"FISH SHELF LIFE PREDICTIONS PROGRAM- FSLP"

USER MANUAL
VERSION 1.0

"Fish Shelf Life Predictions Program-FSLP", version 1.0 (January 2007)
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Content

1. INTRODUCTION

The *Fish Shelf Life Prediction Program* is property of AZTI-TECNALIA and has been developed by the Institute of Food Research, Norwich, UK in collaboration with AZTI-TECNALIA.

The software developed "*Fish Shelf Life Prediction Program-FSLP*" allows the prediction and the visualization of sensory acceptability, growth of spoilage bacteria in farmed turbot products and the response of time-temperature integrators (TTIs) at constant and fluctuating temperature conditions. Moreover, the software allows the graphical comparison of experimental microbiological, sensory and TTIs data with the respective model at either constant or fluctuating temperature. Optionally, the predictions and plots can be saved as an Excel workbook. The predictive models are based on experimental data obtained at AZTI-TECNALIA with farmed turbot within a temperature interval between 0-15ºC.

1.1. Basic predictive microbiology

Predictive microbiology is the science of describing and predicting, by mathemathical means, the response of microorganisms to their environments. If responses are observed under a sufficient number of combinations of the environmental factors, then it is possible to predict how the organisms would respond to any conditions of the environmental region where the observations were made.

1.2. Sensory evaluation of fish freshness

Sensory evaluation is one of the most important methods for freshness and quality evaluation in the fish sector and the fish inspection services. The sensory prediction of this program is based on data obtained by a trained panel. The quality score is from 9 (absolutely fresh) to 4 (completely putrid or spoiled).The rejection level is 6.The sensory analysis of fresh fish was based on judgement of the following quality attributes: eyes, gills, external odour and skin. The measurement of freshness of cooked fish included: odour, flavour and texture.

1.3. Time-temperature indicator (TTI)

A time temperature indicator or integrator (TTI) is a simple, inexpensive device that shows an easily measurable, time-temperature dependent change that reflects the full or partial temperature history and quality status of the food product to which it is attached to. This program include a predictive models that describe the response of two commercial time-temperature integrators, Monitor Mark® (3M, USA) 5ºC model and Fresh Check® (TempTime Corporation, USA) 6D422 model.

2. HOW TO USE THE “FSLP”-Program

2.1. The Opening Screen

FSLP program is an Excel add-in, running under Windows 3.1. and Excel 5 or above.
Warning: Regional configuration/options (form Panel Control) must be set up for “English(UK)”.

- When Open “*Fish Shelf Life Program-FSLP”*, (Excel), the following Opening Screen will be presented (figure 1)

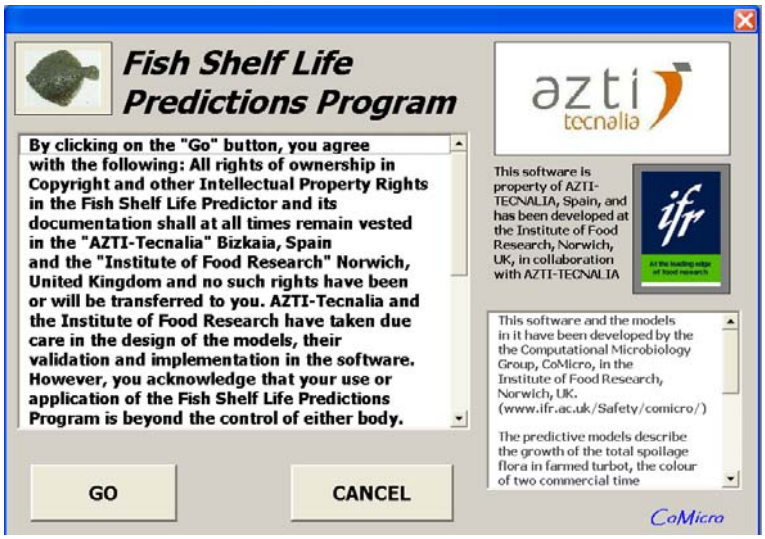

Figure 1

After clicking on the GO button in the Opening Screen, the program will be installed in Excel.

2.2. Generating a prediction

- The first step in producing a prediction is to open a separate Excel sheet and enter time-temperature profiles (can be entered manually). Data must be organized in columns. Time (in hours) must be in the first column of the selection. The table should start at 0 time. Temperature measurements (in Celsius degrees) must be in the second column of the selection. Temperature can be entered between -10 and 25 Celsius degrees, but predictions are only valid form 0-15ºC.

- Click on *“FSLP”*-Prediction during fluctuating temperature, and select a temperature profile in the current Excell workbook. Highlight the data only, without heading.

- In the text box shown 

enter the initial level of total bacteria (log_{10} cfu/g) colony-forming units per gram.

