

THE FORGOTTEN HERMANN HERBARIUM: A HISTORICAL COLLECTION
OF USEFUL PLANTS FROM SURINAME (CA. 1689).

Thesis of a research internship, part of the EBC Master programme Biology



Slangenkruidt (*Eryngium foetidum*) Photo: Ben Kieft

Sarina Veldman [s0624055]

Research conducted under supervision of Tinde van Andel
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ABSTRACT

The NCB Naturalis is in possession of the 17th century herbarium containing 49 dried specimens from Suriname, which is contributed to the famous botanist Paul Hermann. All specimens are accompanied by (pre-Linnaean) Latin or vernacular names and in some cases Latin descriptions of the use of the plants. Our main research aim is to assess the importance of this herbarium for the present-day flora and ethnobotany of Suriname. All specimens were determined, Latin texts were translated and comparisons were made with present-day vernacular names and local uses of these specimens. Moreover, the herbarium was compared to contemporary plant collections and appears to be the oldest known collection of Suriname plants. The herbarium was unfortunately not seen by Linnaeus and does not contain any type specimens. It however does contain the first physical evidence for cultivation of African crops (*Abelmoschus esculentus* and *Sesamum radiatum*) in Surinam. It appears that 66% of the 17th century vernacular names and 70% of the 17th century uses have remained the same until today, but all of the plants present in the herbarium are still of ethnobotanical importance in present-day Suriname. Being the oldest ethnobotanical record of Surinam plants accompanied by actual specimens, this herbarium is of great importance to the flora and ethnobotany of Surinam.

INTRODUCTION

Historical plant collections are subject to extensive study. They represent physical evidence of the occurrence of a species at a particular time and place, provide us with information on the botanical interest of the past centuries and, in some cases, tell us something about the history of plant use. Moreover several historical collections have been used by Carl Linnaeus to serve as a basis for his *Historia Plantarum*, which means they possibly contain type specimens (Jarvis, 2007). The National Herbarium of the Netherlands (NHN), now part of the Netherlands Center for Biodiversity Naturalis, possesses various old herbaria. Amongst these is a late 17th century bound herbarium, containing dried, predominantly sterile specimens from Surinam (Van Ooststroom, 1939). The specimens are in most cases – three exceptions – accompanied by at least a vernacular name, a Latin name or a description in Latin of the characteristics or use of the plant. Based on the binding and the handwriting, the herbarium is thought to be composed by the well-known botanist Paul Hermann (1646 – 1695), professor in botany at Leiden University at the end of the 17th century (Brinkman, 1980). Hermann was born in Germany (Halle), studied theology and medicine in Wittenberg, botany in Leipzig and reached his medical degree in Padua, where he met many important botanists. Thereafter he went to the University of Leiden, where he was enrolled in 1671. Only a year later he was asked by the Dutch East India Company (VOC) to travel to Ceylon as a botanist and medical doctor, where he stayed until 1679 (Smit, 1969). Hermann's Suriname herbarium served as a present for the famous politician and botanist Hieronymus van Beverningh, who recommended Hermann to the influential governor van Rheeде tot Drakenstein for the exploration of the South African, Indian and Ceylon flora. Although Hermann himself was said to have constructed this herbarium, he probably did not collect the plants in person, as there are no records of him ever visiting Suriname. Even though this herbarium might be the oldest preserved plant collection from Suriname, it seems that it has never been examined by Linnaeus, since he does not mention it in his *Plantae Surinamenses* (1775). There is no reference to this collection in Charlie Jarvis' extensive work on pre-Linnaean collections used by Linnaeus for his taxonomic studies. For his work on Surinamese plants, Linnaeus rather used the collections of the Swedish botanists Carl Gustav Dahlberg and Daniel Rolander (Jarvis, 2007). The only person to publish about this herbarium was Van Ooststroom (1939). He identified 44 of the 51 plants present in the book to species level and three to family level, while four were left unidentified. Van Ooststroom did not translate the Latin text accompanying the specimens, but did make few remarks on its contents. In this paper, we present the up-to-date identification of this 17th century Surinamese plant collection, trace its origin and compare the ethnobotanical information with contemporary Caribbean plant collections and present-day plant use in the region. Our main research aim was to assess the importance of this herbarium for the present-day flora and ethnobotany of Suriname. Therefore, we posed the following questions: Which plants are present in this herbarium and why these? What is the history of this old collection? Are there other Surinamese collections from the same period? What is mentioned in the Latin text accompanying the dried specimens? Which vernacular names and uses changed over time and which are still in use in Suriname today?

