

## 6 = Characterization of psychoactive plant pollen: a new tool in forensic investigations

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Palynology, based on the micromorphological characterization of pollen and spores, can be a valid ally for the resolution of forensic cases. Since its first application in 1959 for a murder in Austria, this discipline has been applied to cases of illegal smuggling involving drugs, weapons, medicines, and money (1). Also in Italy, several examples of palynology applied to kidnapping and homicide crime solving have been reported. In particular, a close connection was found between forensic palynology and aerobiology, as a reference tool for establishing the season when unknown death occurred (2-4). The use of palynology is also useful to trace possible pollen contamination of drugs: e.g. in a seizure of a batch of drugs in New York in 1991 (5). It is also possible to solve cases of murder, rape, theft, and food fraud (6). Pollen can adhere firmly to any surface and resist decomposition, while its morphology can be a distinctive feature for the identification of plant species and habitats (1,4,6). The present study concerns the pollen of 12 species of psychoactive plants belonging to 9 families, including illegal drug plants (e.g. *Erythroxylum coca*; *Lophophora williamsii*), and plants used as legal alternatives to drugs (e.g. *Leonotis leonurus*; *Brugmansia suaveolens*), some of which are currently marketed on internet. Given the lack of literature in this study, we started to compile a palynological atlas of psychoactive plants, aimed at providing support in the forensic field. These data can be useful to trace the origin of illegal drugs, and to identify the most likely route of drug shipping (2). The selected pollen grains was sampled from herbarium specimens, the Reference Pollen Collection (Palinoteca), or prepared as fresh samples collected from the Botanical Garden of Genoa University and the Hanbury Botanical Garden of Ventimiglia. Unacetolyzed pollen was prepared in glycerin jelly containing basic fuchsin dye. The analysis was carried out on 40 pollen grains for each species at the magnification of 40x. The diagnostic features of pollen grains studied were: length of polar axis (P) and equatorial axis (E), pollen shape (P/E ratio), number and type of apertures, exine thickness and sculpture. For the two species belonging to Convolvulaceae (*Ipomoea violacea* and *Argyria nervosa*), also spine length, interspinal distance, pore diameter, exine and nexine thickness, have been considered. Observations were carried out by using light and scanning electron microscopy. In some cases, the analyses showed slight morphological differences compared to literature data, probably due to a different number of measurements, while in other cases new morphological features were recorded. A web repository is being created to make morphometric data and pictures of psychoactive plant pollen available, thus providing a useful tool for forensic investigations.

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