Synthesis of Blue Dye from Loganin, its Application in Dyeing, Ultraviolet Protection of Proteinious Fabric and Docking studies

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Abstract

Iridoids are secondary metabolites produced by plants and some animals. These iridoids give colored pigments or dyes by a simple chemical process in the presence of primary amine, amino acids and protein-based substrate.

The aim of the present work is mainly to study the blue colored dye, synthesized from an iridoid glycoside loganin from Strychnos nux-vomica and explore its application in textile industry. Another aim is to carry out Computer-Aided Drug Design (CADD) studies to determine the blue dye interrraction with silk monomeric units. Isolated white loganin was converted to blue dye by one step chemo enzymatic reaction, wherein loganin was transformed to aglycone, loganetin which was further allowed to react with amino acids generating a blue colorant. The colorant was further studied for its application to dye proteinous fabric like wool and silk. Color strength, fastness properties and Ultraviolet protection factor were evaluated. Mordanting studies were carried out using three different mordants.

Blue dye produced is polar, water soluble, insoluble in inorganic solvents and showed λmax at 590 nm. The dye showed variation in absorbance in different solvents. The single bath dyeing of fabric was carried out. The fabric was also subjected to pre-mordanting, meta-mordanting and post-mordanting studies. The colour strength (K/S) of wool fabric was found to be higher in case of meta-mordanting method using alum as a mordant as compared to pre and post mordanting techniques. Treated fabrics showed adequate wash, light and rubbing properties with and without mordanting. The treated silk and wool fabric showed good to very good ultraviolet protection property with mordanted fabric. The loganin, its aglycone and blue dye structures were subjected to molecular docking using Glide and SiteMap software.

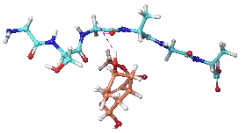
Image



Blue dye



Dyed silk



Dye docked with silk monomer

Recent Publications

1. Shao X, Ding K, Liu J. Color forming property of derivatives and modification products of natural iridoids with methylamine. J Americ Leath Chem Assoc 2015; 106(10):303-308.
2. Park JE, LeeJY, Kim HG, HahnTR, PaikYS.Isolation and characterization of water-soluble intermediates of blue pigments transformed from geniposide of *Gardenia jasminoides*.J Agric Food Chem 2002;50,6511-6514.
3. Park, J.E., Hahn, T.R., Paik, Y.S. Separation and characterization of watersoluble blue pigments formed from geniposide of *gardenia* fruits. Agric Chem Biotech, 2001; 44, 90-193.
4. Bhatia, S., Schultz, T., Roberts, D., Shen, J., Kromidas, L., Api, A.M.Comparison of Cramer classification between Toxtree, the OECD QSAR Toolbox and expert judgment, Regulatory Toxicology and Pharmacology,2015;71,52-62.
5. Scotti L, Mendonça Junior FJ, Ishiki H, Ribeiro FF, Rajeev K S, Barbosa Filho JM, Silva MS, Scotti MT. Docking studies for multi-target drugs. Current Drug Targets 2017; 18(5):592- 604.

Biography

Sapna Patil is on the verge of finishing her Phd studies in natural products under Dr.K.S. Laddha. She is very hard working and enthusiastic. She is energetic and very interested in medicinal plants, phytochemistry and herbal drug utilization.She has worked on Iridoids, their extraction, isolation and chemical derivatization during PhD tenure.

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Notes/Comments: