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Location and Seed to Plant Transmission of *Alternaria radicina* in Carrot

A. Shakoor Shakir, S. M. Khan, M. B. Ilyas and S. S. Alam*

Department of Plant Pathology University of Agricultural Faisalabad, Pakistan

*Nuclear Institute for Agriculture and Biology, Jhang Road, Faisalabad, Pakistan

Abstract: A study of determine the location of *Alternaria radicina* Meier, Drechsler and Eddy, in different seed components of carrot revealed that hyphae of *A. radicina* were found in outer and inner pericarp but not in endosperm and embryo. In transmission study surviving plants yielded 54.5 % recovery of *A. radicina* from dried leaves while a lower recovery of 4.5 percent from green leaves. In case of stem it was 14.5 percent after 80 days. Overall recovery of *A. radicina* from green parts was very low.

Key words: Transmission, *Alternaria radicina*, Carrot

Introduction

Carrot (*Daucus carota* L.) is an important winter vegetable and is sown in many part of the Punjab province. From seed germination to harvest, carrot is attacked by a number of fungi, which under certain climatic conditions significantly reduce the yield and quality of the crop in Pakistan (Mahmud and Aslam, 1984; Wahid *et al.*, 1988; Shakir and Khan, 1992). Of the various fungal organisms associated with carrot, *Alternaria radicina* not only reduces germination and vigour of carrot seed that it also causes seedling blight disease knowledge of location of seed-borne fungi in different seed components is vital in understanding their seed to plant transmission. This is not only helpful in evaluating the effect of *A. radicina* during germination but also important in understanding the disease cycle and control strategy. This paper reports the results of studies carried to locate the site of infection and seed to plant transmission of *A. radicina*.

Materials and Methods

Location of *A. radicina* in carrot seeds: Component planting of four hundred seeds of carrot was carried following Singh *et al.* (1977) and Raut and Bhombe (1983) to find the location of *A. radicina* in carrot seeds. Seeds were washed in distilled water and one seed in each test-tube was soaked in sterilized water for about two hours. The soaked seeds were dissected aseptically, under stereomicroscope with the help of sharp blades, into pericarp, endosperm and embryo. In addition to this free hand sections of infected seeds were made with a sharp razor. The various components were plated on the blotter paper (ISTA, 1993) and incubated at 28°C to detect the infection of *A. radicina* on different parts of seed. Data regarding growth of *A. radicina* on different components were recorded.

Seed to plant transmission of *Alternaria radicina*: Four hundred carrot seeds naturally infected with *A. radicina* were incubated on well moistened blotter paper in petriplates (10 seeds/plate) and placed at 20±2°C in growth chamber. The isolation were made at regular interval of 10, 20, 40, and 80 days for the presence of *A. radicina*. Ten seedlings/plants were uprooted and incubated on blotter paper after washing it in running tap water and sterilized with one percent sodium hypochlorite solution.

The following seedling/plant parts were studied in this experiment.

1. Germinating seeds.
2. Seedlings (Hypocotyls, cotyledons and roots).
3. Leaves (Dried intact and green leaves).

4. Stem (Nodes and internodes).

Results regarding recovery of *A. radicina* from different plants were expressed in percentage.

Results

Location of *alternaria radicina* in carrot seed: To study the location of fungi in carrot seeds, four hundred naturally infected seeds were analysed by component plating technique. Seed samples free from *A. radicina* were used as control. Sections of infected and uninfected seeds were made with microtome, then cleared and stained with lactophenol cotton blue and observed under the microscope. Hyphae of *A. radicina* were found in outer pericarp of 47.5% seed and inner pericarp of percent seed (Table 1). No infection was found in endosperm and embryo. *A. radicina* was not detected from components of carrot seed used as control.

Table 1: Percent recovery of *A. radicina* from different components of carrot seeds

Component plating (400 seeds)	Percent recovery
Outer pericarp	47.5
Inner pericarp	9.0
Endosperm	0.0
Embryo	0.0

Seed to plant transmission of *alternaria radicina*: Fungus started sporulation on some seeds after 48 hours of incubation at 20±2°C on blotter paper. The seeds which were covered by fungal growth in 3 days of incubation, showed no sign of development and germinating seedlings were adversely affected. Two hundred infected seedlings were transferred in pots individually. Isolation were made at interval of 10, 20, 40, 80 days by uprooting 10 seedlings/plants. The dying seedlings were incubated by component planting technique. Hypocotyle were infected up to 70% and roots up to 91%.

Frequency of the recovery of *A. radicina* from surviving plants was 21.5, 33 and 54.5 percent, in dried leaves and 0, 1.5 and 4.5 percent in green leaves after 20, 40 and 80 days of germination respectively. In case of stem, it was, 0, 9 and 14.5 percent (Table 2). On the whole, percentage recovery of *A. radicina* was very low from the green part.

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Table 2: Transmission of *A. radicina* from seed to plant in carrot

No. of seed/seedling	Parts of carrot plant at different stages	Observation interval during growth (days)				
		10	20	40	80	Control
400	- Germinating seeds on blotter paper	90	-	-	-	0.00
200	- Dying seedlings in pots	-	35	-	-	0.00
	- Hypocotyl	-	89	-	-	0.00
100	- Cotyledonary leaves	-	82	-	-	0.00
	- Roots	-	91	-	-	0.00
	- Surviving plant leaves	-	-	-	-	-
	- Dried	-	21.5	33	54.5	0.00
	- Green	-	0	1.5	4.5	0.00
	- Stem (Node and internode)	-	0	1.5	4.5	0.00

Discussion

This study was not only helpful in evaluating the effect of seed-borne fungi on seed germination but also important in understanding of disease cycle and for planning of control strategies. To locate the site of infection of *A. radicina* in carrot seed, component plating technique was used (ISTA, 1993). *A. radicina* showed high infection in outer pericarp and low in inner pericarp but it was not found in endosperm and embryo. Contamination of the pericarp is of importance in species where pericarp and seed coat are fused (Neergaard, 1977). Similar results were achieved by Soteros (1979) and Tylkowska and Dorna (1988).

Seed transmission of *A. radicina* revealed that carrot seeds which failed to germinate, were found to be covered with the fungal conidia. Surviving seedlings showed no disease symptoms in initial stage. However, component plating of such seedlings yielded *A. radicina* upon incubation on artificial substrate. Green part of such seedlings gave minimum recovery of *A. radicina* which indicates that fungus exhibit slow process of growth to produce symptoms in plant parts. Stem infection was also noted at later stage. It may be due to the reason that this fungus takes long time to establish in green parts of carrot. Maximum recovery of *A. radicina* was obtained from carrot root while in some parts, it was not found to be associated which indicates that the said fungus is not systemic in nature. It may be concluded that seed to plant transmission takes place by production of conidia of the fungus on leaves and stem lesions.

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