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Tungoil Tree (*Aleurites fordii* Hemsl.) (Euphorbiaceae) New to the Arkansas Flora

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The problems associated with the introduction, subsequent establishment, and naturalization of non-native plant species in the United States continue to increase. This can be illustrated by the recent discovery of *Koelreuteria bipinnata* Franch. (Chinese flame tree) and *Euphorbia graminea* Jacq. (grassleaf spurge) in Arkansas (Serviss et al. 2007, Peck and Serviss 2006). Many of the worst invasive species are escaped ornamentals, and *Koelreuteria bipinnata* has shown the potential in Arkansas, subsequent to introduction and establishment, to become invasive. Other non-native ornamental species, such as *Ligustrum sinense* Lour. (Chinese privet) and *Lonicera japonica* Thunb. (Japanese honeysuckle), have subsequently established

and become invasive in Arkansas and elsewhere in the United States following intentional introduction. Over time, non-native species have altered native habitats, often displacing native species and reducing biodiversity (D'Antonia and Vitousek 1992, Daehler and Strong 1994, Wilcove et al. 1998). Non-native plant species comprise about 23% of the Arkansas flora (Arkansas Vascular Flora Committee 2006).

Aleurites fordii Hemsl. = *Vernicia fordii* (Hemsl.) Airy-Shaw (tungoil tree, Fig. 1), another non-native ornamental species, is reported here as spontaneous in Arkansas (spontaneous is here defined as the autonomous occurrence through sexual or asexual reproduction of a non-native plant species in a region or flora to which it is not native). This species is a small to medium-sized tree that is native to China (Bailey and Bailey 1976, Krüssmann 1977, Griffiths 1994). It is occasionally planted or cultivated in the southern United States from eastern Texas to Florida, but was also introduced in Florida, Louisiana, and Mississippi, in an attempt to establish a tung oil industry in the United States (Brown 1945, Vines 1960, Brown and Kirkman 1990). It is now well established in some areas of southern Mississippi. *Aleurites fordii* is also established to various degrees in Alabama, California, Florida, Georgia, and Louisiana (USDA, NRCS 2007). *Aleurites fordii* is capable of sexual reproduction at only a few years of age and is also capable of self-pollination and self-fertilization; hence a single tree has the potential to produce an entire colony. While it is too early to determine whether or not *A. fordii* will become invasive in Arkansas, it has shown the ability to reproduce successfully, escape cultivation, and establish in the Arkansas flora.

We discovered 185 spontaneous plants of *A. fordii* distributed over an area of about 0.2 hectares, which partially encompasses a small semi-wooded portion of the Henderson State University (HSU) campus in Arkadelphia, AR. Spontaneous plants of *A. fordii* were mostly concentrated in 2 portions of this area. Voucher specimens of *A. fordii* were deposited in the HSU herbarium (HEND): Serviss 7037. The habitat of the *A. fordii* location consisted of edge, wooded portions, and open areas without canopy cover. Interestingly, no *A. fordii* plants were observed more than a few meters into wooded areas with dense canopy cover, even though *A. fordii* is at least somewhat shade tolerant. The area also included several sections with various levels of manmade disturbance, such as lawns, flower and garden beds, and shrub plantings. A home site with a single, large, cultivated *A. fordii* tree was present at the location. The cultivated *A. fordii* tree was apparently the putative founder plant for the spontaneous population of *A. fordii* plants. Numerous

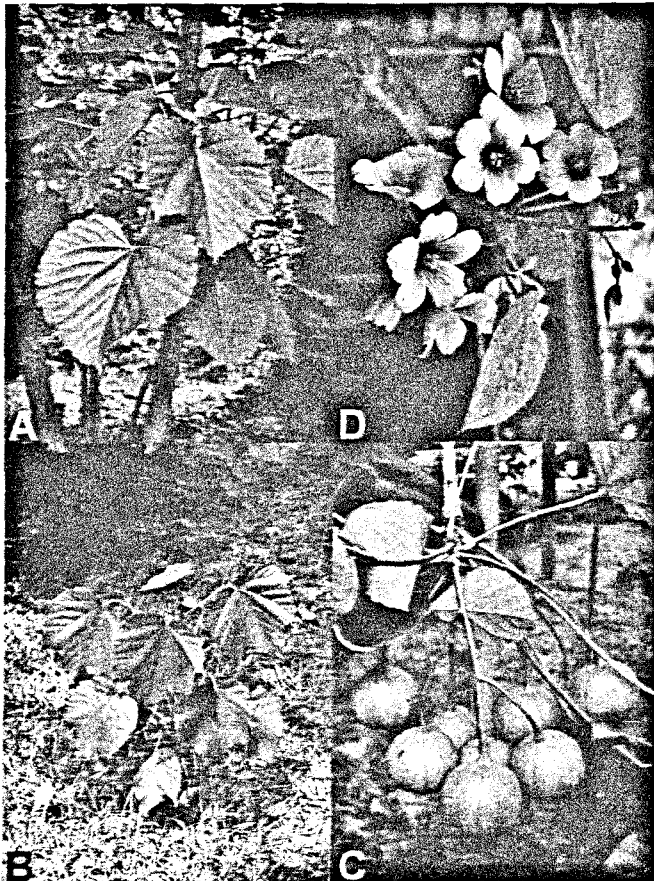


Fig. 1. Photos of *Aleurites fordii* Hemsl. (tungoil tree). A. Leaves. B. Juvenile. C. Fruits and leaves (notice the large petiolar glands on the petiole of the leaf at the upper right). D. Staminate flowers.

