Supplementary material:

Flavonoids with Glutathione Antioxidant Synergy: Influence of Free Radicals Inflow

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Table 1S. $ABTS^{\bullet+}$ self-bleaching at different initial absorbances

Initial $ABTS^{\bullet+}$ concentration, µM	Decrease rate, µM/min					
	0–1 min	1–10 min	10–15 min	15–20 min	20–25 min	25–30 min
33.3 (initial absorbance 0.50)	0.32±0.19	0.17±0.04	0.11±0.01	0.10±0.02	0.09±0.01	0.08±0.02
50.0 (initial absorbance 0.75)	0.28±0.11	0.20±0.05	0.12±0.04	0.11±0.01	0.09±0.01	0.08±0.02
66.7 (initial absorbance 1.00)	0.33±0.09	0.27±0.04	0.15±0.03	0.12±0.02	0.09±0.01	0.09±0.02
133.3 (initial absorbance 2.00)	0.51±0.10	0.28±0.03	0.15±0.05	0.13±0.02	0.09±0.02	0.08±0.03

Table 2S. Influence of different initial $ABTS^{\bullet+}$ concentrations on the antioxidant mixture effect of quercetin–glutathione 1:5 in the decolorization assay

Quercetin–glutathione 1:5				
$C_0(ABTS^{\bullet+})$, µM	Traditionally calculated mixture effect, %		Webb's simulation mixture effect, %	
133.00	-0.07±5.68	a	6.7±6.3	a
66.67	-7.15±3.20	d	4.8±0.3	b
50.00	-10.28±2.16	b	10.2±2.8	c
33.33	-6.26±6.47	a	8.7±5.9	a

a—statistically insignificant, p > 0.05; b, c, d—statistically significant with p-values less than 0.05, 0.01 and 0.001, respectively.

Table 3S. Influence of different component addition orders on the antioxidant mixture effect of the quercetin–glutathione 1:5 combination in the decolorization assay

Quercetin-glutathione 1:5								
Addition order	Traditionally calculated mixture effect, %				Webb's simulation mixture effect, %			
$ABTS^{\bullet+}$ + quercetin + (after 1 min) glutathione	-8.73	±	3.07	C	6.97	±	3.60	c
$ABTS^{\bullet+}$ + glutathione + (after 1 min) quercetin	-7.88	±	2.97	C	7.97	±	3.48	c

