

COLLECTIONS CORNER

DAEMONOROPS, DRACAENA AND OTHER DRAGON'S BLOOD

While trade in medicinal plants attracts much attention—what species come from where, and in what quantity—other plant products such as resins may also need monitoring, especially if the used volumes are increasing and likely to threaten source plant populations. In order to monitor, however, one must be able to identify. Known for centuries, dragon's blood as a name has been applied to resins from quite different species from different continents—but how does one tell them apart?

Lyons (1974) summarised the history and mythology of dragon's blood. Its name originated in the struggle (recorded by Pliny (AD 61–113)) between a dragon-like basilisk and an elephant that, at its climax, led to the mixing of the blood of the two creatures. It was a magical substance, imbued with medicinal properties and much in demand by artists for its colouring. At that time it most likely referred to *Dracaena* spp. (Convallariaceae according to Angiosperm Phylogeny Group 1998) but in the past few centuries the name of dragon's blood has extended to include species of *Croton* (Euphorbiaceae) from Sri Lanka and the New World, and *Daemonorops* (Palmae) from South East Asia. The sort of confusion engendered by their common vernacular name is well shown by *The Modern Herbal* of Mrs Grieve (Grieve 1931) and perpetuated by its online version (<http://www.botanical.com>). Both point out these three genera as sources of dragon's blood but, in an Other Species section following an account of *Daemonorops*, state: "The Malay varieties are from *D. didynophyllos*, *D. micranthus* and *D. propinguis* (*sic*). The Borneo variety is from *D. draconcellus* and others. 'Zanzibar Drop' or Socotrine Dragon's Blood is imported from Bombay and Zanzibar, and is the product of *D. cinnabari*." The latter should in fact refer to *Dracaena cinnabari*, an endemic of Socotra.

The issue of chemical identification of the various resins traded as dragon's blood was tack-

led soon after Prof Bayley Balfour, of the University of Glasgow, returned from his pioneering botanical exploration of Socotra in 1880 (see Balfour 1888). It was he who described *D. cinnabari* and gave a sample of the resin to Glasgow's Professor of Chemistry, James Dobbie, for analysis. This work was then expanded (Dobbie and Henderson 1883) to include *Croton* and *Daemonorops* (*D. draco* then being known as *Calamus draco*). "We resolved," they wrote, "to collect as many varieties as possible of resins passing under the name of dragon's blood and compare them closely with one another." The resins were obtained from three collections (including Kew's Economic Botany Collections; EBC) and analysed according to their solubility and reactions. The immediate findings were that "the resins known as dragon's blood differ widely from one another, not only in their degree of purity, but also in their appearance" and that "specimens labelled as having come from the same locality must, in reality, in some cases, have been derived from very different sources." In other words, the provenance data confused where the resins were obtained with where they originated.

While dragon's blood *sensu lato* has since been investigated for its constituents and activities (see, for example, Pieters et al. (1992) for *Croton* spp., <http://www.ars-grin.gov/cgi-bin/duke/farmacy2.pl> and Arnone et al. (1997) for *Daemonorops* (also Fulling (1953) for its role in the preparation of drawings for publication in this journal!), and González et al. (2000) for the Canary Island species *Dracaena draco*), comprehensive comparative analyses with a view to identification are less frequent. Using Raman spectroscopy, Edwards et al. (1997) were able to distinguish fresh resins of *Dracaena cinnabari* and *Daemonorops draco* (as well as a less well known dragon's blood, an ant gall residue on the bark of *Eucalyptus terminalis*). How these results might compare with those from older, de-



