

Functionality and *in-vitro* digestibility of yellow pea, green lentil, chickpea and navy bean proteins extracted by different methods

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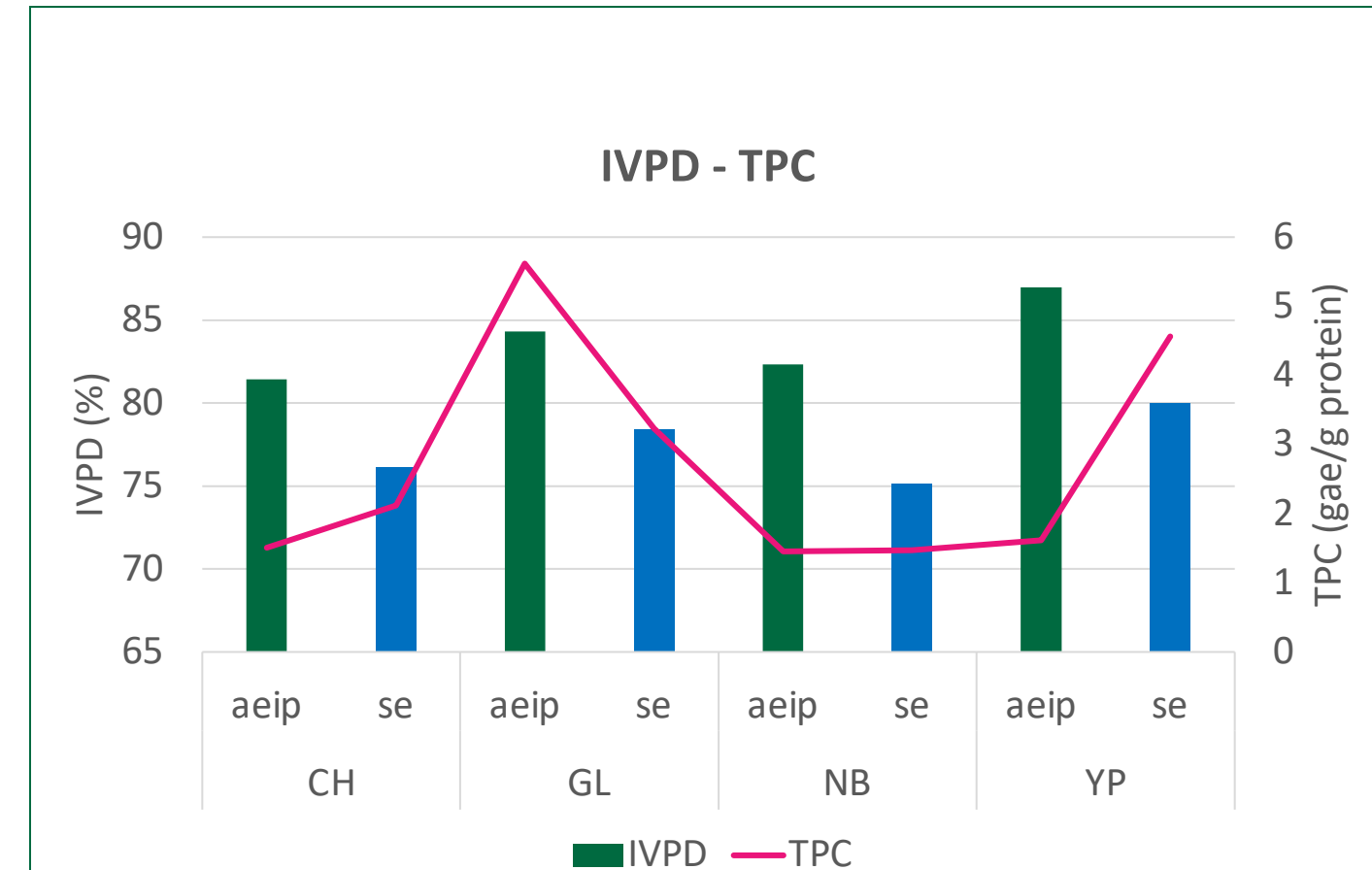
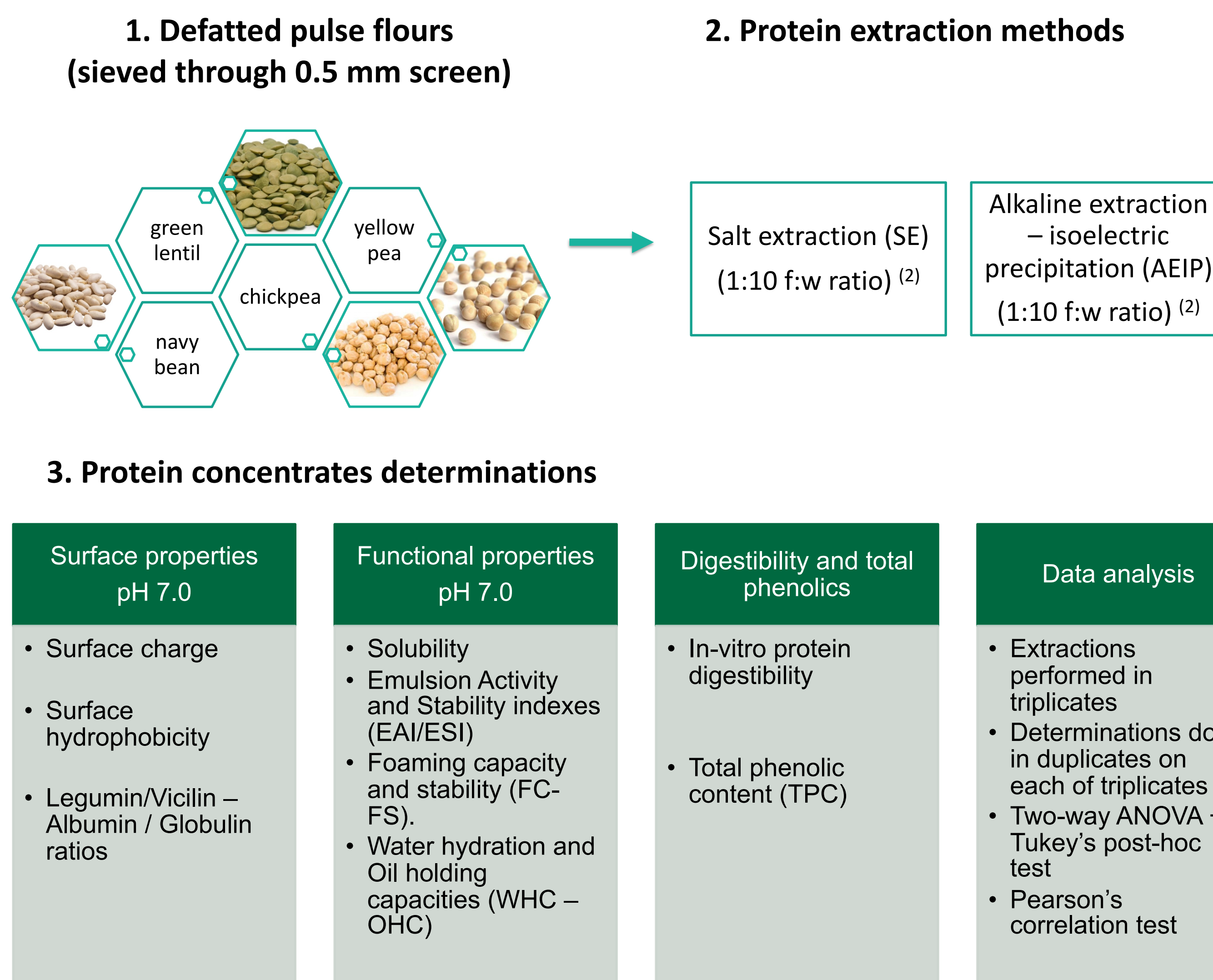
INTRODUCTION

Proteins in pulses can be extracted using wet extraction methods (e.g., alkaline extraction-isoelectric precipitation and salt extraction) to achieve high levels of protein (~70 – 90%). Each method, due to the different processing conditions (pH, presence of salts) will favor the selection of different protein fractions present in the seed, such as salt-soluble globulins (legumin, vicilin and convicilin) and water-soluble albumins (1). These protein fractions, due to their characteristics (conformation, flexibility, solubility, etc.) will contribute to the protein concentrates behavior when their surface, functional properties and *in-vitro* protein digestibility are evaluated.

