

EFFECT OF EXTRACTION CONDITIONS ON THE ANTIOXIDANT ACTIVITY OF BUCKWHEAT AND SPELT FLOURS

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INTROCUPTION

- ♦ Cereals and pseudocereals contain a number of biologically active substance, especially phenolic compounds with various profitable effects on health, including antioxidant activity
- ♦ Amount of phenolic compounds in cereals vary, as it is besides the other factors, affected by cereals variety and milling procedure

The influence of extraction solvent systems on antioxidant activity of different types of spelt and buckwheat flours was evaluated

List of extraction solvent systems and conditions of extraction

ID	Extraction solvent system	Sample extracts were prepared at ambient temperature by mixing 2.5 g of flour with 50 ml of solvent Mixture was shaken for 1 hour and centrifuged for 10 minutes
1	Absolute ethanol	
2	50% ethanol in water (v/v)	
3	Distilled water	
4	20% acetone in water (v/v)	
5	50% acetone in water (v/v)	



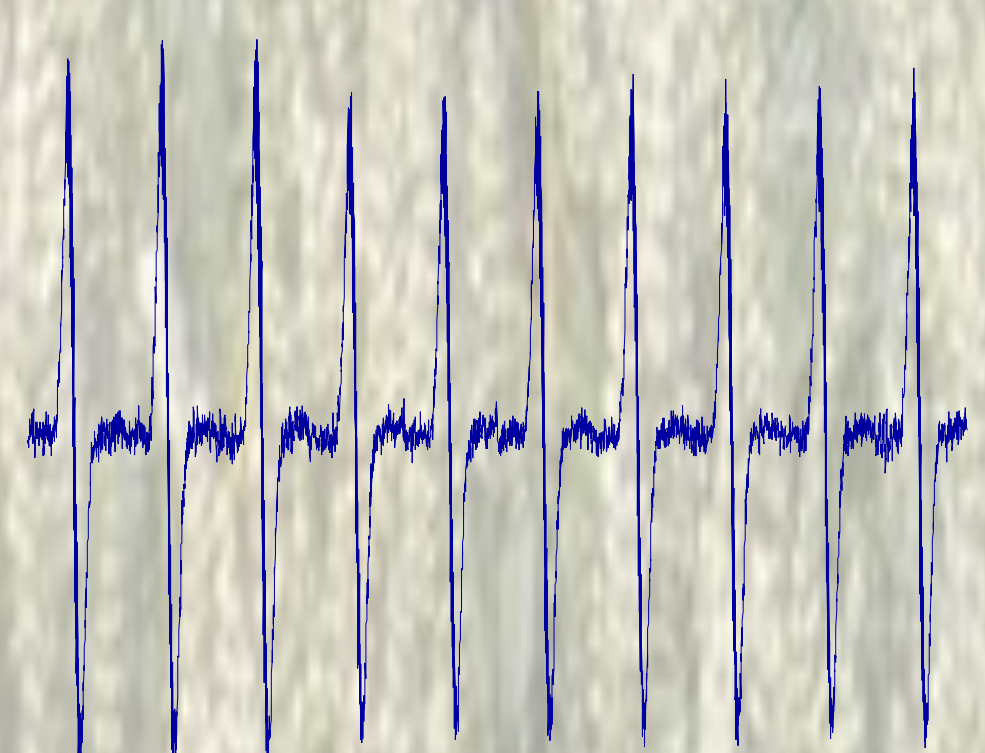
MATERIALS & METHODS

- ♦ EPR and UV-VIS spectroscopy were used for the characterisation of radical-scavenging and antioxidant properties of flour's extracts using several commonly assays, i. e. *DPPH and ABTS^{•+}
- ♦ Total polyphenol compounds contents expressed as Gallic acid equivalent (TPC), total flavonoid contents expressed as Rutin equivalent (TFC) and colour characteristics of samples were monitored by UV-VIS spectroscopy

