

## Physicochemical properties of lipids extracted from Tenebrio molitor larvae

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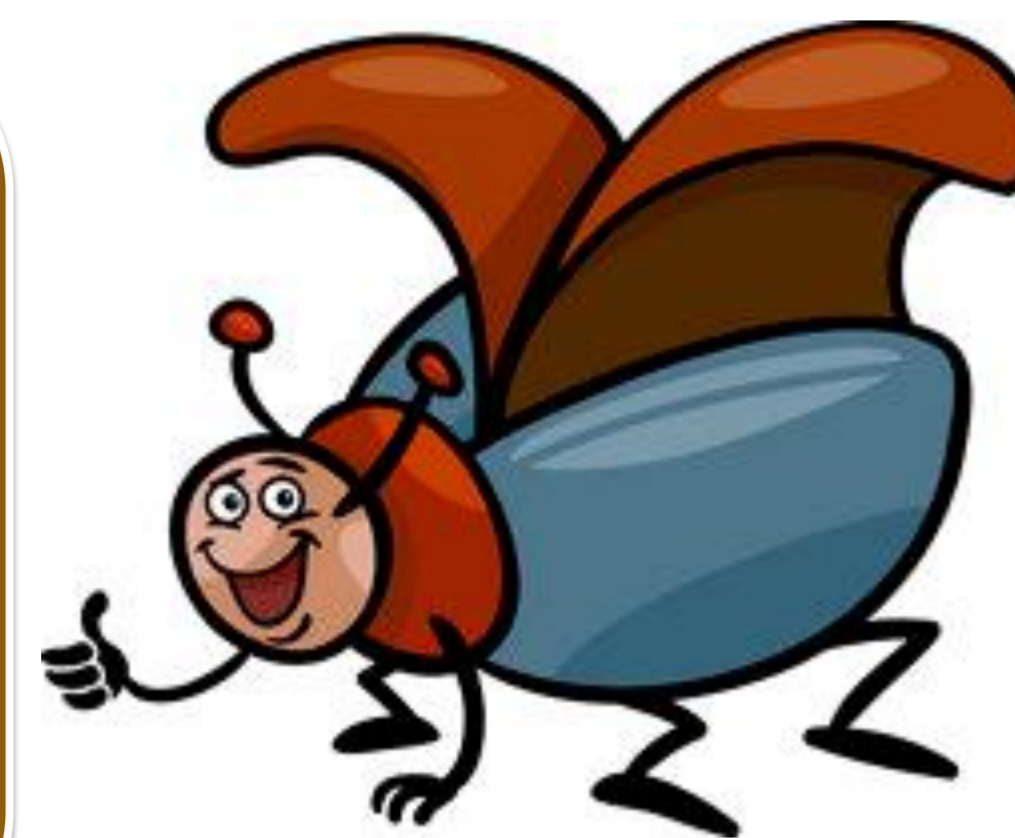
### What is Entomophagy?

1. Consumption of insects as human food
2. Over 1900 insect species are popularly eaten in many parts of the world
3. Important source of proteins, lipids and some minor components
4. High social value to people who believe they have good nutritive and pharmaceutical properties
5. Heavily influenced by local cultural and religious practices

### Why to eat insects?

1. Nutritionally superior to conventional meats
2. Production results in lesser emission of green house gases and ammonia
3. Insects are not closely related to humans, so chances of disease transmission are very low compared to livestock
4. Much less water requirement
5. Higher feed conversion ratio and percentage edibility

	Crickets	Poultry	Beef
Feed Conversion Ratio (kg feed: kg live weight)	1.7	2.5	10
% Edibility	80	55	40



## Introduction

### Nutrients Richness

1. Protein content of insects ranges from 15% to 81% (dry basis), which is of good quality and high digestibility (Ramos - Elorduy et al., 1997)
2. They are also rich sources of fat, vitamins and minerals, especially iron and zinc (Akinnowo & Ketiku, 2000)

