RESEARCH ARTICLE

Mycodiversity Associated With Seeds of Soybean (*Glycine max* L.) Seeds

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Manuscript details:

Date of publication 18.10.2014

Available online on http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Patharkar SP and Hedawoo GB (2014)Mycodiversity Associated With Seeds of Soybean (*Glycine max* L.) Seeds., *Int. J. of Life Sciences, Special issue,* A2: 39-42.

Acknowledgement:
The authors are thankful to Principal of college and Dr. P. W. Deotare, Head Department of Botany, Shri Shivaji Science College, Amravati for facilitation during the course of this work.

ABSTRACT

In Maharashtra state, oilseeds are cultivated in both kharif as well as rabbi seasons. Out of which soybean (*Glycine max* L.) is major oilseed crop. After harvesting, seeds are stored in various conditions. If these conditions are not provided properly that time different microbes like fungi are interacted with seeds and play a dominant role in decreasing quality and longevity of the seeds. Therefore the present work deals with the isolation, identification and percent germination of soybean seed mycoflora by using ISTA techniques. In seed health test, total 17 species of fungi were recorded from soybean seeds. Among them *Aspergillus flavus* (7.06 %), *Rhizopus stolonifer* (6.60 %), *Phoma oleraceae* (6.30 %) and *Aspergillus niger* (5.15 %) were found to be predominant. The highest (97.33 %) seed germination of soybean was recorded in the month of Nov. followed by Dec (95.21%) and lowest in Jan. (91.00 %).

Key words: - Seed-borne mycoflora, % frequency, % germination, soybean.

INTRODUCTION

Soybean [(*Glycine max* L.) Merril] a highly nutritive as well as commercial crop is grown both under irrigated and rain fed conditions and plays an important role in Indian economy (Kakade and Chauhan, 2011). It is widely accepted as an excellent source of nutrient to both man and poultry due to its high protein content. It contains 40-45% protein, 20-22% oil, 20-26% carbohydrates, and high amount of Ca, P and vitamins. Fat free soybean meal is cheap source of protein used as fodder and many prepackaged meals; soy vegetables oil is another product of soybean crop (Bansode *et al.,* 2014).

Seed quality is the cheapest input in advance agriculture. The viable as well as vigorous seed during planting time is very important for achieving the target of agricultural production because it acts as catalyst for realizing the potential of other input (Yadav *et al*., 2014). Various environmental factor like high relative humidity, moderate temperature etc. favours growth of seed borne micro-fungal flora on storage seeds, even some pathogens attack matured preharvested seeds in entire crop, as result of favourable storage environment (Bhajbhuje,2014). Several seed borne fungal pathogens have been reported by different researchers (Mishra *et al.,* 1969; Muthuraj *et al*., 2002).

During storage, variety of biochemical changes occurred due to fungal deterioration in oilseeds (Kakde and Chavan, 2011). Also, seasonal climatic variation of Vidarbha and improper storage condition contribute to make the

storage condition extremely supportive for fungal attack to the seeds (Bhajbhuje, 2014). In this context, the present work was carried out to explore seed mycoflora complex and their effect on seed germination.

MATERIALS AND METHODS

Soybean [(*Glycine max* L.) Merril]) seed samples collected from five different talukas of Amravati district during 2010-2011, were brought to laboratory in sterile cotton bags and kept at room temp. The untreated seeds were used for isolation of external mycoflora while surface sterilized seeds by aqueous 0.1% mercuric chloride solution were used for detection of internal seed mycoflora. The isolation of seed mycoflora was made by standard blotter paper and agar plate method technique of ISTA (2012). After incubation for seven days at 25±1^{0}C, seeds were observed under stereo-binocular microscope for prevalence of fungal growth on seed surface. A count of germinating seeds as well as fungal colonies on seeds was taken and expressed in percent frequency (Bhajbhuje, 2013).

RESULTS AND DISCUSSION

Mycological examinations of the soybean seeds were carried out for month of Nov.– 2011, Dec. – 2011and Jan. - 2012. The seeds were screened for prevalence of seed mycoflora (Table-1). Altogether a population of 17 fungal species representing13 genera has been confined to seeds of soybean (*Glycine max* L.). Of these, isolates of *Ascomycota* are most predominant, represented by 6 genera and 10 species followed by Deuteromycota, contributing 3 genera and 3 species. *Oomycota* and *Zygomycota* had 4 genera and 4 species. The result confirmed with report of Hedawoo *et al*., (2014) who reported higher count of fungal isolates of Ascomycota from spices.

