

(4) The effect of partial soil sterilization (Treatment B) was found to be considerable. In the pots, increased yields of 181.30% grain and 192.77% straw over the control were recorded. In the field, lower but significant responses of 20.10% grain and 20.15% straw were obtained. Partial soil sterilization in the case of pots also hastened the ripening of crop by 5-6 days.

(5) Partial soil sterilization in combination with nutrient mixture (Treatment F) recorded further increases in yields of grain and straw in pots and field.

The beneficial effect of soil heating or partial sterilization may be due to the improvement in the physical properties of soil, killing of undesirable groups of pathogens, parasites and weeds and to increase in the production of ammonia, nitrates and other available mineral plant nutrients.¹¹⁻¹⁴

(6) The highest increases of 275.56% grain and 236.28% straw in pots and 53.87% grain and 58.04% straw in the field over control were obtained with combination of partial soil sterilization, nutrient mixture and blue-green algæ (Treatment H).

It is evident from these findings that partial soil sterilization, and blue-green algæ in the

presence of nutrient mixture contribute to increase in paddy yields.

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A STUDY OF THE POLLEN GRAINS OF JUSSIEUA AND LUDWIGIA WITH REMARKS ON THE TAXONOMIC STATUS OF JUSSIEUA SUFFRUTICOSA LINN.

J. VENKATESWARLU AND V. SESHAVATARAM

Department of Botany, Andhra University, Waltair

THE family Onagraceæ constitutes about 500 species distributed among 40 genera which are temperate and tropical.¹ Embryologically the family is of special interest because of the universal occurrence of monosporic tetranucleate embryo-sac known as the Oenothera type, having been demonstrated in more than 16 genera.² A majority of the species studied exhibit a remarkably homogeneous and most fundamental type of embryonomy known among the angiosperms.³ Warming (1932) describes the pollen grains of the family to be well pronounced, triangular and connected together by viscous threads. Erdtman (1952) gave a detailed palynological account of the family and remarked that the pollen grains of the family are not similar to those of any other family. As far as the writers are aware, *Jussieua repens* Linn., *J. suffruticosa* Linn. and *Ludwigia parviflora* Roxb. have not been studied

palynologically. Hence the present study is undertaken.

The material was collected from paddy fields and the nearby areas in the West Godavary District of the Andhra Pradesh. The pollen bearing material was suspended in glacial acetic acid and acetolysed, a part of which is chlorinated. Both acetolysed and chlorinated pollen grains were mounted under the same coverslip in glycerine jelly.⁴

Jussieua repens LINN.

Pollen grains free and not united in tetrads, triporate, angulaperturate, ora lalongate, sexine thicker than nexine with a fine granular structure (Table I, Fig. 1).

Jussieua suffruticosa LINN.

Pollen grains united in tetrads with a mean diameter of 123 μ . Tetrads tetrahedral, with

apertures uniting according to Fischer's rule.⁴ No viscin threads were observed protruding out of the margins of the grains. Pollen grains triporate, angulaperturate, ora lalongate, raised above the surface of the grain with a conspicuous rim at the periphery and a similar one at the base. Sexine thicker than nexine, finely granular (Table I, Fig. 2).

Ludwigia parviflora ROXB.

Pollen grains united in tetrahedral tetrads with a mean diameter of 60 μ . Apertures of the grains uniting in tetrads according to Fischer's rule. Pollen grains triporate, angulaperturate, ora lalongate, raised above the surface of the grain (cf. *J. suffruticosa*). Sexine thicker than nexine. No viscin threads were observed protruding out of the pollen grain margins (Table I, Fig. 3).

