Fig. 1. Astaxanthin in virgin coconut oil

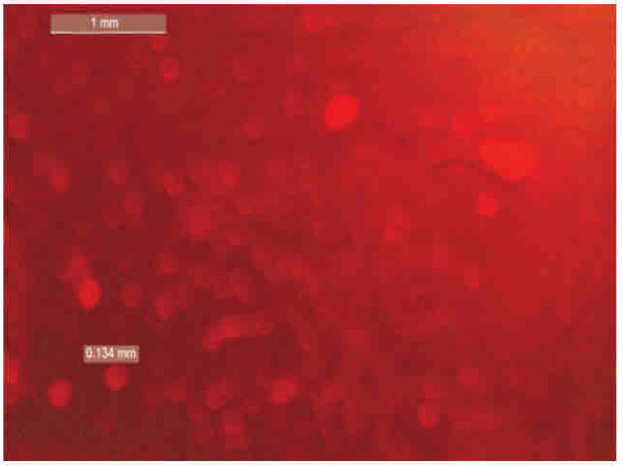

Fig. 2. Stereo-microscopic image of astaxanthin extracted from shrimp head waste

Thermal denaturation profile indicated a rapid rate of denaturation above 60 °C.

UV Spectra of astaxanthin indicated high absorption at UV range of 200-400 mm which suggests its potential to be used in as cosmetic formulations as UV protective agent. The UV protective effect of astaxanthin was evaluated on *Staphylococcus aureus* ATCC 25923. Results indicated good UV protective effect for the extracted astaxanthin in terms of cell viability. Bacteria grown in astaxanthin-incorporated culture media gave protection to the colonies even after exposure to UV radiation for 48 hours (Fig. 3). Further studies also indicated that the UV protective effect of astaxanthin was not altered during accelerated storage conditions.

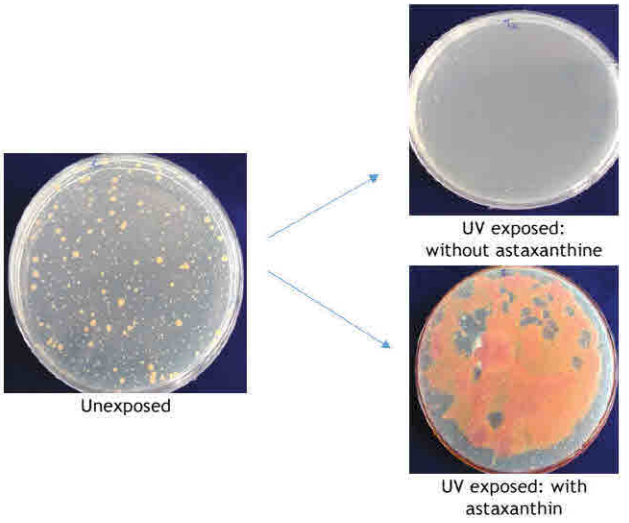

Fig. 3. UV protective activity of extracted astaxanthin on Staphylococcus aureus

Optimization of prawn pulp-incorporated fish sausage using mixture response surface methodology

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A study was undertaken to optimize the combinations of surimi and prawn pulp for the development of prawn pulp-incorporated fish sausage in order to enhance the utilization of small varieties of shrimps. Fish mince was taken from Thread fin bream and prawn pulp was taken from *Metapenous dobsoni* (Thelly chemmeen) for the development of combination sausage. A D-optimal mixture design for 10 different combinations of surimi and prawn pulp was

Table 1. Ingredient combination of sausage

Ingredients	% Weight
Surimi and Prawn pulp	86.7
Salt	2.15
Spice mix (mint: ginger: chilly)	0.9
Black pepper powder	0.4
Corn flour	7.8
Garlic	0.2
Cinnamon and clove powder(1:1)	0.3
Vegetable oil	1.5

formulated with different proportions of surimi and prawn pulp. The ingredients of combination fish sausage is given in Table and sausage was prepared by standard procedure.

Quality response variables *viz*: Texture profile analysis (TPA), Water holding capacity (WHC) and Colour values were measured for each combination by standard analytical procedures. Sensory score in terms of Overall acceptability (OA) was recorded in 9 point Hedonic scale. Linear, Quadratic and Cubic mixture response surface regression models were fitted to the quality response variables using OLS method and goodness of fit of the models were assessed by R2 values (Myers and Montgomery, 2002). The functional forms of Linear, Quadratic and Cubic models are given below:

Linear: $Y=\sum_{i=1}^{q} \beta_i x_i + e,\ i=1,2$,

Quadratic: $Y=\sum_{i=1}^{q} \beta_i x_i + \sum_{i<j=2}^{q} \sum \beta_{ij} x_i x_j + e,\ i=1,2$,

Cubic: $y=\sum_{i=1}^{q} \beta_i x_i + \sum_{i<j=2}^{q} \sum \beta_{ij} x_i x_j + \sum_{i<j=2}^{q} \sum \delta_{ij} x_i x_j (x_i - x_j) + e,\ i=1,2$

where Y is the response variables and are linear, quadratic and cubic regression coefficients and e is the error term. The above models were used to predict the response variables. Linear model was found to be best fitted model for springiness, quadratic model for hardness 1, L* and a*; and cubic model for WHC, b* and OA.

Fig. 1. Optimized prawn flavoured combination sausage

The desirability score was computed based on the predicted values of the response variables and the optimum combination was found to be 83.4% surimi and 3.3% prawn pulp; and the corresponding desirability score was 0.99. The combination sausage prepared at this optimum level was also found to have maximum consumer acceptability.

Reference

Myers, R.H. and Montgomery, D.C. (2002) Response surface methodology: Process and product optimization using designed experiments (2nd Ed.), John Wiley & Sons, Inc., USA, 798 p.