

NOMENCLATURE OF THE SAPOTE AND THE SAPODILLA.

By O. F. COOK.

INTRODUCTION.

The botanical investigation of tropical trees, notwithstanding their economic importance, has been greatly neglected. This is shown by the lack of any general agreement among botanists regarding the names of some of the most familiar species. In the case of the sapote the nomenclatorial complications are so numerous and intricate as to become almost interesting, and they may be useful as examples of some of the taxonomic problems that still remain to be solved.

Though the method of types is now widely recognized, especially in the United States, as necessary to secure stability in the application of names, many of the consequences of its adoption have yet to be worked out. Indeed, it is evident from the codes of nomenclature proposed in recent years that our European contemporaries have continued to overlook the necessity of dealing with genera on the basis of types.¹

The Vienna code of 1905 has a curious provision regarding the subdivision of a genus, namely, that when "one of the parts detached contains a great many more species than the others, the name is reserved for that part of it." The framing of such a rule makes it evident that the idea of a generic name being permanently associated with a type species had not yet dawned. The regulations adopted by the Brussels congress of 1910, in seeking to establish lists of *nomina conservanda* and to set many different dates for beginning the nomenclature of the various groups of plants, would also introduce endless complications into the work of placing taxonomy on a basis of types. Restricting dates of publication does not simplify the problems of generic nomenclature unless there is also to be a consistent method of fixing the application of the accepted names.

¹ The Method of Types in Botanical Nomenclature. Science n. ser. 12: 475. 1900. Types and Synonyms. Science n. ser. 15: 382. 1902. Types of Pre-Linnæan Genera. Science n. ser. 17: 350. 1903. The Nomenclature of the Royal Palms. Bull. Torrey Club 31: 349. 1904. An American Code of Botanical Nomenclature. Bull. Torrey Club 34: 167. 1907.

Generic names must have definite relations to plants, as well as specific names. Uniformity in the application of names is one of the prime essentials of stability, and the use of types is the only method thus far suggested for supplying this deficiency in our taxonomic laws. Nomenclatorial legislation that fails to consider types can have little hope of permanence.

CONFUSION OF VERNACULAR NAMES.

In some cases where the scientific names of tropical economic plants have fallen into confusion, resort can be had to the vernacular names, which often have very definite applications, but with the sapotes there is no hope in this quarter. The word "sapodilla" has only a limited use, even in the West Indies, and is scarcely known on the Continent. There it is the chicle tree that is usually called "sapote," while the tree with larger fruits is distinguished as "sapote grande" or "mammee sapota." But "mammee" is also the name of another tropical fruit belonging to a different family, though often confused with the sapotes. Thus there is special need of scientific names with definite applications. The only reason for adopting "sapote" as the English name of the larger fruit is that the name "sapodilla," for the smaller fruit, has already found lodgment in our English dictionaries.

In addition to serving as the common name for two important fruit trees, the word "sapote" is also used, with a qualifier, for many other fruits, some of them belonging to distinct families, just as we say "thorn apple," "May apple," "rose apple," or "custard apple." Sapote is supposed to have been derived from "tzapotl," the Aztec generic name for all of the soft, sweet fruits. The Spanish name "sapote chico" is also thought to mean "sapote chicle," or "sapote with the chicle gum," instead of signifying "small sapote."

ESSENTIAL DIFFERENCES.

In spite of bearing the same name, the "sapote grande" and the "sapote chico" are essentially different and would never be confused by natives or residents in the tropics who have first-hand familiarity with both trees. One of the most obvious differences is in the fruit itself, which in the sapodilla has a grayish or brownish, granular flesh like a pear, while in the sapote the fruit has a yellow flesh and a firmer and more uniform texture, not crisp like the flesh of an apple, but more like that of a cooked carrot or squash. The trees are strikingly different, the sapote with an open crown of large, lanceolate, coarsely-veined, deciduous leaves and the sapodilla with a dense covering of smooth, delicately-veined, laurel-like, evergreen foliage. The triangular-fusiform seeds of the sapote are very large and thick and have

SAPOTA.

