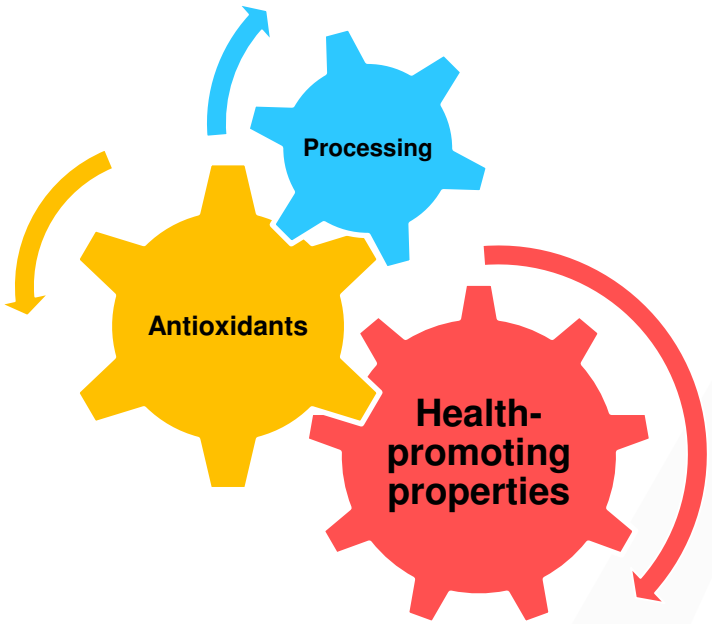
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Effect of processing on *in vitro* bioaccessibility of phenolics, flavonoids and antioxidant activity of vegetables with/without yoghurt

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Introduction

- The best sources of antioxidants: **Fruits & vegetables**
- Protective effects due to bioactive antioxidant compounds
- Consumed fresh or processed into a variety of food products
- Shelf-life, availability, new products, nutrition, quality

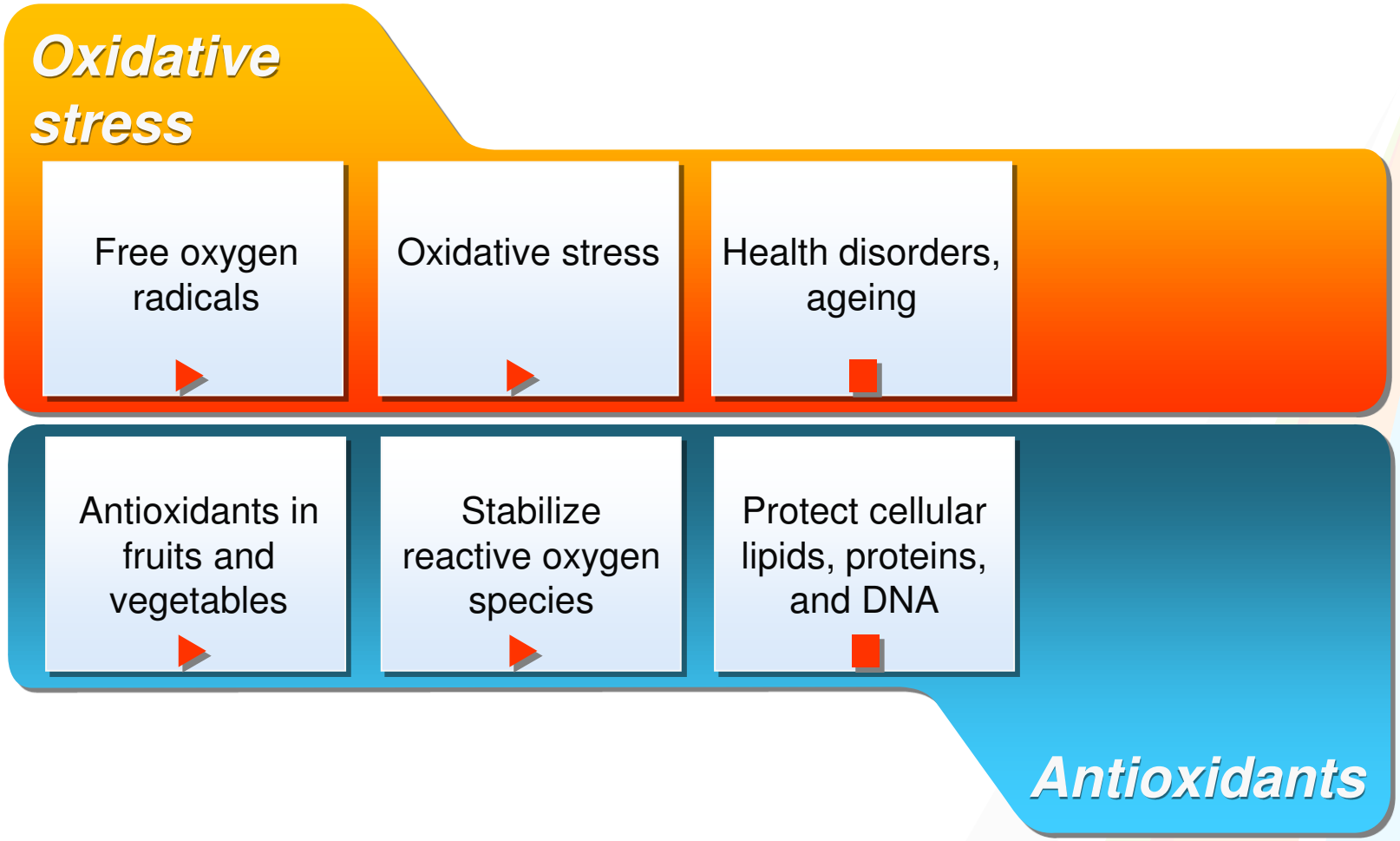


Introduction

- Nature and conditions of the processes applied
- Variety/origin of the food material used
- Biochemical properties of the antioxidant

Effect of processing on antioxidants

Dietary antioxidants



Dietary antioxidants

Carotenoids	Food sources	↓ Risk
α-carotene, β-carotene, lutein, lycopene	tomato, carrot, spinach, chilli (red), kale, lettuce	cancer (lung and stomach) , CVD, eye diseases
Flavonoids	**Food sources**	**↓ Risk**
quercetin, hesperedin, naringenin, catechin, cyanidin, genistein	onions, apples, berries, tea, red wine, parsley, thyme, citrus, tea, apples, cherries, grapes, legumes	cancer , CVD, gastric and duodenal ulcers, allergies, infection
Vitamins	**Food sources**	**↓ Risk**
vitamin C, vitamin E, vitamin A	orange, tomato, vegetable oils, nuts, carrot, tomato, green leafy vegetables	cancer, CVD, cataract development

Changes in antioxidant profile during food processing

- High potential to affect the nutritional properties and biological activity of the end product
- Both positive and negative effects

Thermal Treatments

Blanching
Evaporation
Pasteurization
Canning
Drying
Boiling

Non-thermal Treatments

Washing
Selection
Cutting
Homogenization
Packaging
Transportation
Storage

Changes in bioavailability

- Bioavailability: “the proportion of a nutrient that is digested, absorbed, and metabolized through normal pathways”
- Physiological effect is influenced by the active bioavailable dose
- Food processing affects bioaccessibility and bioavailability (change in the chemical form of the compounds)
- Lack of information on the effect of processing on bioavailability

Vegetables and yoghurt

- Home processed vegetables and yoghurt are commonly consumed together in Turkish diet.



