TABLE III

Showing the performance of the field rat B. bengalensis *to a laboratory concentration of Rodafarin (0·005%) given up to 6 days only and then switched to normal food*

No. of rats used	Sp. of rat	Av. weight of rat in gm.	Con. of Rodafarin	Percentage mortality and bait consumption									% Survival after 20 days	Days of death			Av. mg./kg. warfarin taken to die
				Up to 6th day			Up to 10th day			Up to 20th day				Max.	Min.	Average	
				Bait in gm. Av.	Normal food in gm.	% Mortality	Bait in gm. Av.	Normal food in gm.	% Mortality	Bait in gm. Av.	Normal food in gm.	% Mortality					
20	Bb	247	0·005	50·1	..	70	..	59·5	90	..	65·1	100	..	12	2	6	16·79
20	Bb	160	0·005	42·0	..	70	..	55·7	100	..	..	..	..	8	3	5·6	18·5
20	Bb	125·4	0·005	47·4	..	65	..	56·7	95	..	56·7	95	5	10	4	5·8	19·4

Bb. *Bandicota bengalensis.*

done with *B. bengalensis*. The rats were given normal food after 6 days. Table III, which is the summary of these experiments on 60 rats shows that *B. bengalensis* continues to die even after consumption up to 6 days only, with this lower concentration, which does not kill *R. rattus* which is a much smaller rat. *R. rattus* has not died when bait consumption was suspended after 6 days and switched to normal food. It is therefore summarised that *R. rattus* in Bombay shows tolerance in even heavier doses of locally made warfarin and that the field rat is at present quite susceptible even in smaller doses which are taken as standard showing resistance in *R. norvegicus* by Lund.[2]

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Haffkine Institute, P. J. DEORAS.
Bombay, *October* 14, 1966.

1. Deoras, P. J., *Curr. Sci.*, 1966, **35** (16), 415.
2. Lund, M., *Nature*, 1964, **203** (4946), 778.
3. Hayes, W. J. (Jr.) and Gaines, T. B., *Pub. Hlth. Repts.*, 1959, **74**, 105.

A DIFFUSIBLE WATER-SOLUBLE ANTIGENIC FRACTION EXTRACTED FROM *BR. ABORTUS* CELLS

ANTIGENS of *Br. abortus* have been studied by various workers. The method of extraction of antigen according to most of the workers has been either by subjecting the cells to ultrasonic disruption or treating the cells with phenols and acids.[1-3] It was also reported that phenol extracts of Brucella species could be used for serologic reactions but were not antigenic.[4] The diffusible antigens of *Br. melitensis* have, however, been studied by obtaining water-soluble fractions besides its phenol and trichloracetic acid extracts. A diffusible precipitin antigen could not be prepared from *Br. abortus* and *Br. suis* cultures by similar methods which were effective in producing such an antigen from *Br. melitensis*.[5,6]

The present communication reports the preparation of a diffusible water-soluble antigenic fraction of *Br. abortus* which can also be used in the study of the organisms by gel diffusion precipitin technique.

The bacteria were grown on tryptose agar plates under CO_2 tension for 4 days, suspended in sterile 0·85% sodium chloride solution, washed three times by high centrifugation in sterile saline, and stored at 4° C. until the desired quantity was obtained. The method described for isolation of a soluble antigen of *V. fœtus*[7] and also reported successful in the study of characterisation of Actinobacillus species,[8] was employed for the extraction of the heat stable water-soluble fraction of *Br. abortus* (Strain 544 and a local strain).

This heat stable, water-soluble fraction appeared to be polysaccharide in nature as it reacted positively to Molisch test and negatively to the biuret, Millon and ninhydrin tests for proteins. The individual seven amino-acids were identified in the acid hydrolyzate of the fraction by two-dimensional chromatography. The maximum ultraviolet absorption exhibited by this water-soluble fraction was at 258–260 mμ.

When reacted with sera of varying agglutinin titres from brucella infected animals the water-soluble antigen extracted from both the strains (*loc. cit.*) gave one to three lines of precipitin

depending on the titre of the serum. When injected parenterally into rabbits and guinea pigs, this fraction produced antibodies (both agglutinins and precipitins) in high titres by intravenous, intramuscular and subcutaneous routes.

The presence of amino-acids in the fraction represents a protein complex to which a polysaccharide molecule is also attached. The presence of the conjugated ring system of the purins and pyrimidines in nucleic acid is known to result in marked absorption in the UV absorption maxima near 260 mμ. As such the exact nature of this fraction appears to be that of a nucleoprotein. The polysaccharide moiety of this purified preparation suggests its complex haptenic nature which contributes increasingly to the antigenicity of this fraction.

