Original Research Article

Effect ofpredominant seed mycoflora (*A. alternata*and *M. phaseolina*)on seed quality parameters of sesamum.

Abstract

Sesamum is an important oilseed crop affected by toxigenic fungal pathogens *viz., Alternaria, Macrophomina, Fusarium and Aspergillus*spp. Among these, *A. alternata* and *M. phaseolina* are seed borne pathogens causing yield loss to an extent of 20 to 40 percent. The effect of *A. alternata*and *M. phaseolina* on seed quality parameters of susceptible cv. Swetha was investigated during 2022-2023. The *A. alternata* and *M. phaseolina* inoculated and uninoculated seeds of both test pathogens were tested for germination and seedling growth by rolled paper method and pot culture studies. Significant differences in seed germination, seedling length, seedling dry weight, seedling vigour index I and II and seed moisture content were observed in susceptible cv. Swetha. The results indicated that *A. alternata*recorded less seed germination percentage (60.50%), seedling length(656 cm), dry weight(9.12 mg) and SVI-I and II (656 and 552) over untreated seeds recording high germination (82.25%), seedling length(14.84 cm), dry weight(13.17 mg) and SVI-I and II(1221 and 1116). Similar results were observed in *M.phaseolina* treated seeds where the pathogen treated seeds recorded less seed germination percentage (70.75 %), seedling length (9.42 cm), dry weight(8.71 mg) and SVI-I and II (667 and 599) than pathogen untreated seeds recording high seed germination (82.50 %), seedling length(14.25 cm), dry weight(13.30 mg) and SVI-I and II (1175 and 1097).

Key words :*Alternaria alternata*, *Macrophomina phaseolina*, Sesamum, Germination, Seedling Vigour.

INTRODUCTION

Sesame (*Sesamum indicum* L.) is one of the important oilseed crop which is used as quality food, nutrition, edible oil, biomedicine and health care, all in one.The oil is used as the base for ayurvedic preparations and known as the Queen of oils. The crop is preferred due to its rich edible oil content (about 50%) and nutritious protein (about 23%) and having sufficient carbohydrates (15%) (Ranganatha *et al.*,2012). The crop is accepted on worldwide due to its several medicinal benefits and it isalso rich source of linoleic acid, vitamin Eand vitamin B1 (Brar and Ahuja, 1979). The seeds contains methionine, tryptophan and aminoacids with innumerable health benefits. The therapeutic benefits of sesame seeds is mainly due to the

presence of antioxidants like sesamin, sesaminol and sesamolin (Bedigian, 1985; Moazzami, 2006; El- Bramway and Mahesh, 2010).

Sesamum seeds are infected by different seed borne mycoflora. Infected seeds disperse mycoflora from seed to seed. They cause seed to deteriorate in the soil prior to germination, resulting in seedling mortality. Many fungi are known to be associated with seeds viz., *A. alernata, A. sesami, A. tenius, A. sesamicola,Macrophominaphaseolina, Aspergillus flavus, A. niger, Fusarium* spp. Among these diseases, at present leaf spot/blight caused by *Alternaria alternata, root rot caused by* M*acrophomina phaseolina*are widespread and posing a major threatto the production and productivity of sesame crop throughoutIndia and with reference to Telangana state.They affect seed quality parameters minimizing the seed germination and seedling vigour.

