DISTRIBUTION OF *JUNIPERUS ASHEI* VAR. *ASHEI* AND VAR. *OVATA* AROUND NEW BRAUNFELS, TEXAS

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ABSTRACT

The distribution of *J. ashei* var. *ashei* and *J. a.* var. *ovata* was examined by leaf essential oils. The populational boundries between these varieties seems to be very distinct. However, there appears to be some intergradation between the two taxa near New Braunfels, Texas.

KEY WORDS: *Juniperus, J. ashei* var. *ovata,* , essential oils, distribution, Cupressaceae

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Juniperus ashei is a small tree that grows abundantly on limestone on the Edwards plateau in central Texas with disjunct populations on limestone in Arkansas, Missouri, and Oklahoma as well in Coahuila, Mexico (Fig. 1). The Edwards Plateau (limestone) region of central Texas supports dense populations covering millions of acres, whereas the disjunct populations (Fig. 1) often have almost pure stands of *J. ashei*, that may cover only a few acres.

Studies of geographic variation in *Juniperus ashei* have shown that the species has divergent populations in the semi-arid margins of its range (Adams, 1977, 2004). The divergent populations were recently recognized as a new variety (*J. a.* var. *ovata*, Adams and Baker, 2007). The leaf oils of *J. a.* var. *ashei* and *J. a.* var. *ovata* differ mostly quantitatively (Adams and Baker, 2007). Camphor is considerably larger in var. *ashei* (69.1%) than in var. *ovata* (53.5%). In contrast, bornyl acetate is must larger in var. *ovata* (15.6%) than in var. *ashei* (6.3%). Four (non-trace) compounds differ qualitatively(Adams and Baker, 2007): trans-sabinene hydrate, trans-p-menth-2-en-1-ol, verbenone, and sandaracopimara-8(14),15-diene. Several other compounds differ quantitatively: α-pinene, myrcene, p-cymene, limonene, γ-terpinene, linalool, trans carveol, carvone and elemol (Adams and Baker, 2007).

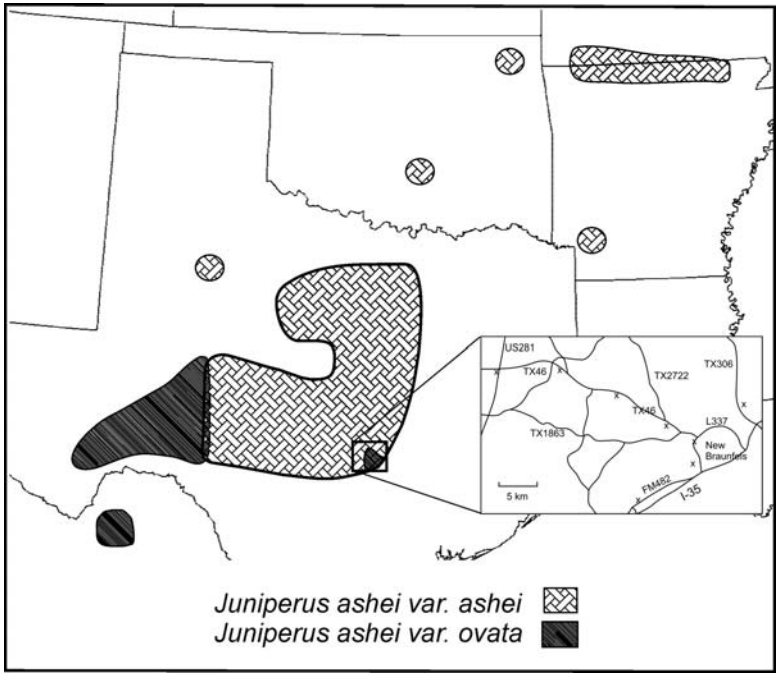

Figure 1. Distribution of *J. ashei*, adapted from Adams and Baker (2007). The study area is indicated by the fly-out box.

In the original study (Adams, 1977), the New Braunfels population of *Juniperus ashei* var. *ovata* was represented by samples from 15 individuals from a single population 8 km west of New Braunfels. The nearest populations sampled (Adams, 1977) were at Bandera and Hyde (80 - 100 km w and nw of New Braunfels) and these were typical *J. a.* var. *ashei*. Thus, it is not clear if var. *ovata* might extend further west.

The purpose of this study was to collect samples near New Braunfels, Texas to determine more precisely the range of vars. *ashei* and *ovata* in this region of disjunct populations.

MATERIALS AND METHODS

Specimens used in this study: *Juniperus ashei var. ashei*: Comal Co., TX: jct TX46 & US 281, *Adams 11295, 11296, 11297*; on TX 46, 8 km e of jct TX 46 and US 281, *Adams 11298, 11299, 11300*; on TX 46, 16 km e of jct TX 46 and US 281, *Adams 11301, 11302, 11303,* on TX 46, 24 km e of jct TX 46 and US 281, *Adams 11304, 11305, 11306, 11307, 11308,* on TX 306, 1 km nw of Hunter Rd, *Adams 11322, 11323, 11324. J. a.* var. *ovata*: Comal Co., TX, Loop 337, 1 km s of jct TX 46 and Loop 337, *Adams 11314, 11315, 11316,* 40 m w of jct Cedar Elm St. and Madeline St. on Madeline St. (site of the National Big Tree for *J. ashei*), New Braunfels, *Adams 11309, 11317, 11318*, 100 m n of jct Hubertus Rd. and FM 482 on FM 482, *Adams 11319, 11320, 11321*. Voucher specimens are deposited at Baylor University (BAYLU).

