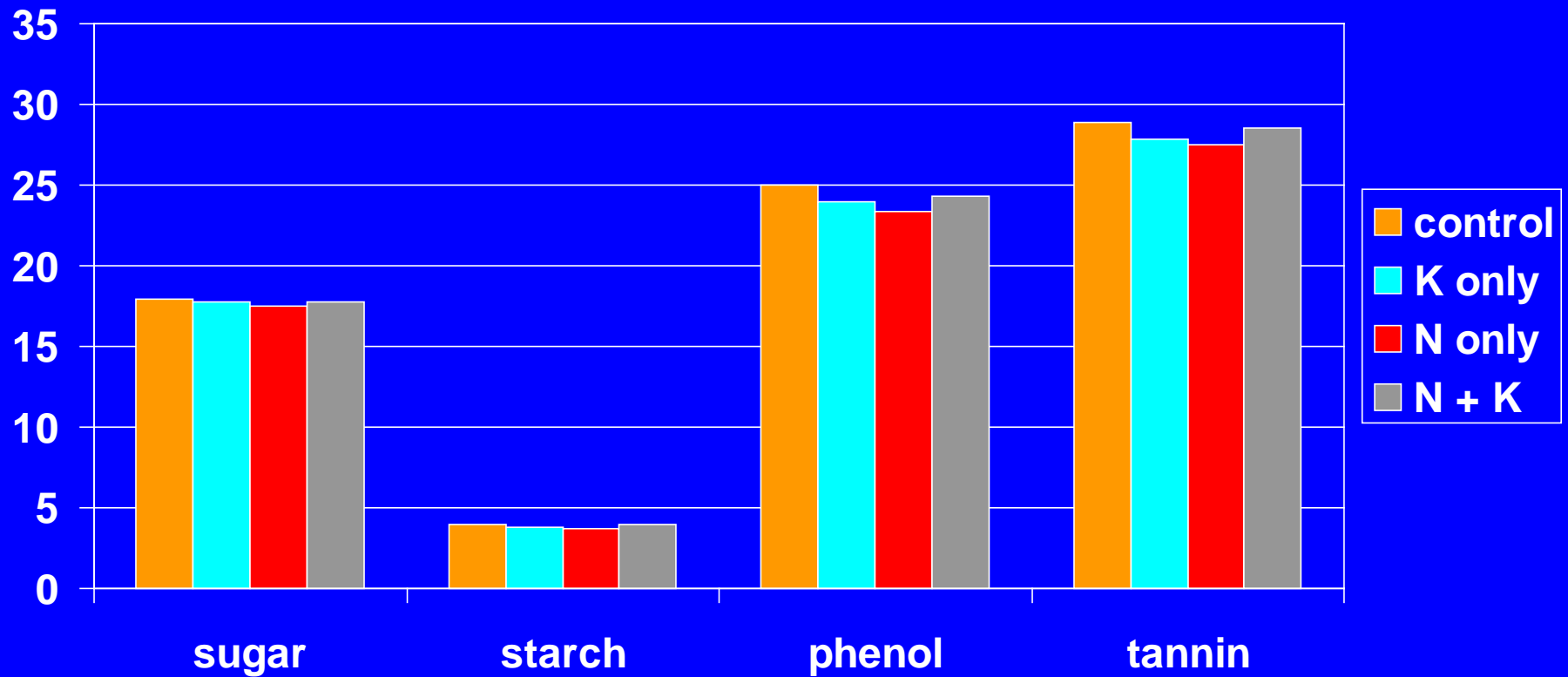
□ □ □

1. The instrument is designed to maintain a high vacuum level during sample collection and analysis. The digital display provides real-time feedback on the current vacuum level and the temperature of the collector. The graph shows the system's performance over time, indicating that the vacuum is being maintained and the collector is operating at the desired temperature.

