Environment & Ecology 36 (1) : 80—85, January—March 2018
Website: environmentandecology.com ISSN 0970-0420

Assessment of Inter Relationship between Seed Borne Mycoflora with Seed Quality Parameters in Sesame

B. Khamari, S. K. Beura, S. P. Monalisa, N. Ranasingh

Received 9 March 2017 ; Accepted 11 April 2017 ; Published on 2 May 2017

Abstract Sesame seed samples collected from different localities of Odisha were analyzed for their quality parameters as well as health test following ISTA rules. Moisture content % of the samples varies from 8.18 to 10.30. Physical purity remains in between 79.5 and 94.75%. Variety Prachi (89.5%), Nirmala (84.5%), Amrit (82.5%), Rampur local (82%), Kesinga local (81%), Maghi khasa (84%) and Bhadri khasa (84.50%) showed good per cent of germination which are above IMSCS i.e. 80%. Vigor index varies from 325.35 to 611.83. Per cent infested seed was recorded between 4 and 18 which are significantly different from each other. Highest infestation was found in case of Nandol local (18%) giving lowest germination per cent (71.50%) with high moisture content (10.30%) and low physical purity (79.5%). Contrast to that variety Prachi collected from Bhubaneswar showed lowest moisture content (8.18%), highest purity percent (94.75%), highest germination percent, high vigor index of 611.83 and lowest per cent of infested seeds (4.0%). The sample containing low moisture content, high physical purity gives good germination, high vigor index and less fungal infestation. The most important seed mycoflora recorded were *Aspergillus flavus*, *Aspergillus niger*, *Penicillium* sp., *Altemaria* sp., *Fusarium* sp., *Macrophomina phaseolina*, *Curvularia* sp., *Helminthosporium* sp. and many other fungi. Among the seed mycoflora, *Aspergillus flavus* infestation is maximum followed by *Aspergillus niger*.

Keywords Quality parameters, Seed, Seed health, Seed mycoflora, Sesame.

B. Khamari*, S. K. Beura, S. P. Monalisa
College of Agriculture, OUAT, Bhubaneswar, Odisha, India

N. Ranasingh
College of Agriculture, OUAT, Bhawanipatna, Odisha, India
e-mail: bhagyashree.khamari@gmail.com
*Correspondence

Introduction

India is the largest producer of oilseeds in the world and oilseed sector occupies an important position in the agricultural economy of the country. Oilseeds are among the major crops that are grown in the country apart from cereals. In terms of acreage, production and economic value, these crops are second only to food grains. India is the fifth largest vegetable oil economy in the world, next only to USA, China, Brazil and Argentina and has an annual turnover of about Rs 80,000 crore. India accounts for 12–15% of oilseeds area, 7–8% of oilseeds production, 6–7% of vegetable oils production, 9–12% of vegetable oils import and 9–10% of edible oils consumption [1]. Sesame (*Sesamum indicum* L.) is an important edible oilseed crop grown in hotter and drier areas of tropical and subtropical regions from ancient times having longest history of its cultivation in India. India produces a wide variety of sesame seeds varying in

color from white to red to black with oil content varying from 40 to 50%. Sesame seed is rich source of linoleic acid, vitamin E, A, B1, B2, niacin and minerals including calcium and phosphorus. The importance of sesame lies in the quality of the oil, the presence of antioxidants sesamin and sesmolin. Sesame is quality food, nutrition, edible oil, bio-medicine and health care, all in one. That's why it is called as the Queen of oils. It is widely cultivated oilseed crop due to its drought tolerance and short duration nature. In Odisha, it is grown in all most all districts. Mainly it is grown in Ganjam, Angul, Sundergarh, Dhenkanal, Raygada, Subarnapur, Bargarh and Bolangir. Farmer's saved seeds generally used for growing next season crop. Quality seed are necessary for a healthy and bumper production. However, lack of quality seed continues to be one of the greatest impediments bridging the vast yield gap. Therefore, to approach the potentially realizable yield of a cultivar, production and distribution of quality seed is essential. After harvesting, seeds are stored in different storage conditions and if these storage conditions are not proper various microbes like viruses, bacteria, fungi and nematode interact with these seeds. It is then act as a vehicle for seed borne diseases. Fungi play a dominant role in decreasing quality and longevity of the seeds. It causes various abnormalities to the seeds like discolored seeds, damaged seeds, shrunken seeds, undersized and rotted seeds leading to reduction of germinability. Seed borne diseases are most disastrous as they reduce the seed vigor and weaken the plant at initial of its growth. This crop suffers from many pest and diseases like other crops. Most of the diseases are known to be seed borne in nature. Present study was carried out to critically analyze the quality status of sesame seeds used by farmers of Odisha with special references to know the seed health status.