c – statistically significant with p-value less than 0.01
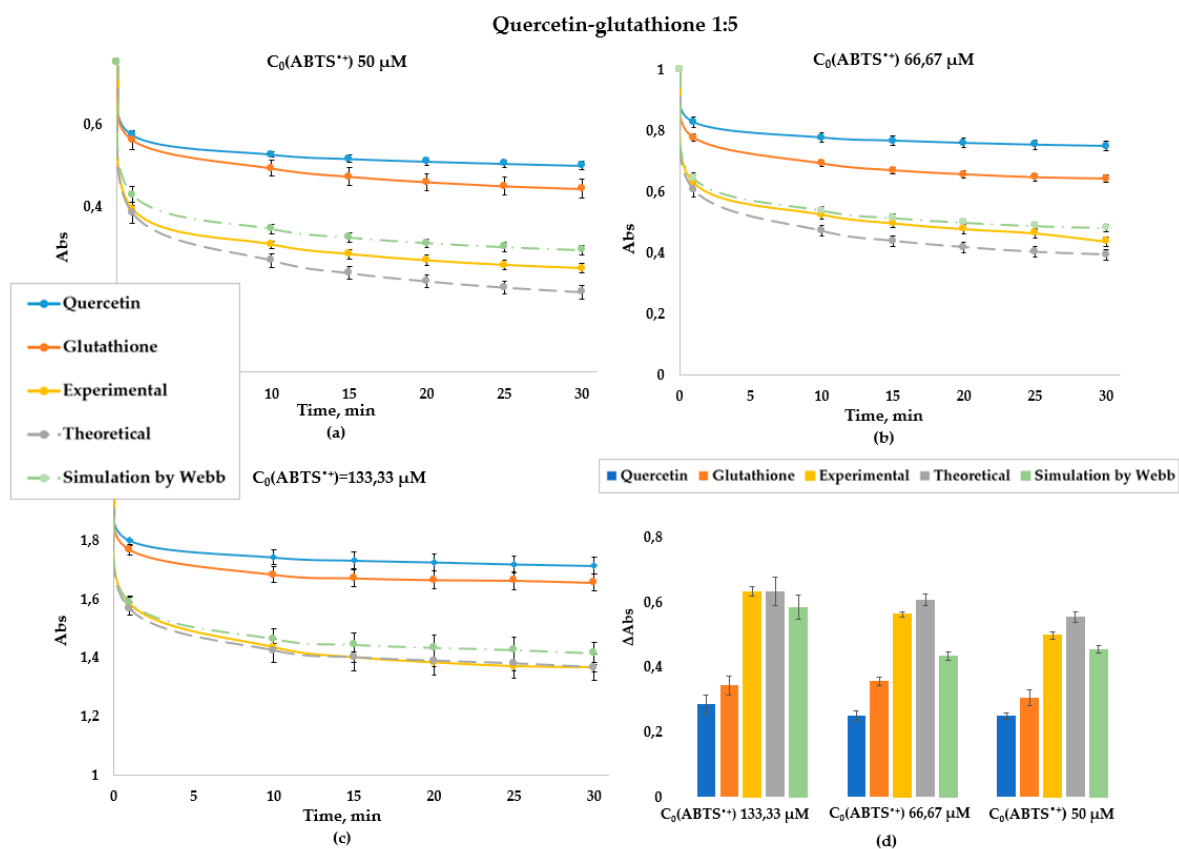
Figure 1S. Susceptibility to different initial ABTS$^{\bullet+}$ concentrations of the antioxidant mixture effect in the decolorization assay: 133.3, 66.7 and 50 μM, respectively; λ 730 nm, pathlength 1 cm.

The ABTS$^{\bullet+}$ absorbance–time curves (**a**, **b**, and **c**) and absorbance loss (ΔAbs) diagram (**d**) demonstrates the experimental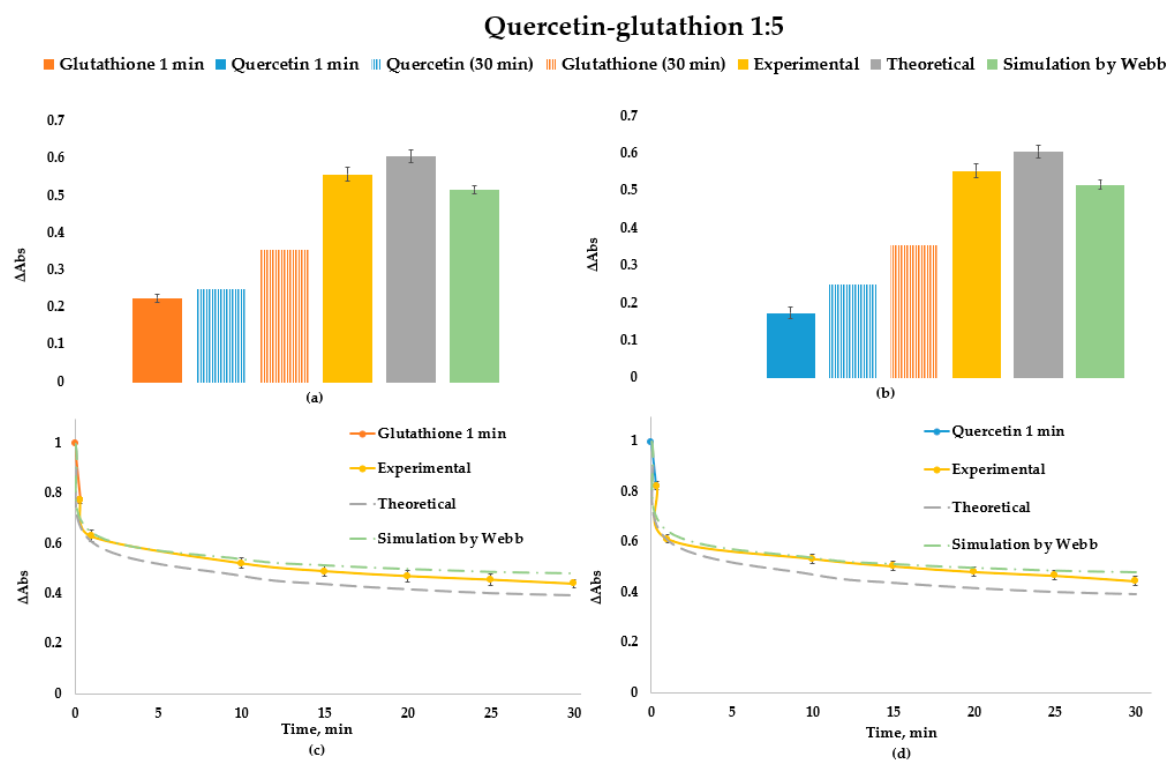ly derived results for individual components of combinations (quercetin and glutathione), the combination of quercetin–glutathione 1:5 (experimental), and theoretically calculated effect for combination obtained by simple summation (theoretical) or by applying Webb's simulation (simulation by Webb).