Objectives

Determine the effects of food processing on total phenolics and antioxidant capacity

Investigate the effect of codigestion of commonly consumed vegetables and yoghurt in Turkey

Materials



Celery





Red beetroot



Carrot



Red capia pepper

Processed materials

Raw

Sliced

Boiled

~100°C
7 min

Roasted

~200°C
7 min



Methods

5 or 10 g (in case of mixtures) of sample
+
20 mL distilled water
+
1.5 mL pepsin solution

↓

Adjust pH of sample solutions to ~ 1.7 with addition of 5 M HCl
+
Incubate at 37°C for 2 h in shaking water bath at 100 rpm

↓

Collect 2 mL aliquots of the post-gastric digestion (PG)

4.5 mL pancreatin and bile salt mixture
+
Place dialysis bags filled with sufficient $NaHCO_3$ to neutralize the sample's titratable acidity

↓

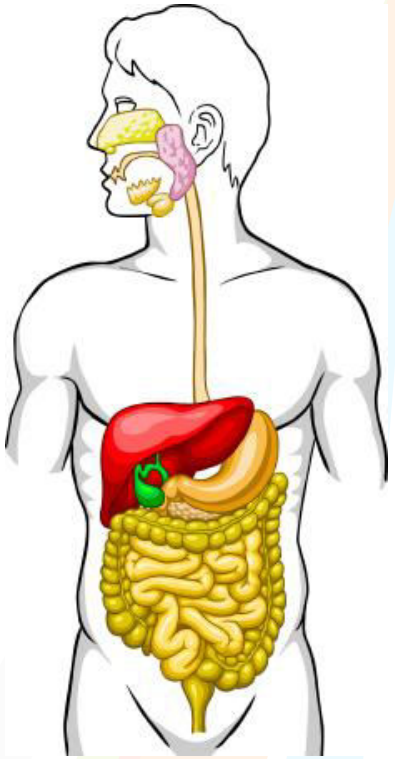
Incubate at 37°C for 2 h in shaking water bath at 100 rpm

