ABSTRACT

Cannabis sativa, a plant with about 5000 years of recorded use, contains over 100 bioactive compounds, including cannabinoids. Despite its natural abundance in Pakistan, *Cannabis* is primarily viewed as recreational drug and remains an untapped resource for medical purposes. Gas chromatography coupled to mass spectrometry (GC-MS) is a commonly employed technique to quantify cannabinoids, which are the active compounds of *C. sativa.*

The research analyzed *Cannabis* samples from 3 distinct regions of Pakistan i-e Bajaur Agency, Khyber Teera valley and Phalian. 200mg of *Cannabis* was used in sample preparation and extracted with the help of ethyl acetate. After further processing, the samples were sent for GC-MS analysis. GC-MS results revealed the presence of 7 cannabinoids including

Cannabidivarol (CBDV), Delta-9-Tetrahydrocannabivarin (Δ9-THCV), Dronabinol (often used interchangeably with Δ9-THC), Cannabinol (CBN), Cannabichromene (CBC), Cannabigerol (CBG) and Cannabidiol (CBD). Fragmentation patterns of these cannabinoids were successfully identified, providing valuable information for future analytical studies. The GC-MS analysis also revealed a diverse range of bioactive compounds beyond cannabinoids including flavonoids, hydrocarbons, esters, terpenes and phenolic compounds. These secondary metabolites have been reported to exhibit various biological activities such as anti-inflammatory, anti-oxidant, antimicrobial, anticancer and neuroprotective effects. GC-MS is also an effective technique for comparing the chemical profiles of *Cannabis* plant, revealing the variations in its chemical components which plays an important role in determining its prevalence and identify areas of production. This comparison also enhances our understanding of the similarities and differences among various cannabinoid samples.