UTERINE CHANGES IN RAT FOLLOWING ADMINISTRATION OF CRUDE EXTRACT OF *PUERARIA TUBEROSA* DC

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PUERARIA TUBEROSA has been reported to have various therapeutic uses like aphrodisiac, tonic, diuretic, galactogogue, lactogogue etc in Indian traditional medicine[1]. The plant belongs to family leguminosae and sub-family papilionaceae. It is a large deciduous climber with tuberous roots. The antifertility activity of this plant has been confirmed in rats and hamsters[2-4]. On the basis of the uterine wet weight method its crude powder and ethanolic extract has been reported to possess significant estrogenic activity[3,5,6], but not much is known about its effect on uterine histology. The present paper deals with the effect of crude powder and petroleum ether extract of *P. tuberosa* on the uterine histology in relation to its estrogenic activity in immature rats.

The fresh tubers of the plant were collected from Shivpuri District (M.P.) and were chopped and dried in shade. The crude powder was obtained by grinding the pieces and was further extracted with petroleum ether by dumping it in air-tight jars. The filtrate was dried under reduced pressure and low temperature. Crude powder was used at doses of 500 and 1000 mg/rat whereas the petroleum ether extract was prepared at 300 mg/kg dose as this dose has been known to produce significant antifertility activity in rats[2,4]. Petroleum ether extract was fed orally to the animals with an intragastric catheter whereas the doses of crude powder were given along with ration. Immature female rats (30 ± 5 g) of Sprague Dowley strain were collected from the departmental animal house. Six rats were used in each experimental and control set. All the rats were kept under uniform conditions of light and temperature and were fed with rat diet (Hindustan Lever) and water *ad libitum*.

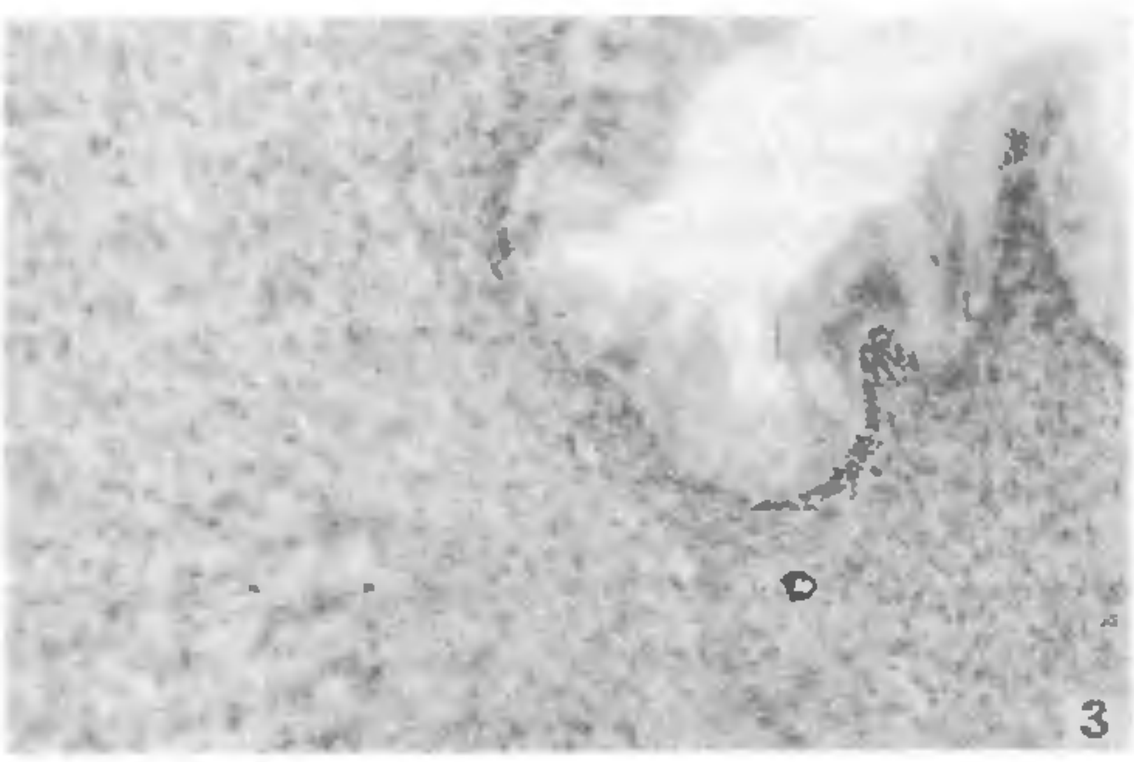
The estrogenic/antiestrogenic activity was measured according to Edgren and Calhoun[7,8] in 25–30 days old immature female rats. The rats were bilaterally ovariectomized and after 7 days, they were divided into various groups (table 1). Group 1 served as control which received vehicle only whereas group 2 received estradiol dipropionate (EDP) subcutaneously. The other groups received crude powder or petroleum ether extract alone or conjointly with EDP. 48 hr after last treatment, the animals were sacrificed and the uteri were dissected out, freed from adhering tissue and weighed to the nearest of 1 mg. Simultaneously the uterine pieces from different animal groups were fixed in alcoholic Bouin's fluid and were processed for gross histology and haematoxylin-eosin stained slides were examined microscopically. The results were analysed statistically using paired student *t* test.

