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Robinetin from black locust wood: a natural highly fluorescent, locally available and multipurpose dye for « in/out of the box » cosmetic applications

Candidate

Company : INRA Val de Loire Orléans
Structure : Public Laboratory
Date of establishment : 01/01/1975
Staff size in 2014 : 10-49

Are you part of an incubator ? : no

Innovation

Type of innovation : Product
Target Market : Make up

Time to market of your project : 1-3 years
Major field of use : Formulation

Proof of concept of your innovation for cosmetic industry available? : yes

If Yes, please detail your preliminary results : Different fluorescent applications ranging from « in formulation » to packaging and even store decoration have been explored with the newly available fluorescent robinetin extracts. The extraction process has been transferred to Alban Müller Intn'l

Description of your innovation

Black locust (*Robinia pseudoacacia*) heartwood is characterized by an intense yellowish fluorescence (see page 1 of the annex pdf document). Due to the great number of trees of this species growing in France and Europe and, also to the fact that its heartwood fills up most of their trunks, one could reasonably assume that great quantities of natural fluorescent molecules could be obtained from this material.

We first identified the fluorescent molecule present in this wood. Wood extracts were separated by HPLC-DAD-DEDL and analysed under the same irradiation than the common black light used to reveal the fluorescence of the wood. The use of internal standards and LC-MS allowed us to show that the main fluorescent molecule was robinetin (ROB) which is specific to this particular tree species. The optimal conditions of extraction from wood were then established at the laboratory scale. They allowed us to obtain 1.94g (dw) of concentrated colorant matter from 78.5g of grinded wood. This concentrated extracts contain about 34% of ROB leading to an estimated final yield of 8.5g of robinetin per kg of wood. As expected, the extracts are highly fluorescent confirming the potential interest to use black locust's wood as local starting material to extract great quantities of this colorant.

The extraction process has then been adapted to fit the standards for cosmetic raw product extractions and transferred at the industrial level at Alban Müller International. Two pilot extractions were realized with about 50 kg of wood. They allowed the production of concentrated extracts containing 17 and 22 percent of ROB, respectively. The extraction results and process have been analyzed in order to optimize it and produce extracts ready for cosmetic applications and tests. Other properties such as antioxidant activities and UV protection are currently understudy.

In addition and beyond cosmetics, several applications can also be foreseen in many areas using this colorant through surface treatments (varnishing or spraying) or impregnation (paper, cloth, ...) providing thus a complete set of "in the box" (formulations) and "out of the box" perspectives of use (packaging, store decoration). A few of these applications are shown in page 2-3 of the annex.

What is the general background to your innovation?

Plants are known to synthesize a great variety of secondary metabolites that present many interesting biological activities. Due to their sizes and diversity, trees represent important sources of biomass. Thus, many biomolecules of interest can be extracted from their wood in order to provide alternative perspectives and new markets even for the local timber industry. Interestingly, heartwood formation that occurs within the trunk of many broad-leaved and coniferous tree species is most of the time associated with the accumulation of specific phenolic extractives that will affect the natural color and durability of the corresponding wood matter (Magel et al. 1994, Burtin et al. 1998, Beritognolo et al. 2002). Even though the use of wood for cosmetics does not appear evident to the common « tree loggers », the Valrob project (Valorization of *Robinia pseudoacacia* wood extracts supported by the Centre-Val de Loire Region) aims at finding new uses for this cheap raw material available in great quantity at the regional or national level.

As a proof of concept, we focused on a fluorescent colorant that accumulates in great quantity within the heartwood of black locust (*R. pseudoacacia*) making this wood highly fluorescent to U.V. irradiation produced by a common black light (page 1 of the annex).

Analysis by HPLC/DAD-DEDL and MS of the different molecules present in robinia wood extracts allowed us to characterize robinetin (ROB) as the fluorescent marker of interest. From there, the extraction process has been optimized and scaled-up to be transferred at the industrial level.

Directly connected to local partners of the timber industry, the whole process of production can be considered as « Eco-friendly ». Indeed, the use of a local resource implies low carbon impact for the transport of the material to be extracted (wood matter transport and preparation

Innovation Added Value for the Fragrance & Cosmetic field (which market?)

The ROB based natural fluorescent colorant we have characterized and extracted is available for cosmetic application testings. Even though its main property relies in its fluorescence, it may also be used as any other dye of natural origin. Depending on the concentration, the range of color that can be obtained varies from invisible, clear yellow to brown (tested on paper and cloth). Due to its great availability, many fluorescent applications can now be investigated while targetting a specialized cosmetic area dedicated to « night-life ». Some applications such as nail-polish and hair dye are documented in page 2 of the annex document.

Due to the difficulties to present the actual colors of the fluorescence after photographic and printing treatments compared to eye perception in the presented document, a small « black box » with a U.V. light source should be presented at the exhibit.

To enlarge the area of applications, the ROB extracts (that might also be directly associated to wood or wood powder) could as well be used in original marketing projects through some « out of the box » applications presented in page 3 of the annex document :

- fluorescent labeling and packaging to highlight a product during special events in a dark environment or on store shelves at night (for example perfume bottle in annex),
- Logo/brand name highlighting by the mean of fluorescent accessories through paper, cloth or thread impregnation : tee-shirts, bags, transient tatoo, caps (annex),...
- store decoration, ...

Other specialized ink applications could imply its use as invisible marker/tracer in order to track counterfeit products or in UV tattooing.

Innovation Patent Application (if so) : no
You are looking for. : Partners

Innovation Existing partnerships : yes
If yes, state business partner(s) : Alban Müller International,
University of Orléans

Specify your expectations

Based on the results and proofs of concept presented here, we are currently looking for partners specialized in cosmetic formulations to develop various fluorescent products based on the use of robinetin concentrated extracts. The targetted market would be "night life" or special events types of clientele (hair-dye, nail polish, lip-stick,...) as well as any other specialty make-up or ink specialties (body-painting, permanent or transient tattooing for design-art photography,...).

In the end, associated partners could also be involved in the packaging industry in order to produce fluorescent labels, boxes and wrappers.