Figure 2S. Susceptibility to different component addition orders of the antioxidant mixture effect in the decolorization assay; λ 730 nm, pathlength 1 cm.

On the left (**a** and **c**): glutathione was mixed with ABTS$^{\bullet+}$ and then quercetin was added 1 min later.

On the right (**b** and **d**): quercetin was mixed with ABTS$^{\bullet+}$ and then glutathione was added 1 min later.

The ABTS$^{\bullet+}$ absorbance loss (ΔAbs) diagrams (**a, b**) and absorbance–time curves (**c, d**) demonstrate the experimentally derived results for individual components: glutathione after 1 min incubation (glutathione 1 min), quercetin after 1 min incubation (quercetin 1 min), and final results for quercetin, glutathione (after 30 min) and quercetin–glutathione 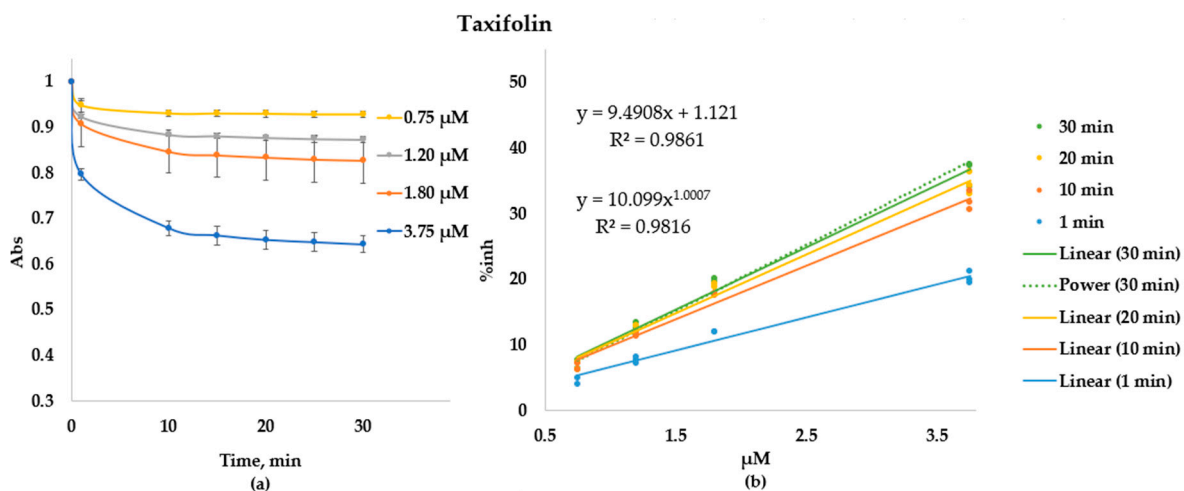1:5 (experimental, after 30 min), and theoretically calculated effect for the combination obtained by simple summation (theoretical) or by applying Webb's simulation (simulation by Webb).
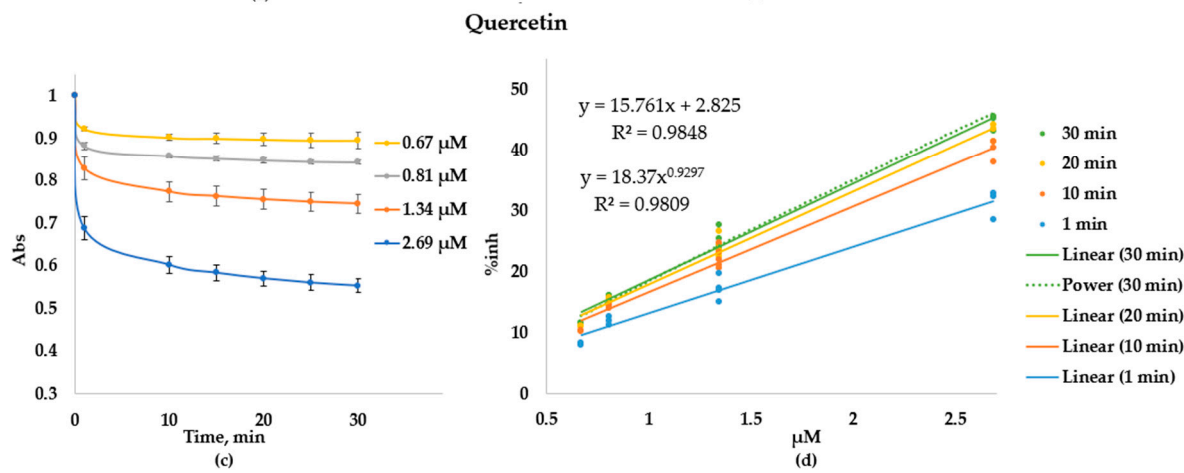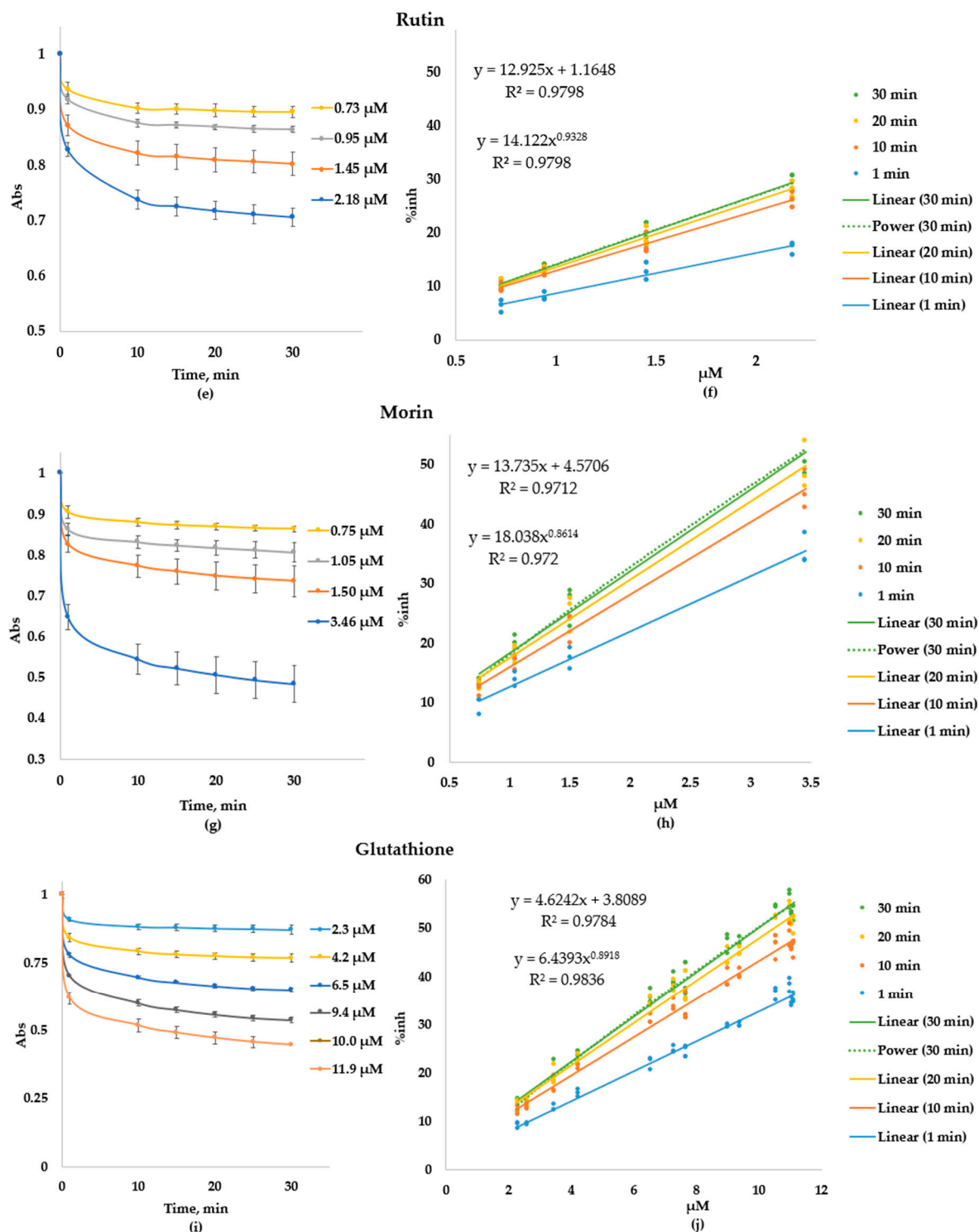
Taxifolin

