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Seed Health Status of Farmers' Saved Black Gram (*Vigna mungo* (L.) Heppper) Seeds in Western Undulated Zones of Odisha

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A B S T R A C T

Seed health testing to detect seed mycoflora and other parameters like germination status, physical purity, moisture, seedling length and seed vigour index are very important component of management of crop diseases. The legume seeds particularly black gram seeds were screened against these parameters using blotter plate method from untreated seeds as per the International rules for seed testing in the laboratory of Seed Science and Technology and Plant Pathology, College of Agriculture, Bhawanipatna. The fungi isolated from these seeds are *Curvularia lunata, Fusariom pallidoroseum, Pencillium spp., Macrophomina phaseolina, Aspergillus flavus, Aspergillus niger and Rhizopus spp.* A total of seven number fungi belonging to different groups were recorded from the samples of farmers' saved seed. *Curvularia lunata* (8.2%), *Fusariom pallidoroseum (5.9%), Pencillium spp.* (4.3%) and *Aspergillus spp*. (3.6%) were recorded as major fungi associated with the seed. Average germination, physical pure seed and seed moisture percentage of farmers' saved seed of different collection places was significantly lower than the Indian Minimum Seed Certification Standards specified for black gram. Therefore, it is recommended that freshly harvested seeds should be well dried to safe moisture content (9.0%) with proper fungicides treatment to protect from seed mycoflora infection.

Introduction

Black gram (*Vigna mungo* L.) belongs to family Fabaceae, sub family papilionaceae, is being grown as one of the important pulse crop. Blackgram is perfect combination of all nutrients, which includes proteins (25- 26%), carbohydrates (60%), fat (1.5%), minerals, amino acids and vitamins. It stands next to soybean in its dietary protein content. Among the various factors responsible for low yields, biotic and abiotic stresses take a heavy toll of the crop, out of which diseases cause an estimated yield loss of 20 to 30 per cent. Seed

is the focal point in agriculture development without which an agriculture system is meaningless and high quality seed is an important pre-requisite for sustainable and profitable crop production. Seed health is an important factor in the control of diseases, since an infected seed is less viable, has low germination, reduced vigour and reduced yield. Diseases and injuries to seeds are caused by micro-organisms including virus, bacteria, fungi and nematodes. Among the parasitic organisms, the fungi are frequently encountered on seeds. The control of seed borne pathogens is the first step in any agricultural crop production and protection programme. Storage fungi do not invade before the harvest, but they may be found on the seeds in low percentages often below one per cent. Seeds are known to carry a considerable amount of microorganisms. Some of these cause various diseases. Pathogens are associated with seeds in the form of contaminants, externally and internally as seed borne. These organisms become active under favourable condition and affect seed germination which results in lower plant population and abnormal seedlings in field, thereby causing considerable reduction in yield. An attempt has been made to study the seed quality and health status of Black gram seeds already saved by the farmers in the western undulating zones of Odisha particularly in different blocks of Kalahandi and Nuapada districts of Odisha.

Materials and Methods

A total of eight number of black gram seed samples were collected from the farmers field after the harvest of the crop in different locations of Kalahandi and Nuapada districts viz. Narla, Bhawanipatna, M. Rampur, Lanjigarh, Nuapada, Komna, khariar and Sinapali and during the harvest seasons of Kharif 2017-18. All the samples were subjected to seed quality status and seed health status by using blotter techniques, seed germination status by paper towel method and vigour index was calculated based on seedling length. (ISTA,2006).

Evaluation of seed germination and seedling vigour

100 seeds having four replicates were placed in wet blotter towels for a period of seven days for germination test in seed germinator according to ISTA. On seventh day, the wet blotter towels were unrolled and the root and shoot length of the normal seedlings were measured in centimeter, percentage of seed germination was also recorded on the basis of its all essential structures present on those seedlings. The vigour index of the seedlings was calculated as mean length of root and shoot (cm.) x germination percentage (Abdul–Baki and Anderson, 1973). The seed moisture and physical pure seed percentage were determined (ISTA, 2006).

Evaluation of seed moisture

The moisture content of each collected sample was estimated by air oven method. Approximately 20 grams of each seed sample were grounded separately and kept in empty aluminum boxes and dried in an oven at 130^0C temp. for 17 hours. After drying, the lids of moisture boxes were immediately covered and placed in desiccators for cooling. The black gram grounded samples were taken for weight by the analytical balance. Average moisture content was calculated on fresh weight basis as: Moisture content (%) = Loss of moisture x100 / weight of the sample.

Evaluation of seed for mycoflora

About 400 seeds of each collected seeds were randomly picked out and were subjected to standard blotter method as recommended by ISTA. The seeds were incubated at BOD

instrument (REMI CI-10plus) for a period of seven days 25±1^{O}C under 12 hour alternate cycles of light and darkness. After incubation fungi association with seeds were observed under different magnifications using Research microscope (Catcam model No. 130) for its occurrence of mycoflora. The fungal species under this study were isolated under PDA media and slides were prepared for proper identification with the help of available literature (Burnet and Hunter, 1972 and Ellis, 1976). The percent incidence of seed mycoflora was also recorded and the data were analysed statistically for variance using MSTAT-C computer programme.

