

Experiments on the Control of "Damping off" in Tobacco Nurseries

by

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Introduction: Tobacco is an important money crop in South India especially in the Madras and Andhra States. It is extensively cultivated in Nellore, Guntur, Krishna, West and East Godavari districts of Andhra State and occupies an area of more than one hundred thousand acres. Extensive areas of nurseries under the Virginian variety of tobacco are raised in the sandy belt from Bapatla to Kothapatnam (Coastal tract of the Guntur district) and in the black soil areas of Repalle, Guntur, Sattanapalle and Narasaraopet in the Guntur district to meet the requirements of seedlings for planting the above area. The chief limiting factor in the raising of nurseries was found to be the "damping off" disease of seedlings. This disease has been reported from most of the tobacco growing countries of the world. Several species of *Pythium* and *Rhizoctonia solani* have been shown to be associated with the "damping off" of seedlings. *P. aphanidermatum* (Eds.) Fitz. is the causal agent in India (Thomas 1943) and also in South Africa (Wager 1931, 1940), China (Yu 1934, Yu *et al* 1945), Gold Coast (Bunting and Dade 1924; Simond 1939). *P. aphanidermatum* has been found to be widely prevalent in all types of soils in the tobacco growing areas in the Madras State (undivided). Diseased seedlings collected from nurseries raised in sandy as well as black soil tracts in the important nursery areas showed the presence of *P. aphanidermatum*.

Various methods such as raised seed beds, sterilisation of seed beds, seed treatment and spraying have been successfully recommended by workers in other countries (Serbinow 1912). But as far as South India is concerned though these measures were advocated in some form or other definite experimental data were lacking. To find out therefore the most economic treatments for the effective control of 'damping off', experiments were laid out from the year 1943 onwards under a scheme of research sanctioned by the Government of Madras and the results of the experiments conducted during the years 1943 and 1944 are presented in this paper.

Materials and Methods: The experiments were laid out in two typical soil tracts viz., black soil area of the Agricultural Research Station, Guntur, representative of the area in which tobacco is grown

as a crop and in the sandy area at Bapatla representative of the sandy soils where by virtue of the better drainage conditions it is easier to raise nursery of tobacco seedlings with the result that a very successful nursery industry has developed, merely to supply seedlings to cultivators in the black soil area. The object of the experiment is to test the relative efficacy of various fungicides like a proprietary colloidal copper sold by Messrs. Boots Pure Drug Company, Calcutta, Bordeaux mixture and home made colloidal copper, as well as heat sterilisation of nursery beds and raising the level of the beds. Lay out: Split plot-randomized blocks; Replications-six.

Main treatments:

- A. Raised bed
- B. Non-raised bed

Subsidiary treatments:

- { Heat sterilized
- { Non-sterilized
- { Heat sterilized
- { Non-sterilized

Sub-plot treatments-3:

- (a) Bouisol-1 ounce in one gallon of water.
- (b) Bordeaux mixture-1%.
- (c) Home made colloidal copper-3 pints of stock solution to 10 gallons of water.
- (d) Control (no spraying).

The area of each sub-plot was 6' x 3' and the total number of sub-plots was 96 with treatments randomized within the sub-plots. Three sprayings were given at fortnightly intervals beginning from the 21st day after sowing. Heat sterilization of the seed beds was done as follows. Dried chilli stalks to a height of about 9 inches were packed over the beds in the black soil area and burnt when the air was still. Dry casuarina twigs and sweepings from casuarina plantations were used in the sandy area. After complete burning the ashes were lightly raked and incorporated into the surface soil of the beds.

The nursery beds were sown with the seeds of the tobacco variety Harrison's special (H. S. 9) at the rate of one tola of seed (2/5 of an ounce) for each cent of seed bed area. Watering was done with a rose can at a uniform rate for all the beds. No covering was used for the nursery in the black soil. In the sandy area a mulch of *Tephrosia purpurea* was used to cover the seed beds for about two weeks from the date of sowing. The results of the experiments were evaluated on the basis of total number of surviving seedlings in the different treatments.

The experiment was repeated during the year 1944 with some alterations. As Bouisol could not be procured on account of stoppage of imports due to war conditions, Burgundy mixture was substituted for Bouisol. Further as the home made colloidal copper was found

ineffective at the strength used (3 pints to 10 gallons) the strength was increased so that the copper content is the same for all the spray treatments.

The sub-plot treatments were therefore, given as detailed below :

- (a) Bordeaux mixture (1%)
- (b) Burgundy mixture (1%)
- (c) Colloidal copper (1%)
- (d) Control

During the previous year only one set of experiments in the black soil and one in the sandy area was laid out. As there was no incidence of damping off in the black soil experimental plots, no information was available about the effect of the treatments under black soil conditions. This year, therefore, the experiments were laid out in each of these places in duplicate at intervals of about a month with the hope of getting disease at least in one series if not in both. In all other respects, the material and methods were similar to those given for the experiment conducted during the previous year.

Observations : The germination was quite satisfactory and the stand of seedlings uniform both in the black and sandy soil areas. The initial growth in the sterilized beds however was found to be much better than in the non-sterilized beds. In the 1943 experiments the first sign of 'damping off' was found in a few plots in a mild form and to a very limited extent 33 days after sowing in the black soil area. The subsequent spread of the disease also was quite negligible. Thus though the total area of the 96 experimental sub plots was 1728 sq. feet, the final extent of damage was found to be only 9.61 sq. feet equivalent to about half the extent of a single sub plot.

