several classes of sporopollenins[6], some of which, as those present in exine-I, are more susceptible to solvents like hot 2-aminoethanol. The insolubility of exine-II is suggested to be associated with its lamellar structure, but lamellar nature is also reported[7] for the soluble pollinial wall raising doubts about assumed correlations between structure and solubility.

Present studies with solvents like 2-aminoethanol indicate that soluble sporopollenin is present in pollinial walls while the pollen grains contained in the pollinium have walls composed mainly of insoluble sporopollenin. In this respect, the pollinial wall of Asclepiads is similar to the exine-I and their pollen grian wall resembles to the exine-II of angiosperm pollen walls tested as controls in this demonstration.

We thank Prof. C. A. Ninan for facilities and the UGC for a fellowship to P. S.

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December 26, 1978.

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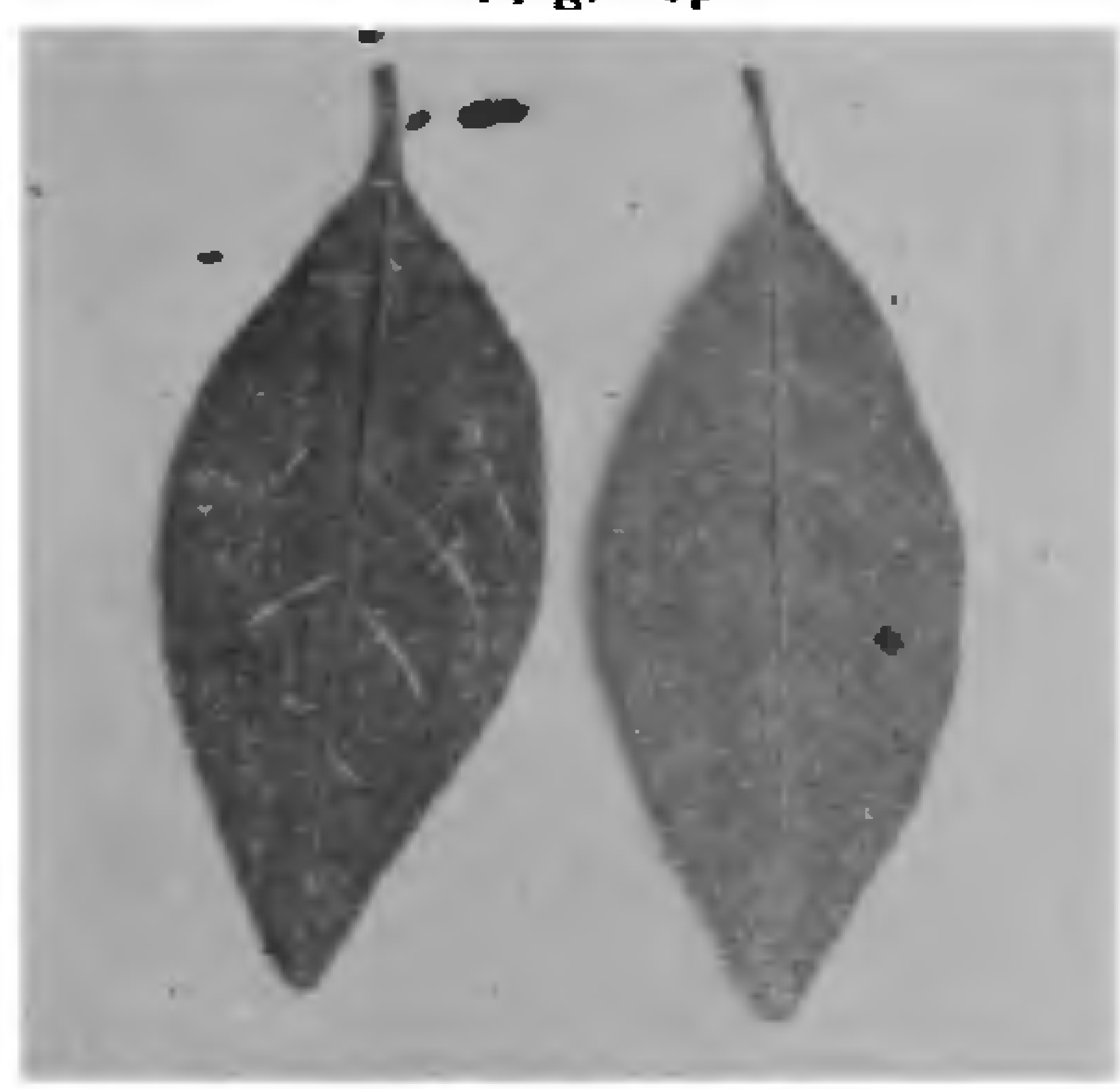
TWO NEW ADDITIONAL HOSTS OF CITRUS TRISTEZA VIRUS

Aegle marmelos Correa. and *Feronia limonia* (L.) Swing. are two species of hard shelled citroid fruit trees indigenous to India. In the course of testing a large number of species, hybrids, varieties of citrus and a few Rutaceous hosts against citrus tristeza virus strains, the above two species were found to be susceptible to severe strain of tristeza virus.

Five Rutaceous hosts, *viz.*, *Aegle marmelos* Correa., *Feronia limonia* (L.) Swing., *Murraya koenigii* L., *Ruta graveolens* L. and *Evodia lupelensis* Dode. were raised under green house condition. Forty-five days old seedlings were inoculated with severe strain (S_3) of tristeza virus through aphid vector [*Toxoptera citricida* (Kirk.)]. The aphids were fed for 30 minutes to the infected source for acquiring the virus and later 25–30 viruliferous aphids per plant were allowed to feed for 30 minutes more for transmission purposes. Further, six months old seedlings were inoculated through bark patch grafting with tristeza source and observed for 15 months. The results revealed that *A. marmelos* and *F. limonia* were susceptible and showed external symptoms. The virus was easily transmitted to the hosts by grafting as well as by aphid vector.

On *A. marmelos*, the infected leaves showed cupping, vein clearing and vein corking symptoms after 85–90 days (Fig. 1). Later the leaves became leathery, crinkled and the entire leaf blade became whitish in colour. The infected plants were very much stunted with numerous axillary sprouts. The wood was thin with bumpy bark. Stem pitting which is characteristic for tristeza was not noticed even 15 months after inoculation.

Aegle Sp



Vein Corking

FIG. 1. Vein corking symptom on *Aegle marmelos*.

Stunting was pronounced on *F. limonia*. Cupping and yellowing with marginal chlorosis was noticed in 60 days following inoculation. The leaves became leathery and dropped-off with the advancement of the age of the seedlings. Vein clearing and stem pitting was not observed on infected plants. The bark became bumpy with thin wood. Severe root decay was noticed in the infected seedlings. The other Rutaceous hosts, *viz.*, *M. koenigii*, *R. graveolens* and *E. lupelensis* did not show any symptoms even though the bark patch was green and developed union with the hosts. However, the virus could be recovered from these hosts, when transferred back to acid lime (*Citrus aurantifolia*) which is an indicator host for tristeza virus, through aphid vector indicating thereby that the hosts are carrying the virus symptomlessly.

A. marmelos and *F. limonia* were found to be susceptible to tristeza virus and this forms the first report from India and elsewhere. Earlier Vasudeva *et al.*[3] reported transmission of citrus tristeza virus from citrus to *Aeglopsis* by means of the aphid vector (*T. citricida*) with symptoms of vein clearings. While McClean[2] transmitted tristeza to *Aeglopsis chevalieri* and *Afraegle paniculata* through aphid vector but failed to transmit the virus across the graft union.

A. marmelos and *F. limonia* cannot be included in the list of root-stocks resistant to tristeza virus as indicated by Bitters *et al.*[1]. Further, there is a possibility that these plants may serve as alternate hosts for tristeza virus under field condition.

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EFFECT OF BLUE-GREEN ALGAE AND *AZOLLA* APPLICATION ON THE AGGREGATION STATUS OF THE SOIL

THE influence of microbial inoculants on the physical properties of soils is little understood. If the degree of aggregation and its stability in water could be quantified, the effect of an inoculant on soil physical behaviour can be assessed. This is particularly relevant because soil aggregates and their arrangement influence the infiltration rate, aeration, soil temperature and thereby improve the physical environment of the crop. Blue-green algae[1-3] and *Azolla*[4-5] have been shown to make a significant contribution to the nitrogen economy of rice plants, but their effect on soil aggregation properties is little known. The water stable aggregates have been shown to be significantly increased due to algal growth in the soil (Table I)[6]. The present communication deals with the comparative effect of blue-green algae and *Azolla* application on the aggregation status of the rice soil.

TABLE I

Effect of blue-green algal inoculation on water stable aggregates

Soil type	% water stable aggregates (> 50 μ)		
	Control	Algal inoculation	% increase
Sandy loam	2·2	4·1	35
Loam	2·6	6·0	130
Silty clay loam	3·5	9·1	160

Pot trials were conducted during *kharif* 1978 with 15 kg sandy loam soil supplied with a uniform basal dressing of P_2O_5 and K_2O at the rate of 50 kg/ha to each pot. Different levels of nitrogen were applied in the form of urea as per the treatment schedule shown in Table II. Soil based dry algae containing a mixture of *Tolypothrix*, *Aulosira*, *Nostoc*, *Anabaena* and *Plectonema* at the rate of 15 kg/ha and dry *Azolla pinnata* at the rate of 1 tonne/ha were applied to the respective treatments. Five 24 day old Pusa 221

TABLE I

Comparative effect of blue-green algae and Azolla *application on the particle size distribution (> 50 μ) of the soil*

Treatments	Particle size distribution		% aggregates		% increase in > 50 μ aggregates
	> 250 μ	50–250 μ	> 250 μ	50–250 μ	
Sand (> 50 μ)	0·5	44·5	..	..	..
Control	1·2	46·8	0·7	2·3	..
Algae	1·5	48·0	1·0	3·5	50
Azolla	1·0	47·0	0·5	2·5	..
60 kg N/ha	0·7	46·6	0·2	2·1	..
60 kg N/ha+Algae	1·6	49·0	1·1	4·5	70
60 kg N/ha+*Azolla*	0·8	47·2	0·3	2·7	..