↓

Collect solutions inside (IN) and outside (OUT) the dialysis bags

↓

PG, IN and OUT samples were stored at -20°C until further analysis



Methods

Chemical extraction

Total phenolic & total flavonoid contents

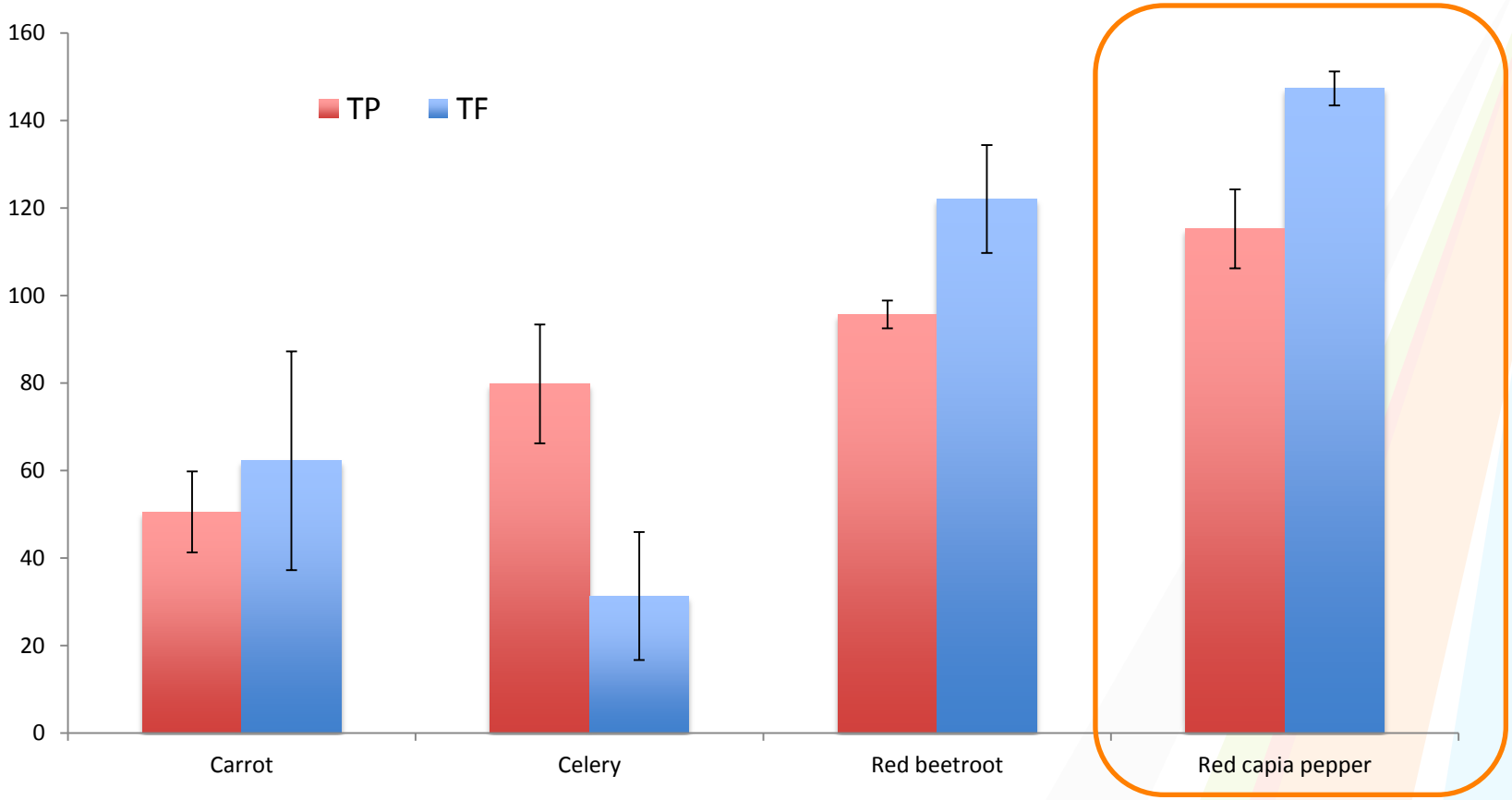
HPLC analysis

Total antioxidant capacity

- ABTS
- DPPH
- FRAP
- CUPRAC

Results and discussion

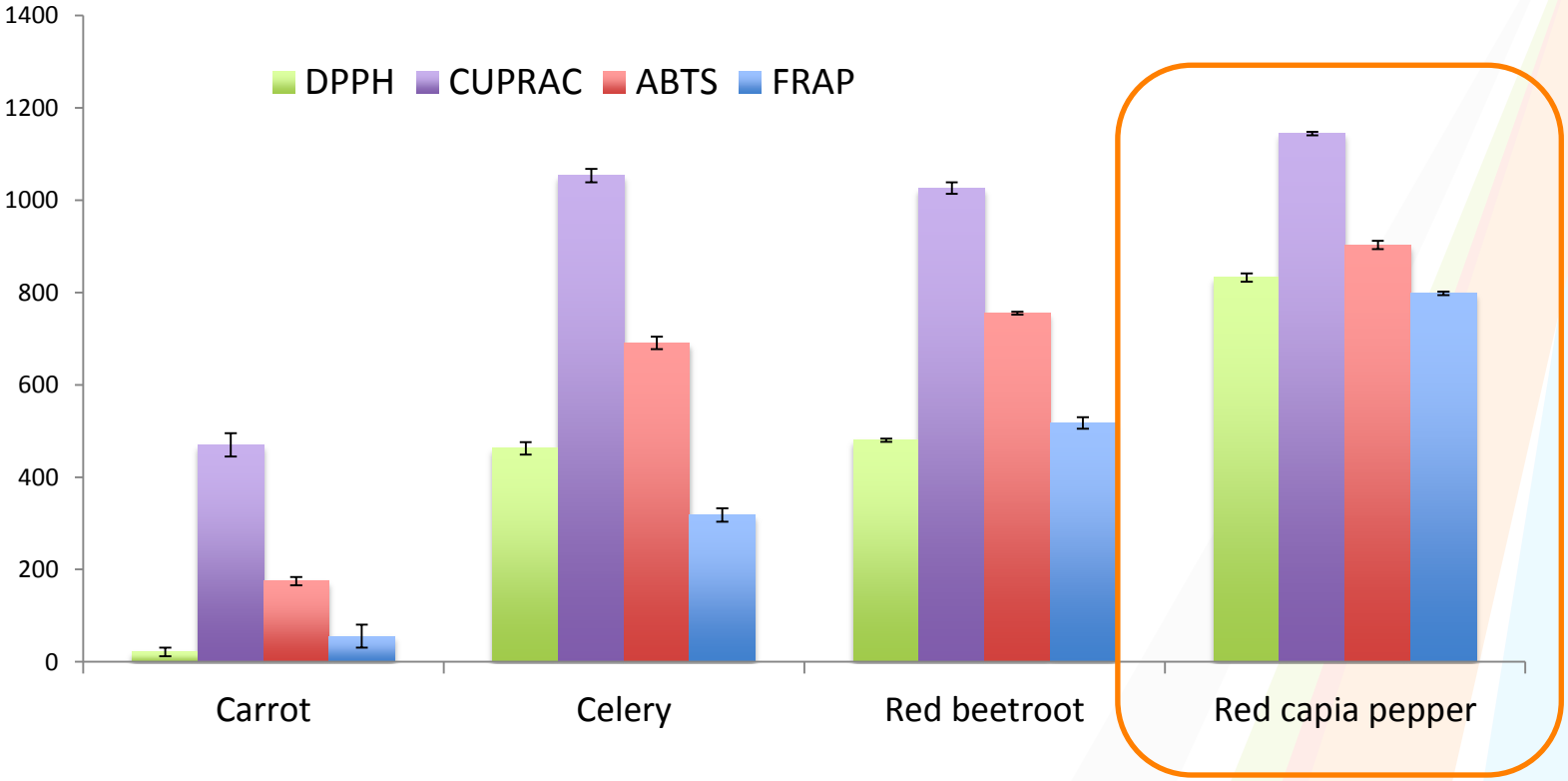
- TP and TF results of raw materials



The results were given as; TP: mg GAE/100 g fresh sample; TF: mg rutin/100 g fresh sample