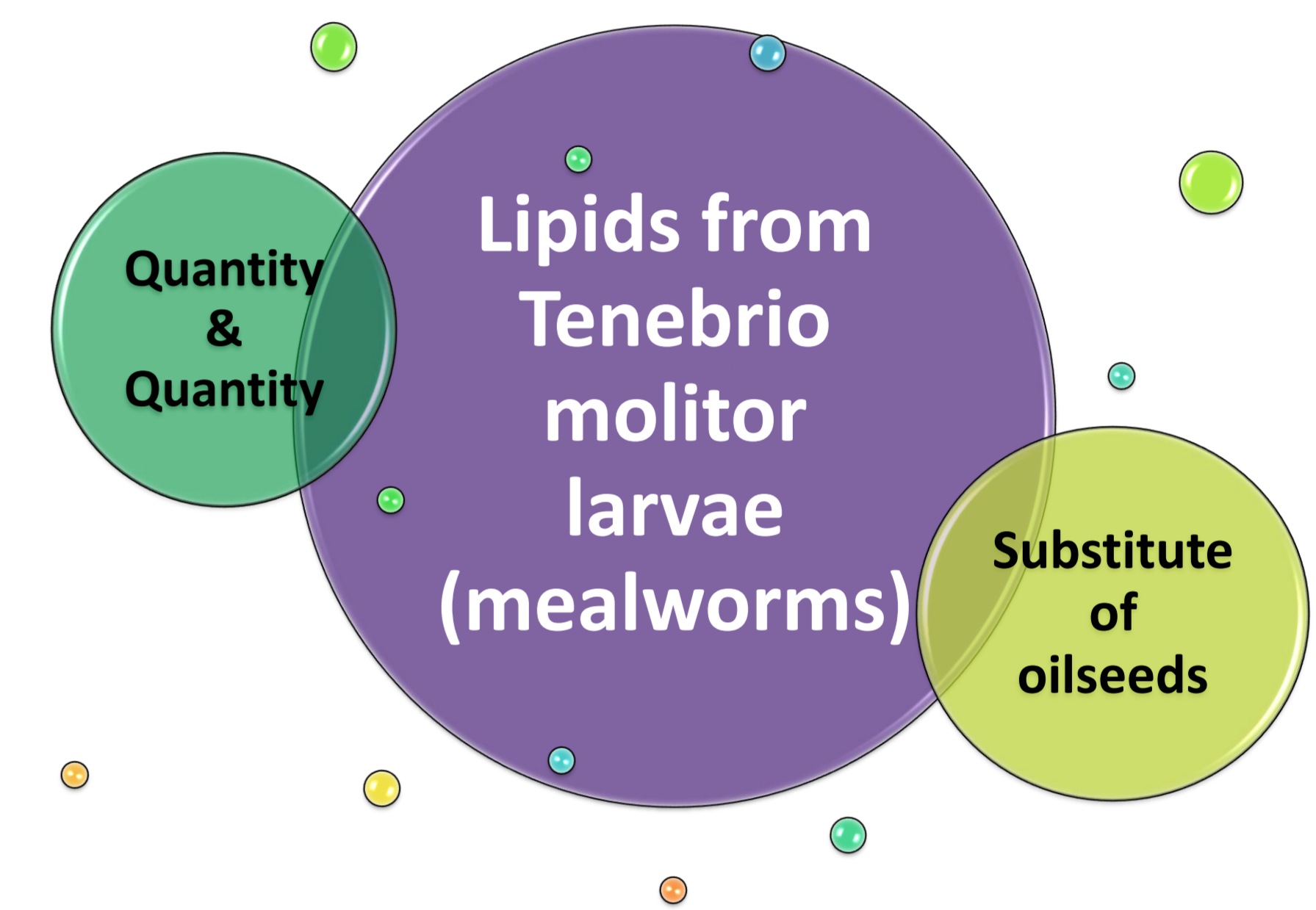
### Lipid Content

1. Fat content among various edible insects ranges from 1.5% (Coleoptera) to 77% (Lepidoptera) (Raksakantong et al., 2010)
2. Insects often establish metabolic reserves, such as fats, especially during immature stages, for example larvae.

### Unsaturated Fatty Acids

1. Polyunsaturated fatty acids were most predominant fatty acids, followed by saturated fatty acids and monounsaturated fatty acids in all the investigated insects (Raksakantong et al., 2010)
2. Insects are good source of important fatty acid, which should be considered for human consumption

## Objectives



## Material and methods

### Samples

1. Two batches of mealworms were purchased from a local supplier
2. Three batches reared in lab were considered

### Methods

1. All the larvae were freeze dried during 48h before analysis and stored at 4°C before analysis
2. Protein estimation was done using dumas method
3. Lipid extraction was done by a cold extraction technique using 2:1 chloroform/methanol as solvent.
4. Fatty acid compositions were determined by gas chromatography on a HP 6890 Series GC System apparatus fitted with a HP 7683 Series injector and flame ionization detector
5. Thermal profile was analyzed by differential scanning calorimetry Q1000 DSC connected to refrigerated cooling system utilizing aluminum SFI pans.