Agar plate method and blotter methods were used to isolate large number of mycoflora from seed samples of soybean (Table-1). Results revealed that blotter paper method is more effective for isolation of mycoflora as compared to agar plate method. Bhajbhuje (2014) isolated greater count of isolates from brinjal seeds on blotter paper.

Table 1: Frequency of isolated fungi on soybean seeds.

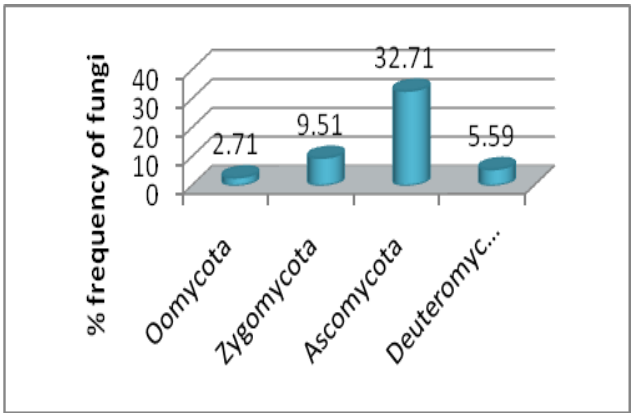
S. N.	Fungi isolated	November-11		December-11		January-12		Mean±SD	±SE
		E	I	E	I	E	I		
1	*Aspergillus flavus*	10.83	8.58	8.58	3.33	4.41	6.66	7.06±30.51	± 2.57
2	*Aspergillus niger*	4.58	2.5	1.08	4.16	10	8.58	5.15±38.67	±3.16
3	*Aspergillus fumigatus*	6.25	2.5	4.16	6.66	6.25	2.91	4.78±12.80	±1.68
4	*Aspergillus nidulance*	3.33	2.5	1.66	1.66	0.83	-	1.99±3.59	±0.85
5	*Aspergillus ochraceus*	2.5	1.66	2.5	1.66	2.83	2.08	2.20±8.75	±0.44
6	*Cladosporium cladosporioides*	0.83	-	0.83	-	0.83	-	0.83±0.83	00
7	*Curvularia lunata*	1.66	-	-	1.66	1.25	0.83	1.35±3.35	±0.34
8	*Cylindrocladium* sp.	-	-	-	-	1.66	-	1.66±6.71	00
9	*Fusarium oxysporum*	7.08	4.66	2.08	2.08	2.08	2.5	3.41±9.95	±1.87
10	*Mucor* sp.	1.66	-	1.66	2.5	7.5	1.25	2.91±4.92	±2.32
11	*Phoma oleraceae*	2.91	4.16	2.91	18.60	2.91	6.33	6.30±25.79	±5.63
12	*Pythium* sp.	1.66	-	0.83	-	-	-	1.24±3.37	±0.41
13	*Phytophthora* sp.	1.08	2.5	0.83	-	-	-	1.47±3.33	±0.73
14	*Penicillium digitatum*	6.66	0.83	0.83	-	2.5	2.91	2.74±11.60	±2.73
15	*Rhizopus stolonifer*	4.3	-	19.58	1.66	10.25	3.83	6.60±26.54	±6.25
16	*Trichothecium* sp.	-	-	-	0.83	-	0.83	0.83±3.57	00
17	*Torula* sp.	-	-	-	-	-	0.83	0.83±3.57	00
Total		55.33	29.89	47.53	44.8	55.8	39.54		
		85.22%		92.33%		95.34%			

±S.D. = Standard deviation **± S.E. = Standard error**

Table 2 : Germination % of soybean seeds.

Sr. No.	Month	Germinated seeds (%)	Non-germinated Seeds (%)
1.	November-2011	97.33%	2.67%
2.	December-2011	95.21%	4.79%
3.	January –2012	91.00%	9.00%

Fig.1: Distribution of fungal flora of soybean seeds (*Glycine max* L.)



