THE LECTOTYPIFICATION AND 19TH CENTURY HISTORY OF *CROTON ALABAMENSIS* (EUPHORBIACEAE S.S.)

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ABSTRACT

A detailed account is presented of the historical events relating to the discovery of *Croton alabamensis* var. *alabamensis* (Euphorbiaceae s.s.) by E.A. Smith in 1877 and its subsequent study by 19th century American botanists. A lectotype is designated and its provenance discussed.

RESUMEN

Este artículo presenta una descripción detallada de los eventos relacionados con el descubrimiento de *Croton alabamensis* var. *alabamensis* (Euphorbiaceae s.s.) por E.A. Smith en 1877 y su estudio subsiguiente por botánicos en el siglo XIX. Además, se designa un lectotipo para esta especie y se discute su origen.

INTRODUCTION

The progress of botany in the southern United States during the latter half of the 19th century has generally not been critically studied. Most of the major figures have yet to be treated by more than brief biographical sketches. Historical narrative is usually traced from the perspective of a particular person or institution, but a few rare southern plants (e.g., *Croton alabamensis* E.A. Sm. ex Chapm., *Dionaea muscipula* Ellis, *Elliottia racemosa* Muhl. ex Ell., *Franklinia alatamaha* Bartr. ex Marsh., *Shortia galacifolia* Torr. & A. Gray, and *Torreya taxifolia* Arn.) have attracted sustained botanical interest from discovery to the present day and are therefore of noteworthy historical interest. *Croton alabamensis* contains an especially rich and complete historical record that is chronicled here to recover lost details about the type collection and reveal extensive and collegial interactions among the network of botanists of the day.

Croton alabamensis is, in habit, the largest native United States representative of the tropical-centered family Euphorbiaceae s.s. The species has a disjunct distribution between Alabama and Texas and contains two morphologically well-differentiated, geographically-named varieties (vars. *alabamensis* and *texensis* Ginzbarg, respectively). *Croton alabamensis* is readily distinguished from other North American species of *Croton* L. by its shrubby habit, petaliferous female flowers, and covering of lepidote scales that give the abaxial leaf sur-

faces a silvery appearance. Webster initially suggested its affinities were with section *Andrichnia* Baill., but later referred it to section *Lamprocroton* Müll. Arg. and then section *Argyrocroton* (Müll. Arg.) G.L. Webster (Webster 1967, 1996; Webster et al. 1996). Recent molecular phylogenetic studies have affirmed a sister relationship between the two varieties and suggested new affinities with a small "basal" *Croton* group (*Moacroton* clade) containing Cuban endemics *Moacroton* Croizat and *Cubacroton* Alain and other *Croton* species (mostly section *Corylocroton* G. L. Webster) ranging from the Caribbean to Central and South America (Berry et al. 2005; van Ee & Berry 2005; Wurdack et al. 2005; van Ee et al. in press).

Croton alabamensis var. *alabamensis* is known from central Alabama and a single probably erroneous report from central Tennessee (see below; Farmer & Thomas 1969; Wofford & Chester 2002). In Alabama the typical variety occurs in Tuscaloosa County along the Black Warrior River and in adjacent Bibb County from the Cahaba River drainage. It was first discovered in Bibb County by Eugene A. Smith in 1877. Ironically, Smith was apparently unaware of the populations along the Warrior River in his home county, Tuscaloosa, which were found by Roland M. Harper in 1905 (Harper 1906b). *Croton alabamensis* var. *texenesis* was an unexpected discovery in 1989 from Texas, 1000 km away from the typical variety (Ginzbarg 1991, 1992; Aplet et al. 1994).

The Alabama plants from the Black Warrior and Cahaba river systems are separated by ca. 40 air km but show morphological, cytological, genetic, and ecological differences (Farmer 1962; Farmer & Thomas 1969; van Ee et al., in press). The plants are semi-evergreen and undergo meiosis and bloom in early spring (February and March) from overwintering flower buds formed the prior season. In Bibb County the *Croton* forms dense understory thickets from 1–2.5 m tall at 76–91 m of elevation in thin soils over limestone or dolomite above waterways within an 8 km radius of Pratt's Ferry, an area roughly bounded by Schultz Creek on the west and Six Mile Creek to the east. The Cahaba River and its nearby tributaries cut steeply through the bedrock to form numerous dry rocky bluffs on which the *Croton* is especially abundant.

