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Management of pre and post emergence diseases of tomato (*Lycopersicon esculentum* Mill.) by botanicals

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Nursery soil was prepared by mixing two parts garden soil, two parts fine sieved leaf mould, one part clean sand, one fourth part bone meal and one fourth part neem cake. The mixture was thoroughly mixed, allowed to dry and filled in pots for sowing. The seed material used was tomato Pusa early dwarf. Eight treatments with three replications were done. Seeds were soaked before sowing for one hour in the listed plant extract of 20% conc. viz. *Lantana camera, Azadirachta indica, Eucalytus* sp., *Murraya koenghii, Calotropis gigantea, Eichhorinia crassipes* and *Ocimum sanctum.* Incidence of damping off was recorded at weekly intervals starting from frist to fourth week after sowing. The same treatment were followed as foliar application sprayed at 15, 30 and 45 days after transplanting. Seed treatment with *Murraya koenghii* showed better results in managing damping off and seed treatment with *Encalyptus* sp. showed better germination than others. Incidence of early blight on tomato foilar spray with *Murraya koenghii* showed better reduction of disease incidence and foliar spray with *Calotropis gigantea* showed better reduction of leaf curl incidence than others. However, foliar spray with *Azadirachta indica* and *Eichhornia crassipes* showed better shoot length and foliar spray with *Calotropis gigantea* showed higher number of fruits per plant.

Key words : Pre and post emergence disease, botanicals, tomato

INTRODUCTION

Indian farmers depend upon several chemicals for controlling crop diseases. It has an advantage of the time and milieu but in the long run it became a disaster to nature. The chemicals are enforcing both plants as well as soil to be sick. Use of synthetic pesticides not only affects human population but also results in developing resistance of the pests which becomes difficult to be controlled by other means.

These problems are forcing scientists to look for other methods which are ecologically safe and specific to pathogen.

Among the several methods available plant derivatives have been found to offer a promising strategy. It is well established that about 346 plant products have fungicidal properties. Plant derivatives have been found to provide different biologically active compounds which are largely non-phytotoxic and easily biodegradable. They do not leave any residue in treated grains. These natural protectants neither affect germination nor organoleptic properties of the produce. Further they are ecofriendly, less expensive and locally available.

In the present investigation attempts have been made to control the pre and post emergence diseases of tomato by using extracts of several plants.

MATERIALS AND METHODS

Nursery soil was prepared by mixing 2 parts garden soil ; 2 parts fine sieved leaf mould ; 1 part clean sand ; 1/4th part bone meal ; and 1/4th part neem cake. The mixture was mixed thoroughly allowed to dry and filled in pots for sowing. The tomato variety Pusa early dwarf was selected for planting. Seeds were soaked for 1 h in the following listed plant extracts (20% concentration) viz. *Lantana*

camera, Azadirachta indica, Eucalyptus sp., *Murraya koenghii, Calotrophis gigantea, Echhorinia crassipes* and *Ocimum sanctum.* Treated seeds were counted and sown in rows in the prepared nursery soil filled in the pots. Incidence of damping off was recorded and total number of plants counted at weekly intervals from 1st to 4th week after sowing. The per cent of seed germination was determined by counting the number of seeds germinated verses number of seeds sown, at 4th day (germination started), 6th day and 10th day (germination became static).

Farm yard manure (1 kg/plot of 2 sq.m) and NPK were applied as the recommended dose in each plot. Randomized block design with 8 treatments of foliar application of plant extracts were done. Treatments were replicated 4 times. Four weeks stages seedlings which were raised in pots were transplanted. Leaf extracts of different treatments were sprayed at 15, 30 and 45 days after transplanting. The observations were recorded on plant height, number of leaves per plant (15, 30, 45 and 60 DAT), number of branches per plant (30, 45 DAT), number of flowers and fruits per plant (45 and 60 DAT) and incidence of early blight and leaf curl at 30, 45 and 60 DAT. Three plants with 10 leaves each were selected from each plot and the leaves were graded according to the per cent leaf area affected by early blight and leaf curl. The infection index was calculated by using the formula.

$$\text{Infection Index} = \frac{\text{Sum of disease ratings}}{\text{Total no. of leaves} \times \text{maximum grade}} \times 100$$

The leaves were graded in the following scale.

0 = 1%, 1 = 1%, 2 = 1-5%, 3 = 5-25% and 5 = > 50% (James *et al.* 1971) ;

The data were analysed by ANOVA method. The calculated value was compared with tabulated value at 3% level of significance, (Fisher and Yates 1957) for appropriate degrees of freedom.

RESULTS AND DISCUSSION

Effect of different treatments on the incidence of damping off was significantly different. The treatments with *Murraya koenghii, Echhorinia crassipes and Ocimum sanctum* were not significantly different from each other but reduced significantly the incidence of damping off.

The incidence of damping off started only after 1st week of sowing. The number of plants showing damping off increased progressively with increase in number of weeks after sowing. The incidence of disease on 2nd, 3rd to 4th was 0.83, 3.13 and 7.08% respectively. The number of diseased plants increased from 2nd to 4th week and being significantly different from each other on each week. After 4th week there was no further increase in diseased plants. This may be due to hardening of the stem of seedling, which provided resistance against invasion of pathogen (Singh, 1983). The germination of seeds increased progressively corresponding to increase in number of days after sowing. Germination of seeds started on the 4th day after sowing. There was significant increase in percentage of seed germination from 4th to 10th week after that there was no further increase in percentage of seed germination (Table 1).