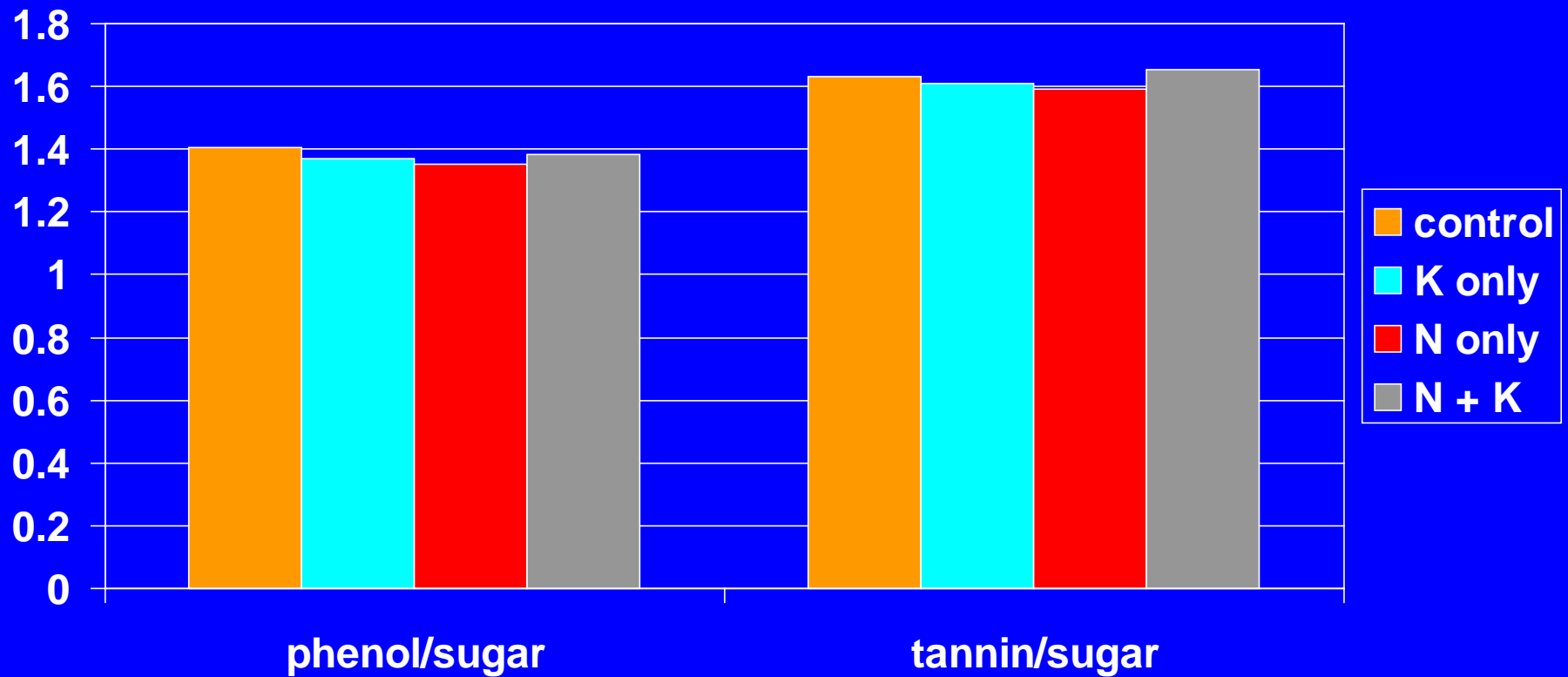




# Root Chemistry by Treatment



# Root Chemistry Ratios by Treatment

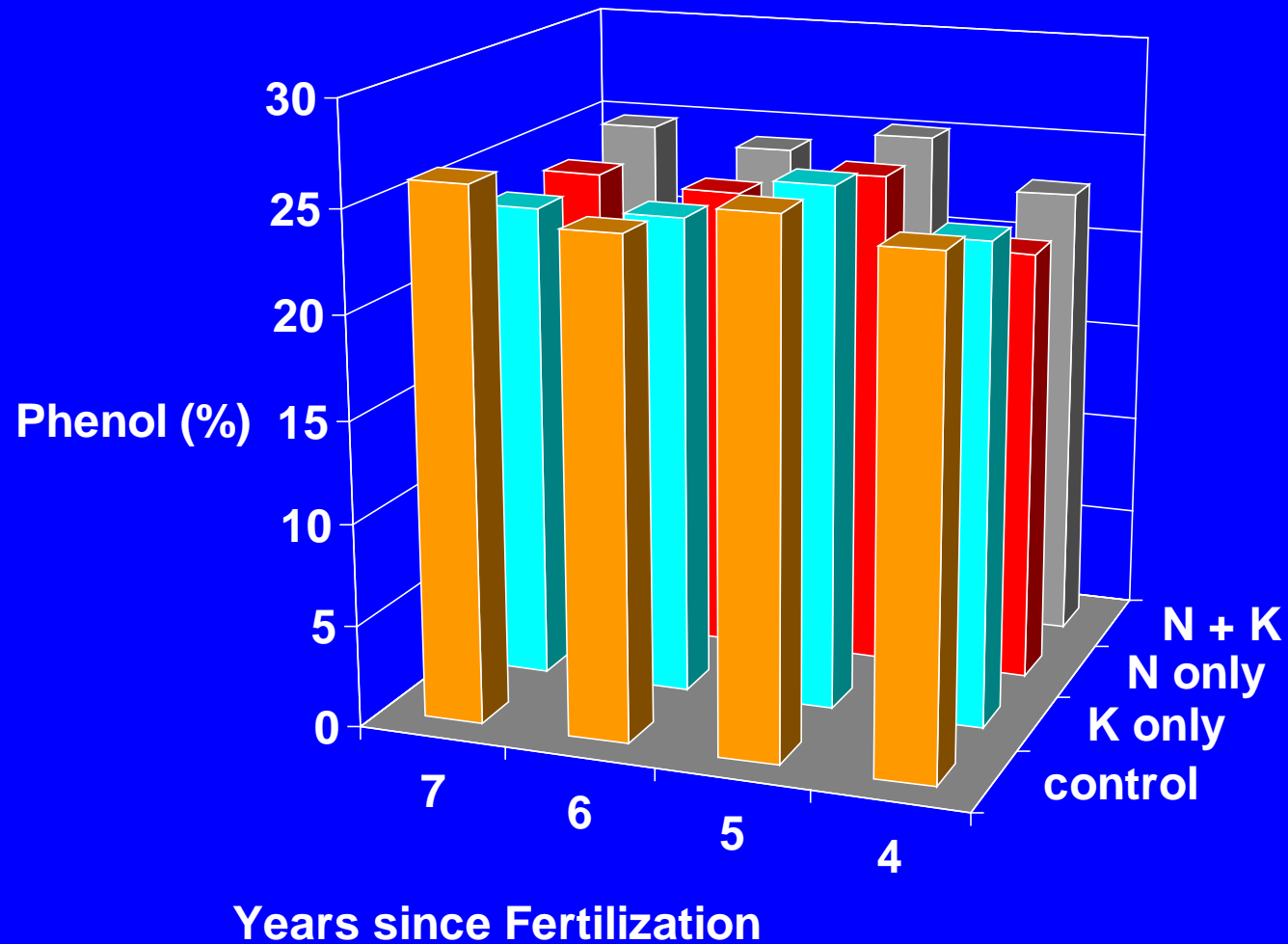




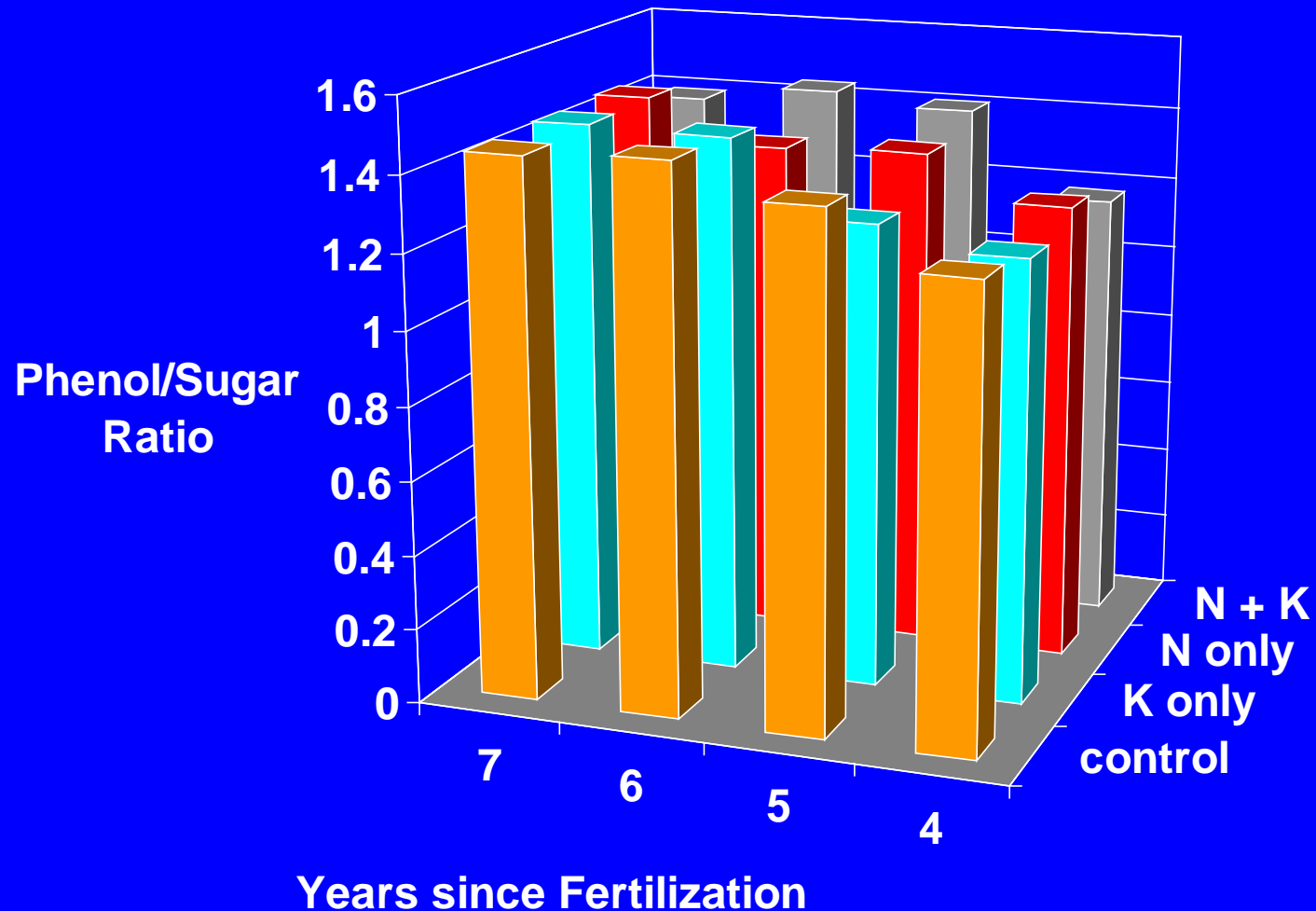
# Sites Sampled

	Vegetation Series											
	DF				GF				WRC/WH			
	Years since fertilization											
Rock Type	4	5	6	7	4	5	6	7	4	5	6	7
Basalt			3				1	2		2	1	
Granite		1	2		1	2					1	1
Metasediment						1		1		1	2	
Mixed		1	1		2				1		2	1

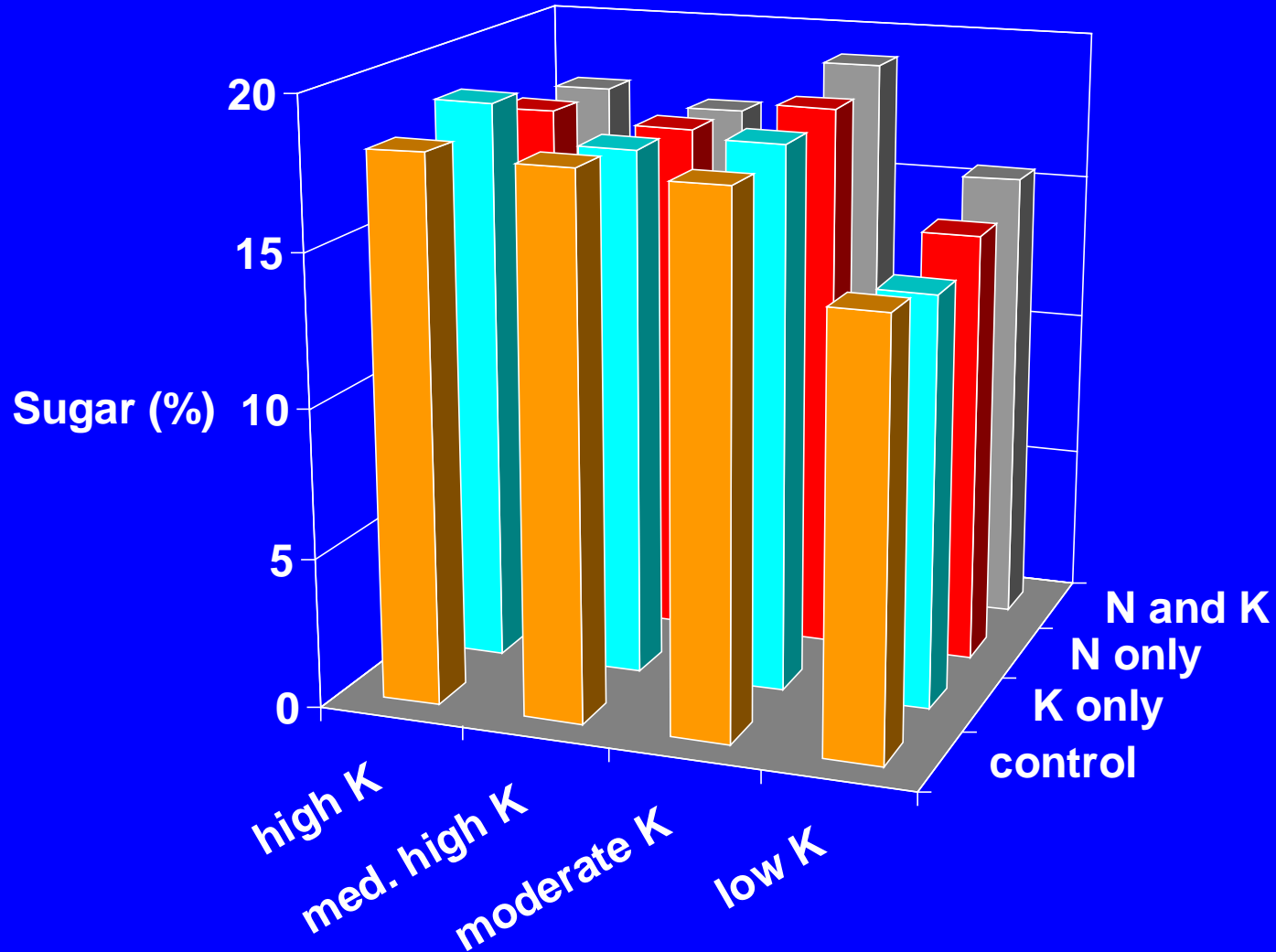
# Root Phenol by Treatment and Years Since Fertilization



