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SCREENING OF SOME PLANTS AGAINST SEED- BORNE FUNGI OF PULSES

Ashok S. Kandhare

K.M.C. College, Khopoli

ABSTRACT

Green gram, Black gram, Pigeon pea and chickpea are common pulses in diet rich in carbohydrates, proteins and minerals. Numerous fungi affect pulses adversely causing reduction in seed content and seed health. Total seventeen seed-borne fungi recorded from all four test pulses. Out of these seventeen seed-borne fungi, six were found to be common and dominant on all four test pulses. These seed-borne fungi cause adverse effect on yield and nutritive value of the pulses. In order to protect pulses from the pathological and economical damage many fungicides are used. Fungicides are harmful to the plant, environment and nutritive value of the pulses. Therefore, biological means like plant powders are tried during the study to curb the infestation of seed-borne fungi. Eighteen plants and three fungi that are more common and dominant on the four pulses are considered for present study. All plant powders were found to be effective to control seed-borne fungi.

KEY WORDS: seed-borne fungi, pulses, plant powders, mycoflora

Introduction:

Pulses are the second most important group of food plants belonging to family Leguminosae. They form an important and indispensable part of daily diet. It is important source of dietary carbohydrates, proteins, essential amino acids and micronutrients such as calcium, phosphorus and iron. Therefore, pulses are important source of protein and essential amino acids for major vegetarians. Pulses like Green gram (*Vigna radiata* L.), Black gram (*Vigna mungo* L), Chickpea (*Cicer arietinum* L.) and Pigeon pea (*Cajanus cajan* L) etc are cultivated in Marathwada region of Maharashtra; India, during Kharif and Rabbi seasons, either as sole or intercrops, under rain fed or irrigated conditions.

Various seed-borne fungi affect pulses. Seventeen seed-borne fungi reported from all four test pulses i.e. Green gram, Black gram, Chickpea and Pigeon pea, of these six found to be common and dominant; these are *Aspergillus flavus, A. fumigatus, A. niger, Drechslera tetramera*, *Fusarium moniliforme* and *Rhizopus stolonifer*. Out of six common and dominant seed-borne fungi three, *Drechslera tetramera*, *Fusarium moniliforme* and *Rhizopus stolonifer* are taken for present study.

Materials and methods:

i) Collection of plants and preparation of plant parts powder.

During present studies, eighteen plants available in the area were selected. The plants were identified from their morphological characters using 'Flora of Marathwada' (Naik, 1998). The collected plants were cut into different parts like stem, leaf and root. All parts were surface sterilized with 0.1% $HgCl_2$ and subsequently washed to remove disinfectant; with sterile distilled water. These plant parts were kept for drying in hot air oven at 60°C for 48 hours.

The dried plant parts such as leaf, stem and root were crushed into powder with the help of grinder. The powders were passed through sieve to get fine portion. The powders of different plant parts were stored in polythene bags for the study.

ii) Evaluation of mycelial weight and sporulation.

Effect of different plant parts powder on dry mycelial weight and sporulation of common and dominant seed-borne fungi of pulses was studied. The seed-borne fungi were grown in liquid GN medium (100 ml) supplemented separately with 5 g of leaf, stem and root powder of different plant parts in conical flasks for ten days at room temperature. After incubation, contents of the flasks were filtered through pre-weighted Whatman filter paper No.1. The filter papers with mycelial mat were oven dried for 24 hours at 60°C and re-weighted. Growth of the seed-borne fungi in terms of dry mycelial weight was calculated by subtracting the initial weight of the filter paper from final weight of filter paper with mycelial mat. The common and dominant seed-borne fungi of pulses grown in GN medium without supplementation of plant powders served as control.

The sporulation of common and dominant seed-borne fungi of pulses was studied separately by collecting spore suspension of the respective fungi after passing the culture filtrate through muslin cloth. The spore suspension was placed on slide and sporulation was recorded by observing different microscopic fields under binocular microscope.

Results and discussion:

The results presented in the Table revealed that, all the test plant parts powder showed restrictive effect on growth of mycelium and sporulation of the fungus *Drechslera tetramera* in more or less degree. The most effective plants that caused maximum reduction in mycelial dry weight of the test fungus were *Ocimum basilicum* L. (leaf 7 mg, stem 8 mg and root 9 mg), *Ocimum sanctum* L. (leaf 8 mg), *Azadirachta indica* A. Juss (root 10 mg), *Ciba pentandra* (leaf 10 mg), *Cyperus rotundus* L. (rhizome 10 mg) and *Carum copticum* Benth & Hook. f. (leaf 12 mg). Slight stimulatory activity on mycelial growth was reported in *Tagetis erecta* L. (root 95 mg), similarly *Samania saman* (Jacq.) Merr. was less effective in reducing mycelial weight of the test fungus (stem 70 mg).