- If you know this data, in the text box shown 

enter the initial sensory score from 9 (fresh) to 4 (spoiled)

- Click on the 

button

- The FSLP output windows shows (figure 2):

(i) Time-temperature profile (blue line)
(ii) Prediction of growth of total bacteria (red line)
(iii) Prediction of sensory score-trained panel (black line)

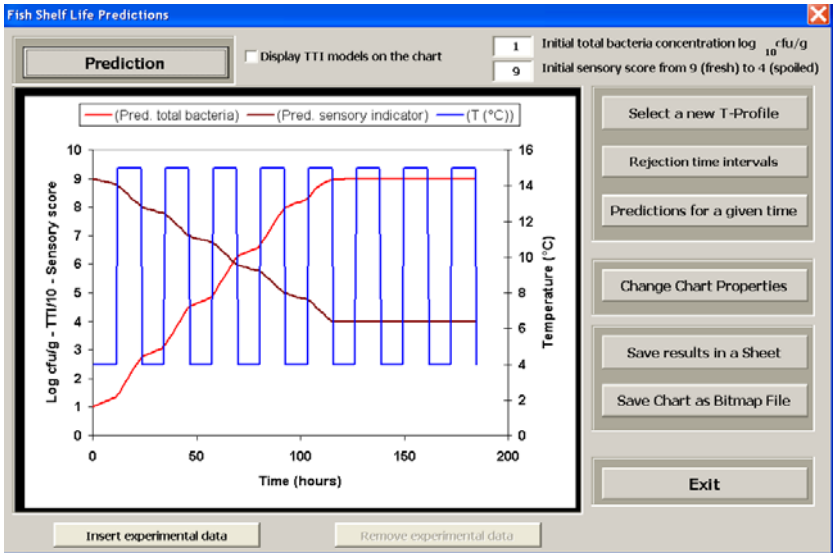

Figure 2

2.2.1. Prediction of time-temperature integrators

- Click on the “Display ITT models on the chart” check button in the upper left corner of the screen to display graphs of predictions of IITs. According to the mathematical model developed for the TTI´s indicators the rejection limit for the Fresh Check® is equal to 51,5 and for the Monitor Mark® is 44. In the graph the data presented is TTIscore/10. (figure 3)

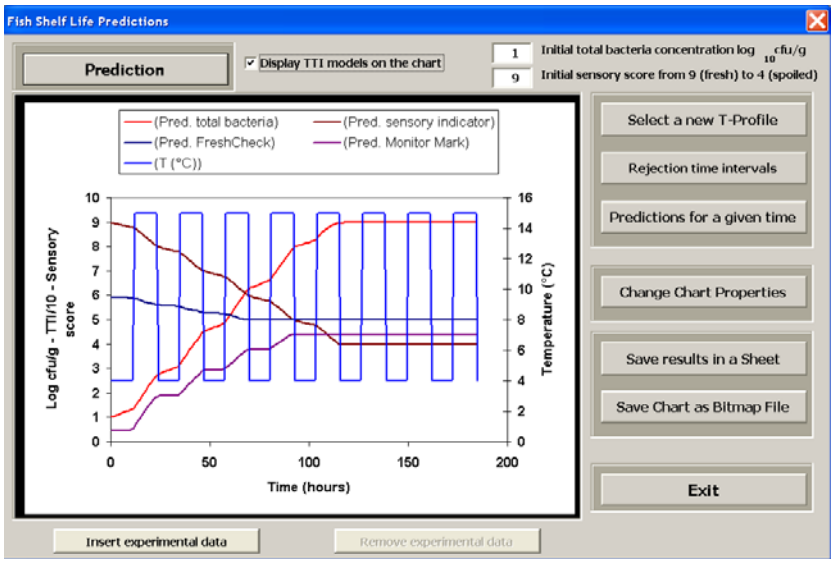

Figure 3

2.2.2. Rejection time intervals

- Click on the "Rejection time intervals" button. The program shows a table that indicates (figure 4):
  (i) The rejection time (hours) according to the model for sensory perception of a trained panel (equal to 6, in a scale from 4 to 9)
  (ii) Total bacteria load (log 10 cfu/g) predicted at this rejection time
  (iii) The rejection time (hours) according to the model for the TTI indicators (Fresh Check® is equal to 51,5 and for the Monitor Mark® is 44.). Moreover, the total bacteria load (log 10 cfu/g) predicted at these rejection times

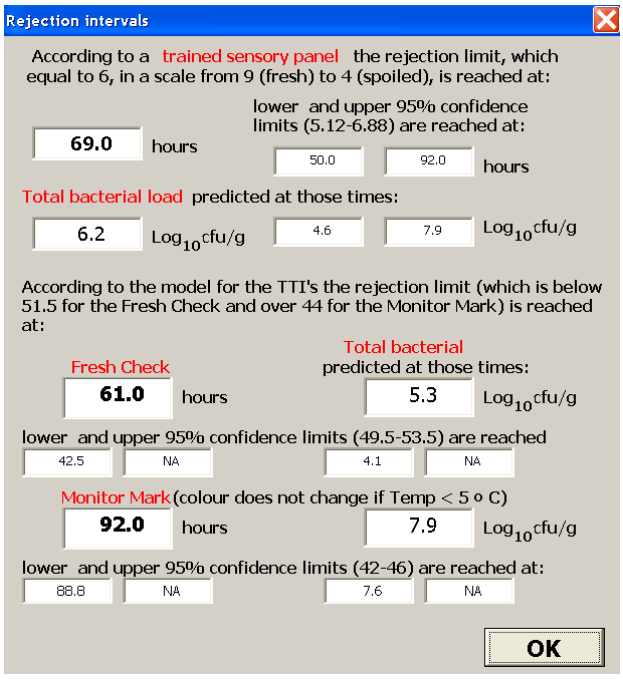

Figure 4

2.2.3. Prediction for a given time

- Click on the "Predictions for a given time" button. Introduce the time in hours for a predictions and press "Predict" (figure 5).The program shows a table with the following information:

