Indigenous naked neck chicken: a valuable genetic resource for Bangladesh

The review by scientists at Japan and Bangladesh aims at determining the potential usefulness of indigenous naked neck (INN) chicken for poultry production in a hot-humid climate. INN chicken has good heat dissipation mechanism and well adaptive to harsh tropical environment and nutrition, and is highly resistant to disease and superior to indigenous full-feathered and exotic egg-type or exotic naked neck counterparts in terms of growth rate, egg production, egg quality and meat yield traits. It can produce double the standard number of eggs under improved nutrition and management conditions. Crossbreds of INN with exotic chicken can perform even better than that of exotic chicken in respect of productive and reproductive traits. Consumers prefer the meat and eggs of INN chickens for reasons of pigmentation, leanness, taste, firmness and they are also used in special dishes. INN chicken prices are typically higher compared with those of products from exotic stocks. There are a very few published papers on the molecular aspects of INN chickens, although this is essential to determine genetic distance or relationship within or between INN chicken and indigenous full-feathered (IFF) varieties for future breeding plans. Therefore INN strains may be a promising and worthy genetic resource for the development of a breed or strain through selective or crossbreeding program suited to Bangladesh and in other countries where similar environments and socio-economic conditions exist. Thus, this review provides genetic and performance information on INN chickens which may be useful for further improvement of tropical breeds [Islam MA and Nishibori M, Indigenous naked neck chicken: a valuable genetic resource for Bangladesh, World Poult Sci J, 2009, 65, 125-138].

Chemical modification of flax reinforced polypropylene composites

An experimental study was carried out by researchers at South Africa on the static and dynamic mechanical properties of nonwoven based flax fibre reinforced polypropylene composites. The effect of zein modification on flax fibres was also reported. Flax nonwovens were treated with zein coupling agent, which is a protein extracted from corn. Composites were prepared using nonwovens treated with zein solution. The tensile, flexural and impact properties of these composites were analysed and the reinforcing properties of the chemically treated composites were compared with that of untreated composites. Composites containing chemically modified flax fibres were found to possess improved mechanical properties. The viscoelastic properties of composites at different frequencies were investigated. The storage modulus of composites was found to increase with fibre content while damping properties registered a decrease. Zein coating was found to increase the storage modulus due to enhanced interfacial adhesion. The fracture mechanism of treated and untreated flax reinforced polypropylene composites was also investigated from scanning electron microscopic studies [John Maya Jacob and Anandjiwala Rajesh D, Chemical modification of flax reinforced polypropylene composites, Composites part A: appl sci Manuf, 2009, 40 (4), 442-448].
Textile fibre-reinforced anionic polyamide-6 composites

In order to manufacture thicker, larger and more integrated thermoplastic composite parts than currently can be achieved by melt processing, a vacuum infusion process is currently being developed by researchers at the Delft University of Technology, The Netherlands using a reactive thermoplastic polymer called anionic polyamide-6 (APA-6). In previous studies it was demonstrated that the anionic polyamide-6 (APA-6) resin that is used has excellent mechanical properties. The present study assesses infused thermoplastic composites and focuses on fibre-matrix interactions. Part I of this study focuses on the thermal effects, causes for deactivation of the initiator and the restriction caused by the low in-plane permeability of the fibre textiles on various transport phenomena. It is shown that addition of pre-heated fibres not only shortens the infusion window, but also influences the matrix properties by reducing the exothermic heat production. In addition, the low in-plane permeability of the fibre textiles influences the infusion time and causes the entrapment of voids. Finally, reactions between the matrix and the fibre surface can lead to deactivation of the initiator and bond formation with the activator [van Rijswijk K, Teuwen JJE, Bersee HEN and Beukers A, Textile fibre-reinforced anionic polyamide-6 composites. Part I: The vacuum infusion process, Composites part A: appl sci Manuf, 2009, 40 (1), 1-10].

Effect of process parameters in laccase-mediator system delignification of flax pulp

Laccase-mediator systems have facilitated the development of TCF sequences, the replacement of oxygen- and ozone-based delignification stages, and the efficient bleaching of pulp in addition to reducing kappa numbers and saving reagents. The use of a laccase in the presence of a mediator is a very promising choice for biobleaching pulp. Therefore, the aim of a study carried out by researchers at Spain was to establish the influence of process variables on pulp properties after a laccase-mediator treatment. Flax (Linum usitatissimum Linn.) pulp was bleached by using an enzyme treatment with laccase (L stage) in the presence of HBT as mediator in order to replace toxic chemicals (e.g. chlorine or chlorine dioxide) with environmentally friendly catalytic biotechnological products in the bleaching process, achieving a clean process technology in the pulp and paper manufacture. The operating conditions for the laccase-HBT system were optimized by using a sequential statistical plan involving four variables (laccase dose, HBT dose, treatment time and oxygen pressure), their influence on the properties of the pulp after the L stage was examined. The main objective was to minimize the reagent doses and the reaction time to make more suitable the industrial application.