(a)

(b)

35

Quercetin

(c)

(d)

36

Rutin

37

Morin

38

Glutathione

39
40

41　　**Figure 3S.** The inhibition of ABTS$^{\bullet+}$ by flavonoids and glutathione.

42　　On the left: absorbance decrease–time curves for taxifolin (**a**), quercetin (**c**), rutin (**e**), morin (**g**) and
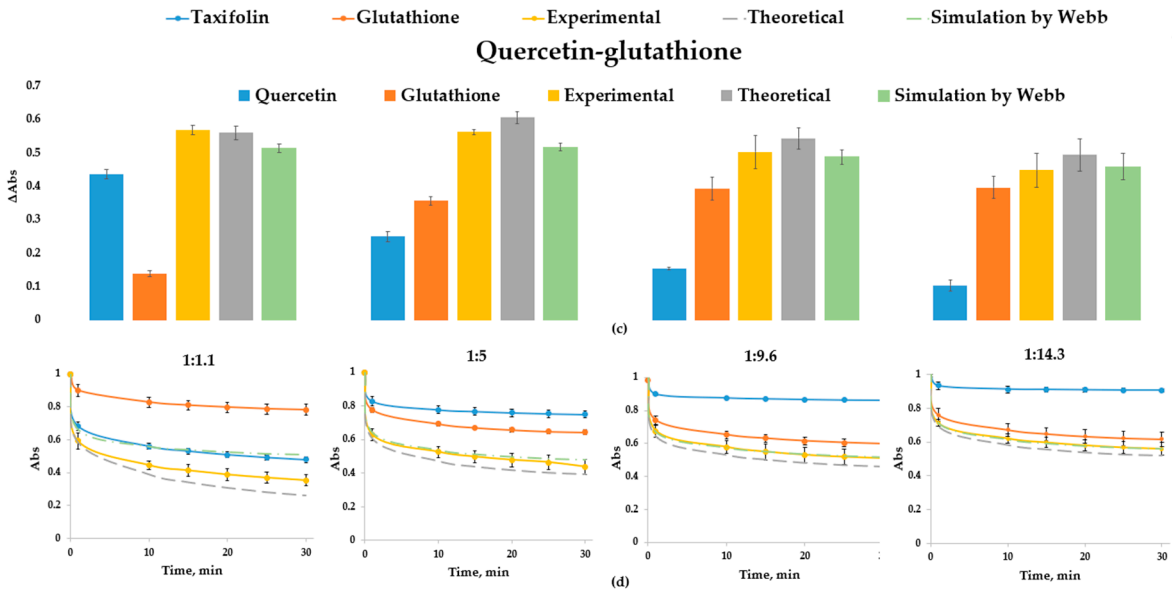43　　glutathione (**i**).

