gen-containing substances. Filtration of the active material through strongly basic anion exchange resin, Dowex 1-4X, and bioassay of the eluted substances indicated that the active material(s) was not retained by the ion exchange resin, and hence must be a neutral substance. The methanol-soluble active eluents from the ion exchange resin were concentrated. Addition of acetone to these concentrates gave crystalline pinitol (3-0-methyl-chiro-inositol). The pinitol was identical by spectroscopic criteria (NMR, IR, MS) with authentic samples isolated from *Pinus ponderosa* and *Sequoia sempervirens* Endl. and the GLC retention times of the TMS ethers of all the samples were identical[7,8]. The yield of crystalline pinitol from both varieties of soybeans studied was about 1% of the dry weight. The isolated pinitol was active in the feeding bioassay (table).

Pinitol occurs frequently in legumes and may eventually be found in most members of this family[7-9]. Pinitol has previously been reported from soybeans[7,8] and is especially abundant in the leaves.[9].

Soybean resistance to *H. zea* feeding increases with increasing leaf maturity[10] which correlates well with increasing pinitol levels as the plant matures[11]. Pinitol mixed with inositol at equal or greater concentrations was fed to the *H. zea* larvae in the bioassay in order to test the possibility that pinitol may act as an antagonist to inositol present as a micronutrient in the diet. The weight gain of the larvae was still low and decreased with increasing levels of inositol so pinitol does not seem to be an inositol antagonist. Moreover, the addition of high levels of inositol to the diet (0.8–5.0%) results in severe inhibition of weight gain (table). In a simple choice test, *H. zea* larvae did not show any preference for the synthetic diet compared to that containing added pinitol. This indicates that pinitol does not act as a feeding repellant or attractant. Since soybean varieties which are resistant to *Heliothis* are also largely resistant to Mexican bean beetles[12] *(Epilachna varivestis* Mulsant), pinitol may also play a role in soybean resistance to this latter insect[13].

Antigrowth activity of soybean extracts and constituents

Material added to diet	Percent of dried plant material	Percent added to synthetic diet in bioassay	Larval weight gain as percent of controls
Acetone extracts	11	2.7	123
		5.4	109
Methanol extracts	13	3.4	80
		6.8	59
Aqueous extracts	9.5	2.3	82
		4.6	50
Pinitol		0.6	62
		0.8	37
		1.6	24
		2.4	21
		3.2	16
Inositol		0.8	93
		1.6	71
		2.4	61
		3.2	57
		5.0	40

1 The authors are indebted to R.J. Molyneux for a reference sample of pinitol and to J. Baker for aid with the bioassay. Reference to a company and/or product named by the Department is only for purposes of information and does not imply approval or recommendation of the product to the exclusion of others which may also be suitable.

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Phosphatase activity in testis and prostate of rats treated with embelin and *Vinca rosea* extract

S. Chauhan, S. Agrawal, R. Mathur[1] and R.K. Gupta

School of Studies in Zoology, Jiwaji University, Gwalior (M.P.) and Indian Grassland and Fodder Research Institute, Jhansi (U.P., India), 29 November 1978

Summary. Daily administration of *Vinca rosea* Linn. extract orally and embelin s.c. to male albino rats caused significant rise in levels of acid and alkaline phosphatases of testis and prostate indicating altered metabolic function.

Vinblastine and vincristine isolated from *Vinca rosea* Linn. (Apocyanaceae) and embelin isolated from *Embelia ribes* Burm. (Myrsinaceae) have been reported to possess anticancerous and antifertility activity respectively in albino rats[2-4]. Vinblastine has been found to arrest mitosis at metaphase in rapidly proliferating cells[4]. I.p. administration of total alkaloids from *Vinca rosea* leaves produced degenerative changes in the spermatogenic elements of the testis of immature male rats[5]. Embelin (2,5-dihydroxy-3-undicyl-1,4-benzoquinone) has been reported to reduce the sperm motility in *Macaca bonnata*[6]. However, no effort has been made to study the influence of these compounds on bio-

chemical constituents of male reproductive organs. It has been proposed, therefore, to undertake detailed study of these plant products in view of their possible antifertility efficacy. The present communication deals with the changes in the level of phosphatases in testis and prostate of albino rats on treatment with embelin and *Vinca rosea* extract.