Materials and Methods

Seed sampling

Seed samples of different varieties of sesame were collected from various localities of the Odisha in *rabi* 2014-2015 in properly labelled polythene packets along with information on variety, month of harvest, place of collection and were analyzed for their quality parameters.

Estimation of seed moisture

The moisture content of each sample was estimated by air oven method. Approximately five grams of seed sample were separately taken in empty moisture boxes and dried in an oven at 103°C temperature for 17 h. After drying, the lids of moisture boxes were immediately covered and after cooling to room temperature, their weights recorded by help of an analytical balance. Average seed moisture content was calculated on fresh weight basis as :–

$$\text{Moisture content (\%)} = \frac{\text{Loss of moisture}}{\text{Weight of sample}} \times 100$$

Physical purity

Physical purity of a seed lot refers to the physical composition of seed lots. A seed lot is composed of pure seeds, the seeds of same kind, inert matter, broken grains less than half in size, soil and dust particles, chaff, weed seeds and other crop seeds. Here out of hundred weighed seeds, pure seeds were separated manually by visual observation and again weighed using electronic balance. Purity percentage was calculated.

$$\text{Purity \%} = \frac{\text{Weight of pure seed}}{\text{Total weight of sample}} \times 100$$

Germination %

Seed samples were analyzed following blotter paper method. Two hundred random seeds from each sample were studied. Twenty five seeds were plated in each plastic petridishes having three well moistened layers of blotter paper employing 4 replications. The seeds kept at 25 ± 2°C for six days. On the day of final count (sixth day), the numbers of normal seedlings were counted and percentage germination was com-

Table 1. Testing quality parameters of seed samples.

Sl. No.	Variety	Place of collection	Moisture content (%)	Physical purity (%)	Germination (%)	SL (cm)	RL (cm)	SL+RL (cm)	Vigor index	Diseases (%)
1	Prachi	Bhubaneswar	8.18	94.75	89.50	4.69	2.15	6.84	611.83	4
2	Nirmala	Bhubaneswar	9.11	94.00	84.50	4.03	2.20	6.23	525.70	8
3	Usha	Bhubaneswar	9.03	87.00	76.50	3.21	1.98	5.19	396.72	9
4	Uma	Bhubaneswar	8.95	84.00	75.00	3.30	1.95	5.25	393.80	8
5	VRI-1	Bhubaneswar	8.35	89.28	77.00	3.55	2.13	5.68	437.35	7
6	Amrit	Bhubaneswar	9.25	91.50	82.50	3.75	2.18	5.93	488.80	9
7	Narla local	Narla	9.70	85.08	74.00	3.30	1.85	5.15	381.30	13
8	Karlapada local	Karlapada	9.23	86.25	75.00	3.70	2.08	5.78	433.55	8
9	Bhawanipatna local	Bhawanipatna	9.51	83.50	75.50	3.95	2.25	6.20	467.90	12
10	M. Rampur local	M. Rampur	10.28	83.00	73.50	3.18	1.93	5.10	374.65	16
11	Nandol local	Nandol	10.30	79.50	71.50	2.68	1.88	4.55	325.35	18
12	Sonepur local	Sonepur	9.21	92.50	82.00	3.05	2.15	5.20	426.05	8
13	Kesinga local	Kesinga	9.50	93.00	81.00	3.15	2.03	5.18	419.45	13
14	Maghi khasa	Mayurbhanj	8.87	92.75	84.00	3.23	1.73	4.95	415.80	6
15	Bhadri khasa	Mayurbhanj	8.53	94.00	84.50	3.58	1.88	5.45	460.30	5
	SE(m)		0.009	0.037	0.056	0.107	0.139	0.180	27.734	0.259
	CD		0.026	0.105	0.159	0.306	NS	0.513	80.488	0.741

puted.

$$\text{Germination (\%)} = \frac{\text{Total germination in all replicates}}{\text{Total number of seeds}} \times 100$$

Seedling length

After final germination count, ten normal seedlings from each set were kept separately for length measurement. Length measurement was made with the help of scale and expressed in centimeter.