TABLE I

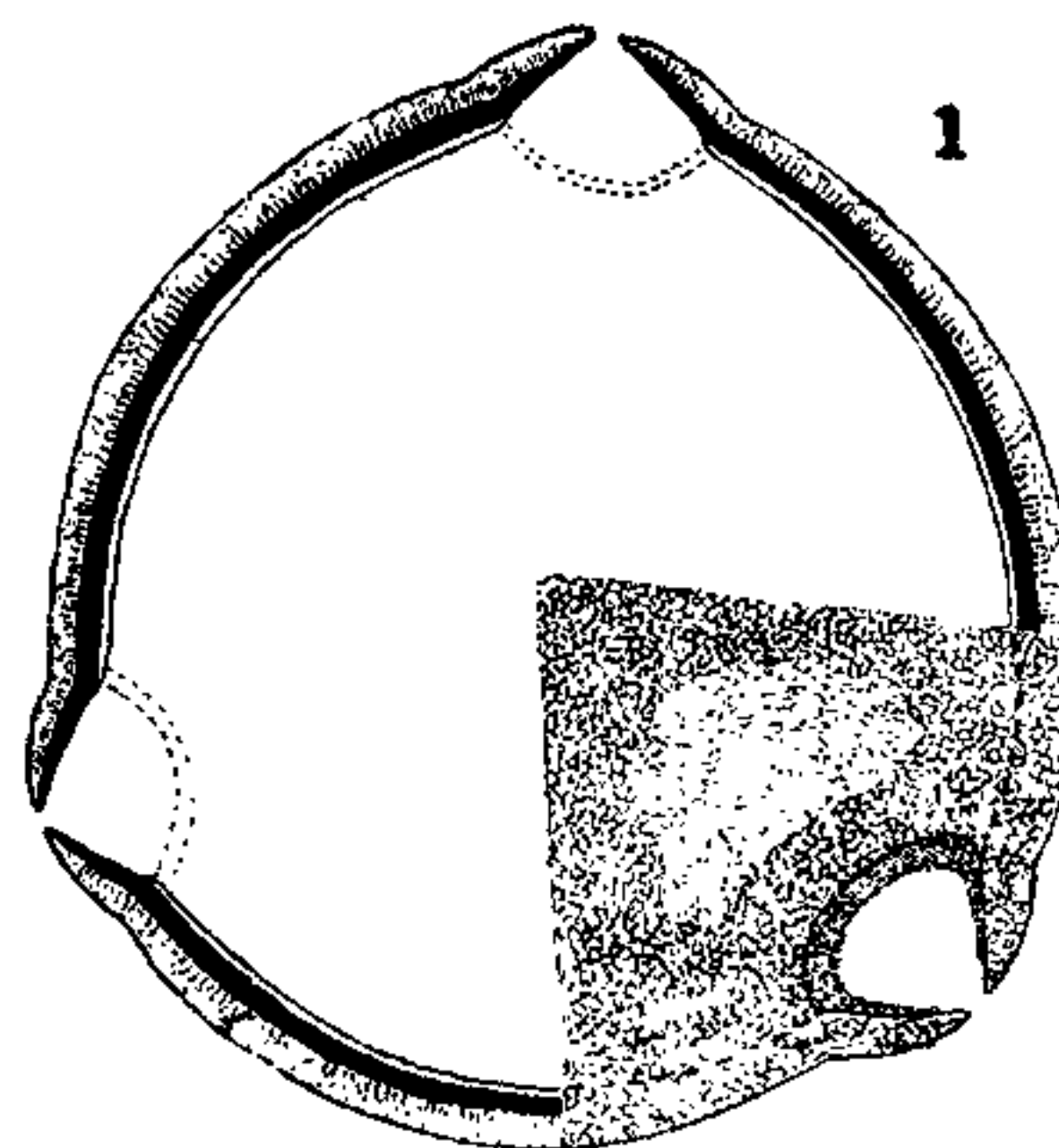