(i) Prediction of the total bacteria load at the entered time
(ii) Predicted sensory score for a trained panel (scale form 4 to 9)
(iii) Predicted score for the TTIs

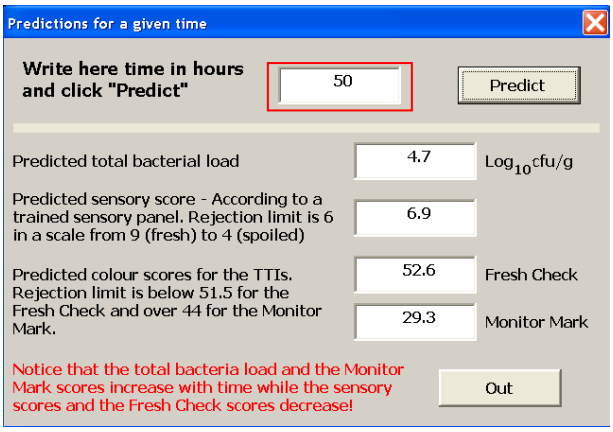

Figure 5

2.3. Comparison of observed and predicted data

The FSLP program allows to compare the predicted growth bacteria data versus experimental data. The model of Baranyi and Roberts (1994) was fitted to the bacterial growth curves. Moreover, it compares experimental sensory and TTIs data with predicted data based on the predictive models developed by IFR and AZTI-TECNALIA.

- Click on the “Insert experimental data” button in the bottom left corner of the screen to display graphs.
- Select the experimental data (microbiological, sensory or TTIs data) in an Excel sheet. Press OK when selected (figure 6). The program allows to predict one parameter each time.
- You can also remove these data, select “remove experimental data” bar

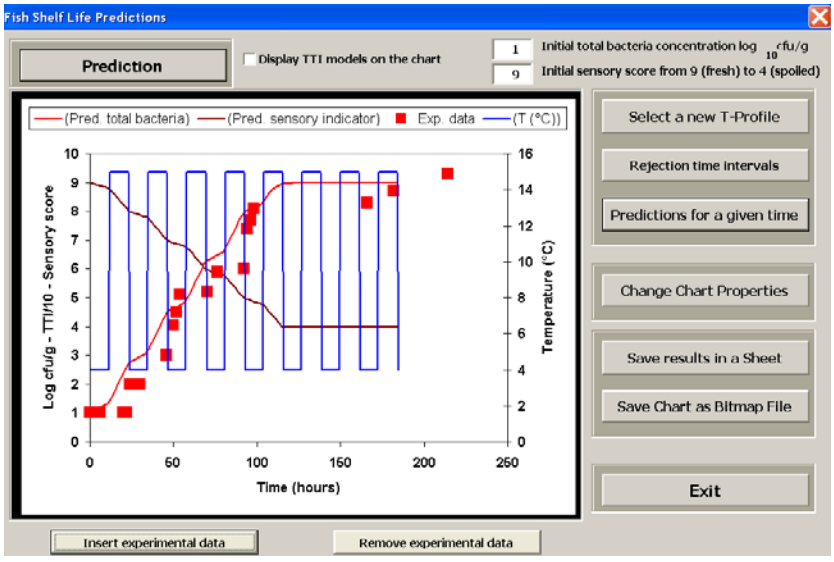

Figure 6

To exit the prediction and close the program, use the Exit button.

3.REFERENCES

Alfaro B., Nuin M., Cruz Z., Argarate N., Pin C. Use of predictive microbiology and time-temperature indicators for shelf life control of fresh fish. Proceedings INTRADFOODS 2005 "Innovations in traditional foods". EFFOST Conference – Elsevier, 2005. pp: 257-260. ISBN:84-9705-879-8.

Baranyi, J., and Roberts, T.A. 1994. A dynamic approach to predicting bacterial growth in food. International Journal of Food Microbiology. 23: 277-294.

Nuin, M; Alfaro B., Cruz Z., Argarate N.; 2006. "Time temperature indicators as quality and shelf life indicators for fresh turbot (*Psetta maxima*). In: Luten, J.B.; Jacobsen, C.; Bekaert, K.; Sæbø, A.; Oehlenschläger, J. "Seafood research from fish to dish. Quality, safety and processing of wild and farmed fish". Wageningen Academic Publishers. Wageningen, The Netherlands. pp:519-524.

Nuin M., Alfaro, B. "Pescado refrigerado envasado: Nuevas herramientas de control de la cadena de frío y de la vida útil". Ruta Pesquera Nº 54 - Año X. pp:74-76. Jan-Feb 2006.