GWAS identifies SNP markers and candidate genes for off-flavors and seed quality in faba bean (*Vicia Faba* L.)

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This supplementary material (tables) file totalling five pages contains four supplementary tables, Supplementary Tables S1, S2, S3 and S6. Please note that Supplementary Tables S4 and S5 are provided in other file.

Supplementary Table S1: SNPs distribution and coverage along the six faba bean chromosomes.

Chromosome	Total SNPs [a]	Covered distance (Mbp)[b]	Average density (SNPs/Mbp)	Max gap (Mbp)[c]
chr1L	8050	1801,79	4,47	31,2
chr1S	5176	1568,29	3,3	28,31
chr2	7783	1716,59	4,53	22,08
chr3	7172	1637,24	4,38	44,14
chr4	6285	1643,87	3,82	60,05
chr5	5600	1364,87	4,1	69,9
chr6	5783	1519,9	3,8	85,56
conting	2596	-	-	-

[a] 48,445 SNPs selected for GWAS.

[b] physical distance between the first and last SNP marker on the same chromosome in Megabase pair (Mbp).

[c] maximum physical distance existing between two neighbouring SNP markers in Megabase pair (Mbp).

Supplementary Table S2: Type-A additive genetic correlation and their approximated standard error estimated in 2021.

	Oil	C18:1	C18:2	C18:3	Protein	Catechin	Epicatechin	Procyanidin B1	Procyanidin B2	Hexanal	p-coumaric acid	Caffeic acid	Myricetin	Quercetin
Oil	1	0.77 (0.05)	-0.48 (0.09)	-0.76 (0.05)	-0.28 (0.14)	0.29 (0.1)	-0.02 (0.1)	0.19 (0.1)	0.07 (0.1)	-0.09 (0.17)	-0.09 (0.14)	0.07 (0.14)	0.08 (0.14)	-0.08 (0.13)
C18:1	0.77 (0.05)	1	-0.68 (0.06)	-0.87 (0.03)	-0.19 (0.12)	0.54 (0.08)	0.23 (0.09)	0.45 (0.08)	0.25 (0.09)	-0.29 (0.15)	0 (0.13)	0.12 (0.12)	0.21 (0.13)	0.17 (0.12)
C18:2	-0.48 (0.09)	-0.68 (0.06)	1	0.36 (0.1)	0.37 (0.13)	-0.27 (0.11)	-0.14 (0.11)	-0.29 (0.1)	-0.13 (0.11)	0.39 (0.17)	-0.04 (0.15)	-0.13 (0.15)	0.01 (0.15)	0.01 (0.13)
C18:3	-0.76 (0.05)	-0.87 (0.03)	0.36 (0.1)	1	0.25 (0.12)	-0.55 (0.07)	-0.2 (0.09)	-0.44 (0.08)	-0.23 (0.09)	0.1 (0.16)	-0.01 (0.13)	-0.09 (0.12)	-0.05 (0.13)	-0.01 (0.12)
Protein	-0.28 (0.14)	-0.19 (0.12)	0.37 (0.13)	0.25 (0.12)	1	-0.14 (0.14)	-0.16 (0.13)	-0.24 (0.12)	0.02 (0.13)	-0.29 (0.19)	-0.07 (0.18)	-0.12 (0.17)	0.12 (0.17)	0.14 (0.16)
Catechin	0.29 (0.1)	0.54 (0.08)	-0.27 (0.11)	-0.55 (0.07)	-0.14 (0.14)	1	0.65 (0.06)	0.92 (0.02)	0.66 (0.06)	-0.37 (0.15)	-0.2 (0.13)	-0.05 (0.13)	0.21 (0.13)	0.15 (0.12)
Epicatechin	-0.02 (0.1)	0.23 (0.09)	-0.14 (0.11)	-0.2 (0.09)	-0.16 (0.13)	0.65 (0.06)	1	0.84 (0.03)	0.92 (0.02)	-0.2 (0.15)	0.1 (0.12)	0.29 (0.11)	0.24 (0.12)	0.2 (0.11)
Procyanidin B1	0.19 (0.1)	0.45 (0.08)	-0.29 (0.1)	-0.44 (0.08)	-0.24 (0.12)	0.92 (0.02)	0.84 (0.03)	1	0.8 (0.04)	-0.36 (0.14)	-0.06 (0.12)	0.15 (0.12)	0.2 (0.11)	0.12 (0.11)
Procyanidin B2	0.07 (0.1)	0.25 (0.09)	-0.13 (0.11)	-0.23 (0.09)	0.02 (0.13)	0.66 (0.06)	0.92 (0.02)	0.8 (0.04)	1	-0.25 (0.14)	0.07 (0.12)	0.29 (0.11)	0.25 (0.12)	0.25 (0.11)
Hexanal	-0.09 (0.17)	-0.29 (0.15)	0.39 (0.17)	0.1 (0.16)	-0.29 (0.19)	-0.37 (0.15)	-0.2 (0.15)	-0.36 (0.14)	-0.25 (0.14)	1	0.05 (0.17)	-0.07 (0.16)	-0.05 (0.17)	-0.27 (0.15)
p-coumaric acid	-0.09 (0.14)	0 (0.13)	-0.04 (0.15)	-0.01 (0.13)	-0.07 (0.18)	-0.2 (0.13)	0.1 (0.12)	-0.06 (0.12)	0.07 (0.12)	0.05 (0.17)	1	0.36 (0.11)	-0.13 (0.14)	0.08 (0.12)
Caffeic acid	0.07 (0.14)	0.12 (0.12)	-0.13 (0.15)	-0.09 (0.12)	-0.12 (0.17)	-0.05 (0.13)	0.29 (0.11)	0.15 (0.12)	0.29 (0.11)	-0.07 (0.16)	0.36 (0.11)	1	0.09 (0.14)	0.04 (0.12)
Myricetin	0.08 (0.14)	0.21 (0.13)	0.01 (0.15)	-0.05 (0.13)	0.12 (0.17)	0.21 (0.13)	0.24 (0.12)	0.2 (0.11)	0.25 (0.12)	-0.05 (0.17)	-0.13 (0.14)	0.09 (0.14)	1	0.71 (0.14)
Quercetin	-0.08 (0.13)	0.17 (0.12)	0.01 (0.13)	-0.01 (0.12)	0.14 (0.16)	0.15 (0.12)	0.2 (0.11)	0.12 (0.11)	0.25 (0.11)	-0.27 (0.15)	0.08 (0.12)	0.04 (0.12)	0.71 (0.14)	1