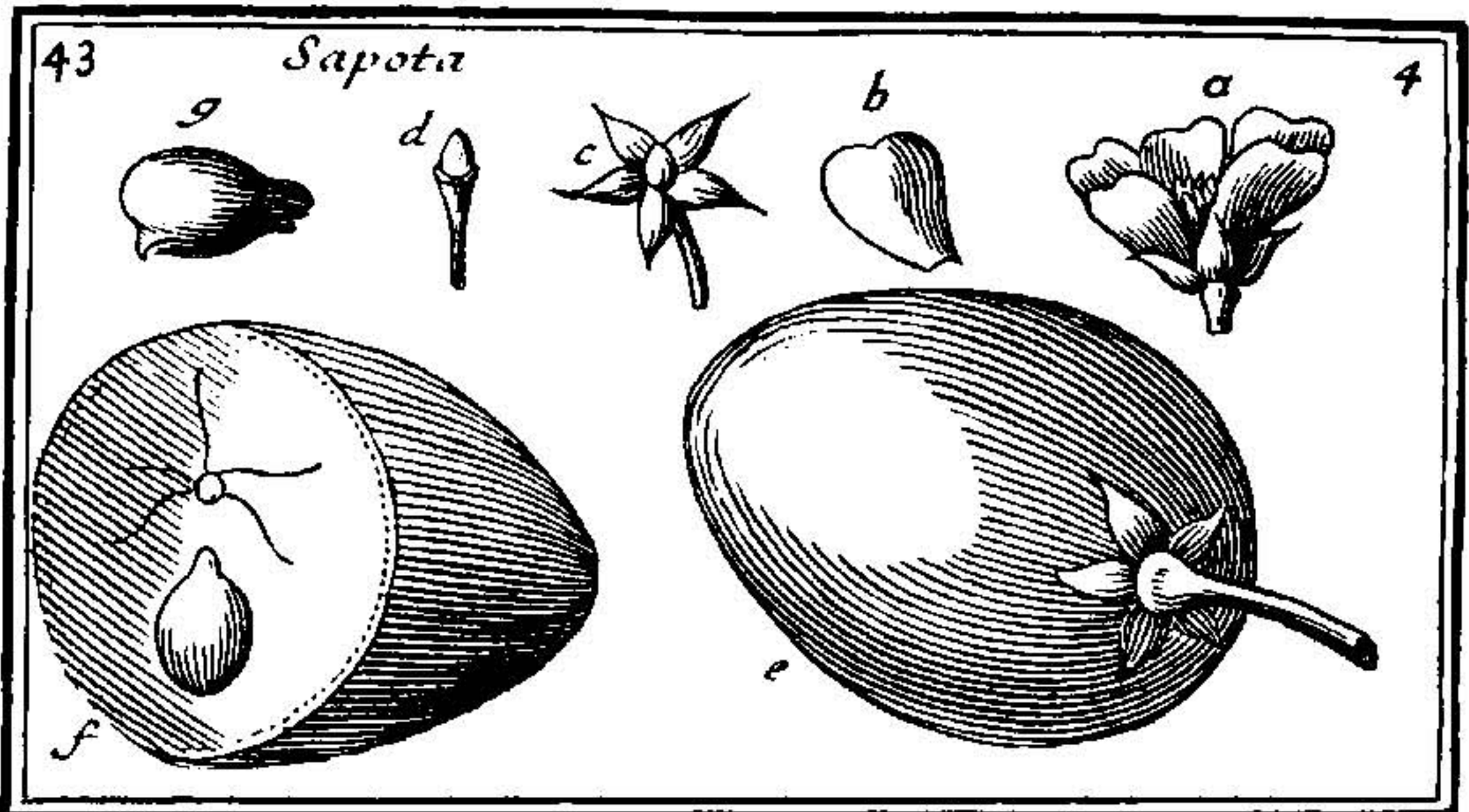
Licet iisdem prorsus characteribus insigniatur hujusce plan-^{Tab. 4}
 tæ genus, ac plantæ superioris; quia tamen tota facie, com-
 muni omnium Americanorum consensu & usu, florum, fruc-
 tuumque natura ab ipsa omnino differat, ut facile ipsam in
 America consideranti patebit, ideo hujus genus peculiare insti-
 tuendum censui. Est igitur Sapota plantæ genus flore rosaceo A,
 plurimis scilicet petalis B in orbem positis, constante; e cujus
 calyce C surgit pistillum D, quod deinde abit in fructum E fe-
 re turbinatum, aut ovatum, mollem, carnosum, in quo nidu-
 latur F unum, aut duo semina subrotunda G, compressa, poli-
 ta & rostrata.

