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Fungi Association with Stored Carrot Seeds in Punjab Province

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Abstract: Twenty seed-borne-fungi were isolated by blotter paper method from thirty six samples of carrot seed. Among these *Alternaria alternata*, *A. radicina*, *Aspergillus* spp. *Rhizopus* sp. and *Fusarium pallidoroseum* were observed in greater number of seed samples. The maximum number of storage fungi were recorded from Gujranwala division of the Punjab.

Key words: Seed-borne fungi, storage, carrot, seed

Introduction

The activity and reproduction of storage mold and insects are favoured by warm temperature (Delouche, 1973). Carrot seeds are susceptible to heat and moisture stress and in the presence of adverse storage temperature and moisture, quality of seed is deteriorated by the growth of fungi (Lauritzen, 1926; Hewett, 1964; Neergaard, 1977; Shakir and Khan, 1992). Some fungi produce toxin in seed under certain favourable environmental condition which may affect germination of seed (Hansen, 1954). However, information on carrot storage fungi is not adequately available in Pakistan. The study was therefore undertaken to know the kind of seed mycoflora and their incidence on stored carrot produce.

Materials and Methods

Collection of seed samples: Thirty six samples of carrot seed were collected from different divisions of Punjab during the year 1996 and stored in laboratory at room temperature (25°C). These seed samples were drawn according to procedure of ISTA (1993).

Detection of fungi from storage seed: Four hundred seeds from each samples were tested by standard blotter method using twenty seeds per 90 mm plate. These seed were incubated for eight days at 20 ± 2°C under alternating cycle of 12 hours light and dark. Seeds were examined under stereomicroscope (magnification 6 × 50). Fungi were primarily identified on the basis of their growth

habit and final identification of species was done from pure cultures using pertinent literature.

Results

To know the kind and extent of storage fungi, 36 seed sample of carrot collected from different Divisions of Punjab were analysed. A total of 20 seed-borne fungi were detected, using blotter paper method. Among these, *Alternaria alternata*, *A. radicina*, *Aspergillus* spp, *Rhizopus*

Table 1: Storage fungi associated with seeds of carrot

Fungi	Percent recovery	Range %
<i>Alternaria alternata</i>	31.00	0-52.5
<i>Alternaria dauci</i>	13.03	0-32.5
<i>Alternaria radicina</i>	42.21	0-73.20
<i>Aspergillus flavus</i>	1.37	0-12.15
<i>Aspergillus niger</i>	2.57	0-13.25
<i>Botrytis cinerea</i>	1.21	0-13.75
<i>Curvularia lunata</i>	0.12	0-5.25
<i>Curvularia pallescens</i>	0.06	0-1.50
<i>Drechslera hawaiiensis</i>	0.50	0-7.50
<i>Drechslera rostrata</i>	0.02	0-0.50
<i>Drechslera sorokiniana</i>	0.02	0-2.0
<i>Drechslera tetramera</i>	3.75	0-19.00
<i>Fusarium pallidoroseum</i>	2.56	0-5.75
<i>Fusarium solani</i>	0.89	0-8.25
<i>Stemphylium botryosum</i>	2.16	0-5.25
<i>Verticillium</i> sp.	1.25	0-4.25

Table 2: Seed-borne fungi of carrot (Caucus carafe)

Name of fungus	Percent recovery of fungi from various divisions of the Punjab							
	R. Pindi	SG	FD	LH	GUJ	BHW	D.G. Khan	MN
<i>Alternaria alternata</i>	32.25	48.50	45.25	31.45	52.55	37.15	31.75	34.00
<i>A. dauci</i>	-	29.15	27.00	31.00	32.50	20.55	19.00	22.25
<i>A. radicina</i>	47.25	54.00	43.25	49.00	96.50	35.15	37.50	39.50
<i>Curvularia lunata</i>	-	3.25	2.00	-	5.45	-	-	1.00
<i>pallescens</i>	-	-	-	-	3.25	-	-	-
<i>Drechslera hawaiiensis</i>	1.25	5.15	2.50	3.35	7.15	2.00	-	3.25
<i>tetramera</i>	11.15	17.00	13.25	12.00	19.21	13.75	11.15	14.35
<i>Fusarium pallidoroseum</i>	-	-	3.25	1.15	-	4.00	-	-
<i>Stemphylium botryosum</i>	-	9.25	7.35	-	11.25	-	-	-
<i>Verticillium</i> sp.	-	3.15	2.00	-	4.25	-	-	-

- = Free from fungus. R. Pindi = Rawalpindi SG = Sargodha FD = Faisalabad LH = Lahore
 GUJ = Gujranwala BHW = Bahawalpur D.G.Khan = Dere Ghazi Khan MN = Multan

sp. and *Fusarium pallidoroseum* were dominant and observed in greater number of seed samples. Seed infection percentage of *A. radicina* and *A. dauci* was greater followed by *Aspergillus* spp. while *Fusarium pallidoroseum*, *Stemphylium botryosum*, *Drechslera* spp. and *Curvularia* spp. had very low seed infection percentage (Table 1). Storage saprophytic fungi including species of *Arthrobotrys*, *Chaetomium* and *Rhizopus* were also observed but not counted. A greater recovery of fungi was recorded from seed samples collected from Gujranwala division followed by Sargodha division (Table 2).

Discussion

Carrot seed is susceptible to high moisture and in the presence of adverse storage conditions (temperature and moisture) its quality is affected by the growth of fungi especially *A. radicina*. To know the kind of seed mycoflora and their incidence on stored carrot seeds, 36 seed samples were collected from different divisions of the Punjab after two to three months of storage and then were kept for one month at room temperature (25°C). A total of 20 fungi were detected. The dominant and wider prevalence of *Aftemaria alternata*, *A. radicina*, *Aspergillus*, *Rhizopus* and *Fusarium* spp., were observed. Among these fungi, *A. radicina* is known to cause seedling mortality and formation of toxic metabolites which decrease the viability and germination of carrot seeds (Shakir and Khan, 1992; Hansen, 1954).

In present investigation, major field fungi detected in stored carrot seed were *A. radicina* and *A. dauci*. The difference in type of fungi and percentage recovery of fungi were found to be associated with conditions of carrot seed storage in different areas especially conditions prevailing at seed maturity and harvesting stage of the crop. A greater recovery of fungi from storage seeds collected from Gujranwala, indicates that storage conditions of that area were not suitable for safe storage of carrot seeds (due to high humidity). Therefore, efforts are needed to avoid use of such infested seeds by using health technology.

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