PHYSICOCHEMICAL PROPERTIES OF DISPERSIONS OF CLOZAPINE, 4-ACETAMIDOPHENOL AND VENLAFAXINE HYDROCHLORIDE IN HYDROPHOBIC MEDIA

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Introduction

The most important factor to ensure reproducible measurements in any dispersion is that the particulate properties do not change significantly throughout the measurements. Hence, it is imperative to ensure that the dispersion process is accurate, so that the particle size analysis precisely reflects particle size distribution. This study presents a continuation of previous studies, with the aim of producing a predictive model that may indicate a set of conditions prior to their application, especially for dispersions in hydrophobic media.

The objectives were to;

- Determine the physical properties of each of the three APIs.
- To distinguish the wetting behaviour of the three.
- To assess the dispersion stability.

Methodology

Three APIs- **4-acetamidophenol, clozapine and venlafaxine hydrochloride** and six hydrophobic media vaseline oil, paraffin oil, rapeseed oil, corn oil, sunflower oil and olive oil were studied.

- The tapped density, bulk density, angle of repose, Compressibility Index and Hausner Ratio of each of the three APIs were determined.
- The rate of permeation of the dispersing liquid into the powder bed was determined by a Sigma 701 Tensiometer. Statistical analysis of the results obtained was performed by generating a 2 or 3 Segment Piecewise Linear Model.
- The dispersion stability of the three APIs in the dispersing liquid was evaluated using a UV-Vis spectrophotometer in which the absorbance against time was monitored at 600 nm.

Results and Discussion

Physicochemical Properties of the APIs

API	Compressibility Index (%)	Hausner Ratio	Angle of Repose (°)
4-acetamidophenol	50.36	2.01	53.01
Clozapine	46.70	1.88	48.37
Venlafaxine hydrochloride	47.71	1.91	49.35

The wettability profile of the three APIs

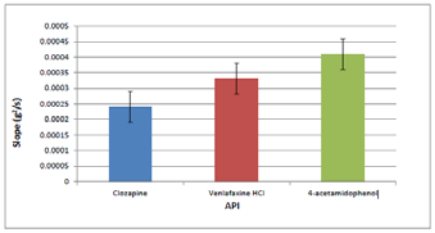

Figure 1: The Hausner ratio, **Compressibility Index** and the **angle of repose** were significant factors for the rate of wetting. **High values** of these factors were correlated with a **high rate of wetting**. A **fast rate** of wetting was achieved for the **most polar API.**

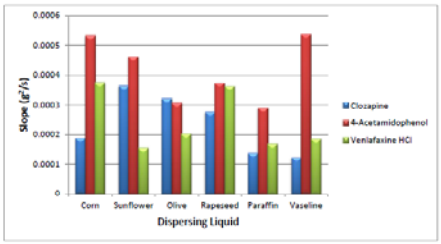

Figure 2: the optimal conditions for an **increased powder wettability rate** are when using a dispersing agent that has a **high surface tension**, a **high density** and **low viscosity**.

Dispersion Stability of the three APIs

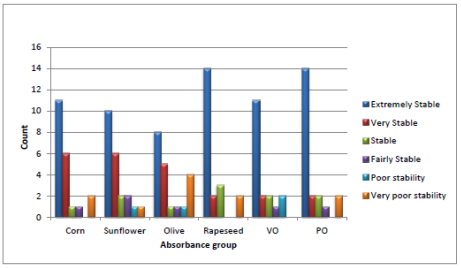

Figure 3: Dispersion stability studies showed that paraffin oil was the dispersion medium which exhibited high dispersion stabilities The **dispersion stability** has a direct relationship to the **viscosity** but an inverse relationship to the **surface tension** and the **density** of the dispersing agents.

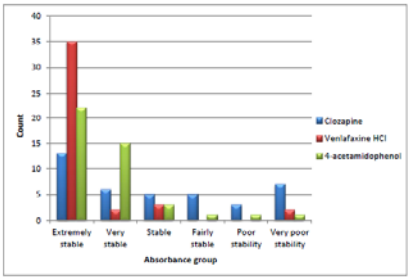

Figure 4: Clozapine had the lowest dispersion stability followed by 4-acetamidophenol and venlafaxine hydrochloride, which was the API having the highest dispersion stability. This observation could be correlated to the fact that clozapine was the API which dispersed well into the liquid phase and also had the **lowest values of the physicochemical properties.**

Conclusions

1. A correlation between the **physical and chemical properties of the active pharmaceutical ingredient and the rate of wetting** was seen.
2. The dispersion stability has a direct relationship to the **viscosity** but an inverse relationship to the **surface tension** and the **density** of the dispersing agents.
3. The **brand of the dispersing agent** does not have a marked effect on the dispersion stability .
4. Both **surfactants** employed in this study were found to **affect** the rate of wetting in a very similar manner.
5. The **surfactant concentration** exhibited **no effect** on the rate of wetting of the same APIs.

References

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3. Pace, F. An investigation of the physical chemistry of oily dispersions of active pharmaceutical ingredients. B.Sc. Dissertation, University of Malta, 2013.