Results and discussion

- AOX results of raw materials

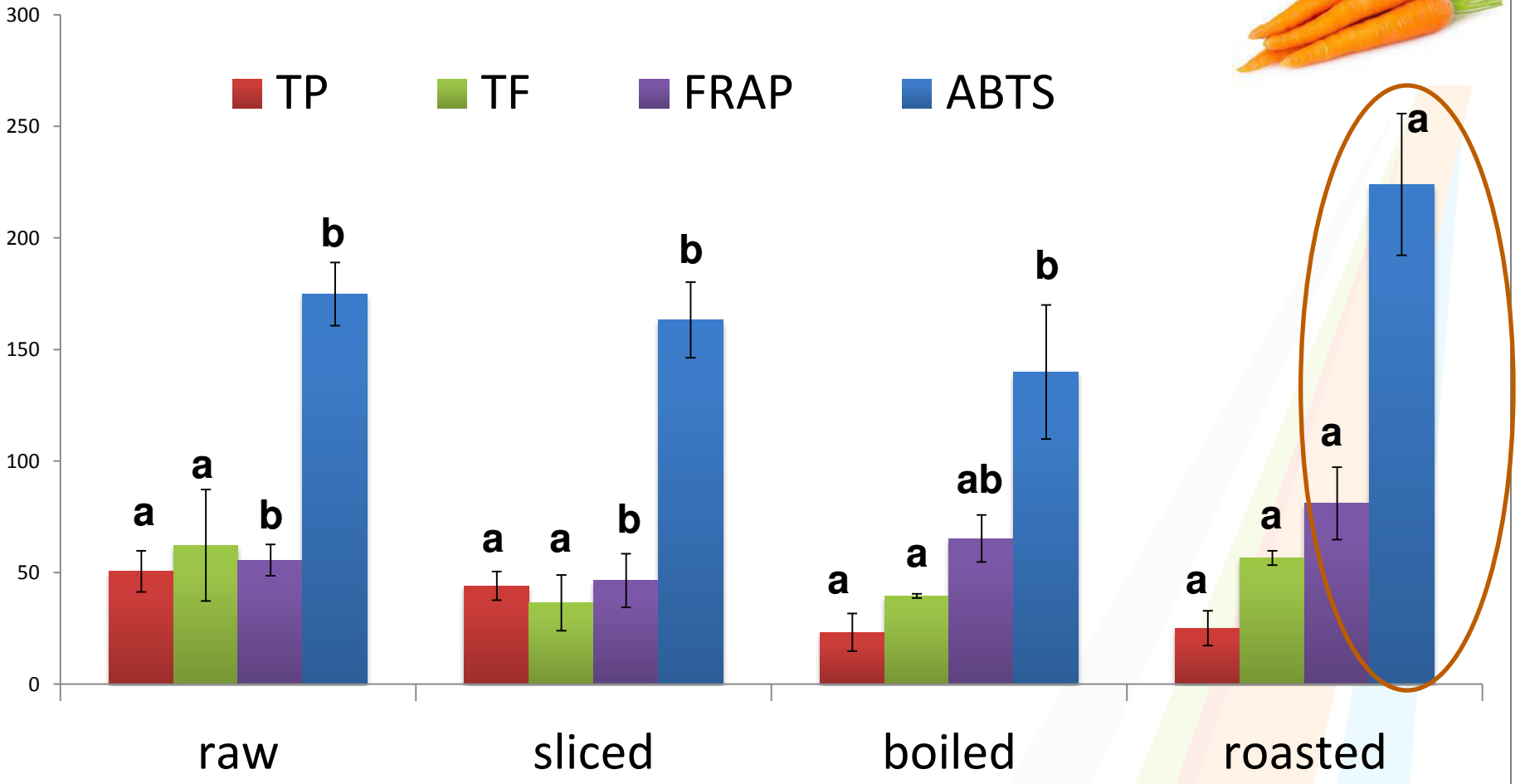


All results were given as: µmol TEAC/100 g fresh sample

Processing effect

Results and discussion



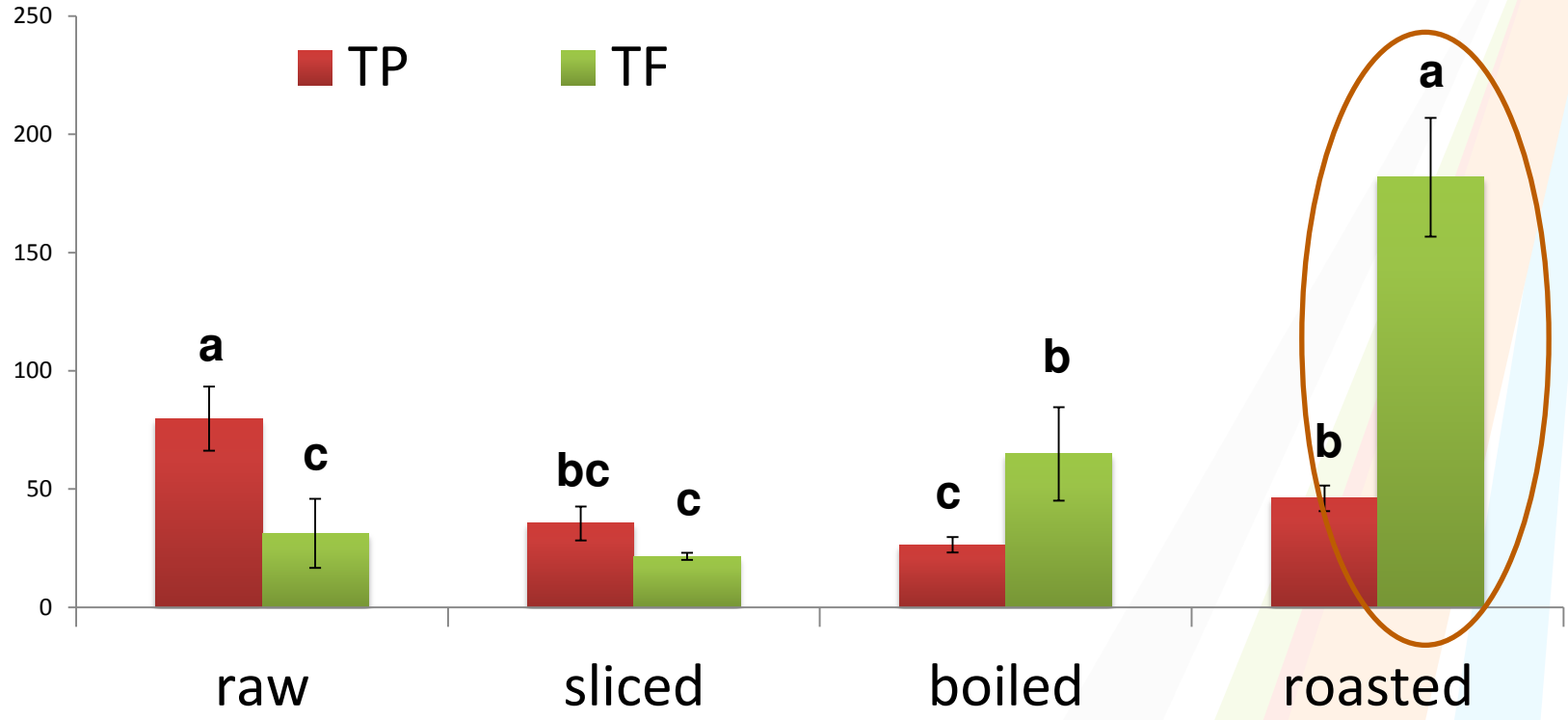


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Results and discussion



