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PRELIMINARY ANALYSES OF THE FLORAL FRAGRANCES OF SPECIES OF *ACINETA*, *HOULETTIA*, *LUDDEMANNIA*, *LYCOMORMIUM*, *PAPHINIA*, AND *SIEVEKINGIA* (ORCHIDACEAE)

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We have previously reported on analyses of the floral fragrances of a number of species of orchids (Hills el al. 1968, 1972; Murrell et al. 1981; Williams et al. 1981). In this paper we report the results of our analyses of the floral fragrances of seven species in six genera of neotropical orchids. All of the species reported here are pollinated by male euglossine bees, or are confidently expected to be pollinated by male euglossine bees. There are several published observations of pollinators of several species in the genera we studied (see Williams 1982 for a list of euglossine-pollinated orchids and their pollinators, and Table 1 in this paper).

The identifications of the floral fragrance components reported here are based on a comparison of relative retention times, co-injection of known with unknown compounds, and field bioassays. Additional techniques were previously described (Williams 1981). We have shown that this is a good method of verifying the identity of orchid floral fragrance compounds, especially of those orchids that are pollinated by male euglossine bees (Hills et al. 1972; Williams and Dodson 1972; Dodson et al. 1968; Dodson 1970, 1975). We hope to confirm these identifications by using combined capillary gas chromatography/mass spectrometry in the near future as these species come into flower in our greenhouse.

MATERIALS AND METHODS

Gas chromatography, equipment and procedures, followed those outlined in Hills et al. (1972), and in Williams et al. (1981). All retention times were manually calculated, and the percent compositions were calculated from disk integration values. All materials were analyzed while the junior and senior authors were at the University of Miami. Fragrances of *Acineta chrysantha* Lindl. & Paxt., *Luddemannia pescatorei* (Lindl.) Lindl. & Rchb. f., and *Sievekingia reichenbachiana* Rolfe were analyzed from cut flowers provided by F. L. Stevenson via air mail; all other flowers were analyzed using material grown in the greenhouses at the University of Miami.

RESULTS

The percent composition of the floral fragrances of the species sampled are shown in Table 1. Of the identified floral fragrance components, it can be seen that cineole, possibly benzyl acetate, and methyl salicylate are the major identified compounds. All are known male euglossine bee attractants (Dodson et al. 1969; Williams and Dodson 1972). Tentative identifications are given for additional compounds. We are quite confident of our identifications of alpha- and beta-pinene, cineole, methyl benzoate, and methyl salicylate. Our identifications of other compounds are indicated by a "?", and indicate a lesser degree of certainty of identity for myrcene, citronellal, lina-

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lool, geraniol, and benzyl acetate (in the species reported here; in other species, benzyl acetate has been positively identified).

DISCUSSION

The floral fragrance compounds we have identified from these flowers are known, for the most part, to be attractants of male euglossine bees. *Acineta chrysantha* has a floral fragrance composed of approximately 45% cineole, a compound known to attract its pollinator, *Eufresia concava* (Friese). *Sievekingia suavis* Rchb. f. produces mainly cineole as its fragrance, a compound known to attract two of its three pollinators. We have not been able to detect 2-phenylethyl acetate in the fragrance of *S. reichenbachiana*, although this compound is known to attract its pollinator. We believe that our failure to detect 2-phenylethyl acetate is a technical problem, and that in the future we will, with improved methods, be able to detect this compound.

We predict that the pollinators of both *Luddemannia* and *Lycomormium* will be male euglossine bees attracted mainly to cineole. The confirmation or refutation of this hypothesis waits for further field work.

We speculate that *Paphinia grandiflora* Barb. Rodr. is pollinated by *Eulaema nigrita* Lep., a bee known to be attracted to linalool. Again, confirmation of this hypothesis awaits additional field work.

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Relative Retention Time		*Acineta chrysantha*	*Houlettia tigrina*	*Luddemannia pescatorei*	*Lycomormium squalidum*	*Paphinia grandiflora*	*Sievekingia suavis*	*Sievekingia reichenbachiana*	
	.39	1.4		70.9	42.6	3.7			α - pinene
	.55					9.2			
	.60	44.0		17.7	27.2		2.9	2.4	
	.68					5.4			
	.80			1.4					
70°	1.00	4.8		.9		4.6	1.0		β - pinene
	1.11						1.3		
	1.27				3.1		1.7		myrcene?
	1.33	5.1		.6					
	1.79	44.8		8.5	20.4		93.1		cineole
	2.34							65.7	
	.41					24.3			citronellal?
	.54					54.2			linalool?
	.67							10.1	geraniol?
130°	.84		2.0						methyl benzoate
	.89							5.4	
	1.29							16.5	benzyl acetate?
	1.58		98.0						methyl salicylate
160°	2.27				2.0				
Flower Visitors		*Euplusia concava*					*Euglossa dodsonii, E. townsendii, E. bursigera*	*Euplusia surinamensis*	