OBJECTIVES

The present study explores the effect of extraction method and starting raw material on the resulting protein's surface, functionality and *in-vitro* protein digestibility (IVPD).

MATERIALS AND METHODS



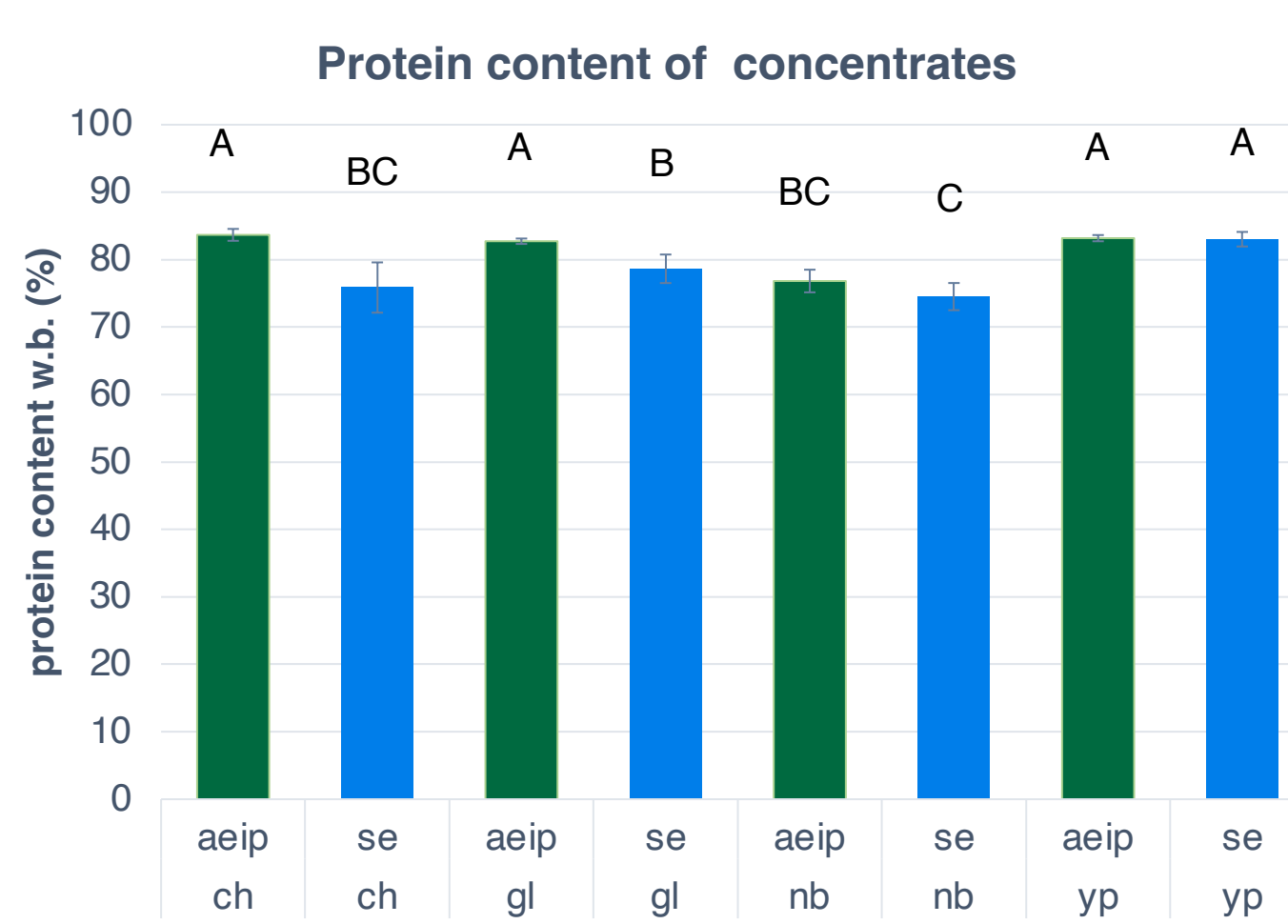
- Extraction method and pulse were significant effects in IVPD
- IVPD AEIP > IVPD SE
- TPC GL > YP > CH > NB

