

Traditional Sweet Peppers as Resources for Internal Fruit Quality: Evidence from Experimental F1 Hybrids Across Two Organic Growing Environments

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Table S1. Monthly climatic conditions during the cultivation periods at the Valencia and Murcia trial locations in 2022.

Month	Torre-Pacheco, Murcia							Total monthly precipitation (mm)
	Mean temperature (°C)	Maximum temperature (°C)	Minimum temperature (°C)	Mean relative humidity (%)	Maximum relative humidity (%)	Minimum relative humidity (%)	Mean daily solar radiation (MJ m ⁻² day ⁻¹)	
February	12.43	24.70	1.04	72.41	97.10	21.73	12.09	0.20
March	13.76	22.03	3.50	81.25	97.20	29.78	10.44	198.70
April	14.86	26.75	3.98	72.72	96.90	21.19	19.00	103.10
May	20.20	34.60	8.94	69.42	96.40	25.34	26.64	17.50
June	24.50	35.98	13.96	64.38	97.30	17.24	27.89	0.90
July	-	-	-	-	-	-	-	-
August	-	-	-	-	-	-	-	-
September	-	-	-	-	-	-	-	-
Month	Les Cases de Bàrcena, Valencia							Total monthly precipitation (mm)
	Mean temperature (°C)	Maximum temperature (°C)	Minimum temperature (°C)	Mean relative humidity (%)	Maximum relative humidity (%)	Minimum relative humidity (%)	Mean daily solar radiation (MJ m ⁻² day ⁻¹)	
February	-	-	-	-	-	-	-	-
March	-	-	-	-	-	-	-	-
April	14.82	27.52	-1.24	68.91	97.30	23.48	17.70	87.50
May	19.88	34.60	8.42	70.33	96.90	28.06	25.23	117.00
June	25.21	39.27	14.61	66.61	96.30	18.04	26.27	1.80
July	27.37	38.89	16.97	64.68	94.10	25.00	24.66	0.60
August	27.98	41.95	16.56	65.11	94.30	20.46	22.39	26.70
September	24.05	36.16	12.37	69.92	95.70	23.46	16.62	9.80

Data were obtained from the SiAR database of the Ministerio de Agricultura, Pesca y Alimentación de España. Data correspond to the nearest available meteorological stations. For the Murcia greenhouse trial, the values represent external climatic conditions.

Table S2. Mean content of fructose and glucose (g kg⁻¹ FM) in fully ripe fruits of the evaluated F1 hybrids and parental genotypes grown under open-field and greenhouse conditions.

