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SCREENING OF SOME WEEDS AGAINST SEED-BORNE FUNGI OF PIGEON PEA [CAJANUS CAJAN (L.) MILLSP.].

Botany

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ABSTRACT

In the present study leaf extracts from 15 weed plants such as *Acalypha indica* L., *Achyranthes aspera* L., *Alternanthera sessilis* (L.) R. Br. Ex. DC., *Cassia tora* L., *Croton bonplandianum* Baill., *Datura stramonium* L., *Euphorbia hirta* L., *E. heterophylla* L., *Hyptis suaveolens*(L.), *Parthenium hysterophorous* L., Sida cordifolia L., *Solanum xanthocarpum Schrad. & H. Wendl., Tephrosia purpuria* (L.) Pers., *Tridox procumbens* L. and Xanthium strumarium L. were tested for their antifungal activity (*in-vitro*) against seed-borne fungi of pigeon pea [*Cajanus cajan* (L.) Millsp.]. All the alcoholic leaf extracts showed good inhibitory activity against seed borne fungi and increased percent of seed germination, root & shoot length and *vigour index.* Alcoholic leaf extracts prepared from *X. strumarium* and *D. stramonium* leaves were showed good inhibitory activity against the seed borne fungi. 98% of seed germination was observed in seeds treated with alcoholic leaf extract of *X. strumarium*. The highest *vigour inde*x was recorded after the application of alcoholic and aqueous extracts prepared from *X. strumarium* and *D. stramonium* while the lowest was observed in case of untreated seeds of pigeon pea (control).

KEYWORDS

Antifungal activity, weed plants, seed-borne fungi, pigeon pea

Introduction

Pigeon pea [*Cajanus cajan* (L.) Mill. Sp.] also known as red gram or arhar, is one of the major legume crop, grown in the semiarid tropics and most important food legume of India. Seeds are good vectors to transport plant pathogenic fungi (Agrawal and Sinclair, 1996). Seed is a primary source of plant growth and 90% of the food crops propagated by seed (Neergaard, 1977); seed is the most important unit of the crop; which should be of good quality and free from pathogen. Pathogen free and healthy seeds are used for sowing to achieve preferred germination, emergence, healthy seedlings and plant population. Fungal diseases are known to cause great damages all over the world. Seed borne diseases affect growth and productivity of crop plants (Kubiak and Korbas, 1999; Weber et. al., 2001). Different species of *Alternaria, Aspergillus, Curvularia, Dreschslera, Fusarium, Penicillium, Rhizoctonia, Rhizopus* and *Trichoderma* are most common associates of seeds of pigeon pea (Jalander and Gachande, 2011). Seed-borne pathogens causes pre-and post-infections and considerable quality losses *viz.* seed abortion, seed rot, seed necrosis, reduction or elimination of germination capacity, seedling damage and their nutritive value have been reported (Miller, 1995; Janardhana *et. al.,* 1998; Kavitha *et. al.,* 2005). In recent years we are using very harmful chemicals to control pathogenic fungi. Using of such type of chemicals are environmentally unsafe. Using of plant extracts against plant pathogenic fungi is however, a recent approach to plant disease control. It helps to avoid environmental pollution by chemicals. Seed treatment is the safest and the cheapest way of control of seed-borne fungal diseases and to prevent biodeterioration of grains (Chandler, 2005; Bagga and Sharma, 2006). In the present study, the effect of leaf extracts prepared from different weed plants on seed borne fungi of pigeon pea seeds, seed germination, root & shoot length and vigour index were investigated.

Materials and Methods:

Collection of Plant Material: Fresh and healthy leaves of weed plants such as *Acalypha indica* L., *Achyranthes aspera* L., *Alternanthera sessilis* (L.) R. Br. Ex. DC., *Cassia tora* L., *Croton bonplandianum* Baill., *Datura stramonium* L., *Euphorbia hirta* L., *E. heterophylla L., Hyptis suaveolens (L.), Parthenium hysterophorous L., Sida cordifolia L., Solanum xanthocarpum Schrad. & H. Wendl., Tephrosia purpuria (L.) Pers., Tridox procumbens L. and Xanthium strumarium* L. growing in agriculture field near by the campus area and washed with tap water; surface sterilized with 0.01% mercuric chloride (HgCl2) for 1 to 2 min and washed thoroughly 2-3 times with sterile distilled water then shade dried. Dried leaves were pulverized in electric blander to obtain fine powder.

