The temperature effect on the cuticular chemical profile of *Lucilia sericata* blowfly larvae

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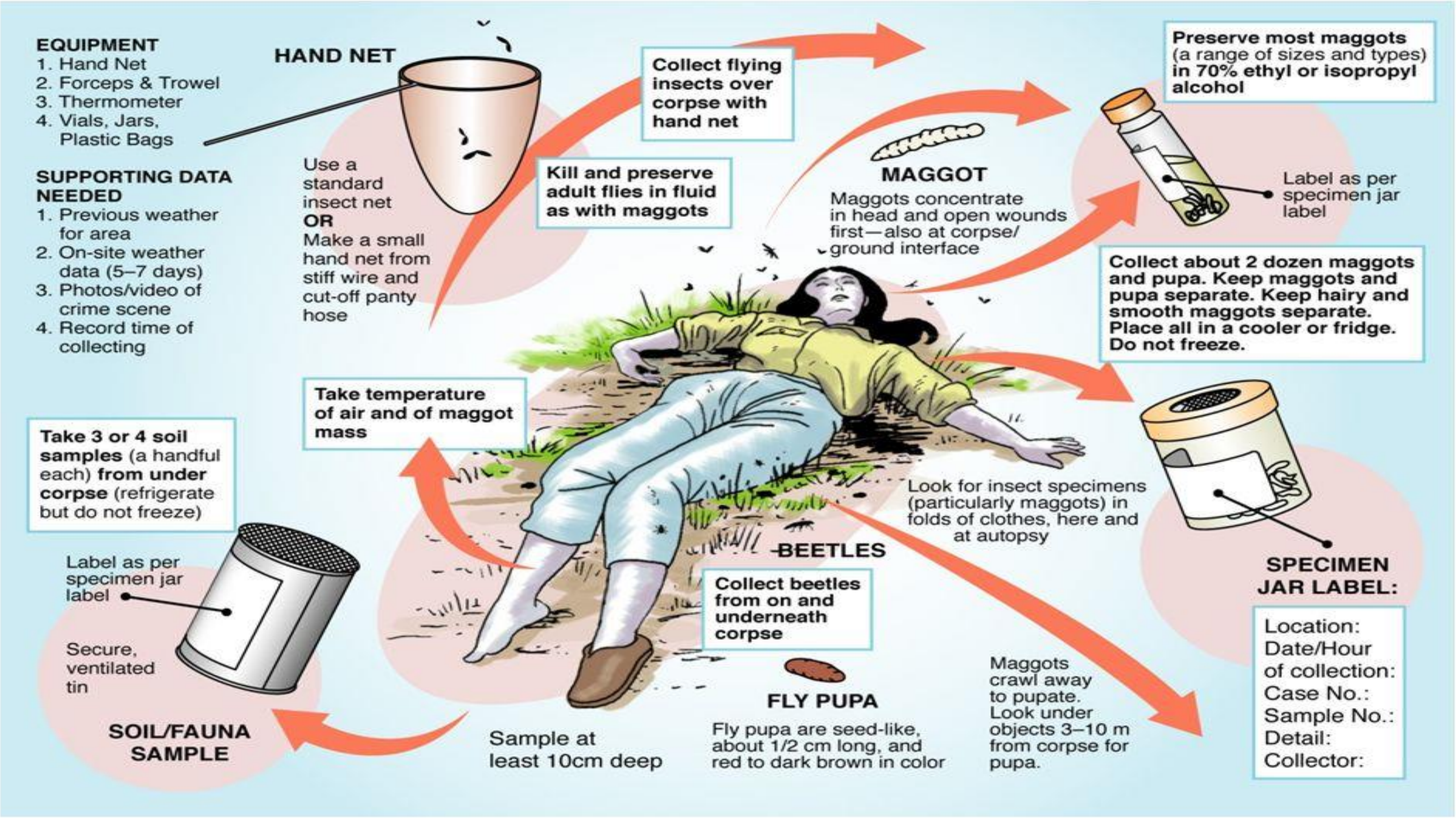
The importance of forensic entomology in criminal cases

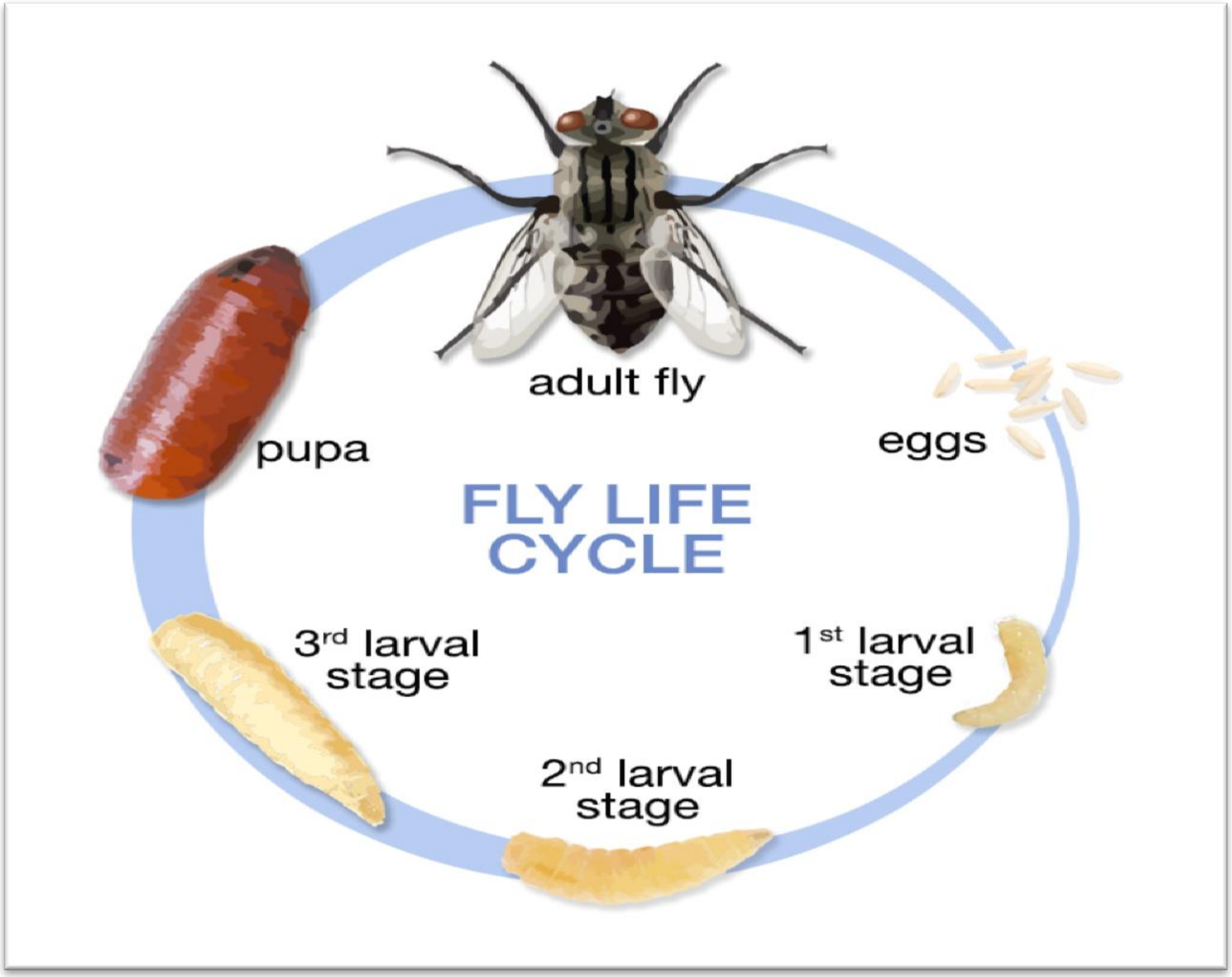
Entomological evidences are;