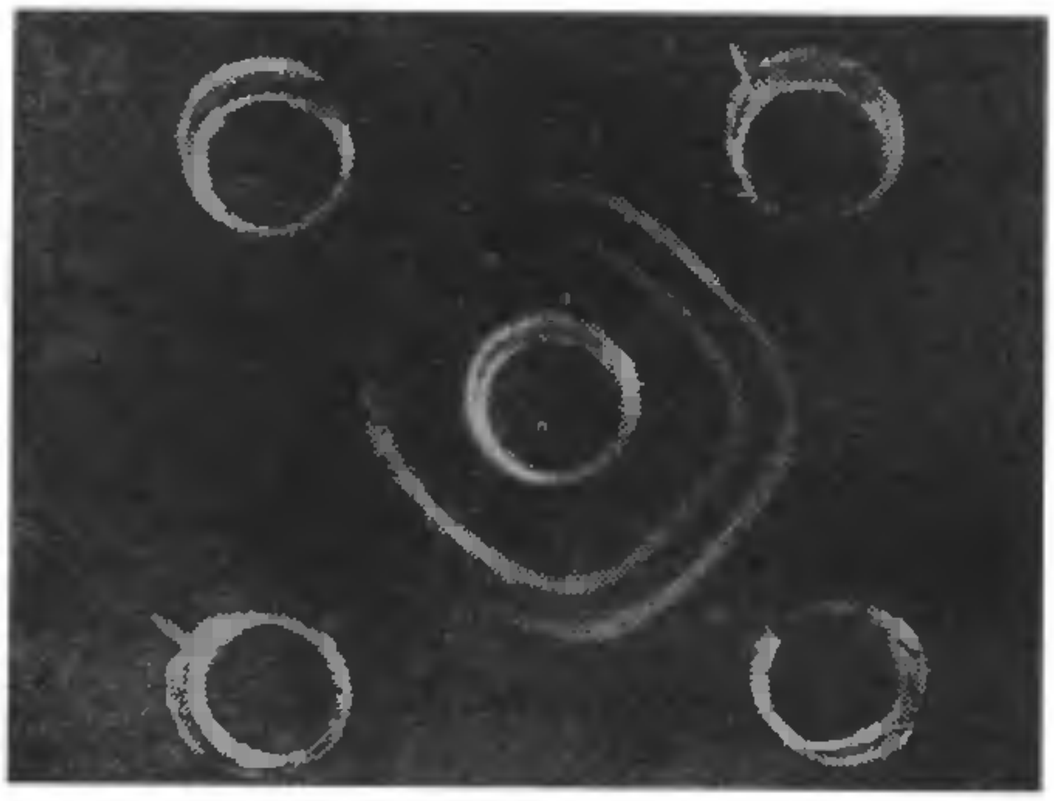

FIG. 1. Showing precipitin lines in gel. (The third line is faint). The central cup contains the antigenic fraction and peripheral cups sera of varying agglutinin titres from *Brucella* infected animals.

Thus the immunologically reactive nucleoproteins and serologically active polysaccharide hapten in this antigenic fraction not noly make it useful as a tool for the study of the antigenic structure of the genus but can also be employed in the field of diagnostic serology. Additional studies would be needed to determine the efficacy of this fraction in immunization of small animals as also for its application in various tests like Passive hæmagglutination and conglutinin complement absorption test.

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U. P. College of Veterinary Science and Animal Husbandry, Mathura, and Indian Veterinary Research Institute, Izatnagar (Bareilly), *September* 30, 1966.

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C. M. SINGH.

1. Braun, W., Burrous, J. W. and Phillips, J. H., *Nature*, London, 1957, **180**, 1356.
2. Foster, J. W. and Ribi, E., *J. Bact.*, 1962, **84**, 258.
3. Wolf, B. and Live, L., *Feed Poc.*, 1964, **23**, 143; *Vet. Bull.*, **34**, 3573.
4. Barber, C., Dimitriu, O., Vasilesco, T. and Cerbu, C., *Arch. roum. Path. Exp. Microbiol.*, 1962, **21**, 753. (*Vet. Bull.*, 1963, **33**, 2266).
5. Bruce, W. and Jones, L. M., *Bull. Wld. Hlth. Org.*, 1958, **19**, 187.
6. Paterson, J. S., Pirie, N. W. and Stahleforth, A. W., *Brit. J. exp. Path.*, 1947, **28**, 223.
7. Ristic, M. and Brandly, C. A., *Am. J. Vet. Res.*, 1959, **20**, 148.
8. Pathak, R. C. and Ristic, M., *Ibid.*, 1962, **23**, 310.

TISSUE HYDRATION IN RELATION TO DROUGHT RESISTANCE IN RICE

AMONG the theories put forward to explain drought resistance in crop plants, the one that gained wide acceptance is the ability of the protoplasm to maintain higher water potential at wilting stage (Asana, 1960). A study was undertaken at the Central Rice Research Institute, Cuttack, to see whether this held true in the case of rice.

Seeds of known drought resistant (*Mtu.* 17 and *W.* 418) and drought susceptible (*Co.* 13 and *B.* 76) varieties were sown by dibbling in the field and the crop was grown under normal irrigation (approximately field capacity) upto 30 days. Subsequently it was subjected to drought by withholding irrigation. Soil samples (20 cm. depth) and shoot samples were collected at weekly intervals up to 60 days growth of the crop and the percentage of moisture in both were determined by desiccation in an electric oven at 105° C. for the soil samples and at 70° C. in respect of plant samples.

An examination of the data presented graphically in Fig. 1, indicates that the drought resistant varieties (*Mtu.* 17 and *W.* 418) maintained higher moisture potential in their tissues than the susceptible types (*Co.* 13 and *B.* 76) with increasing moisture stress of the soil. Further, the decrease in moisture content of the plant with increasing moisture stress of the soil was more pronounced in the susceptible varieties than in the resistant ones. Stocker (1961) considered restriction of water loss and maintenance of normal physiological function under moisture stress to be the main mechanism of drought resistance in plants. The present study is also suggestive that, in rice, one of the factors associated with drought resistance is the ability of the plants to retain high moisture potential in their tissue under drought conditions. This might possibly be deemed as one