CONCLUSIONS

- The extraction method and the type of pulse influence on the resulting functionality and characteristics of extracted proteins, which makes them suitable for different applications.
- SE proteins showed improved functionality (emulsion, foaming, OHC and solubility) as well as extraction yields compared to AEIP samples.
- The IVPD was higher in AEIP extracted proteins, but SE samples were higher in TPC.
- The A/G ratio increased with the SE method. This can explain lower IVPD values obtained for the SE samples, where albumins can act as protease inhibitors (3).
- No major differences in L/V ratios between extraction methods, but type of pulse was found to be a significant factor.
- Future determinations will include amino acid analysis that will give more information about the composition and nutritional properties of the extracted proteins.

RESULTS

1. Protein content and yields



	Extraction yield (% d.b)	
	AEIP	SE
YP	17.71 ± 0.07	18.86 ± 0.51
GL	19.59 ± 0.16	20.26 ± 0.39
CH	16.04 ± 0.04	17.51 ± 2.08
NB	19.00 ± 0.32	21.71 ± 0.75

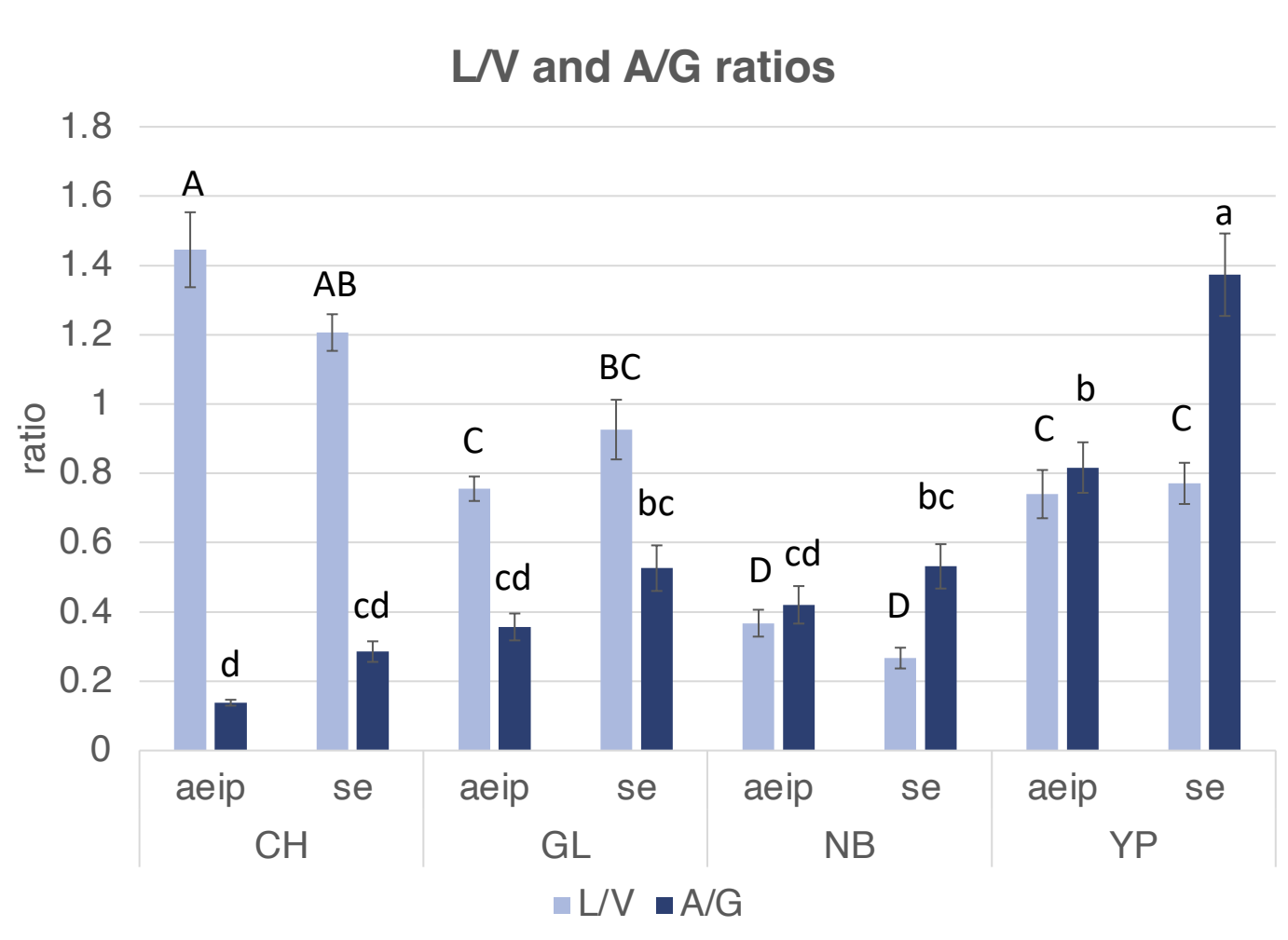
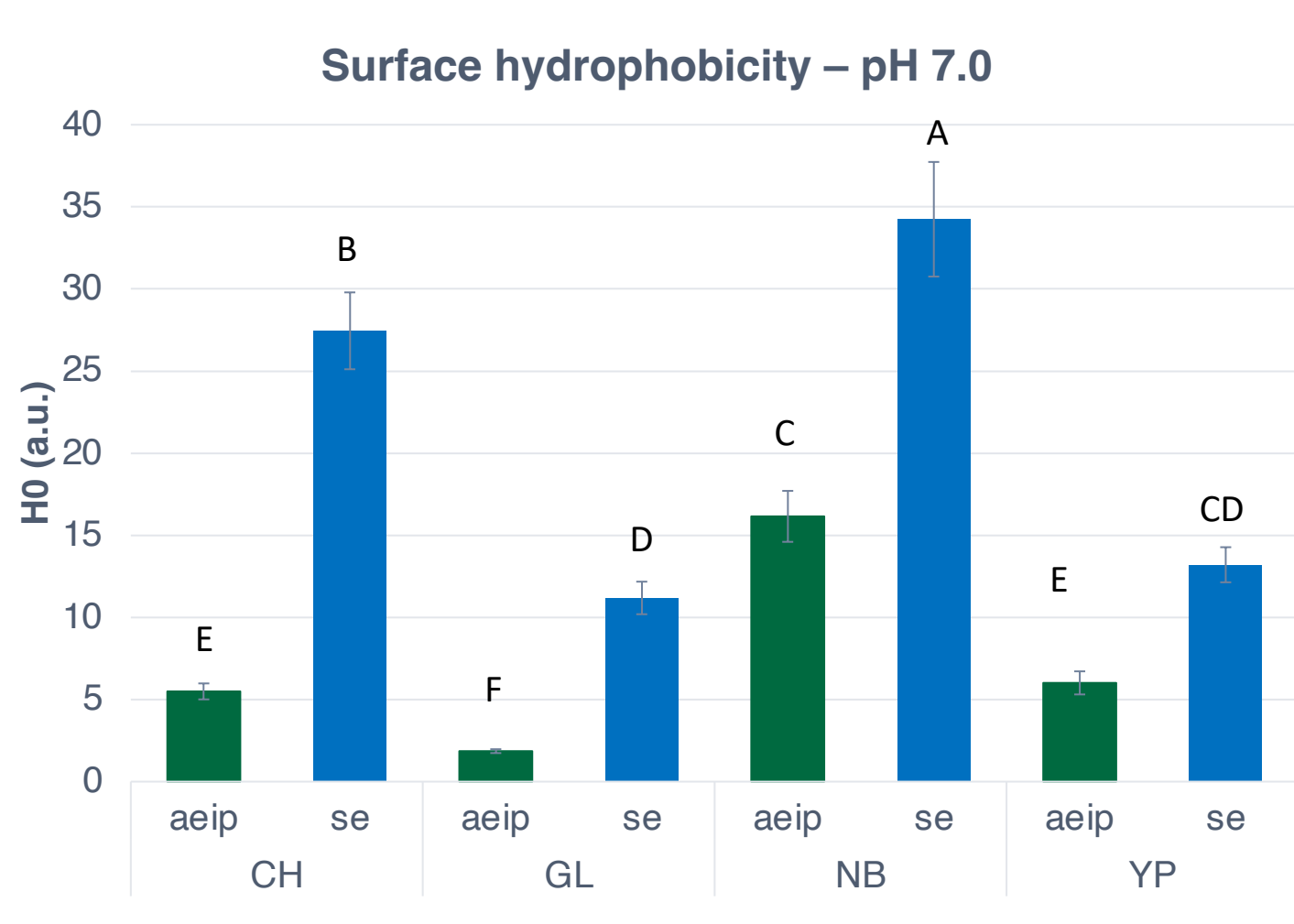
	Protein yield (% d.b)	
	AEIP	SE
YP	72.23 ± 0.28	76.76 ± 2.07
GL	74.44 ± 0.61	70.61 ± 1.38
CH	72.60 ± 0.16	71.54 ± 4.69
NB	68.50 ± 1.15	75.93 ± 2.64

