

Techno-Functional and Antioxidant Properties of Plant and Insect-Based Flours

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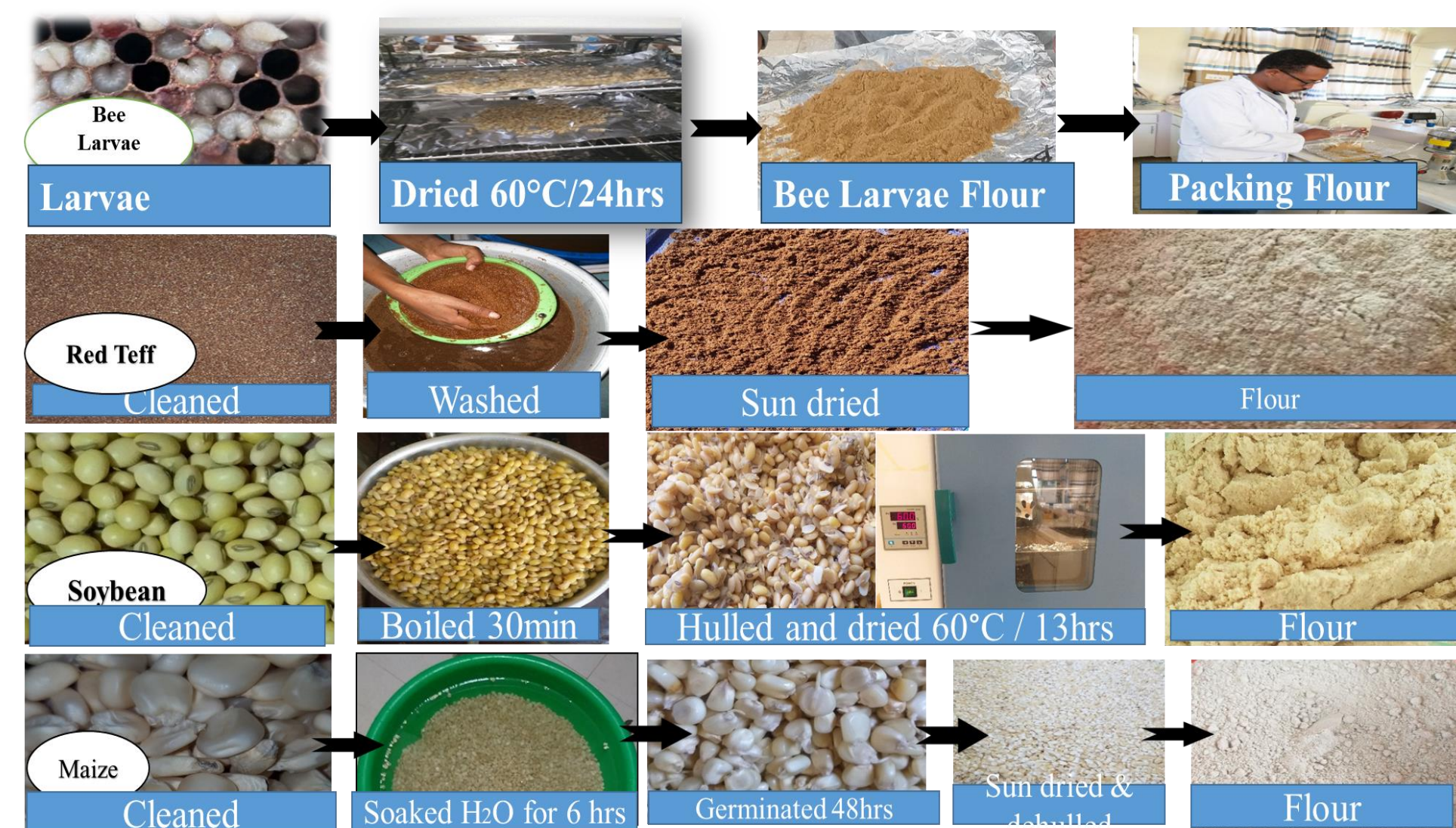
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INTRODUCTION & AIM