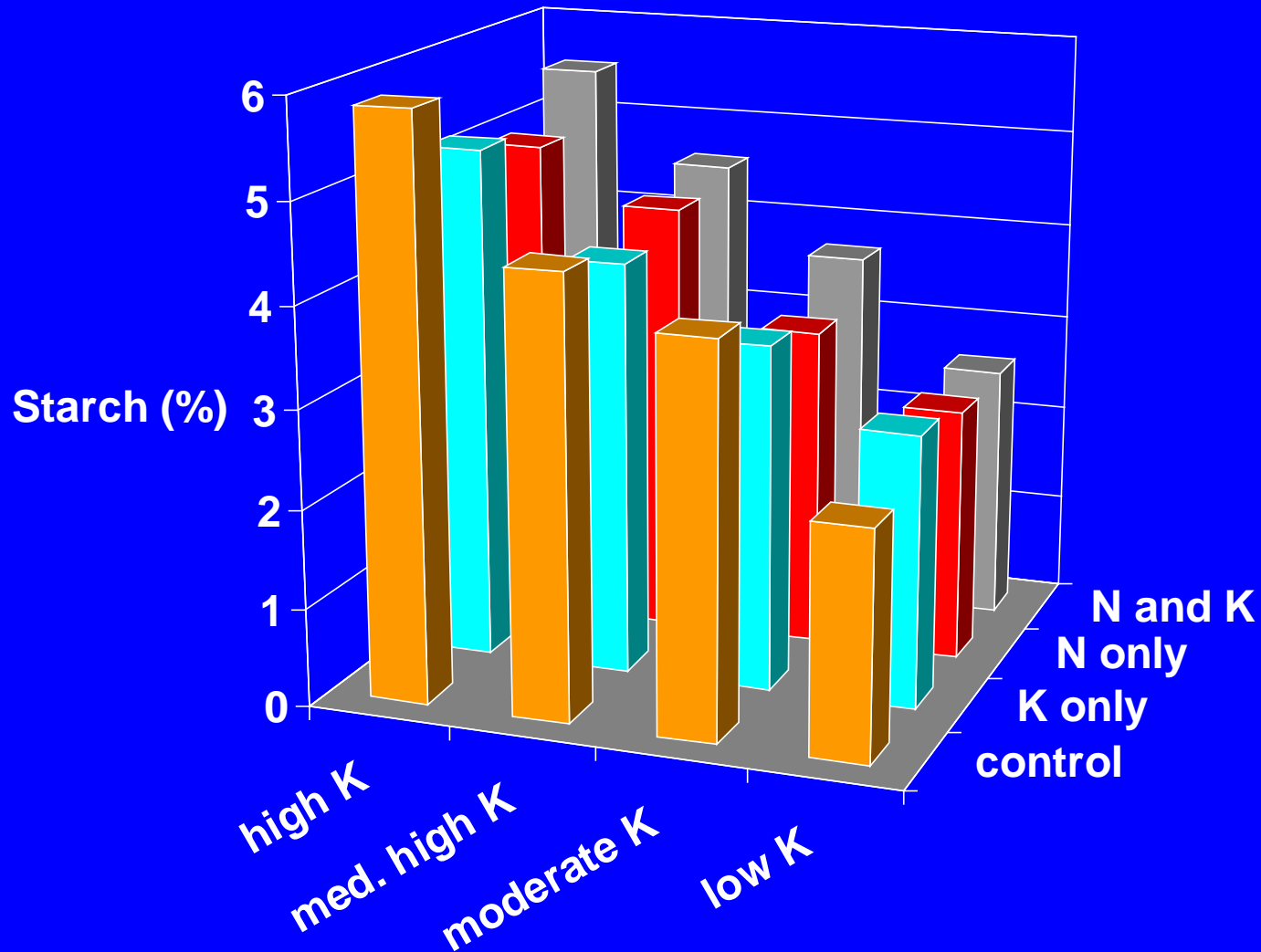
# Root Phenol/Sugar Ratios by Treatment and Years Since Fertilization



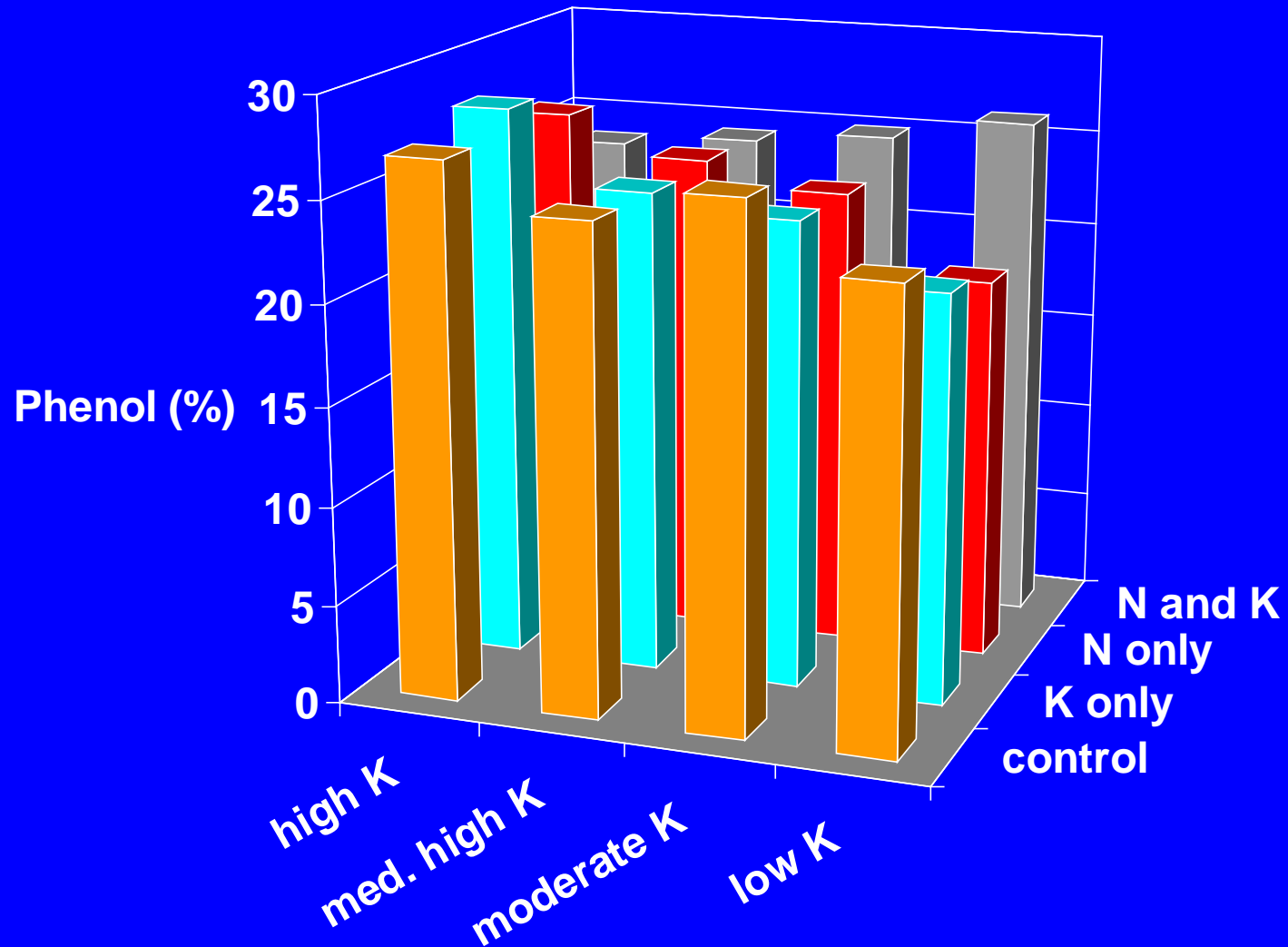
# Root Sugar by Treatment and Foliar Potassium Level



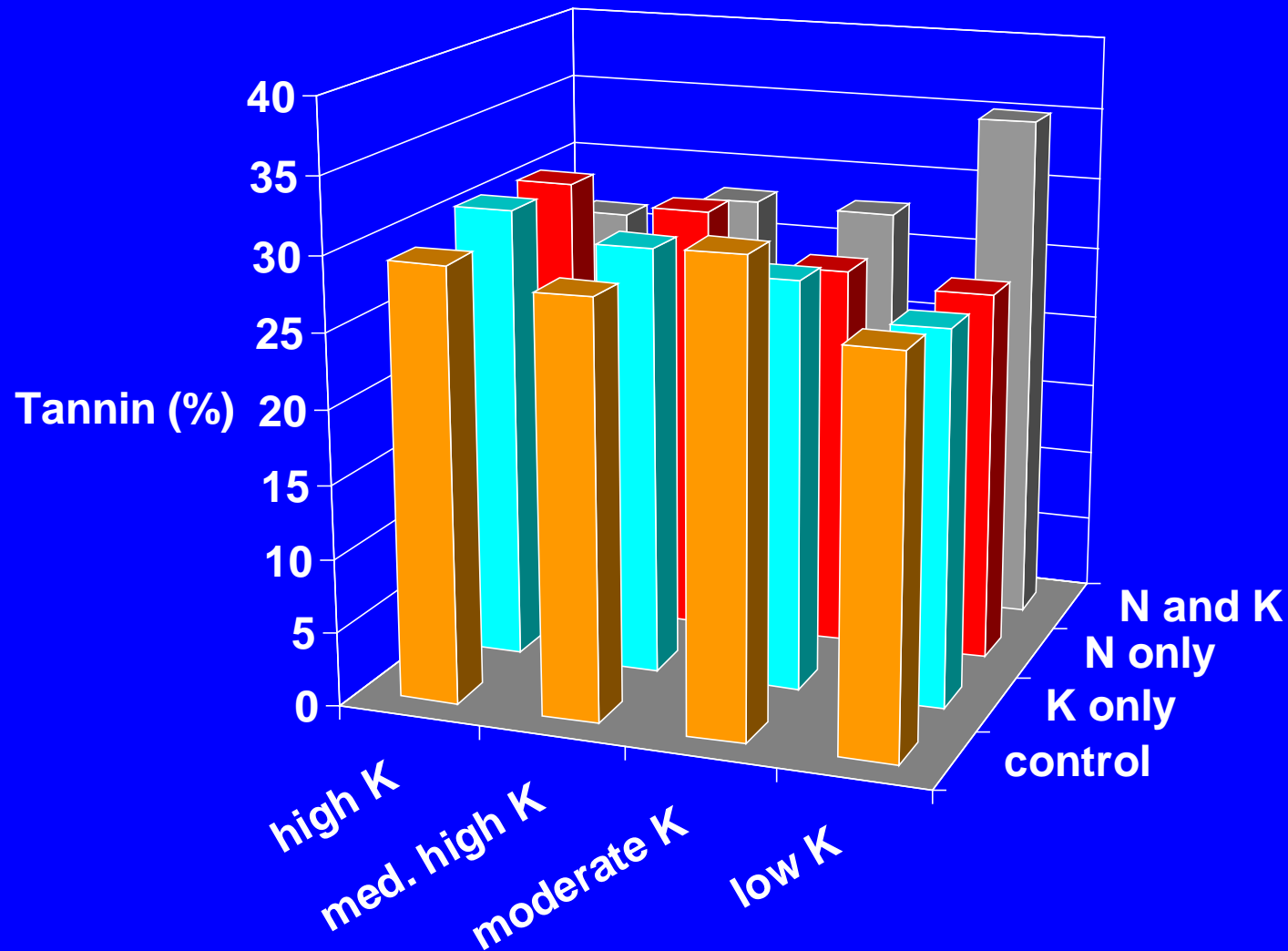
# Root Starch by Treatment and Foliar Potassium Level