- very effective evidence for estimating the minimum time since death
- more accurate and reliable than medical examinations and findings after 72 hours

The importance of forensic entomology in criminal cases



The life cycle of the Blowfly



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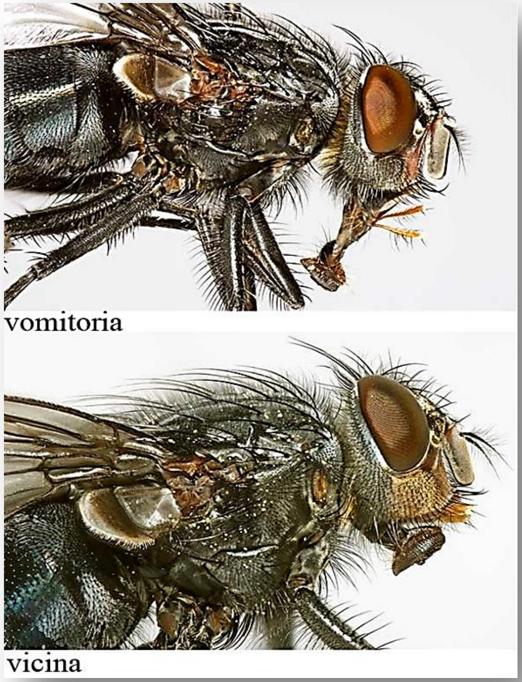
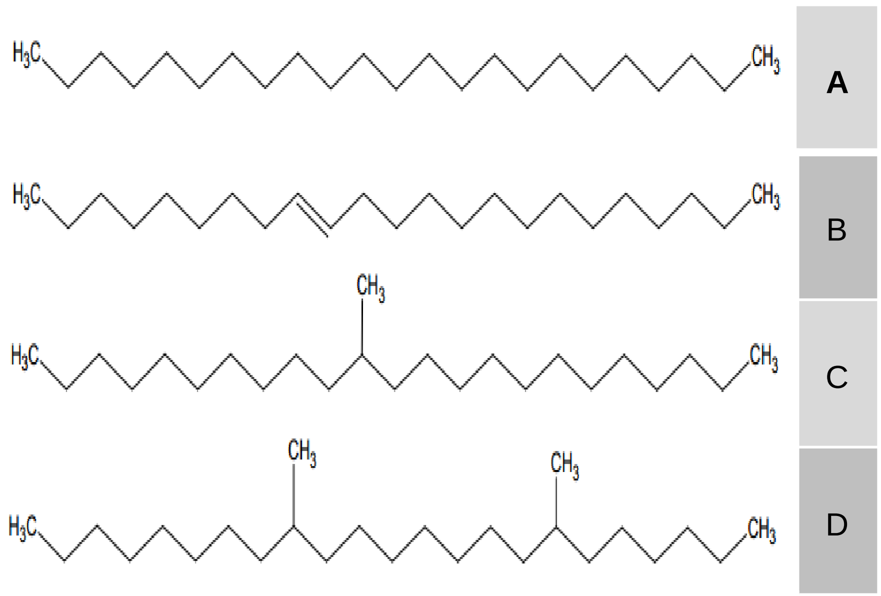


