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STUDY ON ANTHRACNOSE DISEASE OF SMOOTH GOURD *(LUFFA CYLINDRICA)* GROWN IN KOTA DISTRICT OF RAJASTHAN

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Seed samples of smooth gourd collected from Arjunpura, Arandkhera, Giridharpura, Kethun, Raipura, NayaNohra and Dhakarkheri in Kota district of Rajasthan were studied. Dry seed examination revealed the occurrence of variously discoloured seeds and seeds with fungal bodies. Seed samples from Kethun carried higher frequency (54%) of mycoflora. *Alternaria alternata* (± 9%), *Aspergillus flavus* (± 4.13%), *Aspergillus niger* (± 7%), *Colletotrichum orbiculare* (± 53.5%), *Curvularia lunata* (± 10.13%), *Dreschlera* sps.(± 2.38%), *Fusarium monoliforme* (± 9.13%), *Fusarium oxysporum* (±6.50%), *Penicillium* sps.(± 5.25%), *Rhizoctonia solani* (± 12.50%) and *Rhizopus* sps.(± 4.38%) were some important pathogens. *Colletotrichum orbiculare* infection was symptomatic causing black discolouration with or without pale areas. Above ground parts (leaves and stem) showed water soaked or yellowish areas. These areas become dry and tear away, typically giving foliage a ragged appearance. Heavily infected fruits either killed or become malformed.

Keywords: Anthracnose disease; *Colletotrichum orbiculare;* Discoloured seeds; Dry seed examination; Fungal bodies; Smooth gourd.

Introduction

Colletotrichum orbiculare (Berk. & Mont.) Arx a well known anthracnose pathogen, has been reported seed borne in many cucurbit crops. It causes destructive anthracnose disease in luffa crops during warm, wet growing seasons[1]. But there is no much information on its being seed borne in the crop. During the survey the fungus was found to be invariably associated with luffa seeds of Kethun (Rajasthan) and hence the study was concentrated on its incidence, penetration and host parasitic relationship in seeds and above ground plant parts.

Material and Methods

Survey was done made in various areas of Kota district of Rajasthan like Arjunpura, Arandkhera, Giridharpura, Kethun, Raipura, Naya nohra, Dhakarkheri to find out the areas of production of *Luffa cylindrica.* 120 seed samples and plant parts were collected and screened using I.S.T.A. methods. Dry seed examination of the seed samples was done and they were categorised as symptomless and symptomatic carrying infection with pin head like acervuli. Samples of infected plant material were also collected and subjected to dry seed examination, Standard blotter method[2], Potato dextrose agar (PDA) plate method and Czapeks dox agar (CDA) plate method[3]. In Standard blotter test 15-20 seeds per petriplate were spaced in sterilized petriplate containing three well moistened blotters and incubated at 26 ± 2° C under 12h of alternating cycles of artificial light and darkness, for seven days. Percent incidence of seed mycoflora, germination, abnormalities in seedlings was recorded on eighth day of incubation. Sterilized seeds and plant parts were aseptically plated on petriplates (10 seeds per petriplate) containing 15-20 ml of PDA media and incubated for 7 days. In Czapeks Dox Agar (CDA) Plate Method percent incidence of mycoflora, seed germination and abnormalities of seedling were examined by naked eyes as well as under stereobinocular microscope on eighth day of incubation.

Results and Discussion

Seed samples were collected from various smooth gourd growing areas of Kota district of Rajasthan. Dry seed examination of seed samples was done. Besides normal, seeds of Kethun showed variously discoloured seeds with brown (0.25-83 %), black (0.25-90%), white (0.25-25%), small seeds (0.5-35%), shrivelled seeds (0.25-30%), insect damaged seeds (0.25-40%) and broken seeds with inert matter (0.25-65 %) as shown in Table 1.

Incubation tests showed that these discolourations were caused by various fungi such as Brown- *Alternaria alternata*, *Dreschlera* sps, *Penicillium* sp; Black- *Colletotrichum orbicular, Curvularia lunatata, Rhizoctonia solani;* White- *Fusarium oxysporum;* Small discoloured seeds- *Fusarium monoliforme;* Shrivelled seeds- *Aspergillus flavus, Fusarium monoliforme;* Insect

Table - 1 Occurrence of fungal bodies in dry seed examination.

