

TERMS OF REFERENCE FOR THE R&D PROJECT

Foodgrains, Allied Products and Other Agricultural Produce Sectional Committee, FAD 16

1 Title of the Project

Development of test method(s) for determination of degree of milling of rice.

2 Background

- 2.1** Milling is a crucial step in post-production of rice. The basic objective of a rice milling system is to remove the husk and the bran layers, and produce an edible, white rice kernel that is sufficiently milled and free of impurities.
- 2.2** Rice milling includes following steps, cleaning, hulling/shelling, scouring/pearling/whitening/polishing, grading. The polished rice is then graded based on size/ brokens/ whiteness etc. before final packaging.
- 2.3** The degree of milling of rice as conventionally defined by the percentage loss of kernel weight during milling and that as generally understood by product quality (colour or content of a specified constituent of milled rice) are therefore not identical entities. It refers to the amount of husk and bran that has been removed from the rice grain during the milling process. Hence to define degree of milling of rice for product quality needs the use of a different index – such as the percentage retention of bran pigment or the percentage kernel surface area covered with bran – than the conventional criterion of weight loss.
- 2.4** The degree of milling is a critical indicator of rice quality. The determination of the degree of milling of rice is essential for quality control. Determining the degree of milling helps in assessing the efficiency and effectiveness of the milling process, ensuring that the desired level of milling is achieved consistently, therefore, rice milling industries need to ensure consistent quality in their products. Further, understanding the degree of milling is crucial for assessing the nutritional content of rice. By knowing the extent to which the outer layers (bran and germ) are removed, one can evaluate the nutrient profile, such as fiber content, vitamin levels, and mineral content, which can vary significantly between brown and white rice. The degree of milling influences the glycemic index (GI) of rice. Determining the degree of milling can also help in estimating the GI, which is important for individuals, especially those with conditions like diabetes, to manage blood sugar levels effectively. Determining the degree of milling can be a basis for quality differentiation, and thereby sale price, and branding strategies by rice producers and marketers. Highlighting the specific degree of milling (for example, "lightly milled," "highly milled") can be a marketing point, appealing to consumers who are knowledgeable and discerning about rice quality and nutritional aspects. It is further important to define the degree of milling and develop a standard protocol for determination of degree of milling of rice, so that all the stakeholders are at the same level and there is no confusion about this quality trait. The developed protocol should

be easy to understand and implement and also stable or invariant to rice varieties and other geographical variations.

- 2.5** In the absence of standardized test method for determination of degree of milling of rice, Foodgrains, Allied Products and Other Agricultural Produce Sectional Committee, FAD 16 of BIS has, identified the subject of “Development of test method for determination of degree of milling of rice”. The developed test method would be used to formulate a separate Indian Standard on this subject and subsequently would be proposed for adoption in ISO under ISO/TC 34/SC 4 ‘Cereals and Pulses’.

3 Objective

To develop test method(s) for determination of degree of milling of rice suitable for all commercial cultivars and to validate the protocol(s) for uniformity and robustness.

4 Scope

- 4.1** Undertake literature review and market survey in order to prepare a comprehensive list of rice varieties available in Indian market.
- 4.2** Undertake detailed review of existing literature and national, regional and International Standards, research publications for the relevant methods for determination of degree of milling of rice.
- 4.3** If method(s) is available, detailed laboratory experiments to validate the method for determination of degree of milling of rice.
- 4.4** If methods are not available, detailed laboratory analysis to develop/standardize and validate the method(s) for determination of degree of milling of rice.
- 4.5** Verify the applicability of the developed method(s) to minimum 50 different rice samples of different varieties and brands procured from market.

5 Research Methodology

- 5.1** Undertake thorough literature review of relevant test methods as per **4.1** and prepare summary report including comparative analysis.
- 5.2** Development and validation of method(s) for determination of determination of degree of milling of rice. The samples taken for testing should include white rice, brown rice, parboiled rice. Validation of test method shall be done as per relevant parts of ISO 5725 ‘Accuracy (trueness and precision) of measurement methods and results.

5.3 Procurement of rice of different varieties and brands from the market and their analysis to verify applicability of the developed test method(s).

Note: The proposer shall share the detailed methodology for research including the sample plan on the above subject while submitting the proposal to BIS.

6 Expected Deliverables

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

- a) Detailed test method for determination of degree of milling of rice covering the scope of method, reagents and apparatus/equipment, procedure, calculation and expression of results;
- b) Validation report of method including repeatability, its limit of detection and quantification;
- c) The report of review of existing methods available in literature and national, regional and international Standards on this subject; and
- d) Report of the market sample analysis.

7 Timeline and Method of Progress Review

7.1 Timeline for the project is 6 months from the date of award of the project.

7.2 Stages for Progress Review

| Stage | Timeline |
|---|-----------------------|
| Stage I Review of the literatures and existing stipulations, sampling plan and validation plan | First month |
| Stage II: Optimization/development and validation of test method(s) and testing of validated method(s) on the market samples. Submission of interim report to Sectional Committee at the end of third month for review. | Second to Fifth month |
| Stage III: Draft report submission – Sectional Committee will evaluate the draft report and provide feedback/recommend changes, if required. | End of Fifth month |

At the end of 6th month, project allottee to submit final project report incorporating recommendations/feedback of Committee.

Note: The timelines given above are indicative and calculation of time will start from the date of award of sanction letter for the project to the Project leader.

8 Support from BIS

8.1 Access to Indian and International Standards

8.2 Letters from BIS to concerned stakeholders, wherever required for support in research project.

9 Nodal Officer

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