

Supplementary material

Multivariate Analysis of Biochemical Properties Reveals Diversity among Yardlong beans of Different Origins

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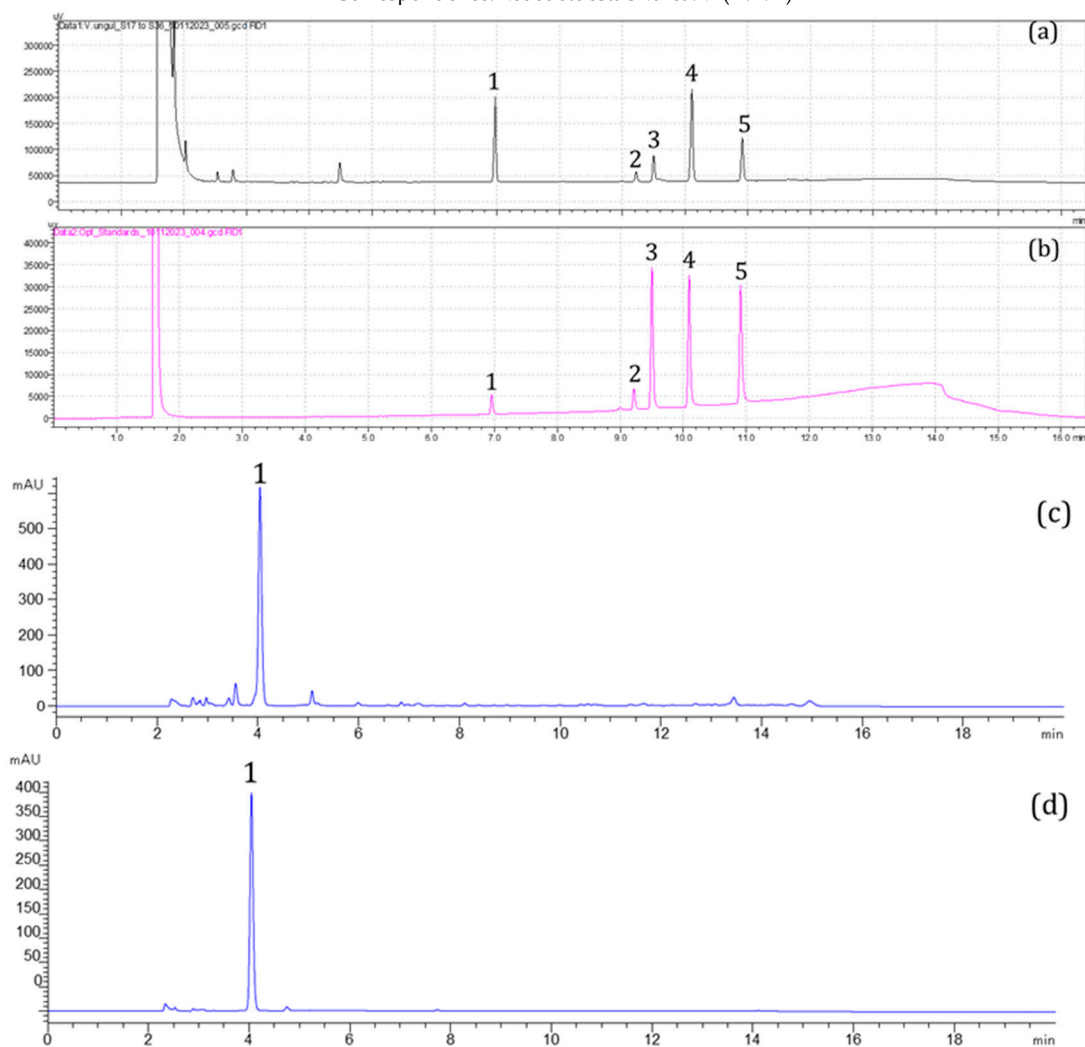


Figure S1. GC-chromatograms of a representative sample (a) and fatty acid standards (b), and LC-chromatograms of a representative sample (c) and L-ascorbic acid standard (d). Peak assignments: GC-chromatograms: Palmitic acid (1), Stearic acid (2), Oleic acid (3), Linoleic acid (4), Linolenic acid (5); LC: Chromatograms: Ascorbic acid (1).

Table S1. Frequencies and distribution of qualitative agronomical traits across 35 yardlong beans grown in Korea.

Variable	Categories	<i>f</i>	Rel. <i>f</i> (%)
Growth habit	Indeterminate	32	91.43
	Determinate	3	8.57
Flower color	Light purple	32	91.43
	White	3	8.57
Pod color	Pale tan	16	45.71
	Mixed	9	25.71
	Dark brown	7	20.00
	Light brown	3	8.57
Pod curvature	Mixed	14	40.00
	Coiled	18	51.43
	Curved	1	2.86
	Slightly curved	2	5.71
Pod pubescence	No hair	35	100.00
Seed shape	Kidney shaped	35	100.00
Seed coat color	Black	3	8.57
	Brown	25	71.43
	Other	6	17.14
	Tan	1	2.86
Seed coat lust	Dull	35	100.00
Hilum color	Eye absent	35	100.00

Table S2. Statistics of quantitative agronomical traits across 35 yardlong beans grown in Korea.

