

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

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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

Race	# Entries
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Table 1: Number of entries representing each race.

Market Class	# Entries
pinto	91
navy	45
black	41
GN	40
small red	30
pink	22
carioca	2
tan	2
black mottle	1
flor de mayo	1
red mottle	1

Table 2: Number of entries representing each market class.

Results: Entry Rankings

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
PR0443-151	black	mesoamerican	16.91	1.55	1.09	13.89
CDC Pinnacle	pinto	durango	16.73	2.76	1.95	24.80
CDC Jet	black	mesoamerican	16.71	1.32	0.94	11.90
TARS-VCI-4B	pinto	durango	16.46	3.43	2.42	30.79

Entry	mktclass	race	IDF	sd	se	ci
TARS09-RR007	small red	jalisco	16.42	0.51	0.36	4.59

Table 3: Five entries with greatest IDF content.

Entry	mktclass	race	IDF	sd	se	ci
BelMiNeb-RMR-4	navy	mesoamerican	12.34	0.11	0.08	0.97
BelMiNeb-RMR-8	navy	mesoamerican	12.05	0.38	0.27	3.43
BelMiNeb-RMR-7	navy	mesoamerican	11.77	0.31	0.22	2.77
BelMiNeb-RMR-3	GN	durango	11.75	0.22	0.15	1.97
AC Pintoba	pinto	durango	11.44	0.19	0.13	1.70

Table 4: Five entries with lowest IDF content.

- Soluble Dietary Fiber (SDF)

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

Table 5: Five entries with greatest SDF content.

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

Entry	mktclass	race	SDF	sd	se	ci
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Table 6: Five entries with lowest SDF content.

- Raffinose (Raff)

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

Table 7: Five entries with greatest raffinose content.

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

Table 8: Five entries with lowest raffinose content.

- Stachyose (Stach)

Entry	mktclass	race	Stach	sd	se	ci
ND021717	black	mesoamerican	5.16	1.86	1.31	16.69
Centa Pupil	small red	jalisco	4.90	0.26	0.18	2.29
Ind. Jamaica Red	red mottle	jalisco	4.89	0.43	0.31	3.90
GN Star	GN	durango	4.78	0.17	0.12	1.57

Entry	mktclass	race	Stach	sd	se	ci
Inta Precoz	small red	jalisco	4.70	0.28	0.20	2.48

Table 9: Five entries with greatest stachyose content.

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

Table 10: Five entries with lowest stachyose content.

- Verbascope (Verb)

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

Table 11: Five entries with greatest verbascope content.

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

Entry	mktclass	race	Verb	sd	se	ci
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Table 12: Five entries with lowest verbascose content.

- Total Oligosachharides (TOligos)

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

Table 13: Five entries with greatest total oligosaccharide (= Raff + Stach + Verb) content.

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

Table 14: Five entries with lowest total oligosaccharide (= Raff + Stach + Verb) content.

- Total Dietary Fiber (TDF)

Entry	mktclass	race	TDF	sd	se	ci
PR0443-151	black	mesoamerican	30.23	1.22	0.87	11.00
IP08-2	pinto	durango	30.06	0.15	0.11	1.39
ND021717	black	mesoamerican	29.78	0.83	0.59	7.48

Entry	mktclass	race	TDF	sd	se	ci
AC Resolute	GN	durango	29.45	1.57	1.11	14.08
Max	pinto	durango	28.59	0.81	0.57	7.26

Table 15: Five entries with greatest total DF (= IDF + SDF + Raff + Stach + Verb) content.

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

Table 16: Five entries with lowest total DF (= IDF + SDF + Raff + Stach + Verb) content.

Results: Marketclass

- Boxplots

Figures below depict fiber content by market class.