- Techno-functional, color, and antioxidant properties of food flours is fundamental in assessing their potential applications in food formulation and processing.
- Techno-functional attributes influence the structural, rheological, and sensory characteristics of food systems.
- Color parameters (L*, a*, b*) are vital indicators of consumer acceptability.
- Antioxidant properties (FRAP, DPPH, ABTS, TPC, and DNS), reflect the flour's capacity to scavenge free radicals and its contribution to nutritional quality.
- Collectively, these characteristics provide comprehensive insight into the functional and health-promoting potential of flours, enabling the development of value-added and nutritionally enriched food products.
- This study aimed to evaluate the techno-functional and antioxidant properties of soybean, maize, red teff and insect bee larvae

METHODS

Flour Sample Collection and Preparation



Functional Properties

- Water-Holding Capacity (WHC)
- Water Absorption Capacity (WAC)
- Oil Absorption Capacity (OAC)
- Hydrophilic-Lipophilic Index (HLI)
- Water Absorption Index (WAI)
- Water Solubility Index (WSI)
- Swelling Power (SP)
- Foaming Capacity (FC)
- Foam Stability (FS)
- Emulsion Activity (EA)
- Emulsion Stability (ES)
- Least Gelation Capacity (LGC)



Granulometric Analysis



CR-310

Colorimeter Analyses



Spectrophotometric Analyses

RESULTS

Table 1-Techno-Functional and Granulometry Properties of Food Flours (g/g)

	Flours			
	Maize	Teff	Soybean	Bee Larvae
Granulometry				
>0.355	95.5	60.0	95.1	42.2
0.250-0.355	2.9	36.2	4.3	44.9
<0.250	1.6	3.8	0.6	12.9
Techno-Functional Properties				
WHC	4.67 ± 0.29 ^c	2.50 ± 0.84 ^d	5.54 ± 0.39 ^a	6.00 ± 0.56 ^a
WAC	2.76 ± 0.06	2.85 ± 0.19	2.63 ± 0.20	2.42 ± 0.14
OAC	1.78 ± 0.09 ^b	1.84 ± 0.14 ^{ab}	1.89 ± 0.05 ^a	2.16 ± 0.05 ^a
HLI	1.55 ± 0.07 ^a	1.56 ± 0.19 ^a	1.39 ± 0.14 ^a	1.12 ± 0.08 ^b
WAI	7.65 ± 0.18 ^a	5.62 ± 0.39 ^b	3.15 ± 0.31 ^d	4.06 ± 0.53 ^c
WSI	11.44 ± 0.91 ^c	9.05 ± 0.64 ^d	40.18 ± 3.72 ^a	23.73 ± 2.74 ^b
SP	8.64 ± 0.28 ^a	6.18 ± 0.38 ^b	5.31 ± 0.57 ^c	5.31 ± 0.57 ^c
FC (ml)	53.5 ± 0.71 ^b	54.0 ± 1.41 ^b	57.5 ± 0.71 ^a	54.0 ± 0.0 ^b
FS (%)	92.68 ± 1.77 ^b	92.68 ± 1.77 ^b	89.56 ± 0.09 ^c	98.15 ± 0.0 ^a
EA (%)	7.26 ± 0.52	7.49 ± 1.19	7.75 ± 0.96	5.71 ± 1.89
ES (%)	11.49 ± 1.89 ^a	7.57 ± 1.72 ^b	7.25 ± 0.96 ^b	2.66 ± 0.72 ^c
LGC (%)	24.0 ± 0.0 ^b	18.0 ± 0.0 ^d	20.0 ± 0.0 ^c	28.0 ± 0.0 ^a