44　　On the right: inhibition percentage–glutathione concentration regressions at different time points for
45　　taxifolin (**b**), quercetin (**d**), rutin (**f**), morin (**h**), and glutathione (**j**). λ 730 nm, pathlength 1 cm.

Taxifolin-glutathione

(a)

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Quercetin-glutathione

(c)

(d)

47

Rutin-glutathione

(e)

(f)
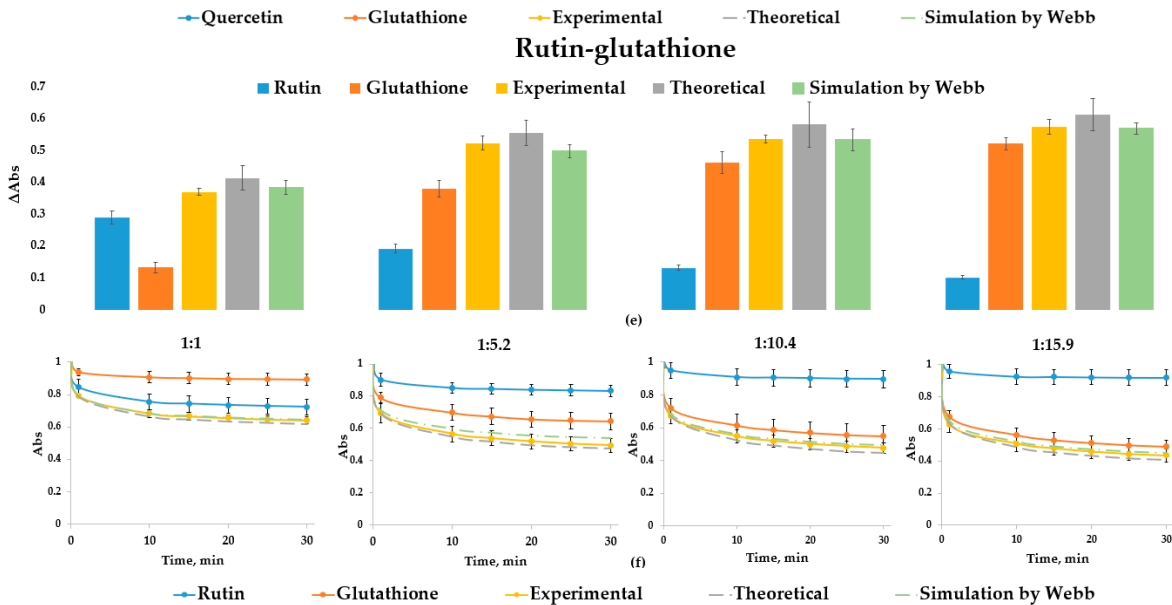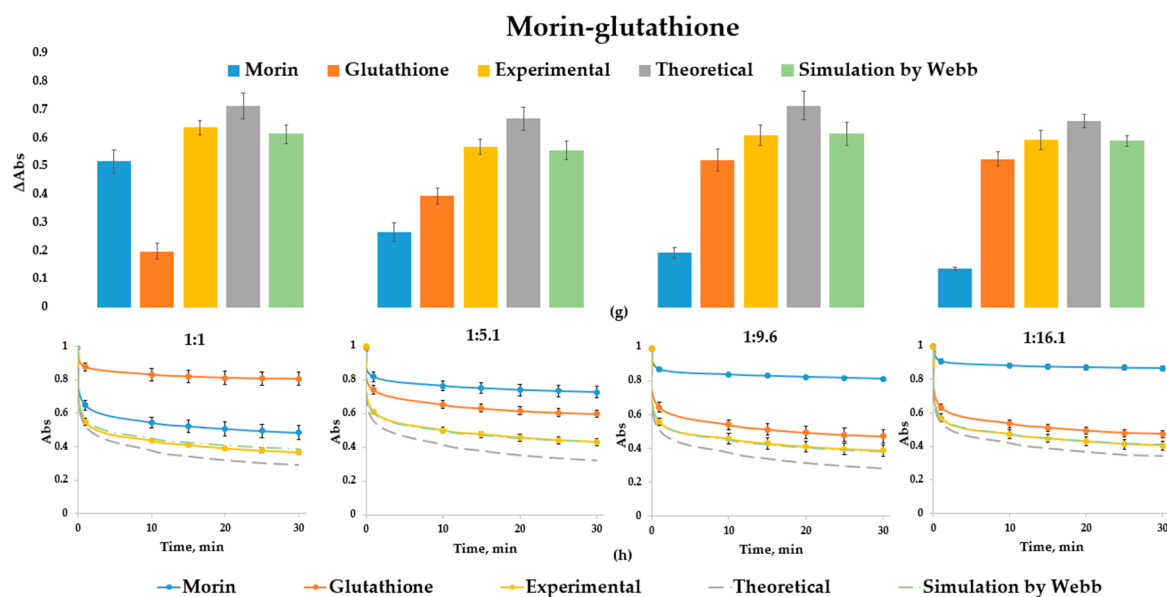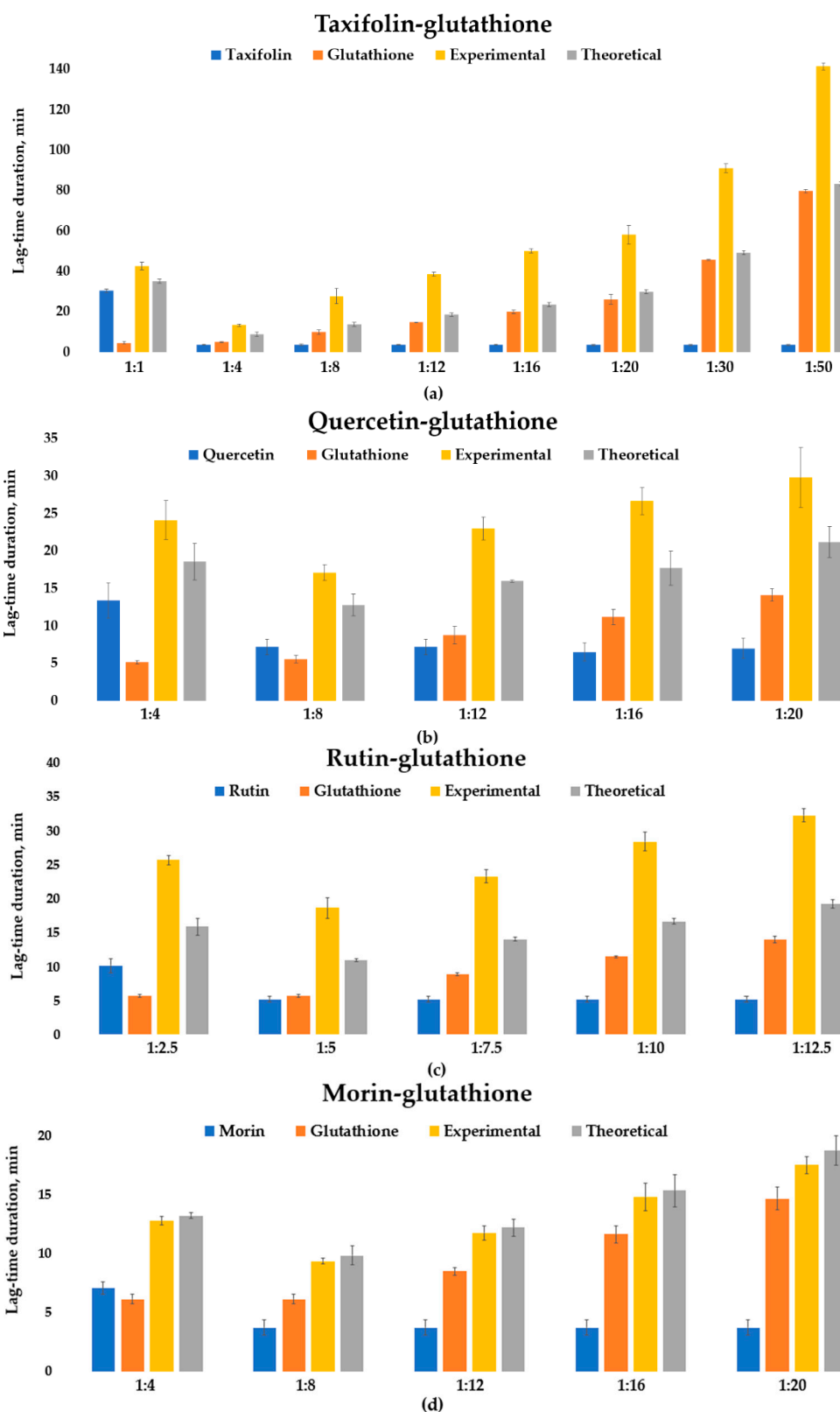
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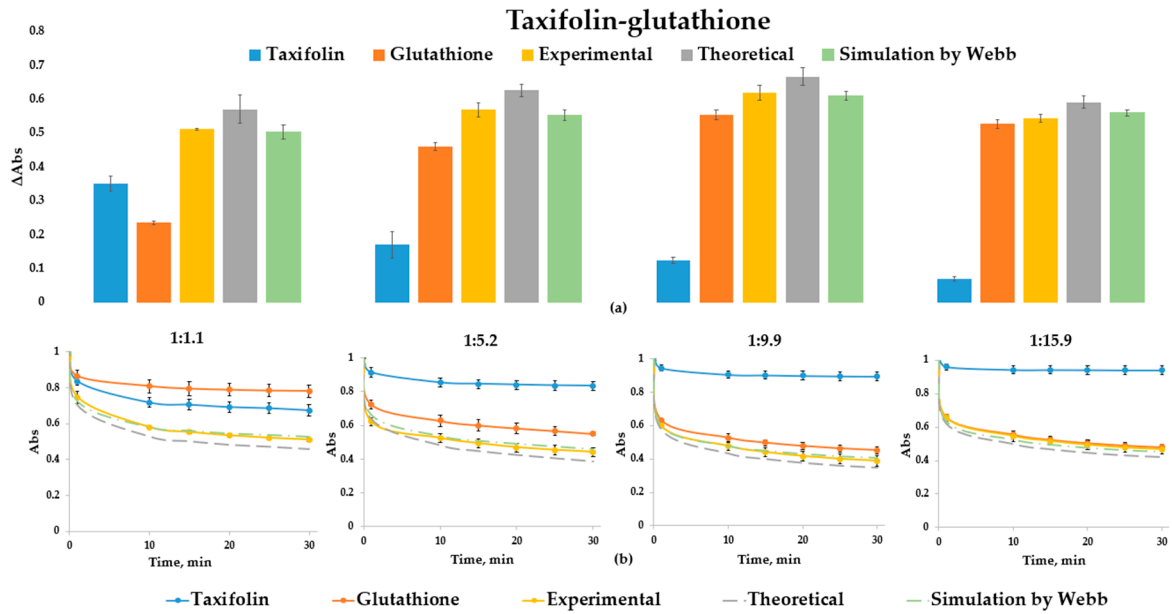
