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MAGNESIUM AND POTASSIUM CONTENTS OF LATICES OF A NUMBER OF HOYA AND EUPHORBIA SPECIES

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Compared with the vast amount of literature which exists on many aspects of latices, relatively little is known about the ionic composition of these fluids. ADRIANI (1850) mentioned the presence of large amounts of magnesium in the latex of *Ficus elastica*, FICKENDEY (1909) in the latex of *Funtumia elastica*. MOLISCH (1901) reported considerable amounts of magnesium, calcium and chloride in the latices of a large number of plant species. ULTEE (1925), in an

Table 1. Amounts of magnesium and potassium in mmol/ml present in latex of several *Hoya* species.

Conductivity of diluted latex (1: 1000) : 10^{-6} Ohm/cm (20 °C).

	place of tapping	Mg	K	K/Mg	Conductivity
White latices					
H. obovata Decne	leaf	0.27	0.00005	0.00018	62
H. crassipes Turcz.	leaf	0.254	0.07	0.027	48
H. pseudolanceolata Cost. (?)	stem	0.238	0.0117	0.049	54
H. gonoloboides Regel	leaf	0.222	0.018	0.080	52
H. longuifolia Wallich	stem	0.187	0.036	0.193	38
H. fraterna Bl.	leaf	0.184	0.040	0.217	54
H. globulosa Hook.	leaf	0.170	0.053	0.312	
H. bandaensis Schlechter	leafstalk	0.159	0.046	0.289	37
H. parasitica Wall. ex Traill	leafstalk	0.134	0.021	0.156	
H. shepherdi Short, ex Hook (?)	leafstalk	0.143	0.063	0.440	44
H. spec.	leafstalk	0.136	0.044	0.324	33
H. australis R.Br. ex. Traill	leafstalk	0.144	0.070	0.49	36
H. spec. (?)	leafstalk	0.118	0.028	0.237	
H. lacunosa Bl.	stem	0.108	0.053	0.490	33
H. keysii F. M. Bailey	leafstalk	0.105	0.088	0.838	
H. cinnamomifolia Hook.	leaf	0.101	0.099	0.980	37
H. latifolia Don.	leafstalk	0.055	0.052	0.946	25
H. pottsii Traill	leaf	0.041	–	–	
H. spec. (?)	leaf	0.028	0.042	0.857	28
H. ridleyi King & Gamble	leaf	0.060	0.002	0.033	26
H. bella Hook.	stem	0.022	0.017	0.773	7.5
H. multiflora Bl.	stem	0.019	0.026	1.37	9.4
Translucent latices					
H. carnosa R.Br.	leafstalk	0.034	0.119	3.50	
H. motoskeii Teysm.	leafstalk	0.031	0.151	4.87	
H. carnosa "variegata"	leafstalk	0.036	0.146	4.05	
H. carnosa "jungle gardens"	leafstalk	0.053	0.117	2.20	

endeavour to make a classification of plant latices in general, distinguished the group of "salt-rich" latices from other groups such as the "rubber-rich", the "protein-rich", and the "phytosterin-rich" latices. With *Hevea brasiliensis* a considerable amount of work has been done on the mineral elements of the latex (FLINT & RAMAGE 1935), especially in connection with latex stability (BEAUFILS 1954, BELMAS 1952, RESING 1955). In the course of a study of latex particles of *Hoya* and *Euphorbia* species the possibility was investigated that the potassium and magnesium ions in the latex have something to do with the stability of the dispersed terpenoid particles present in it. Therefore a number of magnesium and potassium determinations have been carried out using standard atomic absorption determination methods. Latex expelled within 30–45 seconds following incision of the plant with a razor blade was collected with 50 μl glass capillaries. EDTA and $Sr(NO_3)_2$ were added prior to the Mg determination to eliminate a possible protein interference (ALCOCK & MACINTYRE 1966). Values for K and Mg obtained from diluted latex and from latex ash were in agreement.

