

Note on the Identity of the Introduced Passionflower Vine "Banana Poka" in Hawaii¹

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THE AGGRESSIVE ALIEN VINE known in Hawaii as "banana poka" has been identified as *Passiflora mollissima* (HBK.) Bailey, *P. mixta* L., or an introgressive hybrid between *P. mollissima* and some unnamed species due to its atypical morphology (Mueller-Dombois 1975; Mueller-Dombois et al. 1980). Its widespread distribution and destructive impact, particularly in the commercially valuable *Acacia koa* forests, makes it the primary pest in Hawaiian forestry. It is beyond conventional eradication techniques, and all hope of control rests on biological control. Determination of the correct taxonomic status of this taxon is an important initial step in any bio-control work (Bosch and Messenger 1973). This paper reports a comparative analysis of Hawaiian material against type and other collections of this species complex.

Morphological characters were measured on fresh specimens of a random sample of 100 individuals of *P. mollissima* from Hualalai, Laupahoehoe, and Olaa, Hawaii. Fresh and dried specimens were examined and the general form and variability in qualitative characters listed. Hawaiian material was compared with a photograph of the isotype of *P. mollissima* (NY!-holotype destroyed), the original species description (Humboldt et al. 1817), and 64 specimens of South American origin obtained from US!, FM!, and NY!. An additional 220 specimens of those species which hybridize with *P. mollissima*, including *P.*

mixta, *P. cumbalensis* (Karst.) Harms, *P. mollissima* Cav., and *P. tripartita* (Juss.) Poir., were also examined.

Passiflora mollissima is a morphologically variable taxon, but most quantitative characters fall within the range of South American populations of this taxon (Table 1). Although Hawaiian material is similar to *P. mixta*, with which it has been confused, it is closest to *P. mollissima* (Table 1). A comparison of specimens of *P. mollissima* from Hawaii and South America reveals that most characters fall within the range of characters of *P. mollissima sensu* Escobar (1980). Comparisons of quantitative characters of specimens from the two areas illustrate the inherent morphological variability in this taxon (Table 1). Generally, characters are more constant within the Hawaiian population, with the exception of leaf width, petiole length, and fruit length, which are more variable and, on the average, slightly larger in Hawaii.

The nature of the fused calyx tube (hypanthium), particularly the ratio of its length to that of the free sepals and petals, is often a diagnostic character in the subgenus *Tacsonia* (Escobar 1980). This ratio differs in "typical" Hawaiian and South American specimens (Table 1). The "atypical" flowers of the Hawaiian population have undoubtedly been responsible for much of the confusion surrounding the identity of this taxon.

Individuals of *P. mollissima* from South America are generally densely pubescent on all surfaces (except flowers). In contrast, the pubescence is often sparse or absent on Hawaiian plants. Upper leaf surfaces are invariably glabrous or glabrescent. This latter character has probably misled some investigators to identify the Hawaiian taxon as *P. mixta*. Several additional discrepancies deserve note: the leaves are generally more

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TABLE 1

COMPARISON OF SOME DESCRIPTIVE CHARACTERS OF THE HAWAIIAN REPRESENTATIVES OF *Passiflora mollissima* (HBK.) BAILEY WITH SOUTH AMERICAN FORMS OF *P. mollissima* AND *P. mixta* L.