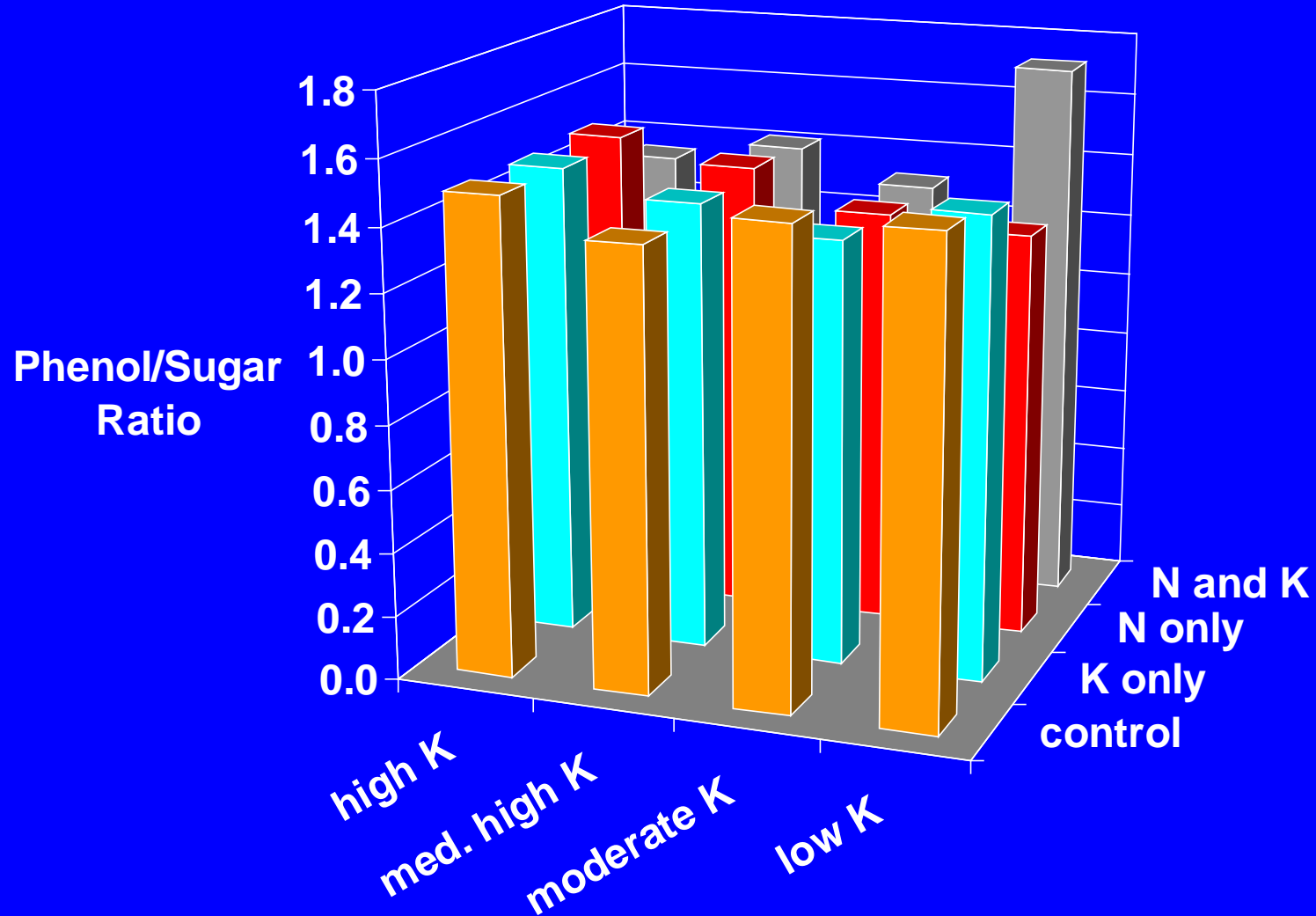
# Root Phenol by Treatment and Foliar Potassium Level



# Root Tannin by Treatment and Foliar Potassium Level

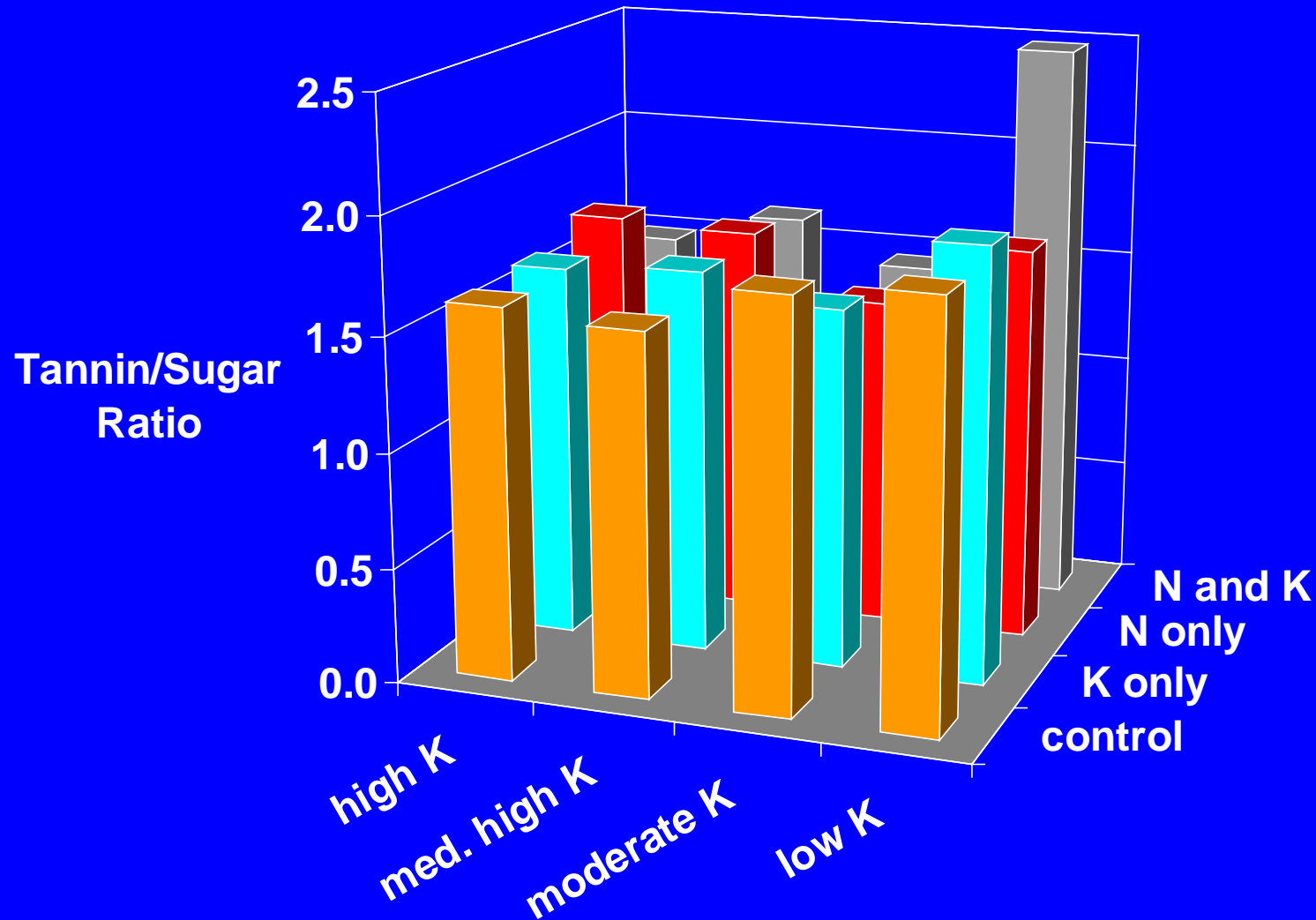


# Root Phenol/Sugar Ratio by Treatment and Foliar Potassium Level





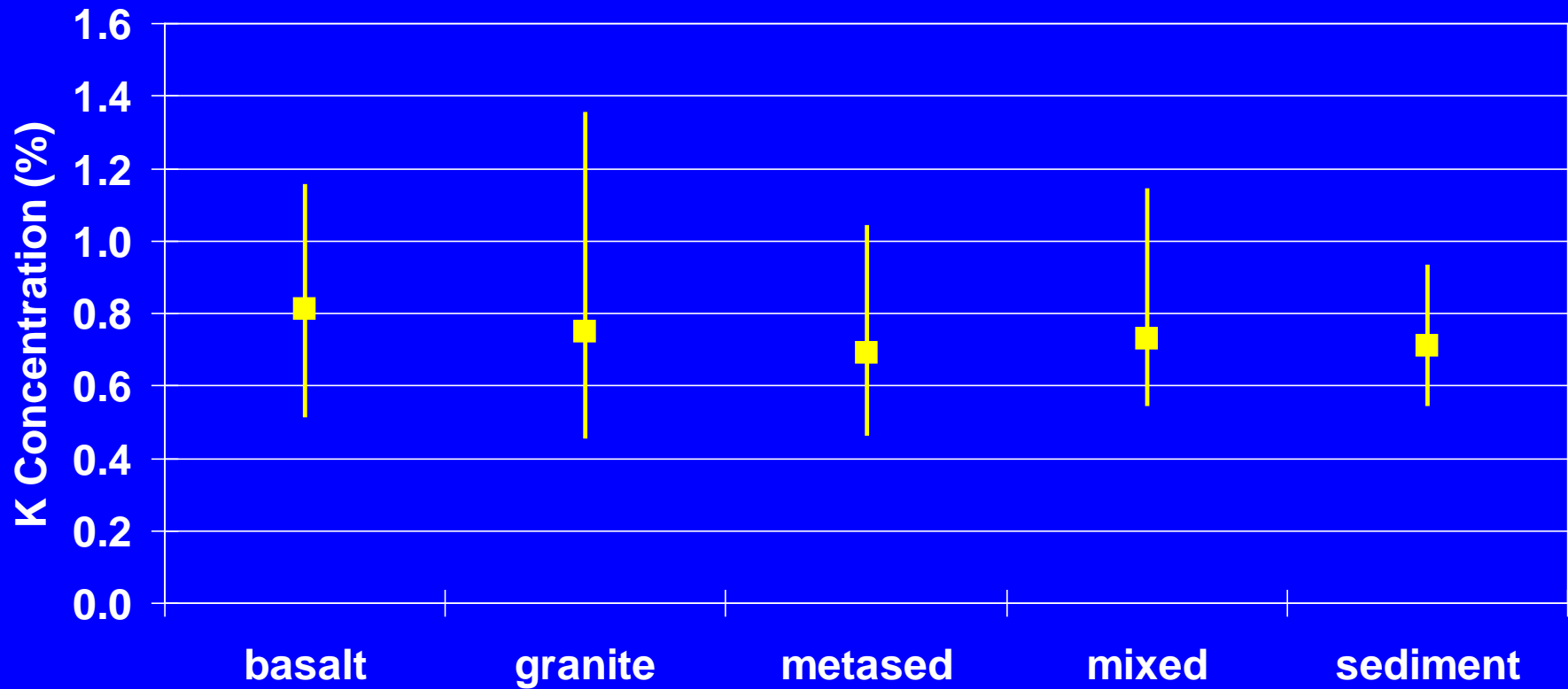
# Root Tannin/Sugar Ratio by Treatment and Foliar Potassium Level