Material and methods. Mature male Swiss albino rats weighing 180–200 g were maintained on a standard diet (Hindustan Lever Ltd, Bombay) and water ad libitum. They were distributed into groups according to the different treatments as shown in tables 1 and 2.

Air-dried, powdered leaves of *Vinca rosea* were soxhletted with 95% ethanol and the extract was evaporated to dryness under reduced pressure and controlled temperature (40–60 °C). A weighed quantity of the dried extract was macerated with an equal quantity of gum acacia to prepare different doses to be administered orally through an intragastric rubber catheter to different groups of rats, as shown in table 1. Control rats received gum acacia distilled water suspension only.

Embelin was obtained by soxhletting 100 g powdered *Embelia ribes* Burm. berries with petroleum ether (b.p. 40–60 °C). The extract was concentrated and kept in a refrigerator for 24 h. The resulting crystalline product was washed with 5 ml ice-cold petroleum ether and was recrystallized from a mixture of petroleum ether and ether (8:2), which yielded embelin (3.1 g) as golden yellow flakes (m.p. 144 °C).

Different doses were prepared by dissolving a weighed quantity of embelin in a weak solution of ammonia. The solution was boiled to evaporate ammonia, cooled and administered s.c. to different treatment groups. Control rats received vehicle only by the same route.

The animals were sacrificed 24 h after the last treatment using light ether anaesthesia. Testes and prostates were excised, blotted free of blood and weighed on a monopan micro-balance. Acid and alkaline phosphatases were estimated colorimetrically by the method of Fiske and Subba Row[7]. The results were statistically analysed using Student's t-test.

Table 1. Effect of V.rosea Linn. on organ weights and enzyme levels

Groups	Dose administered mg/kg b.wt/day		Day of autopsy	Body weight (g) Initial	Body weight (g) Final	Relative organ weight (mg/100 g b.wt) Testis	Ventral prostate	Dorso-lateral prostate	Acid phosphatase (μg/100 mg/h) Testis	Acid phosphatase (μg/100 mg/h) D-L prostate	Alkaline phosphatase (μg/100 mg/h) Testis	Alkaline phosphatase (μg/100 mg/h) D-L prostate
I	Control (vehicle only)	(10)	25	180.00 ± 15.00	177.50 ± 22.50	695.25 ± 14.30	257.14 ± 15.40	85.83 ± 2.52	102.08 ± 6.78	178.57 ± 13.57	132.14 ± 31.33	720.83 ± 18.45
II	75	(8)	25	200.00 ± 11.54	186.66 ± 17.63	677.42 ± 59.53	148.40 ± 23.54	89.52 ± 20.74	162.50 ± 15.14	68.75 ± 8.98	427.08[f] ± 5.02	1183.33[a] ± 20.84
III	150	(8)	25	198.23 ± 12.12	188.10 ± 15.30	623.50 ± 20.54	89.88 ± 16.48	54.56 ± 16.85	207.14 ± 21.97	37.50[a] ± 4.56	493.75[d] ± 21.35	1681.25[a] ± 22.31
IV	300	(8)	25	200.00 ± 0.00	198.00 ± 6.90	647.45 ± 60.39	127.83 ± 20.75	72.31 ± 8.83	400.00[a] ± 7.91	447.92[a] ± 16.51	954.17[a] ± 52.17	1716.66[a] ± 18.45
V	Control (Vehicle only)	(10)	50	182.55 ± 18.10	180.50 ± 10.22	709.79 ± 23.18	240.38 ± 30.19	79.51 ± 15.17	123.21 ± 6.36	167.86 ± 11.20	129.17 ± 7.00	732.50 ± 17.55
VI	75	(8)	50	190.66 ± 8.87	188.33 ± 17.20	577.05 ± 35.29	85.70 ± 11.43	52.81 ± 0.72	235.42[f] ± 7.54	50.00[b] ± 7.22	437.50[f] ± 45.25	1812.50[a] ± 25.30
VII	150	(8)	50	189.91 ± 20.15	200.00 ± 0.66	594.95 ± 7.27	109.22 ± 21.93	50.17 ± 9.82	387.50[a] ± 9.72	37.50[a] ± 5.91	356.25 ± 32.36	1010.42[a] ± 26.26
VIII	300	(8)	50	210.00 ± 10.30	196.21 ± 8.88	491.62 ± 20.21	154.84 ± 10.23	77.44 ± 13.89	337.50[a] ± 20.10	287.50[a] ± 30.91	606.25[a] ± 17.36	1400.10[a] ± 21.39

