

# Variation of dietary fiber content in 282 common bean genotypes from the middle american gene pool

## Contents

Introduction . . . . .	1
Summary Statistics . . . . .	2
Results: Entries . . . . .	2
Results: Marketclass . . . . .	4
- Boxplots . . . . .	5
Results: Race . . . . .	5
- Boxplots . . . . .	5

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*Keywords:* common bean, fiber, oligosaccharide

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## Introduction

282 entries from the BeanCAP study were grown in Fort Collins, CO in 2015 to determine variation in fiber content. All entries originated from the Middle American gene pool and were further subdivided into the following races and market classes:

Race	# Entries
Durango	131
Jalisco	55
Mesoamerican	96

Market Class	# Entries
pinto	91
navy	45
black	41
GN	40
small red	30
pink	22
carioca	2

Market Class	# Entries
tan	2
black mottle	1
flor de mayo	1
red mottle	1

### Summary Statistics

Below are summary statistics for all dietary fiber components for all entries.

##	IDF	SDF	IDF_SDF	Raff
##	Min. :11.30	Min. : 3.980	Min. :17.95	Min. :0.2231
##	1st Qu.:13.38	1st Qu.: 7.036	1st Qu.:21.08	1st Qu.:0.3808
##	Median :14.01	Median : 7.588	Median :21.76	Median :0.4335
##	Mean :14.14	Mean : 7.647	Mean :21.79	Mean :0.4498
##	3rd Qu.:14.82	3rd Qu.: 8.311	3rd Qu.:22.58	3rd Qu.:0.4968
##	Max. :18.88	Max. :10.419	Max. :25.78	Max. :1.0235
##	Stach	Verb	TOligos	TDF
##	Min. :2.847	Min. :0.01055	Min. :3.389	Min. :22.25
##	1st Qu.:3.589	1st Qu.:0.07138	1st Qu.:4.125	1st Qu.:25.37
##	Median :3.838	Median :0.09947	Median :4.365	Median :26.21
##	Mean :3.848	Mean :0.10113	Mean :4.399	Mean :26.18
##	3rd Qu.:4.071	3rd Qu.:0.12714	3rd Qu.:4.660	3rd Qu.:26.99
##	Max. :6.476	Max. :0.25548	Max. :7.549	Max. :31.10

### Results: Entries

Tables below show the five entries with the greatest and five entries with the lowest values of each fiber component averaged across the two replications including standard deviation (sd), standard error (se) and confidence intervals (ci).

#### Insoluble Dietary Fiber (IDF)

##	Entry	mktclass	race	IDF	sd	se	ci
## 1:	PRO443-151	black	mesoamerican	16.91	1.55	1.09	13.89
## 2:	CDC Pinnacle	pinto	durango	16.73	2.76	1.95	24.80
## 3:	CDC Jet	black	mesoamerican	16.71	1.32	0.94	11.90
## 4:	TARS-VCI-4B	pinto	durango	16.46	3.43	2.42	30.79
## 5:	TARS09-RR007	small red	jalisco	16.42	0.51	0.36	4.59
##	Entry	mktclass	race	IDF	sd	se	ci
## 1:	BelMiNeb-RMR-4	navy	mesoamerican	12.34	0.11	0.08	0.97
## 2:	BelMiNeb-RMR-8	navy	mesoamerican	12.05	0.38	0.27	3.43
## 3:	BelMiNeb-RMR-7	navy	mesoamerican	11.77	0.31	0.22	2.77
## 4:	BelMiNeb-RMR-3	GN	durango	11.75	0.22	0.15	1.97
## 5:	AC Pintoba	pinto	durango	11.44	0.19	0.13	1.70

### *Soluble Dietary Fiber (SDF)*

##	Entry	mktclass	race	SDF	sd	se	ci
## 1:	Voyager	navy	mesoamerican	10.29	0.12	0.08	1.03
## 2:	SR7-3	small red	jalisco	9.83	0.83	0.59	7.48
## 3:	NW-63	small red	jalisco	9.81	0.43	0.30	3.84
## 4:	IP08-2	pinto	durango	9.48	0.76	0.53	6.79
## 5:	BelMiNeb 2	GN	durango	9.45	0.05	0.03	0.42