Name	Introduction/temporary Number	Origin	DF (Days)	DFM (Days)	DM (Days)	PL (cm)	SPP (n)	HSW (g)
San chi lu	217325	China	48	25	73	71.40 a	16.00 a-f	18.00 ef
901 Qingjo jiangdou	250133	China	53	19	72	59.60 b-g	14.40 b-i	14.37 mn
Qing jiang 2006	260948	China	54	18	72	65.60 ab	17.20 a-e	14.13 n
Gaotian jinguan	302034	China	54	18	72	61.00 b-f	13.80 d-i	14.53 m
Gyeonggiyonginsujib	K035303	Korea	56	21	77	43.20 lmn	16.00 a-f	16.63 j
Gangwonpyeongchang-2003-4	K037279	Korea	56	17	73	46.40 j-m	16.40 a-f	17.07 i
Gangwonpyeongchang-2003-17	K037292	Korea	57	16	73	42.80 lmn	19.00 a	17.73 fg
Hang xin taikong wu jia dou	K052084	China	47	24	71	32.10 op	15.00 a-i	14.37 mn
Techang 908 jiangdou	K052086	China	54	18	72	57.40 c-g	17.40 a-d	13.13 p
Taiwan chungju hong	K052109	China	56	28	84	52.80 g-k	15.40 a-h	17.63 gh
Techang 902 jiangdou	K052119	China	50	22	72	58.20 c-g	18.20 abc	16.03 k
Tai Htaung Pe Ni	K127002	Myanmar	57	27	84	54.40 f-i	15.20 a-h	18.93 b
THA-JSH-2008-81021	K146060	Thailand	59	29	88	49.60 h-l	15.80 a-g	22.23 a
Tanjingeun	K161964	Korea	53	21	74	30.60 p	13.00 f-i	8.10 s
Jasaekginggori	K162054	Korea	57	17	74	47.40 i-m	18.00 abc	16.27 k
Gatggeungong	K163690	Korea	57	17	74	46.00 klm	18.00 abc	17.37 hi
MMR-JYH-2010-90	K166990	Myanmar	59	28	87	59.80 b-g	11.60 hi	15.27 l
Sung 99	K168155	Myanmar	54	15	69	37.40 no	14.40 b-i	12.90 pq
Guamian hong jiangdou	K170009	China	57	22	79	53.40 g-j	14.20 c-i	18.13 de
Qiu jiang 512	K170010	China	50	24	74	43.20 lmn	13.20 e-i	19.17 b
Chungbuk Geosan 2011-18	K171518	Korea	56	18	74	43.40 lmn	12.00 ghi	16.13 k
Chungbuk Geosan 2011-245	K171745	Korea	56	18	74	42.20 lmn	16.20 a-f	16.67 j
901 Zaoshu jiangdou	K176603	China	54	19	73	63.80 bcd	17.60 a-d	14.17 n

Techang jinqili	K223095	China	50	22	72	57.40 c-g	17.20 a-e	13.53 o
Nan 1 Variety	K243771	Thailand	56	23	79	55.20 e-h	11.20 i	18.47 c
Hei mei 1	K251318	China	54	18	72	62.00 b-e	16.80 a-f	14.33 mn
Chunqiu hong jiangdou	K251346	China	57	22	79	55.40 e-h	14.60 b-i	18.33 cd
Man di hong wu jia dou	K251347	China	54	17	71	23.80 q	16.20 a-f	12.23 r
Tichun zhi jiang28-2	K251348	China	50	21	71	57.00 d-g	16.80 a-f	17.27 i
Te xuan zhang tang wang	K251349	China	54	18	72	57.70 c-g	18.40 ab	17.77 fg
Hei mei huang zi wang	K253775	China	50	27	77	64.60 bc	18.20 abc	13.53 o
Yard long Bean 287/2556	K253844	Thailand	54	25	79	28.60 pq	17.00 a-f	12.67 q
SD 3135	K255113	Korea	59	22	81	42.60 lmn	16.20 a-f	17.80 fg
KSL 170256	K267332	Korea	57	20	77	42.00 mn	16.20 a-f	17.17 i
Gyeongnamhabcheon-2019-2	K272494	Korea	59	23	82	48.00 i-m	15.40 a-h	13.07 p
Range (Min- Max)			47.00-59.00	15.00-29.00	69.00-88.00	23.80-71.40	11.20-19.00	8.10-22.23
Mean			54.51	21.11	75.63	50.17	15.78	15.86
CV (%)			5.76	17.78	6.32	22.21	12.38	16.50

DF: Days to flowering, DFM: Days from flowering to maturity, DM: Days to maturity, HSW: One hundred seeds weight, PL: Pod length, SPP: seeds per pod. Different letters in a column represent significantly different mean values ($p < 0.05$).