Our results reveal that in control ovariectomized immature rats the uterine epithelium is infantile (figure 1). Estradiol-dipropionate stimulates the uterine luminal epithelial cell height (figure 2) along with a significant increase in the uterine wet weight (table 1). The crude powder of *P. tuberosa* DC at doses

Table 1 *Estrogenic/antiestrogenic activity of Pueraria tuberosa DC in immature ovariectomized rats (number of rats used in parenthesis)*

Groups	Substance	Dose administered (oral) (mg/kg)	Estradiol dipropionate (μg/rat) (S.C.)	Uterine wet weight (mg/100 g) Mean ± S.E.	
1.	Control (vehicle only)	—	—	77.29 ± 3.60	(6)
2.	Estradiol-di-propionate	—	0.1	251.23 ± 8.34	(6)[a]
3.	Crude powder	500*	—	258.20 ± 13.60	(6)[a]
		500*	0.1	252.22 ± 13.80	(6)[a]
		1000*	—	271.66 ± 9.26	(6)[a]
		1000*	0.1	258.17 ± 11.49	(6)[a]
4.	Petroleum ether extract	300	—	258.81 ± 4.16	(6)[a]
		300	0.1	267.42 ± 5.18	(6)[a]

[a]: *p* values versus their control < 0.001, * Dose in mg/rat



Figures 1–4. 1. Photomicrograph of the uterus of control ovariectomized immature rat showing infantile epithelium × 100. **2.** Uterus of rat treated with estradiol dipropionate (EDP) showing the stimulation of uterine luminal epithelium × 100. **3.** Uterus of rat treated with crude powder of *P. tuberosa* at a dose of 500 mg/rat dose. Note the stimulation in uterine luminal epithelium × 100. **4.** Uterus of rat treated with EDP + 500 mg/rat dose of crude powder of *P. tuberosa*. Uterine luminal epithelium remains the same as in EDP *per se* induced × 100.

of 500 and 1000 mg/rat and petroleum ether extract at a dose of 300 mg/kg also increase the uterine weight (table 1) and the uterine luminal epithelial cell height (figure 3). The conjoint administration of estradiol-dipropionate with doses of crude powder (500 and 1000 mg/rat) or with petroleum ether extract (300 mg/kg) could neither increase nor decrease the uterine luminal epithelial cell height and the uterine weight when compared to estradiol-dipropionate *per se* induced growth (figure 4 and table 1).

It is known that a typical estrogen increases the uterine epithelium in ovariectomized rats[9,10]. In the present study the crude powder and the petroleum ether extract of *P. tuberosa* increases the height of uterine luminal epithelium indicating its estrogenic activity whereas their conjoint treatment with estradiol dipropionate (EDP) does not decrease the epithelial cell height. This fact clearly indicates that crude powder of *P. tuberosa* does not antagonise the estrogenic action. Therefore, on the basis of present findings it can be stated that both crude powder and petroleum ether extract of *P. tuberosa* DC possess potent estrogenic activity as revealed by the stimulation in uterine histology in addition to a significant increase in the uterine wet weight.

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1. Kirtikar, K. R. and Basu, B. D., *Indian medicinal plants*, Lalit Mohan Basu, Allahabad, India, 1935.
2. Mathur, R., Saxena, V. and Prakash, A. O., *IRCS Med. Sci.*, 1983, **11**, 522.
3. Chandhoke, N., Gupta, S., Daftari, S., Dhar, S. K. and Atal, C. K., *Indian J. Pharmacol.*, 1980, **12**, 57.

4. Prakash, A. O., *Contraceptive delivery systems*, 5, No. 3, 1984, Abs. No. 9.
5. Gupta, S., Chandhoke, N., Daftari, P. and Atal, C. K., *Souvenir of XIII Annual Conference of IPS*, 1980, Abs. No. E-14.
6. Saxena, V., Mathur, R. and Prakash, A. O., *IRCS Med Sci.*, 1985, **13**, 139.
7. Edgren, R. A. and Calhoun, D. W., *Contraception chemical control of fertility* (ed.) R. A. Edgren. Marcel Dekker. Inc. N.Y., 1957, p. 537.
8. Prakash, A. O., *Indian J. Exp. Biol.*, 1978, **16**, 1214.
9. Dutta, I. C., Karkun, J. N. and Kar, A. B., *Acta Biol. Med. Germ.*, 1958, **20**, 147.
10. Karkun, J. N. and Mehrotra, P. K., *Indian J. Exp. Biol.*, 1973, **11**, 7.