Calliphora vomitoria

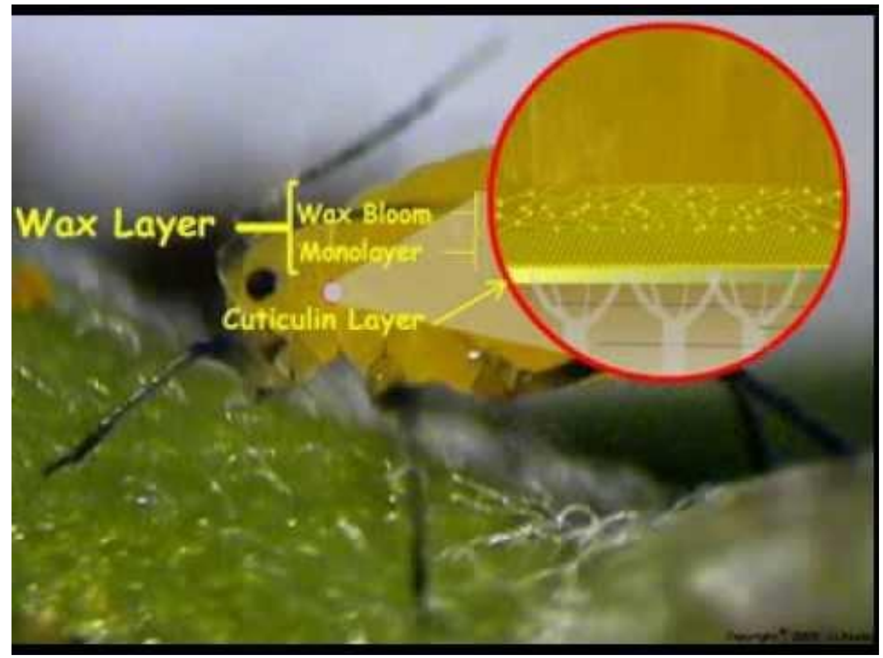
Calliphora vicina

Lucilia sericata

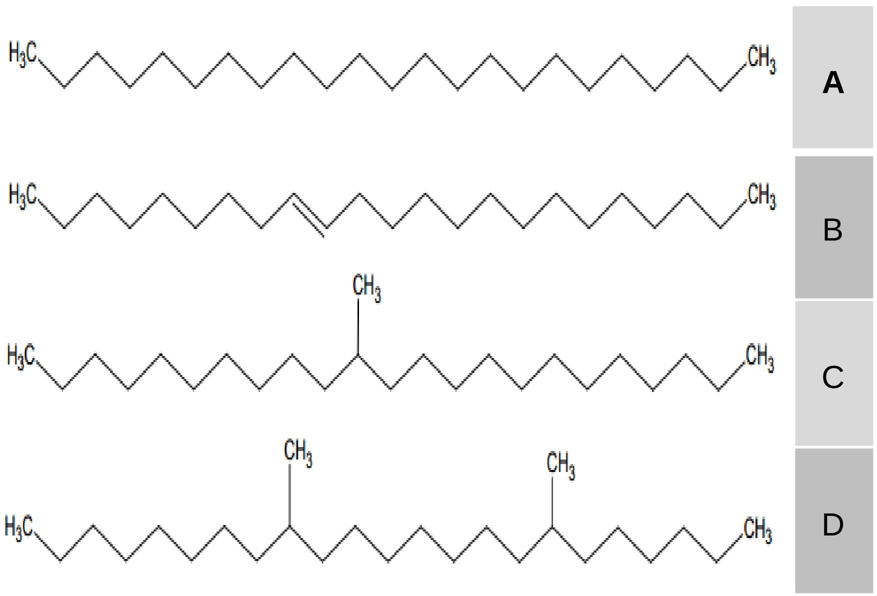
Cuticular hydrocarbons in forensic entomology



A) Linear alkane: Tricosane,
B) Z-Alkene: (Z9)-tricosene,
C) Mono methyl branched alkane: 11-methyltricosane,
D) Dimethyl branched alkane: 9,17-dimethyltricosane.
(Moore 2013)



Cuticular hydrocarbons in forensic entomology



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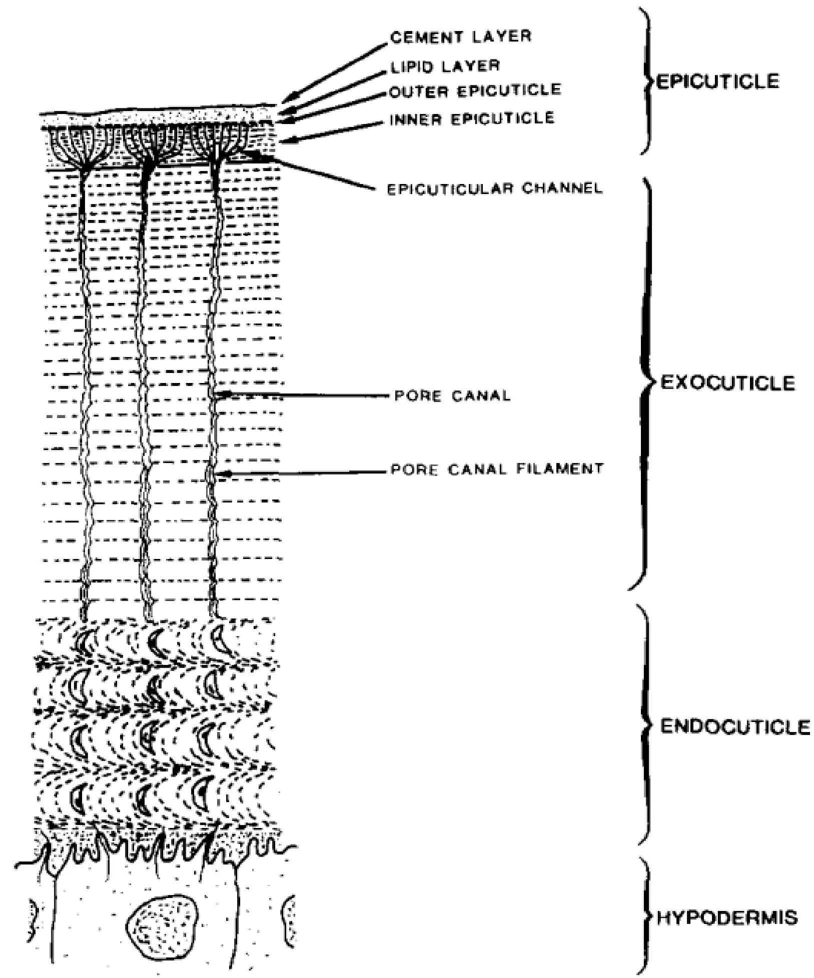


Cuticular hydrocarbons in forensic entomology

Cuticular hydrocarbons of insects can be used for;

- Identification of species for taxonomy
- Estimate the age of an insect specimen (different stages of life cycle)

