

Could Defatted Mealworm (*Tenebrio molitor*) and Mealworm Oil Be Used as Food Ingredients?

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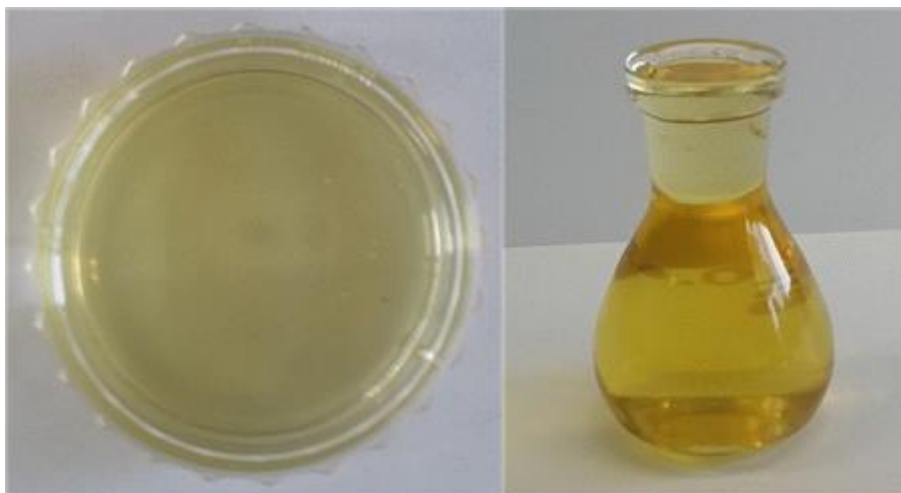


Fig. S1. Pictures of mealworm oil extracted with n-hexane

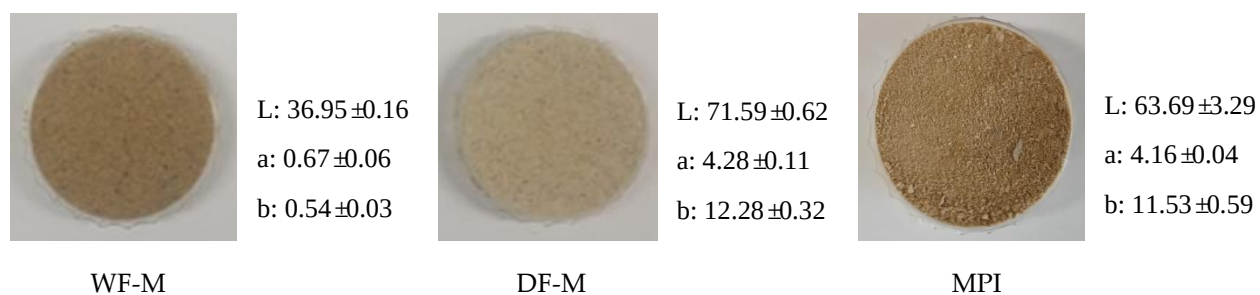


Fig. S2. Pictures and color values of whole- or defatted-mealworm powders and mealworm protein isolate (MPI)

WF-M, whole-fat mealworm powder; DF-M, defatted WF-M with solvent (n-hexane); MPI, mealworm protein isolate

L, lightness; a, redness; b, yellowness

Table S1. HPLC operating conditions for the determination of amino acid content

Instrument parameter	Condition	
Model	Ultimate 3000 (Thermo Scientific Dionex, Waltham, MA, USA)	
Detector	1. UV detector: 338 nm 2. FL detector Excitation: 340 nm, Emission: 450 nm (OPA) Excitation: 266 nm, Emission: 305 nm (FMOC)	
Column	VDSpher 100 C 18-E (4.6×150 mm, 5 µm) (VDS optilab, Berlin, Germany)	
Mobile phase	A: 20 mM sodium phosphate monobasic (pH 7.8) B: water/acetonitrile/methanol (10:45:45, v/v)	
Gradient condition	Time (min)	%B
	0	0
	24.0	57
	24.5	100
	26.0	100
	26.5	0
	30.0	0
Flow rate	1.5 mL/min	
Injection volume	0.5 µL	

