Diuretic activity of several endemic plants from the Canary Island

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INTRODUCTION

The use of plant material in popular medicine is older than mans history. Its utilization is part of the country's traditional culture and it has an important sanitary role nowadays in several places. Most of these species are empirically used by population. In this work, we have tried to confirm, on a scientific basis, the diuretic properties which are attributed to four endemic species from the Canary Islands, by the insular population. Plant choices were*Astydamia latifolia* L.f, *Forsskaolea angustifolia* Retz, *Ceterach aureum* (Cav.) Buch. and *Paronychia canariensis* L.f.

The species *Astydamia latifolia* L.f, *Forsskaolea angustifolia* Retz, *Ceterach aureum* (Cav.) Buch. and *Paronychia canariensis* L.f. are employed in the folk medicine of Canary Island for their diuretic properties.

Astydamia latifolia L.f (*Umbelliferæ*) is an endemic macharonesic and mauritanic plant. That is present in the islans of Gran Canaria, Tenerife, Gomera, Hierro and La Palma and also in Lobos and La Graciosa where the species is incommon. Popularly it is known as "servilleta" or "acelga de mar".[1] Different popular uses are attributed to this plant: carminative, diuretic, stomachic, emmenagogue and sedative.[2,3]

Forsskaolea angustifolia Retz (*Urticaceæ*) is present in the seven Canary Islands and is an ordinary species in dry places of low areas, overall in the coast. Popularly it is known as "ratonera"[1] and the traditional applications in the Canaries are: diuretic, calculolitic and antiflu.[2]

Ceterach aureum (Cav.) Buch. (*Aspleniaceæ*) is an endemic plant of the macharonesic region mainly lacated in the bigger islands and known by the name "doradilla".[1] The parts used as medicinal are the fronds and complete plant and it is used as an infusion or boiled with sugar and vinegar. Traditionally this plant was used as diuretic, antitusive, general tonic, blood tonic and hypotensor, and is still used today. This plant is appreciated due to its diuretic properties, although it is rather scarce.[2,3]

Paronychia canariensis L.f. (*Caryophyllaceæ*) is an endemic plant of the Canary Archipelago. That is present in the central and western islands. Popularly known as "nevadilla"[1] and has been traditionally used as diuretic, galactagogue, calculolitic and in pneumopathies.[2]

MATERIAL AND METHODS

PLANT MATERIAL

The plants chosen were collected in July 1991 in Tenerife (Canary Islands-Spain); *Astydamia latifolia* L.f in the Guimar coast, *Forsskaolea angustifolia* Retz in a place known as "Los volcanes" (Arafo 300 m), *Paronychia canariensis* L.f. in "Cumbres de Bajamar" (El Rincón,300-400 m) and *Ceterach aureum* (Cav.) Buch. in the forest of "Las Mercedes" (Carboneras), 300-400 m).

Several extracts (n-hexane, methanol and different fractions) and an infusion from each plant were prepared.

DIURETIC ACTIVITY

This was carried out following the method of KAU *et coll.*[4] Male Sprague Dawley rats weighing 180-200 g were used. Rats were fasted overnight with free access to water and were given, orally, 4% body weight of normal saline (0.9% ClNa). Immediately after saline loading, each rat was placed in an individual metabolism cage, and urine was collected in a preweighed tube over a period of 6 h. Na^+ and K^+ in urine were measured by flame photometry. Rats whose urine or electrolyte values were not normal were eliminated.

Table 1.
Effect of *Paronychia canariensis* on the different diuretic parameters.

Group	Dose g/kg	n	Urine volume ml/100 g/6 h	UEV (%)[1]	mEq Na^+/100 g/6 h	mEq K^+/100 g/6 h
Saline	—	17	2.96±0.01	74.13	0.220±0.007	0.079±0.003
Infusion	0.25	3	2.75±0.63	68.94	0.480±0.11**	0.077±0.01
	1	3	3.58±0.89	98.73	0.900±0.19**	0.120±0.03*
	5	3	2.76±0.17**	69.09	0.315±0.08**	0.057±0.02
	10	3	2.24±0.00**	55.92	0.410±0.01**	0.144±0.02**

The results show the mean values and their standard errors; n = number of pairs used in each group.
1. EUV (%) = urine volume took up x 100 / volume administered.
* = $p < 0.05$; ** = $p < 0.01$; respect to the saline (the Student's unpaired t-test).

Suitable rats were paired and placed in hanging racks with free access to water and food. The rat with the highest urine volume was paired with the one that had the lowest urine volume; the second highest one with the second lowest one, etc. After a one-week resting period, all pairs of animals were again fasted overnight with free access to water. Subsequently, each pair was given an oral load of normal saline (4% body weight) containing the test extracts and placed in a metabolism cage. Urine was collected over a 6 h period as previously described and its Na^+ and K^+ were measured. Suspension of the test substances was prepared with the aid of 0.50% carboxymethylcellulose. Furosemide was also tested as reference drug.

Data were presented as mean ± SEM of three pairs of rats with respect to the values taken in the same rats 1-2 weeks before taking test values (Grouped t-test).

RESULTS AND DISCUSSION

The results of the different diuretic parameters of the four plants and furosemide, at several doses, are expressed in Tables 1-5. Only the results of infusions are shown, now that extracts did not offer diuretic activity. In Table 6 the content in mEq Na^+ and K^+ of the infusions from plants is shown. In view of the results obtained with the four botanic species chosen based on their possible diuretic effect, we observed that only one of them (*Paronychia canariensis*) did not show a diuretic activity.

