TABLE II

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

Character		*Jussieua repens*	*Jussieua suffruticosa*	*Ludwigia parviflora*
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

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STRAY attacks of onion smut *Urocystis colchici* (Schlecht.) Rabenh. (*U. cepulæ* 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 Venkatakrishniah[7] 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

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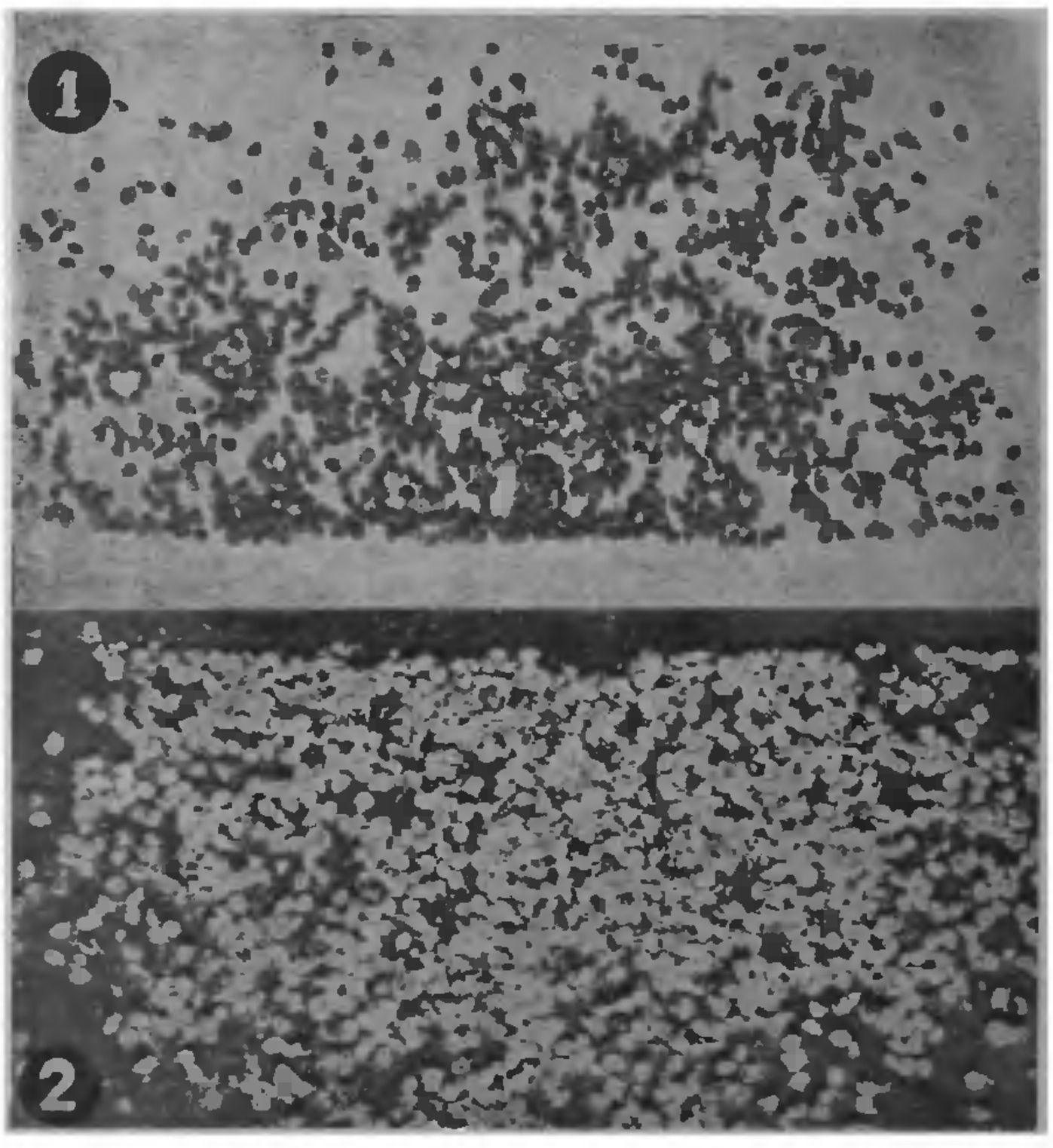
out to determine the efficacy of various fungicides is described below.

The onion crop in Kolar and Bangalore Districts is usually raised by broadcasting seeds; transplanting seedlings raised in nurseries is not commonly practised. Since only one variety is grown, it has been decided that the entire seed intended to be sown in the area declared as infested by the disease would be pelletised with an appropriate fungicide free of cost by the Agricultural Department, Mysore State, and distributed to cultivators for sowing. Experiments were, therefore, conducted in the infested fields at Chennarayapatna and the results of the fungicidal trials are mentioned in this paper.

Numerous workers have previously tried seed treatment with various fungicides for the control of onion smut using methylcellulose as a sticker. Linn and Newhall[6] used Arasan and Tersan for the control of smut with 5% methylcellulose. This treatment was reported to give good control. Larson and Walker[5] applied Thiram at 1/10 lb. and the smut was reported to have been controlled. Duran and Fischer[4] have used 50% Thiram with 4% methylcellulose as sticker and found that smut was reduced by 30%. Chupp and Sherf[3] also got good control of smut by using Thiram and Flit-406 in equal quantities by weight, using methylcellulose as a sticker.

In the present studies, the fungicides tried were Thiram, Arasan, Flit-406 and P.C.N.B. The seeds were pelletised with Tenac (a Burmah-Shell product) as a sticker. Tenac was selected because various brands of (carboxy) methylcellulose manufactured in India inhibited the germination of onion seeds to a marked extent. Previously Tenac has been used as a sticker with dithiocarbamates by Abeygunawardena[1] in Ceylon for the control of late blight of potato. Experiments were conducted in January 1963, the main growing season for onion in the affected areas. Replicate plantings were made in all cases and the blocks were randomised. For each replication there was one control block. The seeds were pelletised with Tenac 1 : 1000 c.c., which gave a complete coating on the entire surface of the seed (Fig. 2) as compared with the check (Fig. 1). Two



FIGS. 1–2. Fig. 1. Untreated onion seeds compared with pelletised. Fig. 2. With Tenac as sticker.

ounces of onion seeds were mixed well with known concentration of sticker in a litre flask and well shaken. When the seeds were completely moistened, the excess of the solution was drained off. Two ounces by weight of each of the fungicides were added to the flask separately and vigorously shaken so that the seeds were uniformly coated with the fungicide. It was then dried in shade and sown after two days in the field. There was 100% germination in all the treated seeds, when they were sown in the germination box in the laboratory. Periodical observations were made to study the germination of the seeds under field conditions. Data were collected till the crop was three months old, and the determination of the relative efficacy of the treatments in the field was based on the percentage of decrease in the amount of smut infection as compared with control plots (Table I).

TABLE I

Percentage of healthy onion plants compared with control for each treatment by four fungicides replicated four times

Replications	Treatments				
	Thiram	Flit-406	P.C.N.B.	Arasan	Control
1	100·0	94·94	99·75	99·43	93·93
2	99·5	99·32	99·98	99·74	93·75
3	100·0	100·0	98·18	99·17	95·37
4	100·0	99·86	99·54	98·98	93·33
Average	99·87	98·53	99·36	99·33	94·09

It can be seen from Table I that the average incidence of smut in control (untreated) was 5·91 whereas it was 0·13, 1·47, 0·64 and 0·67% respectively in treatment with Thiram, Flit-406, P.C.N.B. and Arasan. In view of the superiority of Thiram over others, it will be used for pelleting seeds for distribution to the cultivators by the State Agriculture Department.

It is also of interest to note that, even in the absence of the onion crop since 1960, the smut has survived in the soil for about 2½ years. This is not unusual; the ability of the smut to survive in soil for as long as 15 years in the absence of susceptible host has been reported.[2]

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* Original not seen.

COHERENTLY DRIVEN MOLECULAR VIBRATIONS AND LIGHT MODULATION

THEORIES of Raman lasers have concentrated attention on the individual molecular processes of Raman scattering and on the normal Raman emission. Very intense light beams in dense matter produce interesting higher-order Raman effects, particulary through excitation of intense coherent molecular oscillations at infrared frequencies. These modulate the original light and its Raman-scattered radiation, producing Raman and anti-Stokes lines of many orders, frequently without a threshold condition for generation, and in some cases with highly directional radiation patterns.

By using what is known as the "giant-pulse" technique laser beams from a ruby laser rod have been known to develop a peak power of 500 million watts per sq. cm. When such a pulsed beam is focussed by a lens on to a Raman-active liquid the molecules of the illuminated liquid are subject to an oscillating electric field of enormously high intensity. In a recent communication to *Physical Review Letters*, August 15, 1963, Townes *et al.* discuss from theoretical considerations the effect of very intense electric fields on the natural oscillations of radiating molecules and their interaction with the incident radiation. They deduce a number of interesting conclusions.

One of the deductions is that anti-Stokes radiation of frequencies $\omega_0 + \omega_r$ is emitted in cones in the forward direction around the initial beam at angles determined by the vibration frequency, the polarizability of the molecule and other parameters.

(For an excellent photograph in colour of the Raman laser effect produced in benzene, see *Scientific American*, July 1, 1963.)—(*Physical Rev. Letters*, 1963, 11, 160.)