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Management of Seed Health of Pulses Using Plant Extracts

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Abstract Chickpea (*Cicer arietinum* L.) is affected by seventeen seed-borne fungi. These fungi caused adverse effects on seed health and yield. Application of synthetic fungicides causes damage to consumers and environment. Therefore, petroleum ether plant part extracts of locally available plants are tried to control seed mycoflora and to boost overall seed health of the pulse. Almost all plant extracts showed restrictive effect on seed mycoflora of the test pulse. Significant plants that controlled seed mycoflora in higher percents are *Azadirachta indica* A. Juss., *Cyperus rotundus* L., *Ocimum basilicum* L., *O. americanum* L., *O. sanctum* L. etc.

Keywords Seed mycoflora, Pulses, Plant extracts

1 Introduction

Chick pea (*Cicer arietinum* L.) is an important pulse crop in Maharashtra, it is affected by different fungal pathogens as seed mycoflora which is harmful to seed health, seed content and ultimately to yield. Association of the fungi with the seed has found to be harmful to the seed health and seed content. Total seventeen seed-borne fungi (*Alternaria tenuis, A. alternate, Aspergillus carbonarius, A. flavus, A. niger, A. nidulans, A. fumigatus, Cladosporium spp., Colletotrichum truncatum, Chaetomium globosum, Curvularia lunata, Drechslera tetramera, Fusarium moniliforme, Fusarium oxysporum, Penicillium spp., Rhizopus stolonifer, Macrophomina phaseolina*) were isolated from the test pulse, on Agar plates and Moist blotters. Agar plates showed more fungal incidence compared to Moist blotters. Among seventeen fungi isolated and identified, six dominant fungi *Aspergillus flavus, A. fumigatus, A. niger, Drechslera tetramera, Fusarium oxysporum* and *Rhizopus stolonifer* taken for the study. These six dominant seed-borne fungi of Green gram were tested against plant extracts of eighteen commonly and locally available plants.

2 Materials and Methods

2.1 Preparation of petroleum ether plant extracts

Five g powder of each of the plant parts was dissolved separately in mixture of 50 ml petroleum ether and 50 ml distilled water; in 250 ml borosil glass conical flasks. The flasks were kept in oven (Metlab) for 24 hours at 60^{o}C and the content was filtered through Whatman filter paper No.1. The filtrates were used as 5% plant extracts.

2.2 Evaluation of seed mycoflora and seed health (seed germination, seedling emergence, shoot, and root length) of pulse.

During present studies, the seeds of Black gram were soaked separately in the leaf, stem, and root petroleum ether extracts (petroleum ether and water 1:1) of the selected plants for 24 hours. The effect of extracts on seed health was studied by placing seeds of test pulse on moist blotter plates and incubated for ten days at room temperature. On eleventh day percent seed mycoflora, seed germination, root and shoot length was recorded. The seeds soaked in sterile distilled water served as control.

For seedling emergence, seeds of Black gram were treated as mentioned above and sown in earthen pots containing sterilized soil for ten days; at room temperature. On eleventh day percent, seedling emergence, root, and shoot length was recorded. The seeds soaked in sterile distilled water served as control.

3 Results and Discussion

Almost all plants showed restrictive effect on seed mycoflora and stimulatory or supportive activity on seed germination, shoot and root length in more or less quantity.

It is evident from the tabulated result that, all the plant extracts were found to be supportive or stimulatory for seedling emergence, shoot and root length of the test pulse in more or less degree, with some exceptions (Table 1).

Table 1 Effect of petroleum ether extract (petroleum ether and water 1:1) of different plant parts on Seed mycoflora and seed health (seed germination, shoot and root length) of Chick pea (*Cicer arietinum* L.) on blotter (after ten days of incubation)

