

# Reserva Biológica Allpahuayo-Mishana, Iquitos, Loreto, PERU

## Photo Guide to the **BURSERACEAE** of Allpahuayo-Mishana

(Useful throughout the western Amazon)

by  
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Photos: Paul Fine. Produced by: P. Fine, S. Kaplan, M. Giblin, T. Wachter, R. Foster. Support from: A. Mellon Foundation and G. & B. Moore Foundation.  
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*Protium sagotianum*

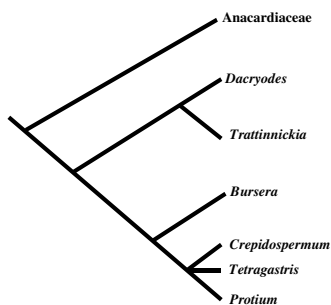
Burseraceae is a cosmopolitan family of mostly lowland tropical trees and shrubs. In Peru, it is represented by six genera (five can be found in the Amazon basin and are included in this guide) and around 45 species. At least 36 of these species have been collected in the Allpahuayo-Mishana Reserve near Iquitos (Loreto). Most of these species have wide distributions; therefore, this 34-species photo key will be useful for most areas throughout the western Amazon. For more Burseraceae pictures from the Neotropics, please see <http://fm2.fieldmuseum.org/plantguides/default.asp>.

### Identifying Burseraceae

This guide is designed for identifying saplings and seedlings of Burseraceae plants, between ~1m and 2m in height. Burseraceae saplings have alternate, pinnately compound leaves and (with few exceptions) a distinctive odiferous resin. This resin is present in the twigs, the leaves, and the trunk of the tree, and when apparent, it is either a clear sticky resin (which often dries white) or a milky white latex. Burseracs almost always have a distinctive odor: they either smell sweet or have a strong incense or sharp turpentine odor. Even the sweet-smelling species have a trace of the incense odors that add a unique depth to the scent that separates them from other sweet-smelling trees, for example, the Meliaceae. Other families have compound leaves and distinctive odors, like the two closely related families Anacardiaceae and Rutaceae, which can have resins and/or odors. Anacards generally have a clear resin and smell more like mangoes, and their resin almost always dries black. Rutaceae have no resin, but have a citrus-like odor.

Many of the characters presented in this guide can also be used for much larger individuals, including adults. Keep in mind that for leaves in the canopy, many of the compound leaves become thicker, smaller, with fewer leaflets, and often exhibit somewhat less distinctive venation patterns. Also worth noting is that in very small seedlings (less than 50cm in height), many of these species have simple leaves – so although the odor and venation patterns of the single first leaves can help you get to a species identification, the information concerning number and size of the leaflets in this guide will be of no help.

### Intrafamilial relationships



**Figure 1:** Phylogenetic relationships of the named genera in the Burseraceae

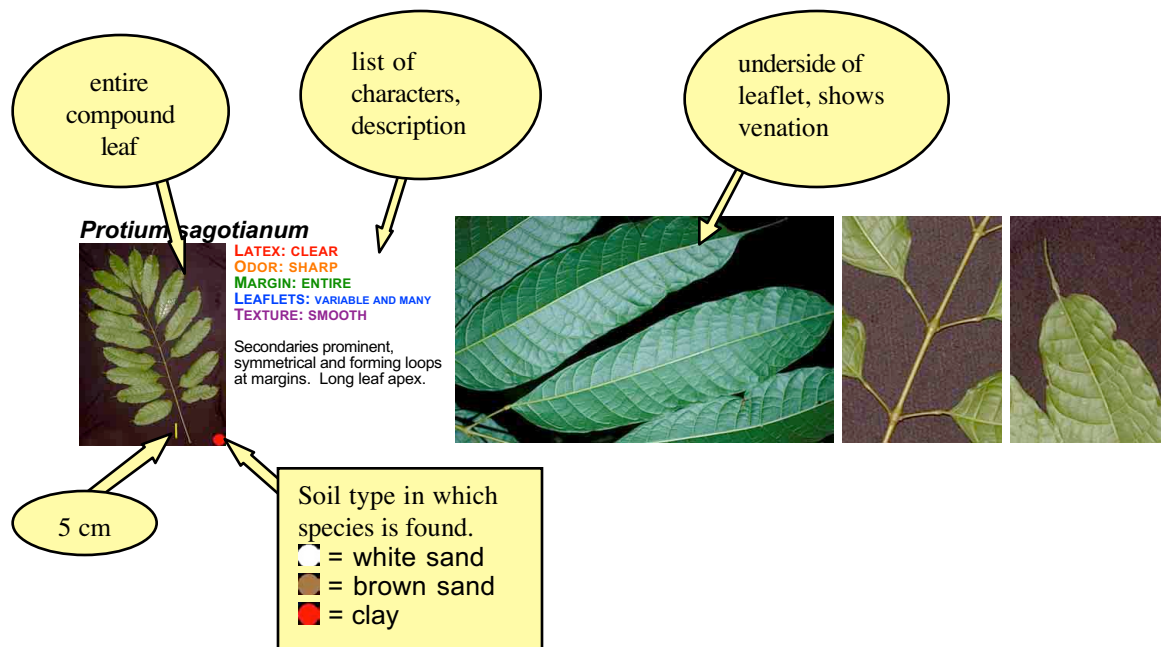
As seen in Figure 1, the intrafamilial relationships of the Peruvian Burseraceae genera are not completely worked out. While morphological and molecular evidence strongly support the idea that the Canariie (*Dacryodes* and *Trattinnickia*) are each others' closest relatives, and the Protieae (*Crepidospermum*, *Tetragastris*, and *Protium*) form a natural group, whether or not these five genera form a monophyletic groups is not resolved. Recent molecular work has shown that there may be species of *Protium* that are more closely related to *Tetragastris* and *Crepidospermum* than they are to other *Protium* species. Similarly, a recent unpublished analysis of *Dacryodes* and *Trattinnickia* found that *Dacryodes cuspidata* appeared to be as closely related to *Trattinnickia* as it was to other *Dacryodes* species. While research continues on the classification of these

