Nematol. medit. (1993), 21: 103-105

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THE EFFECT OF ASCORBIC ACID ON *ROTYLENCHULUS RENIFORMIS* AND THE RATE OF TRANSPIRATION OF TOMATO

by
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Summary. Inoculation of tomato with *Rotylenchulus reniformis* resulted in an increase in the rate of transpiration in both evaporation checked and unchecked plants. Nematode inoculation also adversely affected plant length and fresh weight recorded four weeks after inoculation. A 10 ml soil drench of 0.1% ascorbic acid normalized the rate of transpiration and improved the growth of nematode inoculated plants. Ascorbic acid adversely affected nematode multiplication.

Drooping of leaves due to nematode infection has been explained by a disturbance in the oxidation of cell membrane phospholipid rather than by impaired water absorption (Mjuge and Estey, 1978). Analysis of drooping leaves showed that they contain a lower percentage of water by weight. Other changes are similar to those in ageing plants (Souchorukoff, 1952). Damage caused by nematodes can be reduced by protecting host plant roots with an application of ascorbic acid (Fawole, 1982). Nematodes require oxidation of lipids in the roots to become pathogenic. In the presence of ascorbic acid nematodes use their own lipid reserves which leads to a decrease in their activity and infectivity. Nematodes start ageing and later die (Fawole, 1982). Moreover, tissues and cells containing high concentrations of ascorbic acid are also characterized by high peroxidase activity (Chinoy, 1984) and high peroxidase activity has been correlated with the resistant response of the plant (Fehrman and Diamond, 1967).

An attempt was made to study rate of transpiration in tomato (*Lycopersicon esculentum* Mill.) plants inoculated with reniform nematode (*Rotylenchulus reniformis* Linford *et* Oliveira) in both evaporation checked and evaporation unchecked plants. The effect of ascorbic acid on nematode multiplication and rate of transpiration was also studied.

Materials and methods

Seeds of tomato cv. Pusaruby were surface sterilized with 0.1% mercuric chloride and washed three times with distilled water. Five seeds were sown in 15 cm polythene bags containing 1 kg steam sterilized soil. After germination seedlings were thinned to one per polythene bag. Two weeks after germination seedlings were inoculated with 1000 immature females of *R. reniformis* into the root zone of the plant. The population of *R. reniformis* was multiplied on castor plant (*Ricinus communis* L.). Specimens for the inoculum were obtained from the soil by Cobb's sieving and decanting technique followed by Baermann funnel (Southey, 1986). The nematodes were kept in an incubator at 25° C for one week with the water changed every 24 hrs when the immature *R. reniformis* females were collected. 0.1% ascorbic acid solution was prepared in distilled water and 10 ml of this solution was used in control and nematode inoculated plants as a soil drench.

Rate of water loss from the plants was meausred 24, 48, 72 hrs and 1, 2, 3 and 4 weeks after nematode inoculation. The rate of transpiration was measured in plants covered with polythene sheets (evaporation checked) or kept uncovered (evaporation unchecked). After inoculation, the control and treated plants were saturated with water and weighed. The loss of water was constantly monitored by weighing the plant after every 24 hrs up to 4 weeks after inoculation. The plants were watered every 24 hrs to make up the water lost by transpiration.

The experiment was conducted in March and April at temperature ranging from 22°C-30°C. Each treatment was replicated four times.

Four weeks after inoculation the experiment was terminated. Data were recorded as plant length and fresh weight. Nematodes in roots were stained in cotton blue. The data on the rate of water loss were analysed using multifactorial analysis while data on plant length, fresh weight and nematode population were analysed by simple randomized method.

Results and discussion

Water loss in plants inoculated with *R. reniformis* was significantly higher in evaporation checked or in unchecked plants over their respective controls. A soil drench with ascorbic acid caused significant reduction in loss of water through plants when used against *R. reniformis* inoculated plants either having evaporation checked or unchecked. Moreover, soil drench of ascorbic acid caused no significant result in uninoculated control plants (Table I).

Loss of water through transpiration in 24 hrs duration was found to be generally increased with the age of the plants (Table I). Higher water loss in evaporation checked and *R. reniformis* inoculated pllants was notd over control from 72 hrs after inoculation up to Ist week. However, ascorbic acid soil drench caused significant reduction in water loss of these plants. At other time intervals there was no significant difference in loss of water in nematode inoculated and evaporation checked plants over their respective control (Table II).