Table S3. Factor loadings and contribution of variables to the variance observed among the yardlong bean accessions in the principal component analysis

Variable	PC1		PC2		PC3		PC4		PC5		PC6		PC7	
	FL	%	FL	%	FL	%	FL	%	FL	%	FL	%	FL	%
DF	0.58	4.21	-0.52	6.69	0.09	0.30	-0.08	0.24	0.02	0.01	0.31	8.36	-0.36	12.97
DFM	0.36	1.65	0.24	1.40	0.10	0.33	-0.40	6.34	0.60	17.20	0.18	2.77	0.27	7.22
DM	0.66	5.55	-0.16	0.59	0.14	0.65	-0.36	5.30	0.48	11.10	0.34	10.27	-0.03	0.06
PL	-0.36	1.59	0.18	0.77	0.51	8.70	0.09	0.35	0.57	15.65	0.05	0.24	-0.13	1.68
SPP	-0.32	1.28	0.15	0.53	0.32	3.57	0.24	2.35	-0.37	6.59	0.33	9.65	0.04	0.19
HSW	0.25	0.77	-0.10	0.26	0.72	17.76	-0.51	10.66	0.06	0.19	-0.22	4.07	0.04	0.14
TP	0.48	2.89	-0.30	2.24	0.40	5.40	-0.07	0.22	0.38	6.93	-0.25	5.63	0.37	13.32
TF	-0.16	0.33	0.62	9.20	0.37	4.61	0.01	0.00	-0.09	0.39	0.08	0.52	-0.17	2.90
CFC	0.02	0.01	0.24	1.38	-0.42	5.96	0.62	15.87	0.53	13.59	0.02	0.03	-0.02	0.05
DFC	0.25	0.79	0.15	0.57	-0.24	1.88	0.60	14.71	0.16	1.29	-0.09	0.66	0.54	29.42
Vit C	0.02	0.01	-0.21	1.04	0.05	0.09	-0.10	0.38	-0.37	6.36	0.67	39.53	0.47	21.47
TPC	0.63	5.04	0.66	10.71	-0.07	0.17	0.05	0.12	-0.08	0.27	0.16	2.26	0.03	0.07
DPPH	0.73	6.73	0.54	7.08	0.17	0.97	0.11	0.46	-0.25	3.06	-0.05	0.19	-0.03	0.10
ABTS	0.81	8.30	0.47	5.37	-0.01	0.01	-0.03	0.04	-0.18	1.61	0.05	0.22	-0.03	0.07
RP	0.82	8.46	0.47	5.42	0.08	0.21	0.03	0.03	-0.25	3.02	0.00	0.00	0.02	0.03
TTC	0.85	9.03	0.25	1.51	0.30	3.08	-0.11	0.48	0.12	0.67	0.02	0.05	-0.04	0.17
TSC	0.75	7.06	0.36	3.09	0.01	0.01	0.09	0.31	-0.19	1.64	-0.29	7.27	0.08	0.71
PA	0.64	5.22	-0.64	9.97	0.21	1.43	0.17	1.18	-0.21	2.15	-0.12	1.23	0.03	0.10
SA	-0.49	3.03	0.01	0.00	0.33	3.61	0.61	14.91	0.30	4.36	0.25	5.56	-0.11	1.12
OA	-0.79	7.87	0.50	6.01	0.26	2.29	-0.17	1.16	-0.04	0.10	-0.04	0.12	0.10	0.92
LA	0.82	8.42	0.17	0.67	-0.22	1.71	0.24	2.29	0.19	1.70	0.09	0.78	-0.22	4.90
LLA	0.00	0.00	-0.40	3.87	-0.68	15.46	-0.46	8.57	-0.01	0.01	-0.01	0.01	0.09	0.78
TSFA	0.48	2.91	-0.66	10.61	0.34	3.87	0.41	6.77	-0.10	0.52	-0.03	0.06	-0.01	0.01
TUFA	-0.48	2.91	0.66	10.61	-0.34	3.87	-0.41	6.77	0.10	0.52	0.03	0.06	0.01	0.01

PUFA	0.69	5.96	-0.13	0.41	-0.65	14.09	-0.11	0.50	0.15	1.07	0.07	0.46	-0.13	1.59
Eigenvalue	7.92		4.12		2.96		2.46		2.10		1.15		1.01	
Variability (%)	31.66		16.48		11.83		9.85		8.40		4.59		4.03	
Cumulative (%)	31.66		48.14		59.97		69.82		78.22		82.81		86.84	

ABTS: ABTS^{•+} scavenging activity, C: Cultivar, CFC: crude fiber content, CHN, China, DF: Days to flowering, DFC: Dietary fiber content, DFM: Days from flowering to maturity, DM: Days to maturity, DPPH: DPPH[•] scavenging activity, HSW: One-hundred seeds weight, KOR: Korea, L: Landrace, LA: Linoleic acid, LLA: Linolenic acid, MMR: Myanmar, OA: Oleic acid, PA: Palmitic acid, PL: Pod length, PUAF: Total polyunsaturated fatty acid, RP: Reducing power, SA: Stearic acid, SPP; number of seeds per pod, TF: Total fat, THA: Thailand, TP: Total protein, TSFA: Total saturated fatty acid, TUFA: Total unsaturated fatty acid, TPC: Total phenolic content, TSC: Total saponin content, TTC: Total tannin content, Vit C: Vitamin C.