Temperature

Column: 40°C

Sample: 20°C

Table S2. Operating conditions for GPC analysis

Instrument parameter	Condition
Model	Breeze 2 HPLC system (Waters, Milford, MA, USA)
Detector	RI detector
Column	Waters Ultrahydrogel linear Waters Ultrahydrogel 500 Waters Ultrahydrogel 250 Waters Ultrahydrogel 120 (Waters, USA)
Mobile phase	0.02 N NaNO ₃
Flow rate	0.8 mL/min
Temperature	Column: 30°C Sample: 20°C

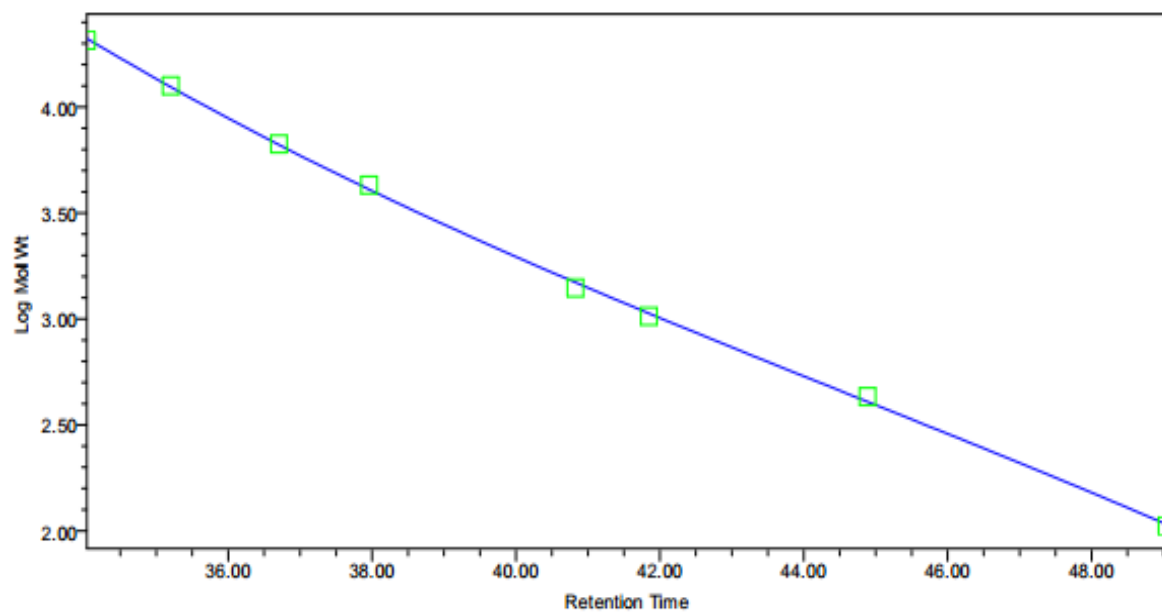


Fig. S3. GPC calibration plot

Table S3. GC analysis conditions for examining fatty acids composition

Instrument parameter	Condition
Model	Agilent 6890 (Agilent Technologies, Santa Clara, CA, USA)
Detector	260 flame ionization detector
Column	DB-23 capillary column (30 m×0.25 mm×0.25 μm) (J&W Scientific, Folsom, CA, USA)
Carrier gas	Helium gas
Flow rate	1.3 mL/min
Injection volume	1 μL
Injection mode	Split mode (Split ratio 50:1)

Table S4. HPLC operating conditions for the determination of tocopherol content

Instrument parameter	Condition
Model	Ultimate 3000 (Thermo dionex, USA)
Detector	UV detector (295 nm)
Column	C ₁₈ Inno Column (4.6×250 mm, 5 µm) (Innopia, Seongnam, Korea)
Mobile phase	100% MeOH
Gradient condition	isocratic flow
Flow rate	1.0 mL/min
Injection volume	10 µL
Temperature	Column: 20°C Sample: 20°C

Table S5. Operating conditions of GC-MS for the determination of squalene and sterols