##	Entry	mktclass	race	SDF	sd	se	ci
## 1:	ABCP-15	pinto	durango	5.76	0.56	0.39	5.00
## 2:	Quincy	pinto	durango	5.53	0.22	0.16	2.00
## 3:	Centa Pupil	small red	jalisco	5.34	0.52	0.37	4.69
## 4:	TARS-VCI-4B	pinto	durango	5.16	1.32	0.93	11.84
## 5:	I9365-5	pink	jalisco	5.09	1.57	1.11	14.13

### *Raffinose (Raff)*

##	Entry	mktclass	race	Raff	sd	se	ci
## 1:	NE1-09-20	GN	durango	0.92	0.06	0.04	0.50
## 2:	CDC Crocus	GN	durango	0.85	0.05	0.04	0.47
## 3:	I9365-31	black	mesoamerican	0.85	0.25	0.18	2.24
## 4:	A-55	black	mesoamerican	0.79	0.06	0.04	0.56
## 5:	NE1-09-9	GN	durango	0.79	0.10	0.07	0.86

##	Entry	mktclass	race	Raff	sd	se	ci
## 1:	Sawtooth	GN	durango	0.30	0.11	0.08	0.96
## 2:	USRM-20	small red	jalisco	0.30	0.03	0.02	0.28
## 3:	Bill Z	pinto	durango	0.28	0.01	0.01	0.13
## 4:	Ind. Jamaica Red	red mottle	jalisco	0.28	0.07	0.05	0.60
## 5:	Apache	pinto	durango	0.27	0.01	0.01	0.07

### *Stachyose (Stach)*

##	Entry	mktclass	race	Stach	sd	se	ci
## 1:	ND021717	black	mesoamerican	5.16	1.86	1.31	16.69
## 2:	Centa Pupil	small red	jalisco	4.90	0.26	0.18	2.29
## 3:	Ind. Jamaica Red	red mottle	jalisco	4.89	0.43	0.31	3.90
## 4:	GN Star	GN	durango	4.78	0.17	0.12	1.57
## 5:	Inta Precoz	small red	jalisco	4.70	0.28	0.20	2.48

##	Entry	mktclass	race	Stach	sd	se	ci
## 1:	ND040494-4	pinto	durango	3.10	0.24	0.17	2.11
## 2:	NE1-09-9	GN	durango	3.07	0.32	0.23	2.86
## 3:	NE1-09-20	GN	durango	3.03	0.08	0.05	0.69
## 4:	T9905	navy	mesoamerican	3.00	0.10	0.07	0.93
## 5:	F07-449-9-3	small red	jalisco	2.99	0.18	0.13	1.61

*Verbascose (Verb)*

##	Entry	mktclass	race	Verb	sd	se	ci
## 1:	Ind. Jamaica Red	red mottle	jalisco	0.233	0.031	0.022	0.281
## 2:	Pink Floyd	pink	jalisco	0.233	0.002	0.001	0.017
## 3:	ROG 312	pink	jalisco	0.229	0.024	0.017	0.216
## 4:	ABC-Wei hing	GN	durango	0.201	0.016	0.011	0.143
## 5:	GN Star	GN	durango	0.201	0.002	0.002	0.020

##	Entry	mktclass	race	Verb	sd	se	ci
## 1:	NE1-09-22	GN	durango	0.038	0.001	0.001	0.012
## 2:	T9905	navy mesoamerican	0.037	0.011	0.008	0.096	
## 3:	A-55	black mesoamerican	0.036	0.035	0.025	0.317	
## 4:	GN9-4	GN	durango	0.033	0.032	0.022	0.284
## 5:	McHale	navy mesoamerican	0.021	0.006	0.004	0.050	

*Total Oligosachharides (TOligos) = Raff + Stach + Verb*

##	Entry	mktclass	race	TOligos	sd	se	ci
## 1:	ND021717	black mesoamerican	5.98	2.22	1.57	19.92	
## 2:	Centa Pupil	small red	jalisco	5.45	0.18	0.13	1.62
## 3:	Ind. Jamaica Red	red mottle	jalisco	5.40	0.47	0.33	4.22
## 4:	GN Star	GN	durango	5.39	0.23	0.16	2.04
## 5:	Inta Precoz	small red	jalisco	5.32	0.25	0.18	2.24