Seed vigor index

Vigor index of seed sample were calculated. Seed vigor index-I = mean seedling length (cm) × germination (%).

Infested seed

Total number of infested seeds were counted and expressed in percentage following formula :

$$\text{Infested seed (\%)} = \frac{\text{Number of infested seeds}}{\text{Total number of seeds}} \times 100$$

Seed mycoflora were isolated from seeds of each and maintained on potato dextrose agar medium for further studies. The identification of fungi was done based on the spore morphology and colony character. The culture was further purified by following single spore isolation technique. The contribution of each mycoflora was calculated.

Table 2. Contribution of each seed mycoflora (no.) to the total number of seeds.

Sl. No.	Infes-ted seed	No. of seed infected by each mycoflora								Total No. of seed infected by each pathogen
		Af	An	Alt	Mp	Fus	Cur	Hel	Pen	Others	
1	8	4	2	1	1	1	1	1	0	0	11
2	16	2	5	2	0	0	0	0	0	0	17
3	18	8	7	0	1	3	0	0	0	0	18
4	16	3	9	2	0	1	1	0	2	0	18
5	14	7	5	0	3	1	0	0	0	0	16
6	18	3	5	0	2	3	0	0	3	2	18
7	26	6	9	1	2	5	1	1	3	0	28
8	16	11	2	1	0	2	0	0	0	1	17
9	24	2	5	0	3	8	2	2	1	2	25
10	32	11	7	8	2	5	3	1	0	0	37
11	36	10	13	5	2	4	2	0	2	1	39
12	16	8	5	2	0	2	0	0	1	0	18
13	26	7	6	4	0	4	0	0	5	0	26
14	12	2	4	2	2	2	1	1	0	0	14
15	10	4	2	2	0	2	1	0	0	0	11
Total		92	86	30	19	47	12	6	17	6	

$$\text{Per cent contribution of each mycoflora} = \frac{\text{Number of seed infected by a particular fungus}}{\text{Total number of seeds}} \times 100$$

Statistical analysis

All the data obtained from the experiments were analyzed statistically using OPSTAT software.

Results and Discussion

Fifteen sesame seed samples were collected from different places of Odisha. The highest moisture content was found in case of Nandol local (10.30%) followed by Rampur local (10.28%) which is higher than the IMSCS. Rest of the samples possess moisture content ranging from 8.18% to 9.7% which satisfy IMSCS and are significantly different from each other. Lowest MC was found in case of Prachi (Bhubaneswar). Similarly, physical purity remains in between 79.5 and 94.75%. Highest purity per cent was found in case Prachi (89.5%) followed by Nirmala and Bhadri khasa (94.0%) which are at par with each other which is above IMSCS. Seed germination of samples varied from 71.50—89.50% (Table 1). Highest seed germination was found in case of Prachi (89.5%) followed by Nirmala and Bhadri khasa (84.5%) which were significantly different from each other. Lowest germination percentage was found in case of Nandol local (below IMSCS i.e. 80%).

The seedling length varied from 6.84 cm to 4.55 with highest seedling length was found in case of sample collected from Prachi (6.84 cm) followed by Nirmala (6.23 cm) which are significantly different from each other. The data obtained from the experiment were used for calculation of vigor index by multiplying germination percentage and seedling length. The highest vigor index was found in case of Prachi (611.83) followed by Nirmala (525.70) which are significantly different from each other.

Seed infestation varied from 4% to 18%. Highest infection was seen in case of Nandol local (18%) followed by Rampur local (16%) which are significantly different from each other. Lowest infestation was found in case of Prachi (4%). Eight fungi, viz. *Aspergillus niger*, *A. flavus*, *Fusarium* sp., *Alternaria* sp., *Macrophomina phaseolina*, *Curvularia* sp., *Helminthosporium* sp., *Penicillium* sp. and other

Table 3. Percent contribution of each seed mycoflora to the total number of seeds. Af : *Aspergillus flavus*, An : *Aspergillus niger*, Alt : *Alternaria* sp., Mp : *Macrophomina phaseolina*, Fus : *Fusarium* sp., Cur : *Curvularia* sp., Hel : *Helminthosporium* sp., Pen : *Penicillium* sp.