HISTORICAL CONTEXT

Long after the Americas were discovered in 1492, there was not much interest in the Guyana's. This so-called 'Wild Coast' was full of swamps, aggressive indigenous tribes and gold was not easily found. The initial interest of the Europeans was Brazil, where they established many sugar cane plantations and Peru, where they mined for gold and silver. Only in the beginning of the 17th century, the first foreign settlements – by two Dutchmen – were made in Suriname (Van Lier, 1977). When the country, after being English property from 1651 onwards, came officially into Dutch hands at the Treaty of Breda in 1667, settlements expanded and the coastal swamps were transformed into plantations. To work on these plantations, thousands of slaves were imported from West African countries by the Dutch. At that time, the Surinamese population was culturally very diverse, with European plantation holders, African slaves and indigenous Indians. In 17th century Europe, plant collecting served several purposes. After the first medicinal gardens (*horti medici*) and dried plant collections (*horti sicci*) were established in the 16th century, many European physicians, botanists, and wealthy politicians wanted to start their own collections. Collectors exchanged both living and dried material amongst each other and tried to obtain as many rare and exotic species as possible. Material from the overseas colonies was of course more than welcome, especially since the invention of the

greenhouse, which allowed Europeans to grow tropical plants in their gardens (Brinkman, 1980; Wijnands et al. 1994). Another reason for their interest in exotic plants was the economic value. European and East Asian plants were introduced in Suriname, while potentially interesting plants were sent from Suriname to Europe. Amongst them were the plants that now form the ‘forgotten Hermann herbarium’ (NI-HaNa, Sociëteit van Suriname, 1.05.03 inv. nr 212-219).