Material and Method

A trap used in field studies for collecting flies

Material and Method

Eggs of *L. sericata*

Material and Method

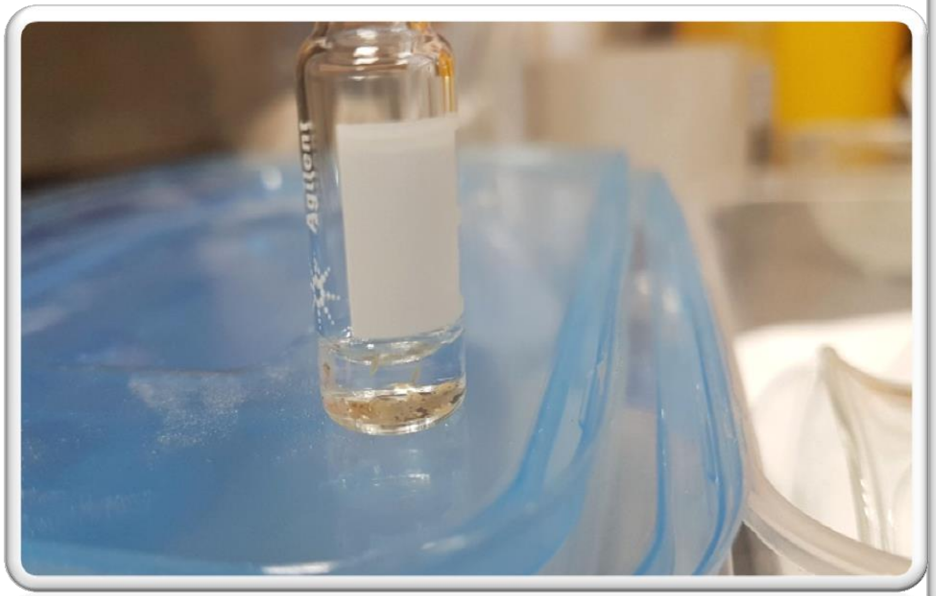
14 ºC

L. sericata post-feding larvae

25 ºC

34 ºC

Material and Method

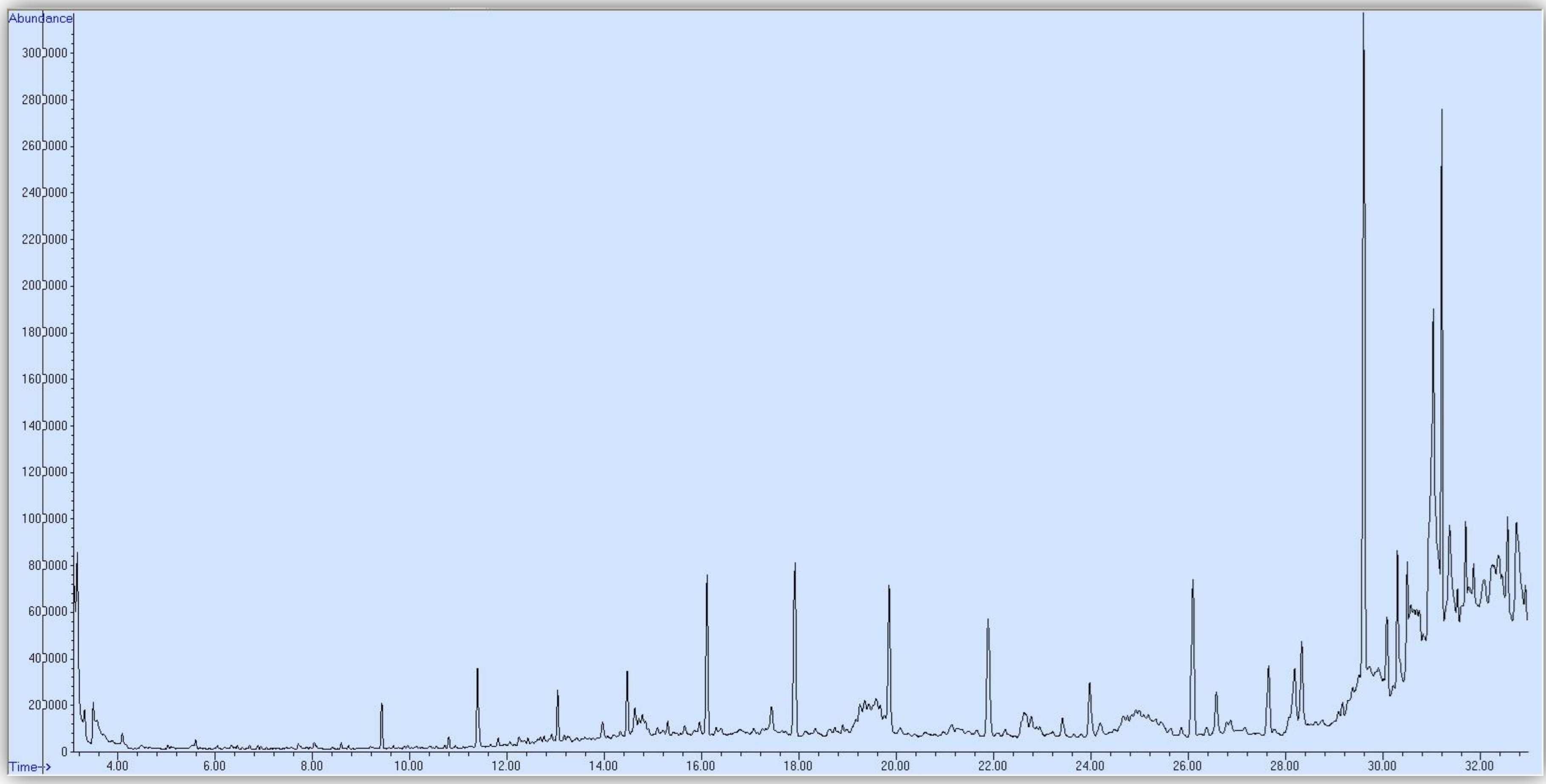


Preparation of CHC extractions

Material and Method

Preparation of CHC extractions

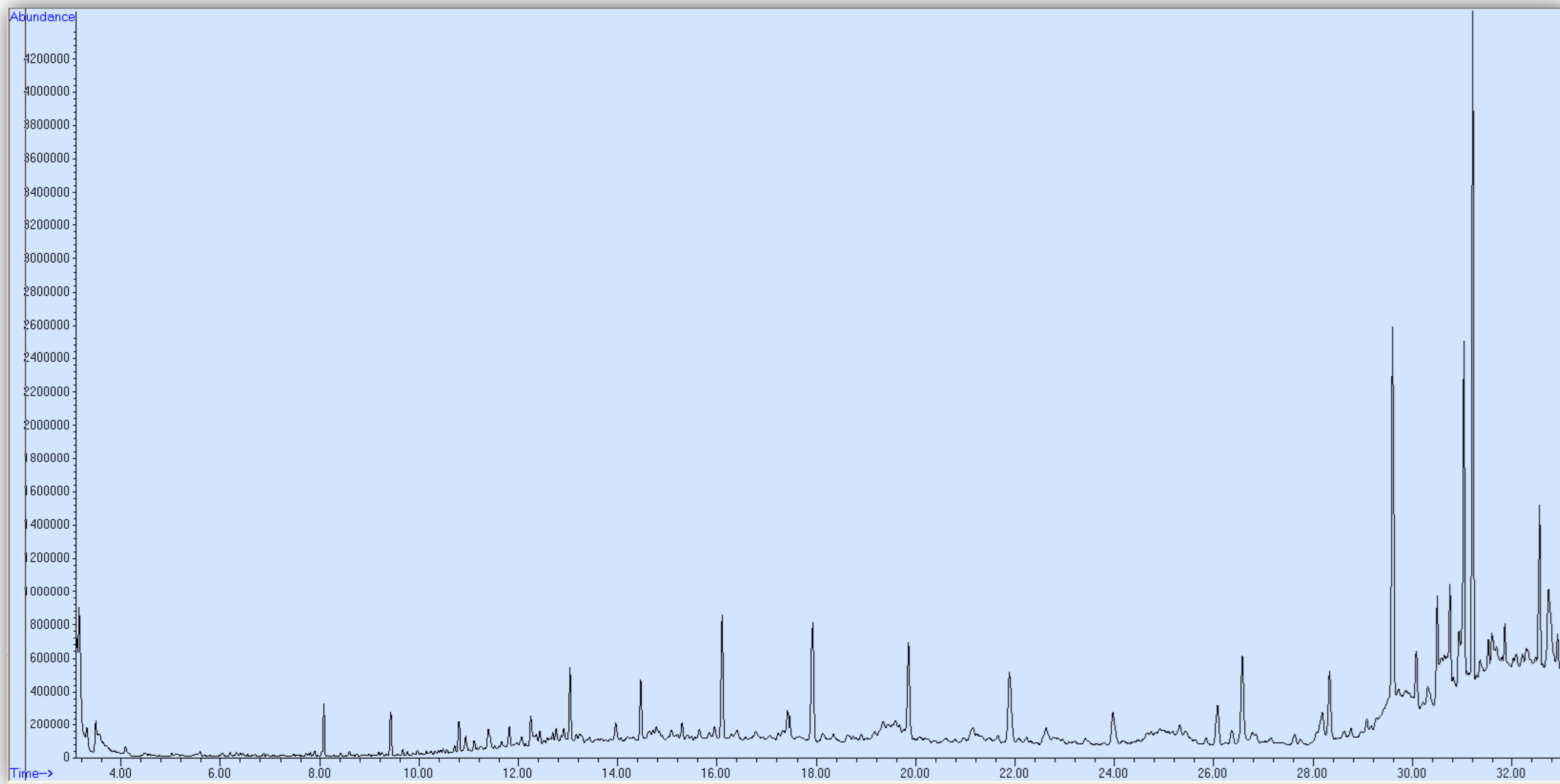
Results



The GC-MS spectrum of *L. sericata* larvae reared at 14ºC