Sapotæ species sunt.

Sapota fructu turbinato, minori.

Sapota fructu ovato, majori.

Sapota nomen est Americanum vulgare.



PLUMIER'S DESCRIPTION AND FIGURES OF SAPOTA.

the whole inner face covered by an enormous hilum. The seeds of the sapodilla are many times smaller, strongly compressed, and with a relatively short, narrow hilum. These differences are really more significant than those that are usually enumerated as botanical characters, such as the greater number of carpels in the sapodilla and the more numerous sepals in the sapote. Such characters are subject to much variation in this group of plants.

The sapodilla tree not only produces a delicious fruit (now being grown in Florida) and a valuable wood, but is the source of chicle gum, which has become an important article of commerce. The sapote is of no commercial importance, though the fruit is used extensively for food by the native populations of Central American regions and the West Indies. The sapote ascends into the plateau regions of Central America, while the sapodilla is largely confined to regions of low elevation.

PLUMIER'S ACCOUNT OF THE SAPODILLA.

The taxonomic complications in this group began with Plumier, the first botanist to attempt a formal generic description of either of the fruits in question. Plumier used the word "sapote" in its latinized form "Sapota" as a generic name for the sapodilla and not for what we now call the "sapote." As that author traveled widely in the West Indies it may be argued that he must have known both fruits, but whether so or not there at least is nothing to show that he had anything but the sapodilla in mind in preparing the description and figures on which his genus was based. (Pl. 100.)

The seed and fruit represented in Plumier's plate are unmistakably those of the sapodilla. The calyx is shown with only 5 or 6 divisions, not 10 or 12 as in the sapote. The seed is of the proper size and shape, with a curved spine near the middle and with a narrow bidentate base. The fruit is a symmetrical rounded oval, as in many sapodillas, instead of being unsymmetrical and somewhat pointed at the end as in the true sapotes. Though not closely approaching the form of the sapote, the different kinds of sapodilla show a wide variation. Some are even narrower and more elliptical than in Plumier's figure, while others are broadly rounded or flattened. (Pl. 101.)

The most misleading feature in Plumier's plate is the indication of 5 dissepiments in the fruit, for there are 10 or 12 carpels in the sapodilla; but, on the other hand, only a few of the divisions remain conspicuous, that is, those that contain partially developed seeds. Moreover, no such obvious radiating figure appears in the ripe fruit of the sapote, where the enormous size of the seeds results in much more extensive distortion.

EXPLANATION OF PLATE 100.—Reproduction of plate 4 of Plumier's *Nova Plantarum Americanarum Genera* with text (p. 48). Figures original size.

EXPLANATION OF PLATE 101.—Three forms of sapodilla fruit found together in the market of Guatemala City, April, 1902. Natural size.

ACHRAS SUBSTITUTED FOR SAPOTA.

The Linnæan genus *Achras* was based directly on Plumier's plate of *Sapota*, which is the sole reference in all the editions of the *Genera Plantarum*. In the first edition of the *Species Plantarum*, *Achras* is represented by a single species, *Achras zapota*, and the first reference under this is to Plumier's mention of the ovate-fruited form of *Sapota*, the form shown in the plate. Thus both the genus *Achras* and its type species, *Achras zapota*, are definitely established on Plumier's description and figures of the sapodilla. This feature of the case seems to have escaped the attention of Radlkofer and others who have dealt with the taxonomy of the Sapotaceae.