BROMO BENZODIAZABOROLES

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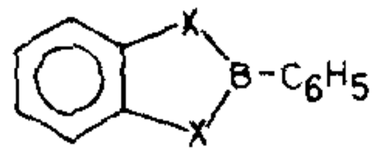
THE uses of boron heterocyclic compounds as insecticides[1], bactericides[2], fungicides, possible use in cancer therapy[3], curing agents, intermediates in organic synthesis, fuel for propellers[4], latent hardeners for resins etc aroused interest for further studies in this field. A series of analogous 2-phenyl derivaties were earlier reported[5-7] to be obtained by reacting alkyl/aryl boron dichloride or aryl boronic acids and their esters with an appropriate *o*-substituted benzene (scheme 1). The hydrolytic stability of these compounds as compared to the corresponding open chain analogues has been attributed to their being cyclic and stabilized by resonance.

The IR and UV spectra of a number of benzo- and naphthoboroles indicate close similarity with the corresponding heteroaromatic analogues[8] *e.g.* UV absorption of 2-phenyl benzimidazole is similar to that of 2-phenyl-diazaborole. Benzodiazaboroles can be described by the two forms (scheme 2).

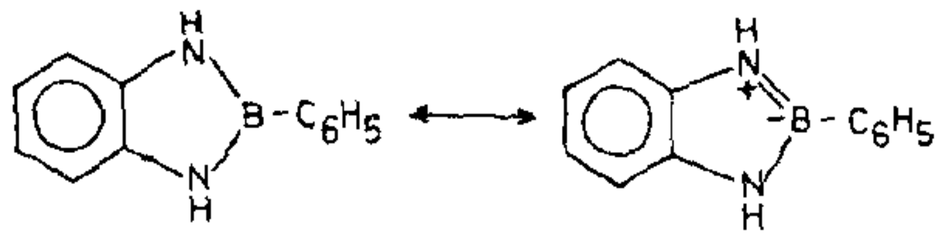
The spectra of borazole is different as compared with the complex (scheme 3).

We report here new boron containing heterocycles obtained from bromo substituted *o*-phenylenediamines and various aryl boronic acids.



X = NH, S, O

SCHEME 1



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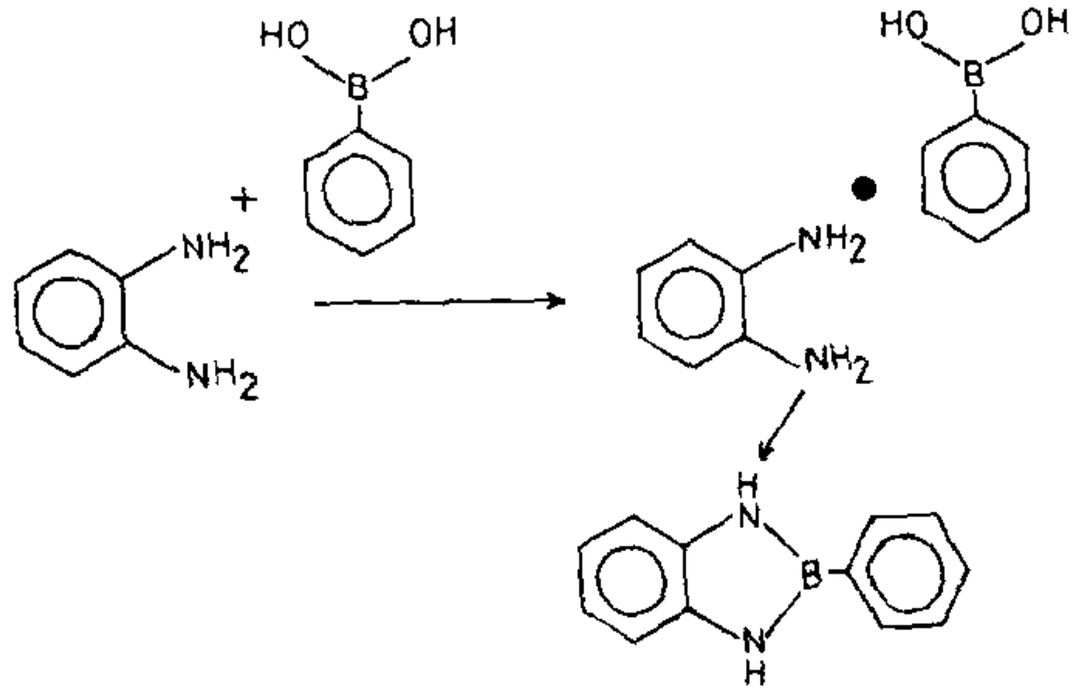

SCHEME 3

Equimolar amounts of bromo substituted *o*-phenylenediamine (0.01 mol) and aryl boronic acid (0.01 mol) dissolved in xylene were refluxed for 4–5 hr. The solvent xylene was distilled off at reduced pressure. The products were crystallized from carbon tetrachloride or benzene. The values of elemental analysis agreed with calculated values within the limits of experimental errors. The physical properties of the compounds are given in table 1.

UV absorption values show that the bromo borimidazolines exhibit two strong absorptions, first in the 230–245μ region and the other at 285–310μ. Electron-donating substituents produce a bathochromic shift in the absorption spectra, whereas electron-withdrawing groups result in a hypsochromic effect.

The infrared spectra of these borimidazolines show the absorptions for NH bands at 3470 cm^{-1} and 1435 cm^{-1}, trivalent boron at 1350 cm^{-1} and out of plane C-H modes aromatic rings at 760–750 cm^{-1}.

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