The plant species used are all in cultivation in the greenhouses or in the botanic garden of the laboratory. As indicated in *tabel 1* an uncertainty exists about the correct naming of some *Hoya* species. Most plants used are vegetatively propagated specimens, and therefore genetic diversity within the species could not be investigated more extensively. *Tables 1* and *2* list the data obtained from some forty species. *Table 3* shows that the latex composition, as far as these minerals are concerned, is of a reasonable constancy in clonal material of *H. australis* R. Br. Material of *H. diversifolia* was collected in the field (Java, Indonesia) at various locations; it gives some indication about the variation which may naturally exist within a species.

Table 2. Amounts of magnesium and potassium in mmol/ml in several latices.

	place of tapping	Mg	K	ratio K/Mg
Euorbia pulcherrima Willd. ex Klosch	leafstalk	0.100	0.101	1.0
E. milii Desm.	stem	0.089	0.160	1.79
E. palustris L.	stem	0.013	0.049	3.77
E. tirucalli L.	stem	0.127	0.003	0.023
E. avasmontana Dinter	stem	0.141	0.004	0.010
E. coerulascens Haw.	stem	0.274	0.003	0.01
E. lactea Haw.	stem	0.217	0.003	0.013
E. grandicornis Goebel	stem	0.183	0.002	0.010
E. balsamifera Ait.	stem	0.105	0.026	0.248
Hura crepitans L.	stem	0.263	0.09	0.356
Ficus elastica Roxb.	stem	0.261	0.015	0.054
Ficus lyrata Warb.	stem	0.175	0.034	0.19
Allemanda cathartica L.	stem	0.000	0.030	–
Taraxacum spec.	root	0.015	0.030	2.00
Taraxacum spec.	root	0.015	0.042	3.23

Table 3. Magnesium and potassium amounts (mmol/ml) in relation to the place of tapping and way of cultivation. Variation of magnesium and potassium in *Hoya diversifolia* Bl.

		Mg	K
Hoya australis R.Br.	top of the stem	0.14	0.040
	young leaf	0.14	0.080
	leaf	0.13	0.080
	old leaf	0.13	0.073
	stem	0.12	0.077
Hoya australis R.Br.	cultivated on:		
	soil	0.14	0.080
	water-culture	0.13	0.078
	gravel-culture	0.13	0.076
Hoya diversifolia Bl. collected	in Indonesia,		
	Meru Betiri	0.206	0.032
	Meru Betiri	0.210	0.025
	Pangandaran	0.174	0.037

As expelled latex gradually becomes diluted with water from surrounding tissues (FREY-WYSSLING 1952) the actual mineral concentrations in the intact plant might even be somewhat higher. The amounts of magnesium and potassium based on "total solids" of expelled latex would solve this problem but the small amounts of latex produced by some plants was the principal reason for magnesium and potassium concentration to be expressed in mmol/ml latex. The ratio K/Mg is of course not influenced by an unknown dilution factor.

From the data obtained various conclusions may be drawn:

a) The Mg and K content of a latex seems more or less characteristic for the plant species or subspecies from which it is withdrawn. Although experiments in which various levels of minerals are supplied to the root system have not yet been carried out, these levels cannot explain the variation found within the *Hoya* collection since all plants were cultivated on the same nutrient solution.

b) Both a high magnesium and a high potassium content may be found in the latices of various plant species, but in most of them it is the magnesium ion which predominates. In the *Hoya* species studied, white latices have a potassium/magnesium ratio < 1 in contrast with the translucent latices (terpenoid particles absent) of *H. carnosa, H. motoskeī* and their subspecies. Besides the *Taraxacum* species three investigated *Euphorbia* species have a potassium/magnesium ratio > 1 too. It should be mentioned that the plants having white latices with a K/Mg ratio > 1 have non-succulent leaves (e.g. *Hoya multiflora* Bl.) contrary to those with succulent leaves which have a K/Mg ratio < 1 in their latices.

c) The variation in mineral composition could not be correlated with the stability of the latices concerned.

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