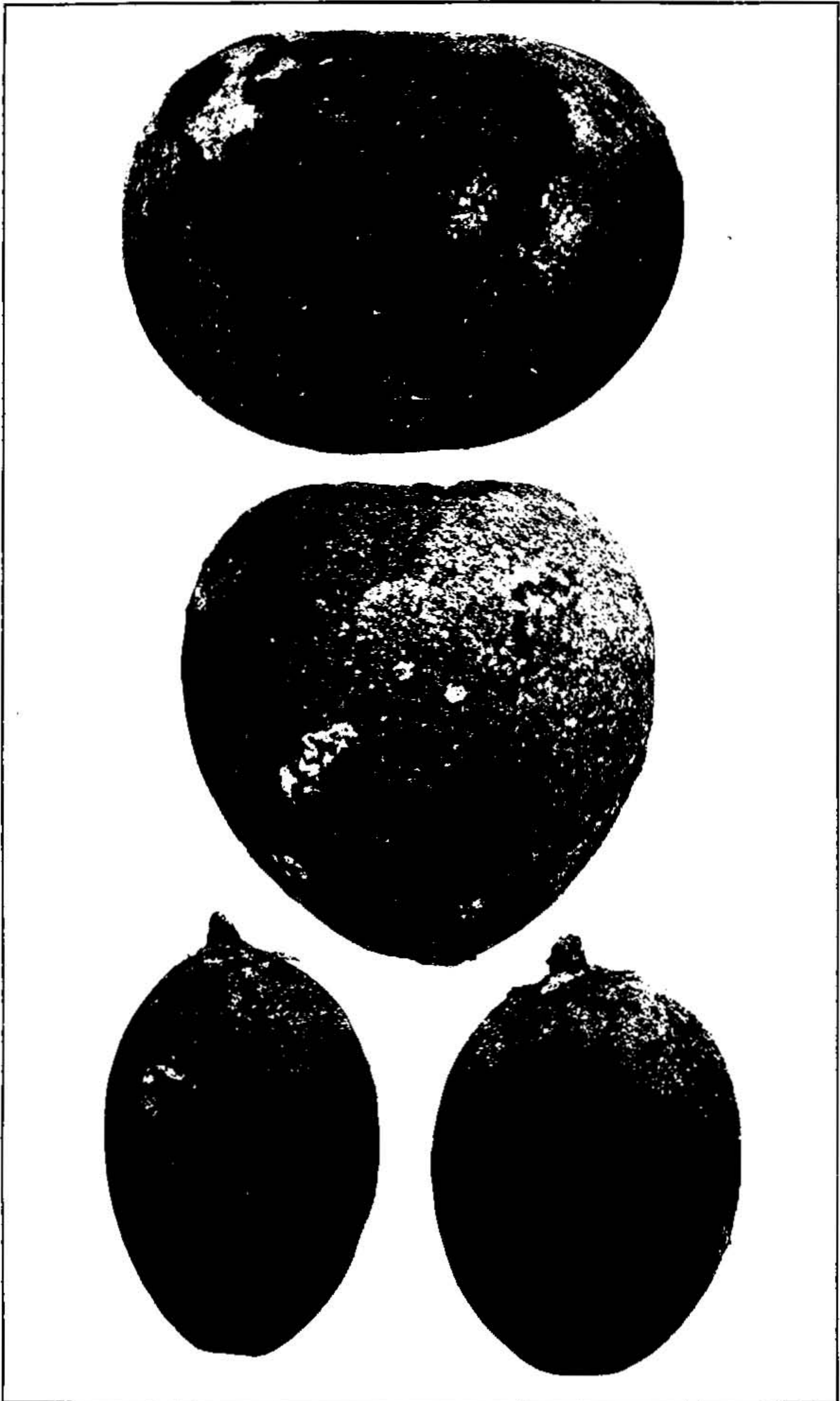
The same specific name, though with a different initial letter, was applied to the sapote in 1760 by Jacquin¹ under the genus *Sideroxylum*. The accompanying descriptive phrase, "*Sideroxylum inerme; calycibus decaphyllis*," undoubtedly alludes to the compound calyx or involucre, which is still used by botanists as a distinctive generic character of the sapote. Yet it can not be claimed that Jacquin had at that time any intention of separating the sapote from the sapodilla, for the latter tree is not listed in the *Enumeratio*. The only citation given by Jacquin under his *Sideroxylum sapota* is of Sloane's plate of "The *Mammee Sapota* tree" of Jamaica. Jacquin may have borrowed his specific name from the first edition of the *Species Plantarum*, where Sloane was cited, as well as Plumier.

CONFUSION OF SPECIES BY LINNÆUS.

When the second edition of the *Species Plantarum* was prepared, Linnæus had become aware of the existence of more than one kind of sapote in the West Indies and undertook to distinguish between them in the works of his predecessors. The sapote received a new specific name, *Achras mammosa*, for Jacquin's *Sideroxylum sapota*, if not already a synonym of the Linnæan *Achras zapota*, would have become a homonym if transferred to the genus *Achras*. References to Jacquin's species and to Sloane's plate were the real basis of the new Linnæan species, but a reference to Plumier was also included, and this has been the occasion of much confusion.

