ment the expected photoperiodic effect in Rai, due to shortening of day length is, however, seen to be counterbalanced by low temperature effect.

(3) *Vernalization.*—Soaked unsprouted seeds of both the varieties were exposed to 2-4° C. in a refrigerator for 10, 20 and 30 days and sown on 1-10-'43 with controls. The flowering time for the control, and 10, 20, 30 days vernalized sets were 34, 33, 30 and 30 days and the fruiting time 43, 38, 38, 38 days respectively for Rai and the flowering time were 18, 18, 17, 15 days and the fruiting time 26, 25, 23 and 24 days respectively for Tori. Tori thus seems to be indifferent in the flowering and fruiting time due to presowing low temperature treatment and in Rai in view of the variation between plants within each treatment the differences in flowering and fruiting time are not significant.

Sen and Chakrabarty (1942) in the course of their intensive investigations over a number of years have reported a clear earliness of flowering in mustard due to presowing low temperature treatments. The results reported here do not confirm their findings, but it should be remembered that the varieties used by them and the authors are not the same and the post-treatment environmental factors in Almora and Calcutta are distinctly different.

It is thus seen that for any conclusion arrived at, after vernalization studies, the variety and the post-treatment environmental conditions should always be taken into account.

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May 6, 1944.

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1. Sen, B., and Chakrabarty, S. C., *Ind. Jour. Agr. Sci.*, 1938. 2. —, *Ibid.*, 1942.

TRICHODINA SP. FROM THE CAPSULAR GLAND OF *ARIOPHANTA LIGULATA* (FER.)

DASEN[1] in his account of the reproductive system of *Ariophanta ligulata* (Fer.), states that "in the cavity of the 'capsular gland' are found lying freely great numbers of very complex bodies which appear to be extrusions from the glandular wall". In the course of my studies of the reproductive system of some South Indian Pulmonates with special reference to the formation of the spermatophore, I had the opportunity of examining in detail the contents of the capsular gland of *Ariophanta ligulata*, and I find that what Dasen[1] considered to be 'excretory corpuscles' are really Peritrichous ciliate parasites belonging to the genus *Trichodina*. The two sketches given here illustrate the structure of the *Trichodina* found in *Ariophanta ligulata*. Dasen[1] does not seem to have examined the contents of the capsular gland of living specimens of *Ariophanta ligulata*. Had he done so, he would have noticed the so-called 'excretory corpuscles' swimming rapidly with their cilia.

The shape of the *Trichodina* from *Ariophanta ligulata* is best made out in living specimens. Dasen[1] described the 'excretory corpuscles' as resembling 'a finger bowl'. In the living specimen, with the velum extending all round the base, the shape resembles that of a hat, and is intermediate between that of *Trichodina pediculus*, and *Trichodina urinicola.*

A sketch of the basal view of the specimen is given by Dasen,[1] but he mistook the denticulated ring for a 'twisted rope'. As may be seen from the sketches given below, the organisation is typical of *Trichodina.* There is a well developed basal disc, velum, and denticulated ring. The denticulated ring contains about 19 teeth. In *Trichodina pediculus*, Clark[2] states that there are 24 teeth. The meganucleus is horse-shoe shaped and the micronucleus, which is not seen in the view represented in the figures, is imbedded in the meganucleus.

The incidence of the parasite in the capsular gland of *Ariophanta ligulata* seems to vary in the different seasons and also with the locality from which the snails are collected.

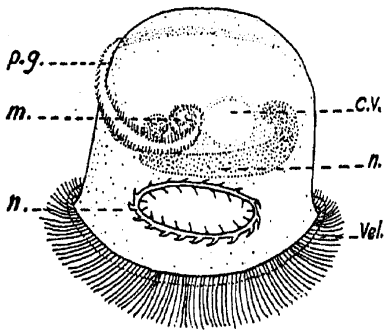

FIG. 1. *Trichodina* sp. from *Ariophanta ligulata* (Fer.), side view. *c.v.*, contractile vacuole; *m.*, mouth; *n.*, meganucleus; *p.g.*, peristomial groove; *r.*, denticulated ring at inner end of basal disc; *vel.*, velum.

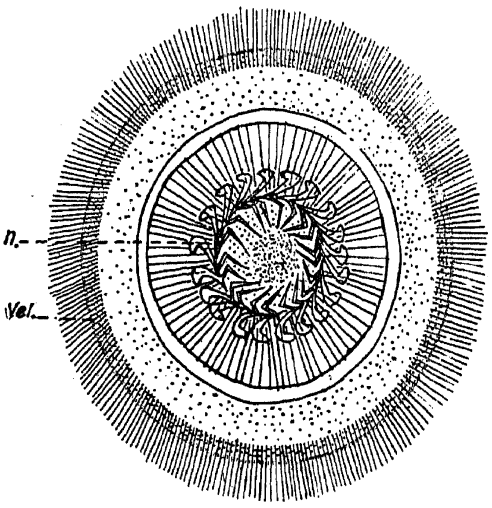

FIG. 2. *Trichodina* sp., from *Ariophanta ligulata* (Fer.), basal view. *r.*, denticulated ring at inner end of basal disc; *vel.*, velum.