The samples analysed using Agilent Technologies 6890N Network GC systemGC-MS

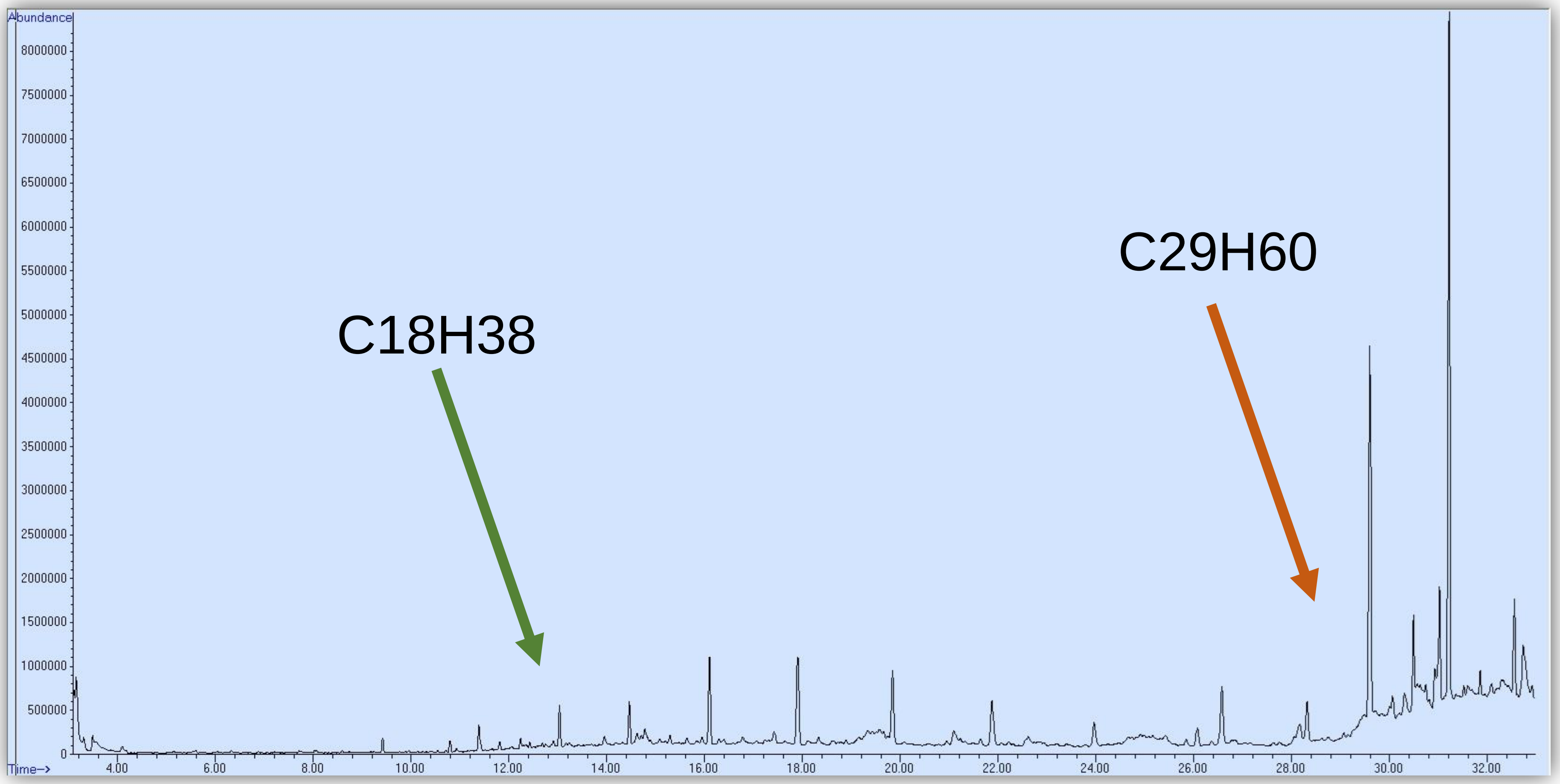
Results



The GC-MS spectrum of *L. sericata* larvae reared at 25ºC

The samples analysed using Agilent Technologies 6890N Network GC systemGC-MS

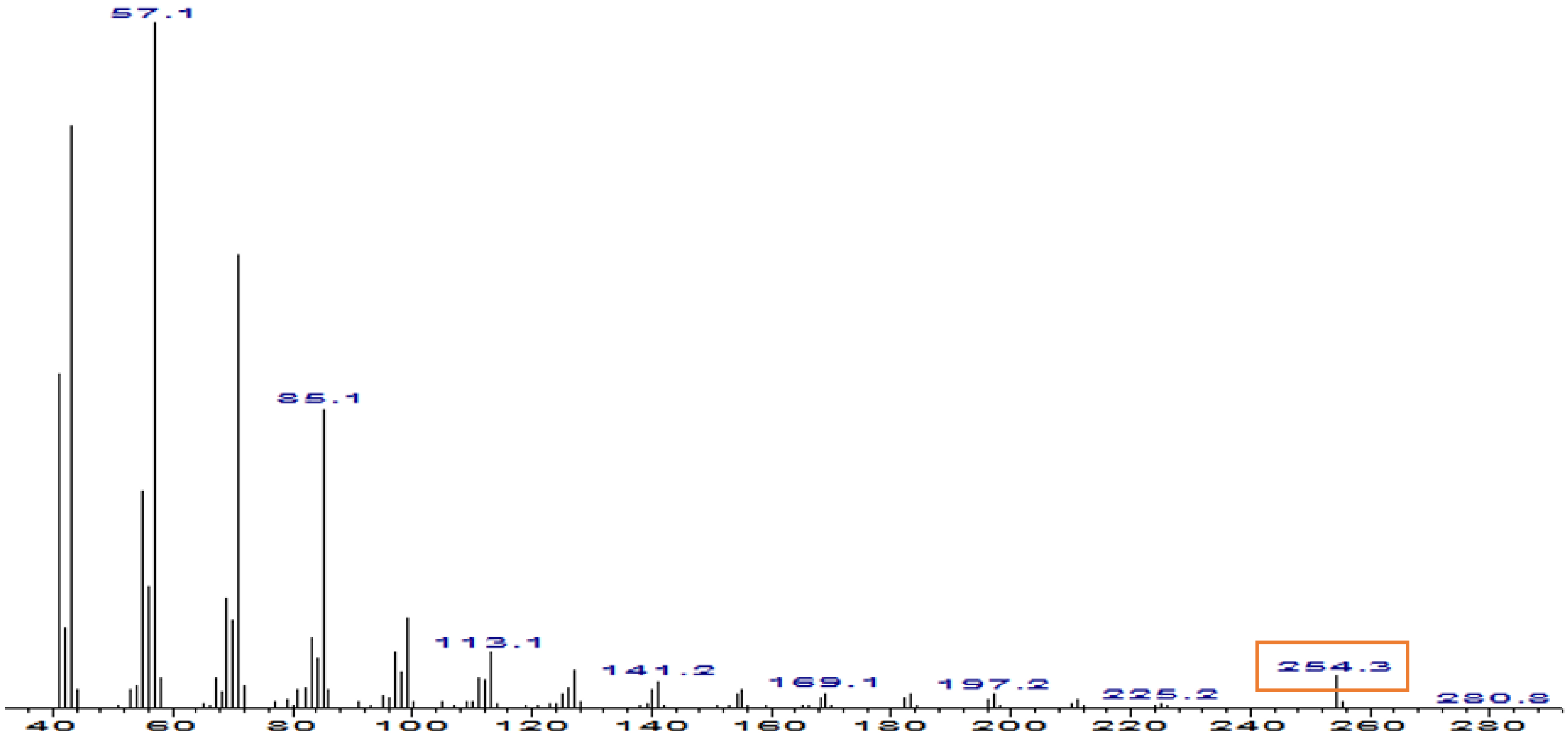
Results



The GC-MS spectrum of *L. sericata* larvae reared at 34ºC

The samples analysed using Agilent Technologies 6890N Network GC systemGC-MS

Results

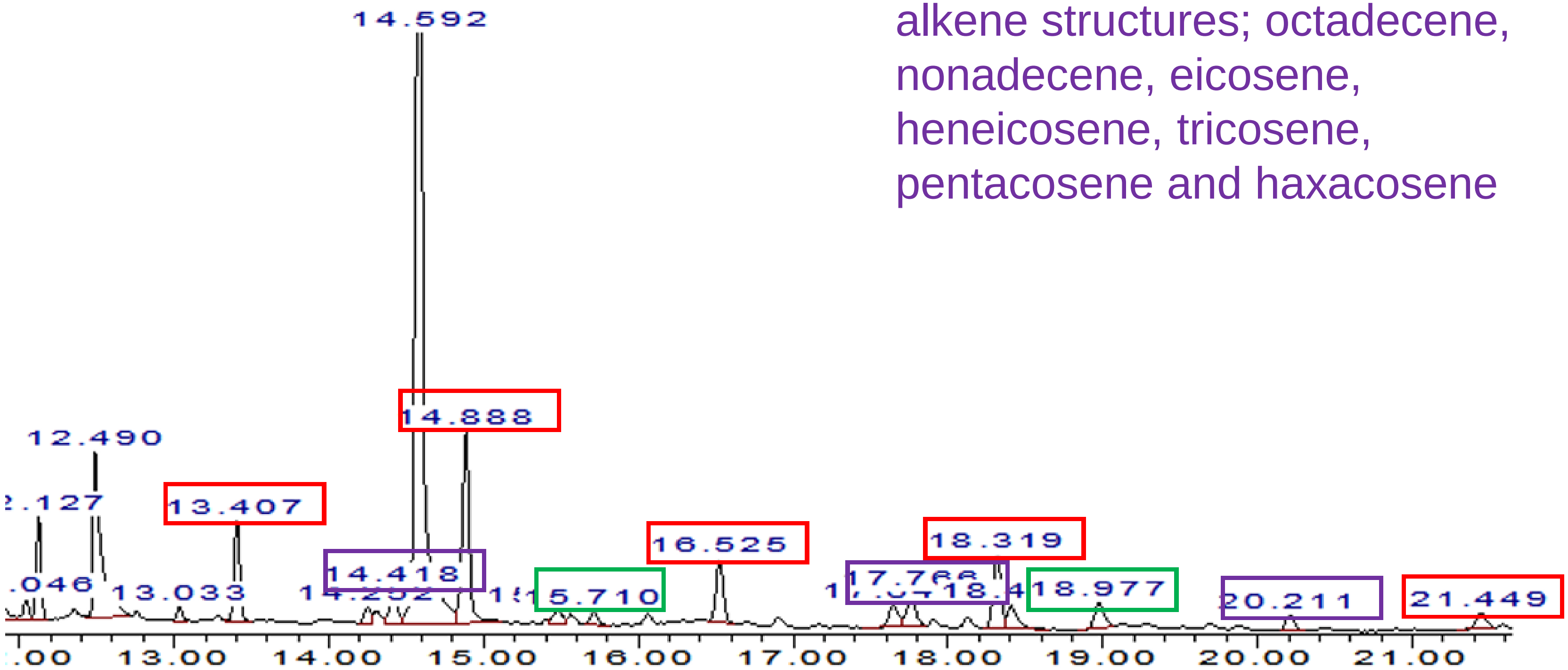