A mathematical model for predicting the kappa number in terms of the process variables was developed. The kappa number decreased with increase in the value of each variable down to a minimum level of 6.9, which was obtained with a laccase dose of 13 U/g, an HBT dose of 2%odp and a treatment time of 6.5 hours. The model predicted a limiting laccase dose of 13 U/g above which no additional reduction in kappa number would be obtained. By contrast, oxygen pressures of 0.2-0.6 MPa in the reactor had no effect on brightness or kappa number. Brightness was not correlated with the kappa number due to the formation of chromophores in the pulp at the beginning of the enzymatic treatment. The LP biochemical sequence allows obtaining a final brightness of 75.2%ISO.

Further, laccase influence on the effluent properties (COD, colour, toxicity, spectra and residual enzymatic activity) was also examined by them to evaluate the impact of L stage on environment. Mathematical models accurately predicting effluent properties in terms of the previous four variables were developed. High COD levels were obtained as a result of using commercial laccase. Also, red colour produced, especially at
long treatment time, relates to formation of oxidation products from HBT. The residual enzymatic activity depends basically on mediator dose, and mainly activity loss is produced during the first 30 min of treatment. The toxicity of the effluents was below the limits set by the sewage regulations for Catalonia and can be ascribed to the combined effect of the laccase-mediator system [Fillat Ursula and Blanca Roncero M, Effect of process parameters in laccase-mediator system delignification of flax pulp: Part I. Pulp properties; Effect of process parameters in laccase-mediator system delignification of flax pulp. Part II: Impact on effluents properties, Chem Engg J, 2009, 152 (2-3), 322-329, 330-338].

**Application of laccase-natural mediator systems to sisal pulp**

Non-wood fibre plays a major role in the pulp and paper business in as much as it constitutes the main stay of papermaking in many developing countries (particularly China and India). Sisal (*Agave sisalana* Pers.) is a monocotyledon plant endemic to Central America which provides fibre with a papermaking potential. In fact, sisal, which has traditionally been used to make natural ropes, cordage and sacking, possesses some attractive properties for the production of a number of specialty paper varieties such as those used in tea bags, surgical gauze, filters or condensers. Moreover, new opportunities exist for sisal pulp to cost-effectively replace long-fibred chemical wood pulp for the reinforcement or basis weight reduction of many paper grades.

Thus, the effects of laccase-natural mediator systems (LMS) on sisal pulp and their potential for either biobleaching or functionalizing (via radical-coupling) its fibres were investigated by researchers at Textile and Paper Engineering Department, ETSEIAT, Universitat Politècnica de Catalunya, Terrassa, Spain. The enzyme treatment (L stage) was followed by extraction with hydrogen peroxide in order to determine whether observable effects could be enhanced by removing LMS-modified lignin. Four different plant phenols [viz. the *p*-hydroxycinnamic compounds sinapic acid (SNC), ferulic acid (FRC), coniferyl aldehyde (CLD) and sinapyl aldehyde (SLD)] were used as laccase redox mediators and their effects on pulp and effluents compared with those of the synthetic compound 1-hydroxybenzotriazole (HBT). During the L stage performed with HBT, laccase underwent a loss of 99 and 78% of the initial activity, in the absence and presence of pulp, respectively. With natural mediators inactivation was markedly reduced, being the residual activity between 65 and 100% of the initial one, in the presence of pulp. The pulp was found to protect the enzyme against inactivation: the activity was only reduced by 45% in its presence. Under the operating conditions used the natural mediators proved less efficient than HBT in facilitating pulp bleaching; rather, they tended to bind to pulp fibres. This effect could be used to functionalize fibres in order to improve intrinsic properties of pulp or introducing novel ones (e.g. antimicrobial, antioxidant, optical properties, etc.) [Aracri E, Colom JF and Vidal T, Application of laccase-natural mediator systems to sisal pulp: an effective approach to biobleaching or functionalizing pulp fibres?, Bioresour Technol, 2009, 100 (23), 5911-5916].

**Using both xylanase and laccase enzymes for pulp bleaching**

Two enzyme treatments involving xylanase (X) and laccase (L) were used jointly in an XLE sequence (where E denotes alkaline extraction) by researchers at Spain to bleach oxygen-delignified eucalyptus (*Eucalyptus globulus* Labill.) kraft pulp in the presence of 1-hydroxybenzotriazole (HBT) as mediator. The results of the XLE sequence were compared with those of an LE sequence. The application conditions for the laccase-mediator system were optimized by using...
The researchers at Central Institute of Plastics Engineering & Technology, Bhubaneswar, India carried out studies on fabrication and performance evaluation of banana/glass fibre-reinforced polypropylene hybrid composites. Hybrid composites of Polypropylene (PP) reinforced with intimately mixed short banana and glass fibres were fabricated using Haake twin screw extruder followed by compression molding with and without the presence of maleic anhydride grafted polypropylene (MAPP) as a coupling agent. Incorporation of both the fibres into PP matrix resulted in an increase in tensile, flexural and impact strength with an increasing level of fibre content up to 30wt% at banana: glass fibre ratio of 15:15wt% and 2 wt% of MAPP. The rate of water absorption for the hybrid composites decreased due to the presence of glass fibre and coupling agent. The effect of fibre loading in presence of coupling agent on the dynamic mechanical properties has also been analyzed to investigate the interfacial properties. An increase in the storage modulus (E') of the treated composite indicates higher stiffness. The tan δ spectra confirm a strong influence of fibre contents and coupling agent on the α and β relaxation processes of PP. The nature of fibre matrix adhesion was examined through scanning electron microscopy (SEM) of the tensile fractured specimen. Thermal measurements were carried out employing differential scanning calorimetry (DSC) and the thermogravimetric analysis (TGA) which indicated a decrease in the crystallization temperature and thermal stability of PP with the incorporation of MAPP treated banana and glass fibre [Samal Sushanta K, Mohanty Smita and Nayak Sanjay K, Banana/Glass Fibre-Reinforced Polypropylene Hybrid Composites: Fabrication and Performance Evaluation, Polymer-Plastics Technol Eng, 2009, 48(4), 397-414].

