

CONSTITUENTS OF *CANNABIS SATIVA* L., XIV: INTRINSIC PROBLEMS IN CLASSIFYING CANNABIS BASED ON A SINGLE CANNABINOID ANALYSIS

CARLTON E. TURNER, MAHMOUD A. ELSOHLY, PING C. CHENG and GLENDA LEWIS

*Research Institute of Pharmaceutical Sciences, School of Pharmacy,
University of Mississippi, University, MS 38677*

It is generally accepted that *Cannabis* consists of only one species, *Cannabis sativa* L., but because of a long history of cultivation in a wide range of diverse geographical locations, *Cannabis* has evolved into many different variants with pronounced morphological and chemical differences. Because of these differences, several classification procedures have been developed.

Grlić (1) first classified samples of *Cannabis* into various "ripening types" according to predominant cannabinoids: "unripe," predominantly cannabidiolic acid (CBDA); "intermediate," cannabidiol (CBD); "ripe," (-)-*trans*- Δ^9 -tetrahydrocannabinol (Δ^9 -THC); and "over ripened," cannabinol (CBN). Waller (2, 3), using quantitative chemical data, defined *Cannabis* as fiber or drug type. In the drug type Δ^9 -THC/CBN/CBD is greater than 1.0 and in the fiber type less than 1.0. The ratio of cannabinoids is characteristic of the genetic strain of *Cannabis*, but is dependent on the stage of growth, sex of plant, part of plant analyzed, and to some extent on the conditions of cultivation. Small and Beckstead (4) subdivided *Cannabis* into phenotype I ($>0.3\%$ Δ^9 -THC; $<0.5\%$ CBD), phenotype II ($>0.3\%$ Δ^9 -THC; $>0.5\%$ CBD), and phenotype III ($<0.3\%$ Δ^9 -THC). A fourth phenotype was represented by the plants from northeastern Asia which consistently showed trace amounts (about 0.05%) of cannabinol monomethylether (CBGM).

Phillips *et al.* (5) indicated a cyclic

peaking of cannabidiol throughout the growing season of a variant growing wild in Indiana. A cyclic pattern of cannabinoids (CBD, Δ^9 -THC, and CBN) was observed by Turner *et al.* (6) in studies of a Mexican variant grown in Mississippi. They reported that the content of cannabinoids varied in a rhythmic fluctuation and was a function of time of day and age of plant parts at sampling.

In the past decade, 228 strains of seeds from different geographical locations originating from 61 countries have been grown in Mississippi. Among these, 85 variants and some of their descendants were analyzed weekly in order to investigate the growth profile of three major naturally occurring cannabinoids: cannabichromene (CBC), CBD, and Δ^9 -THC. Leaves were randomly collected from six different plants of the same variant at the same time and day of each week. The age of the plants were recorded from dates of planting. Samples from young, male and female plants were collected. Samples taken from each plant were pooled, air dried, and manicured to remove stems by passing the dry leaves through a 14-mesh sieve (6). The resulting marihuana samples were quantitatively analyzed for ten cannabinoids using the procedure described by Turner *et al.* (7); namely Δ^9 -THC, CBC, CBD, CBN, CBGM, (-)-*trans*- Δ^8 -tetrahydrocannabinol (Δ^8 -THC), (-)-*trans*- Δ^9 -tetrahydrocannabivarin (Δ^9 -THCV), cannabidivarin (CBDV), cannabigerol (CBG), and cannabicyclol (CBL).