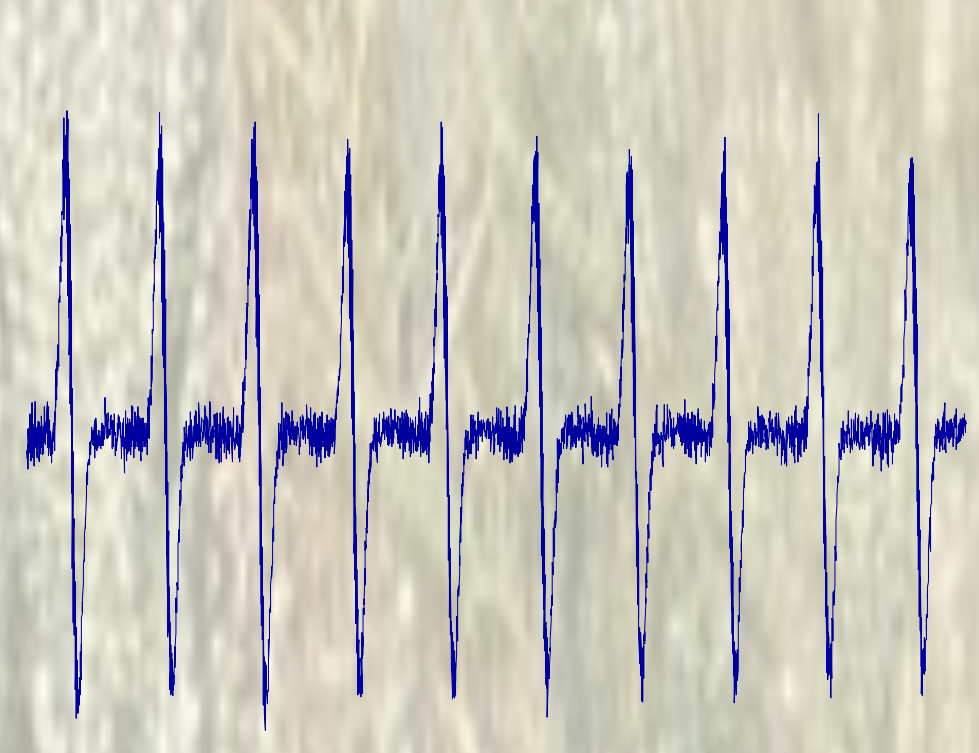
50% EtOH in H₂O (v/v)

50% Ac in H₂O (v/v)

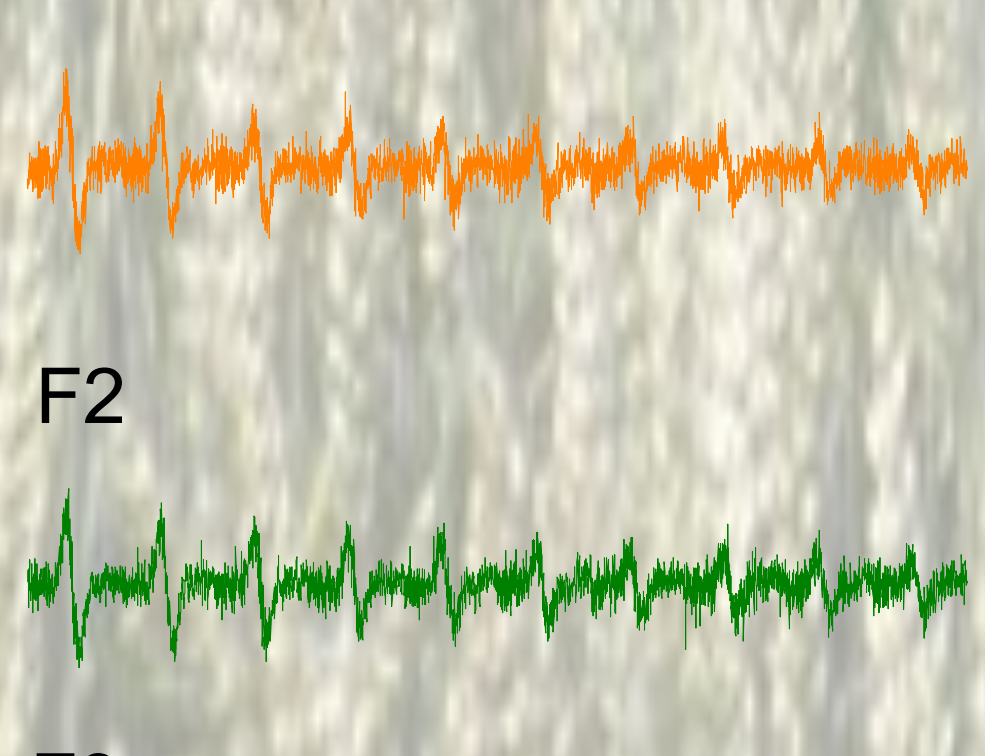
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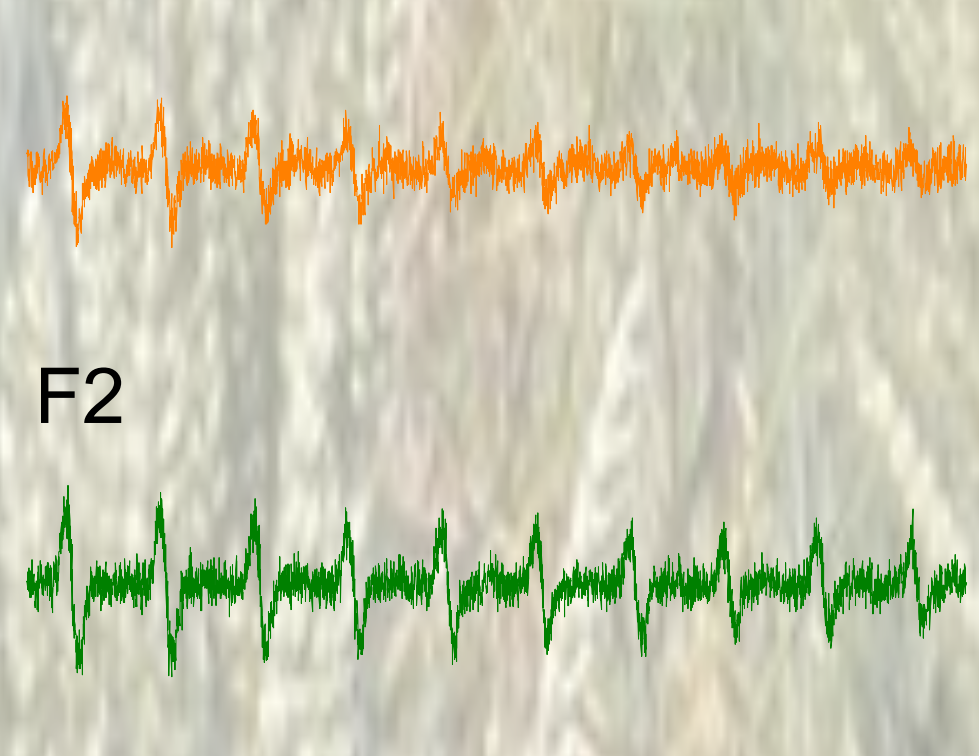