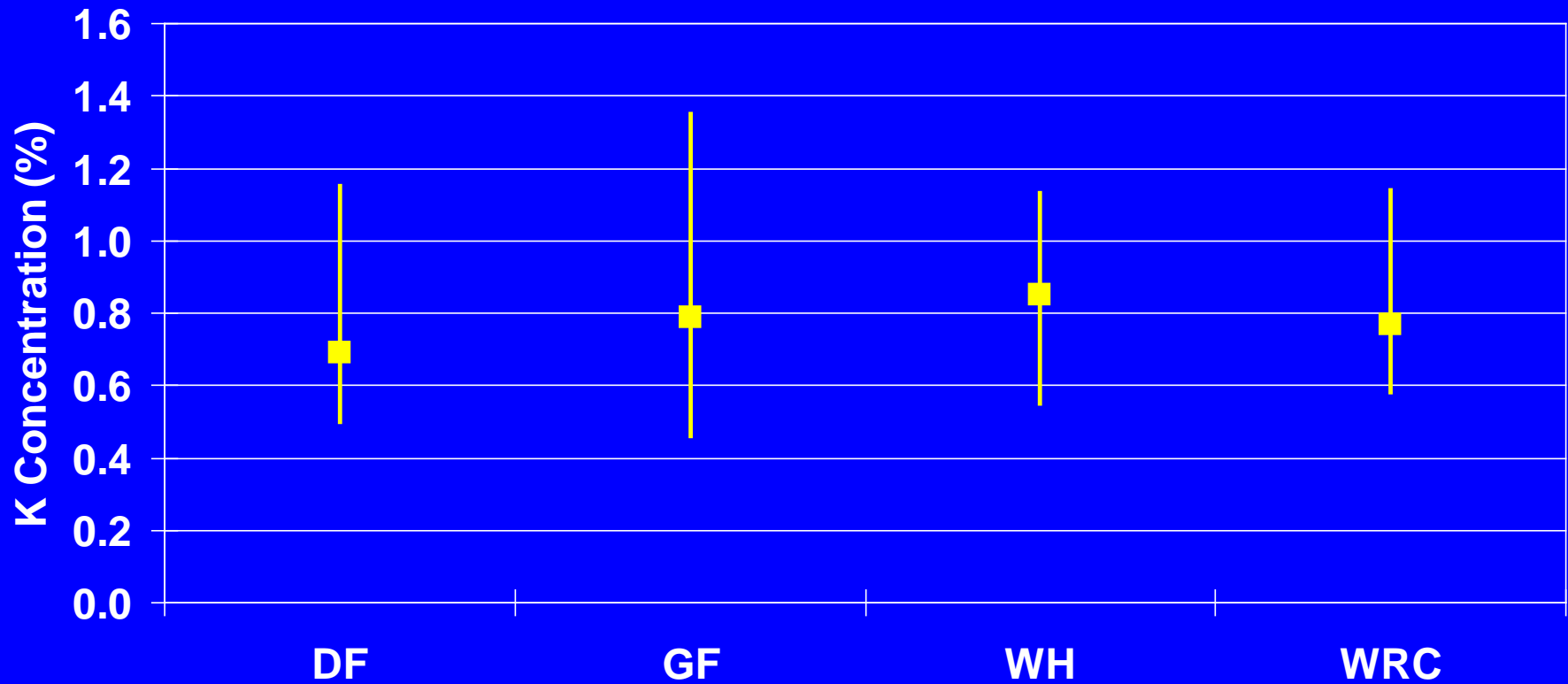
# Sites Sampled

	Vegetation Series											
	DF				GF				WRC/WH			
	Foliar K Level (%)											
Rock Type	<.8	.8-.9	.9-1.	>1.	<.8	.8-.9	.9-1.	>1.	<.8	.8-.9	.9-1.	>1.
Basalt		1	1	1	1		1	1	1	1	1	
Granite		3				1	2		1		1	
Metasediment							2			1	2	
Mixed			1						1	1		2

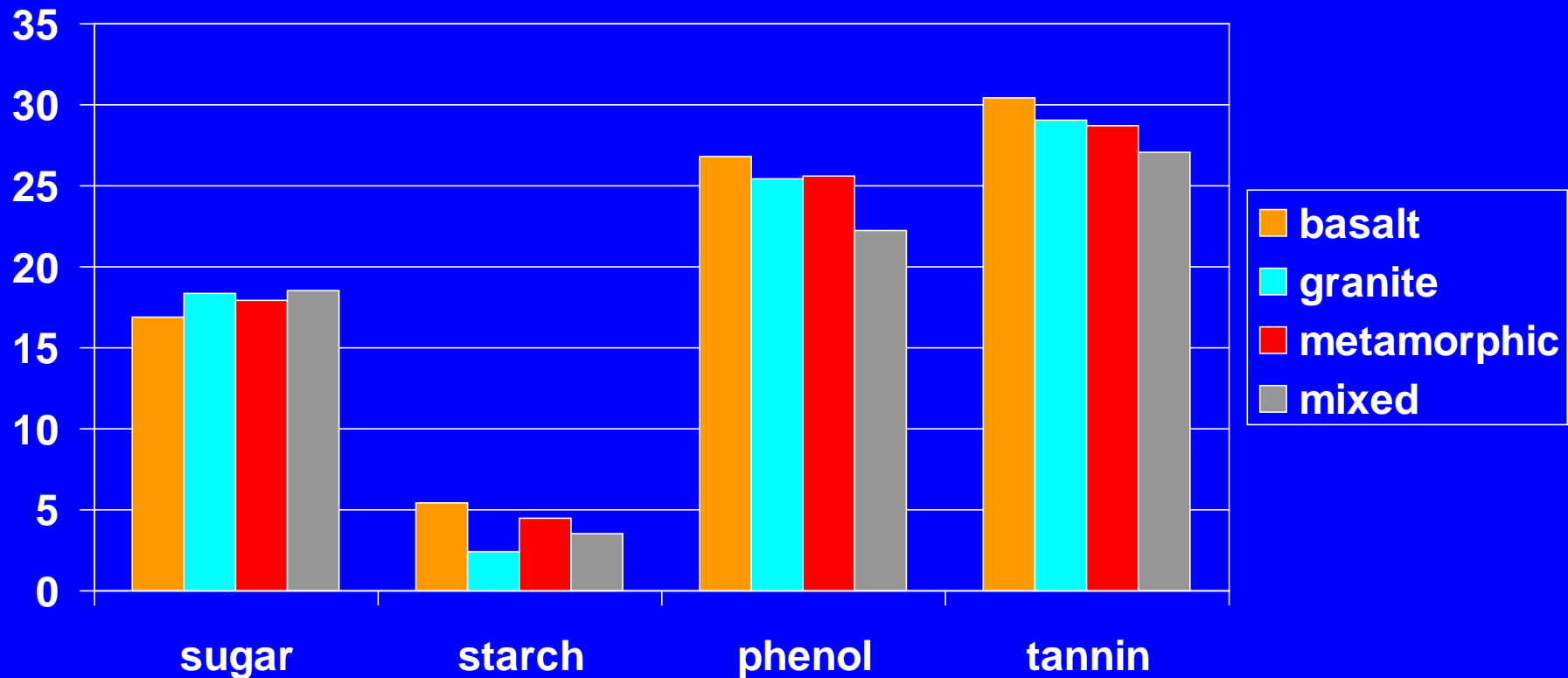
# Foliar K Concentration by Rock Type



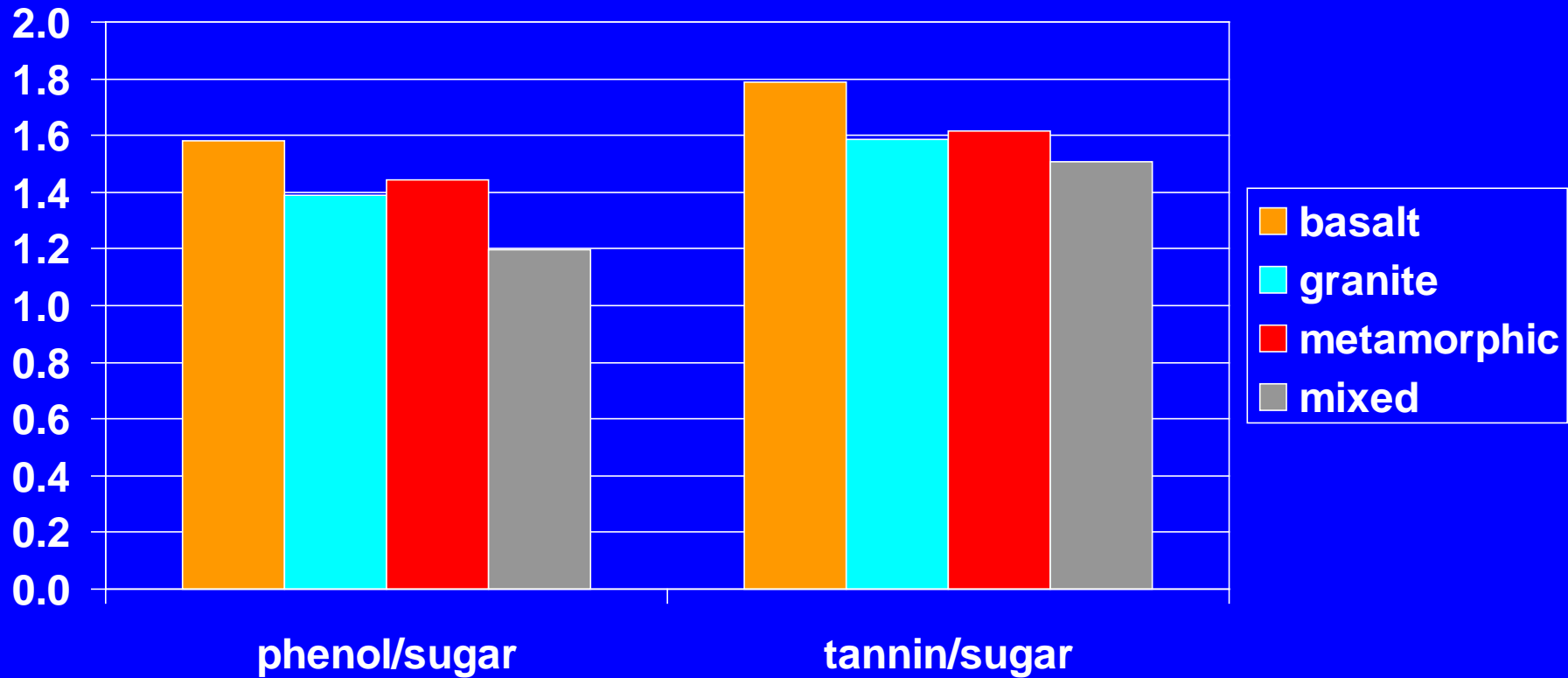
# Foliar K Concentration by Vegetation Series