MATERIAL AND METHODS

To identify the specimens of the Hermann herbarium, first the entire collection was digitized. After Van Oostrooms scientific names were updated with the Plant List (www.theplantlist.org), all specimens were compared to herbarium vouchers of the NHN collection [L] and in case of doubt specialists were consulted. Vernacular names and uses were compared with recent vernacular name lists and ethnobotanical studies for Suriname (Van ‘t Klooster et al., 2003; Blanker et al., 2005; Van Andel and Ruyschaert, 2011). One specimen (*moemoetri*, fol. 19) was identified based on ancient DNA analysis using the following method. For DNA extraction a small part of the leaf (less than 1 cm²) was ground using a Retsch mill (Retsch GmbH, Haan, Germany), further processing was done using a silica adsorption protocol (Rohland & Hofreiter, 2007). Extraction was carried out in the ancient DNA facility of Leiden University following established protocols (Cooper & Poinar, 2001). PCRs were carried out on a PTC 200 DNA engine (MJ Research, St. Bruno, Canada) in a 20 µl volume containing 2 µl of DNA extract, 0.5 µM of each primer, 60 µM of each dNTP (Bioline, Londen, UK), 1x Phire reaction buffer and 2 units of Phire Hot Start II DNA polymerase (F-122S, Finnzymes, Espoo, Finland). The primers used for both amplification and sequencing were Z1aF and 19bR that amplify a fragment of ca. 157 basepairs (bp) of the *rbcL* gene (Hofreiter et al., 2000). Positive and negative controls were included simultaneously in the amplifications to check for contamination. The thermal cycling profile started with a 3 min. denaturation step at 98 °C, followed by 40 cycles of 5s denaturation at 98 °C, 20 s annealing at 55 °C, and 30s elongation at 72 °C, with a final extension step of 2 min. at 72 °C. The PCR product was purified using the Wizard SV and PCR Clean-up systems ((Promega Corporation, Madison, USA). DNA sequencing was done on a 96-capillary 3730xl DNA Analyzer automated sequencer 3730XL (Applied Biosystems, Inc., Foster City, USA) using standard dye-terminator chemistry (Macrogen Inc., Seoul, Korea). To find out more about other historic collections from the region, we revised recent literature on plant collectors from the Guianas (Dandy, 1958; Clokie, 1964; Brinkman, 1980; Hunt et al., 1988; Ek, 1991; Wijnands et al., 1994) as well as 17th century literature (Breyne, J. 1680; Ray, 1686; Hermann, 1687). Websites of the Natural History Museum [BM], the Bodleian Library in Oxford [OXF] and the Burmann herbarium [B]) were checked for the presence of (digitized) historical collections from the Guianas. The 17th century herbaria present in the Sloane Herbarium [H.S. 91; 95; 96; 162; 221; 291] were studied in the Natural History Museum in London, where all relevant pages were digitized. On the inside of the cover of the Suriname Hermann herbarium, we found a small, yellow, handwritten note that the specimens were probably collected by a certain Hendrik Meyer. To obtain more information on collectors of the 17th century herbaria and their personal background, the Regional Archive of Leiden and the National Archive in The Hague were consulted. All possible spellings for the possible collector were searched for separately (e.g., Meyer, Meier, Mayer, Maijer etc) through the search engine on archives’ website. In the ‘Archief van de Sociëteit van Suriname’ (part of the National Archive in The Hague), eight successive books with all correspondence from the Society of Suriname from November 16th 1683 to June 21th 1689 (NI-HaNa, Sociëteit van Suriname, 1.05.03 inv. nr 212-219) were scanned for lists of passengers returning from Suriname on WIC ships. Furthermore, references to this archive from other sources were checked and digitized (Brinkman, 1980; Hunt et al., 1988; Wijnands et al. 1994). We consulted the ‘curators archive’ of the Leiden University Library to obtain early records from the Leiden botanical garden. We obtained digitized manuscripts from the Bodleian Library (M.S. 174 and M.S. 184) that represented species lists from William Sherard (1659 - 1728), which most likely belonged to Paul Hermann, who was his close friend and teacher. To translate the Latin text that accompanied the herbarium specimens, we used the Latin-Dutch and Latin-English dictionaries of Muller & Renkema (1970) and Lewis & Short (1975). The Suriname Hermann herbarium is presently housed in the treasure room of the NHN and can be consulted on request. The digitized collections and translation of the Latin texts will soon be made available on the internet.

RESULTS

A total of 49 plant species is preserved in Hermann's Suriname herbarium, instead of the 51 indicated by Van Ooststroom (1939). Folio 49 appears to contain material belonging to specimens from folio 19 (*Pachira aquatica*) and folio 26 (*Heliconia spathocircinata*), whereas Van Ooststroom identified them as separate species. Although 53% of the specimens is sterile, all specimens could be identified to species level (table 1). The specimens belong to 30 different plant families, with Fabaceae as the best represented family (20%). Forty plants have vernacular names in 17th century Dutch, Sranantongo, African or Indian languages (fig. 1). Eight specimens are accompanied by pre-Linnaean Latin names – that in most cases seem a translation of the Dutch vernacular name. Latin descriptions are given for 34 specimens; six indicate a medicinal use (*Scoparia dulcis*, *Sesamum radiatum*, *Eryngium foetidum*, *Crescentia cujete*, *Jatropha curcas* and *Pterocarpus officinalis*), four descriptions indicate edible fruits (*Tilesia baccata*, *Duroia eriopila*, *Paullinia pinnata* and *Terminalia catappa*), three are most likely food crops (*Abelmoschus esculentus*, *Sesamum radiatum* and *Manihot esculenta*) two are used for construction (*Eschweilera subglandulosa* and *Euterpe oleracea*) and other uses are plaiting fiber for basketry (*Ischnosiphon obliquus*), fish poison (*Tephrosia sinapou*), blue dye (*Renalmia alpinia*) and roofing material (*Cyclanthus bipartitus*). Other Latin texts describe the appearance, smell or taste of the plant parts. The online appendix contains original Latin descriptions (including vernacular names and 17th century use of the plants), their English translations, present-day vernacular names and uses, identifications by Van Ooststroom, current identifications, and a comparison of the species lists from M.S.174 and M.S.184 with the names and descriptions found in Hermann's Suriname herbarium.