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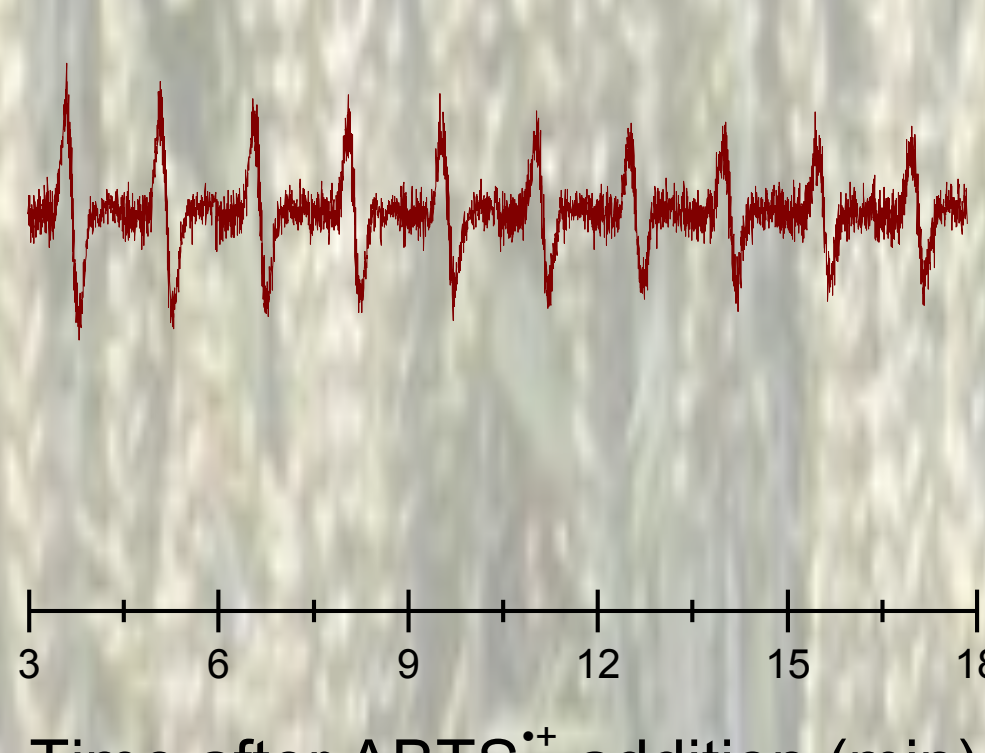
F1



