

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

Food and Agriculture Department  
Slaughterhouse and Meat Industry Sectional Committee, FAD 18

### **1 Title of the Project**

Study on Shelf-life assessment of shell eggs.

### **2 Background**

**2.1** Bureau of Indian Standards has developed 2 Indian Standards pertaining to storage and shelf life of shell eggs; IS 9810 : 1981 'Methods for evaluation of quality of chicken eggs' and IS 6558:1972 'Cold Storage of Shell Eggs - Code of Practice', which can be accessed at <https://standardsbis.bsbedge.com/> free of cost.

**2.2** In the recent years, it has been observed that due to changes in climatic conditions and increase of feed cost, farmers are raising poultry by utilizing non-conventional feed resources along with other supplements to reducing cost of production while increasing the productivity and income. The layer birds are being reared under different management practices for commercial production and their shelf-life assessment are important. Further, while eggs are moving for sale, they are routed through different supply chain channels where eggs are being stored and sold at both room and refrigeration temperatures. Thus, shelf-life declaration or best before use date of these shell eggs are required to be given due priority along with the other specifications for eggs. Food safety is another area of concern by the consumers. Since eggs are highly perishable in nature so they are prone to decay very quickly. Therefore, proper quality assessment of eggs is required which can help to mitigate possible health risk through consumption of safe eggs.

**2.3** Considering the above-mentioned changes of scenarios in storage and production managements of shell eggs, it has been decided to conduct a detailed research study on shelf-life assessment of shell eggs to update the existing standards; IS 9810 : 1981 and IS 6558:1972. Based on the recommendations and findings of the project, the necessary updations in the existing Indian Standards will take place. Considering very little information available in the country beforehand on this subject, this research will be very important in addressing the questions such as; What is the shelf life of shell eggs stored at room ( $27 \pm 2$  °C ) and refrigeration temperature ( $4 \pm 1$  °C)? and What are the parameters to be checked in order to evaluate the quality of shell eggs?

More information on rationale and relevance of the project is provided at Annex A.

### **3 Objective of the Project**

- 3.1** To determine shelf life of shell eggs produced under commercial environment across different geographic regions during storage at room ( $27 \pm 2$  °C) and refrigeration ( $4 \pm 1$  °C) temperatures at 70-80 % and 80-90% R.H.
- 3.2** To identify parameters (physical, chemical and microbiological) and acceptable limits of this parameters to be considered for quality assessment of shell eggs.

## **4 Scope**

- 4.1** Study of existing literature related to published research conducted, international/ regional guidelines & standards related to shelf-life assessment and quality analysis of shell eggs and any other relevant national/ international documents.
- 4.2** Visit to at least 2 laboratories/research institute working on shelf-life assessment and quality analysis of shell eggs, if any.
- 4.3** Visit to at least 2 large scale and 2 small scale stakeholders involved in commercial shell egg storage, quality evaluation and transportation for understanding the best practices for storage, quality evaluation and transportation of shell eggs.
- 4.4** Collection of representative field samples of shell eggs for necessary evaluation.
- 4.5** The study includes evaluation of shell eggs for weight loss, specific gravity, air cell depth, albumen index (AI), yolk index (YI) and sensory quality for updating Indian Standards, IS 9810: 1981 'Methods for evaluation of quality of chicken eggs' and IS 6558:1972 'Cold Storage of Shell Eggs - Code of Practice'.
- 4.6** Collection of available information under commercial production system related to shell egg storage, quality evaluation and transportation.
- 4.7** Study on microbiological quality of shell eggs during storage at room ( $27 \pm 2$  °C) and refrigeration temperature ( $4 \pm 1$ °C) under 70-80% and 80-90% R.H.
- 4.8** Preparation of the technical report and providing recommendations in the form of requirements for shelf-life declaration of shell eggs under above standards also falls under scope of the project.
- 4.9** Comparative analysis of existing commercial best practices with the proposed recommendations regarding storage, quality evaluation and transportation of shell eggs.

## **5 Research Methodology**

- 5.1** Conduct a thorough literature review for existing national and international guidelines, regulatory stipulations and standards related to shelf-life assessment and quality analysis of shell eggs
- 5.2** Conduct pan India data collection on various available commercial eggs with respect to market share, major producers/suppliers, user feedback, supply chain intermediary inputs related to storage & quality evaluation of such eggs, difference between various eggs, benefits and potential issues related. (through secondary as well as primary survey using structured questionnaire and structured interview)
- 5.3** Conduct primary survey through structured interview/ structured questionnaires with laboratories/research institute working on shelf-life assessment and quality analysis of shell eggs, if any to understand the existing testing protocols or ongoing research related to the subject.
- 5.4** Conduct primary survey through structured interview/ structured questionnaires with large scale and small-scale commercial stakeholders for collection of information/database on commercial production system of eggs existing in various agro-climatic zones in the country.

- 5.5** During visit to commercial stakeholders, observe and record the best practices, observe and record the issues faced, observe and record sustainability aspects addressed during shell egg storage and transportation (if any), observe and record waste management practices followed during storage and transportation of shell eggs.
- 5.6** Collect a minimum 250 representative shell egg samples from 5 regions of India (North, South, East, West & North-East).