## Results and discussion

### Protein & Fat Content (% dry matter) of Tenebrio molitor larvae

Sample	Protein content	Fat content
Commercial	58%	30%
Lab reared	52%	36%

### Fatty Acid profile of Tenebrio molitor larvae

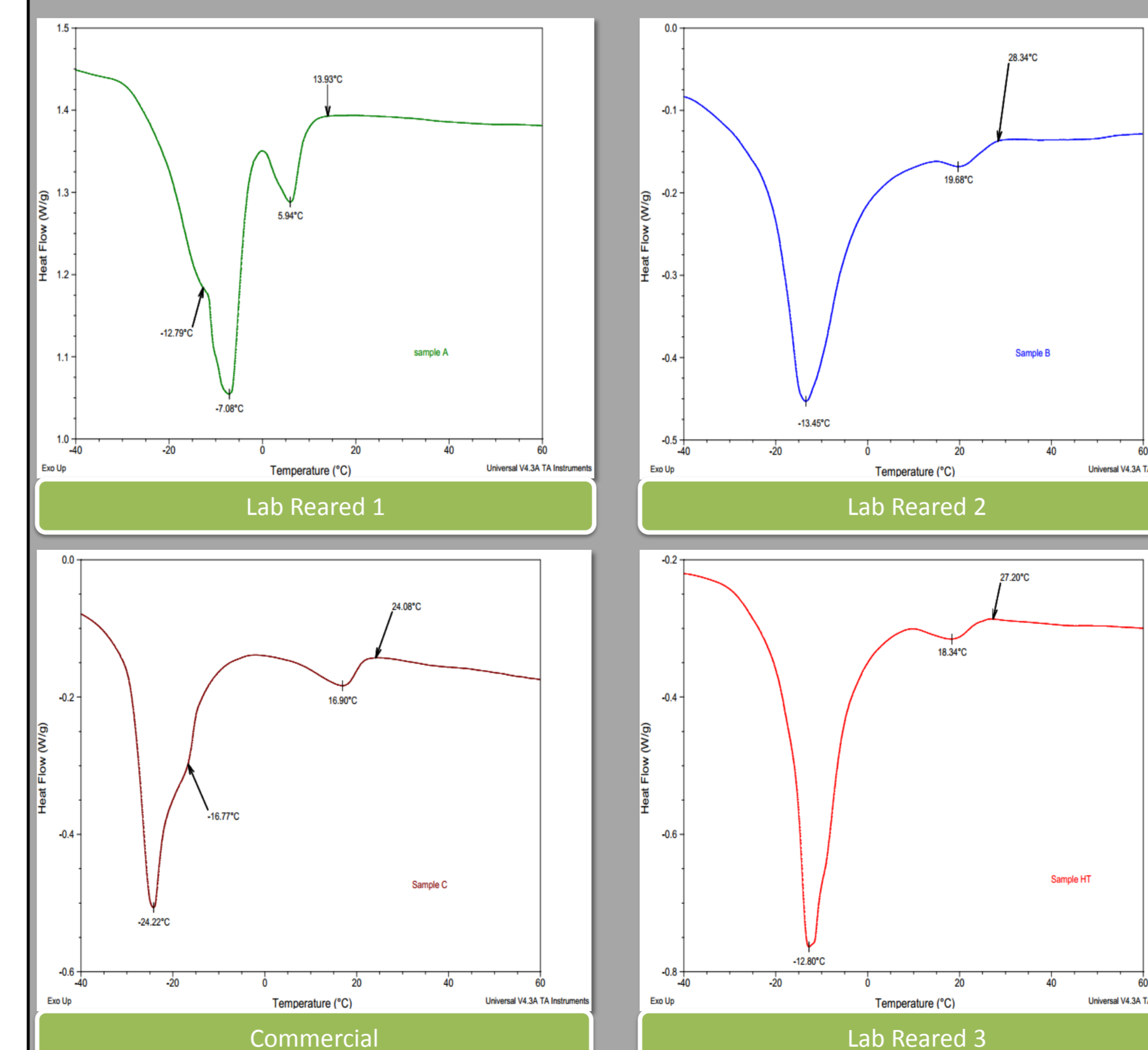
Fatty Acid %	Sample A (Lab Reared 1)	Sample B (Lab Reared 2)	Sample C (Commercial 1)	Sample HT (Lab Reared 3)
C 12:0	0.34±0.00	0.36±0.00	0.36±0.00	0.33±0.00
C 14:0	1.52±0.26	4.30±0.07	2.36±0.66	4.19±0.01
C 16:0	20.75±0.01	17.31±0.03	14.36±0.01	17.23±0.01
C 18:0	2.05±0.05	4.00±0.00	2.33±0.02	3.40±0.02
C 16:1	1.00±0.00	1.54±0.00	1.30±0.00	1.60±0.00
C 18:1	51.84±0.01	53.12±0.08	40.34±0.06	54.18±0.01
C 18:2	16.06±0.01	15.67±0.08	29.74±0.06	15.71±0.03
C 18:3	0.13±0.00	0.17±0.00	1.13±0.03	0.14±0.00

Note: Unsaturated fatty acids represent 70% of total fatty acids in commercial as well as lab reared samples.

### % MUFA & PUFA

Sample	MUFA	PUFA
Commercial	41%	31%
Lab reared	53-56%	16%

### Thermal profiles (DSC curves)



## Conclusion

The level and quality of lipid content could be considered as sufficient & it offers potential for oilseed substitute

Tenebrio molitor larvae (mealworms) are potentially important source of unsaturated fatty acids specially oleic and linoleic acids

The chemical composition and the thermal properties of the samples varied according to their origin. It should be interesting to further investigate the effect of diet on the fat composition

### References

- Ramos-Elorduy J., Pino M. J. M., Prado E. E., Perez M. A., Otero J. L. and De Guevara O. L. (1997). Nutritional value of edible insects from the state of Oaxaca, Mexico. *Journal of Food Composition and Analysis*, 10, 142-157.
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- Raksakantong P., Meeso N., Kubola J. and Siriamornpun S. (2010). Fatty acids and proximate composition of eight Thai edible terrocolous insects. *Food Research International*, 43, 350-355.