- Total phenolic and flavonoid results

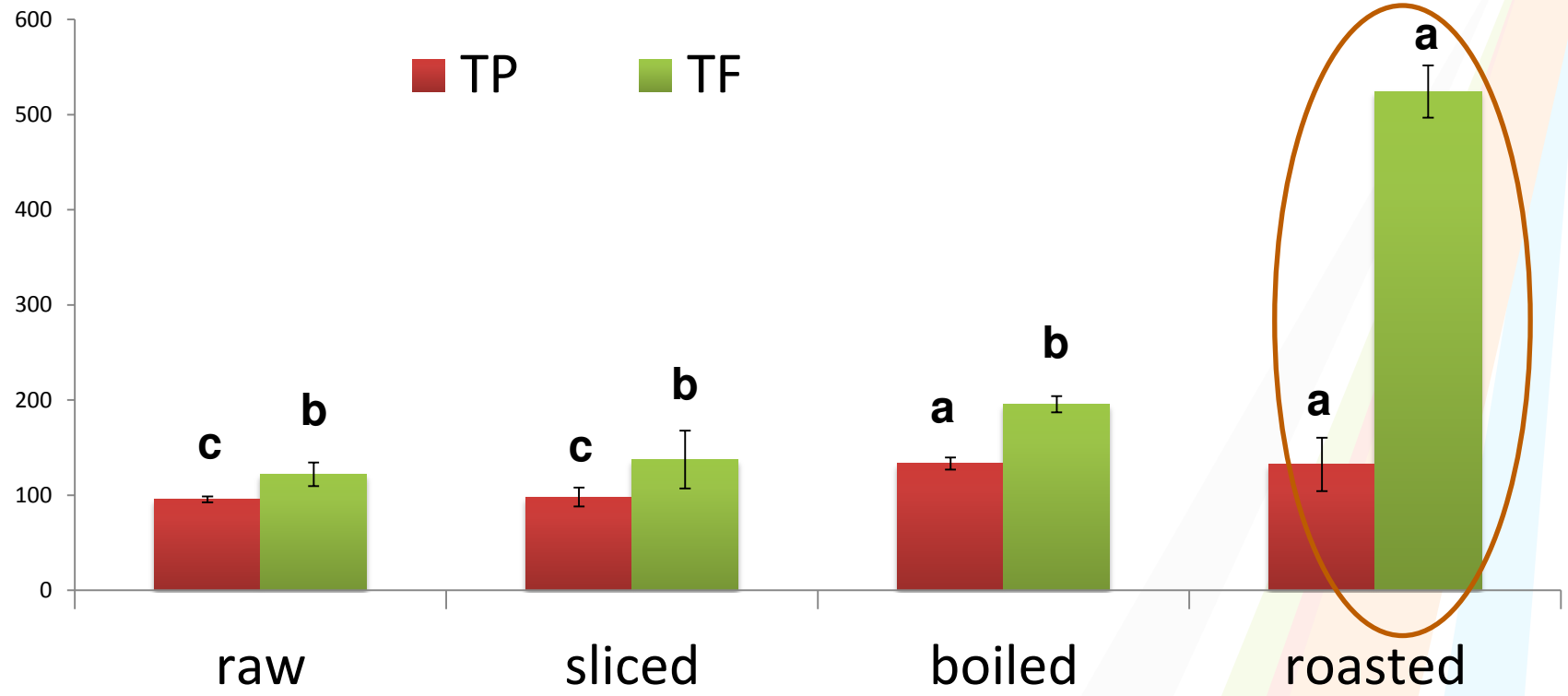


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Results and discussion



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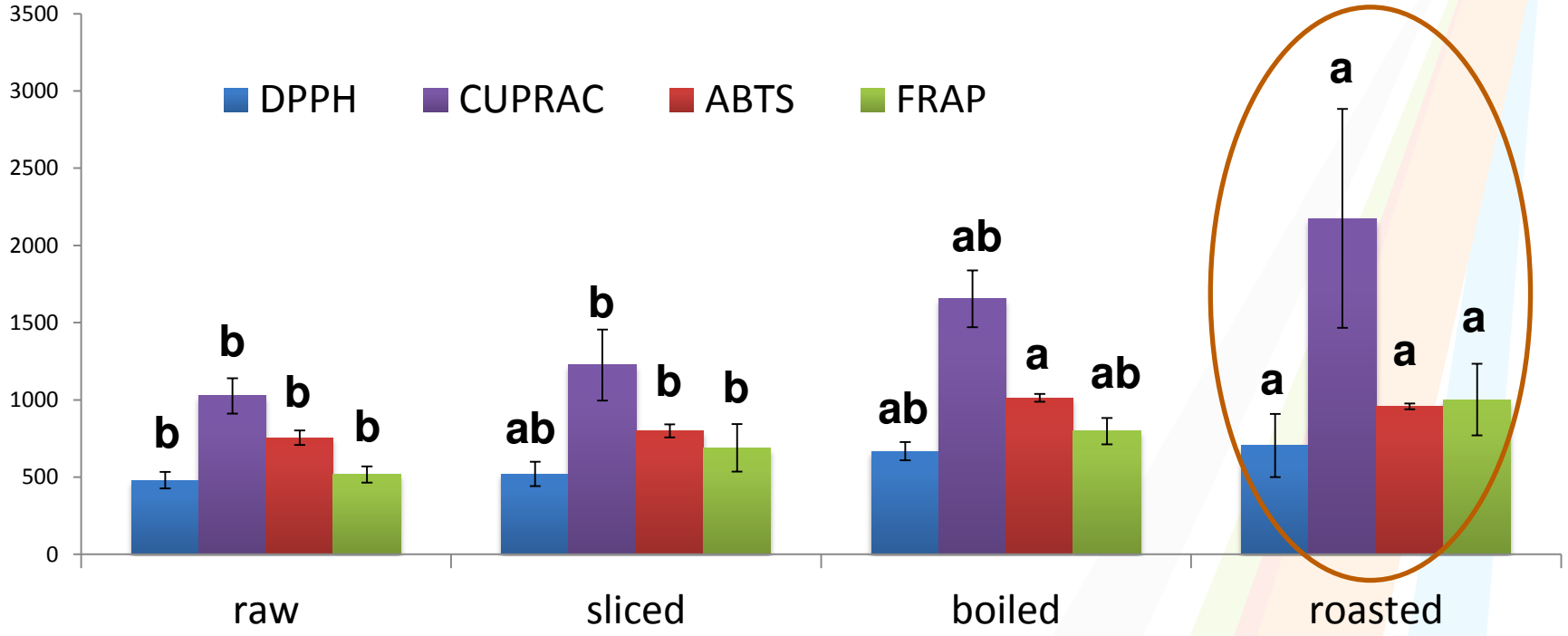