##	Entry	mktclass	race	TOligos	sd	se	ci
## 1:	Mariah	pinto	durango	3.60	0.30	0.21	2.67
## 2:	NE1-09-19	GN	durango	3.57	0.08	0.06	0.71
## 3:	ND040494-4	pinto	durango	3.55	0.14	0.10	1.24
## 4:	T9905	navy mesoamerican	3.53	0.12	0.09	1.08	
## 5:	F07-449-9-3	small red	jalisco	3.50	0.06	0.04	0.57

*Total Dietary Fiber (TDF) = IDF + SDF + Raff + Stach + Verb*

##	Entry	mktclass	race	TDF	sd	se	ci
## 1:	PR0443-151	black mesoamerican	30.23	1.22	0.87	11.00	
## 2:	IP08-2	pinto	durango	30.06	0.15	0.11	1.39
## 3:	ND021717	black mesoamerican	29.78	0.83	0.59	7.48	
## 4:	AC Resolute	GN	durango	29.45	1.57	1.11	14.08
## 5:	Max	pinto	durango	28.59	0.81	0.57	7.26

##	Entry	mktclass	race	TDF	sd	se	ci
## 1:	T9905	navy mesoamerican	23.59	0.93	0.66	8.39	
## 2:	Norstar	navy mesoamerican	23.43	0.31	0.22	2.77	
## 3:	BelMiNeb-RMR-7	navy mesoamerican	23.36	0.12	0.08	1.05	
## 4:	Topaz	pinto	durango	23.18	0.00	0.00	0.02
## 5:	AC Pintoba	pinto	durango	22.82	0.80	0.57	7.19

*Results: Marketclass*

mktclass	IDF
black	0.02077a

- *Boxplots*

Figures below depict fiber content by market class.

```
##Boxplots by Marketclass: Oligosaccharides
source('boxplot.mktclass.R')
plot_grid(p.Verb.mkt, p.Raff.mkt, p.Stach.mkt, p.TOligos.mkt, labels = c("A", "B", "C", "D"), 1
```

*Results: Race*

Race	IDF	Verb	Raff	Stach	TOligos	TDF
Durango	0.46a	0.46a	0.46a	0.46a	0.46a	0.46a
Jalisco	0.03b					
Mesoamerican	0.05a					

- *Boxplots*

Figures below depict fiber content by race.