Significant increase in water loss of evaporation unchecked and nematode inoculated plants was found over their respective control from 24 hrs to 2 weeks after inoculation. Ascorbic acid treatments to these nematode inoculated plants caused significant reduction in loss of water over their respective control. In the third and fourth weeks after inoculation water loss through plants was either same or less to their respective controls but ascorbic acid treatments to these plants normalized the water loss to their respective controls (Table II).

Length and fresh weight of both shoots and roots were significantly less in nematode inoculated plants either having evaporation checked or unchecked (Table III). Moreover, soil drench of ascorbic acid to nematode inoculated plants caused significant improvement in length and fresh weight of both shoots and roots over untreated and nematode inoculated plants. On the other hand ascorbic acid treatments to uninoculated plants had no significant results.

TABLE I - *Effect of ascorbic acid on rate of transpiration of tomato plants inoculated with* Rotylenchulus reniformis.

Treatments	Loss of water (ml) in 24 hrs.
Control Evaporation checked	16.8
Control Evap. checked+Ascorbic acid	1.8
Inocul. Evap. checked	2.1
Inocul. Evap. checked+Ascorbic acid	1.9
Control. Evap. unchecked	15.8
Control. Evap. unchecked+Ascorbic acid	15.8
Inoc. Evap. unchecked	17.4
Inocul. Evap. unchecked+Ascorbic acid	16.3
C.D. 5%	0.16
Loss of water 24 hrs	7.0
24 - 48 hrs	7.0
24 - 72 hrs	8.9
24 hrs - 1 week	8.3
24 hrs - 2 weeks	9.5
24 hrs - 3 weeks	11.1
24 hrs - 4 weeks	11.9
C.D. 5%	0.17

TABLE II - *Effect of ascorbic acid on rate of transpiration of tomato plants inoculated with* R. reniformis.

Treatments	Loss of water (ml) in every 24 hrs showing mean up to 4th week						
	24 hrs.	48 hrs.	72 hrs.	Ist week	2nd week	3rd week	4th week
Control Evap. checked	2.5	2.0	1.9	1.3	1.3	1.4	1.9
Control Evap. checked+Ascorbic Acid	2.5	2.1	1.8	1.4	1.3	1.5	1.9
Inoc. Evap. checked	2.6	2.2	2.9	2.4	1.5	1.7	1.5
Inoc. Evap. checked+Ascorbic Acid	2.6	2.2	2.1	1.7	1.4	1.4	2.0
Control Evap. unchecked	10.3	10.6	14.5	14.3	16.7	20.8	23.1
Control Evap. unchecked+Asco. acid	10.2	10.5	14.8	14.2	16.9	20.6	23.2
Inoculated Evap. unchecked	19.3	15.2	18.2	16.2	19.1	20.8	17.9
Inocul. Evap. unchecked+Asco. acid	10.8	11.3	15.3	14.6	17.6	20.9	23.6
C.D. 5%	0.4	0.5	0.5	0.4	0.5	0.6	0.4

TABLE III - *Effect of ascorbic acid on growth of tomato plants four weeks after inoculation with* R. reniformis.

Treatments	Length (cm)		Fresh weight (g)		No. of females on roots
	Shoot	Root	Shoot	Root	
Control Evap. checked	20.5	11.0	9.0	3.8	–
Control Evap. checked+Asco. Acid	20.7	11.3	9.5	3.8	–
Inoculated Evap. checked	18.0	8.5	7.9	2.4	204
Inocul. Evap. checked+Asco. Acid	20.1	10.6	8.6	3.4	113
Control Evap. unchecked	21.8	12.0	10.4	4.0	–
Control Evap. unchecked+Asco. Acid	22.2	12.6	10.5	4.2	–
Inoc. Evap. unchecked	16.8	8.6	7.0	2.7	242
Inoc. Evap. unchecked+Asco. Acid	21.4	11.4	9.8	4.0	118
C.D. 5%	1.0	0.7	0.3	0.2	11

Acknowledgement. Senior author is thankful to Council of Scientific and Industrial Research, New Delhi for the award of Research Associateship.

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Accepted for publication on 17 February 1993.