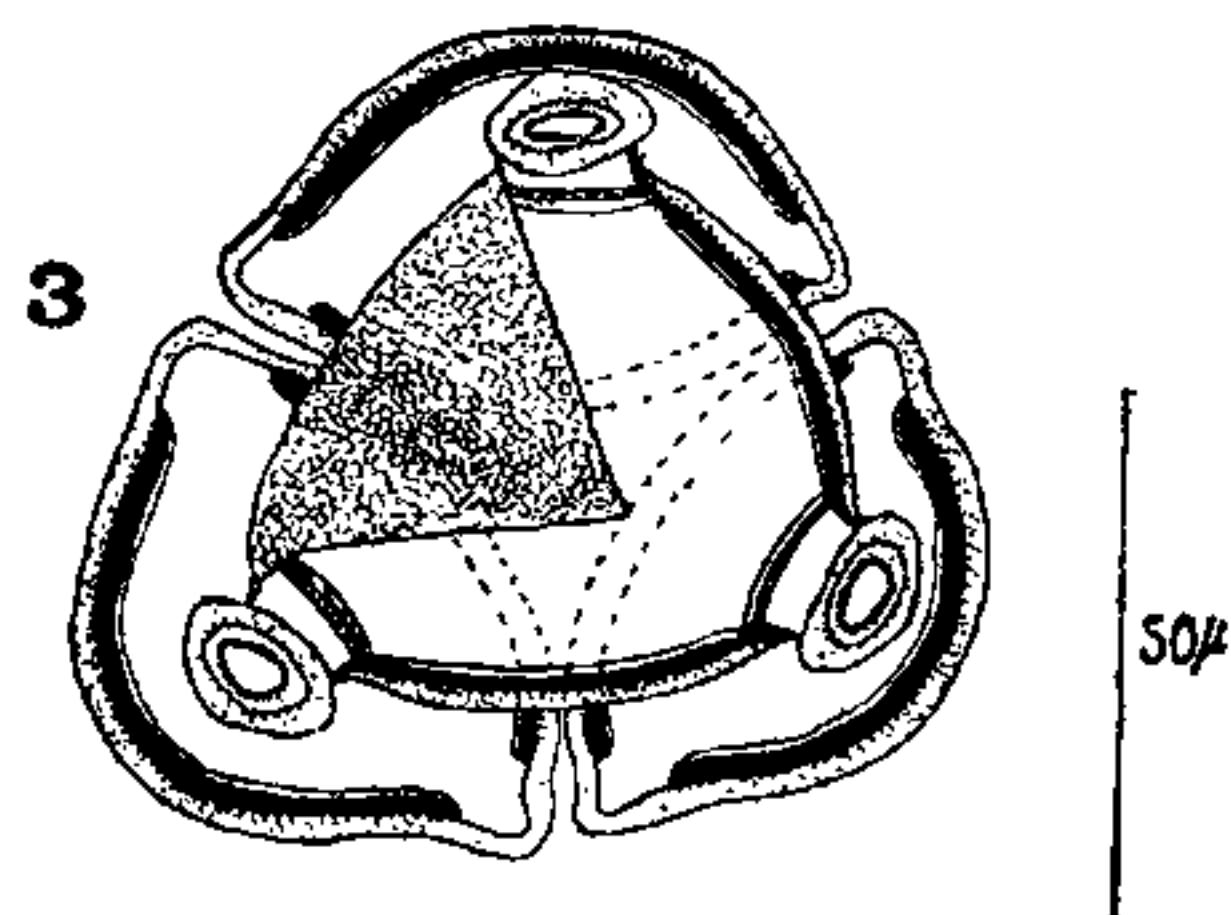
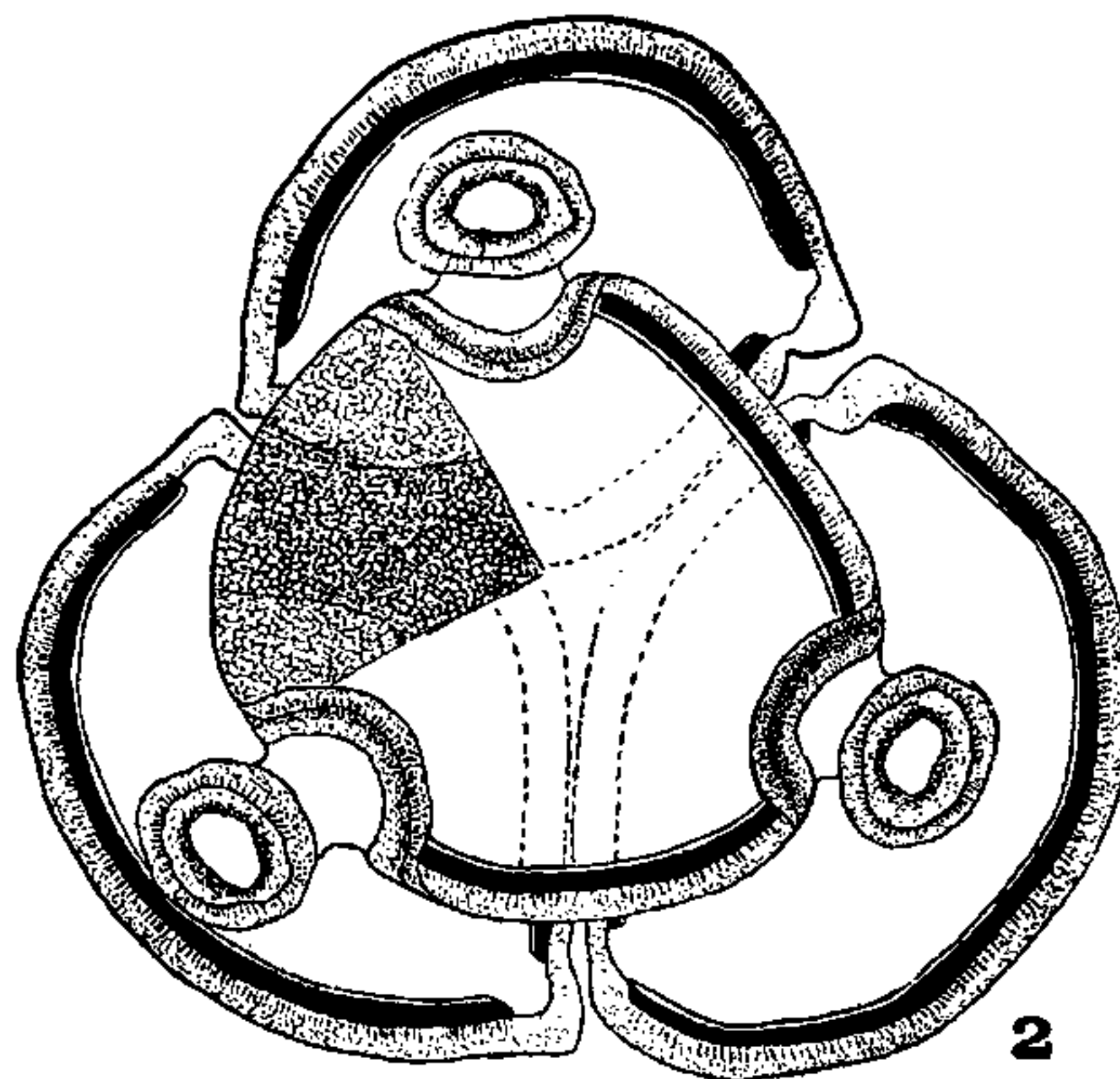
Showing the morphological characters of the pollen grains