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Results and discussion



- AOX Analyses

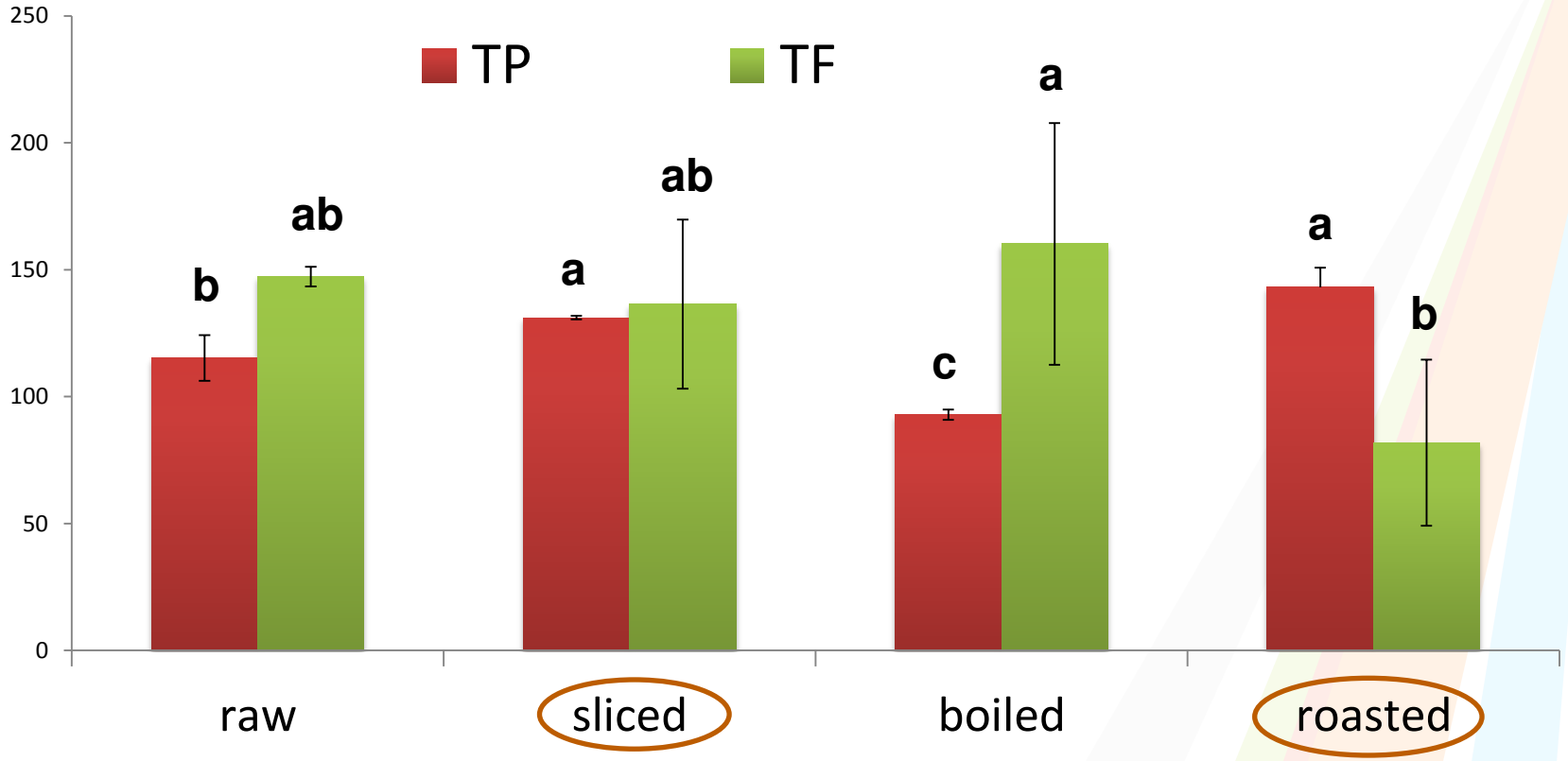


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Results and discussion



- Total phenolic and flavonoid results

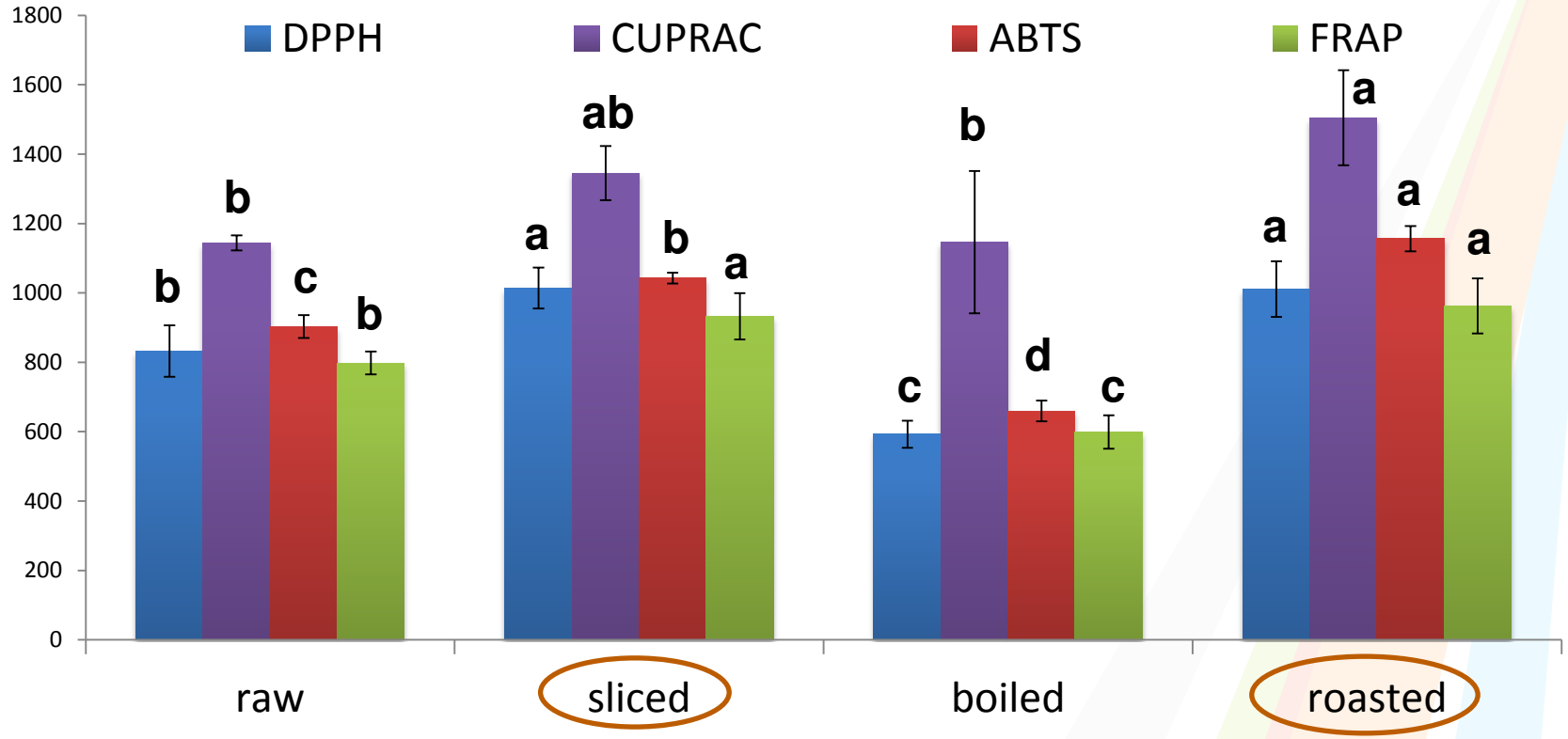


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Results and discussion



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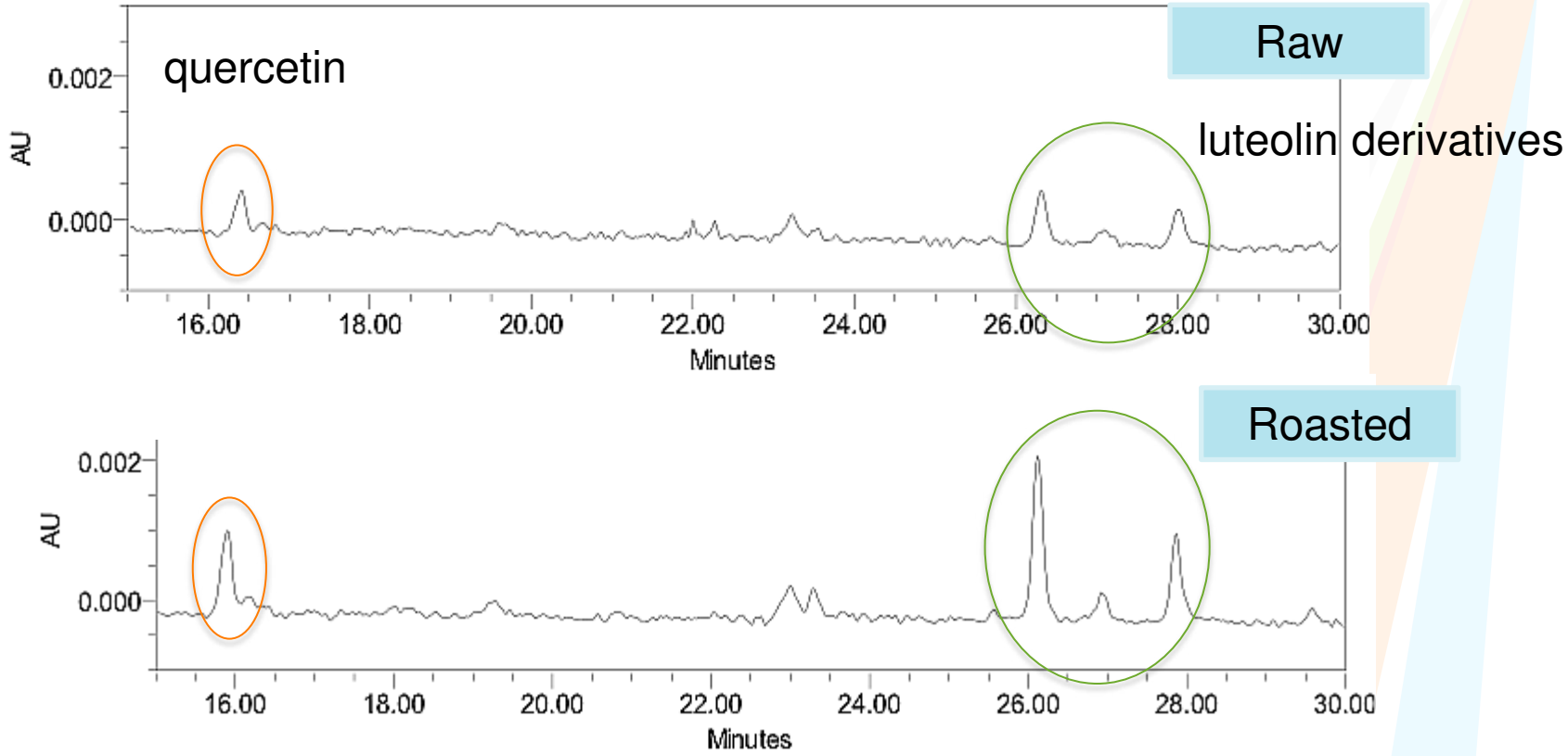