Plumier had mentioned two forms of fruit, one turbinate and the other ovate, under his genus *Sapota*, and Linnæus, assuming that these were the two fruits that were to be assigned to different species, took Plumier's ovate fruit to be the same as Sloane's "mammee sapota." As a result of this mistake the same reference to Plumier's ovate sapodilla that had been given under *Achras zapota* in the first edition of the *Species Plantarum* was transferred in the second edition to the new species, *Achras mammosa*, while Plumier's reference to the

¹ Enum. Pl. Carib. 16.



THREE FORMS OF SAPODILLA FRUITS.

turbinate form of the sapodilla was cited under what was now called *Achras zapota*, the initial letter of the specific name being changed from the *zapota* of the first edition.

From the standpoint of that time this was a natural attempt on the part of Linnæus to improve the form and limit the application of his name *Achras zapota* of the first edition, while establishing a new species for the sapote, but we no longer admit the right to alter a name or change its original application.

ADJUSTMENT OF LINNÆAN NAMES.

As Plumier's drawing shows an ovate sapodilla fruit, this must be considered as the type of the genus *Achras*, and of the species *Achras zapota*, as established in the first edition of the species *Plantarum*. If Linnæus had been correct in placing Plumier's ovate (sapodilla) fruit with *Achras mammosa*, he would have been incorrect in applying a new name to this species, for it was the ovate sapodilla that had already received the name *Achras zapota* in his first edition. Thus, if the treatment of the second edition were taken at its face value, *Achras zapota* would be the name of the sapote, *Achras mammosa* would be a synonym, the sapodilla would be left without a Linnæan name, and the question of finding a post-Linnæan substitute would arise. But if, as seems certain, Linnæus was mistaken in supposing that Plumier's ovate fruit was a sapote, there is no occasion for following this line of reasoning any further. We have only to reject the reference to Plumier under *Achras mammosa* as a piece of erroneous synonymy. The exclusion of the reference is also justified by the fact that Linnæus gives a specific description of *Achras mammosa* which mentions the cuneiform-lanceolate leaves of the true sapote, in contrast with ovate-oblong leaves ascribed to the sapodilla. With the misplaced reference to Plumier excluded, the name *mammosa* can be supported by the references to Jacquin and Sloane, and remains available as a specific designation for the sapote.

TWO VARIETIES OF SAPODILLA NAMED BY JACQUIN.

In a later work¹ Jacquin recognized the fact that the two forms mentioned by Plumier were varieties of the same species and avoided the mistake made by Linnæus in associating Plumier's ovate fruit with the sapote. For the ovate-fruited form Jacquin adopted the correct Linnæan name *Achras zapota* and gave the subspecific name *zapotilla* to include the form with the broader, turbinate fruit. The sapote, though treated as a distinct species, was not designated by a binomial name, but was called *Achras zapota major*.

¹ *Stirp. Amer.* 56. 1763.

The name *zapotilla* has been given specific rank by Coville and may come into use when a classification of the many different forms of the sapodilla is attempted. Though a reference to Plumier's small, turbinate fruit is included by Jacquin under the subspecies *zapotilla*, it is preceded by references to varieties described from Jamaica by Brown and Sloane, in the latter case to Sloane's plate no. 230. This shows a variety with rather small, round fruits, which may be taken to represent the type of the species or subspecies *zapotilla*. Sloane's account, published in 1725, indicates that the tree had been introduced into Jamaica rather recently from the region of Campeche.

THE NAME SAPOTA NOT TO BE REVIVED.

These complications regarding the sapote do not affect the sapodilla, which remains in undisputed possession of the generic name *Achras*, with *Achras zapota* as the specific designation and *Sapota* of Plumier as a generic synonym. Later use of Plumier's name *Sapota*, as in Miller's *Gardener's Dictionary*, does not suffice to re-establish it as a valid generic name for either the sapote or the sapodilla. As *Achras* represented a direct substitution of a name without change of generic content, the only way to restore *Sapota* would be to return directly to Plumier's name. Some writers would take this course and deny the right of Linnæus to transfer the Greek name of the wild pear tree to a tropical genus.