Most of the plants could reduce the sporulation. Maximum reduction in sporulation was shown by the plants such as *Ocimum americanum* L. (stem, leaf and root), *Ocimum sanctum* L. (stem, leaf and root), and *Ruelia tuberosa* L. (leaf), and *Acorus calamus* L. (leaf),

In case of *Fusarium oxysporum* Maximum dry weight reduction was reported due to plants *Ocimum americanum* L. (leaf 5 mg), *Ocimum basilicum* L. (leaf 8 mg, root 9 mg and stem 10 mg) followed by *Acorus calamus* L. (leaf 12 mg). *Samania saman* (Jacq.) Merr. showed stimulatory effect on dry weight (stem 90 mg and

root 88 mg) and supportive action (leaf 78 mg) on the dry weight of mycelium of the test fungus. Similarly *Butea monosperma* (Lam.) Taub. could not reduce mycelial growth of the fungus (stem 68 mg, leaf 61 mg and root 55 mg).

In case of *Rhizopus stolonifer,* plants that inhibited mycelial growth of the fungus maximum were *Ocimum basilicum* L. (leaf 17 mg), *Azadirachta indica* A. Juss (root 20 mg), *Ocimum americanum* L. (leaf 22 mg), *Croton tiglium* L. (leaf 27 mg) and *Ocimum sanctum* L. (leaf 27 mg).

Some plants showed supportive or stimulatory activity on the test fungus, like *Tagetis, erecta* L. (leaf 107 mg, stem 100 mg and root 103 mg). Least reduction in dry mycelial weight was recorded in case of plant *Acorus calamus* L. Sporulation was reduced by all plants with few exceptions. *Acorus calamus* L. reduced sporulation maximum followed by *Ocimum sanctum* L.

Discussion:

Among all tested plants *Ocimum americanum* L., *Ocimum basilicum* L., *Ocimum sanctum* L., *Azadirachta indica* A. Juss, *Cyperus rotundus* L., *Eucalyptus lanceolatus*, *Murraya koinigii* (L.) Spreng. were found to be effective in reducing seed mycoflora of the test pulses. These plant powders found to reduce dry mycelial weight and sporulation of the common and dominant seed-borne fungi of pulses. *Croton tiglium* L. and *Tagetis erecta* L. in case of *Aspergillus niger* and *Aspergillus flavus*. In addition, *Samania saman* (Jacq.) Merr. in case of *Aspergillus fumigatus* and *Rhizopus stolonifer*, *Tagetis erecta* L. and *Samania saman* in case of *Drechslera tetramera* was found to be stimulatory to mycelial growth. The phytochemicals like quircitin, azdirachtin, nimbidin, nibonin etc from *Azadirachta indica* A. Juss. , chavicol, methyl chavicol, linalool, eugenol etc from *Ocimum* species is effective in controlling the seed-borne fungi of test pulses. These phytochemicals could be harnessed instead of artificial chemicals to control menace of seed-borne fungal infestation.

Similar results were reported by Khirsagar and Meheta (1972) where substances from three ferns i.e. *Adiantum trapiziforma, Aleuritopteris farinose* and *Pterris vittal* were shown to possess antimicrobial property. Bhargava *et al* (1981) tested oils of *Ocimum americanum* L. leaf against *Aspergillus* spp. and found it to be antifungal. Singh and Prasad (1993) found leaf extracts of *Azadirachta indica* A. Juss, *Ocimum sanctum* L. and *Ricinus communis* effective against *Helminthosporium speiciferus*, *Fusarium oxysporum* and *Aspergillus flavus* causing fruit rot of banana. Khan *et al* (1996) reported plant extracts of *Azadirachta indica* A. Juss, *Calatropis procera*, *Cuscuta reflexa, Euphorbia pulcherrima* and *Solanum nigrum* were effective against fungi of pulses and further these plant extracts were compared with synthetic fungicides. Aridogan *et al* (2002) studied essential oils from eight plants for their antimicrobial activity against *Staphylococcus aureus* and *Escherichia coli* and found that, these oils were effective in more or less quantity as antibacterial. Ahmed and Aquilf (2003) tested antimicrobial activity of *Delonix regia* flower extract and found that these extracts showed antimicrobial activity in different degrees. Rukhsana and Saima (2005) studied antifungal activity of aqueous leaf extracts of two species of *Eucalyptus* against three pathogenic fungi namely, *Alternaria alternata*, *Drechslera hawaiiensis* and *Drechslera tetramera*. All the plant extracts were found to be antifungal. Dhekle (2007) studied plant powders of *Cocculus hirsutus*, *Holarrhina antidysentrica*, *Merremia aegyptiaca*, *Merremia quinquefolia*, *Mucuna puriens*, *Plumbago zeylanica* and *Wrightia tinctoria* against some seed-borne fungi, these plants showed antifungal properties in more or less degree. Tare (2001) studied oils of *Acorus calamus* L., *Azadirachta indica* A. Juss, *Cedrus deodara*, *Eucalyptus* spp. *Pongamia glabra, Salvadora oleoides, Sesamum indicum* and *Trachyspermum* spp. and found that, these oils were lethal to different insects. Kuldeep and Shah (2012) reported antifungal activity of marigold, lemon grass, mehandi, onion and neem against *Dreschslera bicolor*. Emad et. al. (2012) reported different solvent extracts of *Azadirachta indica* A. Juss found to be effective against different fungi.Trivedi et.al. (2013) found neem oil, mustered oil and azdirachtin effective to control viral and leaf spot infections.