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Results and discussion

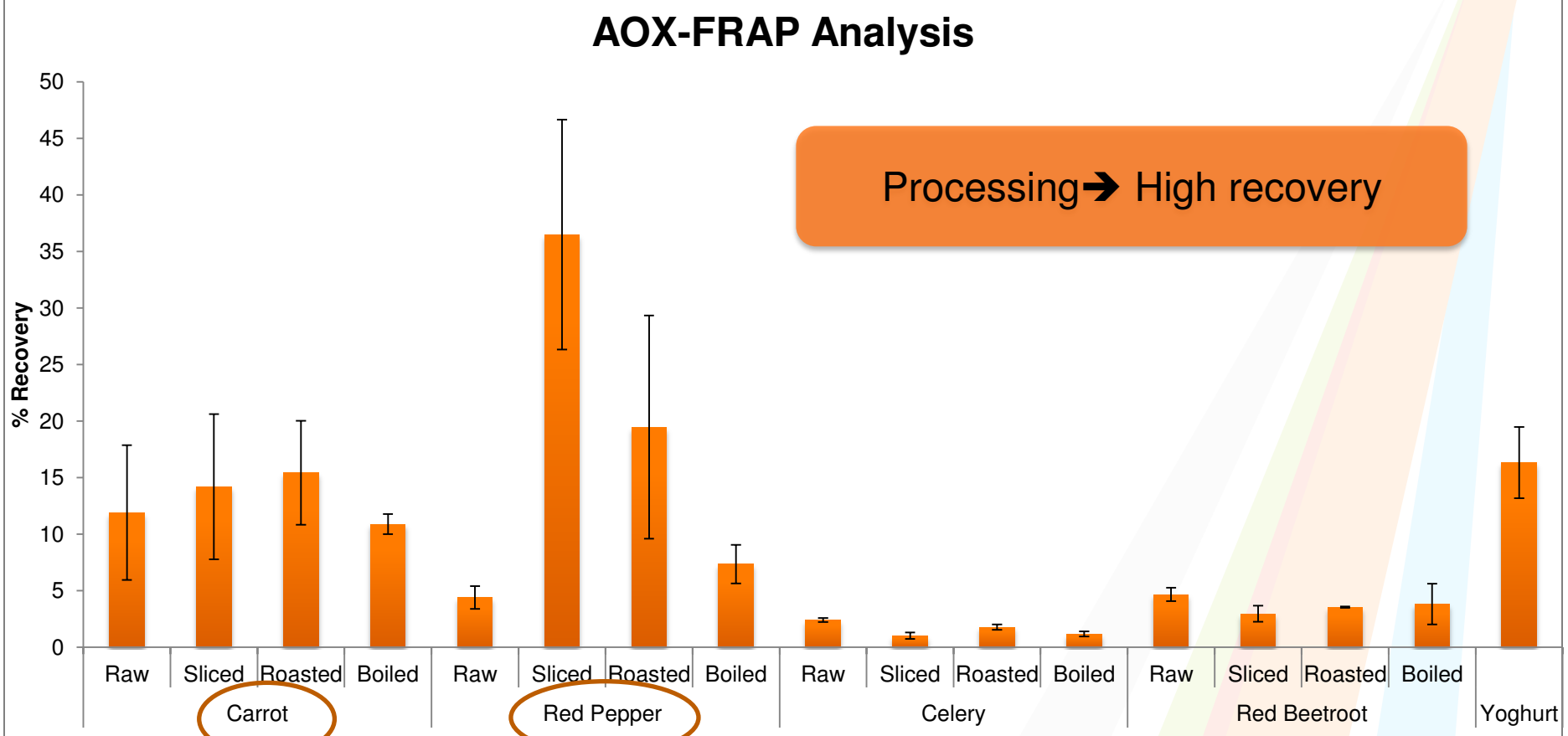
- *HPLC Analysis*





Results and discussion

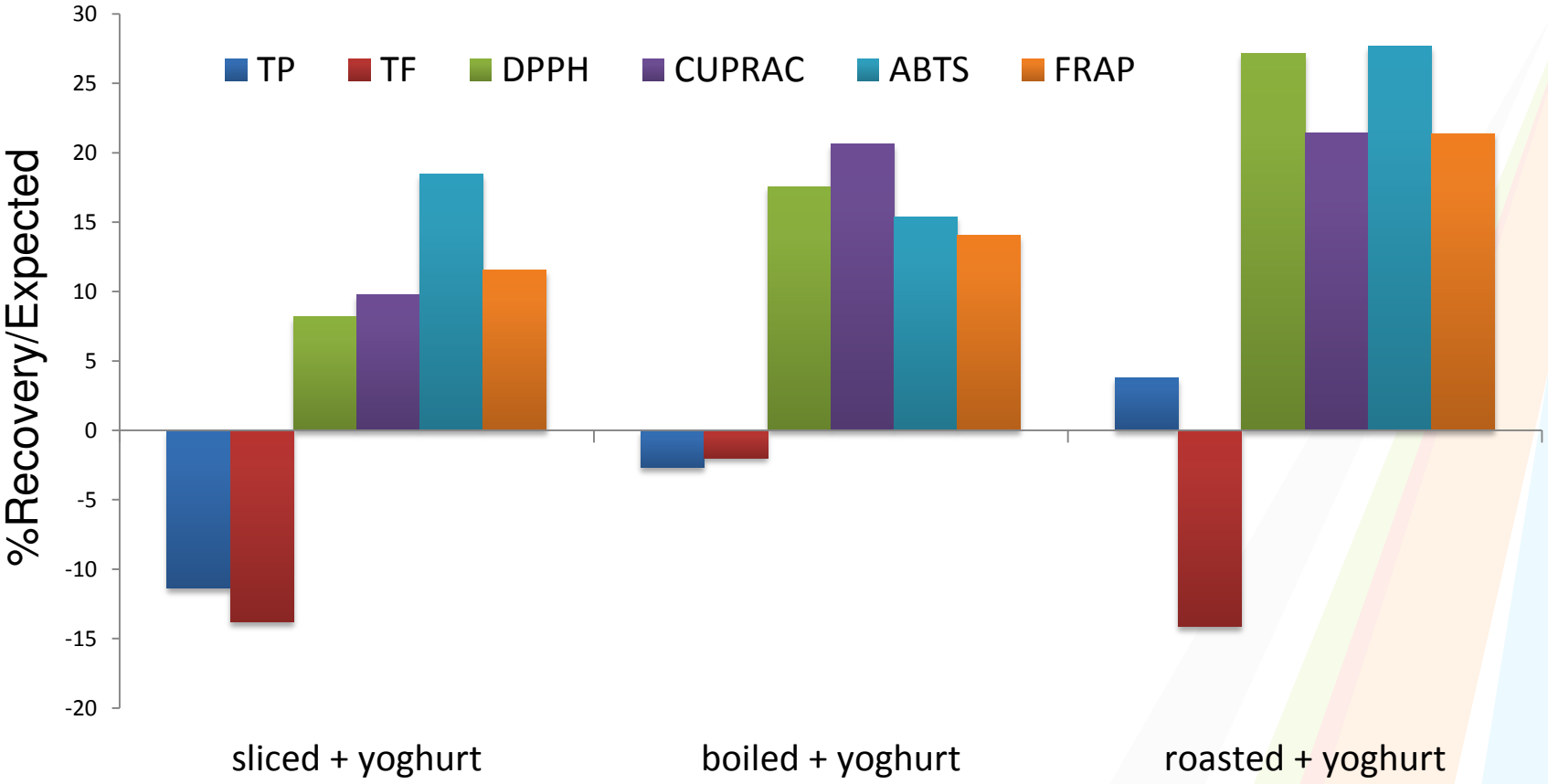
- *In vitro* gastrointestinal digestion



Effect of yoghurt addition

Results and discussion

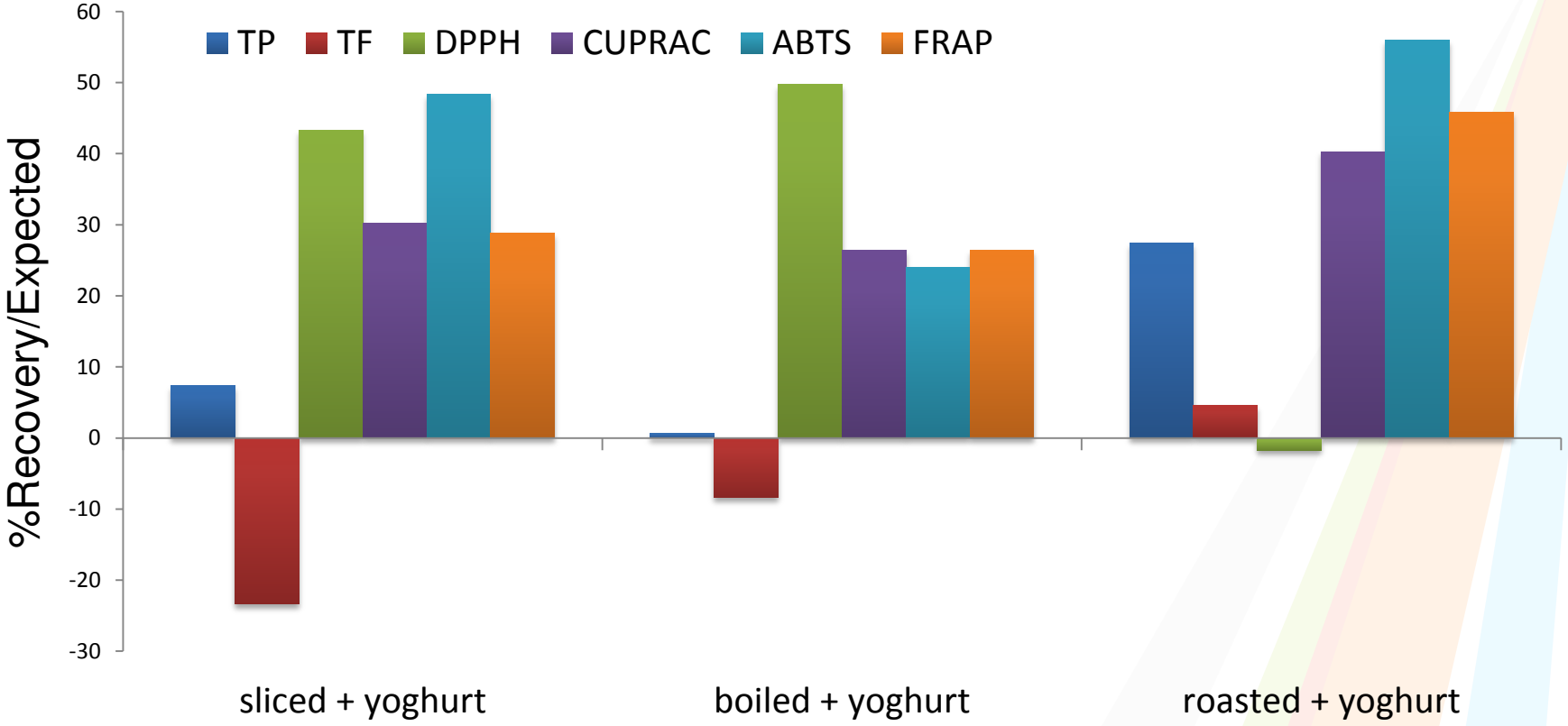




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Results and discussion

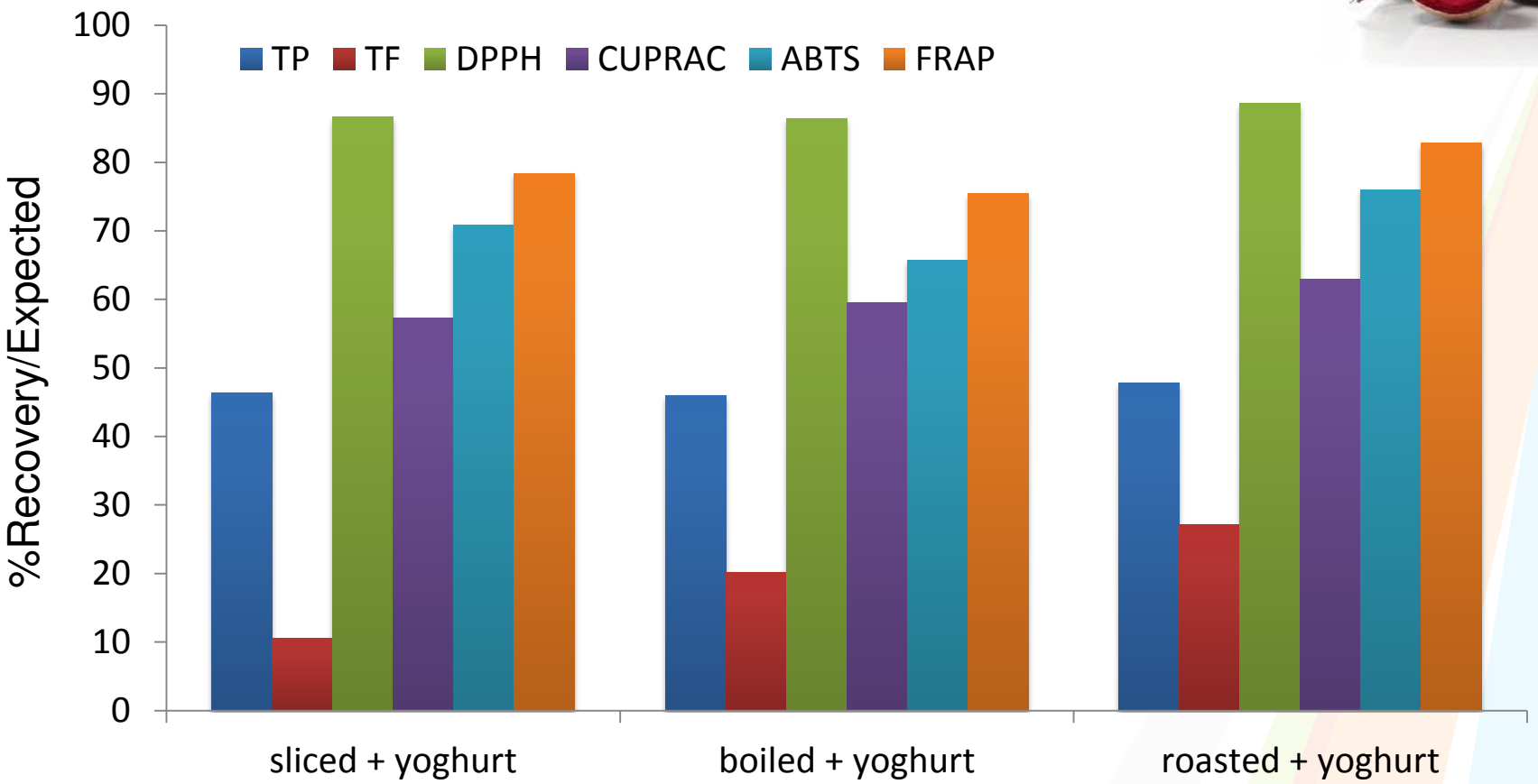




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Results and discussion

