ELEMENTS IN THE TENNESSEE FLORA WITH TROPICAL RELATIONSHIPS*

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The flora of Tennessee is comparatively rich in species and includes several geographical elements. One of these is a group of plants whose ranges at the specific, generic or family level center in the tropics.

References to recent publications by Good (1953), Lawrence (1951), Gunderson (1950), Fernald (1950) (whose manual is used for the binomials below) and earlier works by Hutchinson (1926, 1934) can result in the synthesis of much better distribution patterns than was possible a few years ago. A survey of the flowering plants in Tennessee made in reference to the geography of the taxa to which they belong reveals that there are fourteen families whose centers of distribution lie to the south and which have in Tennessee a single species. The Loranthaceae is represented by our common mistletoe, *Phoradendron flavescens;* Phytolaccaceae, by the pokeweed, *Phytolacca americana;* Annonaceae, by the pawpaw, *Asimina triloba;* Podostemaceae, by *Podostemon ceratophyllum;* Escallionaceae, by tassle-white, *Itea virginica;* Theaceae, by the mountain camellia, *Stewartia ovata;* Cactaceae, by the prickly pear, *Opuntia humifusa;* and Martyniaceae, by the unicorn plant, *Proboscidea louisianica.* The essentially tropical order, Ebenales, has three families each represented in Tennessee by a single species: Sapotaceae by *Bumelia lycioides* (buckthorn), Ebenaceae by *Diospyros virginiana* (persimmon) and Symplocaceae by *Symplocos tinctoria* (horse-sugar). Clethraceae has a single species: *Clethra acuminata* (white alder). Another family, Thymelaeaceae, which is distributed widely in warm temperate areas as well as the tropics, has only *Dirca palustris* (leatherwood) in Tennessee and still another family, Piperaceae, is represented by the lizard's tail, *Saururus cernuus* (sometimes placed in the Saururaceae).

Six families whose center of distribution is tropical each have only two species indigenous to Tennessee. They are: Dioscoreaceae with *Dioscorea quaternata* and *D. villosa* (wild yams), Lauraceae with *Lindera Benzoin* (spice bush) and *Sassafras albidum,* Rutaceae with *Ptelea trifoliata* (wafer ash) and *Xanthoxylum americanum* (prickly ash), Balsaminaceae with *Impatiens pallida* and *I. capensis* (touch-me-nots), Passifloraceae with *Passiflora incarnata* and *P. lutea* (passion flowers) and Melastomaceae with *Rhexia mariana* and *R. virginica* (meadow-beauties). A third genus, *Litsea,* (in America mostly south of the U. S.) in the Lauraceae has been reported by Gattinger

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(1901) and Small (1933) from Tennessee, but no specimens are available to confirm the record.

There are six families very widely distributed to the south which are represented in Tennessee by several genera of one species each. Included are: Menispermaceae (moonseed or *Menispermum canadense*, coralbeads or *Cocculus carolinus* and cupseed, *Calycocarpum Lyoni*); Santalaceae (sapsuck or *Buckleya distichophylla*, bastard toadflax or *Comandra Richardsiana* and oil nut, *Pyrularia pubera*); Loganiaceae (jessamine or *Gelsemium sempervirens*, Indian pink or *Spigelia marilandica*, and miterwort, *Cynoctonum mitreola*); Bignoniaceae (crossvine or *Bignonia capreclata* and trumpet creeper, *Campsis radicans*); Cucurbitaceae (manso or *Cayaponia grandifolia*, bur-cucumber or *Sicyos angulatus* and melonette, *Melothria pendula*); and Amaryllidaceae (spider lily or *Hymenocallis occidentalis*, false aloe or *Agave virginica* and stargrass, *Hypoxis hirsuta*).

There are six families with only one genus in Tennessee but with a number of others in the subtropics and tropics. These families, with their Tennessee genera in parentheses, are: Oxalidaceae (*Oxalis*); Anacardiaceae (*Rhus*); Aquifoliaceae (*Ilex*); Tiliaceae (*Tilia*); Lobeliaceae (*Lobelia*) and Xyridaceae (*Xyris*).

There are also rather large more-southern genera in widely distributed families which have a single species in Tennessee. The bear grass, *Yucca flaccida*, of the Liliaceae, climbing hempweed, *Mikania scandens*, of the Compositae and *Phyllanthus caroliniensis* of the Euphorbiaceae are examples. Other genera in such families have a few species in Tennessee but the majority of the species are to the south, often in the tropics. *Smilax* of the Liliaceae, *Salvia* of the Labiatae, *Styrax of the* Styracaceae and *Senecio* of the Compositae illustrate this type of distribution.