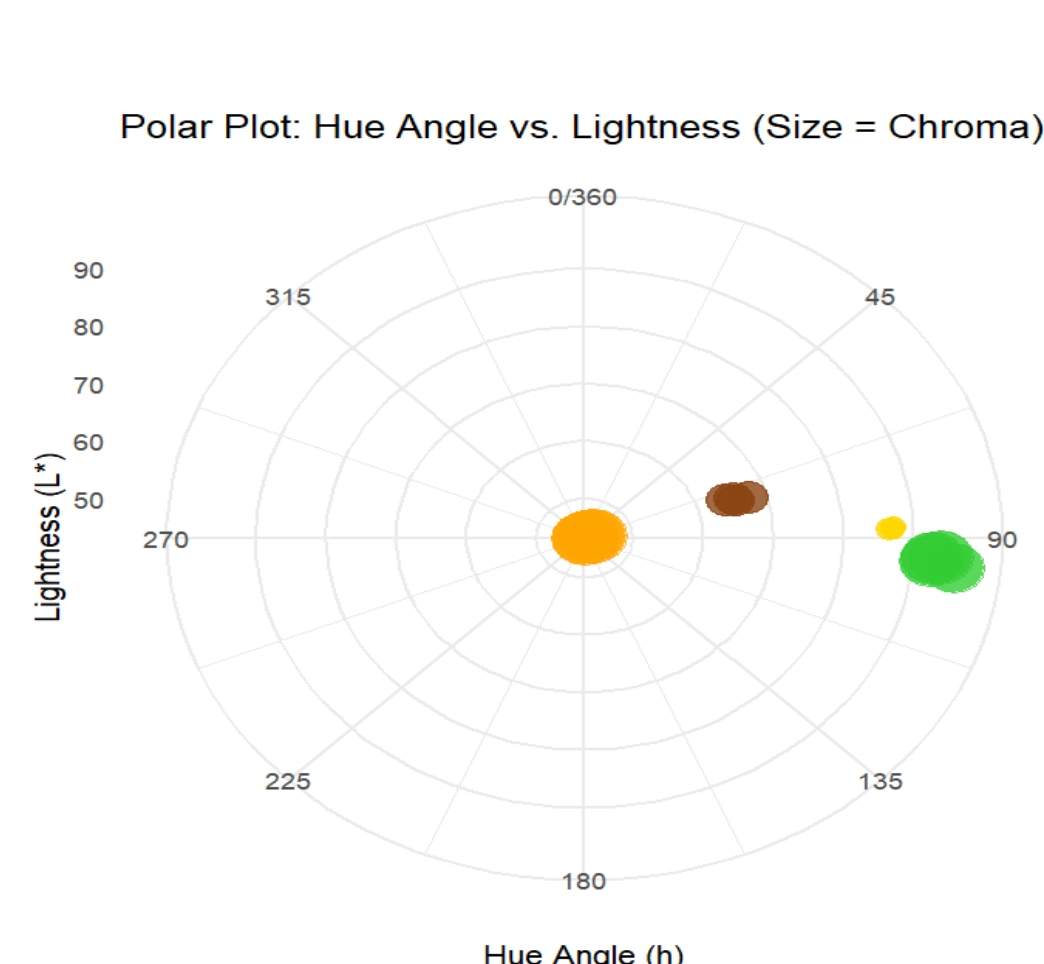


Figure 1 -Colorimetry analysis of food flours
Hue Angle-Chroma-Lightness

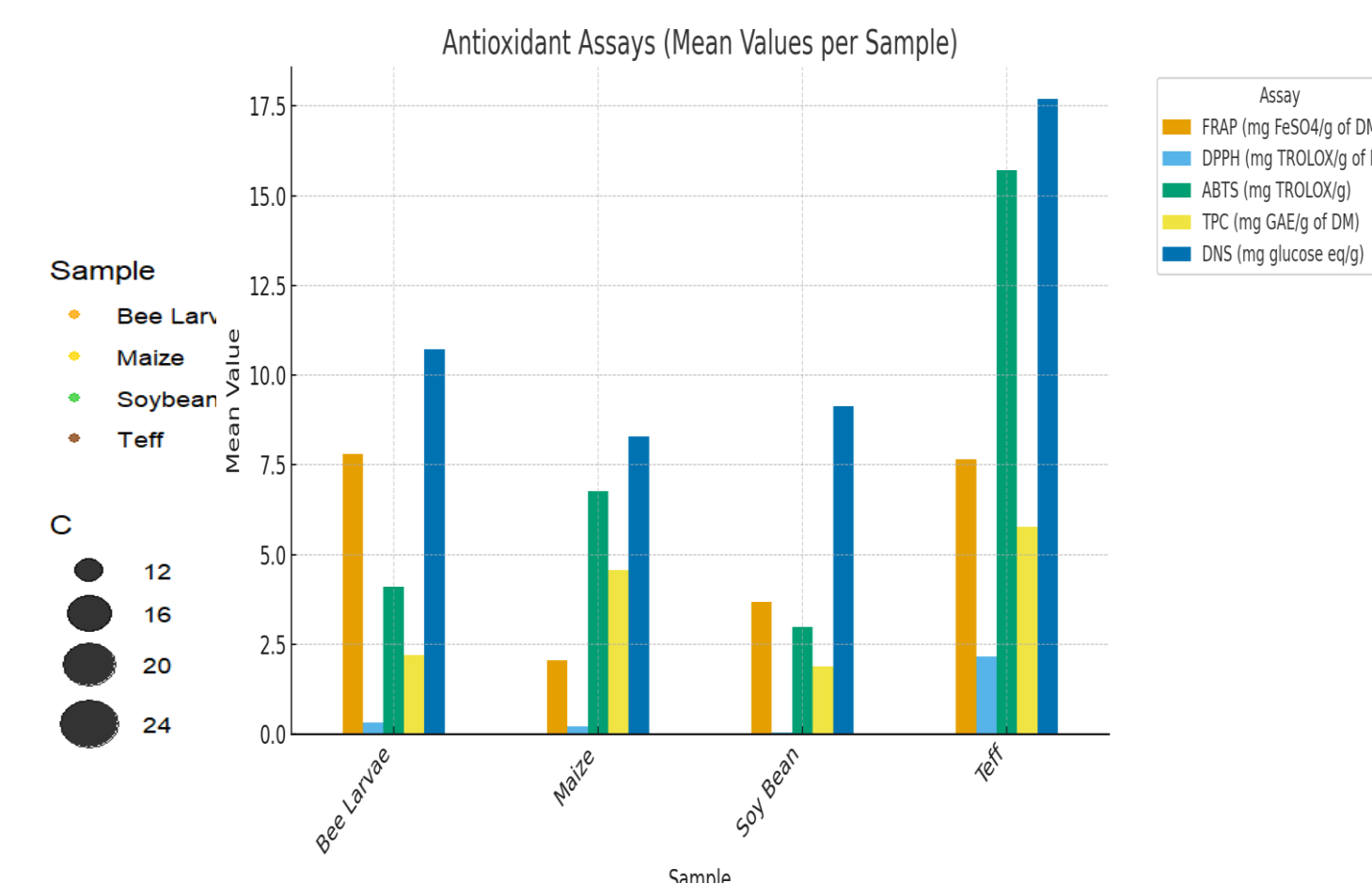


Figure 2 –Antioxidant properties of food flours

CONCLUSIONS

- ❖ Bee larvae had the highest WHC, OAC, FS, LGC and lowest HLI and S.
- ❖ Maize exhibited the highest WAI and SP, and soybeans recorded the highest WSI and FC.
- ❖ Teff exhibited the highest antioxidant properties.
- ❖ Soybeans are suitable for moist burgers and plant-based meat alternatives, bee larvae like for novel protein bars, teff for crispy snacks, and maize for chip coatings and thickened sauces.

FUTURE WORK

- Nutritional, pasting, rheological and texture attributes of food flours and their blend products

ACKNOWLEDGMENTS

- Wrocław University of Economics and Business, Department of Biotechnology and Food analysis, Wrocław Poland.
- Polish National Agency for Academic Exchange (NAWA) Contract No. BNI/ULM/2024/1/00147 for this postdoc research funding.