

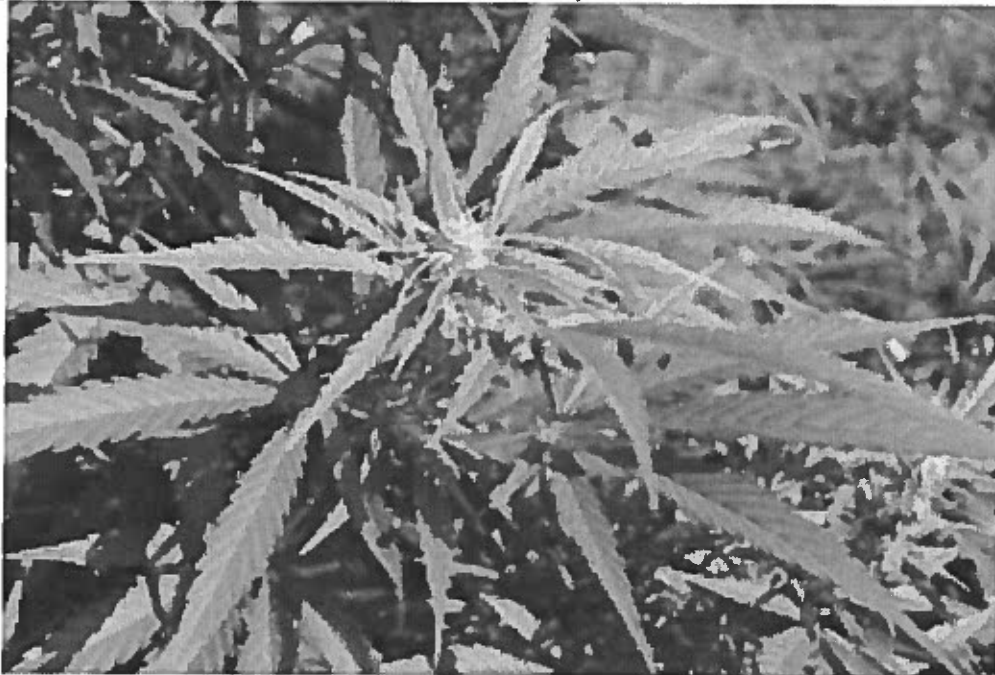
Name: \_\_\_\_\_

Date: \_\_\_\_\_

# Cannabis

Cannabis is a flowering plant found in most parts of the world, though indigenous to central Asia and parts of India. Existing in both male and female form, this plant includes three species; *cannabis sativa*, *cannabis ruderalis*, and *cannabis indica*, all of which can be easily distinguished from one another based on appearance.

*Cannabis sativa* is the most commonly encountered plant in criminal investigations. It is tall and typically a lighter shade of green than other species, with longer and narrower leaves. It is most commonly cultivated due to its higher cannabinoid content. *Cannabis indica* originated in Asia (hence the name *indica*, derived from India). It is a compact plant with thick stems, shorter and wider leaves, and typically exists in a darker shade of green. It has more side branches than *cannabis sativa*. Its cannabinoid content is high, and is often cross-bred with *cannabis sativa* to produce hybrids. *Cannabis ruderalis* often grows by roadsides and in ditches, with its name meaning 'wild plant'. It is a shorter plant with fewer branches, wide and flat leaves, and lower levels of THC.



*The cannabis plant has distinctive digitate, serrated leaves.*

Cannabis has a long history of both medicinal and recreational drug use. As a drug it is most commonly smoked, though it can also be baked into food products and consumed.

Typical effects include relaxation, euphoria (to a lesser extent), increased heart rate and increased appetite, with paranoid and anxiety being amongst some of the undesired effects.

## **Cannabinoids**

Cannabis plants produce a particular group of chemicals known as cannabinoids, which is a general term for a group of compounds that interact with the cannabinoid receptors largely located in the brain. It is these compounds that bring about the desired “high” when the cannabinoid receptors are activated. There are approximately 480 different cannabinoids, though the compounds of most relevance in the analysis of cannabis are  $\Delta^9$ -THC, cannabidiol (CBD) and cannabinol (CBN). THC is the primary psychoactive compound in the cannabis plant, whereas CBD is a precursor and CBN is the breakdown product of THC. Cannabinoids are primarily found in the flowering heads of the female plant, however lower concentrations are still found in the leaves and stalks. Therefore it is possible to identify cannabinoids from the rest of the plant, but more material will be required.