Pratt's Ferry has been reported to be the type locality of *Croton alabamensis* var. *alabamensis* and, as one of the most easily accessible localities for the plant, has been the source of numerous recollections. Pratt's Ferry was a public ferry crossing of the Cahaba River just south of the community of River Bend and was probably named (although the Pratt family had many members in the area) for Mary Pratt (1800–1882), who ran the ferry from 1854 through at least the Civil War (Ellison 1984). Pratt's Ferry and aptly named River Bend are at a large bend in the river where a ferry crossing could be established with relative ease. An iron bridge was built at the crossing in 1902 (Harper 1906a; the old roadbed is evident on the south side of the river and an iron pylon for this bridge remains on the north shore, pers. obs.) that was superseded by the present bridge

crossing of County Road 26 just downstream from (west of) the original bridge. The exact nature of the ferry landings has been obscured. However, based on topography (i.e., limitations imposed by adjacent bluffs), the ferry route appears to have diagonally spanned the river with the northern landing upstream and the southern landing downstream of the current bridge. In the vicinity of Pratt's Ferry, the *Croton* presently occurs on the north side of the river in a small population immediately west of the current bridge and on the south side as a more or less continuous band east of the bridge for at least 1.6 km (pers. obs.).

Despite a sustained interest in *Croton alabamensis* since its discovery in 1877 and concomitant visits to Bibb County by many botanists, the flora in the area has only recently been documented and found to be rich in endemic and disjunct taxa (Allison & Stevens 2001). Most of the endemics occur on ecologically sensitive patchy glades (Ketona Glades) developed over Ketona Dolomite. Populations of the *Croton* in the Cahaba River drainage are often found around, but not restricted to, the fringes of the Ketona Glades (pers. obs.). Despite occasional logging activities, the region appears relatively unspoiled, remote, and undeveloped today and similar to a vintage 19th century riverbank photograph (Davenport 1988:40). A very different picture emerges when looking at the historical record of regional industrialization. Taken in that light, Charles Mohr's dire prediction over 100 years ago that the survival of the *Croton* in its native habitat "will in all probability be of short duration" may not have been unfounded (Mohr 1889). The limited distribution of both *Croton* varieties, as well as the Ketona Glade flora, has caused conservation concerns. Some habitat in Bibb County has been recently preserved (i.e., The Nature Conservancy's Bibb County Glades Preserve).

Discovery of *Croton alabamensis*

Eugene Allen Smith (1841–1927), professor of geology and mineralogy at the University of Alabama, was appointed State Geologist in 1873 of the newly reestablished Alabama Geological and Agricultural Survey. He began surveying the geology of the state during summer expeditions in a custom-built field wagon (modeled after a horse-drawn ambulance and preserved at the University of Alabama) in a manner documented in photographs (see Wolfe 1983:99) and in his copious geological field notes (Smith 1870–1889). Although the original field notebooks were lost, transcriptions made during a 1930's Depression-era public works project (probably WPA or preceding agencies) remain and allow a detailed picture of Smith's field activities to be reconstructed here. His recurring interest in Bibb County was economically oriented toward an investigation of coal and iron deposits that had originally made the region a leader in antebellum iron production (Ellison 1984). In the mid-19th century the Bibb County countryside was dotted with ironworks, mill dams, stone quarries, mines for ore (limonite) and coal, and associated communities. Today few traces

remain of this industrialization and the environmental degradation it caused is scarcely evident. Once thriving industrial communities are now extinct (i.e., Tionis) or severely depopulated (i.e., River Bend and Six Mile).

