0.83[10,11,13,14]. The substances at Rf 0.6–0.7 in *W. prolifica* and at Rf 0.7 to 0.8 in *P. boryanum* are likely to be of the nature of zeatin.

The gibberellic acid has a stimulating effect on cotyledon growth in the absence of cytokinin while in the presence of cytokinin it is markedly inhibitory[15]. The absence of any increase in the length of radish hypocotyl sections in the experiments shows that the expansion of radish cotyledons in the bioassay is due to cytokinin-like substances only.

It may be concluded that *W. prolifica* and *P. boryanum* contain cytokinin-like substances. Their actual chemical nature, however, needs confirmation. The presence of gibberellins[16] and cytokinins may partly account for the beneficial effect observed[17,18] in some crops on blue-green algal seed treatment.

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TEMPEH—A FERMENTED FOOD FROM SOYBEAN

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SEVERAL fermented food products are known from the South-East Asian countries. A few examples are *sufu* and *tempeh* from soybean, while *ragi* and *bhakar* are obtained by fermenting rice. *Tempeh*, particularly, has interested many investigators because of its good flavour, cheap base and nutritional value. Since *tempeh* has more protein as compared to other pulse products and is palatable, it can be a good substitute for raw soybeans which are considered unpalatable. However, most of the work on *tempeh* fermentation to date has been with American soybean cultivars *viz* Hawkeye, Hood, Harvey, Dorman, Lincoln, Chippawa, Dortchsoy, Jackson and Lee or with Japanese cultivars *viz* Hokkaido, Iwota and Kunamoto. It was, therefore, thought desirable to develop *tempeh* fermentation with popular Indian commercial cultivars of soybean, mainly, DS-74-24-2, Bragg, Clark-63 (yellow-seeded) and Jawa-16 (black-seeded).

Pioneering work on food fermentation in the Orient led to the knowledge that *Rhizopus* was associated with fermentation in *tempeh*[1,2]. Later, other species like *R. oligosporus*[3], *R. oryzae*[4], *R. arrhizus*, *R. formosaensis* and *R. achlamydosporus*[5] were also utilized for fermentation technology.

Tempeh is traditionally prepared by soaking the beans overnight, dehulling by hand and boiling for 30 min at atmospheric pressure. These are later dried and packed into banana leaves or paper along with an old piece of *tempeh* as starter[6].

In the present investigation, the laboratory method devised by Hesseltine *et al*[7] was employed. *Rhizopus stolonifer*, *R. arrhizus*, *R. oryzae*, *R. microsporus*, *R. oligosporus* and *R. chinensis* were utilized to ferment the four soybean varieties mentioned above. The beans (100 g) were soaked in 300 ml of water for 20 hr at 25 C. These were then dehulled by hand under tap water and boiled for 30 min at atmospheric pressure.

The excess water was drained off, the beans cooled and dried, but enough moisture was maintained to permit fungal growth. A spore suspension of six species of *Rhizopus* was prepared in 1.5 ml of sterilized water, which was used to inoculate the beans tightly packed in petriplates (7 cm size) in each case. The incubation period was 20 hr at 31 C. Subsequently fermentation takes place and *tempeh* is obtained as a compact mass. It can be removed from the petriplate as a solid cake. Good quality *tempeh* has a fresh, pleasant slightly mushroomy odour. It should not be musty or sour because it is then considered unpalatable (figure 1).

The best results were obtained with *Rhizopus oligosporus*. It not only imparted a good flavour and colour to the *tempeh*, but also formed a compact mass which was covered with a white mouldy growth. This was followed by *R. stolonifer*, *R. oryzae*, *R. microsporus*, *R. arrhizus* and *R. chinensis*. In the case of *R. arrhizus* and *R. chinensis* the mycelial penetration of the beans was minimal, specially with *R. chinensis*; the beans were loosely bound. Except for *R. chinensis*, which was utilized for the first time in *tempeh* production, the findings were similar to those of Hesseltine *et al*[7]. All the three yellow-seeded cultivars of soybean produced satisfactory *tempeh* but the black-seeded (Jawa-16) did not yield *tempeh*.

One of the major constraints with the popularisation of *tempeh* as a food is its short shelf-life. This is because, if the mould growth is allowed to continue, the product acquires an ammoniacal smell. This can be controlled by boiling slices of *tempeh* in 10% brine[7]. These slices are then dried, wrapped in polythene and stored in the deep-freeze. It was observed that no deterioration in taste or smell occurred upto 10 days and this method can be utilized by industrialists as well.