Materials and methods

The present investigation was carried out in Seed research and technology centre (SRTC), PJTSAU, Rajendra nagar , Hyderabad**.**Sesamumseed samples collected from different districts of Telangana state were subjected to standard blotter method for the isolation of predominant seed mycoflora *A. alternata* and *M . phaseolina.*

Isolation of predominant seed mycoflora

For isolation of seed mycoflora associated with sesamum seed samples subjected to standard blotter method (ISTA, 2022) and to study theeffect of predominant seed mycoflora *A. alternata* and *M. phaseolina* on seed germination, seedling length, dry weight and seedling vigour indexthe culture filtrate is prepared as follows and data analysed (CRD).

a. Preparation of culture filtrates

The ten day old fungal growth of *M. alternata* and *M. phaseolina* on the agar plate was scraped .The spore suspension of predominant fungi were prepared using sterile distilled water by vortex mixture for five minutes to separate spores from mycelia. The suspension was filtered through cheese cloth and concentration of the spores were adjusted to $1x10^9$ ml^{-1} by using haemocytometer.

b. Seed inoculation

The healthy seeds of susceptible sesamum cv. Swetha til were surface sterilized and soaked in spore suspension of both the pathogens viz., *A. alternata* and *M. phaseolina* for 30mins and dried at room temperature for over night. The seed of control treatment were similarly treated except that they were soaked in sterile distilled water.

c. Rolled paper towel method

This method was used to determine the effect of seed borne inoculum on sesamum seed quality parameters, i.e., germination, seedling length, dry weight and seedling vigour. According to ISTA 2022 rules hundred seeds of *A. alternata* and *M. phaseolina* treated seeds were selected randomly and placed in between two layers of moistened germination papers and carefully rolled. The rolled paper towels of both the pathogen treated seeds were kept in slanting positions and incubated for 7 days at 25± 2 °C. On the seventh day, the first count of germination was made. The seedlings that are morphologically normal were counted and germination was expressed as percentage.

d. **Germination percentage (%)**

On the seventh day, all normal seedlings were counted. Based on the number of normal seedlings, the germination percentage from each sample in each replication was computed.The following formulae was used to compute the germination percentage (ISTA, 2022).

$$\text{Germination (\%)} = \frac{\text{Number of normal seedlings}}{\text{Total number of seeds}} \times 100$$

e. Seedling length (cm)

Ten normal seedlings from each replication were selected randomly on 7th day (Final count), for measuring shoot and root length.The shoot length was measured from the cotyledonary node to the tip of the apical bud. The root length was measured from the

cotyledonary node to tip of the primary root. Themeanshoot and root length were expressed incentimetres (cm).

f. Dry weight of the seedling (mg)

The dry weight of the ten normal seedlings were selected for measurement of shoot length and root length were kept in butter paper bags and dried in an hot-air oven and maintained at60°C temperature for 24 h. Later, the seedlings were removed and allowed to cool indesiccator for 30 minand then dry weight was recorded and expressed in milligrams (mg).

g. **Seedling vigour (SVI)**

Ten normal seedlings were taken from the germination test at random and the root length and shoot length was measured in centimeters (cm). Vigour index was calculated by the following formulae as given by Abdul Baki and Anderson (1973).

Vigour Index I = Seed germination (%) x Seedling length (Shoot +Root length (cm))

Vigour index II= Seed germination (%)x Seedling dry wt (mg)

Results

Table 1Effect of *A. alternata* on seed quality in sesamum cv. Swetha by rolled paper towel method during 2022 -2023

S.No	*Alternaria alternata*	Germination (%)	Seedling length (cm)	Seedling vigour index (I)	Dry wt (mg)	Seedling vigour index II	Moisture content (%)
1.	Pathogen treated	60.50 (51.04)	10.83	656	9.12	552	5.450 (13.49)
2.	Untreated	82.25 (65.07)	14.84	1221	13.17	1116	4.703 (12.50)
	Mean	**71.37**	**12.83**	**938.36**	**11.15**	**834**	**5.07**
	S.Em±	**0.95**	**0.27**	**26.93**	**1.19**	**23.95**	0.10
	CD at 5%	**3.29**	**0.95**	**93.19**	**0.33**	**84.52**	0.36