Mass spectrum for octadecane h_1; *m/z* for M=254

Results

alkane structures; heptadecane, octadecane, nonadecane, eicosane, heneicosane, docosane, tricosane, tetracosane, pentacosane and heptacosane

alkene structures; octadecene, nonadecene, eicosene, heneicosene, tricosene, pentacosene and haxacosene



Retention times and determinations of some hydrocarbon structures on the chromatogram Alkanes – Alkenes – Methyl branched HC

Results

Chain lenght

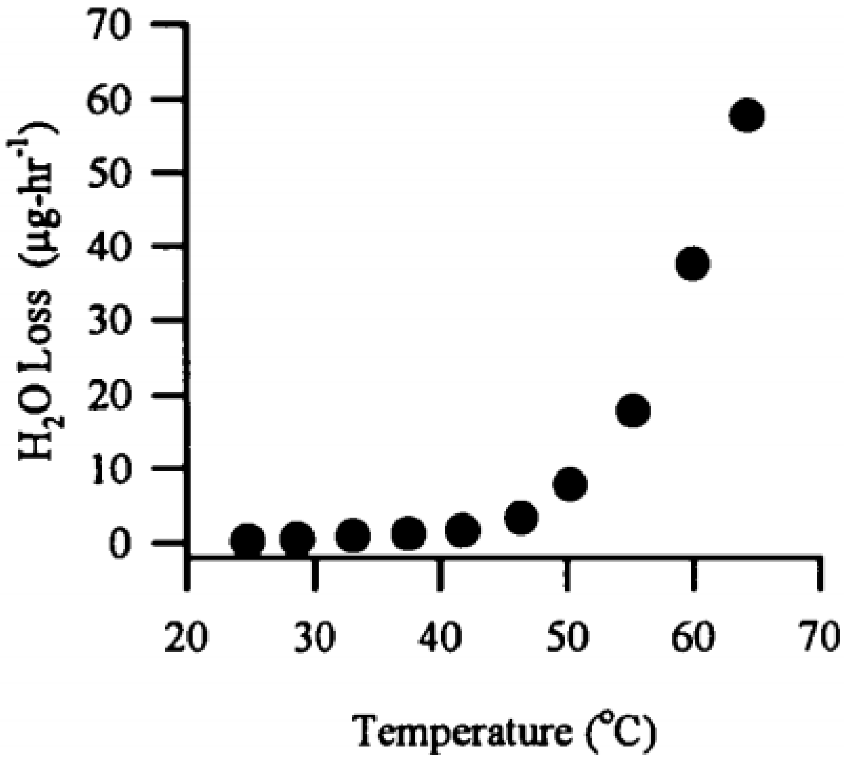