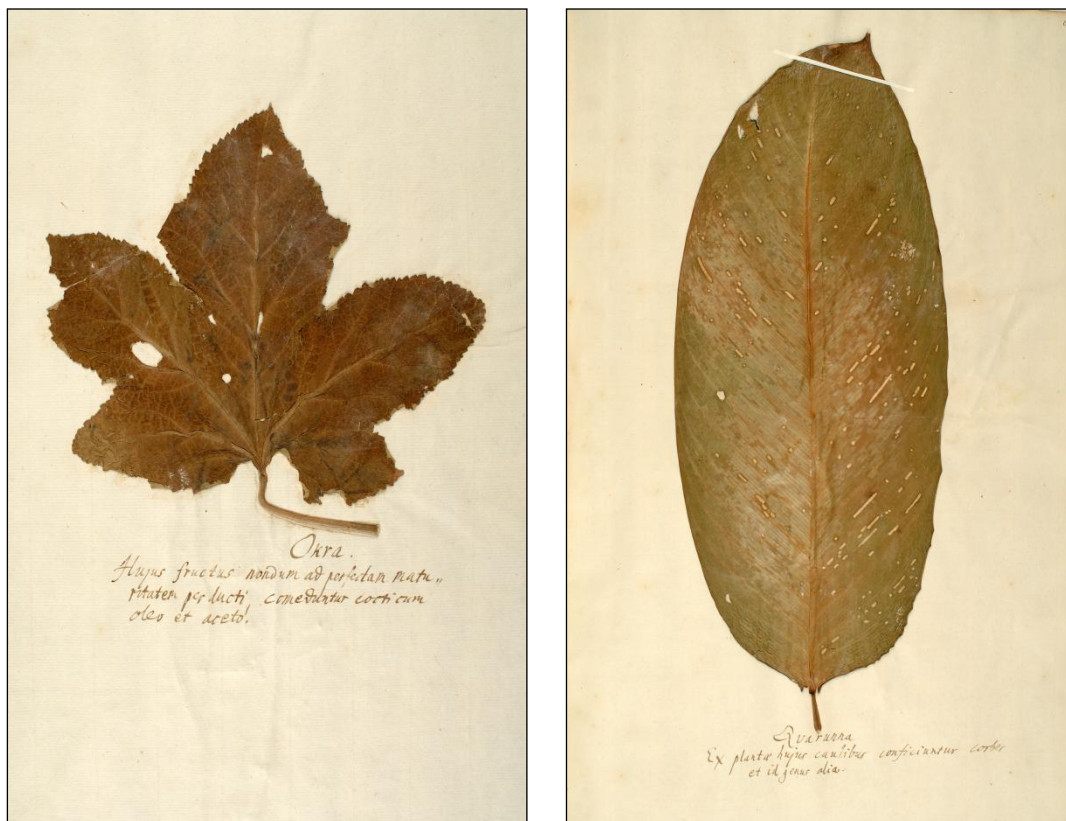


Figure 1. Two examples of specimens inside Hermann's Suriname herbarium. Left: *okra* (*Abelmoschus esculentus*); right: *quarunna* (*Ischnosiphon obliquus*). *Okra* is an Igbo name (Nigerian language), followed by a Latin description of the use: *Hujus fructus nondum ad perfectam maturitatem perducti comeduntur cocti cum oleo et aceto*; When the fruits of this (plant) are not fully grown, they are eaten after being cooked with oil and vinegar. *Quarunna* is a Carib name, also followed by a Latin description of the use: *Ex plantae hujus caulibus conficiuntur corbes et id genus alia*; With the stalks of this plant baskets are made and other similar things.