Genotype	Fructose		Glucose	
	Open field ¹	Greenhouse	Open field	Greenhouse
Hybrids				
P1 × P10	16.9 ± 0.6 ²	18.8 ± 0.9	17.6 ± 0.7	16.9 ± 1.3
P10 × P2	24.6 ± 1.2	24.0 ± 1.0	27.4 ± 1.4	23.2 ± 1.2
P11 × P2	23.9 ± 1.4	21.5 ± 0.7	25.2 ± 2.3	23.1 ± 0.6
P3 × P10	18.5 ± 1.0	23.5 ± 1.2	19.7 ± 1.1	25.2 ± 1.3
P11 × P3	21.5 ± 1.4	25.0 ± 2.5	22.3 ± 1.5	26.5 ± 2.5
P10 × P4	22.2 ± 0.9	20.1 ± 0.9	24.5 ± 1.0	21.6 ± 1.0
P4 × P11	21.6 ± 1.0	25.3 ± 1.9	24.0 ± 1.2	27.3 ± 2.1
P10 × P5	24.3 ± 0.9	22.5 ± 0.7	26.0 ± 1.0	23.9 ± 0.8
P11 × P5	19.7 ± 1.1	24.1 ± 0.8	21.3 ± 1.3	26.1 ± 0.8
P6 × P10	17.2 ± 0.9	21.3 ± 1.4	18.4 ± 1.0	18.8 ± 1.0
P11 × P6	21.0 ± 1.7	22.7 ± 1.2	22.1 ± 1.8	24.0 ± 1.3
P7 × P10	17.6 ± 0.5	25.0 ± 1.0	18.1 ± 0.4	26.1 ± 1.0
P8 × P10	17.7 ± 0.4	19.7 ± 2.5	18.1 ± 0.5	20.5 ± 2.5
P9 × P10	20.7 ± 0.4	24.8 ± 1.4	22.0 ± 0.3	25.4 ± 1.5
P11 × P12	20.2 ± 1.0	19.5 ± 2.1	20.4 ± 0.8	20.4 ± 2.1
P13 × P11	21.2 ± 0.5	24.4 ± 1.1	21.5 ± 0.4	24.5 ± 1.0
Parents				
P1	15.9 ± 1.4	15.8 ± 0.6	15.3 ± 1.5	16.4 ± 0.7
P2	21.5 ± 1.0	15.6 ± 0.7	24.2 ± 1.3	18.1 ± 0.9
P3	20.5 ± 0.9	17.9 ± 0.8	21.7 ± 1.2	22.5 ± 0.9
P4	23.9 ± 1.7	20.0 ± 0.7	27.1 ± 1.8	24.6 ± 0.9
P5	18.7 ± 1.3	21.6 ± 0.5	20.9 ± 1.6	25.5 ± 0.3
P6	20.9 ± 0.8	22.9 ± 0.5	22.6 ± 0.9	24.3 ± 0.2
P7	29.7 ± 2.4	20.6 ± 0.9	30.2 ± 2.4	21.7 ± 1.0
P8	17.4 ± 1.6	15.3 ± 0.8	17.1 ± 1.6	16.3 ± 0.9
P9	22.7 ± 0.8	19.4 ± 1.2	25.7 ± 1.0	20.2 ± 0.9
P10	20.5 ± 1.0	17.1 ± 1.6	19.8 ± 1.1	18.0 ± 1.6
P11	22.6 ± 0.7	17.6 ± 0.9	22.1 ± 0.7	18.2 ± 0.9
P12	26.4 ± 0.4	19.4 ± 1.1	28.0 ± 0.4	19.6 ± 0.9
P13	26.0 ± 1.5	31.2 ± 0.9	26.0 ± 1.7	30.2 ± 1.0

¹ Open field: Valencia, spring–summer; greenhouse: Murcia, winter–spring. ² Values are expressed as mean ± standard error (SE).

Table S3. Mean content of quercetin, luteolin, apigenin and kaempferol (mg kg⁻¹ FM) in fully ripe fruits of the evaluated F1 hybrids and parental genotypes grown under open-field and greenhouse conditions.