Results and Discussion

Eight black gram seed samples were collected from the farmers' field of different locations of Kalahandi and Nuapada districts. The farmers' saved seed differed significantly among themselves for both germinability, physical pure seed, seed moisture content, root-shoot length and vigour index. Seeds of Sinapali exhibited highest average germination value (83.2%) which is statistically *at par* with the seeds of Narla (82.2%) only due to having adequate seed moisture content maintained its seed quality norms followed by seeds of Khariar (79.7%), M. Rampur (73.0%), Komna (72.5%), Lanjigarh (65.0%), Nuapada (62.5%) and Bhawanipatna (61.0%). The germination percentage of individual collected seeds drastically reduced in individual's increase of seed moisture content and also noticed the reduction of the Physical pure seed percentage of Farmers' saved seed. Each collected seed samples revealed maximum seed moisture content as above than the IMSCS i.e., ranged between 10.1% to 12.4%. Highly infected seeds showed high moisture content which corroborate the findings of Owolade *et al.,* (2011) in Sorghum. The seedling length varied from 20.6 cm to 16.5 cm with maximum seedling length was recorded in case of sample collected from Sinapali (20.6cm) followed by Narla (20.4cm) which is statistically *at par* with each other.

At that same time the seedlings with average highest vigour index value was estimated in Sinapali (1713.92) followed by Narla (1676.88), Khariar (1570.09), M. Rampur (1416.2) and Komna (1326.75) as having higher germination percentage with longer root and shoot (Table -1). Majority of seed borne mycoflora on different collected seeds of black gram reduced seed germination and this agrees with the report given by Rahman *et al.,* (1999) in mung bean and black gram and Khamari *et al.,* (2018) in Sesame seed.

Among the seed mycoflora six fungal species were recorded to be associated with the seed samples from different blocks of Kalahandi and Nuapada. The identified six fungal species were *Curvularia lunata*, *Fusarium pallidoroseum, Macrophomina phaseolina, Rhizopus sp., Aspergillus flavus*, *Aspergillus niger* and *Penicillium spp*. The percentage of total seed borne infection of various fungi in different locations ranged from 15.4–37.8 %. The highest total fungal prevalence was recorded from the seeds of Bhawanipatna (37.8%) and lowest fungal prevalence from Sinapali seeds (15.4%). Due to maximum seed infection was recorded by seed borne fungi reduced the seed germination in the sample of Bhawanipatna (61.0%). The least infection of Sinapali, Narla and Khariar was due to having lowest seed moisture percentage 10.1 to 10.9% whereas, the highest seed mycoflora observed in Lanjigarh, Nuapada and Bhawanipatna and due to highest seed moisture content i.e., 11.5 % to 12.4 %. All of seed samples did not meet with the minimum seed certification standards for seed moisture content as prescribes for black gram i.e. 9.0%., it may due to improper management during post-harvest and storage of seed without any suitable chemicals for seed treatment.

Table.1 Seed quality status of black gram seeds collected from farmers in the western undulating zone of Odisha

Locations	Seed Moisture (%)	Physical Pure seed (%)	Germination (%)	Seedling Length (cm)	Seed Vigour Index	% Seed mycoflora
Narla	10.5	93.7	82.2	20.4	1676.8	16.8 (24.20)
Bhawanipatna	12.4	76.9	61	16.5	1006.5	37.8 (37.94)
M. Rampur	10.9	88.3	73	19.4	1416.2	25.8 (30.53)
Lanjigarh Road	11.8	84.1	65	17.4	1131.0	34.4 (35.91)
Nuapada	11.5	85.9	62.5	18.6	1162.5	36.0 (36.87)
Komna	11.3	86.2	72.5	18.3	1326.7	27.0 (31.31)
Khariar	10.9	92.3	79.7	19.7	1570.1	19.4 (26.13)
Sinapali	10.1	94.7	83.2	20.6	1713.9	15.4 (23.11)
SE(m) ±	0.07	0.28	0.69	0.11	0.34	0.44
CD (0.05)	0.23	0.86	2.02	0.35	1.05	1.30
CV	1.15	0.57	1.92	1.06	0.04	6.02

*Figures in the parentheses are angular transformed value.

Table.2 Seed mycoflora association in farmer saved black gram seeds

Locations	*Curvularia lunata.*	*Fusarium pallidoroseum*	*Aspergillus niger*	*A. flavus*	*Penicillium sp.*	*Rhizopus sp.*	*Macrophomina phaseolina*	*Other fungi (%)*	*Total mycoflora*
Narla	4.8	3.2	1.2	1.6	3.2	1.6	0.8	0.4	16.8
Bhawanipatna	11.8	8.4	2.8	2.4	6.2	3.2	1.8	1.2	37.8
M. Rampur	8.2	5.2	2.0	1.6	4.4	2.4	1.2	0.8	25.8
Lanjigarh Road	10.8	7.6	2.8	2.4	5.8	3.2	1.4	0.4	34.4
Nuapada	11.2	8.4	2.0	2.4	5.2	3.6	2.0	1.2	36.0
Komna	8.8	5.2	1.6	1.6	4.0	2.8	2.2	0.8	27.0
Khariar	5.6	3.6	1.2	1.8	3.0	1.2	2.0	1.0	19.4
Sinapali	4.4	3.2	0.8	1.2	2.4	1.4	0.8	1.2	15.4
Avg	8.2	5.94	1.8	1.88	4.28	2.43	1.53	1.53	

Highest infection was observed by *Curvularia lunata* (8.20%), *Fusarium pallidoroseum* (5.94%) and *Penicillium sp.* (4.28%) whereas lowest infection recorded by *Macrophomina*

sp. (1.53%), *Aspergillus niger* (1.80%) and *A. flavus* (1.88%) and represented in Table -2. Similar type of seed mycoflora association was also reported by Sadhu (2014) and Devamani *et el.,* (2017) in green gram. All the farmers' saved sesame seeds collected from different location of Kalahandi and Nuapada were the below standard. It is recommended that seed should be well dried to keep seed moisture content within the 9.0% and treated with appropriate fungicides prior to planting in order to have better seed quality.

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