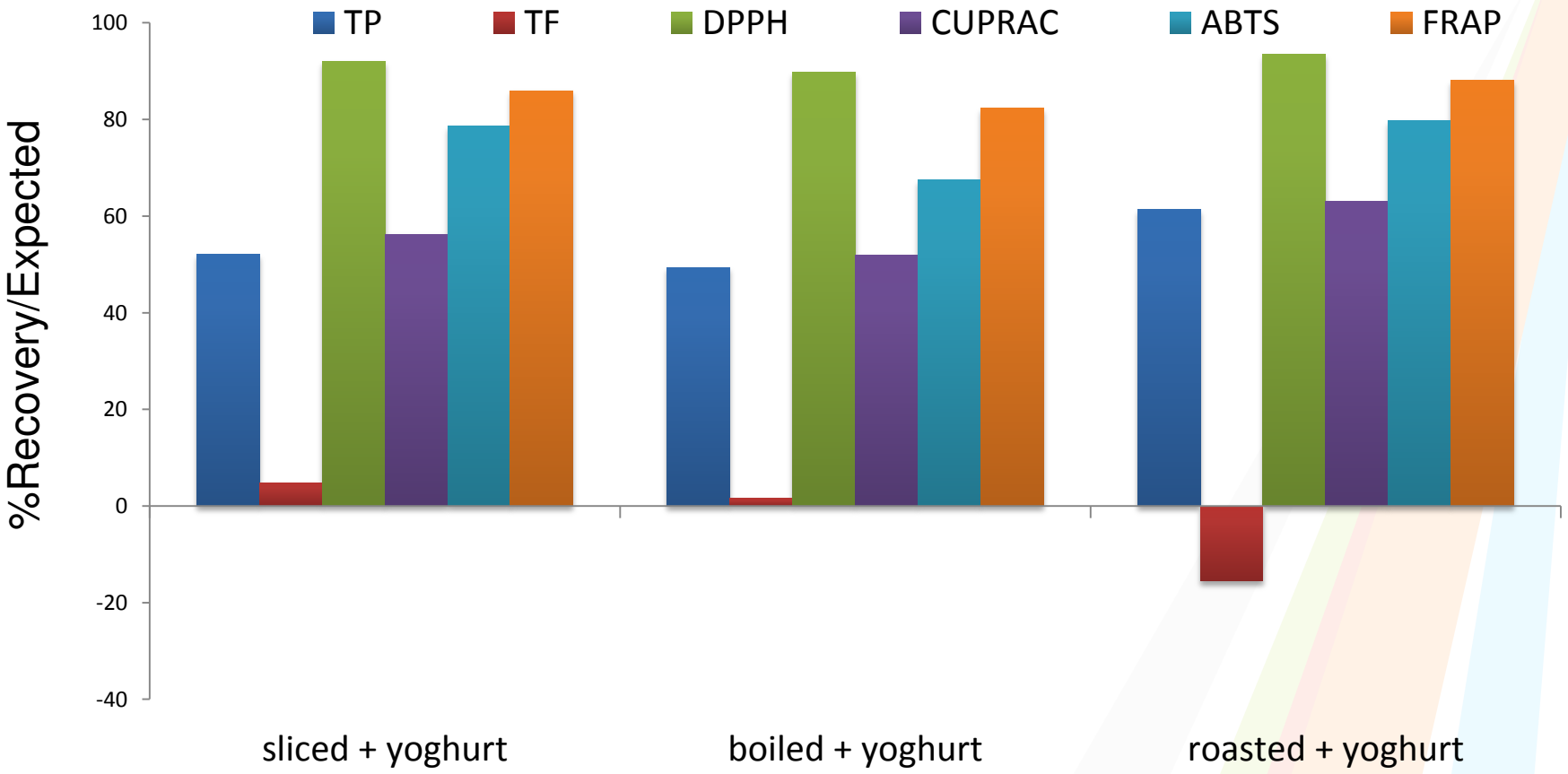




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Results and discussion





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Conclusion

Effect of processing varies according to the type of the fruit/vegetable, variety, etc.

Roasting may have a positive impact on bioactives and AOX capacity of vegetables

Yoghurt addition may increase AOX capacity of vegetables

Yoghurt addition may also enhance the bioavailability of processed vegetables

Thank You!