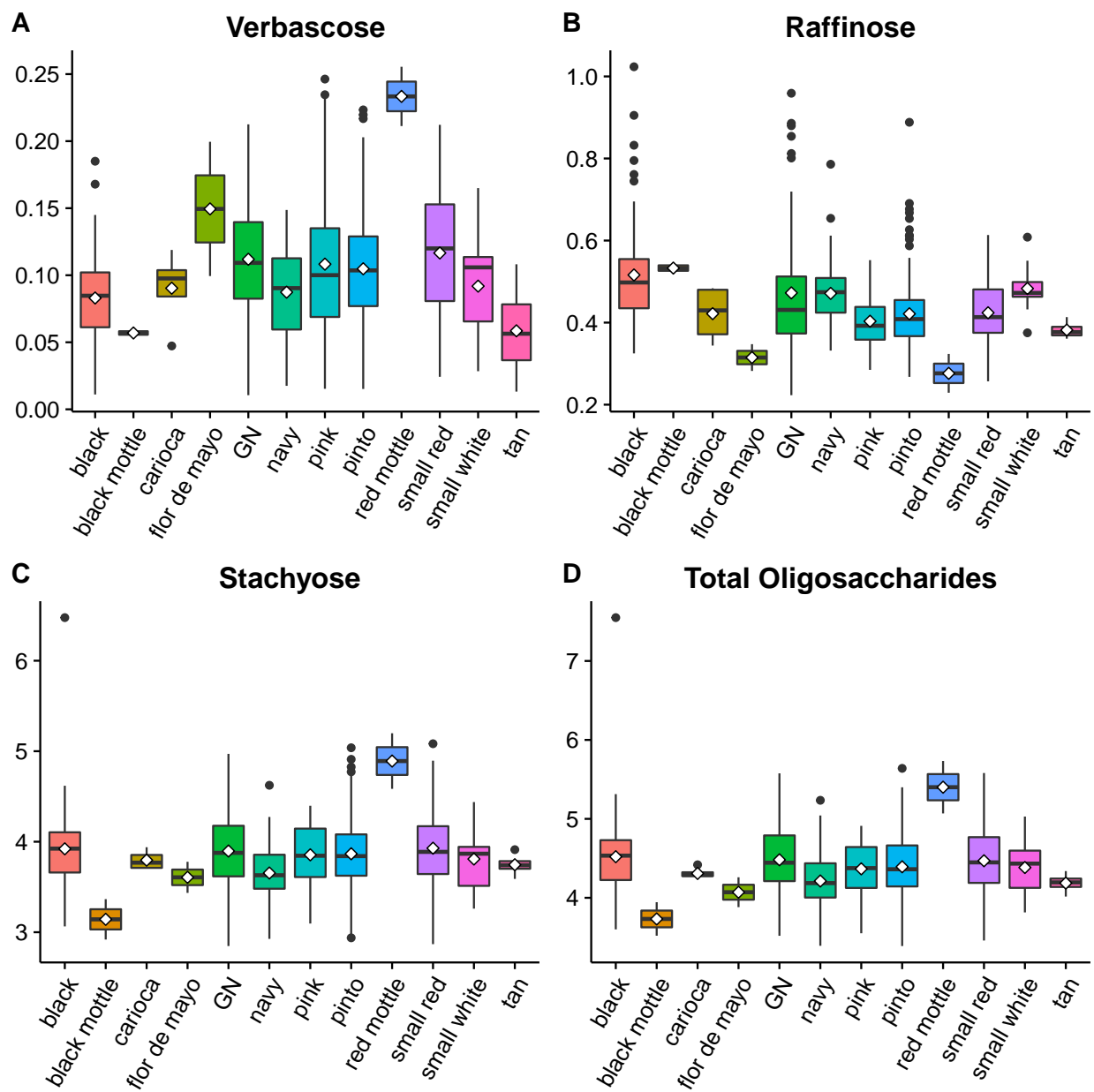


Figure 1: Oligosaccharide content in 282 common bean genotypes by marketclass (A) Raffinose, (B) Stachyose, (C) Verbascose, and (D) total oligosaccharides (= Raff + Stach + Verb).

