

REVISED METHOD FOR DETERMINATION OF ACID VALUE IN OILS AND FATS

(CLAUSE 11 OF FSSAI MANUAL OF METHODS OF ANALYSIS OF FOODS – OILS & FATS)

11.1 Definition:

The acid value is defined as the number of milligrams of Potassium hydroxide required to neutralize the free fatty acids present in one gram of fat. It is a relative measure of rancidity as free fatty acids are normally formed during decomposition of triglycerides. The value is also expressed as per cent of free fatty acids calculated as oleic acid, lauric, ricinoleic and palmitic acids.

11.2 Principle:

The acid value is determined by directly titrating the oil/fat in an alcoholic medium against standard potassium hydroxide/sodium hydroxide solution.

11.3 Analytical Importance:

The value is a measure of the amount of fatty acids, which have been liberated by hydrolysis from the glycerides due to the action of moisture, temperature and/or lipolytic enzyme lipase.

11.4 Apparatus:

250 mL conical flasks

11.5 Reagents:

a) Phenolphthalein indicator solution: - Dissolve one gram of phenolphthalein in 100mL of ethyl alcohol.

b) Alkali Blue 6B indicator solution: When testing rice bran oil or rice bran oil based blended oils or fats, which give dark colored soap solution, the observation of the end point of the titration may be facilitated, by using Alkali Blue 6B in place of Phenolphthalein.

Preparation: (2%) Extract 2gm of alkali blue 6B with rectified spirit in a Soxhlet apparatus at reflux temperature. Filter the solution if necessary and dilute to 100ml with rectified spirit. Alkali blue 6B indicator to be stored in closed Ambered colored bottle to avoid oxidation of dye.

c) Ethyl alcohol:

1) Ninety-five percent alcohol or rectified spirit neutral to phenolphthalein indicator.

2) Ninety-five percent alcohol or rectified spirit neutral to Alkali blue 6B indicator in case of rice bran oil or rice bran oil based blended oil or fats.

d) Standard aqueous Potassium hydroxide or sodium hydroxide solution 0.1 or 0.5 N. The solution should be colourless and stored in a brown glass bottle. For refined oils, the strength of the alkali should be fixed to 0.1 N.

11.6 Procedure:

Mix the oil or melted fat thoroughly before weighing. The mass of the test sample shall be taken based on the colour and expected acid value.

Expected Acid Value	Mass of Test portion (gm)	Accuracy of weighing of test portion (gm)
<1	20	0.05
1 to 4	10	0.02
4 to 15	2.5	0.01
15 to 75	0.5	0.001
>75	0.1	0.0002

- Weigh accurately appropriate amount of the cooled oil sample as mentioned in the above table in a 250 mL conical flask.
- Add 50 mL of freshly neutralised hot ethyl alcohol and about one ml of phenolphthalein indicator solution. In case of rice bran oil or RBO based blends, add about 1mL of Alkali blue indicator.
- Heat the mixture for about fifteen minutes in water bath (75-80°C)
In case of Rice bran oil or RBO based blended oils or fats, add 1mL of Alkali blue indicator after heating.

- d) Titrate while hot against standard alkali solution shaking vigorously during the titration.
- e) End point using phenolphthalein indicator shall be from colourless to light pink (Persisting for 15 sec.)
- f) End point using Alkali blue 6B indicator shall be disappearance of blue colour which developed during addition of indicator.

Note: Noting burette reading after “obtaining dark pink colour OR Orangish red” as end point should be avoided as it will lead to erroneous result

- g) The weight of the oil/fat taken for the estimation and the strength of the alkali used for titration shall be such that the volume of alkali required for the titration does not exceed 10mL.

11.7 Calculation:

$$\text{Acid value} = \frac{56.1 V \times N}{W}$$

Where,

V = Volume in mL of standard potassium hydroxide or sodium hydroxide used

N = Normality of the potassium hydroxide solution or Sodium hydroxide solution; and

W = Weight in gm of the sample