Laboratory Work No. 15

DETERMINING THE ACIDITY OF MILK

Theoretical Part:

The acidity of milk and dairy products plays an important role in determining their quality. Hydrogen ions are very active and can break down the calcium phosphate compound of casein in milk, causing it to spoil and affecting the composition of its salts. As acidity increases, the nutritional and raw material qualities of milk also change.

Milk acidity depends on the concentration of hydrogen ions in it, so its quality can be determined by its pH level. However, active acidity (pH) alone cannot fully represent the quality of milk. Like other physiological fluids, milk also has buffering properties. For example, if a small amount of alkali or acid (3–4 ml of a 0.1 N solution per 100 ml of milk) or water is added to fresh milk, the pH value does not change.

Titrable Acidity

Since milk products possess buffering properties, the dairy industry relies on **titrable acidity**, rather than active acidity, to determine milk acidity.

Titrable acidity indicates the amount of alkali added to milk to reach a neutral reaction using **phenolphthalein indicator**. To calculate milk acidity, **Turner degrees (°T)** are used.

Turner degrees refer to the number of milliliters of caustic sodium (or potassium) solution required to neutralize milk that has been diluted twice with 100 ml of water, or 100 g of product.

Each Turner degree corresponds to 1 ml of 0.1 N alkali solution.

When determining milk acidity through titration, not only the active hydrogen ions but also the **potential H^+ ions** released during the titration process are involved.

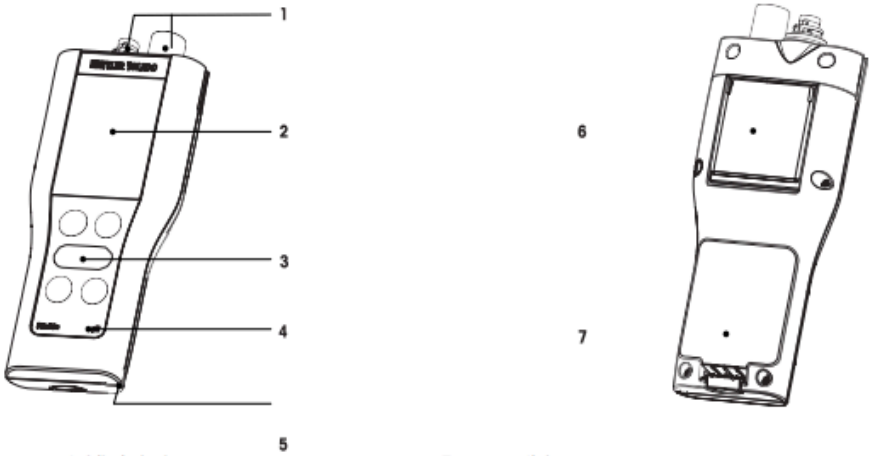
This is the main difference between **active acidity** and **titrable acidity**.

Apparatus and Equipment:

- **Lactoscan LW** milk analyzer
- **pH meter** or **titration device**
- **Burette** (25–50 ml capacity, graduated by 0.1 ml, vertically fixed on a stand)
- **Dropper** for phenolphthalein solution

- **100 ml conical flask**
- **10 ml and 20 ml pipettes**

Lactoscan LW milk analysis device



1	Datchikni ulash	5	Bog'ich mahkamlanadigan joy
2	Displey	6	Stolga qo'yiladigan taglik
3	Klaviatura	7	Batareya bo'lmasi
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pH metr mettler toledo

Reagents:

- **0.1N caustic sodium (or potassium) solution**
- **1.0% phenolphthalein solution in alcohol**

(Prepared by dissolving 1 g of phenolphthalein in 70 ml of 95% alcohol and adding 30 ml of distilled water)

Method of Determination:

1. Measure **10 ml of milk** using a pipette and pour it into a conical flask.

2. Add **20 ml of distilled water** and **3 drops of 1% phenolphthalein solution**, then shake well.

3. For better visibility, place the flask on **a white sheet of paper**.

4. Next to it, place a reference (control) flask containing:

- 10 ml milk
- 20 ml water
- 1 ml of **2.5% cobalt sulfate solution**

5. **Titrate** the milk sample with **0.1N caustic sodium (or potassium) solution**:

- First, add **1 ml of alkali all at once**, then continue to add it **gradually**.
- Near the end point, **add drop by drop**, shaking continuously.
- Stop titration **when a stable light pink color appears** that does **not fade for 1 minute** and matches the reference flask.

6. To calculate milk acidity in **Turner degrees (°T)**:

- Multiply the volume (in ml) of alkali used for neutralization by **10**.

Example: If 2.1 ml of alkali was used, the acidity = 2.1 × 10 = **21°T**

7. The difference between parallel measurements should not exceed **±1°T**.

8. **Note:**

If distilled water is not available, the procedure can be performed **without adding water**, but in this case, **subtract 2°T** from the obtained Turner degree result.

Control Questions

1. What is active acidity and what is titrable acidity?
2. What do you understand by Turner degrees?
3. Describe the method of determination.