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PHYTOCHEMISTRY OF THE *SALICACEAE*

VI. THE USE OF A GAS–LIQUID CHROMATOGRAPHIC SCREENING TEST FOR THE CHEMOTAXONOMY OF *POPULUS* SPECIES

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SUMMARY

A previously described gas–liquid chromatographic screening test for the detection of phenolic glycosides has been applied to the determination of the phenolic glycoside chromatograms of nineteen samples of *Populus* species. The results have been used as a chemotaxonomic check on existing morphological classification of the samples into the *Leuce*, *Aegeiros* and *Tacamahaca* sections of the genus.

INTRODUCTION

The gas–liquid chromatographic (GLC) screening test for phenolic glycosides developed by Bolan and Steele[1] has been used to detect phenolic glycosides in *Salix* and *Populus* species, to monitor column chromatographic fractions[2], for seasonal variations of phenolic glycosides[3], to examine variations in glycoside patterns in varieties of *P. deltoides*[4] and to provide an additional parameter for the morphological examination of certain *Populus* hybrids[5]. This paper indicates that the same technique can be used to examine a number of species within three of the recognized sections[6] of the same genus for glycoside variations.

EXPERIMENTAL

The extraction and silylation of bark samples (10 mg) and the details of the chromatographic technique have been described in full in the previous paper[4]. All of the *Populus* samples used were collected at the same time (June, 1971) from the collection at the Canada Department of Agriculture Research Station, Morden, Manitoba, so that seasonal and geographical variations could be avoided. The OV-17 column described earlier[4] was used throughout this study.

Slightly different times for the same peak on different chromatograms are due to slight variations in instrument and column performance from day to day. The times of each peak relative to trimethylsilylated arbutin were calculated and showed little or no variation.

RESULTS AND DISCUSSION

Based on detailed morphological data, the members of the genus *Populus* have been sub-divided into five sections. Three of these sections (*Leuce*, *Aegeiros* and *Tacamahaca*) have been examined in this study.

The six samples from the *Leuce* section show very similar, characteristic glycoside patterns (Fig. 1) with only very minor variations. As in earlier studies with this

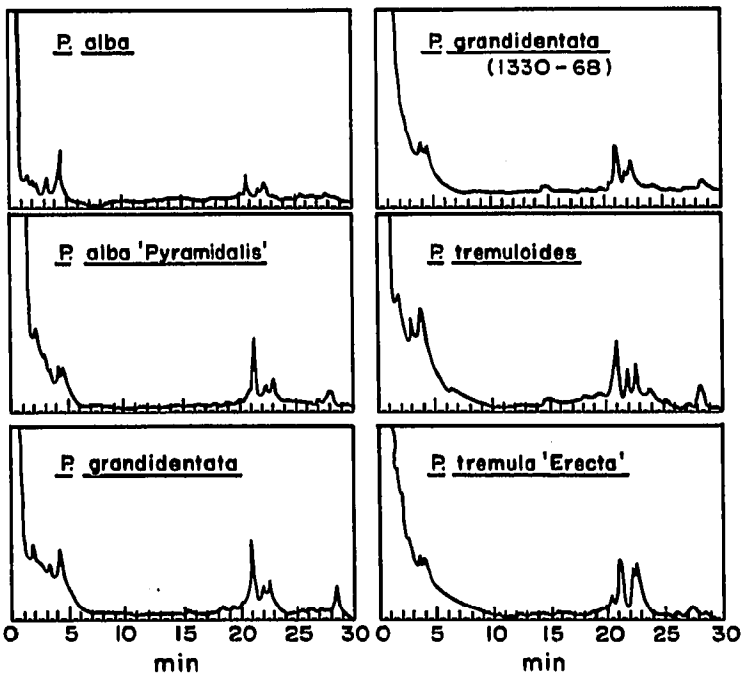

Fig. 1. Chromatograms of glycosides from *Populus* species: *Leuce* section.

GLC screening test, the peaks before 10 min tend to be less reliable than later peaks. The characteristic pattern for *Leuce* appears to consist of a peak at *ca.* 21 min with a shoulder or small peak at the foot of the upward slope, a double peak at *ca.* 22–23 min, a peak at *ca.* 28.5 min and a number of poorly defined, very small peaks. The North American species (*P. grandidentata* and *P. tremuloides*) appear no more similar to each other than to the European species (*P. alba* and *P. tremula*). The phenolic glycoside patterns thus support a very close relationship for both European and North American species in the *Leuce* section.