Instrument	Parameter	Condition
GC	Model	ISQ LT (ThermoScientific, USA)
	Detector	260 flame ionization detector (FID) & MS
	Column	VF-5MS (30 m×0.25 mm×0.25 µm) (Agilent, USA)
	Oven condition	120°C for 5 min
		15°C/min to 320°C
		320°C for 15 min
	Carrier gas	Helium gas
	Flow rate	1.5 mL/min
	Injection volume	1 µL
	Injector temperature	200°C
MS	Injection mode	Splitless mode
	Mass range	35-550 Da
	Transfer line temperature	250°C
	Ion source temperature	250°C
	Analyzer	Quadrupole Single MS-PMT (Photomultiplier detector)
	Aquisition mode	MS scan and SIM
	Ion source	Electron Ionization (EI)

Table S6. Proximate compositions of mealworm powders

(unit: %)

	Moisture	Crude protein	Crude lipid	Ash	Carbohydrate
Blanched	61.5±0.5 ^{a2)}	20.5±1.3 ^c	13.5±0.8 ^b	1.2±0.0 ^c	3.4±0.2 ^c
WF-M ¹⁾	0.5±0.1 ^c	52.2±0.6 ^b	32.3±1.0 ^a	3.6±0.0 ^b	11.5±0.4 ^b
DF-M	4.0±0.9 ^b	70.8±5.8 ^a	2.0±0.2 ^c	5.1±0.1 ^a	18.2±3.8 ^a

Data are expressed as mean±SD

¹⁾WF-M: Blanched and hot-air dried whole-fat mealworm, DF-M: Defatted WF-M with solvent (n-hexane)²⁾Different superscripts within columns (a-c) represent statistically significantly differences at p<0.05 by Duncan's multiple range test

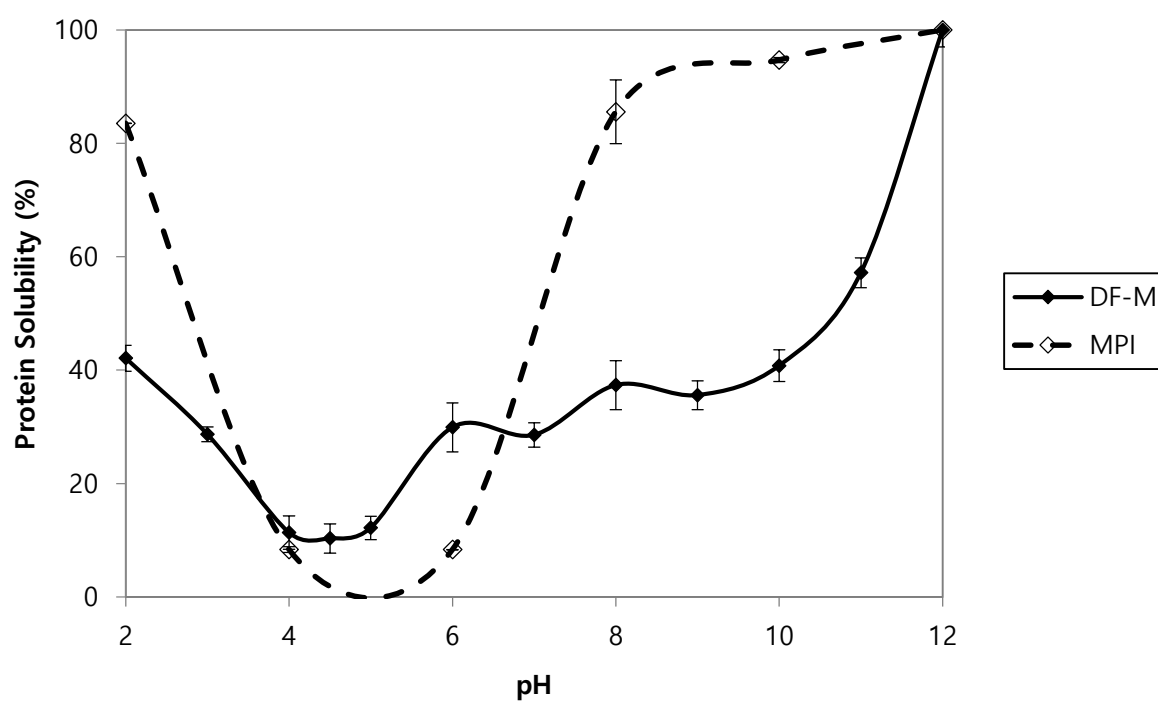


Fig. S4. Protein solubility of mealworm powder

DF-M, Defatted mealworm powder; MPI, Mealworm protein isolate