Genotype	Quercetin		Luteolin		Apigenin		Kaempferol	
	Open field ¹	Greenhouse	Open field	Greenhouse	Open field	Greenhouse	Open field	Greenhouse
Hybrids								
P1 × P10	26.9 ± 2.5 ²	8.0 ± 0.6	4.8 ± 0.1	4.5 ± 0.2	3.0 ± 0.1	1.9 ± 0.1	0.55 ± 0.02	0.44 ± 0.03
P10 × P2	12.6 ± 0.3	6.7 ± 0.1	8.1 ± 0.4	3.5 ± 0.1	2.9 ± 0.1	1.8 ± 0.0	0.60 ± 0.01	0.42 ± 0.02
P11 × P2	13.0 ± 2.6	7.1 ± 0.5	3.6 ± 0.1	4.7 ± 0.5	2.7 ± 0.2	2.4 ± 0.1	0.55 ± 0.02	0.52 ± 0.03
P3 × P10	25.4 ± 2.9	8.2 ± 0.8	4.5 ± 0.3	4.4 ± 0.3	3.5 ± 0.2	2.2 ± 0.1	0.67 ± 0.03	0.53 ± 0.05
P11 × P3	10.9 ± 1.5	5.1 ± 0.1	4.7 ± 0.4	4.4 ± 0.3	2.4 ± 0.2	2.1 ± 0.1	0.52 ± 0.03	0.46 ± 0.02
P10 × P4	18.7 ± 2.2	8.2 ± 1.1	9.1 ± 0.2	4.2 ± 0.3	3.2 ± 0.2	2.5 ± 0.2	0.65 ± 0.03	0.50 ± 0.04
P4 × P11	23.9 ± 4.5	6.2 ± 0.2	4.1 ± 0.2	4.7 ± 0.4	3.2 ± 0.2	2.2 ± 0.1	0.64 ± 0.04	0.53 ± 0.02
P10 × P5	18.2 ± 3.3	6.6 ± 0.5	3.7 ± 0.3	4.7 ± 0.3	2.9 ± 0.2	2.6 ± 0.1	0.49 ± 0.04	0.50 ± 0.02
P11 × P5	15.4 ± 2.2	6.6 ± 0.2	3.4 ± 0.2	4.2 ± 0.2	2.5 ± 0.1	2.3 ± 0.1	0.47 ± 0.02	0.49 ± 0.01
P6 × P10	21.1 ± 3.1	7.8 ± 0.5	3.8 ± 0.1	4.2 ± 0.2	3.4 ± 0.3	2.2 ± 0.1	0.55 ± 0.03	0.53 ± 0.03
P11 × P6	19.3 ± 2.3	5.9 ± 0.6	5.5 ± 0.2	4.8 ± 0.3	3.4 ± 0.1	2.4 ± 0.2	0.62 ± 0.04	0.48 ± 0.04
P7 × P10	33.7 ± 7.7	7.6 ± 0.5	6.1 ± 0.6	3.9 ± 0.2	6.2 ± 1.3	2.2 ± 0.1	0.82 ± 0.10	0.43 ± 0.03
P8 × P10	16.1 ± 2.0	7.8 ± 1.0	5.8 ± 0.4	4.5 ± 0.3	2.6 ± 0.2	1.9 ± 0.1	0.48 ± 0.03	0.49 ± 0.02
P9 × P10	43.4 ± 7.6	7.9 ± 0.5	4.9 ± 0.3	3.6 ± 0.2	4.0 ± 0.4	1.9 ± 0.1	0.64 ± 0.02	0.45 ± 0.02
P11 × P12	24.0 ± 1.2	6.4 ± 0.5	5.4 ± 0.3	3.7 ± 0.1	4.1 ± 0.2	2.0 ± 0.1	0.71 ± 0.02	0.55 ± 0.04
P13 × P11	16.4 ± 0.5	6.4 ± 0.2	5.0 ± 0.2	6.6 ± 0.3	3.6 ± 0.1	2.9 ± 0.1	0.55 ± 0.02	0.53 ± 0.02
Parents								
P1	35.6 ± 2.8	11.7 ± 1.2	2.2 ± 0.1	10.2 ± 0.7	2.2 ± 0.1	1.9 ± 0.1	0.53 ± 0.02	0.45 ± 0.03
P2	10.7 ± 1.0	12.4 ± 1.8	3.5 ± 0.0	8.3 ± 0.7	3.0 ± 0.2	2.4 ± 0.1	0.54 ± 0.04	0.90 ± 0.09
P3	11.8 ± 2.0	10.4 ± 1.6	3.7 ± 0.2	8.0 ± 0.6	2.7 ± 0.2	2.6 ± 0.2	0.83 ± 0.14	0.64 ± 0.04
P4	24.4 ± 4.2	15.4 ± 1.6	3.8 ± 0.3	12.9 ± 1.0	3.4 ± 0.3	2.4 ± 0.1	0.55 ± 0.04	1.06 ± 0.06
P5	17.8 ± 2.9	17.3 ± 2.8	4.2 ± 0.3	11.2 ± 1.6	3.0 ± 0.1	3.0 ± 0.2	0.58 ± 0.03	1.12 ± 0.07
P6	18.5 ± 1.2	7.1 ± 0.4	4.0 ± 0.2	4.6 ± 0.4	3.1 ± 0.2	2.0 ± 0.1	0.59 ± 0.03	0.53 ± 0.01
P7	50.3 ± 8.7	5.4 ± 0.3	5.3 ± 0.7	4.4 ± 0.4	5.1 ± 0.7	2.1 ± 0.2	0.63 ± 0.04	0.51 ± 0.05
P8	19.3 ± 0.7	8.0 ± 0.3	3.9 ± 0.4	5.8 ± 0.2	2.1 ± 0.1	1.8 ± 0.0	0.43 ± 0.02	0.36 ± 0.01
P9	19.4 ± 1.0	12.4 ± 1.5	10.1 ± 0.3	5.7 ± 0.6	3.9 ± 0.1	2.1 ± 0.0	0.71 ± 0.02	0.55 ± 0.03
P10	11.2 ± 1.6	8.2 ± 0.7	2.3 ± 0.1	4.3 ± 0.2	2.2 ± 0.1	2.0 ± 0.1	0.49 ± 0.02	0.35 ± 0.01
P11	15.1 ± 1.3	9.9 ± 0.3	2.4 ± 0.1	4.3 ± 0.1	2.5 ± 0.3	2.1 ± 0.0	0.54 ± 0.04	0.36 ± 0.00
P12	14.0 ± 1.0	11.1 ± 0.4	3.3 ± 0.1	6.8 ± 0.2	3.2 ± 0.2	2.2 ± 0.0	0.53 ± 0.03	0.54 ± 0.03
P13	25.9 ± 1.2	9.2 ± 0.1	25.4 ± 0.9	13.8 ± 0.6	6.3 ± 0.1	3.2 ± 0.1	0.79 ± 0.02	0.62 ± 0.01