Name	Size (μ)			Thickness (μ)			Diameter of the pore (μ)
	Tetrad	Polar view	Equatorial view	Exine	Sexine	Nexine	
<i>Jussieua repens</i>	..	61.88	83.93	5.90	3.95	1.95	11.18
<i>J. suffruticosa</i>	122.85	60.18	87.42	5.26	3.44	1.82	9.42
<i>Ludwigia parviflora</i>	60.12	53.47	45.17	3.08	1.95	1.13	5.72

* Averaged from 50 observations.

The occurrence of pollen grains in tetrads connected by viscid protoplasmic threads has been considered by Pope (1925) to be of a normal feature of the family Onagraceae. Erdtman (1952), on the other hand, considers this feature to be of less frequent occurrence. In *Bosiduvalia densiflora* he reports pollen grains united in tetrahedral tetrads. His descriptions of pollen grains of *Jussieua grandiflora* and *Ludwigia paulstris* indicate in both the cases that the pollen grains are free from one another and not united in tetrads. The present study of *Jussieua repens* clearly shows that the pollen grains are not united in tetrads but are free as in *J. grandiflora*. On the other hand, *J. suffruticosa* and *L. parviflora* have their pollen grains united in tetrahedral tetrads, a feature not found in *J. repens*, *J. grandiflora* and in *L. paulstris*. The last named plant may well be *Jussieua paulstris* as indicated by DeCandolle (1828). Incidentally, it may have to be mentioned here

that *J. suffruticosa* resembles more of *L. parviflora* in other morphological features also than *J. repens*. A comparative account of the morphological features of the three species included in the study is given in Table II.



FIGS. 1-3. Fig. 1. *Jussieua repens*, pollen grain. Figs. 2-3. Pollen tetrads of *J. suffruticosa* and *Ludwigia parviflora*.

From the above it is clear that *J. suffruticosa* seems to be more closely allied to *L. parviflora* than to *J. repens*. DeCandolle (1828) did not

TABLE II

Showing morphological features of *Jussieua repens*, *J. suffruticosa* and *Ludwigia parviflora*

Character	<i>Jussieua repens</i>	<i>Jussieua suffruticosa</i>	<i>Ludwigia parviflora</i>
Habit	Herbaceous water plant with prostrate stems rooting at the nodes	A semi-skrubby erect perennial, 4 to 6 ft. high	Erect herb, 6 inch. to 2 ft. high
Stem	Hollow and round	Angular	Angular
Flowers	Pale yellow or white, pedicels long	Yellow, pedicels short	Yellow, small, pedicels very small
Calyx and corolla	5-merous, petals clawed	4-merous, petals broadly obovate	4 merous, petals elliptic, oblong
Stamens	Ten	Eight	Four
Capsule	Cylindric, 5-valved	Subquadrangular, 4-valved	Quadrangular, 4-valved

consider *J. suffruticosa* as a species of *Jussieua* but includes it under 'species not satis notæ'. The evidence from pollen morphology shows that what is commonly regarded as *J. suffruticosa* by the taxonomists is to be treated as species of *Ludwigia*.

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PRESENT STATUS OF ONION SMUT IN INDIA AND ITS CONTROL

N. V. R. URS, H. C. GOVINDU¹ AND P. R. MEHTA²

STRAY attacks of onion smut *Urocystis colchici* (Schlecht.) Rabenh. (*U. cepulae* Frost) was observed and recorded for the first time by M. J. Narasimhan in 1920 (cf. S. V. Venkatarayan's paper in *Curr. Sci.*, 1960, 29, 324) from Mysore. The disease was observed again in 1958 and 1959 by Venkatakrishniah⁷ near Melur village, Kolar District. The disease was noticed to occur in the same field in both the years over an area of about half an acre. In view of the serious nature of the disease, all the onion-growing areas of the State were thoroughly surveyed and the authors could locate only one infected field of about 3½ acres near Chennarayapatna of Bangalore District. The two localities where smut was observed recently are seven miles apart. The crop in the infested field in both the localities was destroyed by burning and at Melur the soil was drenched with 0.5% solution of Ceresan

wet. Cultivation of onion was also banned in the affected fields.

Since India exports large quantities of onion, particularly a variety known in the trade as 'Bangalore onion', which is grown in Mysore State and elsewhere and because the presence of the disease was jeopardising the export trade, numerous steps are being taken to eradicate the disease and to prevent its spread. The measures taken are enumerated below:

(i) Declaring the area within a radius of 1.6 kilometers of the infested fields under the Pests and Diseases Act of the State.

(ii) Not to permit the cultivation of onion in infested fields for about six years in the first instance.

(iii) Not to allow the export of onion from the areas declared under the Pests and Diseases Act.

(iv) To allow planting of the area under (i) only with onion seeds pelletised with an appropriate fungicide.

Since (i) to (iii) are administrative measures, these are not discussed herein. Work carried

¹ Division of Plant Pathology, Agricultural Research Institute, Hebbal, Bangalore-24.

² Directorate of Plant Protection, Quarantine and Storage, New Delhi.