

Water Compatibility of Vertosa's Cannabinoid Emulsion Systems

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Abstract:

The primary purpose of transforming cannabinoids into a water compatible emulsion is to improve their compatibility with water-based delivery systems. Poorly designed emulsion systems negatively affect the appearance and stability of products and are typically unable to establish homogeneity. Lack of homogeneity often leads to failed potency testing and a limited product shelf life. This whitepaper compares the visual differences of Vertosa's emulsion system with a poorly designed competitor's emulsion system and demonstrates Vertosa's superior water compatibility.

I. BACKGROUND

An emulsion system is defined as a fine dispersion of minute droplets of one liquid in another in which it is not soluble or miscible. Transforming naturally hydrophobic cannabinoids into a water compatible emulsion has become recognized as an effective method for creating water-based cannabinoid products. The water compatibility and stability of an emulsion system heavily relies on the selection of emulsifier types and the processing methods used. A poorly designed cannabinoid emulsion system typically has major limitations in terms of water compatibility and stability. This can be reflected visually by cloudiness upon dilution and relatively fast separation and sedimentation.

Vertosa's emulsion systems have been carefully designed for high initial water compatibility while also solving for other variables including base material compatibility, transparency, and stability for reliable product manufacturing. The following studies have been provided to illustrate the difference between one of Vertosa's emulsion systems and a poorly designed competitor's emulsion system.

II. METHOD AND DISCUSSION

Part 1. Dilution of Competitor's emulsion into water

There was a significant visual change when the competitor's emulsion was diluted into water. Due to the poor design of the emulsifier system, its chemical balance broke down

immediately upon dilution, creating an opaque mixture as seen in Exhibit 1A.

Additionally, the competitor's emulsion attached to the pipette tips upon rinsing, see Exhibit 1B. This stickiness phenomena will ultimately contribute to loss of cannabinoids on processing equipment during the manufacturing process and lead to failure in potency testing.

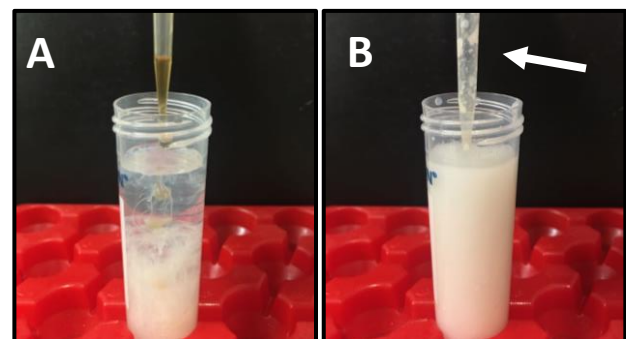


Exhibit 1. Water compatibility test of competitor's emulsion

Within a short period of time (< 4 months), this poorly designed emulsion system generated "O-rings" on top of the liquid, as seen in Exhibit 2A, and additionally revealed sedimentation on the bottom of the bottle, as seen in Exhibit 2B.

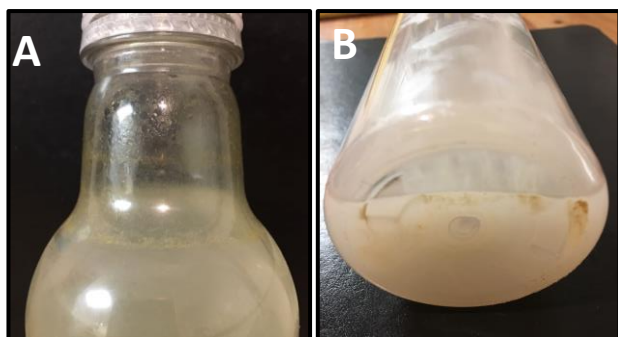


Exhibit 2. Sedimentation observed from poorly designed emulsion system, indicating short shelf life

Part 2. Dilution of Vertosa's emulsion into water

Vertosa's emulsion system is highly water compatible and maintains a nearly transparent quality as seen in Exhibit 3A.

With Vertosa's emulsion, no residue remains within the pipette tips, see Exhibit 3B. This allows for an accurate and easily controlled infusion process at scale and mitigates any potency loss on processing equipment.

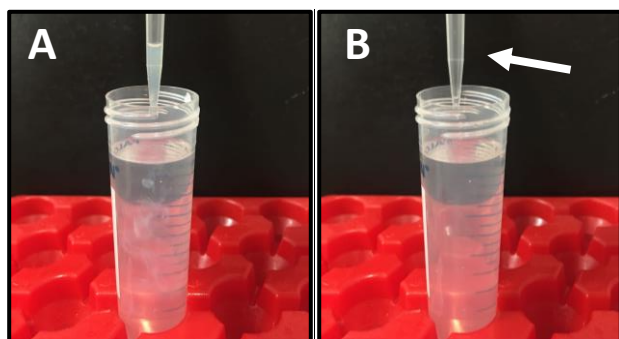


Exhibit 3. Water compatibility test of Vertosa's emulsion

Exhibit 4 Illustrates the visual difference between freshly diluted Vertosa emulsion and the same solution stored at 55°C for 12 weeks (simulating 3 years at room temperature¹).

Unlike the competitor's emulsion, there is no layer separation or sedimentation. More information can be found in Vertosa's white paper on Stability.

Note: The yellowish tint of the 12-week emulsion exists due to the oxidation of the plastic vial under a sustained high temperature and is not a characteristic of the emulsion.

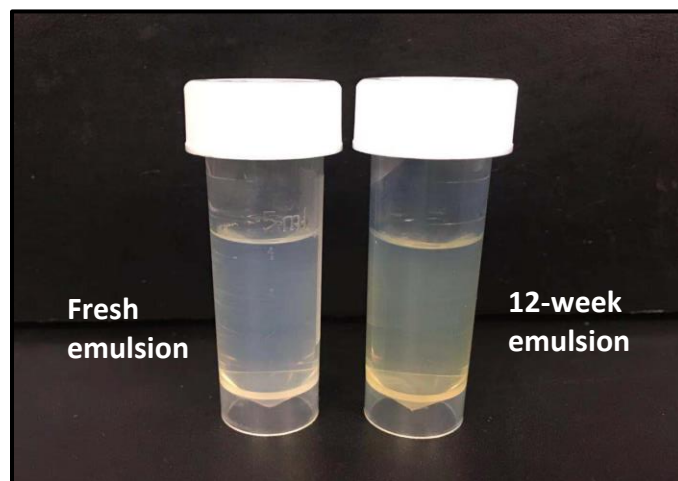


Exhibit 4. Visual review of fresh Vertosa emulsion and 3-year simulated of the same emulsion

III. CONCLUSION

Vertosa's emulsions are well-designed cannabinoid emulsion systems offering superior water compatibility. This is the foundation of an easy, controllable, and reliable cannabinoid infusion manufacturing process.

¹ Drug Stability for Pharmaceutical Scientists, Thorsteinn Loftsson, ISBN-13: 978-0124115484