A STUDY ON THE SOLUBILITY OF *FRANGULA* EMODIN

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Introduction

Emodin (1,3,8-trihydroxy-6-methyl-anthraquinone) is a kind of anthraquinone derived from *Frangula alnus*.[1] This research study describes how its solubility varies in acetonitrile, methanol, ethanol and sodium hydroxide. The physico-chemical properties of emodin were also analysed through particle size, bulk density, tapped density, angle of repose and wettability measurements.

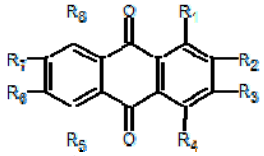

Figure 1 Chemical structure of anthraquinones and positions of substituents.

Methodology

The project consisted of conducting solubility and absorption studies for solutions of emodin containing varying organic concentrations for each solvent using water as an aqueous component. A linearity study was performed for the solution of percentage organic concentrations that showed the highest solubility for emodin in each solvent. The method was then validated according to the International Conference on Harmonisation guidelines and the parameters of linearity, repeatability and range were assessed**.** The second part consisted of analysing powder properties of emodin by testing its wettability, particle size, density, tapped density and angle of repose.

Results

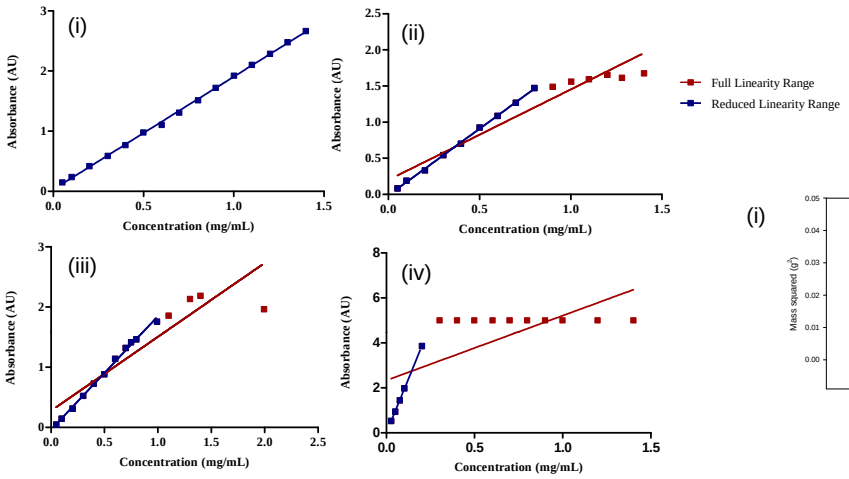

Figure 2 Linearity plots for emodin in (i) 100% ethanol, (ii) 90% acetonitrile, (iii) 100% methanol and (iv) 2M sodium hydroxide at 325 nm

	Correlation Coefficient (R^2)	Residual sum of squares	System precision % RSD	Overall precision % RSD	% Range
90% acetonitrile	0.9992	0.001577	0.720	9.165	10 – 600
100 % ethanol	0.9994	0.005870	0.104	2.317	10 – 300
100% methanol	0.9963	0.012990	0.113	1.512	10 – 200
2M sodium hydroxide	0.9998	0.001399	0.097	11.365	50 – 400

Table 1 Validation parameters of linearity, repeatability and range for solvents showing the best solubility in emodin

Geometric mean diameter (μm)	316.5
Bulk Density (gcm^{-3})	0.195 ± 0.030
Tapped Density (gcm^{-3})	0.255 ± 0.005
Angle of repose (°)	12.078 ± 0.421

Table 2 Powder properties results

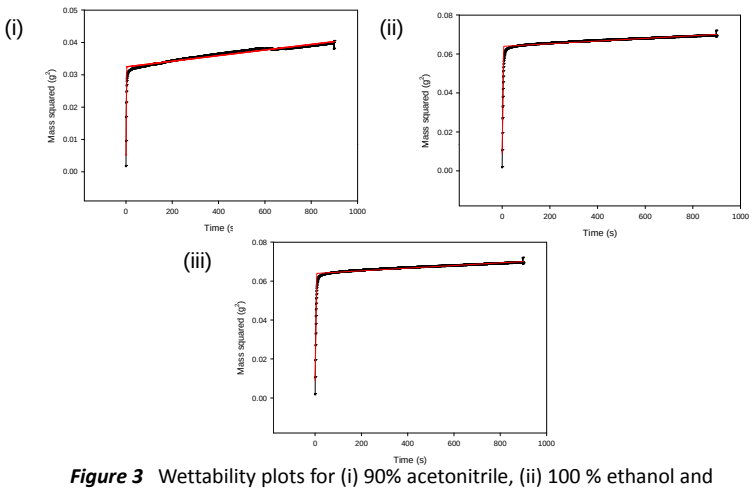

Figure 3 Wettability plots for (i) 90% acetonitrile, (ii) 100 % ethanol and (iii) 100% methanol

	T_1(s)	Gradient (g^2/s)
90 % Acetonitrile	3.578 ± 0.0497	0.0078
100 % Ethanol	6.488 ± 0.0427	0.0086
100 % Methanol	5.998 ± 0.0590	0.0097

Table 3 Inflection point and gradient results from step-wise regression analysis of wettability plots

Conclusions

Emodin was found to be best soluble in 90% acetonitrile, 100% ethanol, 100% methanol, 2M sodium hydroxide, and their linearity studies showed optimal solubility in the ranges of 0.05 mg/mL and 0.8 mg/mL, 0.05 mg/mL and 1.5 mg/mL, 0.05 mg/mL and 1.1 mg/mL, and 0.025 mg/mL and 0.2 mg/mL respectively. Emodin 's powder properties indicated excellent flow properties. The fastest rate and extent of wettability were found in 100% methanol and 100% ethanol.

References

[1] Dave, H.; Ledwani, L. A review on anthraquinones isolated from Cassia species and their applications. *Indian Journal of Natural Products and Resources* **2012**, *3*, 291-319

Acknowledgements

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