Although not all specimens are accompanied by a description of their local applications, all plants present in this herbarium appear to be useful plants and are still in use in Suriname today. The collector must have been communicating with Indians who supplied him with information on vernacular names and local uses. Moreover, he has probably been in contact with African slaves as well. Two of the herbarium specimens (*okra*, fol. 1. and *bowangala*, fol. 25) are food crops of African origin and are the first physical evidence of African plants introduced and grown in Suriname. Just like today, *okra* (*Abelmoschus esculentus*) was an important vegetable in West-Africa in 1689 and also served medicinal purposes. This also counts for *bowangala* (*Sesamum radiatum*), a wild relative of sesame seed (*Sesamum indicum*). European slave ships coming from the West-African coast needed to take fresh food aboard before proceeding their journey to the New World. As provision for the WIC's living cargo, African crops crossed the Middle Passage and were afterwards cultivated by slaves in their private gardens behind the plantations (Carney and Rosomoff, 2009).

We know very little about Hendrik Meyer, the mysterious collector of the Suriname Hermann herbarium, whose name was found on the small note stuck to the cover. The index of Suriname plant collectors (Ek, 1991) mentions Meyer as 'probably the collector of Hermann's herbarium present at U', with a reference to Clokie (1964) and Hermann (1687). In his work *Horti Academici Lugduno-Batavi catalogus* (1687), Hermann mentions at least two times that seeds were sent to him from Suriname by 'Henrico Meyero'. As traveling to Suriname in the 17th century was both dangerous and expensive, this might suggest that the plant vouchers in the herbarium have been collected by this person as well. Additional evidence to support this hypothesis was manuscript M.S. 174 from the Bodleian Library, which is a list of specimens from Suriname with short Latin descriptions and local names that correspond exactly to the names found in the Hermann herbarium. This manuscript also mentions "A *Sirinam a Dno Mayer*" ("from Surinam, by Mr. Mayer"), indicating this might be the manuscript accompanying the specimens when they were sent to the Netherlands (Clokie, 1964).

Archival research on personal details of Hendrik Meyer gave few results: the regional archive in The Hague mentions that he returned from Suriname march 5th in 1689 on the ship "de koningin Hester" (NI-HaNa, Sociëteit van Suriname, 1.05.03 inv. nr 219). As Hermann mentions that Meyer sent him seeds from Suriname in 1687, Meyer must have been in the country for at least two years. Ek (1991) lists three other persons who have collected plants in Suriname before Hendrik Meyer: Antonio Chastelein (1661), Cornelis van Aerssen van Sommelsdijck (1682), and Johannes de Haen (1687; 1688; 1689), but these records are not entirely correct. According to Ek (1991), Chastelein's collections should be in one of three herbaria [OXF, BM or B] and his specimens were probably sent to the German merchant and botanist Jacob Breyne (1637-1697). After we contacted these herbaria only the Sloane Herbarium [BM] was able to trace a Chastelein specimen. After examination of the digitalized voucher, it appeared to be a *Syzygium* (a wild relative of the clove, *Syzygium aromaticum*) from the 'Malachian Insula', which is an island near the Moluccas and nowhere near Suriname.

