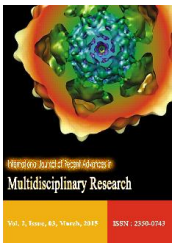
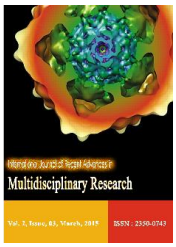


International Journal of Recent Advances in Multidisciplinary Research
Vol. 02, Issue 03, pp.0250-0252, March, 2015



Research Article

EFFECT OF FUNGAL METABOLITES ON SEED HEALTH OF GREEN GRAM

***Ashok S. Kandhare**

Department of Botany, K.M.C. College, Khopoli, India

ARTICLE INFO

Article History:
Received 27th December, 2014
Received in revised form
15th January, 2015
Accepted 26th February, 2015
Published online 31th March, 2015

Keywords:

Seed-borne fungi,
Mycotoxins,
Test pulses.

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. During present study, effects of metabolites of seed-borne fungi on seed health are evaluated. Total seventeen fungi recorded from all test pulses. Out of these seventeen seed-borne fungi, six, *Aspergillus flavus, A. fumigatus, A. niger, Drechslera tetramera* and *Rhizopus stolonifer*, found to be common and dominant on four test pulses. These common and dominant seed-borne fungi produced mycotoxins that affected adversely to the seed germination, shoot and root length of all test pulses in variable quantity.

INTRODUCTION

Pulses are the second most important group of food plants belonging to family Leguminosae. They form an important and indispensable part of our 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. The pulses like Green gram (*Vigna radiata* L.), Black gram (*Vigna mungo* L), and Chickpea (*Cicer arietinum* L.) Pigeon pea (*Cajanus cajan* L) etc are cultivated in Marathwada region of Maharashtra during Kharif and rabbi seasons, either as sole or intercrops, under rain fed or irrigated conditions. Pulses are affected by various seed borne fungi. Seventeen seed-borne fungi reported from four test pulses i.e. Green gram, Black gram, Chickpea and Pigeon pea, of these six found to be common and dominant; they are *Aspergillus flavus, A. fumigatus, A. niger, Drechslera tetramera* and *Rhizopus stolonifer*. Metabolites i.e. mycotoxins of these fungi found to be adversely affecting to seed health of test pulses. Various researchers reported toxins of fungi and their effects on plants. Tripathi (1974) studied seed mycoflora of cereals and reported that, the culture filtrate of *Aspergillus flavus* was inhibitory to root and shoot growth. Deshpande and Gajewar (1976) studied seed mycoflora of cereals and found that the mycotoxins were causing adverse effects on seed germination.

Corresponding author:** **Ashok S. Kandhare,
Department of Botany, K.M.C. College, Khopoli, India.

Kamal and Verma (1987) studied seeds of Arhar and reported that, seed germination was affected greatly due to *Aspergillus flavus, Aspergillus nidulans, A. niger, Trichoderma viridi* and *Alternaria alternata.* Sinha and Prasad (1981) reported adverse effects on seed germination of mung due to *Alternaria alternata, Bortyodiplodia theobrome, Curvularia lunata, Fusarium moniliforme* and *Macrophomina phaseolina*. Bodke (2000) studied toxins of seed-borne fungi in relation to different cereal seeds and found that, these seed-borne fungi adversely affected seed germination and seedling emergence. Kritzinger *et al*. (2003) observed *Fusarium proliferatum* produced mycotoxin in cowpea seeds and the toxin was reported to reduce seed germination. Gure *et al*. (2005) reported adverse effects of fungi on *Podocarpus falcatus* seeds; the toxins, caused reduction of seed germination, shoot length and root length. Howlett (2006) reported toxins of the seed-borne fungi found to be responsible to inhibit normal growth of seedlings in different crops. Marked reduction in germination percentage and vigor index was reported in *Arachis hypogea* L. due to *Aspergillus flavus* (Naikoo Abaas *et al,* 2013)

MATERIALS AND METHODS

Preparation of spore suspension

Spore suspension of common and dominant seed-borne fungi of pulses were prepared separately by adding 10 ml of sterile distilled water into the sporulating pure cultures of seed-borne fungi of pulses; maintained on PDA slants for seven days at room temperature.

The slants were shaken and content was filtered through muslin cloth to separate mycelium and spore. The filtrate thus obtained was used as spore suspension.

Toxin production

Toxin production was studied by growing some common and dominant seed-borne fungi of pulses like, *Aspergillus flavus*, *A. fumigatus, A. niger, Drechslera tetramera, Fusarium moniliforme* and *Rhizopus stolonifer* on liquid glucose nitrate medium (GN) medium and Green gram seed flour medium (GGFM) of test pulse. For this 25 ml of liquid GN was poured separately in 100 ml borosil conical flasks and autoclaved. These flasks were then inoculated separately with 2 ml spore suspension of the test seed-borne fungi, which were maintained on PDA slants for seven days. These flasks were incubated at room temperature for ten days. After incubation, the culture filtrates were collected in pre-sterilized culture bottles from the flasks by filtering the cultures through Whatman filter paper No.1 and treated as crude toxin preparation.