There are tropical and subtropical families represented by a few genera and species in Tennessee and often these genera seem impoverished there. Acanthaceae in the state is limited to *Justicia* and *Ruellia* both of which have many more species in Latin America. The same is true of the Solanaceae with *Solanum* and *Physalis*. The Lythraceae are most abundant in the American tropics but are represented in Tennessee by *Ammania, Decodon, Lythrum* and *Cuphea;* the last a large tropical genus represented in the state by a single species, *C. petiolata*. The Euphorbiaceae is another family with the majority of its members to the south and the same is true of the Leguminosae (particularly the Mimosoideae and Caesalpinioideae). Additional families which are predominantly tropical are the Araceae with *Arisaema, Orontium*, and *Symplocarpus* in Tennessee and Apocynaceae with *Apocynum, Amsonia* and *Trachelospermum*

in that state. Araliaceae in Tennessee is restricted to *Aralia* and *Panax*.

Another group of families the members of which are widely distributed in temperate areas but still have the majority of their genera and species in the subtropics and tropics includes Asclepiadaceae, Commelinaceae, Convolvulaceae, Guttiferae, Malvaceae, Moraceae, Rubiaceae, Verbenaceae and Vitaceae.

This list of taxa in the Tennessee flora whose centers of distribution lie to the south is not exhaustive but it is extensive enough to emphasize the size of the element with tropical affinities. The origin of these relationships may be explained in three ways: (1) some of the taxa are relicts from the Tertiary when they were widely distributed in eastern North America and the flora of Tennessee was more characteristic of warmer environments (Berry 1930); (2) some taxa were probably represented in the state during the Tertiary but became extinct during the Quaternary and are now reinvading the area, and (3) other taxa are possibly moving northward into the region to establish themselves there for the first time. The first might be exemplified by members of the Lauraceae, Annonaceae and the Ebenales which were better represented in our flora during the Tertiary (Berry 1930) than now. Until even more is known of our fossil floras, it is almost impossible to distinguish those which exemplify the second and third explanations. However, comparison of the modern flora with the fossil record suggests the extinction of a great many taxa in Tennessee by the extremes of climate which produced the cooling of the Pliocene and the continental glaciations of the Pleistocene. Also, it is reasonable to think that there may be species from tropical genera or families migrating northward into Tennessee for the first time. *Phyllanthus caroliniensis* might be such as example.

Although the flora of Tennessee is relatively rich in comparison with those of other temperate regions in North America, when compared with floras of equal areas in Central America, the number of species in the latter areas is much greater. Guatemala has about the same area as Tennessee but nearly three times as many taxa. This leads me to suspect that the part of the Tennessee flora which has subtropical and tropical affinities is mostly a depauperate remnant of a rich and widespread Tertiary flora. The loss of taxa from the Tennessee flora during the Pliocene and Pleistocene has not been compensated for by migration of entities from other regions or by evolution since their extinction, and the flora as a whole is not as rich as it was during the Tertiary.

Summary

There is an element in the flora of Tennessee consisting of taxa whose centers of distribution lie to the south. Many of

these are probably remnants of the relatively rich, subtropical flora which inhabited eastern North America during the Tertiary. Others may represent entities which became extinct during the rigors of the Pleistocene and are now reinvading the area. Others may be migrating into Tennessee for the first time.

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News of Tennessee Science

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Dr. Cyril Comar has resigned his post as Laboratory Director of the University of Tennessee-Atomic Energy Commission Agricultural Research Program to accept a position as Principal Scientist of the Medical Division of the Oak Ridge Institute of Nuclear Studies.

The Universitiy of Tennessee Medical Units' new $1,373,354 Chemistry-Physiology Building is now in use. An Administration-Postgraduate Building and a Medical Surgical Building are also under construction. Research grants recently announced include $11,475 from the U. S. Public Health Service and the American Heart Association to Dr. C. Riley Houck for elucidation of the relationship between high blood pressure and the absence of kidney tissue; $9,000 from the National Science Foundation to Dr. J. Sherman Davis for investigation of the affects of estradiol and amenopterin upon growth mechanisms in the uterus; $5,005 from the U. S. Office of Naval Research to Dr. C. H. Eades, Jr., for study of amino acid metabolism in surgical patients; $4,000 from the Lipotropic Research Fund to Dr. D. B. Zilversmit for investigation of fats and oils in experimental liver disease and hardening of the arteries; $5,000 from Mead-Johnson Company for study of the administration of medicinal agents to children; $22,449 from the U. S. Public Health Service for study of hypertension in children suffering from nephritis and study of circulatory phenomena in children with sickle cell anemia; $2,000 from the Junior Department of the Nineteenth Century Club for cardiac catheterization work; $500 from Eli Lilly and Company for studies on the use of snake venom in treatment of poliomyelitis; a $6,000 scholarship from the John and Mary Markle Foundation to Dr. A. H. Tuttle for continuation of his research in pediatrics; $5,000 from the Playtex Corporation to Dr. Albert Hand for studies in pediatric pathology; a $1,160

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