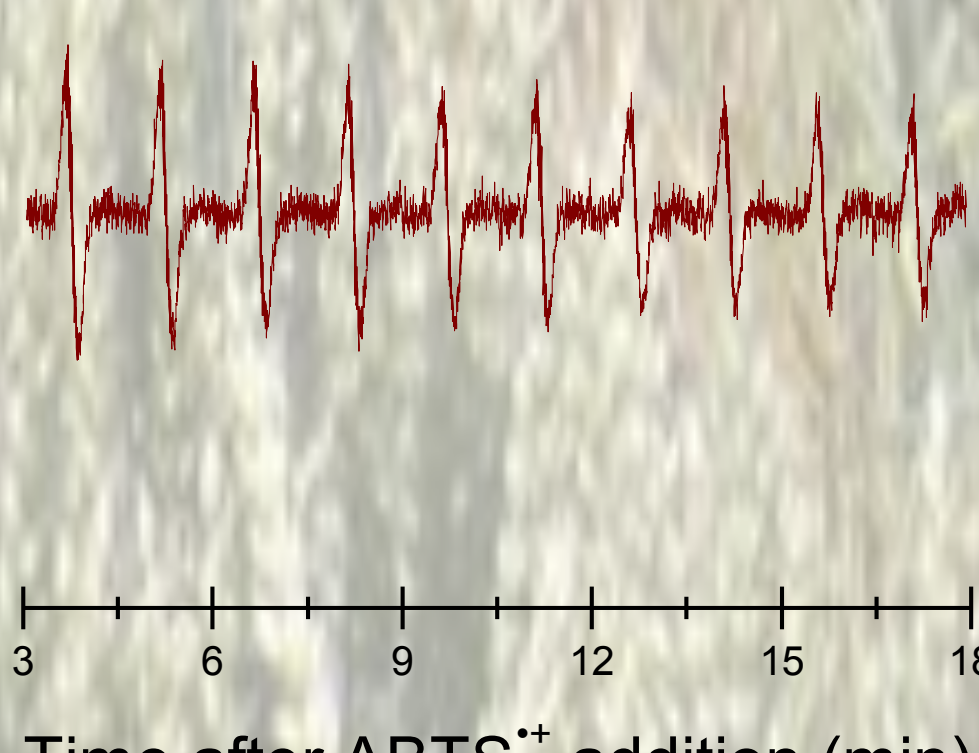
F1



F2



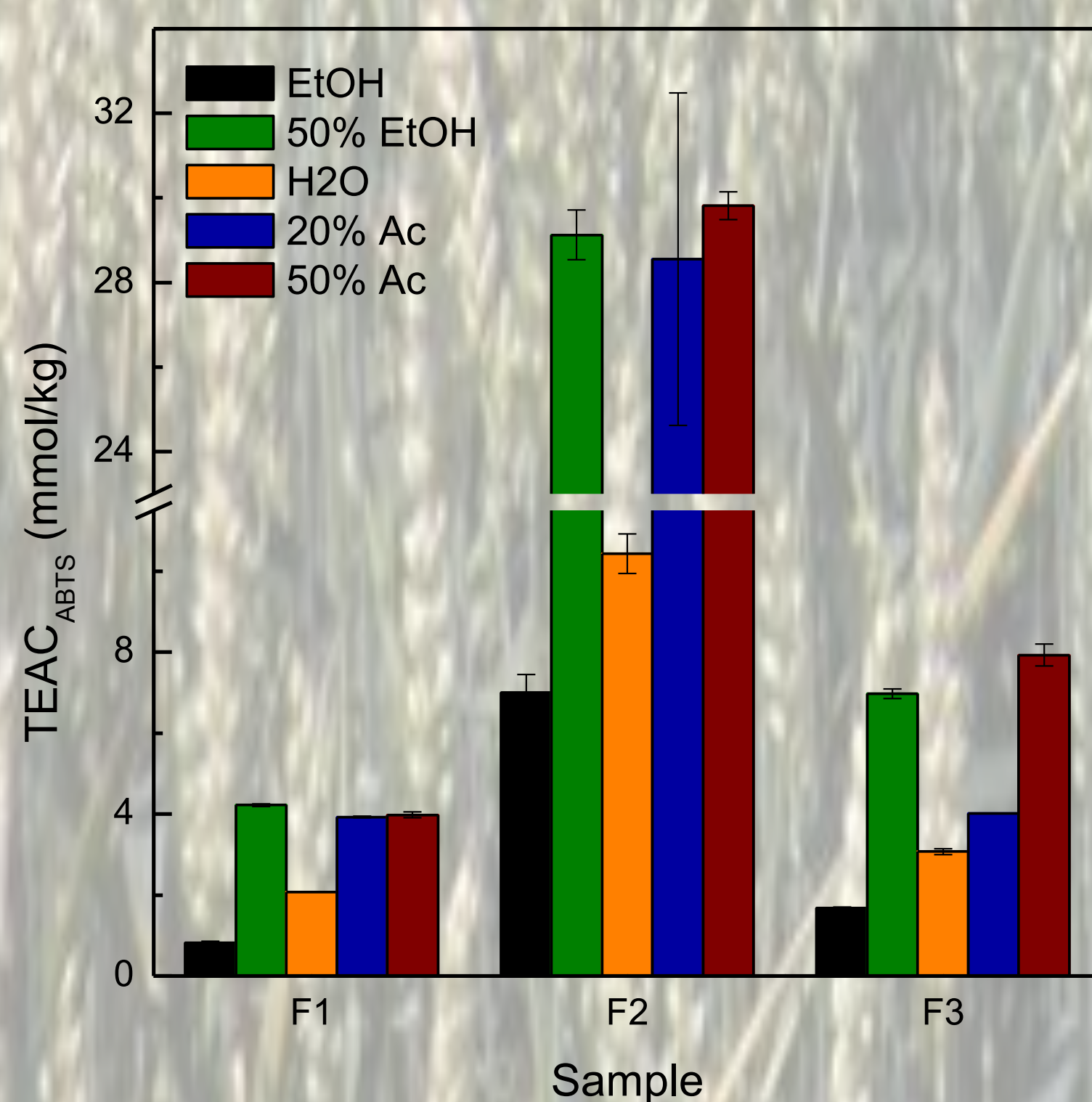
F2



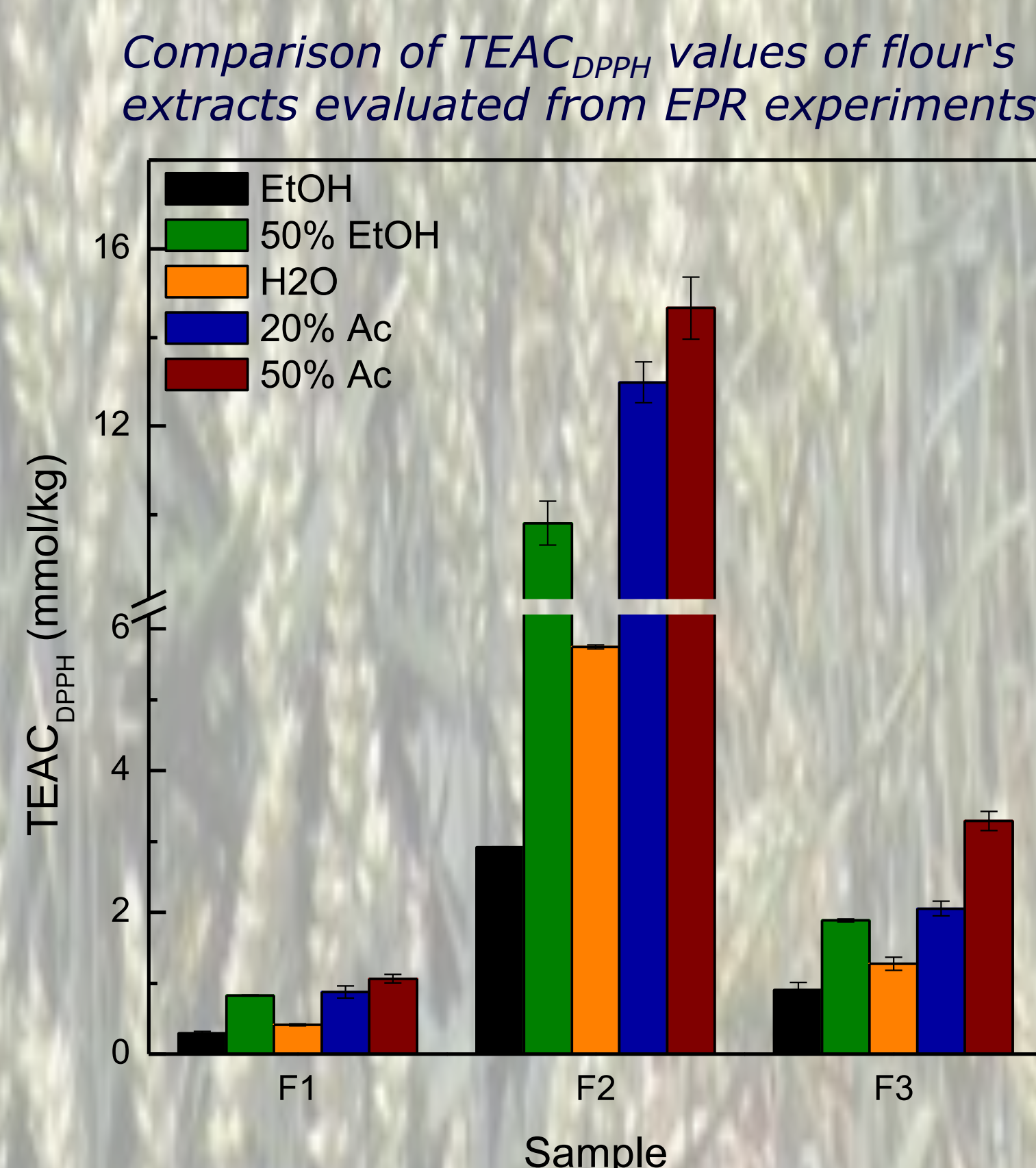
Time after ABTS^{•+} addition (min)

Time after ABTS^{•+} addition (min)

Time course of EPR spectra recorded in system containing 50% ethanol and 50 % acetone solution (reference systems) and flour's extracts in respective solvents in the presence of ABTS^{•+} cation radical



Comparison of TEAC_{ABTS} values of flour's extracts evaluated from EPR experiments