The seeds treated with *Eucalyptus*-extract (20%) showed highest percentage of germination of seed (61.37) followed by *Calotropis gigantea* (54.93) and *Echhorinia crassipes* (54.89). Eight fungal antagonists and leaf extracts were tested, among which the best was *Eucalyptus* leaf extracts against *P. aphanidermatum* on aubergine. The minimum germination percentage was found in seeds treated with *Azadirachta indica* (39.96).

Foliar sprays with *Murraya koengii* (9.39), *Ocimum sanctum* (10.44) and *Eucalyptus* sp. (10.67) exhibited similar effects and minimum incidence of early blight at 30 days after transplanting. Daya Ram and Ram (1997) observed that there has been fungitoxicity of some plant extracts against *Alternaria brassicae.*

The seeds trated with extracts of *Murraya koenghii* (14, 16.22%) and *Ocimum sanctum* (14.89, 17.33%) exhibited similar results at 45 and 60 days after transplanting respectively and significantly reduced the incidence of early blight, and this was followed by extract of *Eucalyptus* sp. Maximum disease incidence was 34.78, 38.67 and 39.33 at 30, 45 and 60 days after transplanting respectively. Daya and

Table 1 : Effect of botanical on pre and post emergence disease of tomato

Treatment	Incidence of damping off	Germination percentage	Incidence early blight			Incidence of leaf curl		
			30 DAT	45 DAT	60 DAT	30 DAT	45 DAT	60 DAT
T_0	6.11	47.3	34.76	38.67	39.33	38.44	55.34	58.67
T_1	7.78	49.85	24.67	26.21	26.89	19.33	37.77	40.67
T_2	3.33	39.96	12.55	18.44	20.44	22.00	22.44	32.56
T_3	6.67	61.37	10.67	16.22	18.89	9.77	19.55	28.67
T_4	1.11	44.29	9.39	14.00	16.22	21.11	49.56	47.33
T_5	3.33	54.93	14.22	19.45	25.33	7.56	15.33	27.11
T_6	1.67	54.89	15.33	17.44	25.11	24.00	32.00	39.78
T_7	2.22	49.11	10.44	14.89	17.33	10.44	21.78	30.00
Treatments								
C.D	2.80	3.54	14.70	12.43	11.48	16.91	15.87	14.14
S.E	1.38	1.75	6.86	5.80	5.35	7.88	7.39	6.59
Weeks								
C.D	1.72	2.17						
S.E	0.85	1.07						
Interaction								
C.D	4.86	6.14						
S.E	2.40	3.04						

Table 2 : Effect of botanical on plant growth attributes of tomato

Treatment	Shoot Length				No. of leaves			No. of branches		No. of flowers		No. of fruits/plant	
	15 DAT	30 DAT	45 DAT	60 DAT	15 DAT	30 DAT	45 DAT	30 DAT	45 DAT	30DAT	60 DAT	45 DAT	60 DAT
T_0	13.33	25.03	32.88	34.09	8.60	21.07	37.60	3.70	10.00	7.47	13.60	0.87	1.93
T_1	11.24	22.11	25.13	29.57	19.60	20.33	31.00	3.93	8.07	4.47	8.07	0.33	1.40
T_2	15.67	28.77	34.47	36.31	10.53	25.13	33.87	4.53	8.80	4.80	8.20	0.87	2.27
T_3	13.15	24.26	30.45	33.39	8.80	2.53	24.60	4.13	6.47	6.27	11.27	0.46	1.87
T_4	13.39	21.33	26.38	32.55	9.47	14.67	20.53	2.67	6.33	3.07	8.00	0.46	1.27
T_5	15.45	23.17	27.44	34.73	8.07	16.00	21.73	3.07	6.27	3.07	11.20	0.73	3.93
T_6	17.77	30.67	33.46	37.91	12.20	29.07	3.40	5.87	8.60	6.53	8.67	1.27	2.26
T_7	28.37	28.73	30.82	33.96	8.67	20.27	23.73	4.47	7.20	2.47	6.27	0.53	1.53
C.D	NS	4.56	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Ram (1997) found inhibition of spore germination of *Alternaria brassica* and *Alternaria alternata* by leaf extract of *Ocimum sanctum*.

Foliar sprays with *Calotropis gigantea* (7.56, 15.33, 27.11%) followed by *Eucalyptus* sp. (9.77, 19.55, 28.67%) at 30, 45 and 60 days after transplanting respectively showed better control of leaf curl disease of tomato. All other treatments significantly reduced the disease as compared to untreated control.

Plant extract *E. citrodera* showed 58% inhibition of cucumber mosaic virus as compared with 94% in the control (Bharati 1999).

The maximum shoot length was found in *Ocimum sanctum* (28.37) followed by *Echhorinia crassipes* (17.77). Data revealed that foliar spray with *Echhorinia crasipes* yielded highest in shoot length (30.67) at 30 days. But *A. indica* (34.47%) and *E. crassipes* (37.91%) had exhibited maximum shoot length at 45 and 60 days respectively followed by *E. crassipes* (33.46%) and *Azadirachta indica* (36.31%). The minimum shoot length was found in *L. camera* both at 45 and 60 days after transplanting.

There was no significant differences between the treatments on the effect of different extract on the number of leaves, branches, flowers and fruits/ plant.

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