Occurrence of fungi was recorded in terms of mean value with standard error and standard deviation (Table-1). The mean of highest percent frequency of *Aspergillus flavus* (7.06%) was appeared to be predominant followed by *Rhizopus stolonifer* (6.60%), *Phoma oleraceae*. (6.30%), and moderate percent frequency was of *A. niger* (5.15%), *A. fumigatus* (4.78%), *Fusarium oxysporum* (3.41%), *Mucor mucedo* (2.91%), *Penicillium digitatum* (2.74%) and lowest percent frequency was of *A. ochraceus* (2.20%), *A. nidulans* (1.99%), *Cylindrocladium* sp.(1.66%), *Phytophthora* sp.(1.47%). *Curvularia lunata* (1.35%), *Pythium* sp. (1.24%), *Cladosporium cladosporioides* (0.83%), *Trichothecium* sp. (0.83%) and *Torula* sp. (0.83%). The fungi, *Cylindrocladium* sp., *Cladosporium cladosporioides* and *Pythium* sp. were isolated by standard blotter paper method whereas, *Torula* sp. and *Trichothecium* sp. by only agar plate method. Popoola and Akueshi (1986) have reported *Aspergillus niger, Fusarium oxysporum, F.solani, Curvularia lunata, Penicillium* sp. on seeds during storage. Muthuraj *et al*., (2002) isolated seed mycoflora of soybean and dominant nature of *Aspergillus flavus, Aspergillus niger* and *Alternaria alternata*. Reddy *et al*.,(2014) also reported that *Aspergillus flavus* produces aflatoxins which is carcinogenic. Heavy infestation of *Aspergillus flavus* and *A.niger* was reported on tomato seeds (Bhajbhuje, 2013).

The germination percent of stored soybean seed was found to be decreasing every month. It was recorded as 97.33% in November –2011, 95.21% in December and 91.00% in January –2012 (Table.3). From the above results it appears that increase in fungal incidence on seeds seem to reduce the germination percentage. In north eastern Karnataka, Bhajbhuje (2013) reported decrease per seed viability in heavily infested seeds. Rao *et al*., (2014) reported biochemical changes biochemical changes in seeds during storage due to association of storage fungi. These microbes degraded seed constituents like amino acids, carbohydrates and bringing down the seed viability, plant growth and productivity. Thus there is a need

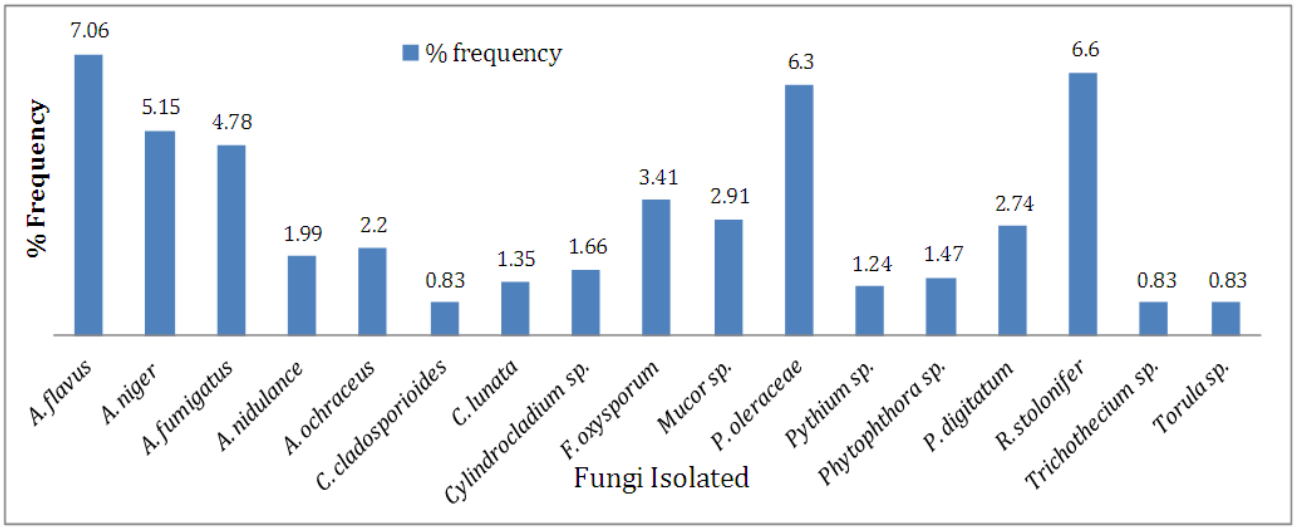


Fig. 2: Frequency of individual fungal species on soybean seeds

for the control of these pathogenic fungi by applying various techniques to ensure improvement of seed health which directly increases crop quality.

CONCLUSION

From the present the investigation it can be concluded that, the nature of fungi associated with the seeds of soybean samples and their effect on seed germination studies are needed to explore more safe and economic method to check seed borne fungi. Therefore, both these methods are easily applicable for isolation of seed mycoflora.

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