groups, we can still recognize many natural groups in the field. This guide is focused on the species level, and while some of the genera do form recognizable natural groups (like *Crepidospermum*), most of the species are best separated using the combination of characters I have devised for field identification.

### How to use this guide

All of the 36 species included are listed with at least 3 photos. The largest photo is the underside of a single leaflet, emphasizing my belief that the venation pattern on the underside of the leaf is ultimately the best character in telling apart Burseraceae trees. There is a smaller picture of the entire compound leaf, with a yellow 5cm scale bar. Then there are one or two small pictures that focus in on the unique characteristics of the species that will help to clinch the identification. Below each species' name is a white box with the list of characters I have used to help separate the species. The characters are 1) latex (resin), 2) odor, 3) leaf margin, 4) size and number of leaflets and 5) leaf texture.

On the compound leaf picture, with the scale bar, are one or two colored circles – white, brown and red. These colors correspond with the soil types in which the species have been found in my extensive Burseraceae inventories at Allpahuayo-Mishana (Fine et al. in press). White stands for white sand forest, brown is for “brown sand” or eroded river terraces, a common sandy clay soil type found in Allpahuayo-Mishana. Red is for clay soil. These soil types can be verified in the field by digging a machete several centimeters below the litter layer and checking the consistency of the soil (sandy or clayey) and the color of the soil. Clay can be gray, red, or purple; brown sand can be reddish-orange to brown; and white sand can be gray or white, fine or coarse sand. If a species is found in two soil types, its more common soil type is on the bottom.



### Burseraceae References:

- Clarkson, J. J., Chase, M. W., Harley, M. M. 2002. Phylogenetic relationships in Burseraceae based on plastid rps16 intron sequences. *Kew Bulletin* 57:183-193.
- Daly, D. C. 1987. A Taxonomic Revision of *Protium* (Burseraceae) in Eastern Amazonia and the Guianas. Ph.D. thesis (City University of New York), New York, NY.
- Fine, P. V. A., Daly, D. C., Villa Muñoz, G., Mesones, I., Cameron, K. *in press*. The contribution of edaphic heterogeneity to the evolution and diversity of Burseraceae trees in the western Amazon. *Evolution*.
- Weeks, A., Daly, D. C., Simpson, B. B. 2005. The phylogenetic history and biogeography of the frankincense and myrrh family (Burseraceae) based on nuclear and chloroplast sequence data. *Molecular Phylogenetics and Evolution* 35:85-101.

## Asperous Leaves: DACRYODES (1) & TRATTINNICKIA

### *Dacryodes cuspidata*



**LATEX: CLEAR**  
**ODOR: SWEET**  
**MARGIN: ENTIRE**  
**LEAFLETS: SMALL AND FEW**  
**TEXTURE: ASPEROUS**

*Protium*-like petiolules,  
irregular leaflet margin and  
venation.