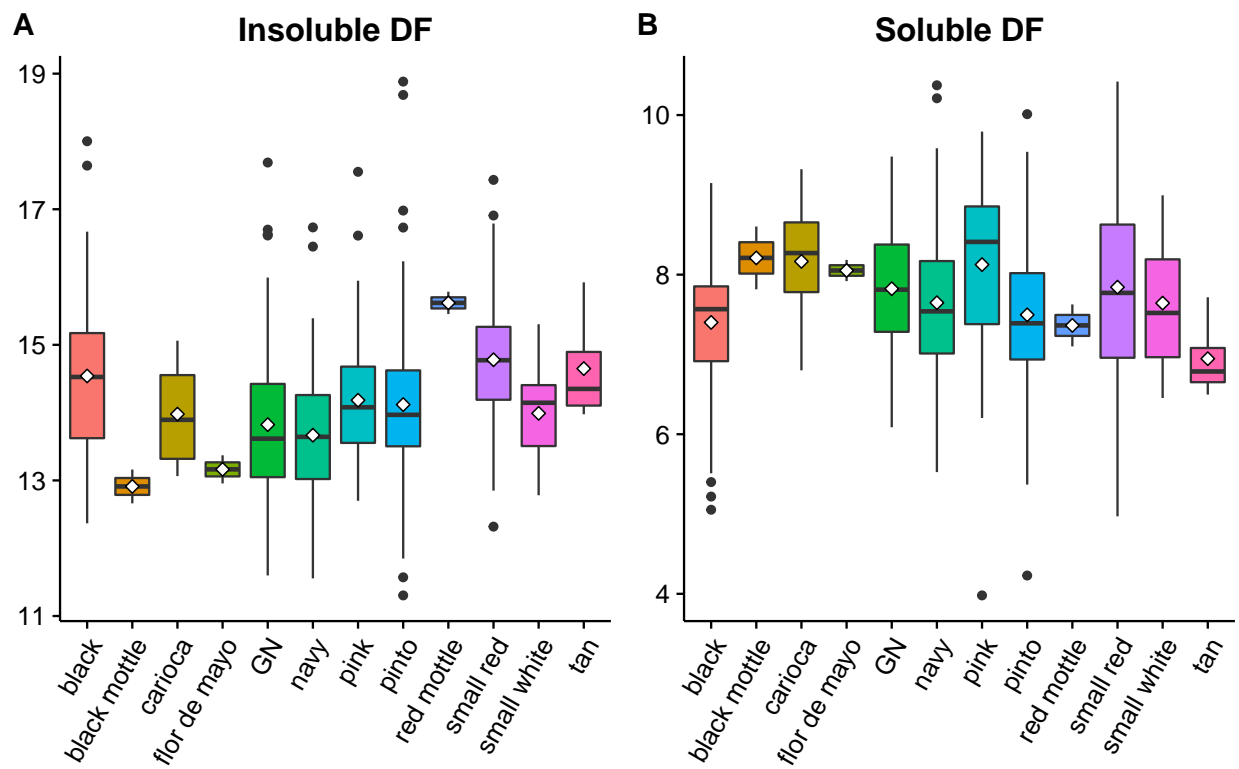


Figure 2: (A) Soluble and (B) insoluble dietary fiber in 282 common bean genotypes by market-class,

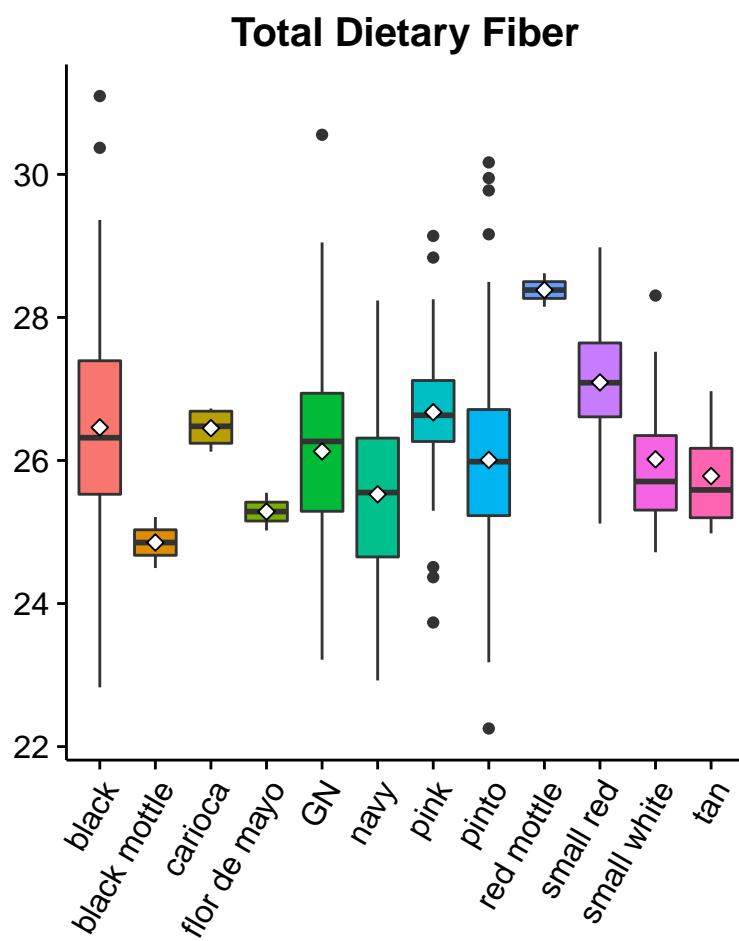


Figure 3: Total Dietary Fiber content in 282 common bean genotypes by marketclass