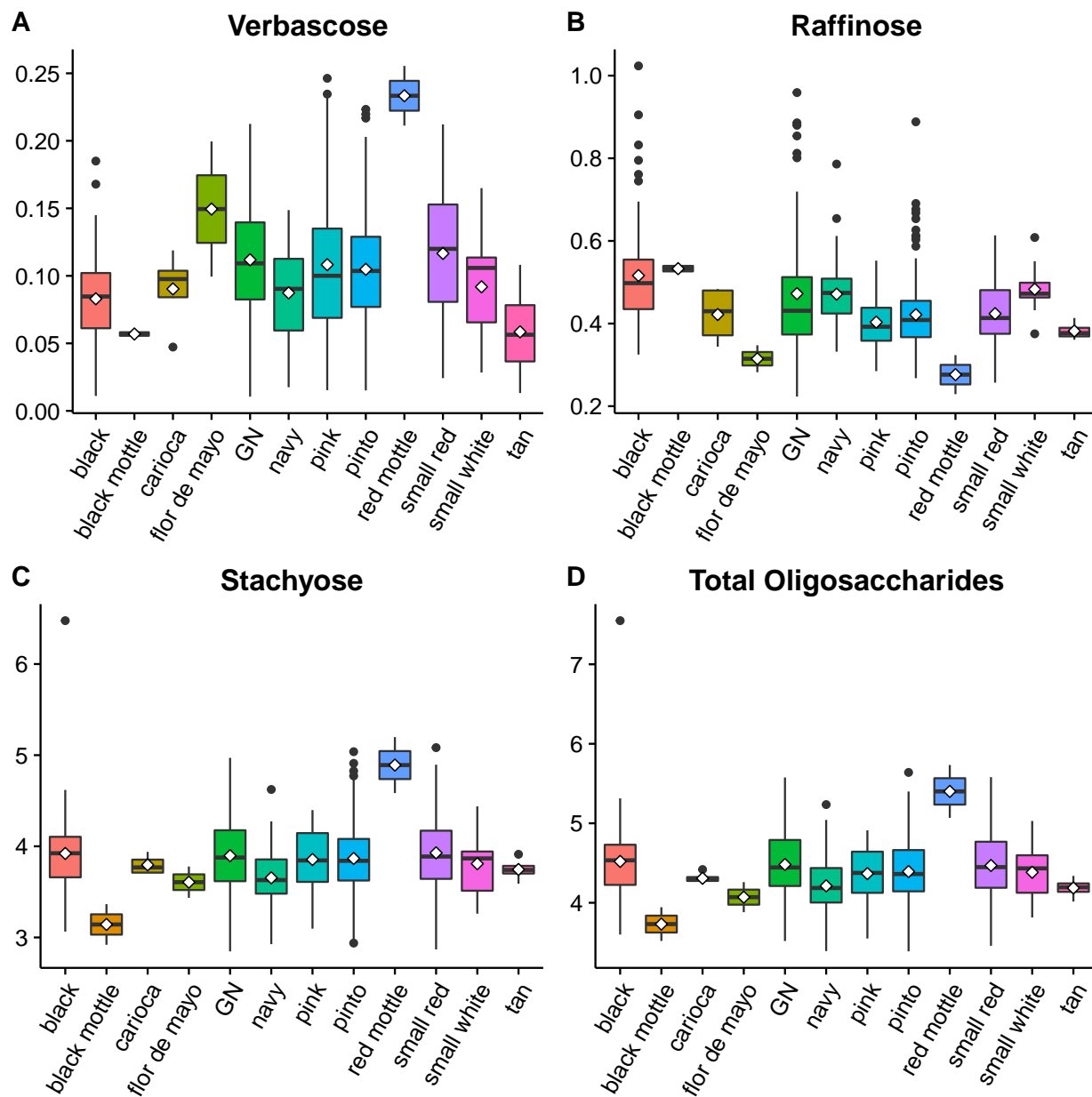


Figure 1: Oligosaccharide content in 282 common bean genotypes by marketclass (A) Raffinose, (B) Stachyose, (C) Verbascose, and (D) total oligosaccharides (= Raff + Stach + Verb).