The six *Aegeiros* samples show a remarkable similarity in glycoside patterns (Fig. 2). The principal peak occurs at *ca.* 23 min and is associated with a second smaller

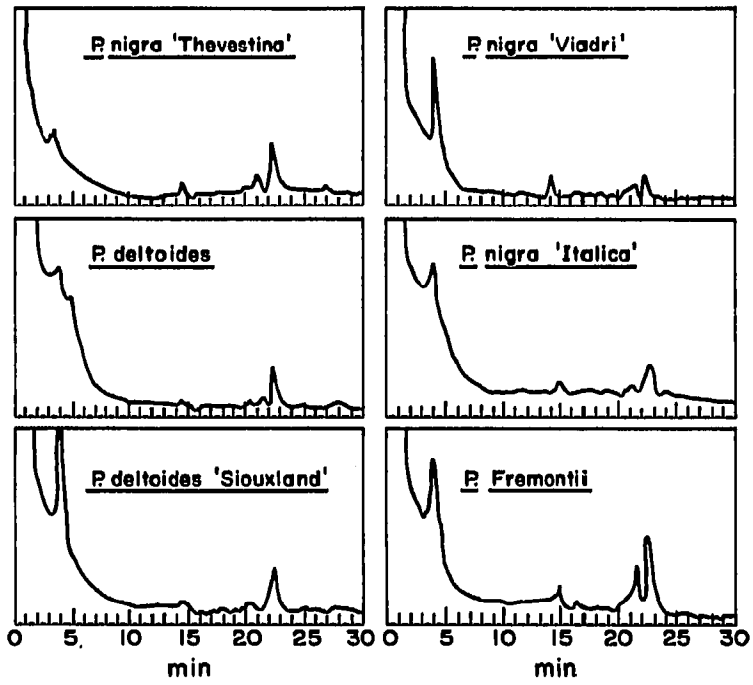

Fig. 2. Chromatograms of glycosides from *Populus* species: *Aegeiros* section.

peak about 1½ min earlier. There is also a peak at 14–15 min, which varies in height but is invariably present. There are again several very small, poorly defined peaks but overall variations between samples in this section are small.

The *Tacamahaca* section (seven samples) showed the largest degree of variation (Fig. 3). Four samples (*P. octorabdos*, *P. cathayana*, *P. balsamifera* and *P. angustifolia*) show a very distinctive double peak at *ca.* 21–23 min and a number of smaller peaks throughout the graph. The two North American species (*P. balsamifera* and *P. angustifolia*) have a relatively large content of glycosides in comparison with the other two (Asiatic) species mentioned. The chromatograms of *P. laurifolia* and *P. tristis* differ from the above four species in that the first of the two peaks at 21–23 min is very small, showing as a shoulder at the foot of the large peak. The chromatograms of *P. octorabdos*, *P. cathayana*, *P. laurifolia* and *P. tristis* are not greatly different from those of some species in the *Aegeiros* section (*e.g. P. nigra* and *P. Fremontii*). This similarity of some *Tacamahaca* and *Aegeiros* species is not surprising, as hybridization and genetic exchange is common between the two sections, whereas it is rare between these two and the *Leuce* section.

The seventh *Tacamahaca* sample (*P. Simonii*) is completely different. It is not comparable with any *Tacamahaca* sample, nor does it appear similar to the patterns of the other two sections.

The results indicate that the GLC screening test does generally reflect existing morphological classifications. The position of *P. Simonii* merits further examination, as it appears to have a rare phenolic glycoside pattern (unique in this study). In general

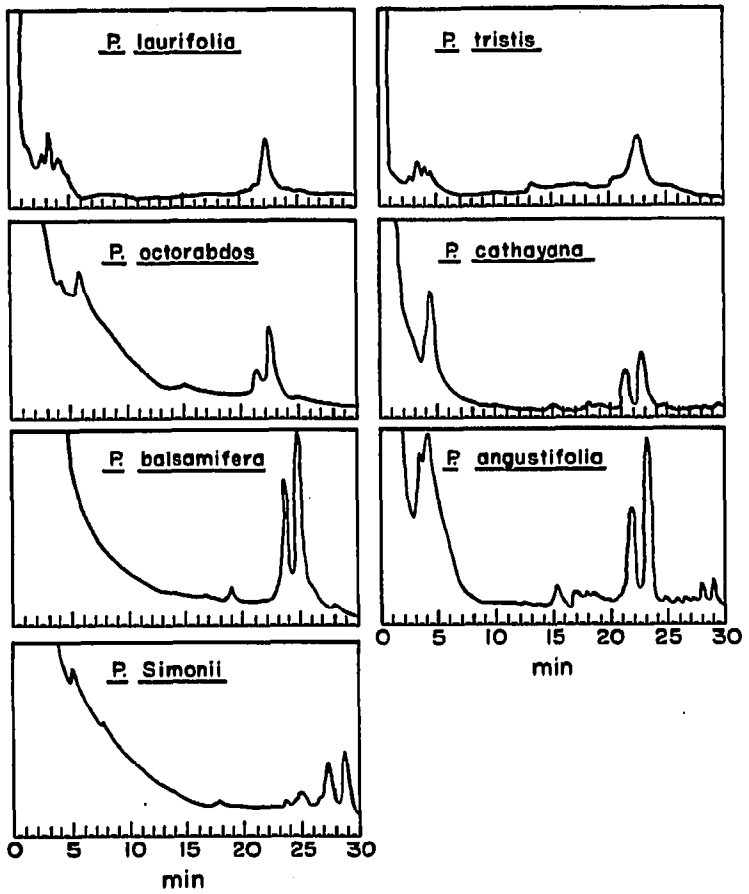

Fig. 3. Chromatograms of glycosides from *Populus* species: *Tacamahaca* section.

the various species and sectional differences illustrated confirm the value of the GLC screening test as a chemotaxonomic parameter.

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