Type of seed disorders	Percent Range	Fungi associated with seeds	Seedling symptoms
Brown discolouration	.25-83	*Alternaria alternata*	Browning of radicle and basal shoot, necrotic spots on leaves.
		Penicillium sps.	Yellowing of leaves and radicle rot.
		Drechslera sps.	Brown spots which turn light brown and coalsce.
		Rhizoctonia solani	Necrosis of the parenchymatous regions of the root.
Black discolouration	.25-90	*Curvularia lunata*	Light brown spots on the leaf and rotting of radicle part.
		Colletotrichum orbiculare	Water soaked yellowish areas on leaves with pin head structure.
White discolouration	.25-25	*Fusarium oxysporum*	Yellowing ,drooping of leaves aand wilting of seedling.
Small seeds	.5-35	*Fusarium monoliforme*	Blightening of leaves and premature leaf fall.
Shrivelled seeds	.25-30	*Aspergillus flavus*	Brown to black lesions,crinckling of leaves, browning of basal part of shoot.
		Fusarium monoliforme	Wilting and drooping of leaves.
Insect damaged seeds	.25-40	*Aspergillus niger*	Browning of leaves and basal part of shoot.
		Aspergillus flavus	Brown to black lesions,crinckling of leaves, browning of basal part of shoot.
		Rhizopus nigricance	Browning and rotting of seedling.
Inert matter (soil particles, stone pieces, broken seed coat and plant debris)	.25-65	*Alternaria alternata*	Necrotic streaks and spots on radicle and basal part of shoot.
		Aspergillus flavus	Browning of leaves and basal part of shoot.
		Fusarium oxysporum	Blightening of leaf and premature leaf fall.
		Fusarium monoliforme	Yellowing of leaves and wilting of seedling.

damaged seeds- *Aspergillus flavus, Aspergillus niger, Rhizopus* sps; Debris and inert matter- *Alternaria alternata, Aspergillus flavus, Fusarium monoliforme, Fusarium oxysporum. Colletotrichum orbiculare* symptomatic seeds show black pin head like acervuli (Fig 1b).Various type seed disorders, fungi associated with them and their seedling symptoms are shown in Table 1. On potato dextrose agar plate method *Colletotrichum orbiculare* was found at a greater extent i.e. (60%). The pathogen was recovered in (0.25-90%), (48%), (40%), (60%) and (65%) percent seeds in dry seed examination, untreated and pretreated standard blotter, potato dextrose agar and czapeks dox agar tests, respectively.

Observation of the collected infected samples leads to the following conclusion. In Kethun disease occurrence was found to be maximum *i.e.* 53% in comparison to other areas. It was found to be minimum in Raipura with (17%). Detailed account of relative fungi found in various areas of Kota district is given in Table 2. The vine is commonly susceptible to *Colletotrichum orbiculare* (53%) causing anthracnose disease during monsoon when the conditions are favourable for the growth of the fungi[4]. 45-90 days old vine showed the infection in all above ground parts. Older leaves first shows small, water soaked, or yellowish areas that enlarge rapidly and turn tan to reddish brown. Spots are circular to angular. Later spots may merge. These areas become dry and tear away, typically giving foliage a ragged appearance (Fig. 2b). Often, leaves at centre of plant are attacked first, leaving stem and runners bare. Fungus also infects the fruit. Young fruits either killed or become malformed. Larger fruits develop sunken, circular lesions (Fig. 3b) that are water soaked[5]. Fungus overwinters the cucurbit vines, in seed, or in weeds in the cucurbit family. Warm (75^0 F), wet conditions favour rapid development and spread of disease.

Control of Anthracnose begins by planting certified seeds, no seed saving from infected plants and use of disease free seeds of a variety resistant to *Colletotrichum* sps. Other measures include planting in well drained soil free from surface runoff water, practicing crop rotation, avoiding overhead irrigation and watering through drip lines or tapes or hoses[6]. Removal and destroying of infected vines at the end of the season, is

Table - 2 Percent range of fungi occuring in 120 seed samples of *Luffa cylindrica*.