Fresh leaves (200 g. fresh wt.) were steam distilled for 2 h using a circulatory Clevenger apparatus (Adams, 1991). The oil samples were concentrated (ether trap removed) with nitrogen and the samples stored at -20°C until analyzed. The extracted leaves were oven dried (48h, 100°C) for determination of their oil yields.

The essential oils were analyzed on a HP5971 MSD mass spectrometer, directly coupled to a HP 5890 gas chromatograph, using a J & W DB-5, 0.26 mm x 30 m, 0.25 micron coating thickness, fused silica capillary column (see Adams, 2006 for operating details). Identifications were made by library searches of our volatile oil library (Adams, 2006), using the HP Chemstation library search routines, coupled with retention time data of authentic reference compounds. Quantitation was by TIC.

RESULTS AND DISCUSSION

Because tricyclene is fairly constant in *J. ashei*, by merely examining if the height of the α-pinene peak (that runs just after tricyclene on DB-5) is greater than tricyclene, one can determine that the oil is from var. *ovata*, whereas if α-pinene is less than tricyclene, the oil is from var. *ashei*.

Figure 2 shows that the samples taken along TX 46 from US 281 to near loop 337 are all the low in α-pinene. This is typical for var. *ashei*. The samples from loop 337 (L) are high in α-pinene that is typical of var. *ovata*. The samples of var. *ovata* from the National Big Tree site (N) are uniformly high in α-pinene. Two of the samples on FM 482 are typical var. *ovata*, but the third sample is more like var. *ashei*.

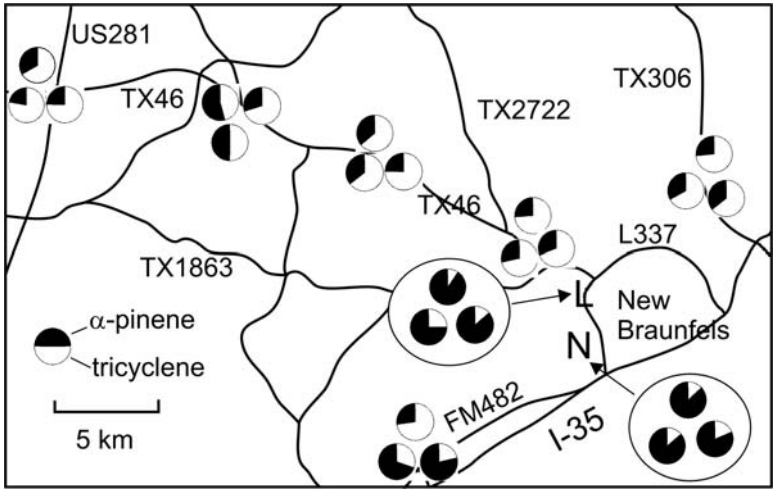

Figure 2. Distribution of *J. ashei* var. *ashei* and var. *ovata* based on the concentration of tricyclene and α-pinene.

Geographic variation in camphor and bornyl acetate show the same pattern (Fig. 3). However, at least one individual in both the FM 482 and the TX 306 populations appear to be intermediate between var. *ashei* and var. *ovata*.

This study shows that var. *ashei* and var. *ovata* co-occur at the lower elevation the Edwards plateau at New Braunfels. Additional sampling is needed to further define the distribution of var. *ovata* in this region.

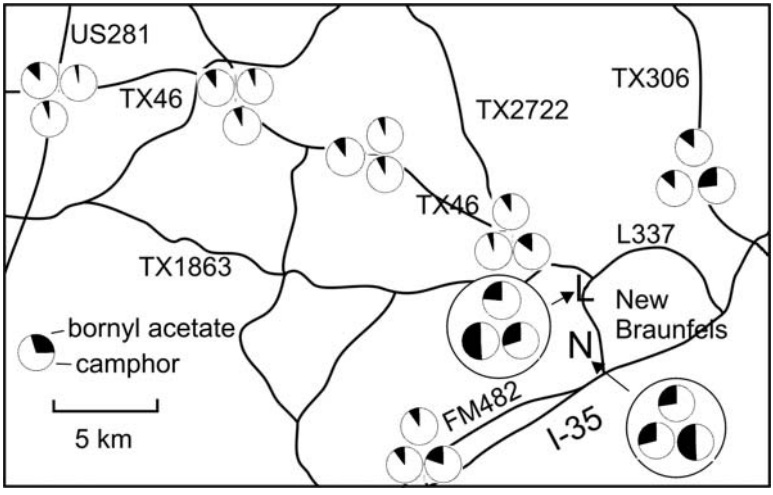

Figure 3. Distribution of *J. ashei* var. *ashei* and var. *ovata* based on the concentration of bornyl acetate and camphor.

ACKNOWLEDGEMENTS

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