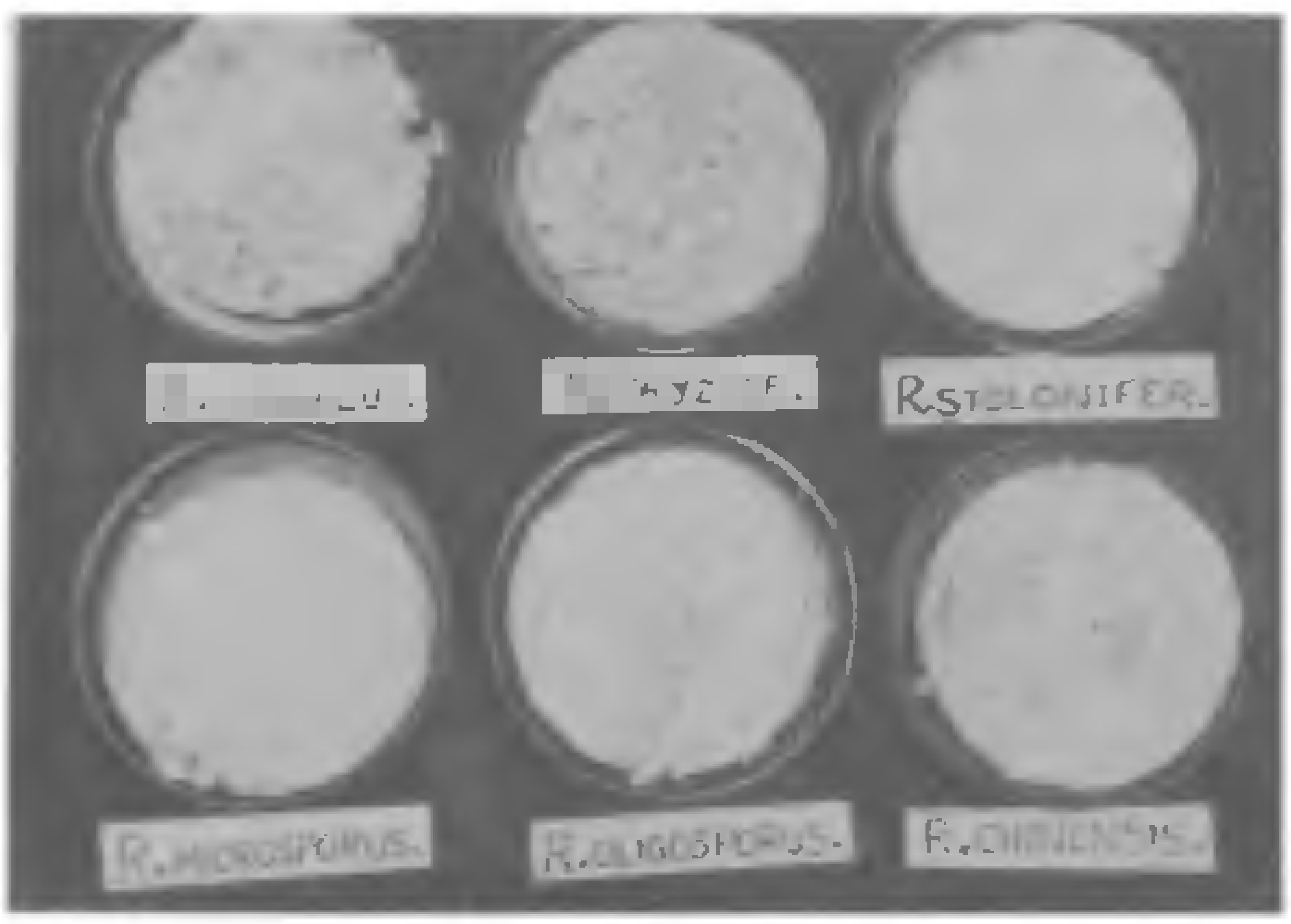

Figure 1. Tempeh cakes fermented by different *Rhizopus* species.

The results reported in this note are based on the M.Sc thesis of RS.

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ON THE MORPHOLOGICAL DIFFERENCES BETWEEN *DACTYLOCTENIUM AEGYPTIUM* AND *DACTYLOCTENIUM ARISTATUM* (GRAMINEAE)

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Dactyloctenium aegyptium (L.) P. Beauv. is an important fodder grass of the rainy season. It is widespread in the tropical regions of the old world and has *D. aristatum* Link as a close relative, the distribution area of which is north-west Africa to north-west India.

In the current taxonomic literature, the morphological differences between *D. aegyptium* and *D. aristatum* are sought in the presence or absence of stolons, spike length, number of racemes per spike and the extent of prolongation of the rachis. According to Bor[1], *D. aegyptium* is stoloniferous with spikes 2-5 cm long and the tip of the rachis extends upto 2 mm in length. On the other hand, *D. aristatum* is not stoloniferous with spike 0.5–2 cm long and the tip of rachis is produced upto 4 mm. However, the separation of *D. aristatum* from *D. aegyptium*, on the basis of above characters, has been found to be extremely difficult in the N.W. Indian populations of these species.

The morphological differences between *D. aegy-*