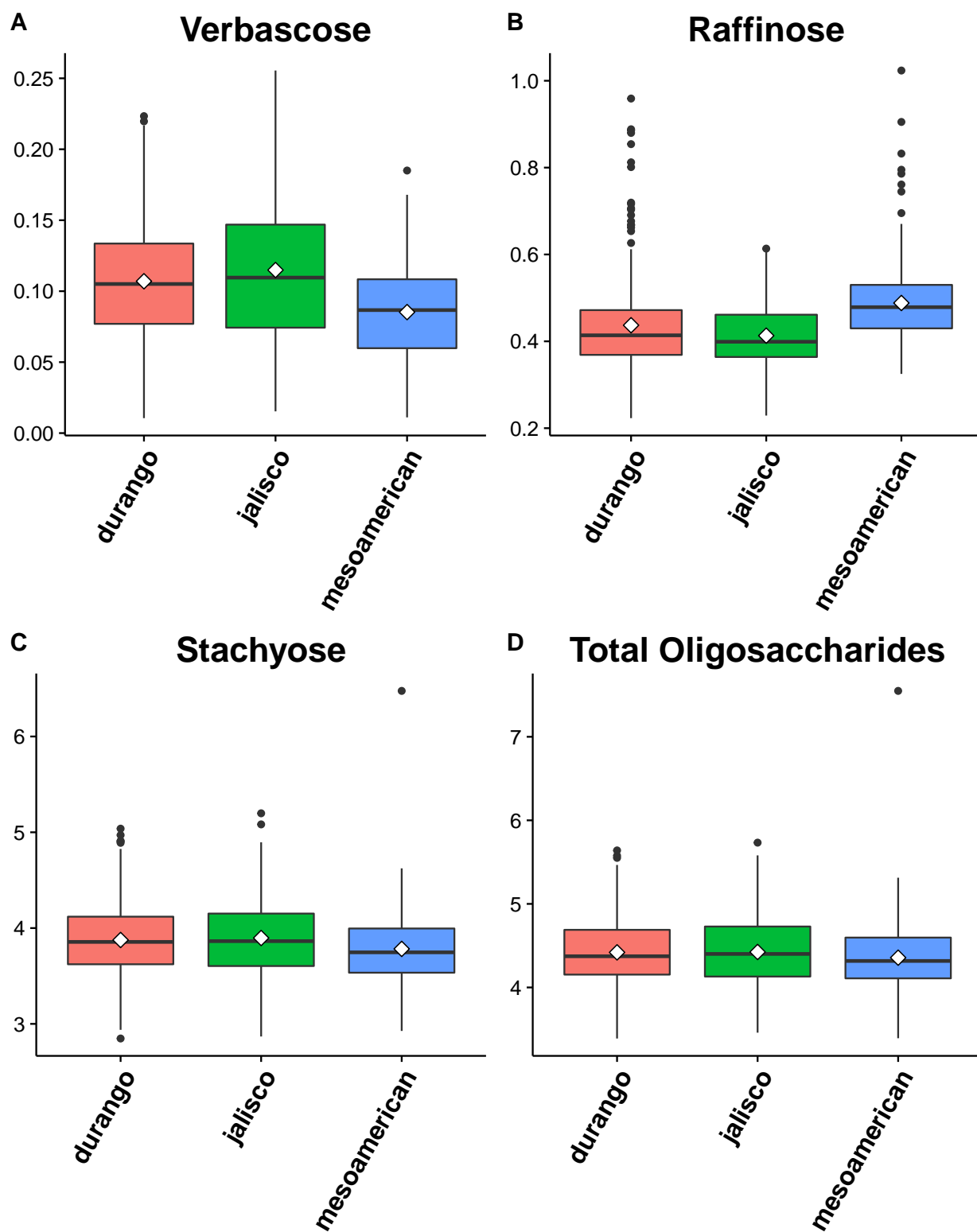


Figure 4: Oligosaccharide content in 282 common bean genotypes by race (A) Raffinose, (B) Stachyose, (C) Verbascose, and (D) total oligosaccharides (= Raff + Stach + Verb).

