two checks namely, Pusa bold (*B. juncea* L—susceptible) and yellow sarson YS-8 (*B. campestris* L—highly susceptible) were raised in 25 cm earthen pots at the rate of four in each.

When these plants were 50 days old, the abaxial surface of the third and fourth leaf counted from the first cotyledonary leaf was gently rubbed with a dry cotton swab to remove the epicuticular wax layer. An equal number of these plants without rubbing of their leaf surface was used as control. Each treatment consisted of four pots which were replicated four times. Plants were uniformly inoculated with equal amounts of conidial suspension of *A. brassicae* (5–7 conidia/low power microscopic field) made from freshly isolated PDA culture of the fungus and then incubated in a moist chamber for 48 hr. Data on the average number and size of lesions developed on the leaves of the three cultivars were taken respectively, after 7 and 15 days following inoculation (table 1). The daily maximum and minimum temperature and relative humidity during the period varied between 9° to 16°C and 90 to 95% respectively.

The results show that the three cultivars differ with respect to the average number as well as the size of lesions on their leaves both under unwiped and wiped conditions. Wiping of the leaves with cotton swab increased the disease susceptibility greatly in *B. oleracea* var *alboglabra* and only marginally in Pusa bold but not in yellow sarson. *B. oleracea* var *alboglabra* contains epicuticular waxy material in the form of white powdery bloom on its surface and its removal from the leaf surface by wiping increased its susceptibility to the disease. It appears to be present in trace on Pusa bold and absent on yellow sarson YS-8 since wiping slightly increased the disease susceptibility of the former but not that of the latter.

According to Skoropad and Tiwari[4] the presence of epicuticular wax on the cultivars of rape seed and mustard confers a physical type of resistance to *A. brassicae* under field conditions. It probably acts by preventing water droplets to stay on the leaf surface and also as mechanical barrier to the invading pathogen. It has apparently no effect on the pathogen after the latter (*A. brassicae*) has made an entry into the host. However, examination of a large number of cultivars belonging to *B. juncea* and *B. campestris* group revealed that resistance against leaf blight is very rare in these two species. Therefore, attempts should be made to incorporate this type of resistance into cultivated varieties by resorting to inter-specific hybridization.

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Table 1 *Effects of epicuticular wax on infection of A. brassicae in Brassica spp.*

Cultivars	No. of lesions/leaf		* Size of lesions (mm)	
	Unwiped	Wiped	Unwiped	Wiped
B. oleracea var *alboglabra*	3.0	9.2	4.7	4.3
B. juncea (var Pusa bold)	19.5	24.7	7.4	8.2
B. campestris (yellow sarson var YS-8)	21.0	21.2	8.0	7.7

* Average of 50 lesions.

1. Bhowmik, T. P., *Intensive Agric.*, 1979, **17**, 23.
2. Chahal, A. S., Kang, M. S. and Chohan, J. S., *Prog. Farming*, 1977, **14**, 21.
3. Tiwari, J. P. and Skoropad, W. P., *Can. J. Plant Sci.*, 1976, **56**, 781.
4. Skoropad, W. P. and Tiwari, J. P., *Can. J. Plant Sci.*, 1977, **57**, 1001.

A SIMPLE TECHNIQUE FOR *RHIZOBIUM* PLANT INFECTION TEST

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PLANT infection and nodulation is the ultimate characteristic in authentication of an isolated bacterium as *Rhizobium*. For this authentication, even though small seeded legumes of the respective cross inoculation group can be substituted for large seeded ones, ideally, a *Rhizobium* strain is tested for its ability to form nodules in the host from which it was originally isolated and/or on plant species to which they are intended. Leonard jar[1] and growth pouches[2] were recommended as growth units for large seeded legumes like soybean and cowpea for establishing nodulation. Prefabricated plastic pouches are preferred due to their ease in handling and economy of space and labour. But these ready made pouches are not

always available and require gamma radiation for sterilisation. Furthermore frame structures are necessary to hold them upright when plants establish. A simpler technique developed in this laboratory is reported.

Glass tubes (30 × 4 cm) containing standard germination paper with a fold at the top were covered with aluminium foil, wrapped in covers and sterilised by autoclaving Surface-sterilised seeds inoculated with a peat-based test culture and allowed to sprout over soft agar (1% W/V) or moistened filter paper in sterile petri dish for 2 days. Three or four seeds were aseptically transferred by forceps to the folds of the germination paper in such a way that the radicle faced downward in the perforation made by forceps. Sterile nitrogen-free nutrient solution[3] (30 ml) was poured along the sides of the tubes with least disturbance to the seeds. Tubes kept in a stand were placed in glass house. Nutrient solution was added periodically as a source for nutrients and to maintain moisture. After 25 days paper with plants was removed, unfolded and plants examined for nodulation. Cowpea, black and green grams and pigeon pea and soybean were well nodulated in tubes and as many as 30, 35, 31, 10 and 13 nodules per plant were formed respectively in these legumes. Glass tubes of 15 × 2.5 cm were also used for this test. Repeated experiments have shown that this technique is well suited for nodulation test with large seeded legumes.