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spontaneous seedlings of the species were observed beneath and in proximity to the cultivated *A. fordii* tree.

Spontaneous plants ranged in size from mature reproductive-age trees, the tallest of which was about 7.7 m tall to seedlings only a few centimeters in height (Table 1). Two of the larger spontaneous trees recently had been cut down, but the carcasses were still relatively fresh, with leaves still green and attached. Numerous seedlings and saplings were observed beneath and in proximity to larger, spontaneous, reproductive plants. We observed several clusters of 3 to 5 young *A. fordii* seedlings, indicating that in several instances seedlings had germinated and emerged from fallen fruits without any shattering of the fruit or dispersal of the seeds (the fruits of *A. fordii* generally contain 3 to 5 seeds). Animal dispersal of the fruits/seeds is probably limited or absent because of the toxicity of the seeds (Krüssmann 1977, Burrows and Tyrl 2001). Of the 185 spontaneous plants, 140 or 75.6% were 1 meter or less in height. Only 7 of the 185 spontaneous plants were reproductive.

In addition to the population discussed above, we have observed 2 other instances of spontaneity of *A. fordii* in Clark

County. One of the 2 sites contained 7 spontaneous seedlings that were present beneath a small, cultivated, but reproductive tree of *A. fordii* (specimen at HEND: Serviss 6300A). The other site had 5, spontaneous, juvenile plants that measured 320.0, 259.0, 208.2, 88.9, and 52.0 cm tall. These 5 plants were present in an overgrown and unkempt area in a yard, which was adjacent to a large wooded area. A small cultivated tree of *A. fordii* is also present near this second, smaller population. We do not know how the *A. fordii* plants arrived at this location, but we suspect, because of the amount of vegetative debris and refuse present at the vicinity of the spontaneous *A. fordii* plants, that fruits or seeds were transported to that area inadvertently by the property owner with subsequent germination and establishment of the 5 plants in question.

Aleurites fordii is somewhat similar to *Firmiana simplex* (L.) F. W. Wright (Chinese parasol tree, Fig. 2), another non-native species of woody ornamental that is established in the Arkansas flora. The similarity of the 2 species to one another is especially pronounced during juvenility, though they can easily be distinguished by using the following key:

1. Leaves with a cluster of 2 to 3 large red or black glands on the distal portion of the petiole (just prior to start of the lamina). *Aleurites fordii*
1. Leaves without large red or black glands on the petiole *Firmiana simplex*

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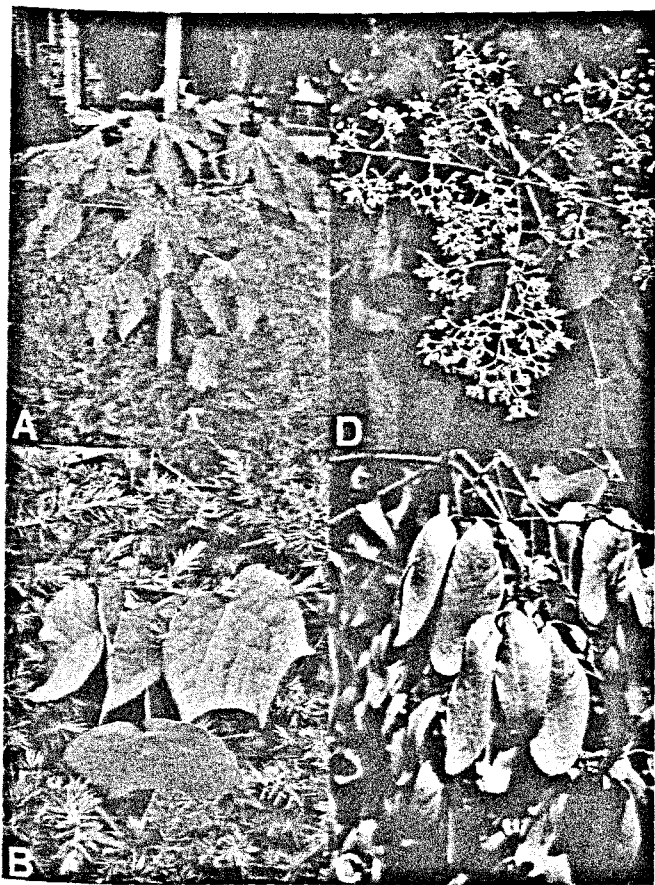


Fig. 2. Photos of *Firmiana simplex* (L.) Wright. A. Leaves. B. Juvenile. C. Fruits. D. Flowers.

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Table 1. List of spontaneous *Aleurites fordii* individuals documented in Clark County, Arkansas, including reproductive status and height range.

Reproductive	Number of plants	Height in meters
no	140	0.1–0.49
no	24	0.5–0.9
no	6	1.0–1.9
yes (1 plant)	5	2.0–2.9
yes (2 plants)	3	3.0–3.9
no	1	4.0–4.9
yes (1 plant)	3	5.0–5.9
yes (2 plants)	2	6.0–6.9
yes (1 plant)	1	7.0–7.9