**Penerangan Cannabis**

Cannabis also known as marijuana or ganja is a psychoactive drug from the cannabis plant. *Cannabis sativa* is the most common type of cannabis plant used as marijuana, although there are other forms of cannabis including [*Cannabis indica*](https://www.sciencedirect.com/topics/pharmacology-toxicology-and-pharmaceutical-science/cannabis-sativa-subsp-indica) and Cannabis ruderalis. Cannabis is an annual, flowering herb. The majority of plants are dioecious (i.e., male and female flowers are found on separate plants), although monoecious plants (i.e., bearing both male and female flowers) may also be encountered. Cannabis is primarily smoked or ingested orally when used for its psychoactive effects. The primary psychoactive constituent of marijuana is a [cannabinoid](https://www.sciencedirect.com/topics/pharmacology-toxicology-and-pharmaceutical-science/cannabinoids), delta-9-tetrahydrocannabinol (THC), which produces relaxation, mild [euphoria](https://www.sciencedirect.com/topics/medicine-and-dentistry/euphoria), sedation, and perceptual distortion. There are over 80 other [cannabinoids](https://www.sciencedirect.com/topics/pharmacology-toxicology-and-pharmaceutical-science/cannabinoids) including [cannabidiol](https://www.sciencedirect.com/topics/medicine-and-dentistry/cannabidiol) (CBD), [cannabinol](https://www.sciencedirect.com/topics/medicine-and-dentistry/cannabinol) (CBN) and [tetrahydrocannabivarin](https://www.sciencedirect.com/topics/medicine-and-dentistry/tetrahydrocannabivarin) present in marijuana as well as [THC](https://www.sciencedirect.com/topics/medicine-and-dentistry/tetrahydrocannabinol).

**Kaedah analisis stable isotope**

Isotope ratio mass spectrometers (IRMS) are specialized mass spectrometers that produce precise and accurate measurements of variations in the natural isotopic abundance of light stable isotopes (such as hydrogen, carbon, nitrogen, and oxygen). IRMS instruments are different from conventional mass spectrometers, in that they do not scan a mass range for characteristic fragment ions in order to provide structural information on the sample being analysed. The mass spectrometers used for isotopic analysis generally comprise three main sections: an ion source, a mass analyser, and an ion collection assembly. Method of choice in the identification of cannabinoids present in cannabis is gas chromatography coupled with mass spectrometry (GC/MS). However, this technique alone is not suitable for determine the geographic origin of a plant-based material.

The geographical origin of a plant-based material is best detected by analysing the ratios of the stable isotopes of carbon and nitrogen, which vary in a stable pattern from region to region. This is especially so with cannabis because it is not chemically processed when prepared as an illicit drug. It can be affected by growing conditions and requires genuine cannabis reference standards whose origins are known definitely. The stable isotopes most commonly used as indicative of global changes are hydrogen, oxygen, carbon and nitrogen, and among them, the variation of stable isotope ratio (δ) of C and N are the most useful for sourcing the geographical origin of plant materials. Unlike drugs such as heroin and cocaine, Cannabis sativa or marijuana is not processed for consumption and maintains its original elemental and isotopic profiles. Thus, these parameters have been used as an important indicative of its geographical origin.

**Keywords**

Cannabis, geographic origin, IRMS, isotope