Smith first explored Bibb County in 1873 and in more detail in 1875. On August 17, 1875 he collected ore samples and explored associated Brighthope ironworks or "bloomery" (originally called Little Cahaba Furnace and in operation by 1850; Ellison 1984), the first blast furnace in the county and about 140 m above a wooden dam (Browne's Dam) on the Little Cahaba River that provided its power. The seats for the dam timbers appear today as a series of steps cut into a riverbank rock outcrop at the Bibb County Glades Preserve near Bulldog Bend (pers. observ; Ellison 1993:51). The apparent present day natural state of this area, which contains some of the finest Ketona Glades, is remarkable considering the past destructive activities engendered by the adjacent ironworks, although it is also possible that disturbance supported or enlarged the glade community. The following day (i.e., August 18, 1875) Smith continued from the Sinks (sec. 26, T24N, R10E) on lower Six Mile Creek, where the creek flows underground except at flood stage, southwestward to Pratt's Ferry, where he noted fossiliferous "limestone" containing the gastropod *Maclurites magnus* LeSueur. It seems improbable that the *Croton* escaped visual detection, even if not considered noteworthy at the time.

The trip credited with the discovery of *Croton alabamensis* was from July 18 to August 4, 1877. On July 18, Smith left Tuscaloosa and on July 24 his geological party set up camp on the north side of the Cahaba River near Pratt's Ferry. On the way, Smith described an area near Schultz Creek "where the Coal Measures are cut off by a fault bringing up Knox Dolomite which in a series of glades or bare hills, with crumbling and much decomposed Dolomite stretches N.E. for a considerable distance" (entry for July 21; Smith 1870–1889). This is on the presently depauperate western end of the Ketona Glades zone and suggests that an extensive loss of glade habitat has since occurred. "Knox Dolomite" as used by Smith would have broadly included Ketona Dolomite which was named in 1910 (see Geological Survey of Alabama 1894).

The label with Smith's first collection of the *Croton* notes "Privet or Privy, Pratt's Ferry. 26. 7. 77" (see Fig. 1). I interpret the date notation as July 26, 1877. Privet is probably derived from the vernacular for *Eleagnus* spp., which *Croton alabamensis* vegetatively closely resemble. Smith rarely recorded botanical observations in his geological field notes, and July 26 is no exception. On that date, Smith spent the morning west of Pratt's Ferry on the north side of the river and then after lunch crossed over the river. On July 28, 1877, however, he makes a record of the *Croton* from a spot I estimate to be near the head of Little Schultz Creek, 3 km downstream from Pratt's Ferry. His field notes for that date read:

FIG. 1. *Croton alabamensis* var. *alabamensis*. Composite sheet including the first collection (branch in top center). Associated small label in bottom left (see enlarged inset at top) reads: "Type Spm.[Specimen]!" [hand of C. Mohr] "Privet or Privy. Pratts Ferry 26.7.77. belong[s] to Ala. Herb." [hand of E.A. Smith]. Geological Survey of Alabama label on bottom right reads: "On rich calcareous soil in copses [at] Pratts Ferry. Discovered by Dr. E.A. Smith. August 27th 1879. – forms dense thickets near the banks of the little Cahaba river. blooms in february. ripens fruit until May" [hand of C. Mohr].

"Went with Mr. Mat Wallace in his skiff from opposite the point of the mountain [eastern end of Big Mountain] down nearly opposite the ore bank. The limestone bluffs furnished exactly the proper ground for the greatest variety of ferns. Amongst those I had not seen before were *Ad[iantum]. capillus-veneris, Cheilanthes alabamensis* and one other which resembles it, but has lobed pinnules instead of entire ones. After climbing through an almost impenetrable thicket of what the natives call privet [*Croton alabamensis*] and another shrub now in flower [probably *Forestiera ligustrina* Poir] and extremely fragrant attracting thousands of bees we came to our ore bed" (Smith 1870–1889).