Sr. No	Source plant	50% petroleum ether + 5gm powder of	Seedling emergence		
			Seedling emergence (%)	RL (cm)	SL (cm)
1	*Acorus calamus* L.	Leaf	50	10	09
		Rhizome	40	12	10
2	*Adenanthera pavonia* L.	Leaf	70	9.3	09
		Stem	50	11.2	10
		Root	60	08	09
3	*Azadirachta indica* A. Juss.	Leaf	100	12	13
		Stem	90	13	12
		Root	78	14	11
4	*Butea monosperma* (Lam.) Taub.	Leaf	50	12.3	10
		Stem	80	09	08
		Root	60	12.3	11
5	*Carum copticum* Benth & Hook. f.	Leaf	60	11	11.2
		Stem	70	10.2	11
		Root	50	09	07
6	*Ciba pentandra*	Leaf	50	15	10
		Stem	60	14	13
		Root	40	10	08
7	*Croton tiglium* L.	Leaf	50	12.3	09
		Stem	40	11	09
		Root	60	09	07
8	*Cyperus rotundus* L.	Leaf	80	16.3	15
		Rhizome	93	15.5	10
9	*Eucalyptus globulus*. Labill.	Leaf	100	12.3	10
		Stem	88	10	12.8
		Root	83	11	12
10	*Melingtonia hortensis*	Leaf	70	05	04
		Stem	40	12	10
		Root	60	12.3	11.3
11	*Muntangia calabura* L.	Leaf	70	11	12.4
		Stem	50	11.5	12
		Root	40	08	07
12	*Murraya koinigii* (L.) Spreng.	Leaf	55	12.3	11
		Stem	80	14	13.2
		Root	90	12	10
13	*Ocimum basilicum* L.	Leaf	90	07	08
		Stem	80	06	07
		Root	70	12	10
14	*Ocimum americanum* L.	Leaf	100	13.5	11
		Stem	87	11	12
		Root	80	09	10

Continuing Table 1

Sr. No	Source plant	50% petroleum ether + 5gm powder of	Seedling emergence		
			Seedling emergence (%)	RL (cm)	SL (cm)
15	*Ocimum sanctum* L.	Leaf	92	15.6	14
		Stem	100	13	12.5
		Root	80	12	11
16	*Ruelia tuberosa* L.	Leaf	100	12.3	11
		Stem	60	11	12.3
		Root	70	10.2	10
17	*Samania saman* (Jacq.) Merr.	Leaf	60	03	02
		Stem	80	02	03
		Root	50	12	10
18	*Tagetis erecta* L.	Leaf	60	07	06
		Stem	40	06	08
		Root	12	12	11.2
19	Control	Sterile distilled water	56	12	10

There was maximum seedling emergence due to plant extracts of *Azadirachta indica* A. Juss (leaf 100 %), *Eucalyptus globulus*. Labill. (leaf 100 %), *Ocimum americanum* L. (leaf 100 %), *Ocimum sanctum* L. (stem 100 %) and *Ruelia tuberosa* L. (leaf 100 %). These plant extracts showed stimulatory effects on seedling emergence (control 56 %).

Shoot and root lengths were stimulated due to extracts of *Cyperus rotundus* L. (leaf 16.3 cm) and *Ocimum sanctum* L. (leaf 14 cm). Some extracts had inhibitory effects on shoot and root length.

Similar findings were recorded on different crops by various workers like Gomati et al. (2000), Ahmed and Aquil (2003), Patni et al. (2005), Rosa-Casian et al. (2007) and Duraipandiyan and Ignacimuthu (2007). Umer et.al. (2014) studied Antifungal potential of twenty antagonistic plants was assessed against the most damaging phytopathogenic fungus *Macrophomina phaseolina*. All the test plants inhibited the growth of *M. phaseolina* significantly to varying levels. Arshad et al. (2012) studied antifungal potential of an allelopathic grass *Sorghum halepense* Pers. for the management of *M. phaseolina* isolated from charcoal rot infected cowpea plants. In laboratory bioassays, different concentrations (0, 0.5, 1.0, 3.0 g/ml) of methanolic extracts of shoot, root and inflorescence of the test grass were evaluated for their in vitro antifungal activity against *M. phaseolina*. Extracts of all the three parts of the grass exhibited variable antifungal activity. El-Kholie et al. (2012) shown antifungal effects of ehanolic and methanolic extracts of *Azadirachta* on different fungi. Wadkar and Kadam (2014) tried *Argemon maxicana* and *Calatropis gagantia* extracts on root rot of Chickpea and found to be effective. Manoorkar et al. (2015) reported antifungal effect of ethanol and aqueous extracts of leaf & latex of *Calatropis procera* (Ait.) against ten seed-borne dominant fungi viz., *Curvularia lunata*, *Alternaria alternata*, *Rhizoctonia solani*, *Fusarium solani*, *Penicillium chrysogenum*, *Aspergillus niger*, *A. flavus*, *A. terrus A. fumigatus*, and *Rhizopus* sp. Zakaria et al. (2015) found that ethanolic extracts of *Datura strumanium*, *Mentha longifolia* and *Malva parviflora* were effective against *Alternaria alternata*, *Botrytis cinerea*, and *Penicillium italicum*.

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