Figures in parentheses indicate number of animals. All the values are mean ± SE. [a] $p < 0.001$; [b] $p < 0.01$; [c] $p < 0.02$; [d] $p < 0.05$. Vs. respective controls.

Table 2. Effect of embelin on organ weights and phosphatases

Group	Treatment mg/kg b.wt/day		Day of autopsy	Body weight (g) Initial	Body weight (g) Final	Relative organ weights (mg/100 g) Testis	Ventral-prostate	Dorso-lateral prostate	Testis size (cm) Length	Testis size (cm) Diameter	Acid phosphatase (μg/100 mg/h) Testis	Acid phosphatase (μg/100 mg/h) D-L prostate	Alkaline phosphatase (μg/100 mg/h) Testis	Alkaline phosphatase (μg/100 mg/h) D-L prostate
I	Control (Vehicle only)	(10)	29	185.00 ± 7.07	185.00 ± 11.09	661.00 ± 24.97	220.79 ± 49.56	79.51 ± 15.17	1.80 ± 0.05	1.10 ± 0.05	198.21 ± 10.36	178.57 ± 13.56	160.71 ± 27.88	428.57 ± 13.84
II	0.3	(8)	29	180.00 ± 7.58	189.00 ± 7.81	560.19 ± 40.48	146.22 ± 27.87	65.39 ± 1.19	1.76 ± 0.04	1.05 ± 0.04	207.14 ± 21.97	381.25 ± 34.62	633.93[a] ± 2.31	1780.36[a] ± 33.40
III	0.4	(8)	29	180.00 ± 0.00	175.00 ± 5.63	631.69 ± 24.96	147.88 ± 23.39	81.21 ± 7.46	1.82 ± 0.03	0.99 ± 0.03	296.43[c] ± 5.08	236.61 ± 20.07	774.12[a] ± 27.96	1973.75[a] ± 29.96
IV	Control (Vehicle only)	(10)	36	186.00 ± 8.27	187.00 ± 5.82	600.56 ± 24.38	193.91 ± 27.39	102.00 ± 7.00	1.85 ± 0.03	1.04 ± 0.03	123.21 ± 6.36	167.86 ± 11.20	135.42 ± 31.33	1805.36 ± 10.15
V	0.3	(8)	36	186.25 ± 4.73	195.00 ± 12.25	546.56 ± 31.35	192.68 ± 20.38	65.28 ± 12.45	1.83 ± 0.03	1.03 ± 0.02	390.28[a] ± 5.05	260.71[c] ± 8.38	575.00[a] ± 24.71	1496.43[a] ± 28.05
VI	0.4	(8)	36	182.25 ± 12.15	192.00 ± 13.57	628.98 ± 14.81	161.14 ± 11.83	77.76 ± 6.88	1.83 ± 0.04	1.07 ± 0.02	573.21[a] ± 11.06	482.12[a] ± 25.28	523.21[b] ± 14.48	2082.14[a] ± 6.60

Figures in parentheses indicate number of animals. All the values are mean ± SE. [a] $p < 0.001$; [b] $p < 0.01$; [c] $p < 0.05$. Vs. respective controls.