### *Trattinnickia glaziovii*



**LATEX: CLEAR**  
**ODOR: SHARP**  
**MARGIN: ENTIRE**  
**LEAFLETS: SMALL AND MANY**  
**TEXTURE: ASPEROUS**

Leaflets are papery with long  
apices, petiolules are long  
and thin.



### *Trattinnickia peruviana*



**LATEX: CLEAR**  
**ODOR: SHARP**  
**MARGIN: ENTIRE**  
**LEAFLETS: LARGE AND MANY**  
**TEXTURE: ASPEROUS**

Leaflets are subcoriaceous  
with short apices.



## Serrated Margins: CREPIDOSPERMUM (+ 2 Protium on following page)

### *Crepidospermum goudotianum*



**LATEX:** CLEAR  
**ODOR:** SWEET  
**MARGIN:** SERRATED  
**LEAFLETS:** SMALL AND MANY  
**TEXTURE:** SMOOTH

Like *P. subserratum*, but no white latex, and veins terminate in the margins' teeth.



### *Crepidospermum prancei*



**LATEX:** CLEAR  
**ODOR:** SWEET  
**MARGIN:** SERRATED  
**LEAFLETS:** LARGE AND MANY  
**TEXTURE:** SMOOTH

No petiolules, dense hairs on leaf and rachis.

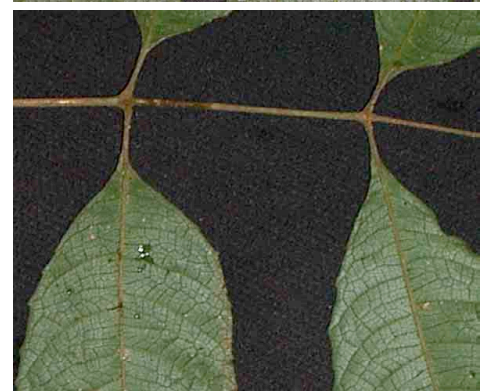


### *Crepidospermum rhoifolium*



**LATEX:** CLEAR  
**ODOR:** SWEET  
**MARGIN:** SERRATED  
**LEAFLETS:** LARGE AND MANY  
**TEXTURE:** SMOOTH

Can be hairy like *prancei*, but distinct petiolules.



### *Protium subserratum*



**LATEX: WHITE**  
**ODOR: NONE**  
**MARGIN: SERRATED**  
**LEAFLETS: SMALL AND MANY**  
**TEXTURE: SMOOTH**

Leaflets sessile, no distinct petiolules. Larger individuals can have entire leaflets.



### *Protium ferrugineum*



**LATEX: WHITE**  
**ODOR: NONE**  
**MARGIN: SERRATED**  
**LEAFLETS: SMALL AND MANY**  
**TEXTURE: SMOOTH**

Well-defined petiolules, larger individuals always have entire leaflets.



### *Protium gallosum*



**LATEX: WHITE**  
**ODOR: NONE**  
**MARGIN: ENTIRE**  
**LEAFLETS: LARGE AND FEW**  
**TEXTURE: SMOOTH**

Glabrous and very shiny leaflet surface, with a long apex.

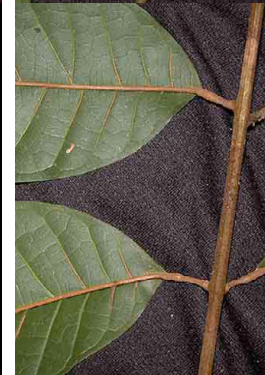


### *Protium amazonicum*



**LATEX: WHITE**  
**ODOR: NONE**  
**MARGIN: ENTIRE**  
**LEAFLETS: LARGE AND MANY**  
**TEXTURE: SMOOTH**

Dull leaf surface, midveins often hairy and reddish, short leaflet apex.



### ***Protium calanense***



**LATEX: CLEAR**  
**ODOR: SHARP**  
**MARGIN: ENTIRE**  
**LEAFLETS: SMALL AND FEW**  
**TEXTURE: SMOOTH**

Sometimes labeled *P. aracouchini*.  
Secondaries prominent. Completely  
glabrous underside that reflects light  
(unlike similar *spruceanum* and  
*krukoffii*).



### ***Protium altsonii***



**LATEX: CLEAR**  
**ODOR: SHARP**  
**MARGIN: ENTIRE**  
**LFLTS: SMALL AND MANY**  
**TEXTURE: SMOOTH**

Secondary veins are not prominent,  
glabrous leaflet underside reflects  
light.