Infusion from *Ceterach aureum* and *Astydamia latifolia*, present an important diuretic action. Particularly the last one that was dose-dependent. The values of EUV (%) for the *Astydamia latifolia* infusion were similar to that of the drug of patron furosemide. Nevertheless this type of diuretic activity seems due to an effect of osmotic type, correlated with natrium and the potassium salts content of these plants (it is known that, with overcharge of sodium and fundamentally potassium that if the renal tubules are not capable of absorbing, they appear in the urine and being osmotically active bring water.[5]

This is supported by the fact that only infusions —but not extracts— showed a diuretic effect, which suggests that this effect is mediated by the presence of salts, since, logically, these are found in larger amounts in infusion than in other extracts. On the other hand, *Astydamia latifolia* was the plant with the highest content of potassium salts which presents a larger diuretic effect. Therefore, we are faced with three species which present an osmotic diuretic effect, included in the acuaretic group of diuretic plants and whose uses are quite different to the saluretic ones.

The urologic indications of the acuaretics are the bacterial affections and the inflammatory ones of the paevis and urinary vias. The best therapeutic treatment so called "therapeutic washing" taking simultaneously sufficient amounts of liquid. They are also useful in the pro and metaphylaxis of the nephrolithiasis and the urocheras where the administration in medicinal form is a must.

Finally, we can conclude that the *Astydamia latifolia* and *Ceterach aureum* species showed an important diuretic effect and this fact could justify their use in insular popular medicine as diuretic agents.

Table 2

Effect of *Astydamia latifolia* on the different diuretic parameters.

Group	Dose g/kg	n	Urine volume ml/100 g/6 h	UEV (%)[1]	mEq Na^+/100 g/6 h	mEq K^+/100 g/6 h
Saline	—	17	2.96±0.01	74.13	0.220±0.007	0.079±0.003
Infusion	1	4	2.92±0.49	78.70	0.887±0.16**	0.109±0.01**
	5	4	4.45±0.35**	111.40	1.577±0.14**	0.193±0.02**
	10	4	5.96±0.32**	149.02	3.090±0.60**	0.297±0.07**
	15	4	6.37±0.54**	159.17	3.105±0.53**	0.405±0.08**

The results show the mean values and their standard errors; n = number of pairs used in each group.

1. EUV (%) = urine volume took up x 100 / volume administered.

* = $p < 0.05$; ** = $p < 0.01$; respect to the saline (the Student's unpaired t-test).

Table 3

Effect of *Forsskaolea angustifolia* on the different diuretic parameters.

Group	Dose g/kg	n	Urine volume ml/100 g/6 h	UEV (%)[1]	mEq Na^+/100 g/6 h	mEq K^+/100 g/6 h
Saline	—	17	2.96±0.01	74.13	0.220±0.007	0.079±0.003
Infusion	0.25	3	3.05±0.29	76.32	0.526±0.01**	0.087±0.006
	1	3	3.17±0.18**	79.35	0.570±0.07**	0.098±0.02
	5	3	3.16±0.59	79.13	0.595±0.13**	
	10	3	3.64±0.46**	91.16	1.126±0.08**	0.169±0.03**
	15	3	3.73±0.32**	93.41	0.946±0.45**	0.133±0.04**

The results show the mean values and their standard errors; n = number of pairs used in each group.

1. EUV (%) = urine volume took up x 100 / volume administered.

* = $p < 0.05$; ** = $p < 0.01$; respect to the saline (the Student's unpaired t-test).

Table 4

Effect of *Ceterach aureum* on the different diuretic parameters.

Group	Dose g/kg	n	Urine volume ml/100 g/6 h	UEV (%)[1]	mEq Na^+/100 g/6 h	mEq K^+/100 g/6 h
Saline	—	17	2.96±0.01	74.13	0.220±0.007	0.079±0.003
Infusion	1	3	3.34±0.15**	83.64	1.223±0.07**	0.961±0.02**
	5	3	5.48±0.26**	137.24	2.702±0.08**	0.122±0.02**
	10	3	5.86±0.09**	146.62	2.993±0.06**	0.187±0.03**
	15	3	6.11±0.72**	152.87	2.941±0.11**	0.201±0.04**

The results show the mean values and their standard errors; n = number of pairs used in each group.

1. EUV (%) = urine volume took up x 100 / volume administered.

* = $p < 0.05$; ** = $p < 0.01$; respect to the saline (the Student's unpaired t-test).

Table 5

Effect of *Furosemide* on the different diuretic parameters.

Group	Dose mg/kg	n	Urine volume ml/100 g/6 h	UEV (%)[1]	mEq Na^+/100 g/6 h	mEq K^+/100 g/6 h
Saline	—	17	2.96±0.01	74.13	0.220±0.007	0.079±0.003
Infusion	12.5	2	3.35±0.35**	83.81	0.808±0.11**	0.092±0.02**
	25	3	4.94±0.41**	123.64	1.116±0.17**	0.124±0.009**
	50	2	7.23±0.65**	180.97	1.249±0.32**	0.150±0.14**
	100	2	7.35±0.71**	183.97	1.290±0.21**	0.157±0.12**

The results show the mean values and their standard errors; n = number of pairs used in each group.

1. EUV (%) = urine volume took up x 100 / volume administered.

* = $p < 0.05$; ** = $p < 0.01$; respect to the saline (the Student's unpaired t-test).

Table 6

Ion contents Na^+ and K^+ of the four plants, measured in the infusion sample.

	mEq Na^+/ml/1 g dry plant	mEq K^+/ml/1 g dry plant
Astydamia latifolia	0.954	0.234
Forsskaolea angustifolia	0.680	0.106
Ceterach aureum	0.274	0.150
Paronychia canariensis	0.152	0.106

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