## **Types of Cannabis**



*The flowering female tops contain the highest amount of THC.*

## **Herbal & Plants**

If cannabis is seized prior to being processed, it may be in whole plant form. However cannabis is most commonly encountered as herbal material, typically the flowering tops of the female plants, the portion of the plant containing the highest amount of THC. Fruiting herbal cannabis may also be encountered. This often appears and smells less fresh and has seeds visible in the material. This type of cannabis is often imported and of poor quality.

## **Resin/Hashish**

Cannabis resin is a sticky, thick, dark material made by the glandular trichomes of the plant. This high-THC product consists of finer plant material, more difficult to identify microscopically than herbal material. Primarily produced in Morocco, Afghanistan and Pakistan, it is obtained by rubbing the female head until the resin forms, after which it is put through mesh and collected. Alternatively it can be extracted in solvent (IPA, butane, etc), the solvent evaporated and then collected. Following production it resembles a sticky powder that is most typically pressed into blocks.

## **Cannabis Oil**

Hash oil is a dark brown, viscous material with a high THC content. It is typically obtained by solvent extraction, which involves passing butane or a similar solvent through the plant material and evaporating the solvent. Alternatively the cannabis can simply be boiled to produce the oil.

## **Synthetic Cannabinoids**



More recently, new psychoactive substances (NPS) or “legal highs” have appeared on the market, rendering the analysis and identification of substances of abuse increasingly complex. Synthetic cannabinoids are synthetic drugs designed to mimic the effects of natural cannabinoids, typically produced by spraying some kind of plant-based material with the manufactured chemical. After this, the drug is generally consumed as with natural cannabis (ie smoked). Common synthetic cannabinoids include Spice and AB-CHMINACA.

## **Analysis**

Cannabis products will typically be identified using a variety of morphological-based and chemical analysis techniques, with different combinations of techniques being utilised depending on the police force or forensic service provider.

## **Macroscopic Examination**

The morphological characteristics and colour of cannabis plants will differ depending on the plant strain along with environmental factors during growth. Male and female cannabis plants are easily distinguished, with male plants being typically taller, less robust and lacking the distinctive flowering heads found only on female plants. It may be possible to determine whether the plant is likely to have been grown from seed or cuttings based on the presence or absence of the taproot (found only in plants grown from seeds) and the symmetry of the branches.

## **Microscopy**

Microscopy can be used to examine the features of the material with the primary aim of identifying a number of particular characteristics: simple covering hairs, cystolithic trichomes, glandular trichomes, and stigma. Covering hairs are long, thin structures with a tapering tip, generally found on

all plants so not specific to the cannabis plant. Cystolithic trichomes are short, claw-like structures with a bulbous base of calcium carbonate, also a common feature of many plants. Glandular trichomes are composed of a multi-cellular stalk and a rosette-shaped head, responsible for the secretion of cannabinoids. Finally, the stigma is a thick, brown structure that is part of the sexual reproductive system of the plant.

### **Presumptive Tests**

Duquenois-Levine reagent can be used as a screening test for the presence of cannabis. The reagent, which is composed of vanillin, acetaldehyde and ethanol, is added to the suspected cannabinoid along with hydrochloric acid, producing a purple colour change in the presence of cannabis.

Following this, the addition of chloroform will cause the purple colour to transfer to the organic phase if cannabinoids are present. However this test is not specific to cannabis and may produce a positive result in the presence of other substances.

### **Thin Layer Chromatography**

Thin Layer Chromatography, or TLC, is a qualitative method used to indicate the presence of THC, cannabinol and cannabidiol in a suspected cannabis product. A silica gel TLC plate (stationary phase) is loaded with spots of solvent-extracted samples alongside THC, CBN and CBD standards before being stored in an enclosed tank with a small amount of solvent (mobile phase). As the mobile phase passes through the stationary phase, the individual components move up the plate at different rates, thus being separated. The plate will later be treated with a chemical such as Fast Blue BB to visualise the components.

### **Gas Chromatography-Mass Spectrometry (GC-MS)**

GC-MS is an analytical technique used to separate the components of a mixture and subsequently identify them. Following MS analysis, a unique spectrum will be produced for each particular compound, which can be compared to spectra of known compounds to determine the identity of components in the mixture. More can be read about mass spectrometry [here](#). In the forensic analysis of cannabis products, mass spectrometry is not necessarily required to confirm that a sample is cannabis, as microscopy and TLC are typically sufficient. However techniques such as GC-MS may be necessary when analysing new synthetic cannabinoids, which may not be identified by simpler methods.

*United Nations Office on Drugs and Crime. Recommended methods for the identification and analysis of cannabis and cannabis products. [online] Available:*

*<https://www.unodc.org/documents/scientific/ST-NAR-40-Ebook.pdf>*