Fig. 1. Five purported samples of dragon's blood from *Dracaena cinnabari*. Clockwise from top left: Schweinfurth's 1881 collection (EBC 36599) from Socotra; a rather marble-like sample (EBC 36580), overall a dark brown with many tiny gleaming facets, purchased in 'Kurrachi' (Karachi?) and possibly not *Dracaena* at all; finest grade (known as *Edah Amsellah*) collected by Balfour (EBC 36773); an unusually large (6 × 4 cm), very deep red lump (EBC 36543) first presented to the Pharmaceutical Society in 1875, of unknown provenance and resembling the lump of *Daemonorops propinquus* in Fig. 2; lowest grade resin collected by Balfour (EBC 36809), comprising roughly textured nuggets up to 2 cm across, often with one or two flat surfaces, dull reddish brown in colour with paler material (bark?) mixed in. (All photographs by A. McRobb, RBG Kew.)

graded historical or archaeological specimens is still unknown but would clearly be of interest, not least, for example, for those involved in the conservation or restoration of medieval paint-



Fig. 2. A lump of *Daemonorops propinquus* (EBC 35482) from Perak (Malaysia), donated in 1886. Its greatest dimension is 15.5 cm, and it has a smooth, mostly purple surface, matt red where this has been scraped.

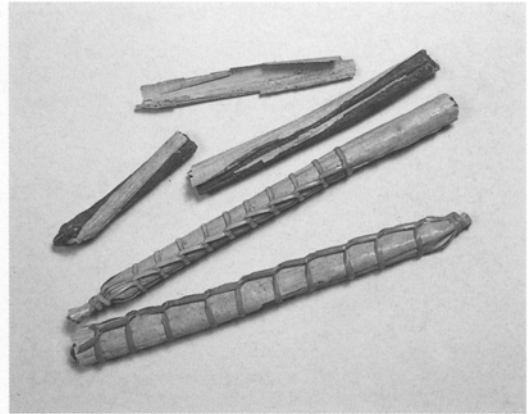


Fig. 3. Purported samples of dragon's blood from *Dracaena draco* (EBC 36516). Of unknown provenance, they are up to 18 cm long, and wrapped in leaf material and bound with what looks like thin strips of cane (see Fig. 4).

ings where dragon's blood was used as a pigment.

Morphological examination shows the difficulty of separating older resins of the different genera (Pearson 2001). Of the 15 *Dracaena* resin samples in the EBC with certain geographic origins, most are of *D. cinnabari* from Socotra (Balfour himself being the main collector), others are of *D. draco* from the islands of Macaronesia, and there is one of *D. schizantha*, purchased in Zanzibar in 1871. On Socotra, Balfour (1888) noted that "the gum resin exudes in tears from the stem of the tree, and is collected after the rains" and that there are three grades of it: the most valuable being tear-like in appearance, followed by one made of small chips and frag-

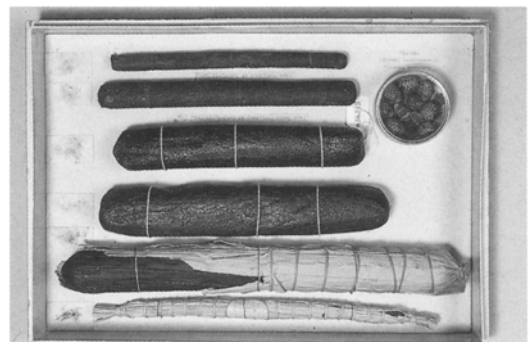


Fig. 4. Sausage-like dragon's blood from *Daemonorops propinquus*. (EBC 56395). The largest so-called 'pipe' is 32 cm long. Each is covered as in Fig. 3. The fruits in the round tin are up to 1.5 cm long.



Fig. 5. Fruits of *Daemonorops propinquus* covered with dragon's blood exudate (EBC 35500). They were obtained from Sumatra in 1896 by H. N. Ridley (director of Singapore Botanic Garden and commonly regarded as the founder of the Malayan rubber industry).

ments, and the cheapest being a molten mixture of fragments and refuse (bottom left, Fig. 1). A top grade Balfour collection does indeed look tear-like (bottom right, Fig. 1), the pieces about 1 cm across, and covered in fine, rust red powder; some surfaces, perhaps where the pieces have been broken, have a lustrous appearance. In 1881 Georg Schweinfurth visited Socotra and his collection has pieces with an angular, dark red/black and distinctly shiny appearance (top left, Fig. 1). One sample purporting to be from Socotra is very different again. Here the resin is in the form of dark, brown-red sticks wrapped in leaves (Fig. 3). This looks so like a specimen