Banana/glass fibre-reinforced polypropylene hybrid composites

The manufacturing of high-yield pulps is attractive due to its efficient utilization of lignocellulosic material. However, their rapid brightness reversion when exposed to heat and light restricts their more widespread use in high-quality papers. Therefore, the researchers at State Key Laboratory of Microbial Technology, Shandong University, China investigated the potential of bio-treatment with more than 30 species of fungi and yeasts to inhibit heat-induced yellowing of high-yield pulps. Treatment with Penicillium sp. ZGF34, Saccharomyces cerevisiae INVS2 and 724 reduced the brightness reversion and increased the brightness of wheat straw semi-chemical pulp after 4 days incubation (postcolor number decreased by 33.96, 66.42 and 57.09%, and brightness increased by 0.84 ISO, 0.48 ISO and 0.89%ISO, respectively). Phanerochaete chrysosporium W14 treatment was best for depressing yellowing of bleached aspen CTMP (chemi-thermo-mechanical pulp) and Saccharomyces cerevisiae AH22 treatment gave the highest brightness and a lower postcolor number. For unbleached aspen CTMP, treatment with Fusarium concolor X4 and Saccharomyces cerevisiae H158 was effective in improving brightness and brightness stability after 2 and 4 days.
incubation, respectively.

Treatment with some microorganisms increased pulp brightness and strongly suppressed heat-induced yellowing. It offers an option for improving the brightness stability of high yield pulps and some valuable information for biopulping and bio-bleaching with microbial treatment [Wenzhu Tang, Xuezhi Li, Jian Zhao, Jun Yue, Hua Yue and Yinbo Qu, Effect of microbial treatment on brightness and heat-induced brightness reversion of high-yield pulps, *J Chem Technol Biotechnol*, 2009, **84**(11), 1631-1641].

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**Sugar surfactants in paper recycling**

The use of surfactants based on sugars and proteins in ink removal from recycled paper via flotation deinking was evaluated by the researchers at North Carolina State University, Raleigh, USA. Lab scale flotation deinking efficiency (image analysis) and flotation yield (gravimetry) were measured. It was demonstrated that these surfactants are viable replacements to petroleum-based surfactants [Kelley Spence, Richard Venditti and Orlando J. Rojas, Sugar surfactants in paper recycling, *Nordic Pulp & Paper Res J*, 2009, **24**(1), 107-111].

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**Screening method for classifying virgin and recycled paper and board samples**

The researchers at Spain carried out studies on volatile compounds released by recycled paper and board to demonstrate the feasibility of headspace procedure coupled to gas chromatography/mass spectrometry (GC/MS) applied to complex paper-based samples together with a chemometric procedure as a powerful method for screening potential volatile contaminants released by the recycled and virgin paper samples. Using this procedure, the identification of virgin or recycled paper could be achieved based on the identification on specific markers of the recycled pulp. Fifteen different samples within virgin and recycled paper were studied. After equilibration, the vapour phase of the samples was analysed by automatic headspace coupled online to GC/MS. The analytical approach for volatile compounds, their identification and the selection of some compounds as markers for recycled pulp are shown and discussed. A discriminate analysis applied to the set of results obtained allows classification of the samples into four different groups according to the content of recycled pulp (0, 10-30 and > 80% of recycled pulp), the surface treatment of the paper (no surface treatment, clay coating and plastic coating), the grammage (from <100 to >300g/m²) and the sample thickness (from < 300 to >600µm). The matrix effect on the volatilization of some compounds from the paper samples and the analytical behaviour are also discussed [Asensio Esther and Nerín Cristina, Evaluation of a screening method for classifying virgin and recycled paper and board samples, *Pack Technol Sci*, 2009, **22**(6), 311-322].

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**Spices**

**Characterization of ginger proteases and their potential as a rennin replacement**

Ginger rhizome *Zingiber officinale Rosc.* contains ginger proteases and has proteolytic activity. Ginger proteases have been used for tenderizing meat but rarely for milk clotting. Therefore, the researchers at Taiwan purified ginger proteases and analyzed their biochemical characteristics. The milk clotting activity (MCA) and proteolytic activity (PA) of the proteases was stable after storage at 4°C for 24hours. The MCA and PA of fresh ginger juice with