### ***Protium heptaphyllum* subsp. *ulei***



**LATEX: CLEAR**  
**ODOR: SHARP**  
**MARGIN: ENTIRE**  
**LFLTS: SMALL AND FEW**  
**TEXTURE: SMOOTH**

Secondaries not prominent,  
glabrous underside that reflects  
light. Similar *altsonii* always has  
many pairs of leaflets; *heptaphyllum*  
never does.



### ***Protium hebetatum***



**LATEX: CLEAR**  
**ODOR: SWEET**  
**MARGIN: UNDULATING**  
**LFLTS: SMALL AND MANY**  
**TEXTURE: SMOOTH**

Underside of leaf can be hairy.  
Secondaries prominent and  
brochydromous and close, well in  
from the margin.

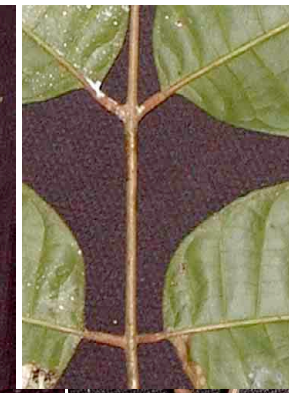


### *Dacryodes peruviana*



**LATEX:** CLEAR  
**ODOR:** SWEET  
**MARGIN:** ENTIRE  
**LEAFLETS:** LARGE AND MANY  
**TEXTURE:** SMOOTH

No petiolar swellings, indistinct tertiaries, and sweeter odor separate from similar *P. nodulosum*.



### *Protium grandifolium*



**LATEX:** CLEAR  
**ODOR:** SWEET  
**MARGIN:** ENTIRE  
**LEAFLETS:** LARGE AND MANY  
**TEXTURE:** SMOOTH

Very symmetrical, prominent secondaries. Thicker leaves and stronger smelling latex than similar *P. opacum*.



### *Protium opacum*



**LATEX:** NONE (OR CLEAR)  
**ODOR:** SWEET OR NONE  
**MARGIN:** ENTIRE  
**LEAFLETS:** LARGE AND VARIABLE  
**TEXTURE:** SMOOTH

Golden spots on rachis and branchlets. Leaf very similar to *P. nodulosum* but no turpentine odor, and has a more papery texture.



### *Protium nodulosum*

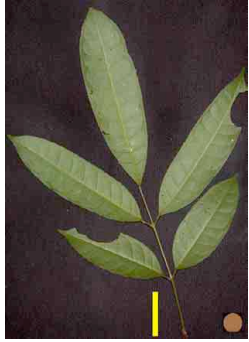


**LATEX:** CLEAR  
**ODOR:** SHARP  
**MARGIN:** ENTIRE  
**LEAFLETS:** LARGE AND MANY  
**TEXTURE:** SMOOTH

Unique yellowish green color of leaf underside. Like *P. opacum* but with oily latex that has a very strong turpentine odor and dries to a visible white powder.



### ***Protium decandrum***



**LATEX: CLEAR**

**ODOR: SWEET**

**MARGIN: ENTIRE**

**LEAFLETS: LARGE AND FEW**

**TEXTURE: SMOOTH**

Short distance between petiole and basal leaflets. Prominent secondaries on adaxial side but prominent midvein on leaflet underside (unlike similar *paniculatum*).



### ***Protium divaricatum* subsp. *divaricatum***



**LATEX: CLEAR**

**ODOR: SHARP**

**MARGIN: ENTIRE**

**LEAFLETS: LARGE AND FEW**

**TEXTURE: SMOOTH**

Leaves almost always trifoliate. Fibrous corky wood in center of branchlets.



### ***Protium paniculatum***



**LATEX: CLEAR**

**ODOR: SHARP**

**MARGIN: ENTIRE**

**LEAFLETS: LARGE AND FEW**

**TEXTURE: SMOOTH**

Yellowish midvein is imbedded in leaf underside, smooth to the touch. Very strongly turpentine-smelling resin dries white. Trees produce collectable resin lumps (*copal*).



### ***Protium pallidum***



**LATEX: CLEAR**

**ODOR: SWEET**

**MARGIN: ENTIRE**

**LEAFLETS: LARGE AND MANY**

**TEXTURE: SMOOTH**

White nodes on petiolule and leaf rachis are unique. Prominent secondaries on adaxial surface, smooth and inconspicuous on leaf underside.





### *Protium glabrescens*



**LATEX:** CLEAR  
**ODOR:** SWEET  
**MARGIN:** ENTIRE  
**LEAFLETS:** LARGE AND MANY  
**TEXTURE:** SMOOTH

Large nodes where leaflets attach. Secondaries do not form loops at margin. Very sticky, strongly sweet-smelling resin.



