Supplementary Material

On the antioxidant activity of eumelanin biopigments: a quantitative comparison between free radical scavenging and redox properties

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Explanation of the chemistry involved in the Briggs Rauscher (BR) reaction (Eq.(1)):

$IO_3^- + 2H_2O_2 + CH_2(COOH)_2 + H^+ \rightarrow ICH(COOH)_2 + 2O_2 + 3H_2O$ **(1)**

The BR reaction is accomplished through two reactions:

$IO_3^- + 2H_2O_2 + H^+ \rightarrow HIO + 2O_2 + 2H_2O$ **(2)**
$HIO + CH_2(COOH)_2 \rightarrow ICH(COOH)_2 + H_2O$ **(3)**

Eq.(2) follows a fast radical path, involving $HOO\cdot$ and the redox chemistry of the catalyst (Mn^{++}), when $[I^-]$ is low, or a non-radical path, when the $[I^-]$ is high.

Eq.(3) is a two-step reaction:

$I^- + HIO + H^+ \rightarrow I_2 + H_2O$ **(4)**
$I_2 + CH_2(COOH)_2 \rightarrow ICH(COOH)_2 + H^+ + I^-$ **(5)**

BR mixtures were prepared by mixing the appropriate amounts of stock solutions of hydrogen peroxide, iodate, perchloric acid, malonic acid and manganese sulphate using burettes in a 100-ml beaker to a total volume of 30 ml. One milliliter of starch solution was then added to the mixture.

The final composition of the BR mixture was: [malonic acid]=0.0500 M, $[Mn^{2+}]$=0.0067 M, $[HClO_4]$=0.03121 M, $[IO_3^-]$=0.0667 M, and $[H_2O_2]$=0.8162 M.

Upon initial mixing of the solutions, IO_3^- reacts with H_2O_2 to produce, via a **fast**, **radical** path, a rapidly increasing $[IO^-]$. IO^- is partly reduced to I^- by H_2O_2 and partly reacts with I^-, producing I_2 according to Eq (4) (AMBER SOLUTION, RADICAL PATH). I_2 reacts slowly with malonic acid, thereby causing an increase in $[I^-]$ according to Eq. (5). Its high concentration triggers its reaction with IO_3^- and hence a **slow non-radical** production of IO^- (BLUE SOLUTION, NON RADICAL PATH). IO^- and I^- are consumed in the iodination of malonic acid at a faster rate compared to that of their slower production. Eventually $[I^-]$ is reduced to such a low value that the radical process takes over again. This oscillating sequence repeats until the malonic acid or IO_3^- is depleted. The oscillations can be observed in Fig.S1 below. The video represents the sonification of the potentiometer output (mV). The sound pitch is proportional to the potential. The video originally stimulates a visual-auditory synesthesia. It elicits concomitant different percepts and a crossing of sensory wiring.

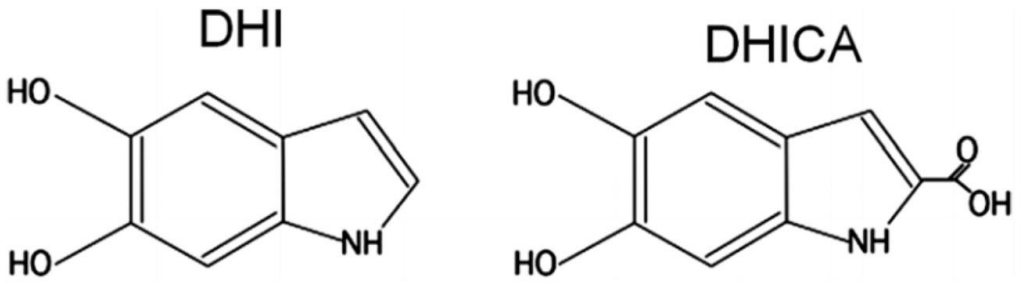

Fig. S1 Molecular structure of the melanins building blocks, namely 5,6-dihydroxyindole (DHI) and 5,6-dihydroxyindole-2-carboxylic acid (DHICA).