	Solubility (%) – pH 7.0	
	AEIP	SE
YP	66.30 ± 3.56 ^d	71.09 ± 4.23 ^{cd}
GL	57.59 ± 3.07 ^e	91.05 ± 3.03 ^a
CH	74.85 ± 3.01 ^{bc}	80.55 ± 3.23 ^b
NB	87.85 ± 3.39 ^a	60.07 ± 3.57 ^e

- Higher protein contents for AEIP samples.
- Higher extraction yields for SE samples.
- Effect of pulse and extraction method influenced on protein yields.
- YP, GL and CH solubilities were higher for SE proteins.

2. Surface properties

	Zeta potential (mV) at pH 7.0	
	AEIP	SE
YP	-39.8 ± 1.8 ^B	-32.8 ± 2.4 ^A
GL	-38.8 ± 1.4 ^B	-38.3 ± 4.0 ^B
CH	-39.6 ± 1.7 ^B	-38.8 ± 3.4 ^B
NB	-32.4 ± 2.1 ^A	-32.0 ± 1.7 ^A



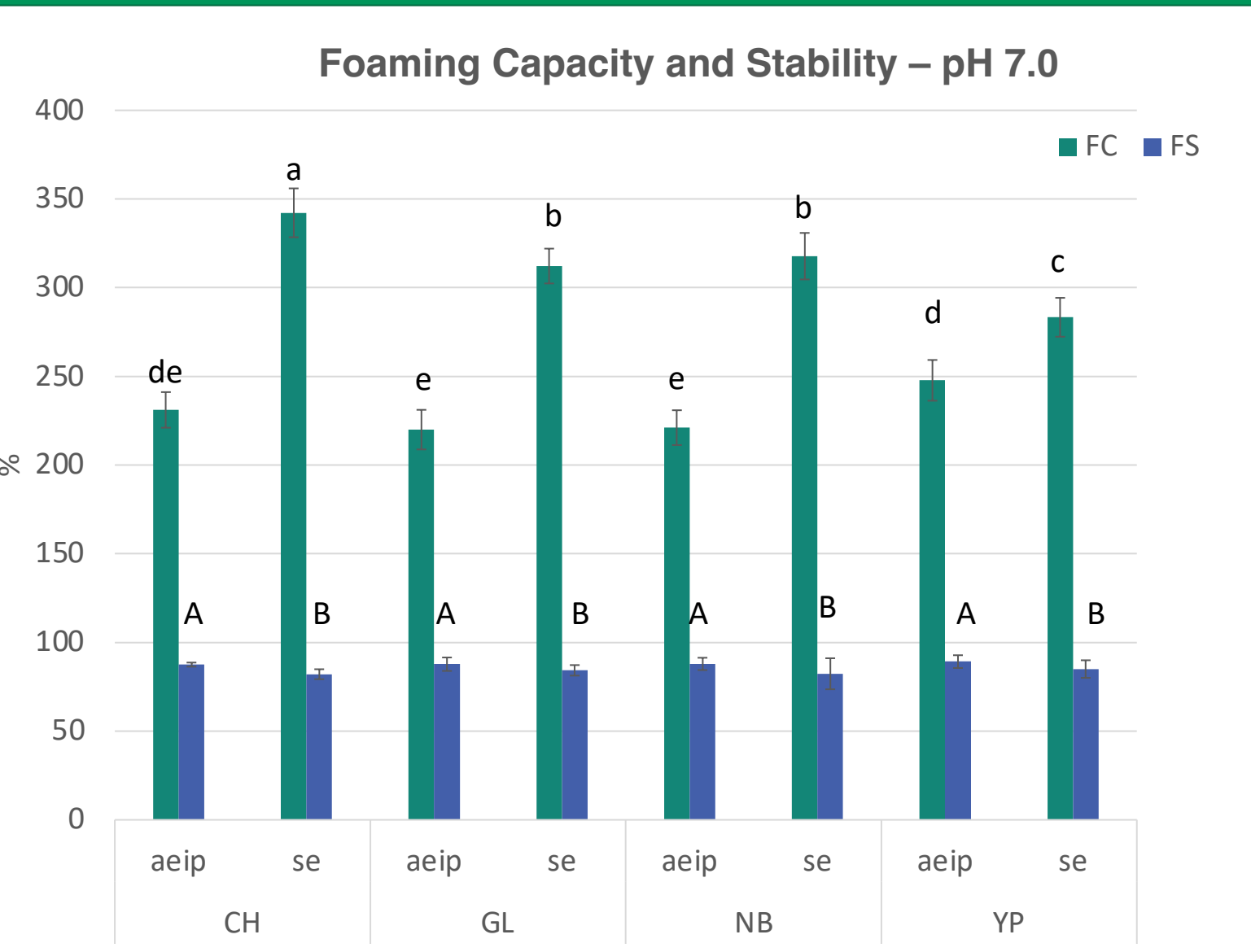
No major changes in L/V ratios with extraction method. Increase in A/G ratios with SE method