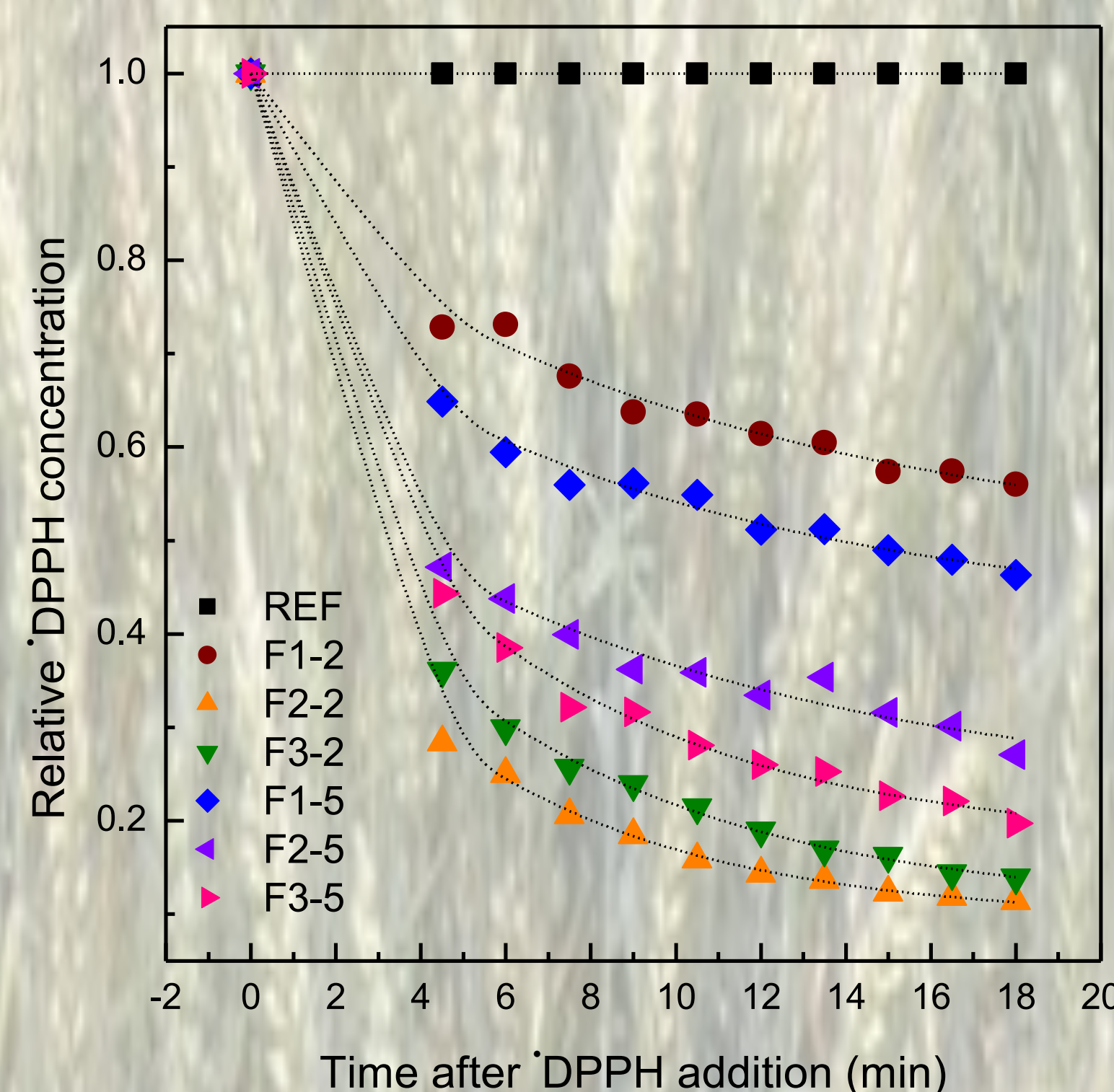
Comparison of TEAC_{DPPH} values of flour's extracts evaluated from EPR experiments

Correlation matrices between TEAC values (Trolox equivalent antioxidant capacity) evaluated from UV-VIS and EPR experiments

	TEAC _{ABTS} (UV-VIS)	TEAC _{DPPH} (UV-VIS)	TEAC _{ABTS} (EPR)	TEAC _{DPPH} (EPR)
TEAC _{ABTS} (UV-VIS)	1,00	0,92	0,99	0,98
TEAC _{DPPH} (UV-VIS)	0,92	1,00	0,92	0,93
TEAC _{ABTS} (EPR)	0,99	0,92	1,00	0,98
TEAC _{DPPH} (EPR)	0,98	0,93	0,98	1,00



Dependence of relative *DPPH free radical concentration on time after its mixing with flour's samples prepared to 50% ethanol and/or 50% acetone



CONCLUSION

- ♦ Selection of proper extraction system is crucial step in the isolation of functional components, including polyphenols
- ♦ As regards their antioxidant properties, extracts prepared to solvents with the higher polarity are more effective than that prepared in less polar ones
 - absolute ethanol is the least suitable solvent to prepare antioxidant extracts from spelt and buckwheat flours
 - 50% acetone could be recommended as solvent of choice for extraction of phenolic compounds from flours