Name of fungi	Percent Range	Arjunpura	Arandkhera	Giridharpura	Kethun	Raipura	Naya Nohra	Dhakarkheri
Alternaria alternata	UT	16	18	14	18	0	20	0
	PT	8	16	12.5	12.5	0	11	0
	PDA	5	5.5	4.5	3	0	3.5	0
	CDA	2	4	3	1.5	0	2	0
Aspergillus niger	UT	10	13	11.5	15.5	12	14.5	12.5
	PT	3	2.5	6	7.5	2.5	5	3.5
	PDA	0	0	2.5	3	2	2	2
	CDA	0	0	0	2	0	0	0
Aspergillus flavus	UT	9.8	12	11.5	13	12	11	10
	PT	5	5	3.5	2	5.5	2.5	3
	PDA	3.5	1	1	1.5	3	0	0
	CDA	1	0	0	0	0	0	0
Colletotrichum Orbiculare	UT	25	20	12.5	48	18	22	19
	PT	20	18	10	40	15	20	15
	PDA	30	25	4	60	20	19	22
	CDA	32	30	3.5	65	22	20	20
Curvularia lunata	UT	0	5	12	18	0	10	0
	PT	0	0	10	12.5	0	8	0
	PDA	0	0	7	6	0	5	0
	CDA	0	0	5	4	0	1	0
Drechsclera sps.	UT	0	6	7	5	0	5.5	0
	PT	0	3.5	5.5	3	0	4	0
	PDA	0	1	2.5	1.5	0	0	0
	CDA	0	0	0	0	0	0	0
Fusarium monoliform	UT	15	11	0	20	12.5	11.5	10
	PT	10	7	0	11	9	5	8
	PDA	3	5	0	3.5	4	3	3.5
	CDA	0	0	0	2	0	0	1
Fusarium oxysporum	UT	10	9	0	15	11	12	11
	PT	8	5	0	9	8	4.5	9
	PDA	3.5	2	0	2	3.5	2	2.5
	CDA	0	0	0	0	0	0	0
Penicillium sps.	UT	3	7	5	10	0	5	0
	PT	1.5	5	3.5	8	0	3	0
	PDA	0	1.5	0	3	0	0	0
	CDA	0	0	0	0	0	0	0
Rhizoctonia solani	UT	10	7	5	20	0	12	11
	PT	8	5	3	18	0	10	5
	PDA	5.5	3.5	1	7	0	5	4.5
	CDA	5	0	0	5	0	0	0
Rhizopus sps.	UT	7.5	5.5	6	7.5	4	5	7
	PT	5	4	5.5	6	3	4	6
	PDA	3	3	2.5	3	0	0	2
	CDA	0	0	1	1	0	0	1

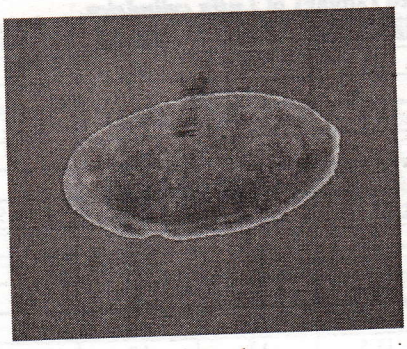

Fig.1a. Healthy Seed

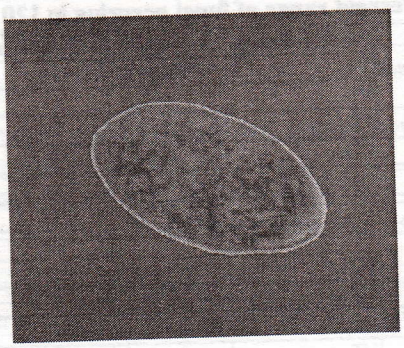

Fig.1b. Infected Seed

Fig.2a. Healthy Leaf

Fig.2b. Infected Leaf

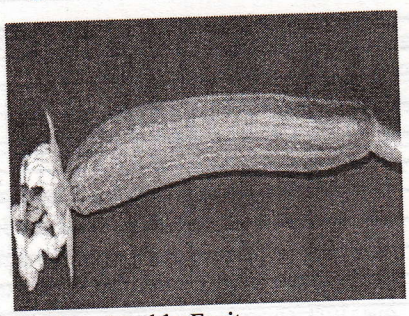

Fig.3a. HealthyFruit

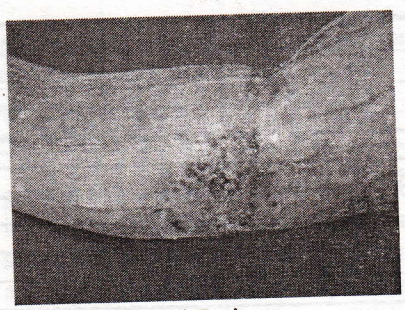

Fig.3b. Infected Fruit

also recommended. Several fungicides are registered for use against anthracnose but may not provide adequate control if good coverage of fruit and leaves is not achieved. A weather based computer software program called melcast is available to help time fungicide applications[7]. Sulphur spray, baking soda spray and Bordeaux mixture can also be used[8].

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