¹ Open field: Valencia, spring–summer; greenhouse: Murcia, winter–spring. ² Values are expressed as mean ± standard error (SE).

Table S4. Mean content of red carotenoids and yellow-orange carotenoids (mg kg⁻¹ FM) in fully ripe fruits of the evaluated F1 hybrids and parental genotypes grown under open-field and greenhouse conditions.

Genotype	Red carotenoids		Yellow-orange carotenoids	
	Open field ¹	Greenhouse	Open field	Greenhouse
Hybrids				
P1 × P10	101 ± 5 ²	77 ± 6	24 ± 1	24 ± 2
P10 × P2	134 ± 3	62 ± 3	46 ± 2	17 ± 1
P11 × P2	96 ± 8	85 ± 11	20 ± 2	21 ± 2
P3 × P10	58 ± 3	63 ± 15	12 ± 2	19 ± 5
P11 × P3	39 ± 5	58 ± 3	10 ± 1	14 ± 1
P10 × P4	67 ± 3	45 ± 7	24 ± 1	14 ± 2
P4 × P11	48 ± 5	86 ± 7	18 ± 2	23 ± 2
P10 × P5	55 ± 4	43 ± 6	6 ± 1	11 ± 2
P11 × P5	64 ± 2	52 ± 6	9 ± 1	13 ± 2
P6 × P10	89 ± 6	71 ± 6	26 ± 3	23 ± 2
P11 × P6	46 ± 1	73 ± 8	15 ± 1	21 ± 3
P7 × P10	116 ± 5	114 ± 10	25 ± 1	31 ± 3
P8 × P10	56 ± 7	66 ± 6	13 ± 1	17 ± 2
P9 × P10	69 ± 10	55 ± 7	12 ± 2	16 ± 2
P11 × P12	104 ± 5	86 ± 8	41 ± 2	23 ± 3
P13 × P11	112 ± 6	104 ± 9	28 ± 2	36 ± 4
Parents				
P1	144 ± 6	123 ± 4	55 ± 4	46 ± 2
P2	86 ± 5	134 ± 12	31 ± 2	45 ± 6
P3	100 ± 4	66 ± 7	42 ± 3	25 ± 3
P4	98 ± 7	104 ± 9	50 ± 6	35 ± 3
P5	89 ± 8	128 ± 6	34 ± 4	46 ± 5
P6	85 ± 3	62 ± 7	37 ± 2	18 ± 2
P7	133 ± 14	100 ± 9	48 ± 4	22 ± 2
P8	58 ± 7	68 ± 3	23 ± 4	16 ± 2
P9	141 ± 9	65 ± 6	53 ± 4	23 ± 2
P10	42 ± 6	30 ± 1	20 ± 2	8 ± 0
P11	72 ± 7	35 ± 1	10 ± 1	9 ± 0
P12	127 ± 10	102 ± 3	55 ± 3	39 ± 2
P13	185 ± 4	130 ± 9	88 ± 1	62 ± 4

¹ Open field: Valencia, spring–summer; greenhouse: Murcia, winter–spring. ² Values are expressed as mean ± standard error (SE).

Table S5. Mid-parent heterosis for total sugars (TS), vitamin C (VC), total flavonoids (TF) and total carotenoids (TC) of the evaluated F1 hybrids under open-field and greenhouse conditions.

