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DOES *AERUA LANATA* HAVE DIURETIC PROPERTIES?

COLVIN GOONARATNA, IRA THABREW AND KUMUDU WIJEWARDENA

Departments of Physiology, Biochemistry and Community Medicine, Faculty of Medicine, University of Ruhuna, Sri Lanka

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Abstract: We have compared the diuretic activity of 200 ml of sucrose flavoured aqueous extract of the herb Aerua lanata with that of 200 ml sucrose flavoured weak infusion of tea leaves, and 200 ml of water, in 14 healthy volunteers under standardized conditions. Each volunteer acted as his or her own control in the three protocols, and chemical, physical and statistical analyses were performed "blind" by coding all urine and blood samples collected. A. lanata extract did not significantly increase urine flow, sodium excretion, potassium excretion, or urine and plasma osmolality as compared to an infusion of tea or plain water.

Key words: *Aerua lanata* diuretic Ayurvedic drugs

INTRODUCTION

Various parts of the common herb Aerua lanata (Linn. Amaranthaceae) when given orally as an aqueous infusion have been claimed from ancient times to have diuretic properties and beneficial effects in the treatment of urinary infections (1,2). Ayurvedic doctors in Sri Lanka often prescribe it, either alone, or in combination with other herbs as a decoction, because of its putative properties. Infusions of the herb are also popular in our country as a home remedy and as a herbal drink. But the properties of aqueous extracts of the herb had never been investigated until recently, by Udupihille and Jiffry (3). They found that an extract of the whole herb produced a significant diuresis when compared to water and to isotonic saline, and also that an infusion of only the fresh flowers and leaves of the herb produced a much more intense diuresis than that produced by the whole plant, with a maximum urine flow at 15 min.

But Udupihille and Jiffry (3) did not define the nature of the diuresis; they merely estimated urine flow. In the present study we have investigated the alleged diuretic action of the herb in a more comprehensive and controlled setting.

METHODS

Fourteen healthy volunteers (9 women) with a mean age of 32 years (SE 7.5 range 20 to 51 years) performed three protocols under standard conditions, with an interval of at least 72 hours between any two protocols. The three protocols consisted of drinking 200 ml of water, an aqueous infusion of A. lanata flavoured with 10 g sucrose, or a weak aqueous infusion of tea (Camellia sinesis Linn. Theacea) also flavoured with 10 g sucrose, and prepared so as to resemble the extract of A. lanata as closely as possible in regard to colour and taste.

The A. lanata infusion was prepared as recommended by traditional Ayurvedic doctors by boiling the whole plant (i.e. leaves, flowers, and stems) in 1600 ml of water until the volume was reduced to 200 ml. The identity of the herb was confirmed by a plant taxonomist.

All 14 subjects performed, after a standardized breakfast, in random order, all three protocols by drinking 200 ml of the respective test fluid in less than 3 minutes at 08:00 hours. Urine output was measured between 08:00 and 12:00 hours and between 12:00 and 16:00 hours. All subjects performed their normal and mainly sedentary duties, and a usual meal was

*Correspondence to Professor Colvin Goonaratna, Faculty of Medicine, Kynsey Road, Colombo 08, Sri Lanka

allowed between 12:00 and 13:00 hours during the test period. A volume of water equal to that of urine passed was also permitted.

In each urine collection sodium and potassium content and osmolality were determined. Venous blood samples were taken during each collection period for estimation of osmolality. All blood and urine samples were coded, and the code was "broken" only after all chemical, physical and statistical analyses were completed, so that these analyses were performed "blind". Statistical analysis was by one-way analysis of variance (ANOVA).

Sodium and potassium estimations were made in duplicate aliquots by standard flame photometry (4). Osmolality was estimated in duplicate aliquots using a cryoscopic osmometer (Advanced Osmometer, Massachusetts), and manufacturer's standard solutions for calibration of the instrument before testing each batch of samples.

RESULTS

Our results, given in Tables I to IV, showed that 200 ml of an aqueous extract of the herb A. lanata prepared according to a traditional method, and given orally to a group of healthy volunteers who acted as their own controls, did not significantly alter urine flow rate, sodium and potassium excretion in the urine, or the plasma and urine osmolality, when compared to an equal volume of an infusion of tea or water.

TABLE I: Urine flow rate in ml/min during the two test periods.

