

## **TERMS OF REFERENCE FOR THE R&D PROJECT**

**Sectional Committee:** Oils and Oilseeds Sectional Committee, FAD 13

**1. Title:** Comparative study for the measurement of colour of vegetable oils, fats and fatty acids by manual and automatic tintometer.

### **2. Background**

**2.1** Colour value is an important quality parameter for edible oils, fats and derived products such as fatty acids. BIS through Oils and Oilseeds Sectional Committee, FAD 13 has published a number of Indian Standards for specification for different types of vegetable oils, fats and fatty acids. In almost all these standards, colour values of the product have been specified as a quality characteristic.

**2.2** For the measurement of colour, IS 548 (Part 1/Sec 2) : 2021 ‘Method of sampling and test for oils and fats Part 1 Sampling, physical and chemical tests Section 2 Physical and chemical tests’ has been referred in the product specification standards which prescribes the method for measurement of colour using manual tintometer. However, International Standards are also available for measurement of colour using automatic tintometer. ISO 15305 : 1998 ‘Animal and vegetable fats and oils – Determination of Lovibond colour’ specifies a method for the determination of the Lovibond colour of animal and vegetable fats and oils using automatic tintometer.

**2.3** As per IS 548 Part 1/Sec 2, yellow and red colour scales are used for measurement of colour, whereas, in the automatic tintometers, measurement is based on RYBN estimation i.e. blue and neutral colour scale readings are also taken into account for colour measurement, apart from yellow and red scales.

**2.4** BIS has received representations regarding the calculation used through the manual tintometer method and variations in the results of analysis by manual and automatic tintometers. Further, it has been pointed out that different pathlengths (dimensions of the cell used) are required for different types of oils based their colour and consistency. However, pathlength (dimensions of the cell used) has been specified for castor oil, groundnut oil, coconut oil, sesame oil, mustard oil, mahua oil and cottonseed oil only in IS 548 (Part 1/Sec 2) : 2021. If any changes are needed to be made in the pathlength and calculations used for colour measurement, colour values specified for different vegetable oils, fats and fatty acids in the Indian Standards may also need to be changed. Oils and Oilseeds Sectional Committee, FAD 13 of BIS has, therefore, identified the subject “Comparative study for the measurement of colour of vegetable oils, fats and fatty acids by manual and automatic tintometers” as an R&D project. The findings of this R&D project would be appropriately used to make changes in the relevant Indian Standards on test methods for colour measurement as well as product specifications wherein colour values have been specified.

### **3. Objective**

To compare the accuracy and precision of measurement of colour of vegetable oils, fats and fatty acids by manual and automatic tintometer, standardize the calculations for colour measurement, prescribe the path lengths for colour measurement and specification for colour values for selected matrices.

#### **4. Scope**

- 4.1** Undertake detailed review of existing literature and national, regional and international Standards for the relevant methods for measurement of colour of vegetable oils, fats and fatty acids by tintometers.
- 4.2** Carry out detailed laboratory experiments to compare the results of measurement of colour of vegetable oils, fats and fatty acids by manual and automatic tintometers.
- 4.3** Standardize the calculation for colour measurement using different applicable colour scales of tintometers.
- 4.4** Standardize path length for colour measurement for the selected matrices.
- 4.5** Suggest specifications for colour values for selected matrices.
- 4.6** The data validation shall be done in at least 3 laboratories.

#### **5. Deliverables**

Detailed report of the work done through the R&D as per the scope specified under Item 4, with the following as appendices:

- a) Detailed comparative analysis of the results of measurement of colour of vegetable oils, fats and fatty acids by manual and automatic tintometers, including accuracy and precision of both the methods, including the multi laboratory validation data;
- b) Recommendations regarding the applicability/suitability of both the methods for the selected matrices;
- c) Recommendation regarding the calculation to be used for colour measurement using both manual and automatic tintometers;
- d) Suggestions regarding the pathlength for colour measurement and specification for colour values for selected matrices based on the research findings;
- e) The report of review of existing methods available in literature and national, regional and international Standards on this subject.

#### **6. Research Methodology**

- 6.1** Detailed study of relevant methods available in literature and national, regional and International Standards.
- 6.2** Laboratory experiments for comparative analysis of the measurement of colour of vegetable oils, fats and fatty acids by manual and automatic tintometers

**6.3** Sampling plan: Minimum 5 dark oils, 5 light coloured oils, 5 different fatty acids covering both dark and light; a population of not less than 10 samples of each selected sample type.

**6.4** Procurement of samples of the selected matrices for the testing purpose.

**Note:** The proposer shall share the detailed methodology for research on the above subject while submitting a proposal to BIS. Same base stock of samples shall be given to all the laboratories for seeing inter-lab variations.

## **7. Timeline and Method of Progress Review**

<b>Stage</b>	<b>Timeline</b>
Review of literature	First month
Comparative analysis of methods and standardization of calculation	Second month
Submission of progress report	End of second month
Testing to suggest path length to be used for colour measurement and specifications for colour values of selected matrices	Third month
Draft report submission	End of Third month
Final report submission	Fourth month

**Note:** The timelines given above are indicative.

## **8. Support BIS will Provide:**

**8.1** National and international standards and research articles for the R&D project, if required.

**8.2** Sending letter to manufacturers requesting to provide samples to the investigator for the purpose of R&D project.

## **9. Nodal officer:**

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