*Note: As per standard protocol it is required to be targeted at least 0.1% of the total production of eggs but it may not be possible to analyze such huge numbers of eggs (0.14 billions of eggs). Considering this, it may be targeted representative data across the country (at least 250 eggs) through cluster analysis by randomized sampling methods. Considering the national geographic diversity, a minimum of 50 eggs from each of region of the country should substantiate the requirement of study.*

- 5.7** Evaluate the egg quality at room ( $27 \pm 2$  °C) and refrigeration temperature ( $4 \pm 1$  °C) under 70-80 % and 80-90% R.H as per requirements given in Indian Standards (IS 9810: 1981 ‘Methods for evaluation of quality of chicken eggs’ and IS 6558:1972 ‘Cold Storage of Shell Eggs - Code of Practice’) and other requirements identified during secondary and primary survey.
- 5.8** Evaluate the sensory and microbiological quality of eggs during above storage temperature.
- 5.9** Prepare report comprised of research findings and data collected as per the deliverables of this project for updating the Indian Standards, IS 9810: 1981 ‘Methods for evaluation of quality of chicken eggs’ and IS 6558:1972 ‘Cold Storage of Shell Eggs - Code of Practice’.

## **6 Deliverables**

Detailed project report of the work done, in hard copy and digital formats, as per the scope specified under 4, with the following as appendices:

- a) Research findings and data collected regarding the secondary as well as primary study.
- b) The optimum storage recommendations for shell eggs at room ( $27 \pm 2$  °C) and refrigeration temperature ( $4 \pm 1$  °C) under 70-80% and 80-90% R.H.
- c) Methodologies to evaluate the quality of shell eggs (physical parameters, chemical parameters, microbiological parameters).
- d) Acceptable limits of recommended parameters (physical parameters, chemical parameters, microbiological parameters) to be considered during quality evaluation of shell eggs.
- e) Data/information related to Shelf-life declaration of shell eggs and best practices related to storage, quality evaluation and transportation under commercial practices.
- f) Response/information collected during primary survey.
- g) Test results generated during quality analysis of eggs as per recommended requirements and methodologies.

## **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 of review:

Stage	Timeline
<b>Stage I :</b> Primary Report covering the review of the literatures and existing stipulations, sampling plan, complete plan regarding shelf life study	First month
<b>Stage II :</b> Visit to relevant laboratory/research institute, large scale stakeholders, small scale stakeholders, data collection, compilation of best practices	Second Month
<b>Stage III :</b> Shelf-life study and quality evaluation of shell eggs Submission of interim report to Sectional Committee at the end of fourth month for review.	Third Month to Fifth Month
<b>Stage IV :</b> Complete report including data from testing of field samples	Fifth month

At the end of 6<sup>th</sup> 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 for support in research project.

## 9 Nodal Officer

Shri Debasish Mahalik, Scientist-B/ Assistant Director, FAD, BIS may be contacted at [fad18@bis.gov.in](mailto:fad18@bis.gov.in) for any queries on the research project

## **Annex A**

### **A.1 Rationale /Need of Project**

The rationale for the project will be addressed to determine shelf life of shell eggs produced under commercial environment across different geographic regions during storage at room (26 °C) and refrigeration (4°C) temperatures (70-80 and 80-90% R.H). This is required to update the existing Indian standards for shell eggs as per pre-requisite demands from the producers, whole sellers, retailers, consumer's etc. In the recent years, it has been observed that due to changes in climatic conditions and increase of feed cost due to direct competition of human with poultry for food grains, farmers are raising poultry by utilizing non-conventional feed resources along with other supplements to reducing cost of production while increasing the productivity and income. The layer birds are rearing under different management practices for commercial production and their shelf life assessment are important. Further, while eggs are moving for sale it is routed through different marketing channels where eggs are holding and selling at room and refrigeration temperatures. Thus, shelf life declaration or best before use date of these shell eggs are required to give due priority along with the other specifications for eggs. Food safety is another area of concern by the consumers. Since eggs are highly perishable in nature so they are prone to decay very quickly. Therefore, proper quality assessment of eggs is required which can help to mitigate possible health risk through consumption of safe eggs. In summary, to supply good quality of fresh eggs to the consumers, there is an urgent need of update the existing BIS standard through setting up certain guidelines considering present climate changing scenario, farming practices and demand by the consumers.

### **A.2 Relevance of the study**

In the past, a very few studies have been identified and utilized to combat deterioration of shell eggs in India's context. The published literature is also very sparse in this aspect and even, status data of different egg and egg products consumed in the country are lacking. Declaration of shelf life of different shell eggs are mandated by many international agencies and organizations like Federal Standard of Canada, EU standard, Australian and New Zealand standard etc. All these standards are designated for under the commercial production system like cage free eggs, caged eggs, farm free eggs, herbal eggs, organic eggs, selenium/iodine enriched eggs, etc. This it is felt that it is required to update national shell eggs standard to safeguard for consumer's rights. Another important area is the safety of the egg products. In the recent years, the trade related to different egg and egg products have shown phenomenon growth, but safety related concern due to consumption of poor quality or contaminated eggs are remaining the key issues. Several epidemiological data revealed that presence of certain infectious agents on/in egg leads to disruption of egg production, interrupting the domestic egg supply, adversely affecting egg processing, marketing and the distribution chain, and causing severe loss to the export markets. This loss to the Indian poultry industry would be billions of dollars in trade related to egg products in the coming years. Currently, there is not enough scientific based information available to define how and what extent of microbial spoilage of shell eggs. Thus, suitable research study is required to be carried out to update the existing standards of shell eggs.