Further research pointed out that there were actually two persons named Antonio Chastelein: a grandfather and a grandson. Although the grandson was mentioned in the collector's index, it was actually the grandfather that sent the specimens, even though we found no evidence that he travelled to Suriname (Breyne, 1680). One of the other 17th century Suriname plant collectors, Cornelis van Aerssen van Sommelsdijck, was a wealthy Dutchman, who owned one third of the Society of Suriname and was governor of the country from the origin of the Society in 1682 until his death in 1687. In that period, he sent many seeds and living plants to the botanical garden in Amsterdam, which sent many European and East Asian plants in return (Brinkman, 1980). The third contemporary Suriname plant collector, Johannes de Haen, supposedly sent specimens from Suriname to Daniël DesMarets in 1687, 1688 and 1689 (Ek, 1991). Hunt et al. (1988) mention that Johannes de Haen was sent to Suriname in 1687 to collect for William the III and received 50 Dutch guilders for this effort. An entire herbarium volume (H.S. 291), consisting of 99 folios with Surinamese plants, was consulted at the DesMarets collection in the Sloane Herbarium, but date nor collector were mentioned anywhere on the pages. While tracing these collectors and their collections, other names appeared in combination with plants from 17th century Suriname. Dandy (1958), who made an inventory of the Sloane Herbarium, mentions six herbaria containing (some) Suriname specimens: H.S. 91, 95, 96, 162, 221 and the already mentioned H.S. 291. H.S. 91, 95 and 96 belonged to Leonard Plukenet, an English botanist who obtained the Suriname specimens from Paul Hermann (via George London) and Daniel DesMarets (possibly via Johannes de Haen). H.S. 162 belonged to another English botanist, Jac.

Petiver. He obtained the specimens from Franz Kiggelaer, a Dutch apothecary, who owned a large botanical collection himself. One of these collections is H.S. 221, with “CXIV Specimina Plantarum ex Surinam a missarum 1690 being the X Vol. of Kiggelaer’s collection” (Dandy, 1958). However, we could not trace any records that mention Kiggelaer ever traveling to Suriname. Moreover, Brinkman (1980) mentions in his unpublished thesis that several Dutch private gardens contained Suriname specimens, like the Hortus Beaumontianus, Hortus Bentingianus, the Hortus of De Flines and the Hortus Flagelianus. From whom these private collectors obtained their seeds remains unclear, as practically no records of living plants sent from Suriname were found. Table 2 lists the early history of European plant collectors in Suriname as far as it was traceable.

| Collector | Period | Plant material collected | Collection | Reference |
|---------------------------------------|-------------|---|------------|--|
| Antonio Chasteleyn | before 1680 | Probably seeds | - | Breyne (1680) |
| Cornelis van Aerssen van Sommelsdijck | 1683-1687 | Seeds, living plants for the Amsterdam hortus? | - | Brinkman (1980); Ek, (1991); Wijnands et al., 1994) |
| Hendrik Meijer | 1687-1689 | Seeds, herbarium vouchers | [L] | Hermann (1687); Van Ooststroom (1939); Brinkman (1980); Hunt et al. (1988); Ek (1991). |
| Johannes de Haen | 1687-1689 | Probably seeds and herbarium vouchers | [BM]? | Hunt et al. (1988), Ek (1991) |
| Franz Kiggelaer | 1690 | Probably herbarium vouchers for the Amsterdam hortus? | [BM] | Brinkman (1980) |
| Maria Sybilla Merian | 1699-1701 | Drawings, seeds and bulbs | - | Ek (1991) |

Table 2. 17th century Suriname plant collectors.

The species lists from the Bodleian Library seem to refer to the specimens present in the Hermann herbarium. One of them (M.S. 174) also contains Latin descriptions and vernacular names, but they do not correspond entirely to those in the Hermann herbarium. The manuscript for example begins with *koerimiaku* (*Renealmia alpinia*) which occupies fol. 24 in the herbarium. For the plant *woenaboe* (*Tephrosia sinapou*, fol. 22), M.S. 174 provides a Latin description of the local use (as a fish poison), while the actual specimen inside the herbarium is not accompanied by any written information other than its vernacular name. M.S. 184 is just a list of vernacular names, but some differences are observed here as well. The *banantis sylvestris* (*Heliconia spathocircinata*, fol. 26 & 49) is called *payrildi* and *wilde banantes* in the manuscript, whereas these names are not mentioned on the herbarium sheets. Moreover, some vernacular names in this manuscript do not seem to correspond to any of the names present in the herbarium: *mangelhud*, *kaiissa*, and *canami*. Of these names, only *canami* seems to refer to one of the specimens (*Tephrosia sinapou*) as many fish poisons in the Guianas are generally called by their Arawak name ‘kunami’ (van Andel, 2000). The other two names cannot be traced back to recent vernacular species names and may have gone extinct.