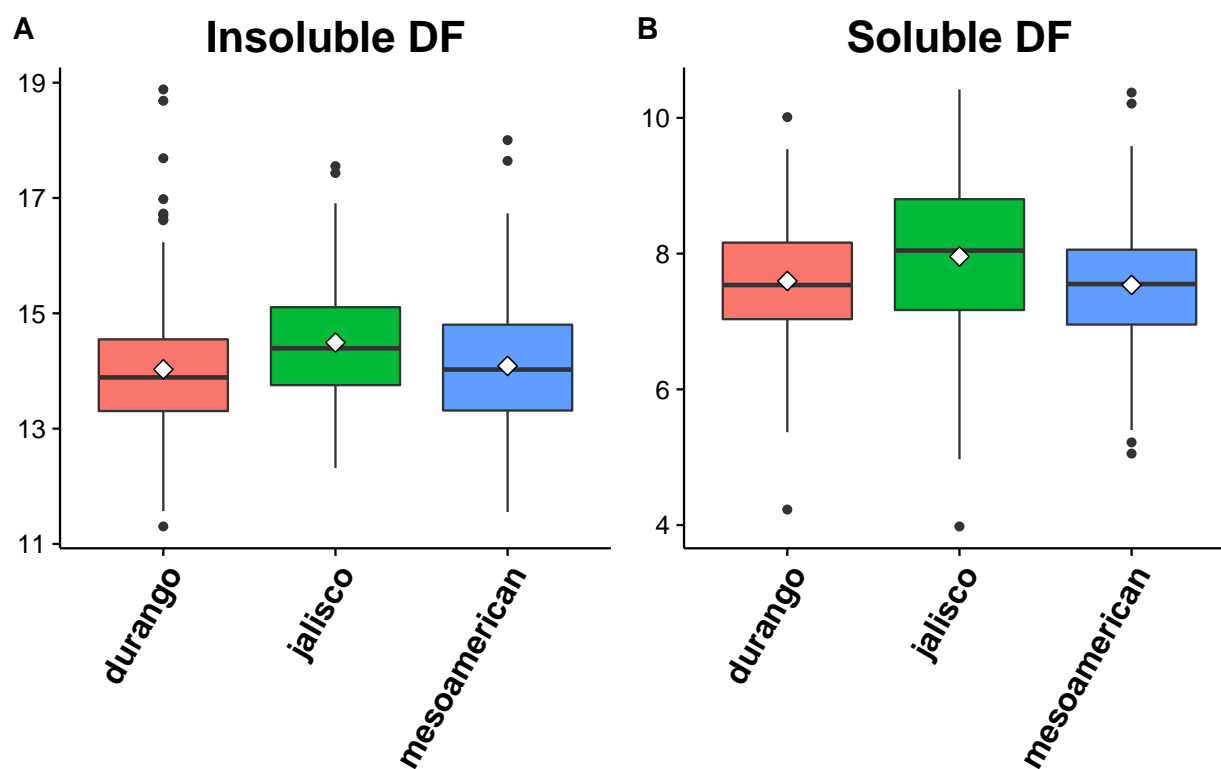


Figure 5: (A) Soluble and (B) insoluble dietary fiber in 282 common bean genotypes by race,

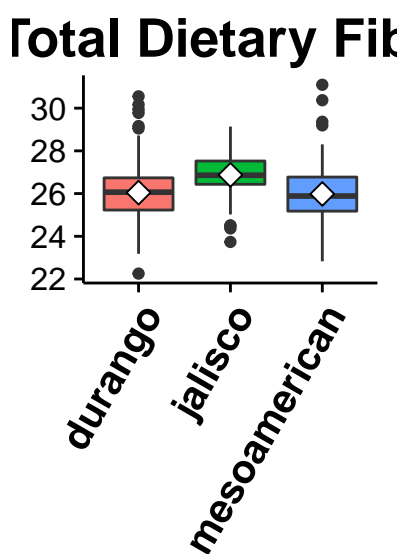


Figure 6: Total Dietary Fiber content in 282 common bean genotypes by race