Characterization of volatile komponents of marijuana and hashish (*Cannabis Sativa L.*)

YUKO T. IWATA, HIROYUKI INOUE, KENJI KUWAYAMA, TATSUYUKI KANAMORI, KENJI TSUJIKAWA, HAJIME MIYAGUCHI and TOHRU KISHI

National Research Institute of Police Science, 6-3-1, Kashiwanoha, 277-0882, Kashiwa, Japan, Chiba

AIMS: The purpose of this study is characterization of volatile components of marijuana, crushed flower heads and leaves of *Cannabis Sativa L.* (*Cannabaceae*). The headspace volatiles of marijuana seizures were analyzed and the compounds detected at high intensities from all the samples were identified. Hashish, cannabis resin, was also analyzed. Sixteen different kinds of *Moraceae* plants, which are taxonomically similar to *Cannabaceae*, were analyzed and the volatile component profiles were compared with that of the cannabis samples. The final goal for this study is to determine the candidate compounds for a biosensor, being developped for illicit products of *Cannabis Sativa L*.

METHODS: Volatile compounds contained in the samples were analyzed using static headspace gas chromatography mass spectrometry. The gas chromatograph was equipped with a TCT CP-4020 thermal desorption cold trap injector (Chrompack). A fused silica capillary column DB-5ms (30 m × 0.32 mm i.d., film thickness 0.25 μm (J&W)) was used for the separation. The sample put into a vial (volume 10 mL) was sealed with a septum and heated at 65°C for 30 min. The 2 mL of the headspace gas was injected and cryofocused in the cold trap at -100°C. The cold trap was then heated at 250°C for 1 min and concentrated sample was introduced into the column. The column was held at 40°C for 1 min, and then raised at 10°C /min to 200°C. Various parts of the Moraceae plants (mainly leaves) were collected and divided into two portions. The ones were analyzed immediately as raw samples and the others were analyzed after drying for a few days.

RESULTS: From the marijuana and the hashish, over 60 terpenoids were detected. Most of them were identified with authentic standards or library searching (both mass spectra and retention indexes). Common logarithms of the peak areas showed good intra- and inter-day repeatabilities (less than 8% RSD, n = 3). The 17 monoterpenoids and the 7 sesquiterpenoids were detected from all the cannabis samples.
Among the terpenoids, compounds eluted at low temperature (*e.g.* α-pinene, ß-pinene) were detected constantly at high intensities. However, these compounds were also detected from some of the Moraceae plant. On the other hand, 5 monoterpenoids eluted at moderate temperature (*e.g.* borneol) were detected from none of the Moraceae plants.

CONCLUSIONS: The 5 monoterpenoids eluted at moderate temperature were the most hopeful candidate compounds for the biosensensor, being developed for detection of *Cannabis Sativa L*.

KEYWORDS: *Cannabis Sativa L., Volatiles, Headspace GC-MS, Terpenoids, Moraceae*

Corresponding author: togawa@nrips.go.jp