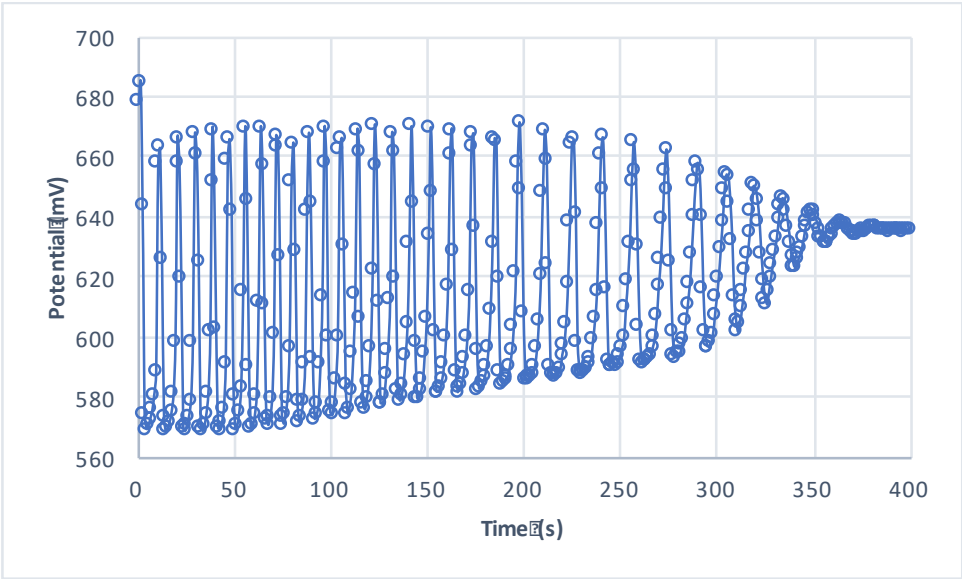

Fig. S2 Potential of a Pt electrode vs time for the active BR mixture without addition of antioxidants.

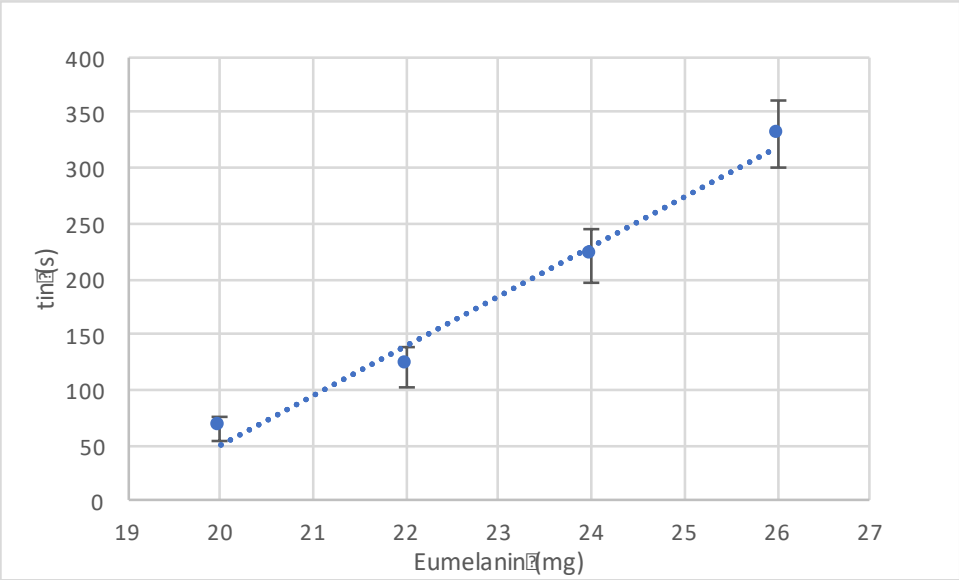

Fig. S3. Linear relationship between inhibition time (t_{in}) and mass of eumelanin added to the oscillating BR mixture. Standard deviations are obtained from *triplicata* measurements.

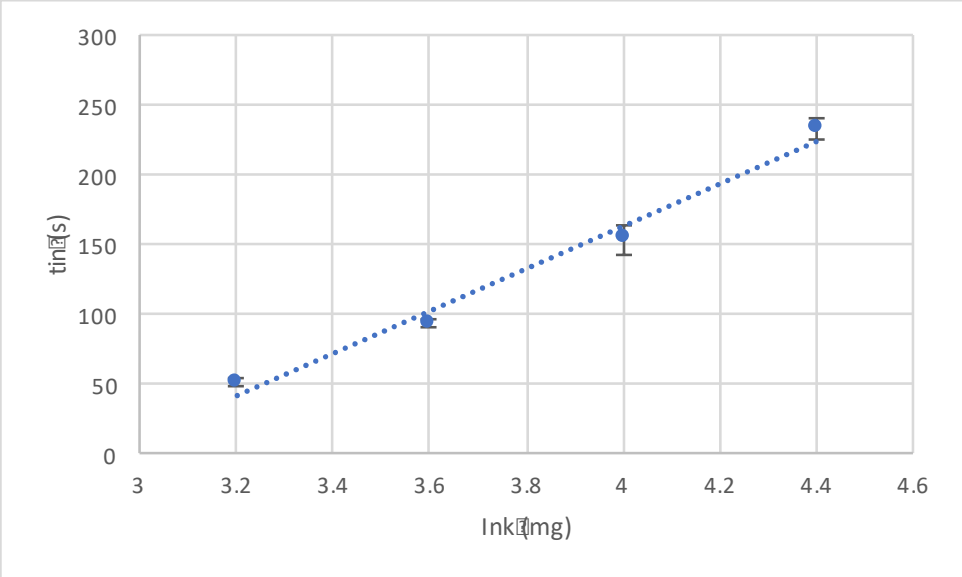

Fig. S4. Linear relationship between inhibition time t_{in}) and mass of ink added to the oscillating BR mixture. Standard deviations are obtained from *triplicata* measurements.