Marketclass	Verbascose	Raffinose	Stachyose	Total Oligosaccharides
black	0.083 a	0.516 c	3.92 b	4.52 bc
black mottle	0.057 ab	0.533 bc	3.14 ab	3.73 ab
carioca	0.09 ab	0.422 bc	3.8 ab	4.31 abc
flor de mayo	0.149 abd	0.315 bc	3.61 ab	4.07 abc

Marketclass	Verbascose	Raffinose	Stachyose	Total Oligosaccharides
GN	0.112 b	0.472 ac	3.9 b	4.48 bc
navy	0.087 ac	0.471 ac	3.65 a	4.21 a
pink	0.108 bc	0.403 b	3.86 ab	4.37 ab
pinto	0.105 b	0.421 b	3.87 b	4.39 b
red mottle	0.233 d	0.276 ab	4.89 c	5.4 c
small red	0.117 b	0.424 ab	3.93 b	4.47 bc
small white	0.092 ab	0.483 bc	3.81 ab	4.38 abc
tan	0.059 ab	0.382 bc	3.75 ab	4.19 ab

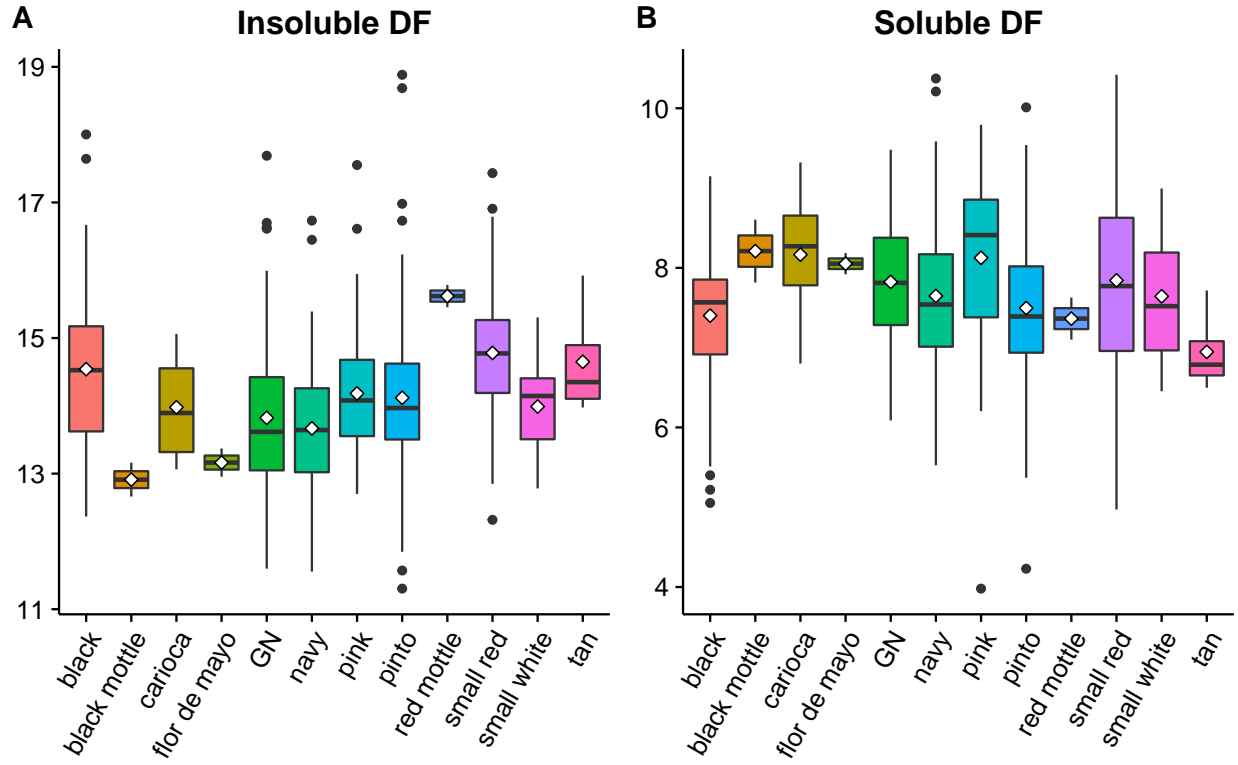


Figure 2: (A) Soluble and (B) insoluble dietary fiber in 282 common bean genotypes by marketclass,

Marketclass	Insoluble DF	Soluble DF
black	14.541 cd	7.401 b
black mottle	12.911 abc	8.21 ab