When we compare the 17th century vernacular names to the present-day vernacular names of the specimens, we can see that for 25 specimens (66%) the local names are still more or less the same today. For thirteen specimens the present-day names are entirely different from those used in 17th century Suriname and the remaining twelve specimens either no 17th century vernacular name was

found or no current vernacular name. Some Indian names (*aribanari*, *kurimiaku*) or other vernacular names (*walhunne* and *baszezam*) could not be traced back in Van Andel (2000), Van 't Klooster et al. (2003), Van Andel & Ruyschaert (2011) or any of the floras of the Guiana's, so they are either misspelled by the collector or may have gone extinct. Of *pinones* and *kokp*. it is not clear which language is used. From the indian vernacular names it is clear that the collectors informant were Carib indians as all indian plant names in the herbarium are Carib (table 1).

For at least fourteen specimens 17th century use is similar to the present-day use of the plants. In other cases either no use was described for the 17th century specimens or no similar use was indicated in recent ethnobotanical literature (table 1).

DISCUSSION

Our research points out that the Hermann Herbarium is the oldest known collection of Suriname plants. Collections made by Johannes de Haen date from the same period, but it still remains unclear whether his vouchers survived and where they can be found. Based on information from Ek (1991) one might assume that the specimens in H.S. 291 [BM] belong to Johannes de Haen, but the volume itself does not provide any prove for this assumption. This seems also the problem with other 17th century collections: in most cases collectors, date of collection and location of collection are not mentioned. When comparing the condition of the Hermann Herbarium to contemporary Suriname plant collections, we can see some important differences. Other collections, such as H.S. 162 and H.S. 221 are collections containing predominantly sterile specimens, which were badly collected. Single leaves and leaflets of various species are scattered across the pages of the bound herbarium and are in most cases not accompanied by any information. Moreover, the overall plant diversity is much lower in these collections, although in most cases, they contain more material. Predominant plant families in these collections are Melastomataceae and Arecaceae. Besides a more diverse overview of important plants in 17th century Suriname, the Hermann herbarium also provides us with the first physical evidence of the cultivation of African crops in Suriname. *Okra* (*Abelmoschus esculentus*) and *bowangala* (*Sesamum radiatum*), which occupy fol.1 and fol.25 respectively, do not appear in any of the other 17th century collections from Suriname. They are, however, present in the Jamaican herbaria of the Irish botanist sir Hans Sloane (1660-1753) who was on expedition to Jamaica from 1687 to 1689 (Dandy, 1958). Although the Surinam Hermann herbarium is the oldest preserved plant collection from Surinam and dates from before Linnaeus, the collection was probably not seen by Linnaeus and thus does not contain any type specimens. The reason Linnaeus did not use this collection for his *Plantae Surinamenses* (1775) is probably because he did not know of its existence. The herbarium was a gift for the politician Hieronymus van Beverningh, who died shortly after receiving the herbarium. It is most likely that the collection was kept either in private possession or was donated to the University Library, but either way it seems as if it was not known to the public or perhaps it was forgotten already. If it would have been seen by Linnaeus, it would of course have been filled entirely with type specimens, but this unfortunately is not the case.

CONCLUSION

The Surinam Hermann herbarium is of great importance to the flora and ethnobotany of Surinam. It is the oldest documentation of local names and uses accompanied by actual vouchers from Surinam and contains the first physical evidence of African crops introduced to Surinam. However, it has not been used by Linnaeus for his *Plantae Surinamenses* (1775) and does not contain any type specimens. All specimens in the herbarium were identified to species level and belong to 30 different plant families. All of the collected plants are of ethnobotanical importance today. It appears that 66% of the 17th century vernacular names and 70% of the 17th century uses have remained until today.

