

# Food Rheology

# Food Rheology

- ✓ The study of deformation and flow
- ✓ It is used for the raw materials, the intermediate products and the final products
- ✓ A relationship between the stress acting on a given material and the resulting deformation and/or flow that takes place

# Where do we need rheological data in the food industry

- ✓ Food acceptability, food processing and food handling
- ✓ Process engineering calculations
- ✓ Determination of ingredient functionality in product development
- ✓ product quality control
- ✓ Shelf-life testing

# Viscosity

- ✓ The resistance to deformation and flow
- ✓ Measure of internal friction of a fluid
- ✓ Different fluids deform at different rates under the same shear stress
  - ✓ Stress: force per unit area
  - ✓ Strain: deformation

# Units of viscosity

- “*Poise*” or OR “centipoise” (cp) =  $\text{g/cm}\cdot\text{s}$ -- The English unit
- Pa.s (  $\text{N}\cdot\text{s}/\text{m}^2$  OR  $\text{kg}/\text{m}\cdot\text{s}$ )-- The SI UNIT

# Rheological Classification of Foods

**Newtonian fluids**

**Non-Newtonian fluids**

# Newtonian Fluids

- ✓ Stress versus rate of strain curve is linear and passes through the origin
- ✓ Viscosity: The constant of proportionality
- ✓ Viscosity depends on;
  - ✓ temperature
  - ✓ chemical composition of the fluid if the fluid is not a pure substance

# Non-Newtonian Fluids

- ✓ Associated with complex internal structure
- ✓ Flow properties are not described by a single constant value of viscosity
- ✓ shear thinning, shear thickening, Bingham



# Rheological Classification of Fluids-NonNewtonian

## ➤ *Time Dependent Fluids*

✓ Thixotropic

✓ Reopectic