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NOTE

EFFECT OF DIFFERENT SEED TREATMENT AND INOCULATION METHODS OF BRANCHED BROOMRAPE ON ITS PARASITISM TO TOMATO SEEDLINGS[1]

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ABSTRACT

Soaking the branched broomrape *(Orobanche ramosa* L.*)* seeds in gibberellic acid, water, or covering them with the antidote powder 1,8-naphthalic anhydride did not cause any significant change in any of the measured characteristics of the parasite and its host.

Direct seeded and transplanted tomato seedlings were inoculated with broomrape seeds by: 1) Mixing the parasite seeds with the soil; 2) placing the seeds as a layer 7 or 10 cm below the soil surface; 3) direct inoculation of tomato roots with broomrape seeds.

For direct seeded tomatoes, placing the parasite seeds 7 cm below the soil surface produced the highest amount of infestation, while for transplanted tomatoes mixing the *Orobanche* seeds with the soil was as effective as layering.

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INTRODUCTION

Orobanche (broomrape) seeds are known to have a dormancy period of up to 2 years (6). Chemical stimulants released from the host roots (2), or soaking in gibberellic acid (G.A.) and, to a lower extent, in water are reported to be stimulatory for seed germination (1, 5).

This investigation was undertaken to study the effect of several seed treatments and inoculation method of *O. ramosa* L. on its parasitism to tomato (*Lycopersicon esculentum* L. cv. Marmande) plants.

MATERIALS AND METHODS

Seed treatments: Non-dormaant seeds of *O. ramosa* were soaked in G.A. or sterile water or were treated with the antidote powder 1,8 – naphthalic anhydride. For G.A. treatment, the seeds were placed in 0.5% solution of the surfactant "Tween 80" for 3 min, washed in water and soaked in a 100-ppm G.A. solution.

These seeds and those of sterile water treatment were kept soaking for one week, in an incubator at 20°C, after which time they were removed, dried and used for inoculation of tomato seedlings. In case of antidote treatment, the powder was applied to the seeds at the rate of 1% of the seed weight.

Twenty five mg of treated *Orobanche* seeds were spread uniformly on the roots

of uniform 4 – week – old tomato seedlings. Inoculated plants were transplanted into clay pots of 25 – cm diameter. The experiment was arranged in randomized complete blocks with four replications.

Inoculation methods: Clay pots (25 - cm diameter) were employed and non-dormant dry *O. ramosa* seeds were used at the rate of 25 mg/pot, using direct seeded or transplanted tomatoes. Seeds of transplanted tomatoes were sown in vermiculite at the same day as direct seeding, and transplanting was done 20 days later. All plants were harvested 2 months after seeding. With direct seeding, *Orobanche* seeds were either mixed thoroughly with the soil, or spread as a layer 7 or 10 cm below the soil surface.

For the transplanted tomatoes, in addition to the afore mentioned methods, direct inoculation onto the tomato root system was also included in the experiment. A randomized complete block design with five replications was used.

RESULTS AND DISCUSSION

Seed treatments: None of the characteristics of the host (plant height and shoot dry weight) or the parasite (number of branches and haustoria, total dry weight) were significantly different among the treatments. However, soaking the seeds in G.A. resulted in an increasing trend in number of shoots and dry weight of *Orobanche* plants as compared to the other treatments.

Earlier studies report stimulating effect of G.A. and water soaking on germination of *Orobanche in vitro* (1, 3). This was not observed under greenhouse conditions in this study. Therefore, it was concluded that the dry non-dormant untreated *Orobanche* seeds can be used as a suitable inoculum for the greenhouse and field tests of this parasite.

NOTE

Inoculation methods: Comparing the two methods of direct seeding and transplanting, it was observed that the transplanted tomatoes were more vigorous and produced higher shoot dry weight (Table 1). The mixing technique produced more *Orobanche* dry weight in the transplanted tomatoes than in the direct seeded plants, although there was no significant difference in the number of *Orobanche* branches and haustoria between the two cultivation techniques. This may be due to the better growth of the host plant when transplanting is practiced.

With direct seeded tomatoes placing the parasite seeds in a 7 – cm deep layer produced significantly more *Orobanche* dry weight and number of branches than when mixing technique was used. This is in agreement with the results obtained by Kott (4).

The transplanted tomatoes, inoculated with *Orobanche* seeds, produced significantly lower (up to 48.1%) shoot dry matter than the control.

When the different methods of inoculation in the transplanted tomatoes were compared, it was found that localized application of *Orobanche* seeds on the roots resulted in less infestation of tomato than layering or thorough mixing with the soil. Due to ease and practicality of layering, this technique was probably the best method of inoculation. Transplanting was found superior to direct seeding since it produced more vigorous plants. Moreover, by producing tomato seedlings ready for transplanting, before hand, time can be saved as the experimental period is reduced.

An interesting observation made during the course of the experiment was that the diameters of the infected tomato roots were decreased by half as a result of food removal by the broomrape haustoria, i.e., the proximal and distal ends of the tomato root with respect to the haustorium averaged 9.3 and 4.7 mm in thickness, respectively.

Table 1. Effects of different inoculation methods with *O. ramosa* seed on its parasitism to tomato in the greenhouse

Tomato planting Method	Inoculation Method	No. of branches	No. of haustoria g	Total dry wt. g	Plant height cm.	Shoot dry wt. g
Direct seeding	Layering 7 cm deep	19.8 a*	7.2 abc	9.9 abc	64.0 a	14.3 def
	Layering 10 cm deep	10.6 b	1.8 de	7.1 bc	58.0 a	8.8 f
	Mixing with soil	13.0 b	8.8 ab	5.4 c	66.4 a	11.5 ef
	Control	0.0 e	0.0 e	0.0 d	87.4 a	15.3 cdef
Transplanting	Layering 7 cm deep	7.2 bcd	10.6 a	8.2 abc	69.2 a	20.1 bcde
	Layering 10 cm deep	9.8 bc	6.2 abcd	7.3 abc	71.6 a	22.7 bcd
	Mixing with soil	11.0 b	7.0 abcd	11.2 a	72.6 a	21.1 bcd
	Direct on roots	3.0 cde	3.6 bcde	5.8 c	76.0 a	23.9 bc
	Control	0.0 e	0.0 e	0.0 d	84.2 a	38.7 a

* Values within a column followed by same letters are not significantly different at 5% level of probability (Duncan's Multiple Range Test).

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