TERMS OF REFERENCE FOR THE R&D PROJECT

[**Technical Committee:** Textile Speciality Chemicals and Dyestuffs Sectional Committee, TXD 07]

1. **Title of the Project:** Development and validation of test method for determination of index ingredient of textiles dyed with tectona grandis, terminalia arjuna, canna indica, impatiens balsamina.

2. Background

2.1 The textile industry, with its ever-growing demand for sustainable and eco-friendly practices, has witnessed a resurgence of interest in natural dyes derived from botanical sources. Tectona grandis (Teak), Terminalia arjuna, Canna indica, and Impatiens balsamina stand out as valuable natural dye sources in India, with their potential to yield vibrant and earthy hues for textile applications.

2.2 Tectona grandis leaves, known as Teak or Sagaun in Hindi, are utilized by Indian dyers to impart a reddish-brown shade to yarn and fabric. The reddish hue is derived from the tender leaves, which transition to green as they mature. Only specific plants with mature leaves yield the valuable reddish dye. Similarly, Terminalia arjuna bark is employed for dyeing textiles in various shades of brown. Canna indica, a perennial garden plant with ornamental flowers and edible rhizomes, includes a red-flowered variety that produces a red dye now used in textile dyeing. Additionally, the red-flowered Balsam (Gulmehndi) variety yields a reddish-brown dye utilized in textile dyeing.

2.3 BIS has published IS 17432 : 2020 on Tectona grandis, IS 17433 : 2020 on Terminalia arjuna, IS 17430 : 2020 Canna indica and IS 17431 : 2020 on Impateins balsamina. These standards specify the method for detection and identification of respective natural dyes using HPTLC and HPLC (chromatographic techniques) and by UV-Visible and FT-IR (spectroscopic techniques). In the 18th Meeting of TXD 07, it was decided to propose the above drafts as NWIPs in index ingredient format to ISO/ TC 38- WG 31 'Natural Materials for Textiles' for formulation of ISO standards on the subjects.

2.4 Indian Standards specify the comparison of the natural dye with synthetic colorants, whereas ISO drafts need to be drafted in index ingredient format, which require a single colorant constituent molecule to be identified and quantified by a suitable analytical/chromatographic method. For conversion of drafts, it is required to identify such an index ingredient for each of the dye and develop and validate a suitable test method for its identification and qualification in the textiles dyed with these respective dyes.

2.5 The results obtained from the study will serve as the basis for development of new test method for determination of index ingredient from colored textile dyed with Tectona grandis, Terminalia arjuna, Canna indica, Impatiens balsamina dyes by HPLC or any other technically accepted method and formulating the ISO NWIP drafts on the aforementioned subjects.

3. Scope

a) Study and analyze the existing literature which include but not restricted to the following:-

   i) National/ International Standards on the subject and related subjects
   ii) Standard operating procedures (SOPs)/guidelines of laboratories

iii) Journals and research papers
iv) Any study conducted by other organizations
v) Any other relevant published information on the subject

b) Collect the database of testing infrastructure equipped with HPLC test facilities or any other technically accepted method and users in the country.
c) Undertake 2 visits to laboratories equipped with HPLC test facilities or any other technically accepted method to collect the information including but not restricted to the following: -

i) Principle of the test method
ii) Procedures for specimen preparation, stock solution/standard preparation.
iii) Any additional preparatory processes required.
iv) Test conditions
v) List of apparatus used during the test
vi) Procedure/detailed method
vii) Reagents, chemicals or any other auxiliaries
viii) Specific tests conducted as part of the method
ix) Test result representation, including chromatograms, calibration curves, or visual observations.
x) Expression or calculation of the obtained results.
xi) Laboratory Standard Operating Procedure (SOP) for the test method
xii) Focused group discussion on testing related issues, challenges being faced and suggestion

d) The feedback from other laboratories where visit is not carried out shall be obtained through structured questionnaire including the above details.

e) Purchase/collect a total of 03 samples of each dyes of different known impurity and carry out tests and interlaboratory validation in 03 NABL accredited lab equipped with the necessary capabilities as per the detailed method of HPLC or any other technically accepted method for determination of index ingredient from colored textile dyed with Tectona grandis, Terminalia arjuna, Canna indica and Impatiens balsamina dyes.

f) Prepare a comprehensive project report covering the all the information mentioned under the scope of the R & D Project.

4. Expected Deliverables

a) Comprehensive report in soft/hard form covering all the aspects detailed in the scope of the R & D project.
b) Questionnaire feedback, reports of visit, test results, focussed group discussion report, other relevant documents and information shall be appended to the project report.

5. **Research Methodology**:

a) Collect and analyse the data/information as specified in the scope [4 (a) to (b)].
b) Visit labs and collect data/information as specified in the scope [4 (c) and 4 (d)].
c) Prepare technical data, test the samples and in the scope [4 (e)].
d) Analysis the data/information and prepare a comprehensive project report.

6. Requirement for the CVs:

Graduate in Textile Technology/Textile Engineering/ Textile Chemistry/Fiber Science & Technology, Chemical Engineering/Chemistry/Applied Chemistry.

7. Timeline and Method of progress review:

The duration of the project is 180 days from the date of the award of the project. The stagewise indicative timelines are as follows:

Time line	Method of progress
0 to 30 days	Literature review, desktop study, collection of data and information **Note** — The plan for visit and collection/purchase of samples shall be discussed and finalized with nodal officer after literature survey and desktop research.
31 to 60 days	Visit to testing lab Collection of Technical data/information on C-14 analysis
61 to 150 days	Testing of samples and completion of test report Preparation and submission of draft report to BIS
151 to 180 days	Consolidation of data, Submission of final report of the project.

8. Support BIS will provide:-

a) All the relevant Indian Standards/ISO Standards or any other standards required during the project will be provided by BIS.
b) Facilitate/introduction of the project leader/organization to relevant Industry and industry association, testing lab, institute, acedamia, user, regulator/ministries.
c) Facilitate testing of samples in BIS Lab/BIS Recognized Lab.

9. Nodal Point

In case any queries/clarification, Shri Himanshu Shukla, Sc-B & Member Secretary, TXD 07 may be contacted on txd@bis.gov.in.