Smith later recalled "the [type] locality of *Croton alabamense*, is Pratts Ferry in Bibb County, on [the] Cahaba River and upon limestone. Date of discovery, August 1877" (Smith 1881d; confirmed in Smith 1907). Smith probably encountered the *Croton* at other times during this 1877 trip, and assuredly so (based on present distribution) on August 1 while on the Cahaba River bluffs, 0.4 km north of where Cottingham Creek joins the river, while examining where "Knox Dolomite" crosses. Smith appears not to have revisited the Pratt's Ferry area until August 1889, based on field note chronology and referring to his "observations of 12 years ago" (i.e., 1877). Mohr variously credits the discovery to 1874 (Mohr 1898, 1901), 1877 (Mohr 1889), or 1879 (Mohr 1887; see Mohr's label notation in Fig. 1). Smith (1881b) recalled, "I think I must be the discoverer as I know of no one else who has ever collected any of the material.... It makes almost inpenetrable "Privet Thickets" as they are called, and the peculiar aroma of the leaves as you feel your way through, is exceedingly characteristic. I have not seen the plant anywhere else, than along the banks of the Cahaba River where it grows upon limestone much like Cedar."

From press to print

In January 1878, Smith approached Charles Theodore Mohr (1824–1901) about preparing a mounted, organized herbarium for the Geological Survey from Smith's collections. Mohr's poor health and business obligations put the project on hold until May 1879, when he received the plants (Mohr 1879a). By July the *Croton* had come to Mohr's attention and he directed an inquiry to Smith:

"Amongst some other interesting plants collected at Pratts Ferry (v.i. *Forrestonia* [sic], *Forrestiera ligastrina* [sic] et al.) I find a shrub marked "Privet." Is it a truly indigenous plant or escaped from cultivation[?] It is very near *Eleagnus Canadensis* (the specimens being without flowers or fruit I cannot decide positively). It should be very strange indeed to find that Northern shrub at once coming up afar in Central Ala[bama]." (Mohr 1879b).

The specimen (Fig. 1) described by Mohr in this letter and annotated by him "Type Spm. [specimen]!" is apparently Smith's earliest collection previously noted; it is in young bud. Mohr later recalled, "I found first a sprigg [sic] of it amongst the plants of the Geol. Survey of Ala. collected by the Professor [Smith]; notwithstanding the poverty of the specimens bearing only a male spike with the flowers yet in the bud. I recognized as plant entirely new" (Mohr 1882a).

After examination of a single male flower, Mohr tentatively referred the *Croton* to section *Hendecandra* Eschw. and sent the specimens off to George

Engelmann (1809–1884) with a cover letter dated February 24, 1880, noting that "perhaps the plant is known to you from Texas or N. Mexico" (Mohr 1880b). Mohr wrote to Smith, "I was somewhat astonished to find the *Croton* (Privet) by Dr. Engelmann referred to *Cr. argyranthemum* [*Croton argyranthemus* Michx.], a straggly herb not infrequent in our dry pine barrens here... It will be necessary to secure large specimens with a portion of the lower stem to establish its character as a true shrub and in full bloom with male and female flowers, the plants appear to be dioecious" (Mohr 1880c). Little progress had been made by October 11, 1880, when Mohr reported to Smith, "the *Croton* continues to be [a] riddle to all who get hold of it" and lamented the lack of adequate fertile material. The lack of fertile material explains his belief that the plant was dioecious (it is actually moneocious, with typical bisexual *Croton* inflorescences), though by this time he had the remnants of female flowers (Mohr 1880d). Mohr recalled, "Some time later I was so fortunate to find a unripe capsule and a female flower, from which it was evident that it has its place amongst [sic] the section *Eleuteria*" (Mohr 1882a). There is no mention of the *Croton* in the Alabama floristic checklist Mohr and Smith published in 1880 (Mohr 1880a).

Mohr turned to Alvan Wentworth Chapman (1809–1899), who was then involved in the preparation of a second edition of his *Flora of the Southern United States* (i.e., Chapman 1883a). Mohr (1881a) wrote to Smith:

"I am glad to learn that you are on the lookout for the *Croton*. Can you not get a slip for me to plant in my garden? I have sent at his request all of the material I had received of yours (except that what I had sent before to Prof. Engelmann who certainly took a wrong view of it) to Dr. Chapman. He was anxious to describe the plant in the new edition of his Flora, he agreeing with me at first sight that [it] is new."