In the sandy area unlike the black soil area, the incidence of 'damping off' in the experimental beds was found to be very severe causing considerable damage in a number of beds. It was observed that seedlings in 30 out of the 96 beds were completely wiped out and ten others had a stand of only 2 to 26 seedlings. The data recorded were statistically analysed. As the treatment effects could not be properly evaluated on account of the negligible incidence of disease, in the black soil nursery this experiment was not taken into consideration. But in the sandy area, 'damping off' was present in a virulent form. Hence the data collected are of value in assessing the relative merits of the various treatments tried. The summary of results and conclusions are given in the table.

In the 1944 experiments there was very heavy incidence of 'damping off' in the experimental beds in the first series in the black soil area. The total number of surviving seedlings in the various treatments and replications were recorded and statistically analysed. The summary and conclusions are given in the table. In the second series in the black soil

area also there was very heavy incidence of disease. The disease appeared very early just after three weeks from sowing and when the first spraying was due to be given. The disease spread to a considerable extent in most of the control beds and many of these were completely wiped out in a few days. Some seeds hitherto lying dormant germinated later and produced a few seedlings. The total number of surviving seedlings were recorded and were statistically analysed. The summary and conclusions are given in the table.

Two series of experiments were also laid out in the same year in the sandy area with an interval of five weeks between the sowings. Though the first series here was also laid out at about the same time as in black soil, the incidence of 'damping off' was quite negligible. Hence the experiment was not taken into account in assessing the merits of the various treatments. In the second series however the incidence of 'damping off' was found to be very severe causing considerable damage to a number of beds. The results in terms of surviving seedlings were recorded under the various treatments. The data were statistically analysed and the summary of results and conclusions are given in the table.

Discussion and Conclusion: Of the six nursery experiments conducted in the years 1943 and 1944 in the black and sandy soils of the Guntur District two experiments have been rejected since the incidence of disease was negligible. The data of the remaining four experiments were analysed and the following conclusions were evident.

1. There is no significant difference between the level of beds in all the four sets of experiments.

2. Sterilization of beds is significantly superior to no sterilization in three out of four series.

3. Of the fungicides tried Bordeaux mixture 1% proved superior to Burgundy mixture in one experiment and in the other two it was on a par. Between Bordeaux mixture and colloidal copper the former proved superior to the later in all the experiments. In the one experiment conducted with the proprietary fungicide 'Buisol', Bordeaux mixture proved superior to it. Burgundy mixture was on a par with colloidal copper in one experiment and proved superior to it in two experiments. Colloidal copper proved inferior to Bordeaux mixture in all the experiments, inferior to Burgundy mixture in two experiments and was on a par with Burgundy mixture in one experiment and with Buisol in another. Both Bordeaux and Burgundy mixture proved superior to control in all the experiments while colloidal copper was superior to control in three experiments and was on a par in one experiment, where the copper content in the colloidal copper was less than 1%. Of the three fungicides Bordeaux mixture is to be preferred in view of its high efficacy.

Consolidated Summary of Results and Conclusions of the Experiments for the Control of 'Damping Off' of Tobacco Nurseries

Mean number of surviving tobacco seedlings per sq. yd. of nursery bed

Year and date of sowing	1943 (20-3-1943)	1944 (25-8-1944)	1944 (29-9-1944)	1944 (24-9-1944)
Venue of experiment	Sandy area Bapatla	Black soil area, Agrl. Res. Station, Guntur	Black soil area, Agrl. Res. Station, Guntur	Sandy area Bapatla
<i>Treatments:</i>				
Raised beds	66.00	231.15	140.34	142.61
Non raised beds	98.80	206.38	158.80	209.60
Critical difference	—	—	—	—
Conclusions	Not significant	Not significant	Not significant	Not significant
Sterilized beds	85.65	274.95	177.625	230.71
Nonsterilized beds	79.10	162.59	121.525	121.89
Critical difference	—	39.86 (5% level)	25.37 (5% level)	31.73 (5% level)
—	—	56.69 (1% level)	36.09 (1% level)	59.79 (1% level)
Conclusions	Not significant	Steriliza- tion	Steriliza- tion	Steriliza- tion
		No steri- lization	No steri- lization	No steri- lization
Bordeaux mixture (A)	176.25	294.5	191.77	269.25
Burgundy mixture (B)	* 36.47	284.44	198.15	205.35
Colloidal copper (C)	78.22	229.46	155.31	208.39
Control (D)	38.45	66.69	53.06	22.30
Critical difference	83.06 (5% level)	44.16 (5% level)	27.12 (5% level)	56.09 (5% level)
	113.39 (1% level)	58.73 (1% level)	36.06 (1% level)	89.01 (1% level)
Conclusions	A C D B*	A B C D	B A C D	A C B D

* Buisol

Therefore sterilizing the beds prior to sowing of the seeds and following it up with spraying preferably with Bordeaux mixture 1% seems to be the best way of combating the 'damping off' disease in the tobacco nurseries.

Summary: Experiments were conducted under randomised replicated split plot design for the control of damping off in the tobacco nurseries in the black and sandy soils in the Guntur District in the years 1943 and 1944. The results indicated that sterilizing the beds by burning chilli stalks in the black soil and casurina sweepings and twigs in the sandy soil and following it with spraying of the fungicides like Bordeaux mixture, Burgundy mixture or colloidal copper controlled the disease. Of the fungicides the former two proved superior to the latter.

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