Supplementary Table S3: Type-A additive genetic correlation and their approximated standard error estimated in 2022.

	Oil	C18:1	C18:2	C18:3	Protein	Catechin	Epicatechin	Procyanidin B1	Procyanidin B2	p-coumaric acid	Caffeic acid	Myricetin	Quercetin	1-Linoleoyl glycerol	OHOA	Convicine
Oil	1	0.74 (0.04)	-0.35 (0.09)	-0.66 (0.05)	-0.22 (0.09)	-0.09 (0.09)	0.04 (0.08)	-0.03 (0.09)	-0.04 (0.09)	0.21 (0.15)	-0.1 (0.14)	0.13 (0.12)	0.32 (0.26)	0.05 (0.2)	0.21 (0.15)	0.02 (0.14)
C18:1	0.74 (0.04)	1	-0.47 (0.07)	-0.8 (0.03)	-0.1 (0.1)	0.08 (0.09)	0.3 (0.08)	0.16 (0.08)	0.19 (0.08)	0.17 (0.14)	-0.05 (0.14)	0.11 (0.12)	0.38 (0.22)	-0.05 (0.19)	0.12 (0.14)	-0.31 (0.13)
C18:2	-0.35 (0.09)	-0.47 (0.07)	1	0.06 (0.1)	0.39 (0.09)	-0.27 (0.09)	-0.34 (0.08)	-0.4 (0.08)	-0.39 (0.08)	-0.15 (0.14)	0.12 (0.14)	-0.07 (0.12)	-0.57 (0.38)	0.07 (0.2)	-0.05 (0.15)	0.24 (0.15)
C18:3	-0.66 (0.05)	-0.8 (0.03)	0.06 (0.1)	1	0.21 (0.09)	-0.15 (0.08)	-0.24 (0.08)	-0.18 (0.08)	-0.19 (0.08)	-0.03 (0.14)	-0.09 (0.14)	0.02 (0.12)	-0.17 (0.21)	0.18 (0.17)	0.04 (0.14)	0.25 (0.13)
Protein	-0.22 (0.09)	0.1	0.39 (0.09)	0.21 (0.09)	1	-0.51 (0.07)	-0.46 (0.07)	-0.56 (0.06)	-0.46 (0.07)	-0.13 (0.16)	-0.23 (0.15)	-0.18 (0.13)	-0.75 (0.36)	0.12 (0.2)	0.29 (0.16)	0.19 (0.15)
Catechin	-0.09 (0.09)	0.08 (0.09)	-0.27 (0.09)	-0.15 (0.08)	-0.51 (0.07)	1	0.69 (0.04)	0.94 (0.01)	0.93 (0.01)	-0.22 (0.12)	0.02 (0.13)	0.14 (0.11)	0.5 (0.22)	-0.35 (0.15)	-0.15 (0.13)	-0.28 (0.12)
Epicatechin	0.04 (0.08)	0.3 (0.08)	-0.34 (0.08)	-0.24 (0.08)	-0.46 (0.07)	0.69 (0.04)	1	0.77 (0.03)	0.83 (0.02)	-0.1 (0.11)	0.21 (0.11)	0.18 (0.1)	0.72 (0.36)	-0.16 (0.15)	-0.12 (0.12)	-0.3 (0.11)
Procyanidin B1	-0.03 (0.09)	0.16 (0.08)	-0.4 (0.08)	-0.18 (0.08)	-0.56 (0.06)	0.94 (0.01)	0.77 (0.03)	1	0.98 (0)	-0.17 (0.12)	0.03 (0.12)	0.21 (0.1)	0.62 (0.29)	-0.32 (0.16)	-0.14 (0.12)	-0.3 (0.12)