Figure 4S. Antioxidant mixture effect of flavonoid–glutathione combinations at different ratios in the decolorization assay: taxifolin–glutathione (**a**, **b**), quercetin–glutathione (**c**, **d**), rutin–glutathione (**e**, **f**) and morin–glutathione (**g**, **h**); λ 730 nm, pathlength 1 cm, incubation time 30 min .
The ABTS$^{\bullet+}$ absorbance loss (ΔAbs) diagrams (**a**, **c**, **e**, **g**) and absorbance–time curves (**b**, **d**, **f**, **h**) demonstrate the experimentally derived results for individual components (flavonoid and glutathione), flavonoid–glutathione (experimental) and the theoretically calculated effect obtained by simple summation (theoretical) or by applying Webb's simulation (simulation by Webb).

Figure 5S. Antioxidant mixture effect of flavonoid–glutathione combinations at different ratios in the lag-time assay: taxifolin–glutathione (**a**), quercetin–glutathione (**b**), rutin–glutathione (**c**) and morin–glutathione (**d**); λ 730 nm, pathlength 1 cm.

The lag-time diagrams (**a**-**d**) demonstrate the experimentally derived results for individual components (flavonoid and glutathione), flavonoid-glutathione (experimental) and the theoretically calculated effect obtained by simple summation (theoretical).

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