AEIP < SE
NB > YP >= GL >= CH

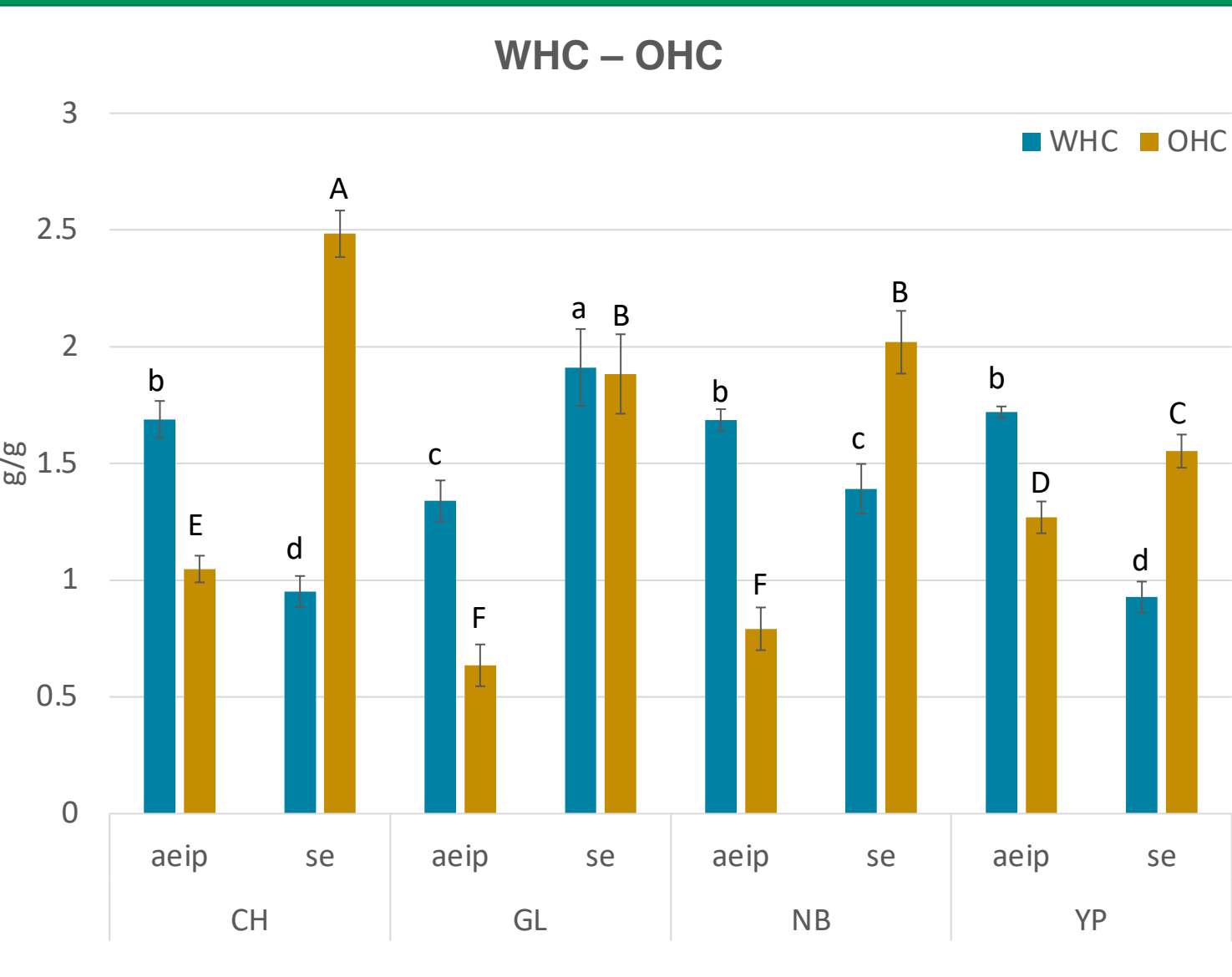
H0 SE > H0 AEIP

3. Functional properties

		EAI (m ² /g) pH 7.0	ESI (min) pH 7.0
		AEIP	
	YP	23.68 ± 1.55 ^C	12.36 ± 0.97 ^{ab}
	GL	26.91 ± 1.73 ^B	11.90 ± 0.50 ^{ab}
	CH	28.12 ± 1.00 ^{AB}	12.58 ± 0.46 ^a
	NB	29.01 ± 0.54 ^{AB}	11.94 ± 0.33 ^{ab}
SE			
	YP	30.08 ± 1.54 ^A	12.44 ± 0.25 ^{ab}
	GL	29.90 ± 0.68 ^A	12.28 ± 0.51 ^{ab}
	CH	29.02 ± 1.72 ^{AB}	11.47 ± 0.63 ^c
	NB	26.89 ± 1.16 ^B	11.57 ± 0.67 ^{ab}



FC SE > FC AEIP
FS SE < FS AEIP



WHC AEIP > WHC SE
OHC AEIP < OHC SE

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