Marketclass	Insoluble DF	Soluble DF
carioca	13.978 abc	8.166 ab
flor de mayo	13.163 abc	8.052 ab
GN	13.823 ab	7.824 ab
navy	13.667 a	7.648 ab
pink	14.182 abc	8.126 a
pinto	14.119 bd	7.496 b
red mottle	15.619 abc	7.364 ab
small red	14.78 c	7.843 ab
small white	13.99 abc	7.643 ab
tan	14.649 abc	6.947 ab

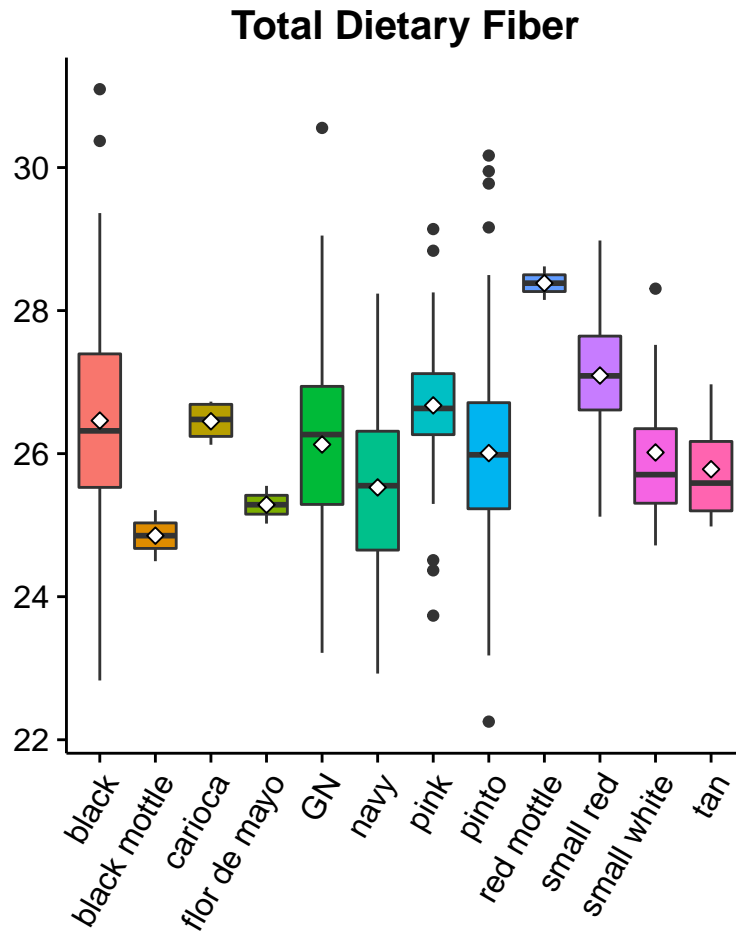


Figure 3: Total Dietary Fiber content in 282 common bean genotypes by marketclass

Marketclass	Total DF
black	26.462 bc
black mottle	24.853 abc
carioca	26.452 abc
flor de mayo	25.286 abc
GN	26.128 cd
navy	25.528 a
pink	26.675 bd
pinto	26.007 ac
red mottle	28.383 bc
small red	27.092 b
small white	26.017 abc
tan	25.782 abc

Results: Race

- Boxplots

Figures below depict fiber content by race.