Though such a policy would not be approved at present, a future revival of interest in Greek civilization might easily lead to a restoration of the ancient plant names to their proper uses. In any event we should be taking entirely unwarranted liberties in transferring Plumier's name from the sapodilla to the sapote. To do this it would have to be argued that Miller's use of the name *Sapota* served to reestablish it under the binomial system, and then the principle of elimination would need to be invoked as a reason for applying the name to a different genus, because Miller included the sapote with the sapodilla. This method of selecting generic types by elimination, though sometimes defended by zoologists, is very poorly adapted to botanical purposes.

Pre-Linnæan botany reached a much higher development than pre-Linnæan zoology and can not be wholly disregarded in the later development of the science. Nevertheless, some of the older names were discarded in the reform of botanical nomenclature by Linnæus, and these names are not available for further use. Unless the names that Linnæus rejected are to be allowed to rest in oblivion there is no good reason for following the proposals of Linnæus. Certainly

¹ Contr. U. S. Nat. Herb. 9: 369. 1905.

nothing is gained by admitting *Achras* and other Linnæan substitutes for pre-Linnæan names like *Sapota* and then allowing these same pre-Linnæan names to be brought back into the system because they happened to be misapplied by some of the early post-Linnæan writers.

If the Linnæan genus *Achras* had not been based on the same type, the placing of Plumier's name *Sapota* as a synonym would not stand in the way of restoration by a later author who used it in the original application, but it is certainly not in the interest of nomenclatorial stability to revive discarded pre-Linnæan names that have been replaced by direct substitutes, as in the case of *Sapota* and *Achras*. It is a rule of botanical nomenclature that the substitution of a new name does not alter the type of a genus. Still less should the type be changed by the casual use of a name for species not congeneric with the original type. Pre-Linnæan genera used by post-Linnæan authors should not be treated as having been adopted under the binomial system unless the pre-Linnæan type was included. Application of this rule to the present case requires us to seek a post-Linnæan generic name for the sapote.

LUCUMA AND VITELLARIA NOT APPLICABLE TO THE SAPOTE.

The name usually given to the sapote in post-Linnæan literature is *Lucuma mammosa*, but this generic assignment seems not to be correct. The genus *Lucuma* was established by Molina in 1782 on a Chilian tree not closely related to the sapote, and the tendency of recent writers has been in the direction of separating the sapote from *Lucuma*. Radlkofer, Pierre, Engler, and Urban are in agreement in this respect, though differing in their applications of generic names. Radlkofer proposed to revive the name of Gaertner's problematical genus *Vitellaria* and apply it to the sapote, but other writers have not followed this suggestion. As long as the type of *Vitellaria* remains unidentified the application of the name can not be determined. Many other genera have been segregated from *Lucuma* or are treated as synonyms, but none of them appears to have been based on the sapote or its closer relatives. Thus the sapote appears to have had no generic name of its own until 1890, when Pierre established a new genus, *Calospermum*, with *Achras mammosa* L. as the type species.

CALOSPERMUM AND CALOCARPUM AS HOMONYMS.

The name *Calospermum* was changed by Pierre to *Calocarpum* in 1897. The reason for this substitution was not stated, but may be found in the fact that Pfeiffer's nomenclator credits Rafinesque with having given the name *Calospermum* to a genus of algæ in 1814. Yet the name *Calocarpum* is open to even more serious objection,

for there was a still older name *Callicarpa* that had been applied by Linnæus himself to another genus of flowering plants from the same regions as the sapote. It is true that the forms of the name used by Linnæus and Pierre, "Callicarpa" and "Calocarpum," are capable of bibliographic discrimination, but essentially they are merely variants of the same word. Such names do not differ as words, but merely as combinations of letters. Instead of aiding in the recognition of plants these ambiguous designations serve rather to confuse them. Some writers have proposed to admit variations of spelling, or even typographical errors, as constituting distinct names. The danger of this tendency finds a striking illustration in the present instance. There would be no need to stop with a few variations like *Callicarpa* and *Calocarpum*, for *Kallikarpon*, *Kalokarpus*, and many others are possible. Indeed, this name is capable of no less than 64 variations of spelling, to say nothing of the possibilities of developing some genuine typographical errors. Each family of plants might have its *Calikarpum* or *Kalocarpon*, or a whole family might be provided with generic names based on the same flexible combination.