Hybrid	TS		VC		TF		TC	
	Open field ¹	Greenhouse	Open field	Greenhouse	Open field	Greenhouse	Open field	Greenhouse
P1 × P10	−3.5 ^{ns} ²	−5.8 ^{ns}	16.7 ^{ns}	13.6 ^{ns}	24.6 [*]	−24.4 ^{**}	−8.9 ^{ns}	−2.6 ^{ns}
P10 × P2	21.2 [*]	22.3 [*]	9.1 ^{ns}	24.1 ^{**}	43.3 [*]	−35.9 ^{***}	86.8 ^{***}	−27.6 [*]
P11 × P2	8.7 ^{ns}	16.0 ^{ns}	−32.4 ^{***}	20.9 [*]	4.8 ^{ns}	−27.2 ^{**}	14.8 ^{ns}	−14.1 ^{ns}
P3 × P10	−7.6 ^{ns}	23.0 [*]	−5.9 ^{ns}	27.0 ^{**}	80.8 ^{***}	−12.2 ^{ns}	−36.8 ^{***}	24.9 ^{ns}
P11 × P3	0.9 ^{ns}	22.4 [*]	−6.4 ^{ns}	8.2 ^{ns}	0.0 ^{ns}	−33.4 ^{***}	−61.7 ^{***}	5.8 ^{ns}
P10 × P4	2.2 ^{ns}	1.8 ^{ns}	7.0 ^{ns}	18.7 [*]	31.2 [*]	−34.5 ^{***}	−16.9 ^{ns}	−35.3 [*]
P4 × P11	−4.7 ^{ns}	19.0 [*]	0.9 ^{ns}	18.6 [*]	21.6 ^{ns}	−43.8 ^{***}	−42.8 ^{***}	18.8 ^{ns}
P10 × P5	25.8 ^{**}	7.0 ^{ns}	5.1 ^{ns}	21.4 [*]	9.1 ^{ns}	−39.3 ^{***}	−37.6 ^{**}	−44.4 ^{**}
P11 × P5	−2.8 ^{ns}	16.0 ^{ns}	−12.5 ^{ns}	18.4 [*]	−0.7 ^{ns}	−44.7 ^{***}	−30.2 ^{**}	−39.8 ^{**}
P6 × P10	−14.9 ^{ns}	−12.0 ^{ns}	−8.5 ^{ns}	32.7 ^{***}	35.4 [*]	0.6 ^{ns}	14.0 ^{ns}	56.7 [*]
P11 × P6	−2.1 ^{ns}	2.1 ^{ns}	−18.9 [*]	1.0 ^{ns}	24.6 ^{ns}	−12.5 ^{ns}	−41.1 ^{***}	45.9 [*]
P7 × P10	−27.0 ^{***}	14.6 ^{ns}	−7.1 ^{ns}	−3.9 ^{ns}	16.3 ^{ns}	3.7 ^{ns}	9.6 ^{ns}	81.2 ^{***}
P8 × P10	−4.2 ^{ns}	6.9 ^{ns}	8.3 ^{ns}	9.2 ^{ns}	20.3 ^{ns}	−4.4 ^{ns}	−7.6 ^{ns}	36.1 ^{ns}
P9 × P10	−3.2 ^{ns}	21.4 [*]	14.3 ^{ns}	30.9 ^{***}	81.9 ^{***}	−22.1 [*]	−45.7 ^{***}	7.9 ^{ns}
P11 × P12	−17.9 [*]	−2.9 ^{ns}	−14.0 ^{ns}	1.6 ^{ns}	65.8 ^{***}	−31.6 ^{***}	8.2 ^{ns}	18.1 ^{ns}
P13 × P11	−11.6 ^{ns}	−6.9 ^{ns}	−29.4 ^{***}	21.1 [*]	−35.2 [*]	−24.1 ^{**}	−22.1 ^{***}	18.6 ^{ns}

¹Open field: Valencia, spring–summer; greenhouse: Murcia, winter–spring. ²Significance was assessed using planned contrasts from linear models, with *p*-values adjusted using the Benjamini-Hochberg FDR procedure. ns, *, ** and *** indicate non-significant ($p \geq 0.05$), and significant effects at $p < 0.05$, $p < 0.01$ and $p < 0.001$, respectively.

Table S6. Best-parent heterosis for total sugars (TS), vitamin C (VC), total flavonoids (TF) and total carotenoids (TC) of the evaluated F1 hybrids under open-field and greenhouse conditions.