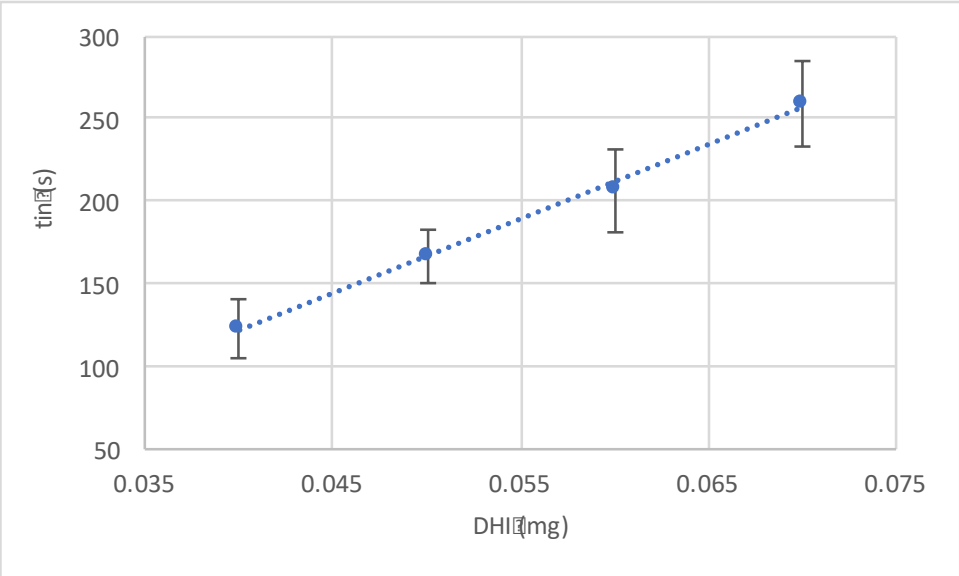

Fig. S5. Linear relationship between inhibition time (t_{in}) and mass of DHI added to the oscillating BR mixture. Standard deviations are obtained from *triplicata* measurements.

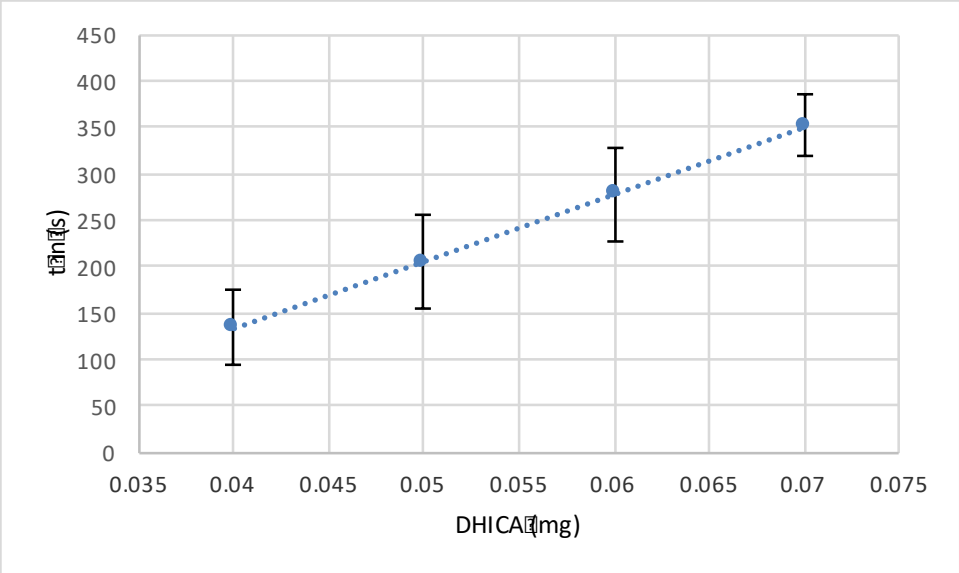

Fig. S6. Linear relationship between inhibition time (t_{in}) and mass of DHICA added to the oscillating BR mixture. Standard deviations are obtained from *triplicata* measurements.