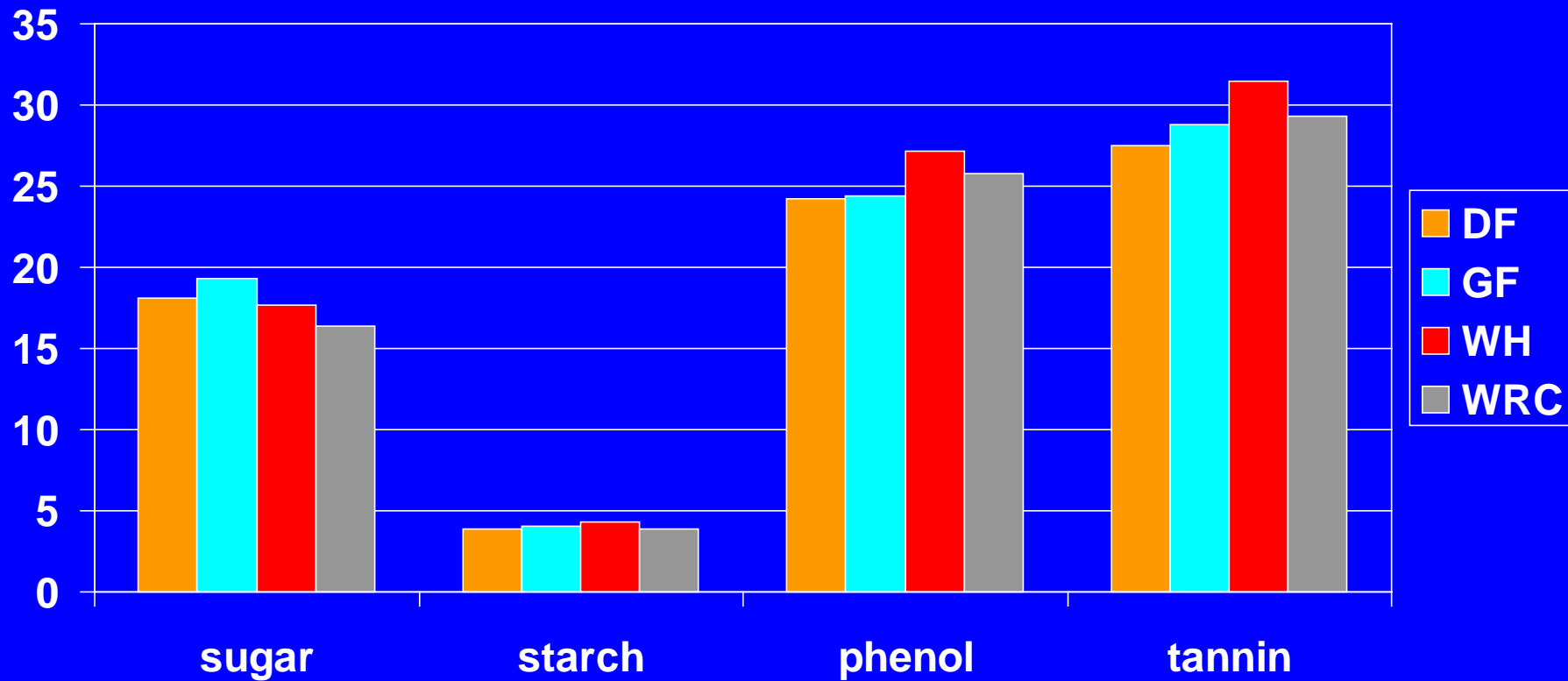
# Root Chemistry by Rock Type



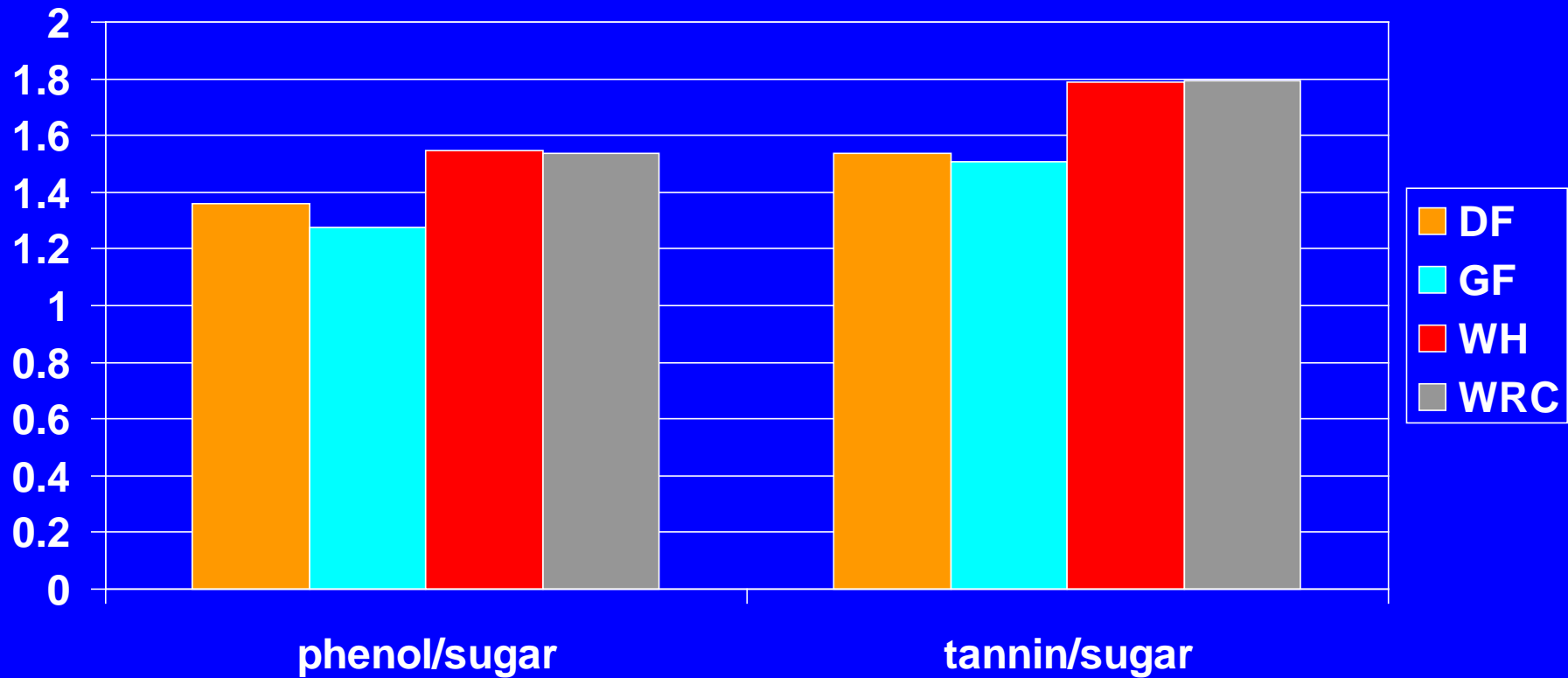
# Root Chemistry Ratios by Rock Type



# Root Chemistry by Vegetation Series



# Root Chemistry Ratios by Vegetation Series

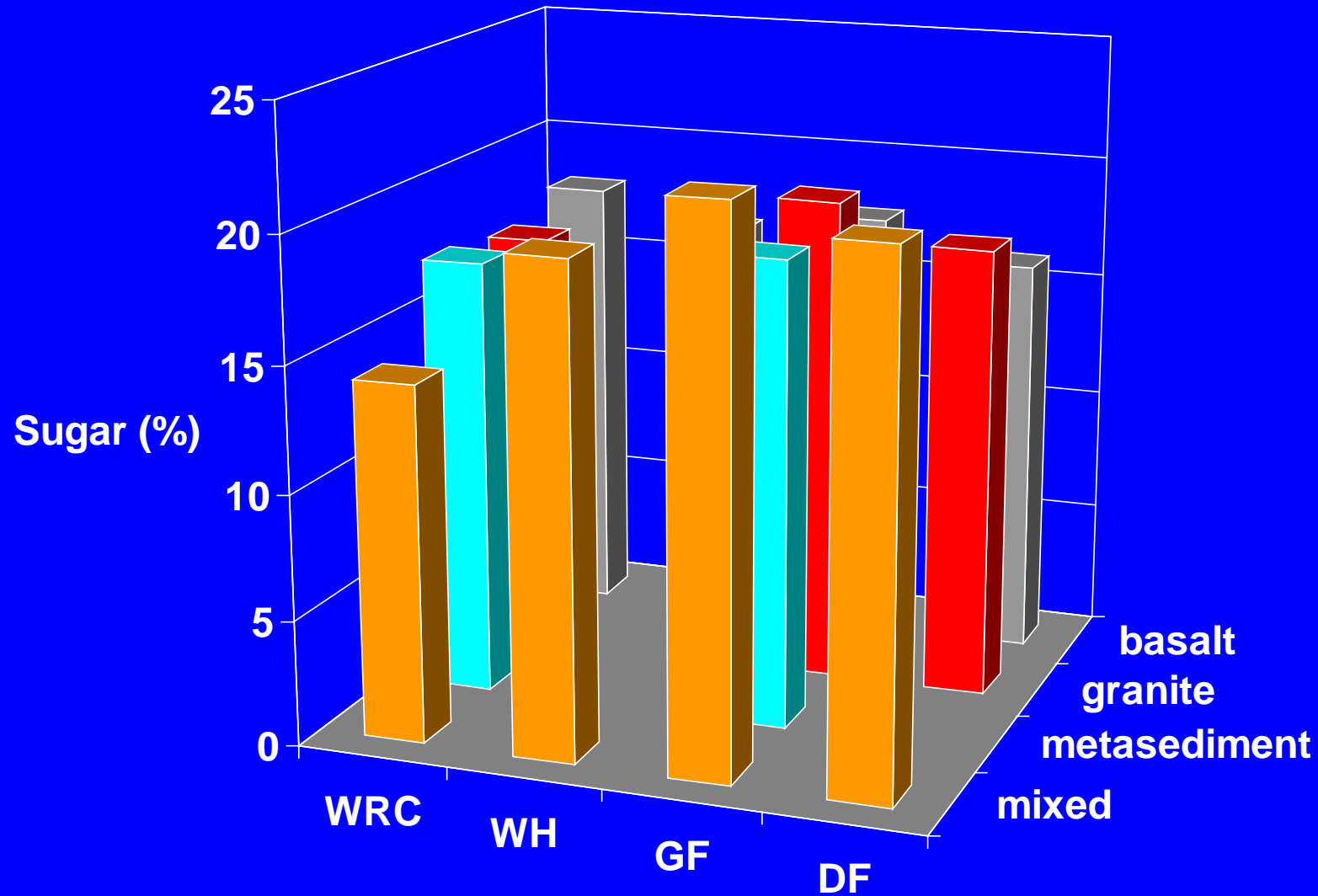




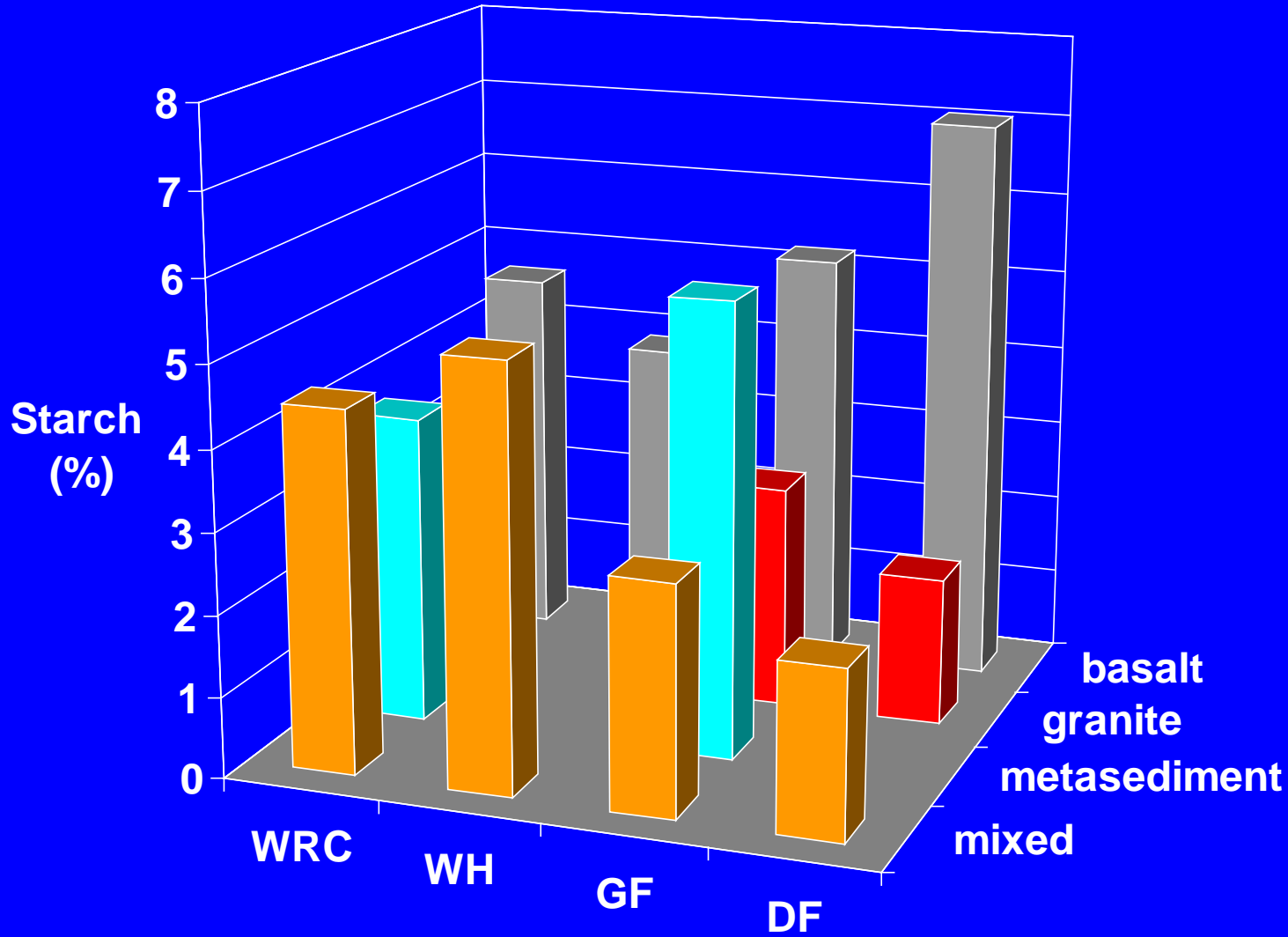
# Sites Sampled

	<b>Vegetation Series</b>			