RESULT AND DISCUSSION

Results presented in Table show that, mycotoxins obtained from all common and dominant seed-borne fungi affected adversely seed germination, shoot and root length. There is great reduction in percent seed germination due to *Aspergillus flavus* and *Rhizopus stolonifer* (GN) followed by *Aspergillus niger* (GN), *Fusarium moniliforme* (GGFM), *Fusarium moniliforme* (GN), *Drechslera tetramera* and *Aspergillus niger* (GGFM). Minimum reduction in percent seed germination was noticed due to *Rhizopus stolonifer* (GGFM). As regards to root lengths *Aspergillus flavus* (GN), *Aspergillus fumigatus* (GN and GGFM) reduced root length to maximum. There was least reduction in root length due to mycotoxin of *Rhizopus stolonifer*. Shoot and root lengths were reduced to maximum due to *Aspergillus niger* (GGFM) and *Fusarium moniliforme* (GGFM) and there was least reduction in shoot and root length due to *Aspergillus flavus*. Culture filtrate obtained from GGFM was found to be inhibitory for all processes like seed germination, shoot length and root lengths of the pulse.

Table: Effect of culture filtrate (CF) of common and dominant seed-borne fungi of pulses [grown on Glucose-nitrate medium (GN) and Green gram floor medium (GGFM)] on seed health of Green gram (*Vigna radiata* L.) by blotter plate method (After ten days of incubation).

Sr. No.	Common and dominant seed-borne fungi	Seed germination					
		Seed germination (%)		Root length (cm)		Shoot length (cm)	
		GN	GGFM	GN	GGFM	GN	GGFM
1	*Aspergillus flavus*	30	10	03	04	4.2	04
2	*Aspergillus fumigatus*	50	50	03	2.3	1.5	3.1
3	*Aspergillus niger*	20	50	04	05	2.8	02
4	*Drechslera tetramera*	40	40	06	3.6	3.3	2.2
5	*Fusarium moniliforme*	30	20	03	03	2.6	02
6	*Rhizopus stolonifer*	10	60	4.6	5.7	3.4	3.4
7	Control	90	90	6.8	7.5	5.3	06

Seed germination method

Hundred seeds of each test pulse Green gram was soaked separately in crude toxin preparation (CF) for 24 hrs. The soaked seeds were then placed on moist blotters in sterilized borosil glass Petri plates. The plates were incubated for 10 days at room temperature. After incubation, percent seed germination, root and shoot length were recorded. The seeds soaked in freshly prepared sterilized liquid GN medium served as control.

Seedling emergence method

Hundred seeds of each test pulse Green gram was soaked separately in crude toxin preparation (CF) for 24 hrs. The soaked seeds were sown at the depth of 2 cm equidistantly in earthen pots (25 cm diameter) containing sterilized soil at room temperature. Percent seedling emergence shoot length, root length were recorded after ten days. The seeds soaked in freshly prepared sterilized liquid GN medium served as control.

Glucose nitrate (GN) medium:	Green gram flour medium (GGFM):
Glucose: 10g	Green gram flour: 10g
KNO_3: 2.5g	KNO_3: 2.5g
KH_2PO_4: 1g	KH_2PO_4: 1g
$MgSO_4.7H_2O$: 0.5g	$MgSO_4.7H_2O$: 0.5g
Distilled water : 1000 ml	Distilled water : 1000 ml

REFERENCES

Bodke, S. S. 2000. Studies on seed-borne fungi of cereals. Ph.D. thesis, S.R.T. Marathwada University, Nanded (M.S.) India.

Deshpande, K.S. and Gajewar, D.S. 1976. Effect of toxic metabolite of *Helminthosporium longirostrata* on germination of M35-1 Sorghum. *Ind. Jour. Agri. Sci.,* 46 (12): 584-588.

Gure, A., Wahlstrom, K. and Stenlid, J. 2005. Pathogenicity of seed associated fungi to *Podocarpus falcatus* in vitro. *Forest Patho,* 35(1): 23-35.

Howlett, B.J., 2006. Secondary metabolite toxins and nutrition of plant pathogenic fungi. *Curr. Opin Plant Biol*., 9(4): 371-375.

Kamal and Verma, A.K. 1987. Seed-borne mycoflora of Arhar (T-21), effect of culture filtrates of some isolates on seed germination and fungicidal treatment. *Indian Jour. Mycol. Pathol.,* 9 (1): 41-45.

Kritzinger, Q., Aveling, T.A., Marasas, W.F., Reeder, J.P., Van Der Westhuizen L. and Shephard, G.S. 2003. Mycoflora and fumonisin mycotoxins associated with Cowpea (*Vigna unguiculata* L. Walp) seeds. *Jour. of Agri. Food Chem., 51*(8): 2188.

Naikoo Abbas, wani mubashir, Nazir ahmad bhat, Waheed –u-zameen, md. Suliman dar and mahmood ahmad tak., 2013. Effect of seed borne mycoflora on the quality of three

varieties of *Arachis hypogea* L. *Int. Jour. of Agri. Sci. and Res.,* (3): 35-42.

Sinha, M.K. and Prasad, T. 1981. Effect of fungal metabolites on seed germination, microbial association and seedling growth of Mung. *Indi. phytopath*. 34 (4):515-517.

Tripathi, R.K. 1974. Head fungi of Sorghum, phototoxic and other effects on seed germination. *Indi. Phytopath,* 27: 499-501.

****