Fig. 6. Sausage-like sample of *Croton aromaticus* from Sri Lanka, 9.0 cm and containing many bark fragments (EBC 43870). It rests on a bed of such fragments, on whose surface small remnants of resin are visible.

of *Daemonorops propinquus* (Fig. 4) that its identity must be questioned. The resin of *Daemonorops* exudes from the fruits (Fig. 5) so any trace of these in an unknown sample excludes the other genera as a source. The forms of the three dragon's blood samples of *Croton* in the EBC include a sausage-like one of *C. aromaticus* (Fig. 6; like *D. propinquus*), uneven lumps of an unnamed species from Venezuela (called *sangre de drago*), with shiny, sharp-edged coal-like surfaces, and the dull rusty powder of *C. gossypifolius* from Trinidad.

Dragon's blood can easily be purchased. Coppen (1995) gave prices of \$60.00/kg for Indonesian origin material (presumably *Daemonorops*) and up to \$33/kg for unnamed material from the Middle East. On two Internet sites in September 2001 specified *D. propinquus* or *D. draco* resin was on sale at \$3.95–\$5.50/oz (\$141–\$187/kg). Most sites, however, give neither the botanical name nor the source of the material offered for sale so it is not possible to make much sense of prices, especially given discounts for the ordering of larger quantities. There is clearly much scope for acquiring, analysing and comparing all sorts of dragon's blood, both old and new, and building the capacity for identifying samples of unknown provenance.

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LITERATURE CITED

- Angiosperm Phylogeny Group.** 1998. An ordinal classification for the families of flowering plants. *Annals of the Missouri Botanical Garden* 85:531–553.
- Arnone, A., G. Nasini, O. V. de Pava, and L. Merlini.** 1997. Constituents of dragon's blood. 5. Draconflavans B₁, B₂, C₁, C₂, D₁, D₂, new A-type deoxyproanthocyanidins. *Journal of Natural Products* 60: 971–975.
- Balfour, I. B.** 1888. Botany of Socotra. *Transactions of the Royal Society of Edinburgh* 31.
- Coppen, J. J. W.** 1995. Gums, resins and latexes of plant origin. Non-wood forest products 6. FAO, Rome.
- Dobbie, J. J., and G. G. Henderson.** 1883. The classification and properties of red resins known under the name of dragon's blood. W.L. Richardson, London.
- Edwards, H. G. M., D. W. Farwell, and A. Quye.** 1997. 'Dragon's blood' I—characterization of an ancient resin using Fourier transform Raman spec-

- troscopy *Journal of Raman Spectroscopy* 28 243–249
- Fulling, E. H.** 1953 Dragon's blood *Economic Botany* 7 227
- González, A. G., F. León, L. Sánchez-Pinto, J. I. Padrón, and J. Bermejo.** 2000 Phenolic compounds of dragon's blood from *Dracaena draco* *Journal of Natural Products* 63 1297–1299
- Grieve, M.** 1931 *A modern herbal* Jonathan Cape, London (Reprinted 1980 by Penguin, London)
- Lyons, G.** 1974 In search of dragons or the plant that roared. *Cactus & Succulent Journal* 44 267–282
- Pearson, J.** 2001 *Dracaena*, a source of dragons blood resin the history, botany and analysis of the dragon's blood collection at the Royal Botanic Gardens, Kew Unpublished Kew Diploma in Horticulture dissertation
- Pieters, L, T. de Bruyne, G. Mei, G. Lemiere, D. vanden Berghe, and A. J. Vlietinck.** 1992 *In vitro* and *in vivo* biological activity of South American dragon's blood and its constituents *Planta Medica* 58 582–583
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