<b>Rock Type</b>	<b>DF</b>	<b>GF</b>	<b>WH</b>	<b>WRC</b>
<b>Basalt</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>1</b>
<b>Granite</b>	<b>3</b>	<b>3</b>		<b>2</b>
<b>Metasediment</b>		<b>2</b>		<b>3</b>
<b>Mixed</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>3</b>

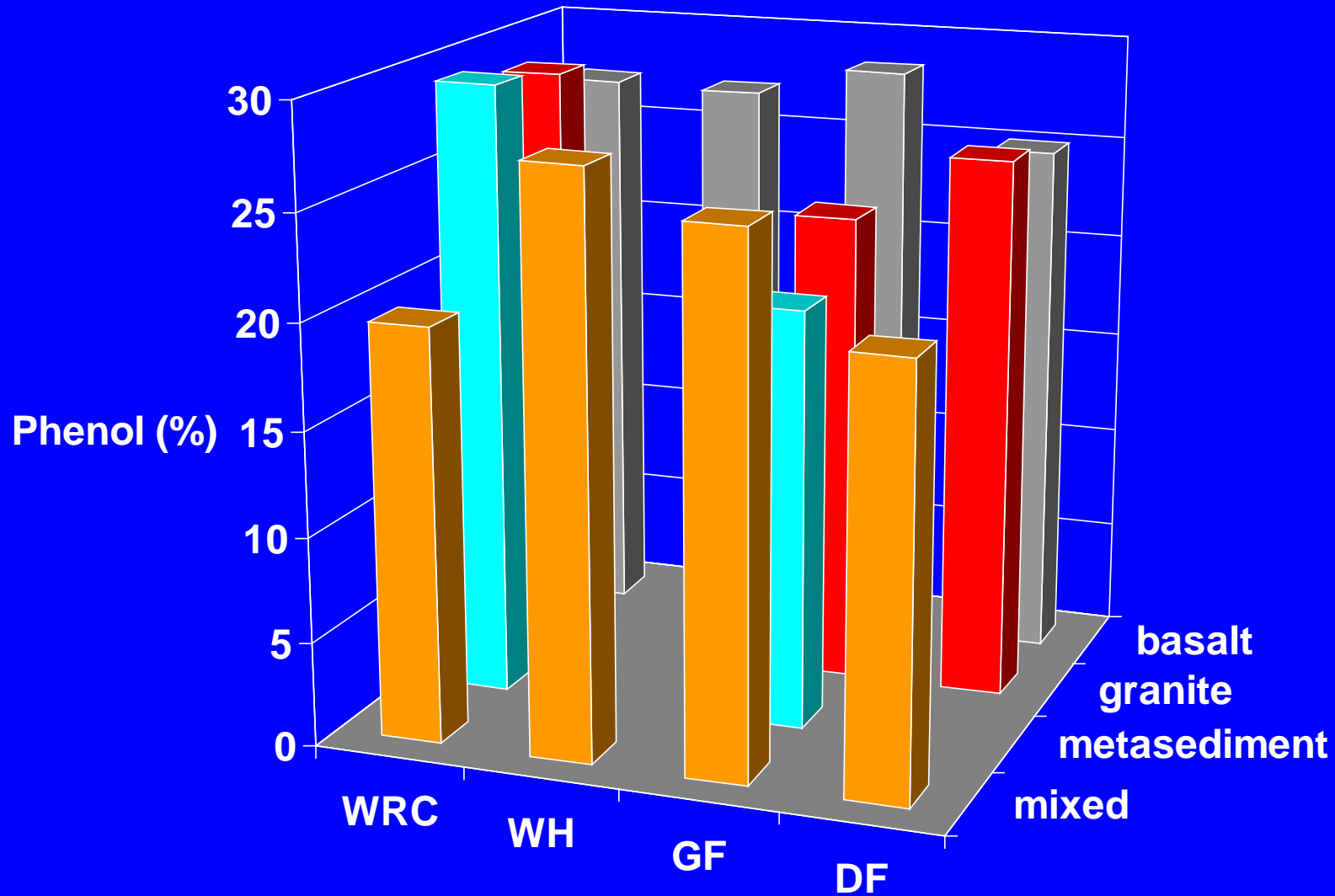
# Root Sugar by Rock Type and Vegetation Series