Preparation of Plant Extracts:

Aqueous Extracts: To prepare aqueous leaf extracts, 20 g of powdered leaves were boiled in 100 ml of sterile distilled water for 10 min. Then extracts were filtered through double layered muslin cloth and finally through Whatman filter paper No.1, the volume of the extracts were adjusted to 100 ml with sterile distilled water and preserved at 4°C in pre-sterilized flasks until use.

Ethanolic Extracts: To prepare ethanolic leaf extracts, 20 g of powdered leaves were boiled in 100 ml of 80% ethanol for 10 min. Then extracts were filtered through double layered muslin cloth and finally through Whatman filter paper No.1. Then the volume was adjusted to 100 ml with sterile distilled water and preserved at 4°C in pre-sterilized flasks until use.

Seed Treatment and Isolation of fungi: Seed samples of Pigeon pea were collected from local market and stored in jute bags for six months of period at room temperature (28±2°C). Hundred seeds of tested samples were immersed in aqueous and ethanolic leaf extracts of above mentioned weed plants and kept for overnight. Control was maintained with distilled water. The control and treated seeds were dried in shade. Seeds were inoculated and fungi were collected by using blotter method as described by International Seed Testing Association (Anon., 1966). Ten seeds were placed per Petri dish containing moist blotter paper. Plates were incubated at 28±2°C for 7 days. On incubation fungi were identified (Barnett and Hunter, 1972; Subramanian, 1971), root length and shoot length of the seedlings was recorded and percentage of seed germination and vigour index was calculated by the formulae.

% of seed germination= No. of seeds germinated in control-No. of seeds germinated in test X 100 No. of seeds germinated in control
Vigour Index=Mean of Root Length (cm)+Mean of Shoot Length (cm)X Percentage of Seed Germination

Results and Discussion:

Total 11 fungal species belonging to 7 genera were isolated and identified from seed samples of pigeon pea, five species belongs to *Aspergillus* i.e *A. flavus, A. niger, A. nidulans, Aspergillus* sp.1 , *Aspergillus* sp.2 and *Cladosporium herbarum, Curvularia lunata, Drachslera tetramera*, *Fusarium* sp. *Penicillium* sp. *Rhizophus stolonifer.* All the alcoholic leaf extracts showed good inhibitory activity against seed borne fungi and increased percent of seed germination, root & shoot length and vigour index. Alcoholic leaf extracts prepared from *X. strumarium* and *D. stramonium* leaves were showed good inhibitory activity against the seed borne fungi. 98% of seed germination, increased root length (7.482 cm) and shoot length (5.820 cm) was observed in seeds treated with alcoholic leaf extract of *X. strumarium.* The highest vigour index was recorded after the application of alcoholic and aqueous extracts prepared from *X. strumarium* and *D. stramonium* while the lowest was observed in case of untreated seeds of pigeon pea (control). Next to these, the alcoholic leaf extracts prepared from *E. hirta* and *C. tora* showed good inhibitory activity against the seed-borne fungi of pigeon pea. Aqueous leaf

extracts from weed plants also showed antifungal activity (less than the alcoholic extracts) against seed-borne fungi of pigeon pea. Similar results were observed in case of different crop plants by different workers; Kandhare (2015) studied effect of petroleum ether extract of different plant parts on seed mycoflora and seed health of green gram and he was observed that increase in seed germination and root length and shoot length. Kandhare (2016) also studied the effect of petroleum ether extract of different plant parts on seed mycoflora and seed health of Pigeon pea on blotter (after ten days of incubation) and reported that maximum stimulation in root length was observed in plant extract of *Cyperus rotundus* and shoot length was reported maximum in *Muntangia calabura.* Umer et.al. (2014) studied antifungal activity of 20 plant species was assessed against the fungus *Macrophomina phaseolina* and they were reported all the test plants inhibited the growth of *M. phaseolina* significantly to varying levels. Satish et. al. (2017) were studied aqueous extracts of 52 plants from different families for their antifungal potential against eight important species of *Aspergillus* isolated from sorghum, maize and paddy seed samples. Among fifty-two plants tested, aqueous extract of *Acacia nilotica*, *Achras zapota*, *Datura stramonium*, *Emblica officinalis*, *Eucalyptus globules*, *Lawsonia inermis*, *Mimusops elengi*, *Peltophorum pterocarpum, Polyalthia longifolia*, *Prosopis juliflora*, *Punica granatum* and *Sygigium cumini* have recorded significant antifungal activity against *Aspergillus* species. Manoorkar et. al. (2015) reported antifungal activity of aqueous and ethanolic extracts of leaf & latex of *Calatropis procera* against ten seed-borne fungi isolated from oil seeds. Zakaria *et.al.* (2015) reported that ethanolic extracts of *Datura strumanium*, *Mentha longifolia* and *Malva parviflora* were effective against *Alternaria alternata*, *Botrytis cinerea* and *Penicillium italicum.*