	Collection period 08:00 to 12: 00 hours			*Collection period 12:00 to 16:00 hours*		
	Water	*Tea*	*A. lanata*	*Water*	*Tea*	*A. lanata*
N	14	14	14	14	14	14
Mean	1.57	1.56	1.69	1.01	0.89	1.01
SD	0.43	1.15	0.97	0.35	0.49	0.45
C	56.3%			44.8%		
P	0.92			0.73		
DF	39			39		

(N = Number of subjects, C = Coefficient of variation, P = Probability, and DF = Degrees of freedom in Tables I to IV

TABLE II: Urinary sodium excretion in millimol/min during the two test periods, and one-way ANOVA:

	Collection period 08:00 to 12: 00 hours			*Collection period 12:00 to 16:00 hours*		
	Water	*Tea*	*A. lanata*	*Water*	*Tea*	*A. lanata*
N	14	14	14	14	14	14
Mean	0.20	0.26	0.25	0.28	0.29	0.29
SD	0.07	0.15	0.14	0.13	0.12	0.11
C	52.4%			41.2%		
P	0.40			0.98		
DF	39			39		

(See Table I for explanation of symbols)

TABLE III: Urinary potasium excretion in millimol/min during the two test periods, and one-way ANOVA.

	Collection peruid 08:00 to 12: 00 hours			*Collection period 12:00 to 16:00 hours*		
	Water	*Tea*	*A. lanata*	*Water*	*Tea*	*A. lanata*
N	14	14	14	14	14	14
Mean	0.048	0.066	0.073	0.060	0.071	0.069
SD	0.034	0.035	0.044	0.027	0.034	0.037
C	98.4%			69.9%		
P	0.54			0.58		
DF	39			39		

(See Table I for explanation of symbols)

TABLE IV: Urine and plasma osmolality during the two collection periods, and one-way ANOVA.

	Collection period 08:00 to 12:00 hours						*Collection period 12:00 to 16:00 hours*					
	Water		*Tea*		*A. lanata*		*Water*		*Tea*		*A. lanata*	
	U.osm	P.osm	U.osm	P. osm.	U.osm	P.osm	U.osm	P.osm	U.osm	P.osm	U.osm	P.osm
N	14	14	14	14	14	14	14	14	14	14	14	14
Mean	682	292	713	290	597	288	619	291	677	291	590	287
SD	174	3	151	3	166	2	143	3	139	2	183	4
P	0.32 (Uosm),		0.91 (Psom)				0.64(Uosm),		0.90 (Posm)			
DF	39						39					

(See Table I for explanation of symbols)

DISCUSSION

Although aqueous extracts of the herb A. lanata are claimed to have diuretic properties, this had not been tested until recently (3). However, these workers used different sets of volunteers for their three protocols in which they drank water, isotonic saline or the herb extract. Furthermore, they have not defined the nature of the diuresis they claim to have observed.

If the intense diuresis with A. lanata extract observed within 15 minutes of administration by Udupihille and Jiffry (3) was a pure water diuresis, then there are only three conceivable mechanisms by which such a diuresis may be produced. The first is an almost immediate and total inhibition of antidiuretic hormone (ADH) release from the neurohypophysis. The second is an almost immediately produced insensitivity of the distal convoluted tubules and collecting ducts to ADH. The third is a combination of these two. These mechanisms could possibly not have produced a maximal diuresis within 15 minutes, or even 30 minutes as described by them (3), considering that the half-life of circulating endogenous ADH is 18 to 25 minutes (5,6) and that significant alimentary absorption of any active principle(s) in A. lanata which could produce such effects would have only just commenced by 15 minutes.

If on the other hand, the diuresis claimed for A. lanata was an enhanced sodium and water excretion, then again, oral administration is most unlikely to produce a maximal diuresis in 15 minutes, because even intravenous administration of potent diuretics such as frusemide do not produce a brisk diuresis within this period (7).

To be at all clinically useful, a diuretic must either produce an enhanced excretion of both sodium ions and water (eg thiazides, frusemide, spironolactone), or act as an osmotic diuretic (eg mannitol), although the latter type of diuresis produces a natriuresis less marked than with the former. And except for the so-called "potassium-sparing" diuretics (eg triamterene, amiloride and spironolactone), the other clinically useful diuretics also produce a kaliuresis, sometimes leading to potassium depletion and hypokalaemia (7).

In view of the above considerations, we tested whether an aqueous extract of A. lanata actually produces a diuresis, employing a carefully controlled experimental setting and "blind" chemical, physical and statistical analyses. Our results show that contrary to earlier unsupported claims (1,2) and more recent experimental results (3), extracts of this herb do not produce any diuresis, natriuresis, kaliuresis or change in urinary osmolar output.

The A. lanata extract did not produce any gastrointestinal adverse effects such as nausea, vomiting or diarrhoea in any of the subjects during or after the test.

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