Molecular formula	*Name of straight chain*	*Molecular ion m/z*
$C_{21}H_{44}$	n-Henicosane	296
$C_{22}H_{46}$	n-Docosane	310
$C_{23}H_{48}$	n-Tricosane	324
$C_{24}H_{50}$	n-Tetracosane	338
$C_{25}H_{52}$	n-Pentacosane	352
$C_{26}H_{54}$	n-Hexacosane	366
$C_{27}H_{56}$	n-Heptacosane	380
$C_{28}H_{58}$	n-Octacosane	394
$C_{29}H_{60}$	n-Nonacosane	408

Tm

Tm: Melting Temperature

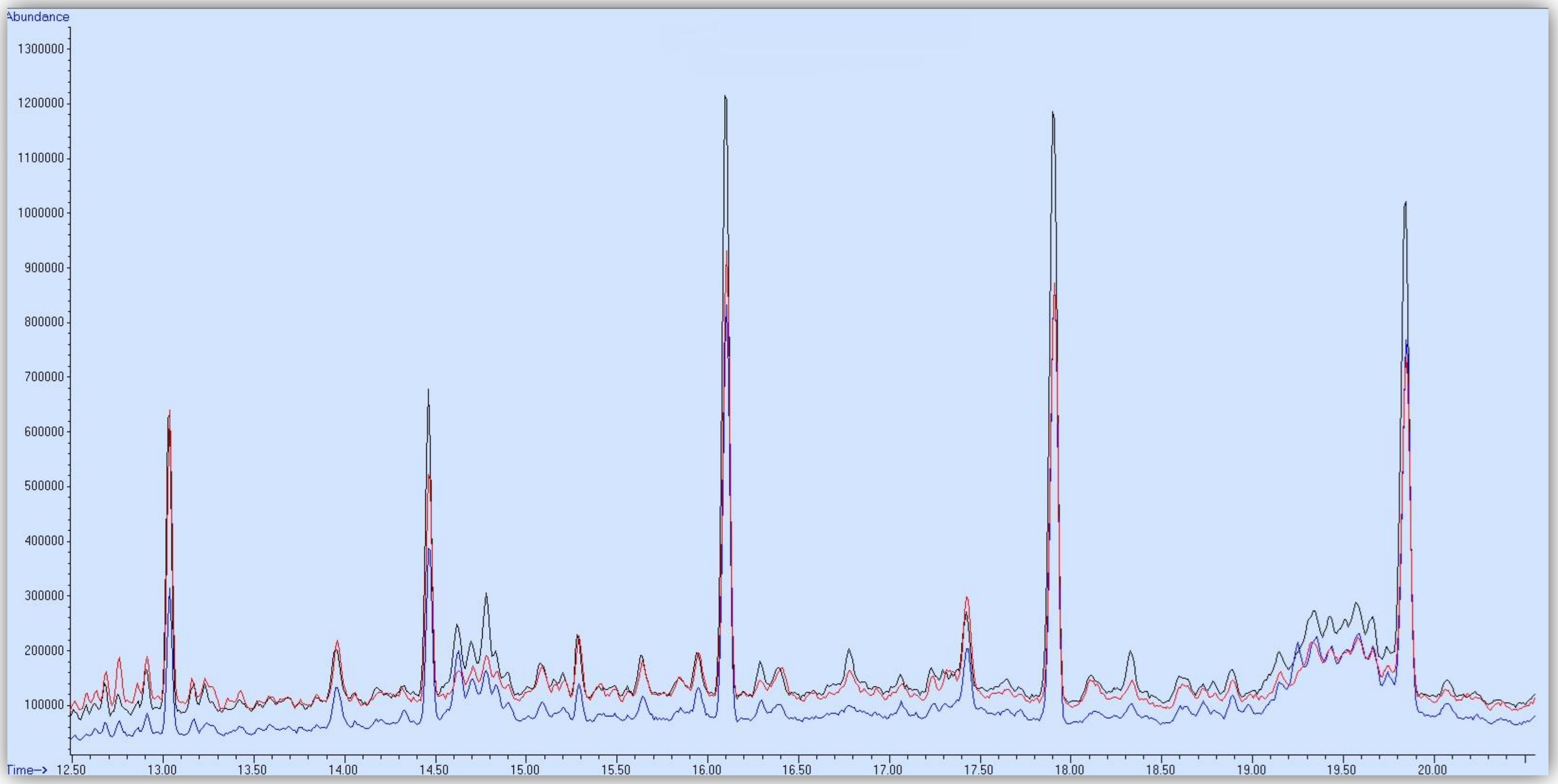
The effects of temperature on the chemical profiles