Sr. No.	Plants used	GN medium + 5 gm powder of	Drechslera tetramera	Fusarium oxysporum	Rhizopus stolonifer			
			Dry weight of mycelium (mg)	Sporulation	Dry weight of mycelium (mg)	Sporulation	Dry weight of mycelium (mg)	Sporulation
01	*Acorus calamus* L.	Leaf	13	+	12	+	97	+
		Rhizome	22	++	28	++	98	+
02	*Adenanthera pavonea* L.	Leaf	28	++	30	++	93	+++
		Stem	30	++	37	++	60	++
		Root	42	+++	40	++	70	++
03	*Azadirachta indica* A. Juss.	Leaf	18	-	28	++	35	+
		Stem	20	+	21	+	60	++
		Root	10	+	22	+	20	+
04	*Butea monosperma* (Lam.) Taub.	Leaf	19	++	61	++	88	+++
		Stem	18	++	68	++	92	++
		Root	22	++	55	++	77	++
05	*Carum copticum* Benth & Hook. f.	Leaf	12	++	22	++	52	++
		Stem	17	++	52	+++	77	++
		Root	19	++	28	++	80	+++
06	*Ciba pentandra*	Leaf	10	+	21	++	61	++
		Stem	19	+	32	++	80	++
		Root	20	++	38	+++	70	+++

07	*Croton tiglium* L.	Leaf	30	++	52	++	27	+
		Stem	38	++	40	++	50	++
		Root	32	++	58	++	30	++
08	*Cyperus rotundus* L.	Leaf	17	++	21	++	32	++
		Rhizome	10	+	29	+	40	++
09	*Eucalyptus globulus* Labill.	Leaf	13	++	30	++	52	++
		Stem	25	++	35	++	40	++
		Root	29	++	40	++	60	++
10	*Melingtonia hortensis*	Leaf	30	++	38	++	70	++
		Stem	32	+++	28	++	70	++
		Root	37	+++	31	++	83	++
11	*Muntangia calabura* L.	Leaf	30	++	28	++	76	++
		Stem	38	++	32	++	52	++
		Root	40	+++	39	+++	80	+++
12	*Murraya koinigii* (L.) Spreng.	Leaf	18	++	38	++	50	++
		Stem	30	++	40	++	68	++
		Root	20	++	51	++	67	++
13	*Ocimum basilicum* L.	Leaf	07	+	08	+	17	+
		Stem	08	+	10	+	50	++
		Root	09	++	09	+	28	+
14	*Ocimum americanum* L.	Leaf	10	+	05	+	22	+
		Stem	11	-	12	+	40	++
		Root	11	+	10	+	30	+
15	*Ocimum sanctum* L.	Leaf	08	+	18	++	27	+
		Stem	10	+	21	++	32	+
		Root	19	+	27	++	38	++
16	*Ruelia tuberose* L.	Leaf	12	+	19	++	55	++
		Stem	19	++	28	++	60	++
		Root	23	++	32	++	40	++
17	*Samania saman* (Jacq.) Merr.	Leaf	60	+++	78	++	52	++
		Stem	70	+++	90	+++	70	+++
		Root	55	+++	88	+++	58	+++
18	*Tagetis erecta* L.	Leaf	38	++	35	++	107	+++
		Stem	35	++	40	++	100	+++
		Root	95	++	55	++	103	+++
19	Control	GN medium	80	+++	75	+++	100	+++

Table: Effect of leaf, stem, root and rhizome powder of plants on seed-borne fungi of pulses.
(+ low , ++ medium, +++ high, - nil sporulation)

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