



---

CERTIFICATE NO : **ICRESMH /2025/C0425431**

**A Study of Mass and HRMS Data Using ESI and TOF Mass Spectrometry Techniques**

**Duse Bhargav Sadashiv**

Research Scholar, Department of Chemistry, Mansarovar Global University, Sehore M.P., India.

---

**ABSTRACT**

Mass spectrometry (MS) and high-resolution mass spectrometry (HRMS) are important analytical techniques used to determine the molecular weight, molecular formula, and structural characteristics of chemical compounds. Among the various ionization and detection methods, Electrospray Ionization (ESI) and Time-of-Flight (TOF) mass spectrometry are widely used due to their high sensitivity and accuracy. ESI is a soft ionization technique that allows the analysis of large and complex molecules without significant fragmentation. In this process, the sample solution is introduced through a fine capillary under high voltage, producing charged droplets that gradually evaporate and generate gas-phase ions. These ions are then transferred into the mass spectrometer for analysis. When combined with TOF mass analyzers, the technique provides high-resolution mass spectra and precise measurement of the mass-to-charge ratio ( $m/z$ ) of ions. TOF mass spectrometry works by accelerating ions through an electric field and measuring the time they take to reach the detector. Since lighter ions travel faster than heavier ones, the instrument can accurately determine their mass values. HRMS using ESI-TOF allows researchers to calculate exact molecular masses with very small error margins, which helps confirm the molecular formula of synthesized compounds. This technique is particularly useful in organic chemistry, pharmaceutical research, and natural product analysis, where precise identification of compounds is essential. Therefore, ESI-TOF HRMS plays a vital role in verifying the purity, structure, and composition of newly synthesized molecules.