Lipids -Lab 4

NUTR 45300
Food Chemistry

Triglycerides

- Fat and oils belong to the triglyceride family of lipids

A triglyceride

Odors-Exp 1

- Short chain fatty acids are volatile and have very unpleasant odors
  - Butyric acid
- Longer chains fatty acids (and triglycerides containing them) are much less volatile and consequently have much less (to no) odor
  - Stearic acid
Some fatty acids used in Exp 1

Solubility and refractive index-Exp 2

- Don’t do step 3
- Like dissolves like
  - Polar things like sugar dissolve in polar things like water
  - Non-polar things like fats dissolve in non-polar organic solvents like chloroform and toluene
- Refractive index (RI) is related to unsaturation
  - RI increases with increasing number of double bonds

Oil-solvent mixtures

Interface

Chloroform-water mixture totally dissolved, no interface
Refractometer

- Used with small samples for very accurate measurements
- One scale reads refractive index, the other one is % soluble solids

Older refractometer

Refractometer reading

- The reading you get will look something like this
- The top scale is refractive index and the bottom one is percent soluble solids
Water absorbing capacity-Exp 3

- As amount of mono- and diglyceride in fat increases so does the water absorbing capacity
- Presence of proteins also increases water absorbing capacity
- Best water absorbing capacity is hydrogenated shortening
- Worst water absorbing capacity is lard

Exp 3 experimental setup

Mono- and diglycerides
Plasticity of fats-Exp 4

- Plastic fats are deformable with pressure and original shape is not recovered when pressure is removed
- Related to creaming ability, i.e., the ability to incorporate air into the fat
  - Much used in baking as a form of leavening
- Related to crystal size—the smaller the crystal size the more incorporation of air

Plasticity of fats-Exp 4

- Much like the case of WAC
  - Hydrogenated shortening is best for incorporation of air
  - Lard is the worst

Chocolate fat bloom-Exp 5

- Caused by the change of fat crystal size from a smaller form (β-3 V) to a larger form (β-3 VI)
  - Generally caused by temperature cycling and temperature abuse
- Produces a quality defect in chocolate (grayness on surface of chocolate)
- This may or may not work due to the length of time necessary for the fat to bloom
Chocolate bloom

Oxidative rancidity-Exp 6
- Fat oxidation produces small, volatile products that smell very bad and ruin foods containing them
- Dependant on presence of multiple, non-conjugated double bonds

Oxidative rancidity-Exp 6

“Line of stink”
Antioxidation

- Antioxidants cause early termination anywhere above the “line of stink”
- Common food antioxidants
  - BHA
  - BHT
  - Propyl galate
  - TBHQ

Typical results

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<th>Factor</th>
<th>Pro-oxidant</th>
<th>Neither</th>
<th>Anti-oxidant</th>
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<tr>
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<td>Sat. NaCl</td>
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Exp 6 experimental setup