Lab Report

Title:Analysis of Various Oil-Based Mixtures Utilizing Advanced Instrumentation Techniques

Report Number:1353

Objective:To analyze different oil-based mixtures using a range of sophisticated instrumentation techniques to determine their physical and chemical properties. Each mixture consists of a combination of oil, emulsifiers, and potential active ingredients.

Instruments Used and Methodology:

Mass Spectrometer (MS-20):Utilized for identifying the presence of specific molecules in the Almond Oil and Gum mixture, with Vitamin E as the primary targeted molecule.

Thermocycler (TC-5000):Applied to assess thermal stability by measuring the effect of Glycerin when combined with Jojoba Oil and Gum at a temperature of 55°C.

Four Ball Tester (FB-1000):Executed on Coconut Oil with Cetyl Alcohol formulation to determine wear scar diameter, recorded as 0.750 mm.

Liquid Chromatograph (LC-400):Implemented for quantifying the concentration of components like Almond Oil and Beeswax in solution, yielding a measurement of 300 ?g/mL.

Ion Chromatograph (IC-2100):Enabled the determination of ionic components with Almond Oil, Cetyl Alcohol, and the presence of Vitamin E, indicated by 75 mM concentration.

UV-Vis Spectrophotometer (UV-2600):Used to evaluate optical properties of the Almond Oil and Beeswax mixture with Glycerin, with an absorbance reading of 1.5 Abs.

PCR Machine (PCR-96):Functional in assessing the amplification cycles of Jojoba Oil and Gum in preparation of formulations, recorded as 25 Ct.

Titrator (T-905):Conducted titrations to verify reactive constituents within the Almond Oil and Gum mix, particularly Vitamin E concentration, found to be 0.005 M.

Viscometer (VS-300):Investigated viscosity levels in different mixtures including:

Results and Observations:

Table 1: Mass Spectrometry and Ion Chromatography Analysis

Sample ID	Oil Type	Additives	Primary Target	Measurement	Unit
MS-20 Test	Almond Oil	Gum, Vitamin E	m/z	1450	m/z
IC-2100 Test	Almond Oil	Cetyl Alcohol, Vitamin E	Concentration	75	mM

Random Observation:In trials, some samples displayed anomalous spikes potentially due to equipment calibration issues, which were cross-validated using the Ion Chromatograph.

Table 2: Thermal and Optical Properties

Sample ID	Oil Type	Additives	Observation Type	Measurement	Unit
TC-5000 Test	Jojoba Oil	Gum, Glycerin	Stability Temp	55.0	°C
UV-2600 Test	Almond Oil	Beeswax, Glycerin	Absorbance	1.5	Abs

Complex Description:The UV-Vis spectrophotometric analysis revealed expected light absorption peaks, corresponding to the conjugated double bonds within beeswax compound structures.

Table 3: Mechanical and Viscosity Evaluation

Sample ID	Oil Type	Additives	Parameter Tested	Measurement	Unit
FB-1000 Test	Coconut Oil	Cetyl Alcohol	Wear Scar Diameter	0.75	mm
VS-300 Test	Coconut Oil	Cetyl Alcohol, Vitamin E	Viscosity	4909.09	cP
VS-300 Test	Almond Oil	Beeswax	Viscosity	7141.74	cP

Discussion:Throughout the experiments, the mechanical and chemical stability of oil-based systems was meticulously evaluated. Discrepancies in viscosity readings suggest potential phase separations in mixtures with heavier additives

like Beeswax. The mass spectrometric results at 1450 m/z strongly indicate the successful inclusion of Vitamin E. Moreover, the thermal and PCR analyses corroborated the temperature resilience and cycle threshold viability of Jojoba Oil alongside varied secondary components.

Conclusion:The extensive analysis elucidated distinct properties across the tested mixtures. Despite occasional instrumental deviations implying methodological refinements, data consistently portrayed the integral roles of emulsifiers and active ingredients in determining the complex physicochemical behavior of these oil systems. Further research into compound stability at extreme conditions is recommended to optimize formulation robustness.