### *Tetragastris panamensis*



**LATEX:** CLEAR  
**ODOR:** SWEET  
**MARGIN:** ENTIRE  
**LEAFLETS:** LARGE AND MANY  
**TEXTURE:** SMOOTH

No petiolar swellings. Often a reddish mark at nodes of leaflet attachment.



### *Protium sagotianum*



**LATEX:** CLEAR  
**ODOR:** SHARP  
**MARGIN:** ENTIRE  
**LEAFLETS:** VARIABLE AND MANY  
**TEXTURE:** SMOOTH

Secondaries prominent, symmetrical and forming loops at margins. Long leaf apex.



### *Protium tenuifolium*



**LATEX:** CLEAR  
**ODOR:** SHARP  
**MARGIN:** ENTIRE  
**LEAFLETS:** LARGE AND MANY  
**TEXTURE:** SMOOTH

Secondaries prominent and symmetrical. Leaf apex shorter than similar *P. sagotianum*.



### *Protium krukoffii*



**LATEX:** CLEAR  
**ODOR:** SHARP  
**MARGIN:** ENTIRE  
**LEAFLETS:** SMALL AND MANY  
**TEXTURE:** SMOOTH

Dull leaf surface, leaf apex often toothed, lanceolate leaf shape. Secondaries prominent. Fewer secondaries and intersecondaries than similar *P. spruceanum*.



### *Protium spruceanum*



**LATEX:** CLEAR  
**ODOR:** SHARP  
**MARGIN:** ENTIRE  
**LEAFLETS:** SMALL AND MANY  
**TEXTURE:** SMOOTH

Dull leaf surface, leaf apex toothed, more ovate leaflet shape. Secondaries prominent. More secondaries and intersecondaries than *P. krukoffii*.



### *Protium trifoliolatum*

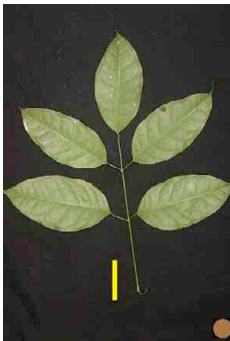


**LATEX:** CLEAR  
**ODOR:** SWEET  
**MARGIN:** ENTIRE  
**LEAFLETS:** SMALL AND FEW  
**TEXTURE:** SMOOTH

Secondaries prominent and asymmetrical. Leaflet base very cuneate. Often hairy.



### *Protium divaricatum* subsp. *krukoffii*



**LATEX:** CLEAR  
**ODOR:** SHARP  
**MARGIN:** ENTIRE  
**LEAFLETS:** SMALL AND FEW  
**TEXTURE:** SMOOTH

Petiolules and rachis long and thin. Prominent midvein, but not sharp like *crassipetalum*.



### *Dacryodes chimatensis*



**LATEX:** CLEAR  
**ODOR:** SWEET  
**MARGIN:** ENTIRE  
**LEAFLETS:** LARGE AND MANY  
**TEXTURE:** SMOOTH

Coriaceous and completely glabrous leaflets, no petiolar swellings.



### *Dacryodes hopkinsii*



**LATEX:** CLEAR  
**ODOR:** SHARP  
**MARGIN:** ENTIRE  
**LEAFLETS:** VARIABLE AND MANY  
**TEXTURE:** SMOOTH

Basal leaflets tiny with asymmetrical base. Indistinct tertiary veins.

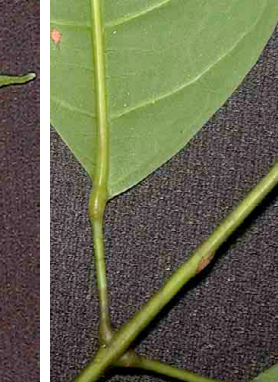


### *Protium crassipetalum*



**LATEX:** NONE  
**ODOR:** NONE (SWEET)  
**MARGIN:** ENTIRE  
**LEAFLETS:** LARGE AND MANY  
**TEXTURE:** SMOOTH

Long, green cylindrical petiole, leaflet midveins very prominent (feels like knife edge).



### *Protium klugii*



**LATEX:** NONE  
**ODOR:** NONE  
**MARGIN:** ENTIRE  
**LEAFLETS:** LARGE AND MANY  
**TEXTURE:** SMOOTH

Winged rachis and petiolules. Yellow latex often present in trunk slash in larger trees.

