Degradation Products of the Glycosidic Components in *Rubia tinctorum*

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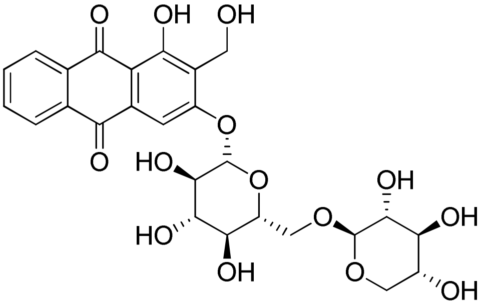
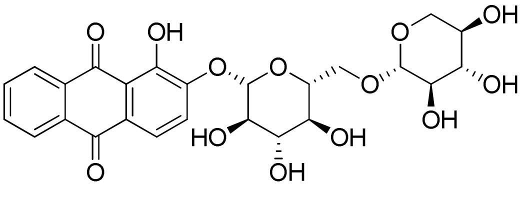
Red coloration of textiles from extracts of various madder species (*Rubia spp*) is a longstanding tradition. The colouring components of these natural plant extracts belong to the chemical family of anthraquinones compounds. By extracting and analysing the solutions obtained in traditional dye recipes it can be seen that the most abundant colouring components present in the plant are glycoside-containing moieties, lucidin primeveroside (1) and ruberythric acid (2), along with smaller amounts of aglycons including alizarin and purpurin (Henderson *et al.*, 2013). It has long been apparent that these glycoside-containing moieties are easily broken down into their aglycons when under acidic conditions, hence the drive for more gentle 'soft' extraction methods.



(1)



(2)

The aglycons of these glycosides are alizarin and lucidin however the only products usually reported in the literature after acid hydrolysis are alizarin and small amounts of purpurin. The breakdown products of lucidin are usually thought of as the oxidation to nordamnacanthal (Derksen *et al.*, 2003) and throughout the literature the breakdown that occurs under acidic back extraction conditions is not described or is stated as being unknown (Boldizsar *et al.*, 2006).

Using synthetic models of these molecules a degradation pathway has been established to better understand the reactivity and stability of these compounds under analysis conditions. The retro-aldol reaction of the lucidin forms xanthopurpurin under acidic and neutral aqueous conditions at high temperatures; the reaction was followed by HPLC-DAD, and NMR data of the standards were obtained. This also provides insights into why lucidin is often missed in back extraction analysis of historical textiles due to similarities between xanthopurpurin and alizarin in analysis.

References

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