In the pursuit of more material, Chapman wrote directly to Smith, who replied April 8, 1881:

"The croton you mention is a shrub growing sometimes to the height of 8 to 10 feet. I have seen some trunks three inches in diameter. It makes an almost impenetrable thicket, and the aromatic odor from the bruised leaves is peculiar. I have a correspondent in the locality [probably Jacob S. Hansberger, see below] who has promised to get me specimens during each month of the year so that I may be able to get sufficient material for identification. Dr. Mohr has now all my material. When I get other specimens, I will remember to send you some" (Smith 1881a).

Chapman requested all the material Mohr had "on hand," and Mohr reported to Smith that the request had been honored including a specimen with "ripened fruit in perfect state" (possibly this collection is US-956957, see below) (Mohr 1881a, 1881b). In a letter dated July 10, Smith (1881b) reported that he was expecting new material in a "week or two," presumably from his "correspondent." He also approved Chapman's proposed name "*Croton alabamense*" (l.c.). On July 17, Smith was able to send Chapman "a small box containing specimens of *Croton alabamense*, in different stages of its growth." He continued, "From these, I hope you will be able to get all the information heretofore lacking. You might plant some of the seeds and perhaps raise it. I have several flourishing plants in

flower pots, which I have lately received from Pratt's Ferry" (Smith 1881c). These additional specimens proved sufficient for the complete description. The "18 inch seedlings" received from the "correspondent" in July 1881, Smith planted in his yard and they attained a height of "7 feet" by 1889 when Mohr reported on their development (Mohr 1889).

Chapman traveled north, meeting with Charles Mohr while passing though Washington (Mohr 1882b), and delivered the manuscript for his *Flora* to the printer in the last week of July 1882 (Chapman in Oakes 1932). Proof corrections continuing into the fall and the preface was dated December 26, 1882 (Chapman 1883a). Copies of the *Flora* were circulating by February 1883 (Chapman 1883b). The main body of the *Flora* was merely a corrected version of the first edition (Chapman 1860) and new taxa, including the *Croton*, were contained in an appended supplement. Chapman (l.c.) credited Smith as the authority for the species but added "ined.," an amendment finally removed in the entirely revised third addition of the *Flora* (Chapman 1897).

Mohr was preoccupied with work for Charles Sprague Sargent (1841–1927) on forest trees for the Tenth Census of the United States and could not visit Bibb County until November 1882 (vouchers at A, GH, MO and US variously give the date as November 11 or 12). Mohr located the *Croton* while collecting wood samples of *Quercus durandii* Buckley on his final trip for Sargent. Of the trip Mohr notes:

"About the middle of last month I was over on the little Cahaba river near Tionus [sic]. I went by way of Montevallo; having to return the same day I made 32 miles on horseback, arriving at my quarters at Mr. Aldriches at 10 o'clock pm... At the time of my visit to the 'Privet' thickets near Tionus the plant was just putting forth the flower buds of the staminate spik[e]lets, which as Mr. Hansberger informs me open with the first warm days of early spring. Not a vestige of even a rudimentary pistillate flower could be found and the fruit of this season was entirely gone... Mr. Hansberger received me with the genuine warm hospitality of the southern gentlemen, he went with me through the woods and gave me all assistance in his power... I am bound to visit again this locality so rich on [sic] botanical treasures" (Mohr 1882c).

Tionis was a community located along lower Six Mile Creek (sec. 26, T24N, R10E; fide Smith 1870–1889) and readily evident on period maps (see online historical map archive at the University of Alabama, http://alabamamaps.ua.edu/index.html). A post office was established in 1870 and Jacob S. Hansberger (d. 1887) served as postmaster from 1874 until 1887 when it was discontinued prior to his death (Stewart 1983). Bibb County deed books show that he owned over 200 ha of land in the vicinity (accrued as many parcels over a period of years). Smith knew Hansberger from his Bibb County trips and they had explored Six Mile Creek together shortly after Smith first discovered the *Croton* (fide entry for August 1, 1877; Smith 1870–1889). It is probable that Smith instilled in Hansberger an interest in the *Croton* and that he served as Smith's "correspondent" and local expert. The exact locations of Tionis and Hansberger's house are presently uncertain and I have not been able to assess the patchy *Croton*

distribution in relation to them. Even today it is clear that *Croton* is readily available in the general area without having to travel all the way to Pratt's Ferry (ca. 6.4 km to the west).

