TERMS OF REFERENCE FOR R&D PROJECT

Food and Agriculture Department

Slaughterhouse and Meat Industry Sectional Committee, FAD 18

1 Title of the Project

Development of protein biomarker-based test method for authentication of cold-slaughtered chicken in fresh and cooked meat.

2 Background

2.1 Illegal sale/processing of cold-slaughtered meat or dead bird meat is an important food fraud issue encountered in different states in India which is posing threat to consumers and challenges to regulatory authorities. Recently several instances of sale of dead bird meat or mixing of cold slaughtered meat into regular meat has been reported from different states in India. Currently there is only one subjective test viz, "Malachite Green Test" which is suitable for application only in fresh meat and is not suitable for cooked meat and meat products. Few other recent procedures involving metabolomic approaches are highly complex and reported only in raw meat. Therefore, protein-based method that is suitable for both raw and cooked conditions need to be developed for addressing these routine food fraud issues and to regulate the market in order to ensure food safety.

2.2 In order to address the above concern, it has been decided to conduct a detailed study for developing/optimizing the protein biomarker-based test methods and validate the protein/metabolic biomarkers for authentication of cold-slaughtered meat for the purpose of framing an Indian Standard.

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

3 Objective of the Project

To develop/optimize protein/metabolic biomarker-based test method for authentication of cold-slaughtered meat in fresh and cooked meat and validation of the test method.

4 Scope

4.1 Study of existing literature related to published research conducted on protein biomarkers, cold slaughtered meat authentication, international/ regional guidelines & standards related to cold slaughtered meat identification and any other relevant national/ international documents.

4.2 Visit to laboratories/research institutes working on development of analytical methodology related to cold slaughtered meat authentication, if any.

4.3 Development/optimization of the protein/metabolite-based methods or any standard procedures for routine screening of cold-slaughtered meat.

4.4 Collection of field samples of dead bird from poultry firms and screening for required validation study.

4.5 Intra and inter-laboratory validation of protein/metabolic biomarkers identified for authentication of cold slaughtered meat

4.6 Comparative analysis of existing test methods (Eg. Malachite green test) for cold slaughtered meat authentication with the new proposed method.

5 Research Methodology

5.1 Conduct secondary survey through study of existing literatures related to researches conducted on protein biomarkers and cold slaughtered meat authentication.

5.2 Conduct primary survey through structured interview/ structured questionnaires with laboratories/research institutes working on development of analytical methodology related to cold slaughtered meat authentication, if any to understand the existing testing protocols or ongoing research related to protein biomarker-based test method for authentication of cold-slaughtered chicken.

5.3 Optimize the physico-chemical methods and protein-based approaches for routine screening of dead bird meat under both raw and cooked conditions.

5.4 Identify and validate protein/metabolic biomarkers of cold-slaughtered meat amenable under both raw and cooked conditions. Validation of test method shall be done as per relevant parts of ISO 5725 'Accuracy (trueness and precision) of measurement methods and results'.

5.5 Conduct screening of field samples of dead birds (n=25) collected from different poultry farms for the presence of marker proteins/metabolites identified from the study.

5.6 Conduct Intra- and Inter-laboratory analysis of samples using available physico-chemical tests for validation of dead bird meat.

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) Optimized protocols, physical and chemical methods for detection of dead bird meat
b) Validation report including Validated protein/metabolic biomarkers for authentication of cold-slaughtered meat (dead bird meat) under both raw and cooked conditions, data generated, test results, repeatability, its limit of detection and quantification;

c) Available novel methodology/procedures for identification of cold-slaughtered chicken and the comparative analysis with the proposed method, if any;
d) Response/information collected during primary survey.

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 field samples. Submission of interim report to Sectional Committee at the end of third month for review.	Second to Fourth 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

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

Annex A

Rationale /Need of Project

A-1 India is a 5th largest poultry meat producer with more than 900 million birds. However, due to poorly managed supply chain and various stress factors thousands these birds die during transportation to processing plant and retail meat shops. The meat from these dead birds may reach the consumers due to economic gains and unregulated markets. Hence, the proposed study will come out with robust and validated protocols which will be of great significance to Regulatory bodies, Food safety officers, Poultry processors, Animal Husbandry Departments and Meat exporters.

A-2 The rationale for the project "Method optimization and validation of protein biomarkers for authentication of cold-slaughtered chicken" is to optimize or develop a method for routine screening of samples and to generate novel biomarkers/validate the existing leads towards robust technology for authentication of dead bird meat. This project is essential for several reasons:

1. Globalization of food value chain: Considering the globalization and movement of meat and meat products across the continents, the consumers are keen to know the geographical origin, quality, production/processing methods and authenticity on ethical, social, health and religious grounds.
2. COVID-19 outbreak: The Covid-19 outbreak has resulted in increased concerns among consumers about meat quality due to deleterious effects on health as a result of avian influenza, foot-and-mouth disease and recently African Swine fever.
3. Misrepresentation: Disruptions in the supply chain, expanding consumption outpacing the production and competition to produce cheaper products to gain easier market access are leading to economically motivated adulteration or misrepresentation (mislabelling) of meat and meat products.

Such malpractices are resulting in loss of trust among consumers while also creating challenges to the regulatory authorities for establishing the authenticity of meat and meat products. Sale of cold slaughtered meat or dead bird meat is one such important food fraud issue encountered in different states in India which is posing threat to consumers and challenges to regulatory authorities. However, currently there are no standard procedure and validated techniques to authenticate the cold slaughtered meat.

A-3 In summary, the project seeks to develop/optimize procedures for routine screening of dead bird meat and to develop a robust and validated technology which is amenable to regulatory standards. By optimizing and validating the robust methodology, the project must aim to propose Regulatory Standards for further harmonization with ISO standards.