

## Supplementary Material

# Origin and function of amino acids in nectar and nectaries of *Pitcairnia* species with particular emphasis on alanine and glutamine

Author: Thomas Göttlinger\*, Gertrud Lohaus

\*Correspondence: Thomas Göttlinger (goettlinger@uni-wuppertal.de)

Supplementary Table S1: Main features of all examined *Pitcairnia* species.

Species	Botanical garden	Main pollinator	Inflorescence type	Flower length [cm]	Floral bracts	Flower sepal	Flower petal	Group	Leaf samples	Nectary samples	Nectar samples	Enzyme assay
<i>P. albolutea</i>	Berlin	tro	spike	8.0	greenish	yellow	white	yellow/white sepals& petals	✓	✓	✓	-
<i>P. altensteinii</i> <i>var. altensteinii</i>	Berlin	tro	spike	5.5	yellow	yellow	white	yellow/white sepals& petals	✓	-	✓	-
<i>P. angustifolia</i>	Berlin	tro	raceme	5.5	greenish	reddish	reddish	reddish sepals & petals	✓	✓	✓	✓
<i>P. atrorubens</i>	Heidelberg	tro	spike	4.0	reddish	yellow	yellow	reddish bracts	✓	-	✓	-
<i>P. breedlovei</i>	Heidelberg	tro	raceme	5.0	reddish	yellow	yellow	yellow/white sepals& petals	✓	-	✓	-
<i>P. bromeliifolia</i>	Berlin	tro	raceme	4.5	reddish	reddish	reddish	reddish sepals & petals	✓	-	✓	-
<i>P. capixaba</i>	Berlin	tro	raceme	6.5	greenish	yellow	white	yellow/white sepals& petals	✓	✓	✓	✓
<i>P. carnososepala</i>	Berlin	tro	raceme	7.5	reddish	reddish	reddish	reddish sepals & petals	✓	-	✓	-
<i>P. chiapensis</i>	Berlin	tro	raceme	5.0	greenish	yellow	yellow	yellow/white sepals& petals	✓	-	✓	-
<i>P. chiriquensis</i>	Berlin	tro	panicle	4.5	reddish	reddish	reddish	reddish sepals & petals	✓	-	✓	-
<i>P. corallina</i>	Berlin	tro	raceme	7.0	reddish	reddish	reddish	reddish sepals & petals	✓	-	✓	-
<i>P. echinata</i> <i>var. vallisensis</i>	Berlin	tro	panicle	4.5	greenish	reddish	reddish	reddish sepals & petals	✓	-	✓	-
<i>P. flagellaris</i>	Berlin	tro	spike	6.5	reddish	yellow	yellow	reddish bracts	✓	-	✓	-
<i>P. imbricata</i>	Stuttgart	tro	spike	5.0	reddish	yellow	yellow	reddish bracts	✓	✓	✓	✓

<i>P. integrifolia</i>	Berlin	tro	raceme	4.0	greenish	reddish	reddish	reddish sepals & petals	✓	✓	✓	-
<i>P. jimenezii</i>	Heidelberg	tro	raceme	5.0	greenish	reddish	reddish	reddish sepals & petals	✓	-	✓	-
<i>P. longisimiflora</i>	Berlin	chi	raceme	9.5	greenish	greenish	white	greenish/white sepals & petals	✓	✓	✓	✓
<i>P. maidifolia</i>	Stuttgart	tro	spike	5.0	reddish	white	white	reddish bracts	✓	✓	✓	✓
<i>P. nigra</i> var. <i>nigra</i>	Berlin	tro	spike	8.0	reddish	reddish	reddish	reddish sepals & petals	✓	✓	✓	-
<i>P. oliva-estevae</i>	Berlin	tro	spike	5.0	reddish	reddish	white	reddish bracts	✓	✓	✓	✓
<i>P. orchidifolia</i>	Berlin	tro	raceme	4.5	greenish	reddish	reddish	reddish sepals & petals	✓	-	✓	-
<i>P. poeppigiana</i>	Berlin	tro	spike	7.0	greenish	reddish	reddish	reddish sepals & petals	✓	✓	✓	✓
<i>P. recurvata</i>	Berlin	chi	spike	7.0	greenish	greenish	white	greenish/white sepals & petals	✓	✓	✓	-
<i>P. rubronigriflora</i>	Berlin	tro	raceme	4.5	reddish	reddish	reddish	reddish sepals & petals	✓	-	✓	-
<i>P. sceptrigera</i>	Berlin	tro	spike	6.5	greenish	yellow	yellow	yellow/white sepals & petals	✓	✓	✓	✓
<i>P. spicata</i>	Heidelberg	tro	spike	5.0	reddish	reddish	reddish	reddish sepals & petals	✓	-	✓	-
<i>P. sprucei</i>	Berlin	tro	raceme	5.5	reddish	reddish	reddish	reddish sepals & petals	✓	-	✓	-
<i>P. suaveolens</i>	Berlin	tro	raceme	5.0	greenish	yellow	white	yellow/white sepals & petals	✓	-	✓	-
<i>P. utcubambensis</i>	Berlin	tro	panicle	4.0	reddish	reddish	reddish	reddish sepals & petals	✓	-	✓	-
<i>P. wendlandii</i>	Berlin	tro	spike	5.5	reddish	yellow	yellow	reddish bracts	✓	✓	✓	✓

tro = trochilophilous; chi = chiropterophilous

**Supplementary Table S2:** Results of the PERMANOVA and PERMDISP of three component groups: (A) amino acids, (B) sugars and inorganic ions, (C) Alanine. Data on leaves, nectaries, and nectar of four *Pitcairnia* species with red flowers or bracts and four *Pitcairnia* species with yellow/white or greenish/white flowers were used for the calculations. The significance level (\*) for both methods is  $p \leq 0.001$ .

	Degrees of Freedom (df)	Pseudo-F (F)	R <sup>2</sup>	PERMANOVA <i>p</i> -value	PERMDISP <i>p</i> -value
<b>(A) Amino acids</b>					
Flower colour	1	29.95	0.58	0.001 *	0.001
Residuals	22		0.42		
Total	23		1.00		
<b>(B) Sugars, inorganic ions</b>					
Flower colour	1	7.68	0.26	0.001 *	0.007
Residuals	22		0.74		
Total	23		1.00		
<b>(C) Alanine</b>					
Flower colour	1	97.54	0.82	0.001 *	0.038
Residuals	22		0.18		
Total	23		1.00		

**Supplementary Table S3:** Ratio of different compounds in leaves, nectaries and nectar of *Pitcairnia* species separated by flower colour.

Flower colour	Tissue	Reddish sepals & petals	Reddish bracts	Yellow/white sepals & petals	Greenish/white sepals & petals
Sugars/amino acids	Leaf	5.4 ± 4.0	4.6 ± 2.9	6.8 ± 7.5	7.0 ± 1.7
	Nectaries	5.9 ± 2.9	5.0 ± 3.6	3.8 ± 1.1	7.5 ± 1.8
	Nectar	81.7 ± 112.7	244.1 ± 351.6	1076.8 ± 1018.0	759.8 ± 222.4
Sugars/inorg. ions	Leaf	0.1 ± 0.1	0.1 ± 0.1	0.1 ± 0.1	0.4 ± 0.4
	Nectaries	1.5 ± 1.0	1.2 ± 0.8	1.2 ± 0.8	1.9 ± 0.6
	Nectar	166.3 ± 141.0	213.3 ± 161.1	99.5 ± 65.6	80.0 ± 38.7