List of representative sample

ID	Name	Type of flour
F1	Spelt flour	wholemeal, smooth flour
F2	Buckwheat flour	farina
F3	Buckwheat flour	smooth flour



RESULTS & DISCUSSION

- ♦ All flour extracts possessed significant antioxidant and radical-scavenging ability, the highest for those prepared into 50% acetone, followed by 50% ethanol
- ♦ For both, spelt and buckwheat flours, 50% acetone extracts revealed the highest content of phenolic compounds to the other extraction systems, whereas the highest total flavonoid content was found in water extracts
- ♦ Antioxidant activity of prepared extract is in good correlation with total polyphenol compounds content
- ♦ The influence of extraction solvent systems on colour characteristics of flour extracts is negligible

Comparison of some experimental characteristics determined in flour's extracts

Extraction solvent system	ID	UV-VIS experiments				EPR experiments	
		TPC (mg.kg ⁻¹)	TFC (mg.kg ⁻¹)	% DPPH	% ABTS	TEAC _{DPPH} (mmol.kg ⁻¹)	TEAC _{ABTS} (mmol.kg ⁻¹)
Absolute ethanol	F1	471.6 ± 70.0	65.5 ± 7.4	13.7 ± 0.6	35.9 ± 0.8	0.3 ± 0.0	0.8 ± 0.0
	F2	1086.3 ± 16.6	48.3 ± 1.8	55.7 ± 0.5	60.1 ± 1.7	2.9 ± 0.0	7.0 ± 0.5
	F3	444.2 ± 0.3	9.2 ± 1.1	32.0 ± 0.0	76.5 ± 1.4	0.9 ± 0.1	1.7 ± 0.0
50% ethanol in water (v/v)	F1	1964.1 ± 67.9	121.8 ± 1.2	40.2 ± 0.0	84.0 ± 1.9	0.8 ± 0.0	4.2 ± 0.0
	F2	3776.9 ± 47.3	188.3 ± 0.0	78.3 ± 0.5	76.1 ± 0.0	9.8 ± 0.5	29.1 ± 0.6
	F3	1026.5 ± 5.7	50.1 ± 0.6	76.1 ± 0.5	55.9 ± 0.4	1.9 ± 0.0	7.0 ± 0.1
Distilled water	F1	1044.6 ± 39.4	207.1 ± 1.3	3.3 ± 0.3	89.5 ± 1.4	0.4 ± 0.0	2.1 ± 0.0
	F2	1990.1 ± 87.3	236.1 ± 2.4	39.0 ± 2.9	85.1 ± 2.9	5.7 ± 0.0	10.4 ± 0.5
	F3	671.2 ± 50.0	211.5 ± 7.1	18.7 ± 2.3	87.4 ± 4.5	1.3 ± 0.1	3.1 ± 0.01
20% acetone in water (v/v)	F1	1901.1 ± 42.0	97.1 ± 0.01	30.6 ± 0.3	76.1 ± 0.4	0.9 ± 0.1	3.9 ± 0.0
	F2	4903.3 ± 14.1	121.1 ± 1.6	48.7 ± 1.0	55.1 ± 1.5	13.0 ± 0.5	28.6 ± 4.0
	F3	1326.2 ± 8.2	58.2 ± 7.8	70.3 ± 1.0	87.1 ± 0.0	2.1 ± 0.1	4.0 ± 0.0
50% acetone in water (v/v)	F1	2751.0 ± 8.7	101.4 ± 0.7	31.9 ± 0.6	88.7 ± 0.9	1.1 ± 0.1	4.0 ± 0.1
	F2	6376.6 ± 0.2	216.3 ± 3.6	59.4 ± 5.9	88.6 ± 0.3	14.7 ± 0.7	29.8 ± 0.3
	F3	1716.9 ± 0.0	50.2 ± 3.1	84.8 ± 0.0	68.3 ± 0.9	3.3 ± 0.1	7.9 ± 0.3

Total polyphenol compounds content of buckwheat flour (sample F2) in different solvent systems