CHARACTER	LOCALITY	MEAN		RANGE	
		<i>P. mollissima</i>	<i>P. mixta</i>	<i>P. mollissima</i>	<i>P. mixta</i>
Leaf blade length (cm)	Haw*	12.1		6.1–18.7	
	SA	8.3 [†]	6.5	5.3–17.0	3.5–12.0
Leaf blade width (cm)	Haw	17.8		8.1–29.5	
	SA	10.0	9.5	7.0–25.0	5.0–18.5
Petiole length (cm)	Haw	3.3		1.2–6.7	
	SA	2.2	2.0	1.5–3.0	0.9–8.0
Petiolar glands (no.)	Haw	6		4–9	
	SA	—	—	6–14	4–10
Peduncle length (cm)	Haw	3.6		1.5–6.6	
	SA	4.3	3.1	1.8–10.5	1.0–9.0
Bract length (cm)	Haw	4.2		3.3–4.9	
	SA	3.4	4.2	2.5–5.7	1.2–7.5
Hypanthium length (cm)	Haw	7.0		4.7–8.0	
	SA	8.9	9.5	5.5–11.8	7.0–14.0
Hypanthium diameter (cm)	Haw	1.0		0.8–1.2	
	SA	1.2	1.1	—	0.5–1.5
Sepal length (cm)	Haw	5.1		3.8–5.9	
	SA	3.4	4.0	2.4–5.5	2.3–5.5
Sepal width (cm)	Haw	1.9		1.4–2.5	
	SA	1.0	1.4	—	0.9–2.1
Fruit length (cm)	Haw	9.9		7.3–13.2	
	SA	—	—	6.0–11.0	4.0–7.2
Fruit width (cm)	Haw	3.4		2.4–4.1	
	SA	—	—	3.0–4.5	2.0–3.5
Seed length (mm)	Haw	5.9		5.0–7.0	
	SA	6.0	—	—	3.5–5.0
Seed width (mm)	Haw	4.2		—	
	SA	4.5	—	—	2.0–4.0

*Haw = Hawaii, SA = South America.

[†]South American populations of *P. mollissima* and *P. mixta* averages and ranges from Escobar (1980). Averages and ranges of Hawaiian populations from 100 individuals sampled in 1981.

deeply lobed and the lobes more lanceolate (versus ovate); the large, prominent stipules diagnostic of *P. mollissima* are similar in form in both populations but are generally persistent in South America and invariably caducous in Hawaii; and, finally, there are fewer (occasionally none), more obscure, and diminutive petiolar glands.

One specimen (Stork & Horton 1994, F1; from Peru) out of 64 South American specimens examined matched the Hawaiian material. The frequency of other single atypical characters was higher: 20% of the specimens had glabrous upper leaf surfaces; 10% had lanceolate leaf lobes; and 3% had caducous stipules.

The general similarity between Hawaiian and South American *P. mollissima*, *sensu* Escobar (1980), and the existence of a South American specimen which matches those in Hawaii suggest that the taxon in Hawaii is *P. mollissima sensu lato* from the southern portion of the range (Peru). The lack of variability in certain characters which distinguish the Hawaiian form probably represents a highly inbred line from a very limited initial population. Support for this hypothesis comes from Escobar (pers. comm.), who noted that Hawaiian specimens (LaRosa 104, 112-BISH) were atypical but representative of the area around Paucartambo, Peru. Other evidence (LaRosa 1984) indicates that the low level of

variability in the Hawaiian material is not related to apomictic fruit set.

The possibility that the morphological differences observed in Hawaiian representatives could have arisen through earlier hybridization, as suggested by Tillet (pers. comm.), cannot be ruled out by this study. *Passiflora tripartita* is similar in appearance and shares the following morphological characters with the Hawaiian taxon, suggesting that it could be one of the parents: caducous stipules; linear-oblong leaf lobes; petioles lacking glands (on rare occasions); and orange arils. However, the glabrous upper leaf surface and floral characteristics, such as the short length of the calyx and the calyx/corolla ratio, indicate that it is not *P. tripartita*.

There are similarities between Hawaiian *P. mollissima* and several *Passiflorae* introduced to other Pacific areas (Young 1970). New Zealand specimens (AK!) include three distinct forms: typical *P. mixta*, typical *P. mollissima*, and one, known to local nurserymen as "yellow banana passion fruit," which matches Hawaiian material. East African material (Kenya-EA!) contains typical *P. mollissima*, a form similar to the "Hawaiian type," and an intermediate form. Although material from New Guinea was not available, it is reported similar to Hawaiian material (Green 1972).

In conclusion, the Hawaiian material is considered *Passiflora mollissima sensu lato* and is probably derived from a small segregate of the South American population.

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