From August to November I was able to collect large numbers of the parasites. In the subsequent months I found only few parasites and mostly in the encysted condition. In specimens which were obtained from Madras

the parasites were as a rule much less abundant than those from Nellore District. I may also mention that these parasites are not found in *Ariophanta bistralis* (Beck.).

Bhatia[3] states that the family Urceolariidæ, to which *Trichodina* belongs, has not been recorded so far from India. But Dr. H. S. Rao[4] in his paper on a Brackish-water Actinian, *Pelocoetes* from Madras mentioned the occurrence of *Trochodina* sp. in large numbers in the gastrovascular cavity and often swarming in the cavities of the tentacles.

It is, however, very interesting that species of *Trichodina* should occur in a land animal like *Ariophanta ligulata*. *Trichodina pediculus*, the best known species of *Trichodina* occurs on the body surface of *Hydra*. *Trichodina urinicola* has been found in the urinary bladder of a moribund toad and also in the newt *Triturus*, in the same site. Other species of *Trichodina* have been collected from bodies and gills of fish. Discussing the life-histories of ciliate parasites, Goodrich[5] states: "Fulton suggested that *Trichodina urinicola* may have evolved from forms like *Trichodina pediculus* infesting fish-like ancestors; the ciliates leaving the gills and body surface for the bladder as or before the host left the water". But this theory will not explain the origin of a species of *Trichodina* inhabiting the reproductive system of a land Pulmonate like *Ariophanta ligulata*.

In conclusion I have pleasure in expressing my thanks to Prof. R. V. Seshaiya for guidance and encouragement and to Dr. H. S. Rao for pointing out that a species of *Trichodina* was recorded by him.

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March 30, 1944.

1. Dasen, D. D., *Proc. Zool. Soc. London*, 1933, **103**, 97. 2. James-Clark, H., *Ann. and Mag. Nat. Hist.*, 1866, **17**, 401–25. 3. Bhatia, B. L., "Fauna of British India," *Protozoa: Ciliophora*, 1936, 395. 4. Rao, H. Srinivasa, *Journ. and Proc. As. Soc. Bengal* (n.s.), 1924, **20**, 344. 5. Goodrich, H. Pixell, 'Life-Cycles of Certain Infusoria with Observations on Specificity in Parasitic Protoza.' in *Evolution* (edited by DeBeer, G. R.), 1938, pp. 231–34.

BURNT PADDY-HUSK FOR THE CONTROL OF INSECTS IN STORED FOOD GRAINS

RECENT investigations by Briscoe,[1] Parkin[2] and others have shown that certain kinds of finely-ground dusts of natural minerals like Flint, Felspar, Silica, Dolomite and Limonite and flue dusts from power stations and blast furnaces and power-station Clinker, act as very efficient checks against weevils infesting wheat when the dusts are mixed intimately with the grain.

Observations made by the senior author, of the methods of storing grains, followed in the interior villages of the Malnad areas, led to an investigation of the efficacy of burnt paddy husk in the control of insects affecting different grains. It was found that burnt paddy husk, in finely powdered form (100-mesh to the inch), when thoroughly mixed with jola, rice, wheat and horse-gram at the rate of 1 per cent. of the weight of the grains, adhered to them exceedingly well and caused a high percentage of mortality of the insects. In a series of experiments, in Petri dishes, jars and gunny bags (holding one seer of grain) the following rates of mortality were observed:—

Grain	Insect	Average percentage of mortality
1. Jola ..	Weevil: *Calandra oryzæ*	86·3
2. Rice)	Beetle:	
3. Wheat) ..	(*a*) *Rhizopertha dominica*	100·0
	(*b*, *Tribolium* sps.	68·4
4. Horsegram	Beetle: *Bruchus chinensis*	100·0

The larval stages of *Tribolium* and *Bruchus* beetles in their tunnels inside the grains, have also been found to be affected. Sound grains (free of insects) mixed with burnt paddy husk powder, also repelled the insects to a marked degree.

The removal of the powder from the grains offered no special difficulty, since, ordinary winnowing and sieving and the usual cleaning or moistening with water prior to cooking for consumption, are found sufficient to render the grains free of the powder.

As paddy husk is commonly available everywhere, its use makes the problem of control of insects affecting stored-grains very easy, cheap and simple. The chances of 'silicosis' in the use of this powder, are very much less than in the case of the powders of pure minerals and 'clinker'.

Further work on a large scale is in progress. Fine powders of burnt husk of other cereals and some pulses are also being tested.

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June 14, 1944. B. KRISHNA MURTHY.

1. Briscoe, H. A. V., "Some New Properties of Inorganic Dusts," *J. Roy. Soc. Arts*, **91**, (4650). 2. Parkin, E. A., "Control of the Granary Weevil with Finely Ground Mineral Dusts," *Ann. Appl. Biol.*, March 1944, **3**, No. 1.

RELIEF FOR SCIENCE TEACHERS

THE appalling position of science teachers, particularly of those serving in non-Government institutions, whose emoluments even during peace-time were hardly adequate for their sustenance, has been brought home through an ever-increasing number of letters which reach me daily from all parts of India.