Sl. No.	Infes-tated seed (%)	Percent contribution of each mycoflora to the total seed sample taken								Total % of myco-flora
		Af	An	Alt	Mp	Fus	Cur	Hel	Pen	Others	
1	4	2	1	0.5	0.5	0.5	0.5	0.5	0.5	0	5.5
2	8	3	2.5	1	0	2	0	0	0	0	8.5
3	9	4	3.5	0	0.5	1.5	0	0	0	0	9
4	8	1.5	4.5	1	0	0.5	0.5	0	1	0	9
5	7	3.5	2.5	0	1.5	0.5	0	0	0	0	8
6	9	1.5	2.5	0	1	1.5	0	0	1.5	1	9
7	13	3	4.5	0.5	1	2.5	0.5	0.5	1.5	0	14
8	8.25	5.5	1	0.5	0	1	0	0	0	0.5	8.5
9	12	1	2.5	0	1.5	4	1	1	0.5	1	12.5
10	16	5.5	3.5	4	1	2.5	1.5	0.5	0	0	18.5
11	18	5	6.5	2.5	1	2	1	0	1	0.5	19.5
12	8	4	2.5	1	0	1	0	0	0.5	0	9
13	13	3.5	3	2	0	2	0	0	2.5	0	13
14	6	1	2	1	1	1	0.5	0.5	0	0	7
15	5	2	1	1	0	1	0.5	0	0	0	5.5

fungi were found associated with the infested seed. Most of the sesame seeds were found associated with more than one pathogen (Table 2). Among the seed mycoflora, *Aspergillus flavus* infestation is highest followed by *Aspergillus niger*.

These results were in accordance with several workers. Seed mycoflora varies in different castor seed samples collected from different locations of Andhra Pradesh [2]. Prasad et al. [3] showed that sunflower heads infected with alternaria blight reduces seed germination in modern variety and DRSH 1 sunflower hybrid.

Alternaria brassicola, *A. radicina*, *Aspergillus alba*, *A. niger*, *A. viridus*, *Cephalosporium* sp., *Curvularia* sp., *Drechslera* sp., *Fusarium* sp. and *Penicillium* sp. were found in association with abnormal and ungerminated seeds of ten sesame cultivars [4]. The percentage of seed sample infection and extent of fungal infection ranged from 0.75—53%. They also found the presence of *A. niger* and *A. flavus* from naturally infected sesame seeds giving 11—43% abnormal seedlings and 8—35% reduction in seed germination. He conclude increase of seed infection by seed borne fungi reduce seed germination[4]. Nayyar et al. [5, 6] found *Alternaria*, *Aspergillus*, *Fusarium*, *Cercospora*, *Penicillium* and *Rhizopus* are the genera found predominantly in association with sesame seeds which corroborate our findings.

From above experiment, it showed that sample containing low MC and high physical purity gives good germination, high vigor index and less fungal infestation. Increase of seed infection, reduces the seed germination. Hence, seed should be properly dried and stored to get a disease free quality crop in the next season giving good economic return.

References

1. Jha GK, Pal S, Mathur VC, Bisaria G, Dubey SK (2014) Edible oilseed supply and demands scenario in India : Implication of policy, Div Agric Economics, IARI, New Delhi.
2. Rajeswari B, Narayana RP, Reddy RR (2010) Seed quality attributes of castor genotypes in Andhra Pradesh. J Oilseeds Res 27 : 276—288.
3. Prasad MSL, Iyin M, Alivelu K, Chander RS, Singh H (2009) Influence of alternaria blight infection of sunflower head on yield parameters and seed germination. J Oilseeds Res 26 : 451—453.
4. Altaf NS, Khan A, Ahmed M, Asghar R, Ahmed RA, Shaheen S, Zafar M, Saqib M (2004) Seed bo-

rne mycoflora of sesame (*Sesamum indicum* L.) and their effect on germination and seedling. Pak J Biol Sci 7 : 243—245.

5. Nayyar BG, Akram A, Arshad M, Mughal SM, Akhund S, Mushtaq S (2013) Mycoflora detected from seeds of *Sesamum indicum* L. in Sialkot, Pakistan. IOSR J Pharm Biol Sci 7 : 99—104.

6. Nayyar BG, Akram A, Arshad M, Akhund S, Rafiq M (2014) Short communication : Seed viability test and pathogenecity assessment of most prevalent fungi infecting *Sesamum indicum* L. IOSR J Pharm Biol Sci 9 : 21—23.