Hasan *et. al.* (2005) studied the antifungal effect of plant extracts on seed borne fungi of wheat seed regarding seed germination seedling health and vigour index. They have been reported that all the water and alcoholic extracts gave good results against seed borne fungi of wheat seeds.

Table 1: Antifungal effect of aqueous leaf extracts prepared from different weeds on seed-borne fungi of pigeon pea [Cajanus cajan (L.) Millsp.].

S. No.	Name of plant	% of seed germination	Average Root length (cm)	Average Shoot length (cm)	Vigour index
1	*Acalypha indica*	58.00	4.628	3.000	442.42
2	*Achyranthes aspera*	56.00	4.512	2.712	404.54
3	*Alternanthera sessilis*	55.00	3.880	2.426	346.83
4	*Cassia tora*	60.00	4.926	3.226	489.12
5	*Croton bonplandianum*	52.00	3.240	1.526	247.83
6	*Datura stramonium*	70.00	5.212	3.562	614.18
7	*Euphorbia hirta*	62.00	4.942	3.420	518.44
8	*E. heterophylla*	58.00	4.642	3.120	450.19
9	*Hyptis suaveolens*	56.00	4.212	2.612	382.14
10	*Parthenium hysterophorous*	53.00	3.820	2.120	314.82
11	*Sida* cordifolia	58.00	4.812	3.020	454.25
12	*Solanum xanthocarpum*	55.00	3.982	2.524	357.83
13	*Tephrosia purpurea*	50.00	2.828	1.320	207.40
14	*Tridax procumbens*	58.00	4.620	3.000	441.96
15	*Xanthium strumarium*	**75.00**	**5.812**	**4.200**	**750.90**
16	**Control**	**45.00**	**2.230**	**1.170**	**153.00**

Table 2: Antifungal effect of alcoholic leaf extracts prepared from different weeds on seed- borne fungi of pigeon pea [Cajanus cajan (L.) Millsp.].

S. No.	Name of plant	% of seed germination	Average Root length (cm)	Average Shoot length (cm)	Vigour index
1	*Acalypha indica*	69.00	6.000	4.012	690.82
2	*Achyranthes aspera*	62.00	5.524	3.520	560.72
3	*Alternanthera sessilis*	65.00	5.812	3.824	626.34
4	*Cassia tora*	77.00	6.540	4.522	851.77
5	*Croton bonplandianum*	60.00	5.024	3.100	487.44
6	*Datura stramonium*	90.00	7.042	5.520	1130.58
7	*Euphorbia hirta*	78.00	6.624	4.822	892.78
8	*E. heterophylla*	71.00	6.214	4.212	740.24
9	*Hyptis suaveolens*	65.00	5.800	3.820	625.30
10	*Parthenium hysterophorous*	60.00	5.122	3.120	494.52
11	*Sida* cordifolia	69..00	6.100	4.000	696.90
12	*Solanum xanthocarpum*	65.00	5.752	3.862	624.91
13	*Tephrosia purpurea*	61.00	5.424	3.240	528.50
14	*Tridax procumbens*	70.00	6.110	4.012	707.84
15	*Xanthium strumarium*	**98.00**	**7.482**	**5.820**	**1303.59**
16	**Control**	**45.00**	**2.230**	**1.170**	**153.00**

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