Procyanidin B2	-0.04 (0.09)	0.19 (0.08)	-0.39 (0.08)	-0.19 (0.08)	-0.46 (0.07)	0.93 (0.01)	0.83 (0.02)	0.98 (0.02)	1	-0.2 (0.12)	0.03 (0.12)	0.2 (0.1)	0.59 (0.28)	-0.35 (0.16)	-0.12 (0.12)	-0.37 (0.12)
p-coumaric acid	0.21 (0.15)	0.17 (0.14)	-0.15 (0.14)	-0.03 (0.14)	-0.13 (0.16)	-0.22 (0.12)	-0.1 (0.11)	-0.17 (0.12)	-0.2 (0.12)	1	0.29 (0.17)	0.07 (0.13)	0.54 (0.33)	-0.16 (0.24)	-0.37 (0.16)	-0.02 (0.15)
Caffeic acid	-0.1 (0.14)	-0.05 (0.14)	0.12 (0.14)	-0.09 (0.14)	-0.23 (0.15)	0.02 (0.13)	0.21 (0.11)	0.03 (0.12)	0.03 (0.12)	0.29 (0.17)	1	0.04 (0.12)	0.23 (0.24)	0.07 (0.25)	-0.1 (0.15)	-0.09 (0.14)
Myricetin	0.13 (0.12)	0.11 (0.12)	-0.07 (0.12)	0.02 (0.12)	-0.18 (0.13)	0.14 (0.11)	0.18 (0.1)	0.21 (0.1)	0.2 (0.1)	0.07 (0.13)	0.04 (0.12)	1	0.32 (0.23)	0.05 (0.17)	-0.09 (0.13)	-0.35 (0.12)
Quercetin	0.32 (0.26)	0.38 (0.22)	-0.57 (0.38)	-0.17 (0.21)	-0.75 (0.36)	0.5 (0.22)	0.72 (0.36)	0.62 (0.29)	0.59 (0.28)	0.54 (0.33)	0.23 (0.24)	0.32 (0.23)	1	0.15 (0.41)	-0.13 (0.28)	-0.18 (0.29)
1-linoleoyl glycerol	0.05 (0.2)	-0.05 (0.19)	0.07 (0.2)	0.18 (0.17)	0.12 (0.2)	-0.35 (0.15)	-0.16 (0.15)	-0.32 (0.16)	-0.35 (0.16)	-0.16 (0.24)	0.07 (0.25)	0.05 (0.17)	0.15 (0.41)	1	0.75 (0.15)	0.46 (0.19)
OHOA	0.21 (0.15)	0.12 (0.14)	-0.05 (0.15)	0.04 (0.14)	0.29 (0.16)	-0.15 (0.13)	-0.12 (0.12)	-0.14 (0.12)	-0.12 (0.12)	-0.37 (0.16)	-0.1 (0.15)	-0.09 (0.13)	-0.13 (0.28)	0.75 (0.15)	1	0.47 (0.12)
Convicine	0.02 (0.14)	-0.31 (0.13)	0.24 (0.15)	0.25 (0.13)	0.19 (0.15)	-0.28 (0.12)	-0.3 (0.11)	-0.3 (0.12)	-0.37 (0.12)	-0.02 (0.15)	-0.09 (0.14)	-0.35 (0.12)	-0.18 (0.29)	0.46 (0.19)	0.47 (0.12)	1

Supplementary Table S6: Genomic inflation factors (λ) of the GWAS models.

Trait	2021	2022
Oil	0.99	1.01
C18:1	0.97	0.99
C18:2	1.0	0.99
C18:3	0.95	0.97
Protein	1.02	1.01
Catechin	0.94	0.96
Epicatechin	0.97	0.98
Procyanidin B1	0.93	0.94
Procyanidin B2	0.95	0.94
p-coumaric acid	0.95	1.03
Caffeic acid	1.0	0.9
Myricetin	1.05	1.0
Quercetin	1.0	0.96
1-Linoleoyl glycerol	-	1.04
2-Hydroxyoleic acid (OHOA)	-	1.01
Convicine	-	0.95
Hexanal	1.0	-