In the fall of 1882 Frederick Hoffmann, editor of *Pharmaceutische Rundschau*, requested Mohr to submit an article on *Croton alabamensis* for that journal (Mohr 1882b). Mohr had noted that the *Croton* bark was of interest to "pharmacognosy" as a possible native substitute for cascarilla that came from the bark of the West Indian *Croton eluteria* (L.) Sw. Mohr decided to defer writing the article until he could obtain flowering material to clear up the "point of the sexual relation of their flowers" and have a photograph of the plant taken. In March 1883 Smith sent Asa Gray a print of the photograph (annotation on back of print says the photo was taken February 28, 1883; Smith 1883) and Mohr received a copy in May (Mohr 1883a). In June 1883, while collecting wood for the Louisville Cotton Exposition, Mohr returned to Pratt's Ferry, ostensibly for *Quercus durandii* wood, but also unsuccessfully for *Croton* seeds and flowering specimens. (Mohr 1883b).

Mohr's labors finally bore fruit. In a paper read in January 1884 before the Mississippi Valley Horticultural Society, he presented his views on the possible use of *Rhus cotinoides* (= *Cotinus obovatus* Raf.), *Neviusia alabamensis* A. Gray, and *Croton alabamensis* as horticultural subjects (Mohr 1884). The same three species were treated in an expanded form by Mohr for the January 1887 issue of *Pharmaceutische Rundschau* (Mohr 1887). An etching of a cultivated seedling was substituted for the originally intended photograph. Preparation for this article included the examination of additional blooming material that was collected by Smith in his garden and received by Mohr in April 1886 (Mohr 1886). This material probably included a collection in the Mohr Herbarium dated April 16, 1886 from "my yard (Tuscaloosa), transplanted from Pratt's Ferry" (*E.A. Smith s.n.*, UNA-00020895, annotated by Mohr "Type Spm."). In 1888, Mohr's preparation of an article for *Garden and Forest* brought renewed questions to Smith on the life history of the *Croton* and requests for specimens (Mohr 1888). Mohr hoped to have the article sent off to press by the end of August 1888 and it appeared in the December 11, 1889 issue of *Garden and Forest*. In March 1889 Smith sent seedlings of the *Croton* to Sargent and Mohr (Smith 1889).

Typification and historical collections

Chapman gave no collection data beyond "central Alabama" in his original description, therefore a lectotype is selected here:

Croton alabamensis E.A. Sm. ex Chapm., Flora of the Southern United States, ed. 2:648. 1883. LECTOTYPE: UNITED STATES. ALABAMA: *E.A. Smith s.n.* (US-935923, ex John Donnell Smith herbarium). Other original material: Alabama, 4 Apr 1881 (date given on supplemental tag attached to stem), *E.A. Smith s.n.* (MO-1904803); Alabama, *E.A. Smith s.n.* (US-956957, ex Biltmore Herbarium). Alabama, Tuscaloosa, *E.A. Smith s.n.* (F-99491, ex H. N. Patterson herbarium; MO-784596, ex Chapman estate from 1899 purchase by MO).

Herbaria (GH, MO, NY, UNA, and US) containing the best representation of collections from Chapman, Mohr, and Smith were searched for historical *Croton* collections. Five *Croton* specimens were located that bear evidence of having been seen by Chapman (i.e., bear writing in Chapman's hand), although additional specimens may turn up in his widely scattered exciccatae (see Stafleu and Mennega [1997] for a listing of the 27 herbaria with Chapman material). It is unclear whether the two sheets labeled "Tuscaloosa" by Chapman should be considered original material. If taken as a literal exact locality then the collections came from cultivated material and most likely post-date the preparation of the original description (i.e., post 1881). Smith did cultivate plants in Tuscaloosa that were eventually a source of specimens, but these were probably the small, valuable seedlings also received in the summer of 1881, and not likely to become herbarium fodder at that time. On the other hand, label locality data secondarily penned by Chapman and not the collector might be distorted or incomplete. Chapman did generalize that Pratt's Ferry was "near Tuscaloosa" (see below) or he may have referred to Smith being based in Tuscaloosa.