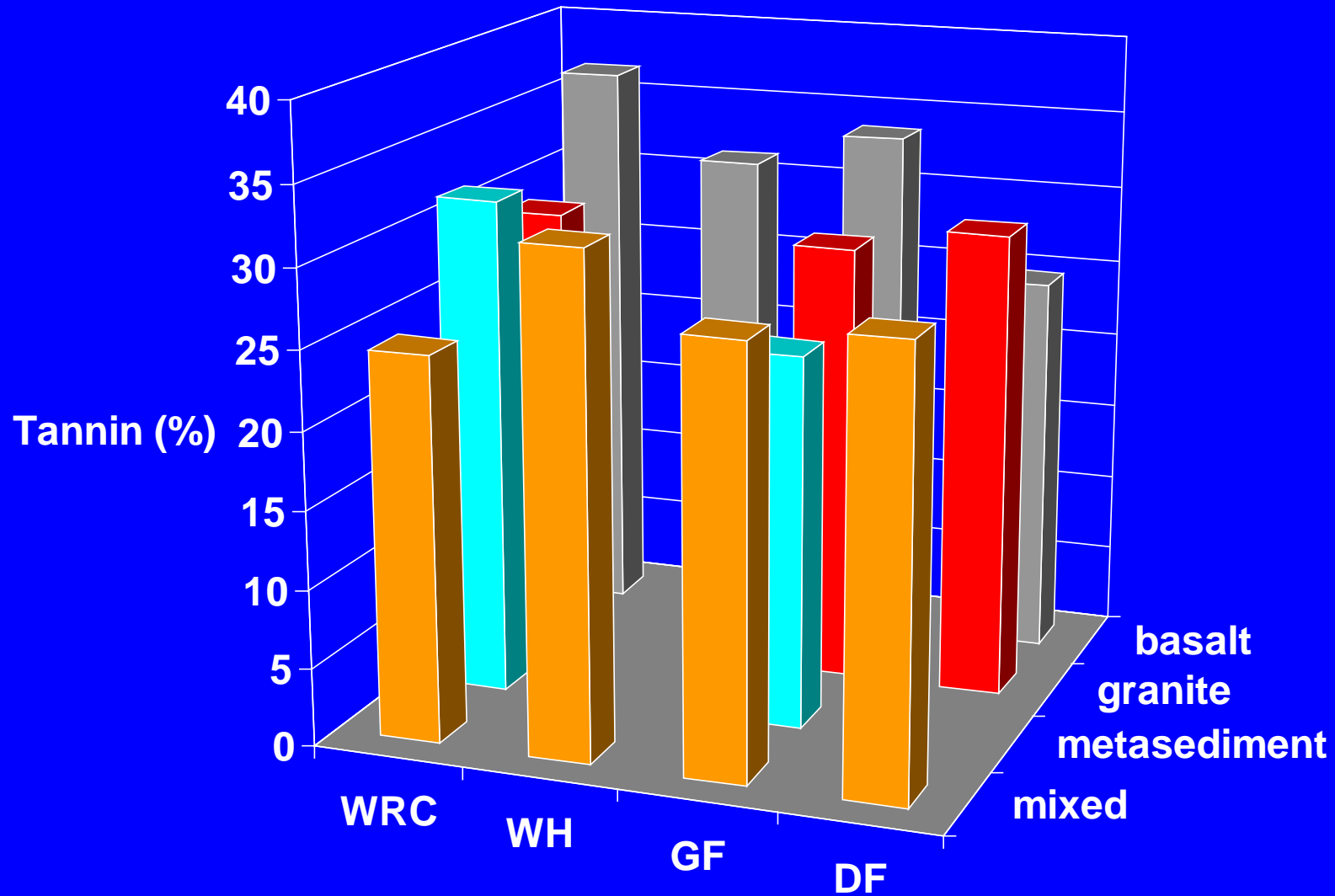
# Root Starch by Rock Type and Vegetation Series



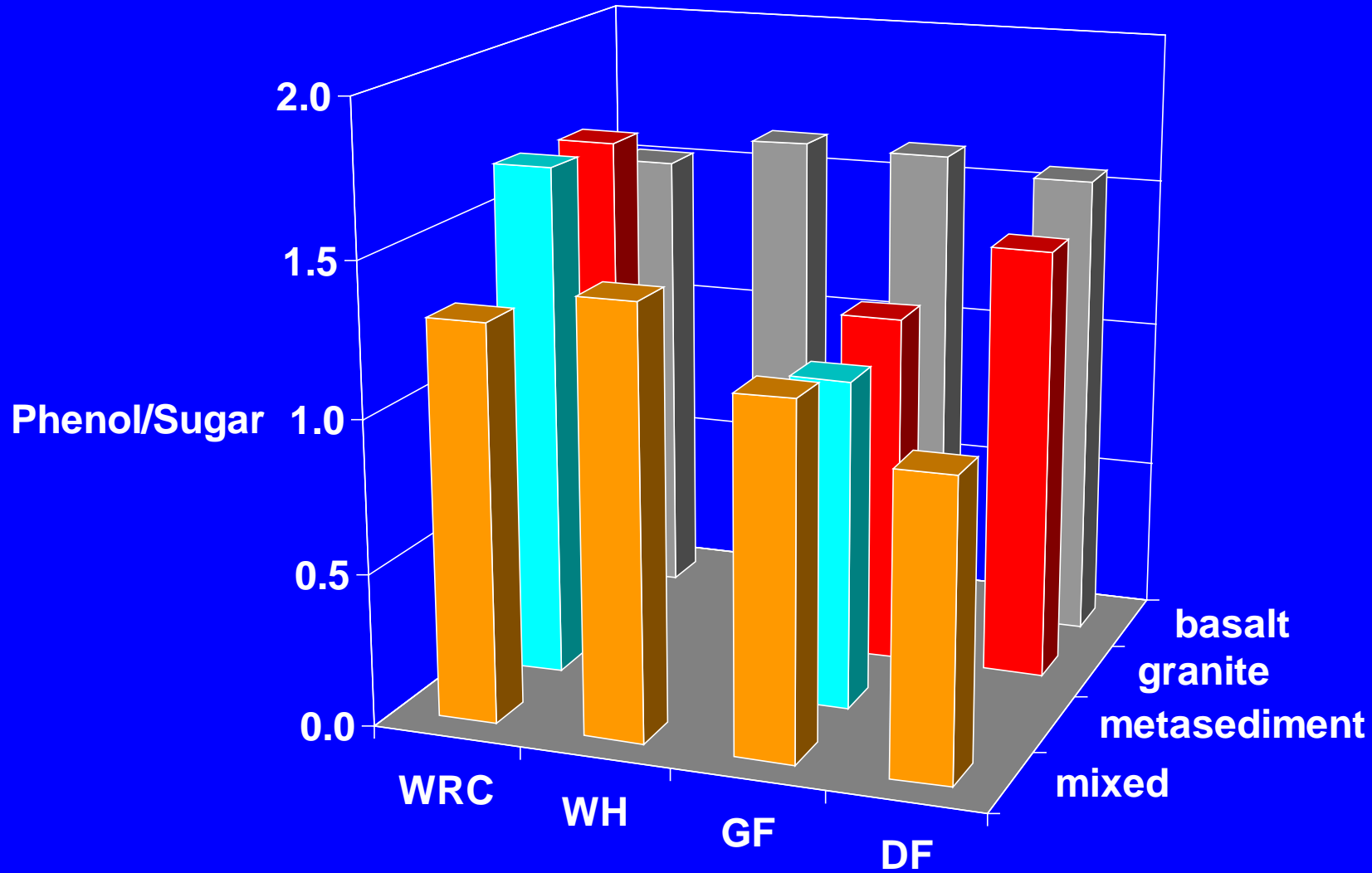
# Root Phenol by Rock Type and Vegetation Series



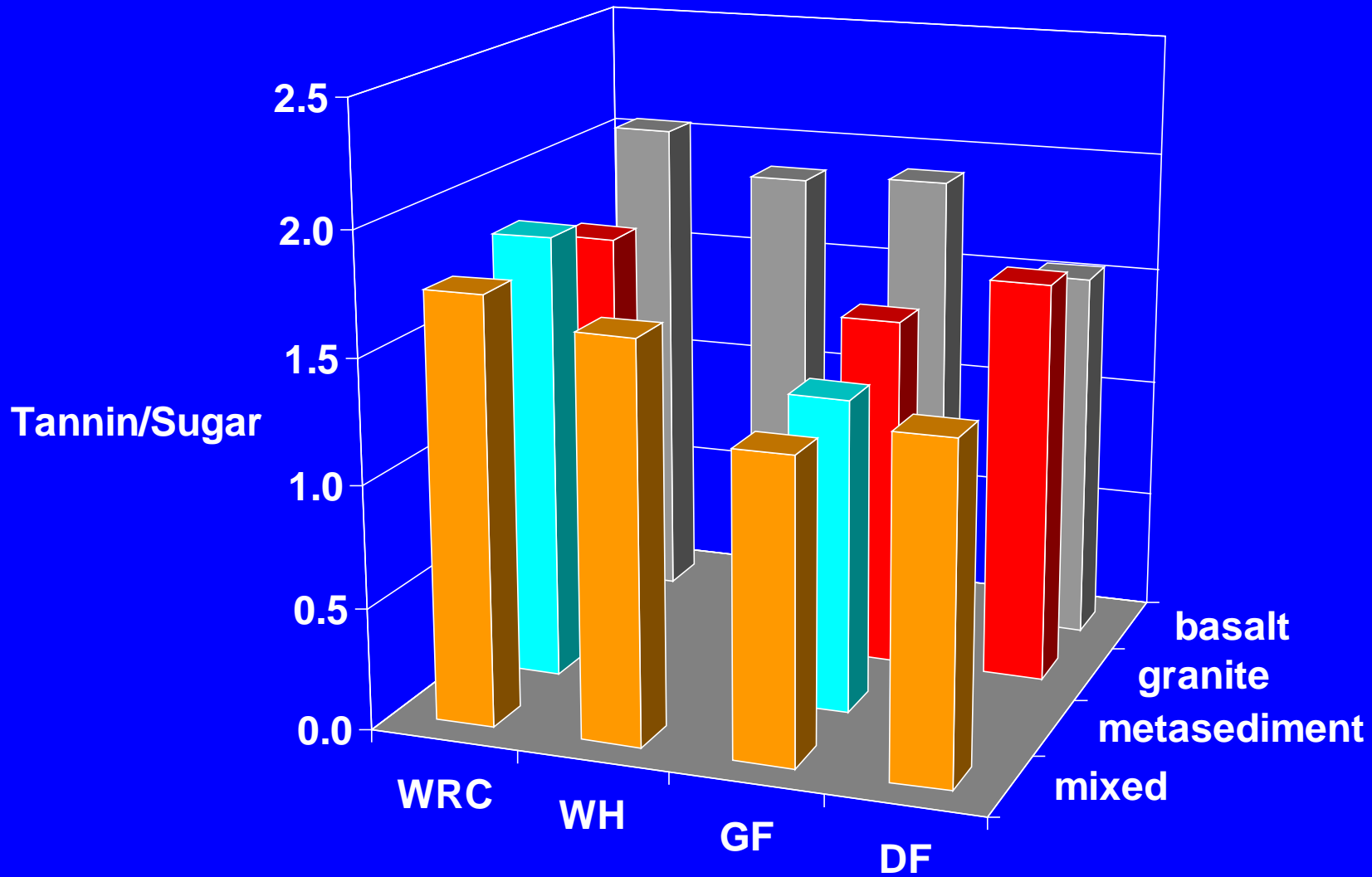
# Root Tannin by Rock Type and Vegetation Series



# Root Phenol/Sugar Ratio by Rock Type and Vegetation Series



# Root Tannin/Sugar Ratio by Rock Type and Vegetation Series



# Conclusions

- Some evidence that fertilization does impact root chemistry, particularly phenol/sugar and tannin/sugar ratios, but effects appear to be limited to sites with insufficient K.
- Root chemistry, particularly phenol/sugar and tannin/sugar ratios, varies significantly across rock types and vegetation types.
  - Sites on glacial tills appear to be different than those on basalts.
  - Root chemistries on DF and GF sites tend to be similar to each other but different than those on WRC and WH sites.