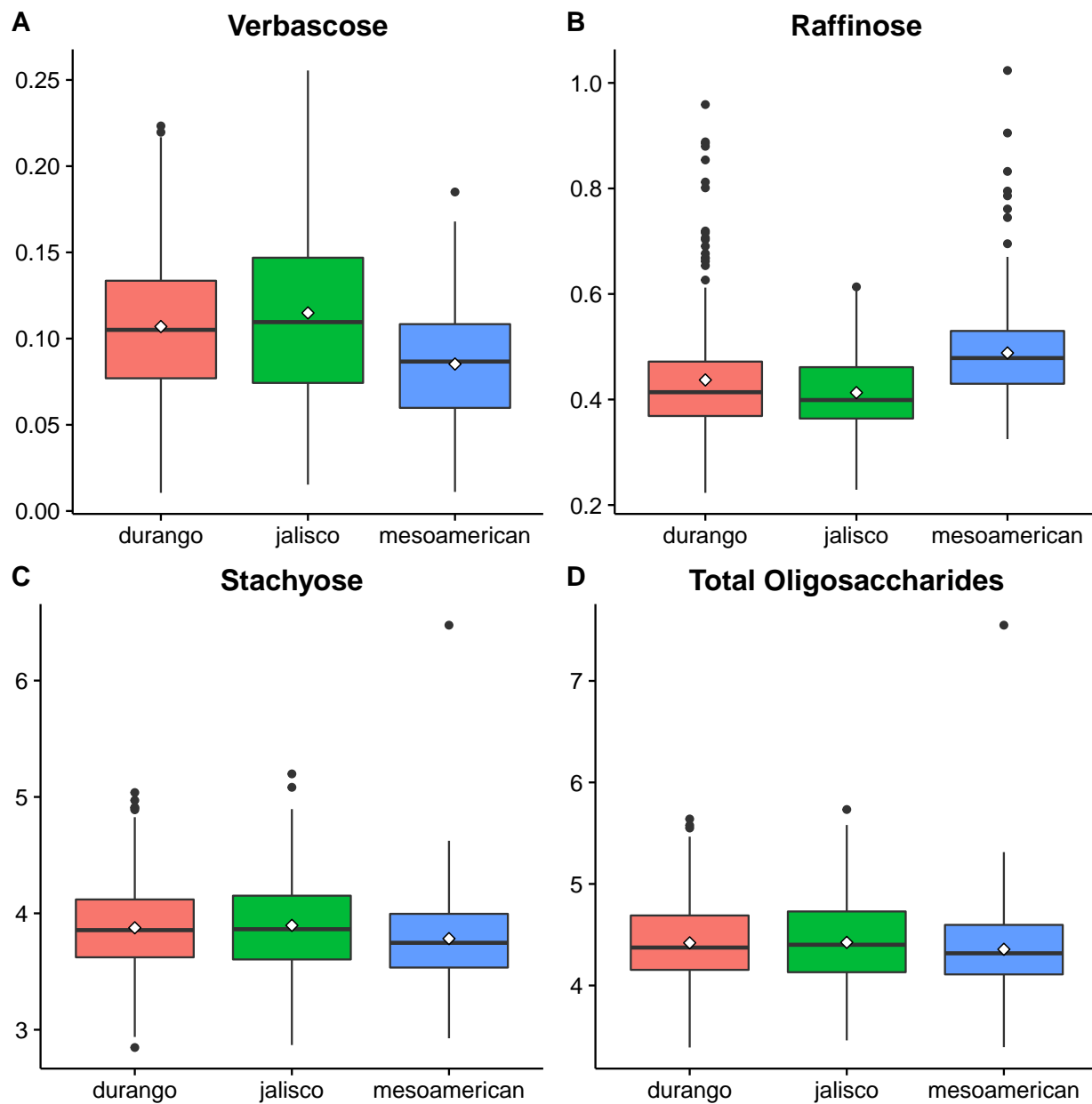


Figure 4: Oligosaccharide content in 282 common bean genotypes by race (A) Raffinose, (B) Stachyose, (C) Verbascode, and (D) total oligosaccharides (= Raff + Stach + Verb).

Race	Verbascode	Raffinose	Stachyose	Total Oligosaccharides
Durango	0.107 b	0.437 a	3.88 b	4.42 a
Jalisco	0.115 b	0.413 a	3.9 ab	4.42 a
Mesoamerican	0.085 a	0.488 b	3.78 a	4.36 a