John Donnell Smith (1829–1928) corresponded with and received specimens from Chapman during at least 1884–1886, based on specimen provenance notations in Donnell Smith's hand and fragments of Chapman letters attached to herbarium specimens at US. Donnell Smith's personal herbarium (including the lectotype, see Figure 2 with embossed stamp) and library were donated to US in 1905. The lectotype has an attached undated fragment of a Chapman letter (consistent in the distinctive paper with other letter fragments established as dating from 1884-1886), presumably to Donnell Smith, that reads:

"*Croton Alabamensis* is not found along R[ail]Roads and being a shrub will remain pretty quiet in its secluded home near Tuskaloosa [sic]. Strange that it should be in flower every month from Sept to May through the coldest weather and yet they sent me specimens collected in all these months!"

Based on the detailed historical account given above, it appears that Chapman had material from two collectors (E.A. Smith and J. Hansberger), multiple dates and perhaps several Bibb County localities on hand for his original diagnosis. The circumstantial evidence (i.e., Smith did not visit the area between the time of the *Croton* discovery and publication, and he also refers to receiving specimens from a "correspondent") suggests that much of the material was collected by Jacob Hansberger near Tionis, and the lectotype may have been collected by him in April 1881 and sent to Smith, who forwarded the specimens to Chapman for description. The two branches on the lectotype sheet have young fruits at slightly different developmental stages and may come from separate late spring collections. Of the five sheets of original material, only the selected lectotype contains an additional printed label that indicates the specimen was associated with the "Flora of the Southern United States and Supplement" (i.e., Chapman 1883a).

In addition to sending duplicates to correspondents, Chapman sold sev-

FIG. 2. *Croton alabamensis* var. *alabamensis* (*E.A. Smith s.n.*: lectotype, US). Label data and fragment of letter in hand of A. Chapman. See text for transcription of letter.

eral sets of specimens that are massive enough to have been described as "herbaria." However, he always retained a personal working collection, the residue of which was purchased from his estate by MO in 1899. In 1896 Chapman selected and sold the best set of material on which his 1883 *Flora* was based, to the Biltmore Herbarium in Asheville, North Carolina. The Biltmore Herbarium, modeled after the Royal Botanic Gardens, Kew, was established ca. 1894 for George Vanderbilt (1862–1914) as a scientific adjunct to his lavish Biltmore Estate. At the time of the Chapman purchase, the herbarium was trying to establish itself as one of the foremost botanical institutions in the southern United States through purchasing and exchanging collections, hiring of collectors, and publishing the eponymous scientific journal *Biltmore Botanical Studies*. The enterprise withered after about 10 years of activity (peaking ca. 1901–1903) due to Vanderbilt's financial downturn and untimely death. A 1916 flood destroyed three-quarters of the collection and the residue of ca. 25,000 sheets was given to US in 1917. The Chapman collection was reportedly stored in a "vault" and largely salvaged (Maxon 1917; Boynton 1936). Only one flood-damaged fruiting specimen (US-956957, stamped ex Biltmore Herbarium) of *Croton alabamensis* clearly has this provenance and was used at the Biltmore in an illustration (see Lounsberry 1901:306). It is possible that other *C. alabamensis* specimens, including other type material at Biltmore, were destroyed.

An anomalous Tennessee record (Tullahoma, Coffee Co., 10 Aug 1899, *T. G. Harbison 725*, NCU-9391) has connections with Biltmore. Thomas Grant Harbison (1862–1936) was a member of the Biltmore Herbarium staff and made extensive collections of the southern flora. His incomplete Biltmore field notes deposited at US (partial number series of duplicate field notes bracketing, but not including, the *Croton* collection in question) place him in Tullahoma, but suggest errors on the specimen label which was made long afterwards (i.e., *Harbison 725* would have been collected on 12 Aug 1899 and not 10 Aug as reported with the specimen). A *Croton alabamensis* collection with the same collection number and from a well-established locality ("On sandstone bluffs along the Warrior River, Tuscaloosa, Alabama," *T. G. Harbison 725*, 11 Oct 1911, A) may have been a source of confusion. The credibility of the Tennessee record is doubtful.

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