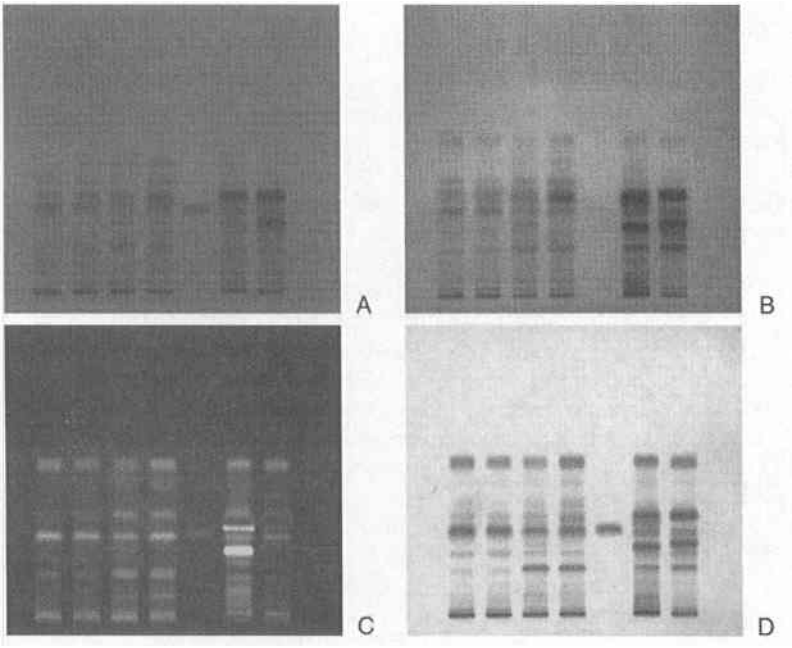

Figure 8 Identity tests on valerian (*Valeriana officinalis*). (A) Fluorescence quenching. All compounds absorbing UV 254 nm are visible. (B) Detection by visible light after derivatization with HCl–acetic acid. Valepotriates appear as colored zones. (C) Fluorescence under 366 nm UV light after additional derivatization with anisaldehyde reagent: general derivatization. (D) Detection by visible light after additional derivatization with anisaldehyde reagent: general derivatization.

Figure 9 illustrates the interesting problem of chemical races. On the basis of their HPTLC fingerprints, three different (chemical) types can be distinguished for ashwaganda (*Withania somnifera*) (33). The phenotypes of the plant samples are identical; therefore, the presence of chemical races can be concluded. If the existence of chemical races had not been known, two of the three samples would not pass as ashwaganda.

Aside from a simple yes-or-no question of whether a sample is of a certain identity and therefore passes or fails quality control, a more difficult problem arises when adulteration is to be detected. In this case the problem is to find out what adulterant and how much of it is present in a given sample. Black haw (*Viburnum prunifolium*) and cramp bark (*Viburnum opulus*), for example, can easily be confused. As can be seen in Fig. 10, not only can both plants be distinguished by their HPTLC fingerprints, but also the percentage of one species in a mixture with the other can be semiquantitatively assessed based on the intensity of the compounds marked with an arrow. For more precise quantitative measurements, scanning densitometry could be used.

Statements regarding the identity of a raw material can be made as long as its fingerprint is characteristic. This is possible even when there is no information at all about the chemical constituents of a given plant. Figure 11 shows the separation of reishi mushrooms (*Ganoderma lucidum*). The HPTLC fingerprint allows the fruiting body to be distinguished from the mycelium of the same species as well as different species from each other.

An important feature of HPTLC is the large number of samples that can be analyzed in parallel, thus affording rapid results. HPTLC fingerprints are often used to monitor the production of extracts and finished products. During process development, HPTLC can help establish proper extraction parameters, standardize and normalize extracts, and detect any changes or degradation in the material during formulation (34,35). After the raw material has been identified it must also be demonstrated that during production of the preparation and the final product the "composition"