Layer structure ◄► Temperature ◄► Water loss



Effects of temperature on water loss from a grasshopper, *Melanoplus sanguinipes* (Gibbs 1998)

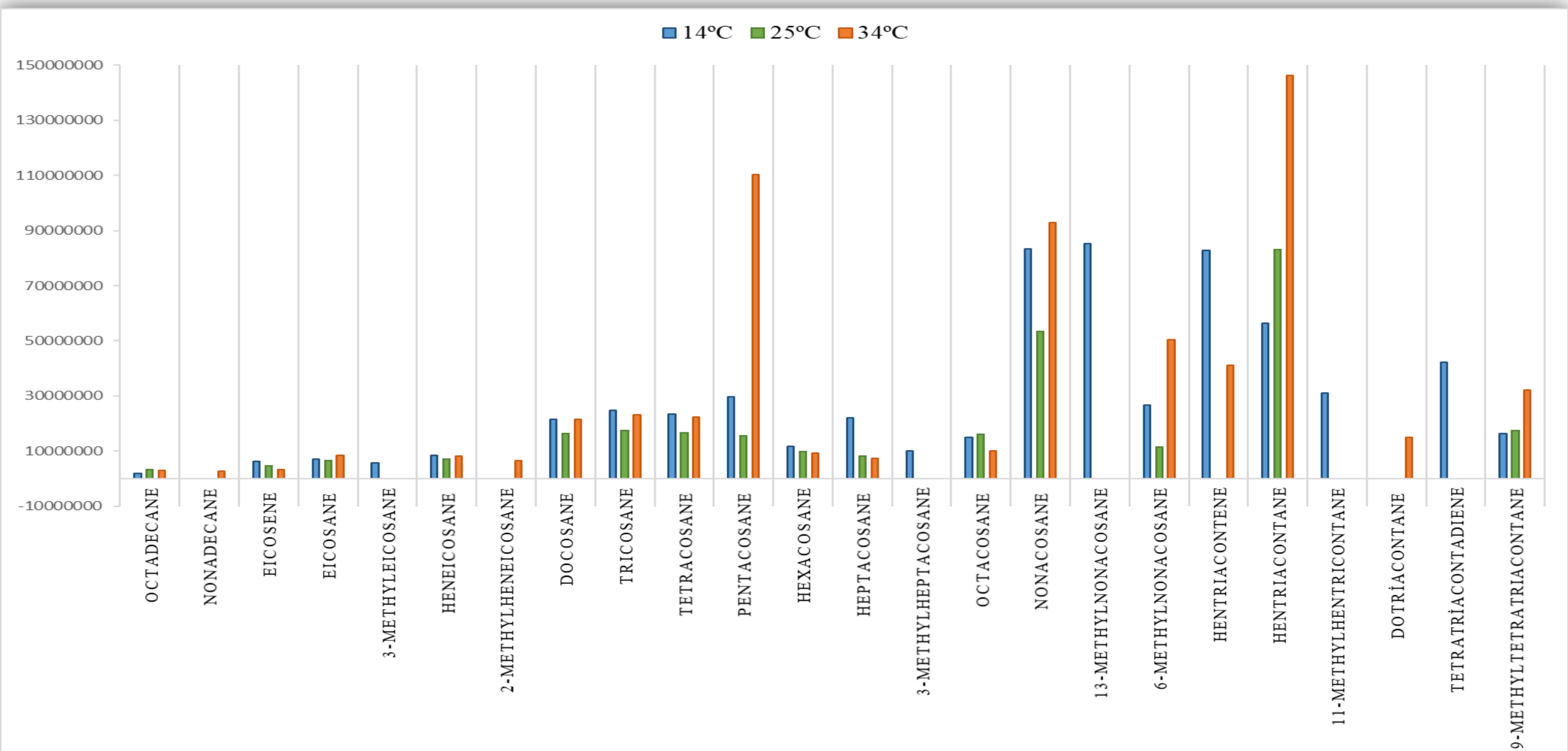
Results



Zoomed GC chromatograms of *L. sericata* larvae reared at three different temperatures.

14ºC 25ºC 34ºC

Results



Graph of the average percentage peak area of the branched methyl alkane and alkane compounds over the extraction period of *L. sericata* larvae reared at 14ºC, 25ºC and 34ºC.

Conclusion

- This study is the first to determine the hydrocarbon structure of the blowfly species changes with temperature.

- This study indicates that increasing in the number of long hydrocarbons in the cuticular structure of the larvae kept in a warmer environment, to prevent water evaporation and adapt to the environment.

References

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- Moore, H. E. (2013). Analysis of cuticular hydrocarbons in forensically important blowflies using mass spectrometry and its application in post mortem interval estimations, Keele University.


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Thank you