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REFERENCES

- Andel van T. 2000.** The diverse uses of fish-poison plants in Northwest Guyana. *Economic Botany* **54** 500-512.
- Andel, T.R. van, 2000.** Non-timber forest products of the North-West District of Guyana. *Tropenbos-Guyana Series*. PhD thesis, Utrecht University
- Andel van T, Ruyschaert S. 2011.** Medicinale en rituele planten van Suriname. Amsterdam: KIT publishers.
- Blanker JCM, Dubbeldam J. 2005.** Prisma Woordenboek. Sranantongo - Nederlands; NI –Sr.
- Breyne J. 1680.** Prodrromus fasciculi rariorum plantarum. Gdansk.
- Brinkman J. 1980.** Surinaamse planten in Nederland in de zeventiende eeuw. Unpublished master thesis, copy in possession of Tinde van Andel .
- Carnet JA and Rosomoff RN. 2009.** In the Shadow of slavery; Africa's botanical legacy in the Atlantic world. Berkeley, Los Angeles, London: University of California press.
- Clokie HN. 1964.** An account of the herbaria of the Department of Botany in the University of Oxford. Oxford: Oxford University Press.
- Cooper A, Poinar H. 2001.** Ancient DNA: do it right or not at all. *Science* **289** 1139.
- Dandy JE. 1958.** The Sloane Herbarium: an annotated list of the Horti Sicci composing it, with biographical accounts of the principle contributors. London: British Museum.
- Ek R. 1991.** Index of Suriname plant collectors. Koenigstein: Koeltz Scientific Books.
- Hermann P. 1687.** Horti academici Lugduno-Batavi catalogus. Leiden: Boutesteyn.
- Hofreiter M, Poinar HN, Spaulding WG, Bauer K, Martin PS, Possnert G, Pääbo S. 2000.** A molecular analysis of ground sloth diet through the last glaciations. *Mol Ecol* **9** 1975–1984
- Hunt JD, de Jong E. 1988.** The Anglo-Dutch garden in the age of William and Mary. *Journal of Garden history*. London, New York, Philadelphia: Taylor & Francis.
- Jarvis C. 2007.** Order out of Chaos: Linnaean plant names and their types. London: Linnaean Society of London.
- Klooster van 't CIEA, Lindeman JC, Jansen-Jacobs MJ. 2003.** Index of vernacular plant names of Suriname. Leiden: NHN, Universiteit Leiden.
- Lewis CT, Short C. 1975.** A Latin dictionary. Oxford: Clarendon.
- Lier van RAJ. 1977.** Samenleving in een grensgebied: een sociaal-historische studie van Suriname. Amsterdam: S. Emmering.
- Merian MS. 1705.** Metamorphosis insectorum Surinamensis. Amsterdam.
- Muller F, Renkema EH. 1970.** Beknopt Latijns-Nederlands woordenboek. Groningen: Wolters-Noordhoff.
- Ooststroom van SJ. 1939.** An old collection of plants from Surinam in the Rijksherbarium at Leiden. *Rec. Trav. Bot. Néerl.* **36** 526-534.
- Pulle AA. 1968.** Flora of Suriname. Vol 1, Part 2. E.J. Brill, Leiden.
- Ray J. 1686-1704.** Historia plantarum (Vol. 1. 1686; Vol.2 1688; Vol. 3. 1704) Londen: Clark
- Rohland N, Hofreiter M. 2007.** Ancient DNA extraction from bones and teeth. *Nat. Prot.* **2** 1756-62.
- Smit P. 1969.** Paul hermann (1646-1695) Ein Vertreter der niederländischen Botanik des 17 Jahrhunderts. *Wissenschaftliche Beiträge Martin-Luther Universität. Halle.* **2** 69-88.
- Wijnands DO, Zevenhuizen EJA, Heniger J. 1994.** Een sieraad voor de stad: de Amsterdamse Hortus Botanicus 1638-1993. Amsterdam: Amsterdam University Press.