DYES (incl. Food colorants)

NPARR, 6(1 & 2), 2015-16 Optimization of an ecofriendly dyeing process using the waste water of the olive oil industry as natural dyes for acrylic fibres

The olive oil industry releases considerable amounts of wastewater which contains huge reserves of natural dyes. Such wastewater could successfully be used for the dyeing of acrylic fibers. The influence of the main dyeing conditions (material/liquor ratio, dye bath pH, dyeing duration, dyeing temperature) on the performances of this dyeing process were studied. The dyeing performances of this process were appreciated by measuring the color yield (\(K/S\)) and the fastness properties of the dyed samples. A \(2^4\) full factorial design method was employed in order to study the interactions between the selected dyeing process parameters and to evaluate the optimal dyeing conditions. The optimization of these dyeing process factors to obtain maximum color yield was carried out by incorporating effect plots, normal probability plots, interaction plots, analysis of variance (ANOVA) and Pareto charts. A regression model was formulated using Minitab software and fitted the experimental data very well. In addition, it was found that dyeing of acrylic enables to reduce the concentration of polyphenols so that it reduced the Chemical oxygen demand COD. Furthermore, the biodegradability ratio (\(COD/BOD_5\)) decreases but it was always superior to 3 which means that this aqueous waste still not biodegradable. It was also found that reusing the residual bath allowed to obtain a depth of shade very similar to the first dyeing and reduced considerably the environmental parameters (the concentration of polyphénols and COD) [Wafa Haddar*, Noureddine Baaka, Nizar Meksi, Imen Elksibi and M. Farouk Mhenni (Research Unit of Applied Chemistry and Environment, Faculty of Sciences of Monastir, 5000 Monastir, Tunisia) Journal of Cleaner Production, 2014, 66, 546-554].

NPARR, 6(1 & 2), 2015-17 Inclusion complexes of red bell pepper pigments with \(\beta\)-cyclodextrin: Preparation, characterisation and application as natural colorant in yogurt

This work aimed to prepare inclusion complexes between red bell pepper pigments and \(\beta\)-cyclodextrin using two different procedures (i.e., magnetic stirring and ultrasonic homogenisation), to characterise the prepared inclusion complexes and to evaluate the colour stability of a selected complex added to yogurt. The mass ratio of extract to \(\beta\)-cyclodextrin was 1:4. The formed extract: \(\beta\)-cyclodextrin complexes and a physical mixture of extract and \(\beta\)-cyclodextrin were evaluated by differential scanning calorimetry, Fourier transform-infrared spectroscopy, proton nuclear magnetic resonance, particle size distribution and Zeta potential. The obtained data showed that ultrasonic homogenisation resulted in better yield and inclusion efficiency compared to magnetic stirring. The yogurt with the added complex produced by ultrasonic homogenisation showed slower variations for the \(a^*\) (redness) and \(b^*\) (yellowness) indices compared to yogurt with added extract, indicating a higher protection of the colour during storage.

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slower variations for the \(a^*\) (redness) and \(b^*\) (yellowness) indices compared to yogurt with added extract, indicating a higher protection of the colour during storage [Lidiane Martins Mendes Gomes, Nicolly Petito, Valéria Gonçalves Costa, Deborah Quintanilha Falcão and Kátia G. de Lima Araújo*(Laboratório de Biotecnologia de Alimentos, Departamento de Bromatologia, Faculdade de Farmácia, Universidade Federal Fluminense, Rua Doutor Mário Viana 523, Santa Rosa, Niterói 24241-000, Rio de Janeiro, Brazil), Food Chemistry, 2014, 148, 428-436].

NPARR, 6(1 & 2), 2015-18 Dyeing of white and indigo dyed cotton fabrics with Mimosa tenuiflora extract

*Mimosa tenuiflora* extract has been used in food industry as an additive and in textile and leather industry as a colorant. Two types of fabrics, ready to be dyed white and indigo dyed fabrics, were dyed with *M. tenuiflora* extract. The fabrics were mordanted after dyeing with six different metal salts. Colorimetric evaluations of fabrics were carried out by spectrophotometer. Colour fastness to washing, rubbing and light were performed. Colour strength of fabrics was calculated from Kubelka–Munk formula. Highest vividness (\(C^*\)) values were obtained by Ni mordant. Moderate fastness values were observed. However poor wet rubbing fastness values were observed in the case of indigo dyed fabrics due to lack of good wet rubbing fastness of indigo itself [Gökhan Erkan, Kemal Şengül and Sibel Kaya (Dokuz Eylül University, Textile Engineering Department, 35260 Tinaztepe Yerleşkesi, Buca, İzmir, Turkey), Journal of Saudi Chemical Society, 2014, 18(2), 139-148].

NPARR, 6(1 & 2), 2015-19 Modeling of antibacterial activity of annatto dye on Escherichia coli in mayonnaise

Anatto ranks second in economic importance worldwide among all natural colorants and its extract fraught with antimicrobial and antioxidant properties. In the present paper, adaptive neuro-fuzzy inference system (ANFIS) and genetic algorithm–artificial neural network (GA–ANN) models were undertaken to predict the annatto dye on *Escherichia coli* in mayonnaise. The ANFIS and GA–ANN were fed with 3 inputs of annatto dye concentration (0%, 0.1%, 0.2% and 0.4%), storage temperature (4 and 25 °C) and storage time (1–17 days) for prediction of *E. coli* population. Both models were trained with experimental data. The results revealed that the annatto dye was able to decline *E. coli* and the bactericidal effect of annatto dye was stronger at 25 °C than that in 4 °C. The developed GA–ANN, included 13 hidden neurons, could predict *E. coli* population with coefficient of determination of 0.995. The largely agreement between experimental and ANFIS predictions data was also acceptable (\(R^2=0.991\)). Sensitivity analysis results revealed that storage time was the most sensitive factor for prediction of *E. coli* population [Mahmoud Yolmeh*, Mohammad B. Habibi Najafi, Reza Farhoosh and Fakhreddin Salehi (Department of Food Science and Technology, Faculty of Agriculture, Ferdowsi University of Mashhad, Iran), Food Bioscience, 2014, 8, 8–13].

NPARR, 6(1 & 2), 2015-20 Microwave-assisted extraction of betalains from red beet (*Beta vulgaris*)

The use of microwave assisted extraction (MAE) was investigated in this work for the extraction of betalains from diced red beets. Several treatments with different combinations of time, power and duty cycle applied to the samples were studied. The combination of 400 W and 100% duty cycle for 90–120 s resulted in the highest amount of recovered betanines; whereas at 140–150 s the highest amount of betaxanthins was obtained. The addition of ascorbic acid (0.040 mol/L) to the extracting solvent and the development of a two-step MAE process with a cooling period in-between and after processing steps led to an enhancement in the amount of
pigments obtained. The effect of extraction time at each extraction step on betalains yield was determined by applying a factorial design and surface plots were constructed. The duration of the second step significantly affected the yield of betanines and betaxanthins obtained ($p < 0.05$). A prediction model was proposed and validated to meet the optimal extraction times. Betalain yields obtained by MAE were twice as high as those obtained during conventional extraction and conventional extraction at 80 °C [G.A. Cardoso-Ugarte, M.E. Sosa-Morales, T. Ballard, A. Liceaga and M.F. San Martín-González (Department of Food Science, Purdue University, 745 Agricultural Mall Dr, West Lafayette, IN 47906, USA), *LWT-Food Science and Technology*, 2014, **59**(1), 276-282].