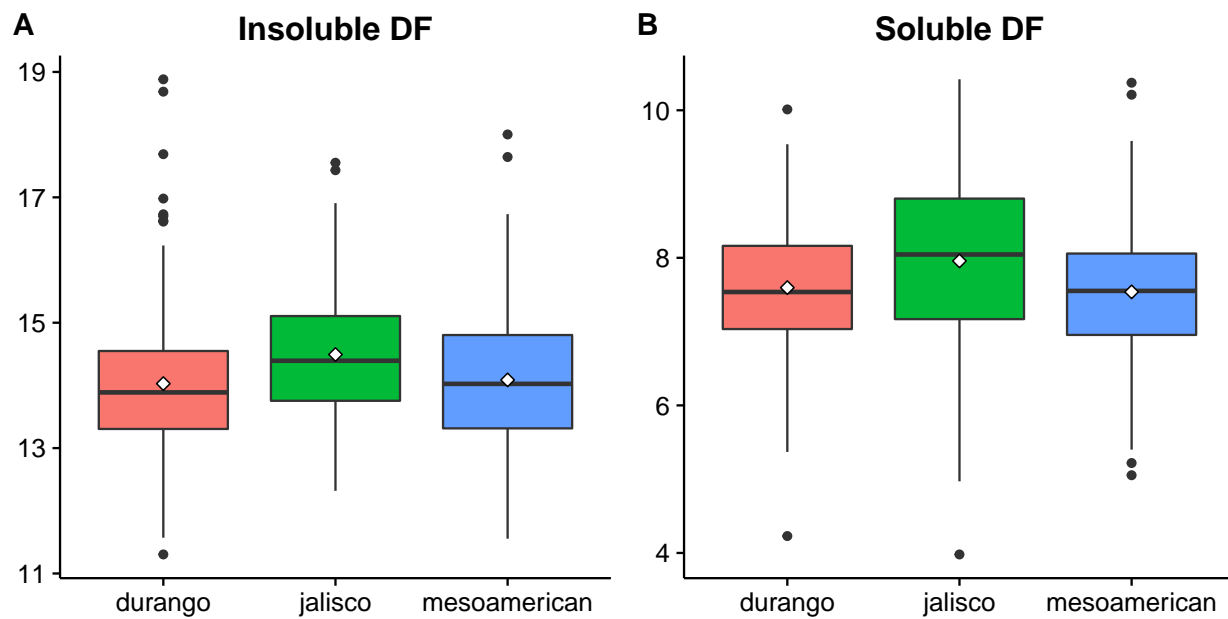


Figure 5: (A) Soluble and (B) insoluble dietary fiber in 282 common bean genotypes by race,

Race	Insoluble DF	Soluble DF
Durango	14.028 a	7.596 a
Jalisco	14.493 b	7.958 b
Mesoamerican	14.087 a	7.538 a

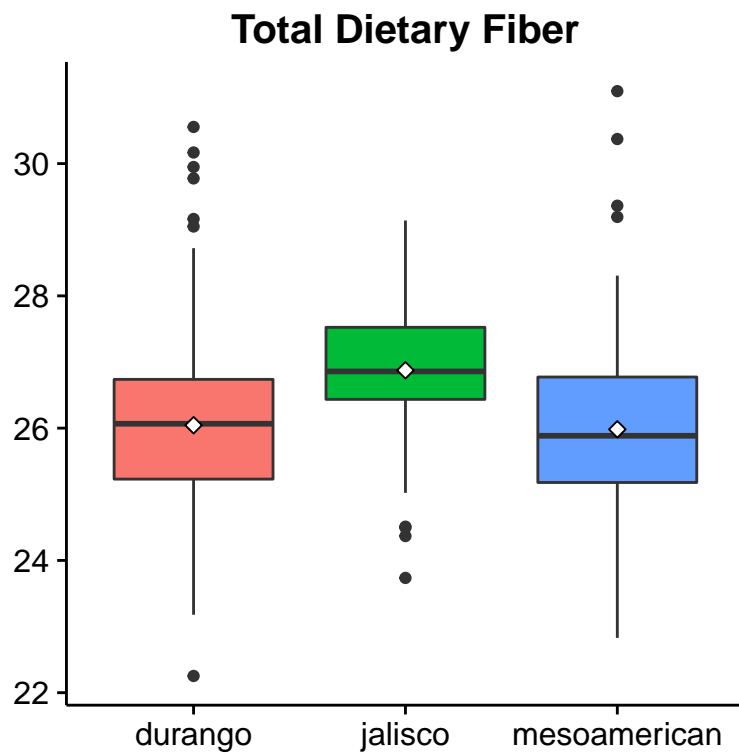


Figure 6: Total Dietary Fiber content in 282 common bean genotypes by race

Race	Total DF
Durango	26.044 a
Jalisco	26.875 b
Mesoamerican	25.982 a

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