The advantages of lower cost and labour observed in plastic pouches are retained in this technique besides an added advantage of protection from frequent contamination due to its compactness. Plants grown in pouches were found quite susceptible to airborne contamination by rhizobia under dusty green house conditions[4], whereas in plants grown in tubes such contaminations were avoided by stoppering the tubes with cotton, leaving the shoot outside along the sides of the tubes. In paper pouches not all the plants grown showed uniform nodulation which might be due to non-compactness and loose drooping nature of roots. However in tubes almost all plants exhibited nodulation due to firmness and compaction achieved by rolling the paper. Use of sterilized sand soil medium might cause injury to roots of host plants which provides portal entry to rhizobia. Heat sterilization of soil released excess of ammonia and water soluble organic compounds that retard growth or toxic to plants[5]. Besides providing adequate aseptic conditions for nodulation in host plants, the toxicity or retardation of plants due to sterilized soil is avoided as soil is dispensed with. Above all, this technique can be carried out anywhere with minimum laboratory facilities.

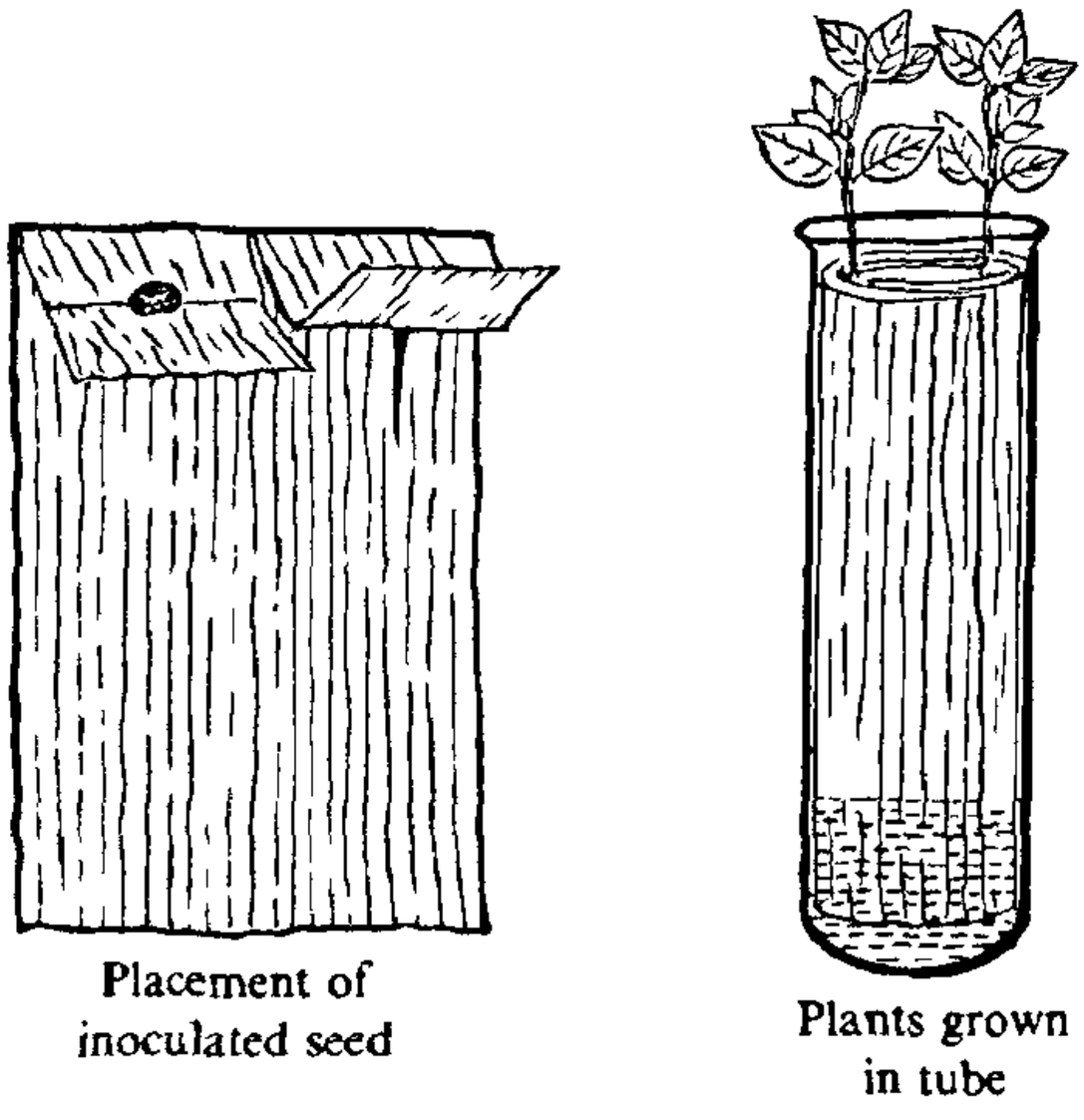

Figure 1. Plant infection test for rhizobia

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1. Leonard, L. T., *U.S.D.A. Circ. No. 703*, 1944, 8.
2. Porter, F. E., Nelson, I. S. and Wold, E. K., *Crops Soils*, 1966, **18**, 10.
3. Jensen, H. L., *Proc. Linn. Soc. N. S. W.*, 1942, **68**, 98.
4. Weaver, R. W. and Fredrick, L. R., *Plant Soil*, 1972, **36**, 219.
5. Lawrence, W. J. C., *Soil sterilization*, George Allen & Unwin Ltd., London, 1956, p. 166.

OPTIC LOBES IN THE SILVERFISH

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THE optic lobes of insects are situated in the anterolateral part of the brain. Normally there are three neuropiles, namely, the lamina ganglionaris, the medulla externa and the medulla interna (lobula)[1]. Important details of optic lobes, their axon pathways