Hybrid	TS		VC		TF		TC	
	Open field ¹	Greenhouse	Open field	Greenhouse	Open field	Greenhouse	Open field	Greenhouse
P1 × P10	−14.5 ^{ns} ²	−18.0 ^{ns}	1.5 ^{ns}	3.2 ^{ns}	−13.0 ^{ns}	−39.0 ^{***}	−37.3 ^{***}	−40.2 ^{***}
P10 × P2	14.2 ^{ns}	8.6 ^{ns}	2.1 ^{ns}	18.2 ^{ns}	36.7 ^{ns}	−48.0 ^{***}	53.5 ^{***}	−56.0 ^{***}
P11 × P2	7.6 ^{ns}	2.6 ^{ns}	−38.8 ^{***}	13.6 ^{ns}	−1.8 ^{ns}	−38.4 ^{***}	−0.7 ^{ns}	−46.4 ^{***}
P3 × P10	−9.6 ^{ns}	18.7 ^{ns}	−6.5 ^{ns}	26.0 [*]	57.7 ^{**}	−23.1 [*]	−51.7 ^{***}	−11.5 ^{ns}
P11 × P3	−2.0 ^{ns}	17.7 ^{ns}	−9.0 ^{ns}	5.8 ^{ns}	−3.1 ^{ns}	−38.9 ^{***}	−69.4 ^{***}	−21.6 ^{ns}
P10 × P4	−8.4 ^{ns}	0.5 ^{ns}	−3.6 ^{ns}	18.6 ^{ns}	−1.5 ^{ns}	−51.9 ^{***}	−36.6 ^{***}	−58.7 ^{***}
P4 × P11	−10.5 ^{ns}	17.9 ^{ns}	−11.9 ^{ns}	16.9 ^{ns}	−1.0 ^{ns}	−57.3 ^{***}	−54.4 ^{***}	−21.8 [*]
P10 × P5	24.5 [*]	2.9 ^{ns}	−9.0 ^{ns}	20.5 [*]	−8.4 ^{ns}	−55.8 ^{***}	−49.8 ^{***}	−66.1 ^{***}
P11 × P5	−8.4 ^{ns}	12.0 ^{ns}	−26.5 ^{***}	17.5 ^{ns}	−7.9 ^{ns}	−58.2 ^{***}	−41.0 ^{***}	−62.3 ^{***}
P6 × P10	−17.9 ^{ns}	−15.9 ^{ns}	−21.9 ^{**}	17.5 [*]	9.4 ^{ns}	−1.5 ^{ns}	−7.8 ^{ns}	15.0 ^{ns}
P11 × P6	−3.5 ^{ns}	−2.1 ^{ns}	−32.8 ^{***}	−9.3 ^{ns}	10.6 ^{ns}	−18.5 [*]	−50.0 ^{***}	12.3 ^{ns}
P7 × P10	−39.3 ^{***}	11.4 ^{ns}	−11.4 ^{ns}	−24.0 ^{***}	−26.6 ^{ns}	−5.1 ^{ns}	−22.5 ^{**}	19.2 ^{ns}
P8 × P10	−11.2 ^{ns}	−7.7 ^{ns}	−8.0 ^{ns}	3.8 ^{ns}	−1.7 ^{ns}	−7.4 ^{ns}	−9.1 ^{ns}	−0.7 ^{ns}
P9 × P10	−11.1 ^{ns}	16.0 ^{ns}	11.7 ^{ns}	24.5 [*]	33.8 ^{ns}	−33.1 ^{***}	−62.3 ^{***}	−23.9 ^{ns}
P11 × P12	−25.1 ^{***}	−8.1 ^{ns}	−14.6 ^{ns}	−3.0 ^{ns}	62.5 ^{**}	−38.3 ^{***}	−20.6 ^{**}	−22.5 [*]
P13 × P11	−17.6 [*]	−20.3 ^{**}	−39.6 ^{***}	17.2 ^{ns}	−56.4 ^{***}	−38.5 ^{***}	−48.9 ^{***}	−27.0 ^{***}

¹Open field: Valencia, spring–summer; greenhouse: Murcia, winter–spring. ²Significance was assessed using planned contrasts from linear models, with *p*-values adjusted using the Benjamini-Hochberg FDR procedure. ns, *, ** and *** indicate non-significant ($p \geq 0.05$), and significant effects at $p < 0.05$, $p < 0.01$ and $p < 0.001$, respectively.