A NEW GENERIC NAME FOR THE SAPOTE.

Hence, it appears that no satisfactory generic designation is available in literature for the sapote, notwithstanding the many names that have been applied to it during the past two centuries. As no combinations of the word *Achras* are known to have been used hitherto, the name "*Achradelpha*," recently proposed,¹ may avoid the danger of homonymy. Allusion to the sapote as the "sister of *Achras*" is warranted by the fact of similarity which has been the occasion of so much confusion.

The type species of *Achradelpha* is *Achradelpha mammosa*, based on *Achras mammosa* L. Some might hold that the specific name previously used by Jacquin in the binomial *Sideroxylum sapota* should be revived under the new genus, instead of adopting the Linnæan name *mammosa*. This is one of the cases where the rule "Once a homonym, always a synonym" would find a useful application. Though it may not seem likely in the present case that the sapote will ever be referred back to *Achras* and thus cause a direct conflict of homonyms, if the alternative combination were adopted, there are other cases of more closely related genera where confusion would be created if the names of species were to be altered with each change of generic assignment. This course becomes necessary unless names that have been subject to rejection as homonyms are permanently discarded. Moreover, it is undesirable to have the same specific

¹ An advance summary of the results of this study has been published in the *Journal of the Washington Academy of Sciences*, 3: 158, March 19, 1913.

name applied to two important economic species in two closely related genera.

In this particular case there is another reason for refusing to base a new combination on Jacquin's *Sideroxylum sapota*. There is nothing to show that this was an original name proposed for the sapote as distinct from the sapodilla. Jacquin, like Linnæus, at first did not discriminate between the sapote and sapodilla. Instead of distinguishing the two fruits and giving them different names, Jacquin's first treatment may be interpreted as a mere transfer of the composite Linnæan species from *Achras* to *Sideroxylon*. In his next work Jacquin accepted the genus *Achras* and used the Linnæan binomial *Achras zapota* in its correct application to the sapodilla, with a citation of the original place of publication in *Species Plantarum*. Thus it was not until Linnæus proposed the name *mammosa*, in the second edition of *Species Plantarum*, that the sapote can be said to have received a specific designation.

SUMMARY OF PRINCIPAL SYNONYMS.

The results of this study of the nomenclature of the sapote and the sapodilla are summarized in the following lists of the principal synonyms:

Achradelpha mammosa (L.) Cook. THE SAPOTE.

- Malus persica maxima foliis magnis*, etc. Sloane, *Voy. Jam.* 2: 124. *pl.* 218. 1725.
Sideroxylum sapota Jacq. *Enum. Pl. Carib.* 15. 1760.
Achras mammosa L. *Sp. Pl.* ed. 2. 469. 1762.
Achras zapota major Jacq. *Stirp. Amer.* 56. 1763.
Sapota mammosa Mill. *Gard. Dict.* ed. 8. no. 2. 1768.
Lucuma mammosum Gaertn. f. *Fruct. & Sem.* 3: 130. *pl.* 203-4. 1807.
Lucuma mammosa DC. *Prodr.* 8: 169. 1844.
Vitellaria mammosa Radlk. *Sitzungsb. Math.-Phys. Akad. München* 12: 325. 1882.
Calospermum mammosum Pierre, *Notes Bot. Sapot.* 11. 1890.
Calocarpum mammosum Pierre in Urban, *Symb. Antill.* 5: 98. 1904.
Achradelpha mammosa Cook, *Journ. Washington Acad. Sci.* 3: 160. 1913.

Achras zapota L. THE SAPODILLA.

- Sapota fructu ovato, majori* Plum. *Nov. Pl. Amer.* 43. *pl.* 4. 1703.
Achras zapota L. *Sp. Pl.* 1190. 1753; Jacq. *Stirp. Amer.* 57. 1763.
Achras zapota L. *Sp. Pl.* ed. 2. 1. 470. 1762.
Sapota achras Mill. *Gard. Dict.* ed. 8. no. 1. 1768.
Sapota zapotilla Coville, *Contr. U. S. Nat. Herb.* 9: 369. 1905.