Results. Wet weights of testes and prostates decreased markedly, whereas acid and alkaline phosphatases were significantly elevated following treatment with embelin and *Vinca* extract (tables 1 and 2).

Discussion. The effect of embelin and *Vinca rosea* extract appear to be dose- and duration-dependent. Reduction in weights of testes and prostates indicates impairment in the function of these organs.

Alkaline phosphatase is associated with the transport of metabolites, differentiation of cells and synthesis of testicular hormones[8-10]. Increased alkaline phosphatase activity in testes and prostates identifies these as the sites of tissue damage and sperm resorption[11,12]. Acid phosphatase, a lysosomal enzyme is present in all the germinal cells of the testis. Increase in acid phosphatase activity coincides with a decrease in the spermatocyte count[13,14]. It has also been associated with the disposal of dead germinal elements and spermatozoa[15] and cell disintegration[16]. However, we observed a significant fall in acid phosphatase levels of prostate at almost all the doses on treatment with *Vinca rosea* extract. Whether this is due to some metabolic alterations in prostate itself has to be ascertained.

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Water regulation in Barmer goat of the Rajasthan desert

M.S. Khan, T.O. Sasidharan and P.K. Ghosh[1]

Division of Animal Studies, Central Arid Zone Research Institute, Jodhpur 342003 (India), 7 November 1978

Summary. The different body fluid compartments in normally watered and 4-day water-deprived goats of Rajasthan desert, India, were measured in autumn. The goats maintained plasma volume and extracellular fluid volume, but lost gut and cell water considerably under the experimental conditions; indicating that the maintenance of the fluidity of the blood has priority over the body's other fluid requirements in this desert-adapted species during water deprivation.

Maintenance of homeostasis is of prime importance for survival in desert-dwelling mammals. The goat occupies a dominant position in all desert biomes. It is only recently, however, that some quantified information on the desert goat's physiological characteristics have been recorded[2-4]. The Rajasthan desert goat has been reported to be a particularly hardy animal[4]. A measure of this animal's ability to maintain its various body fluid compartments under conditions of water stress has been made and the results are reported in this note.

5 3-year-old castrated desert goats of similar body weight were used in this study which was conducted during September-October, 1978 in Jodhpur (26°05'N; 73°01'E) in the Rajasthan desert. Throughout the experimental period, the animals were housed individually in metabolic cages kept inside a well ventilated hall. The environmental conditions prevailing inside the hall in the immediate vicinity of the animals were recorded daily at 7.00 h and at 15.00 h. For the experimental period, the average daily mean maximum and minimum temperatures and the relative humidity of the air were 35.16±0.38 °C, 23.06±0.38 °C and 60.90±0.40% respectively.

The experimental feed, given adlibitum, comprised a 50:50 mixture of *Cenchrus ciliaris* (winter cut) hay and

Body fluid compartments in normally watered and water deprived Barmer goat

Characters	Before water restriction mean±SE	Day 4 of water restriction mean±SE*	Change of complete water restriction from adlibitum value (%)	Average amount of water lost	Percent of the total body water lost
Body weight (kg)	40.10±0.75	35.30±1.08	−11.97	-	-
Total body water (l)	24.46±1.53	18.21±1.09	−25.55	6.24±2.11	-
Plasma volume (l)	1.47±0.03	1.28±0.05	−12.92	0.19±0.07	3.04
Blood volume (l)	2.03±0.07	1.93±0.06	− 4.92	0.14±0.05	2.24
Extracellular fluid volume (l) (thiocyanate space)	11.49±0.22	10.62±0.32	− 7.57	0.90±0.28	14.42
Cell and gut water (l)**	12.96±1.52	7.59±1.03	−41.43	5.58±1.80	89.42
Interstitial fluid volume (l)	10.02±0.19	9.33±0.31	− 6.88	0.71±0.27	11.37

* Significantly different from control animals ($p < 0.05$). ** Cell and gut water = total body water-thiocyanate space.