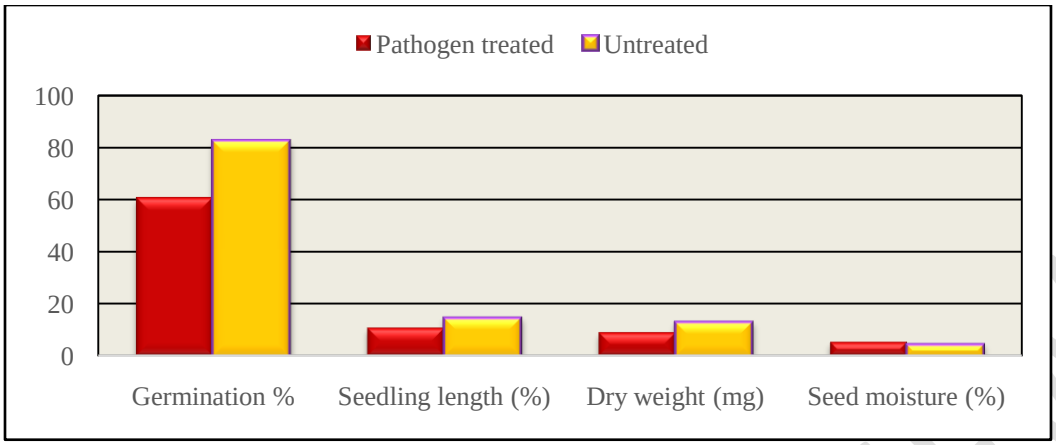

Fig 1 Effect of *A. alternata* on seed quality parameters insesamum cv. Swetha

Plate 1. Germination of *A.alternata* treated and untreated seeds in Rolled paper towel method

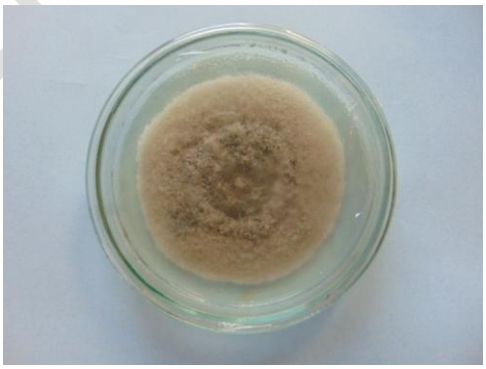

Plate 2. *Alternaria alternata*culture on PDA

Significant differencesin seed quality parameters were observed in susceptible sesamum cv.Swetha which was artificially inoculated withconidial/ mycelial suspensions of *A. alternata* along with untreated seeds. The pathogen treated seeds showed significant differences in respect of germination percentage and treated seeds showed less seed germination percentage (60.50%) over untreated seeds(82.25%). The mean germination percentage was 71.37%. Significant differences were observed between the seedling lengths of *A.alternata* treated and untreated seeds. The treated seeds recorded less seedling length (10.83 cm) when compared to the untreated seeds (14.84 cm). The mean seedling length was recorded as 12.83 cm.Incase of seed vigour index - I was 656 overuntreated seeds (1221). Pathogen treated seeds recorded dry weight of 9.125 mgand untreated seedsrecorded 13.175 mg. Seedling vigour index –II of untreated seeds was 1116 as compared with treated seeds552). The pathogen treated seeds recorded high seed moisture content (5.450%) than untreated seeds (4.703%). (Table 1 and Fig 1)

The reduction in seed germination might be due to usage of energy rich compounds by the fungi that are otherwise required for proper germination and production of the enzymes and/ or toxins by the fungi (Irshad *et al*., 2017). This may be due to seed borne fungi like *Alternaria*, which is known to produce some toxins that are detrimental to seed germination (Rasmegowda and Naik, 2008). Similar reduction in germination, seed vigour, seedling blight and dry weight were reported by Bibi*et al*., (2023) , Nayyar et al., (2014) in *Alternaria alternata* and Pravallika *et al*., in *Alternaria sesami* when inoculated the sesamum seeds with the pathogen.

Table 2 Effect of *M. phaseolina* on seed quality in sesamum cv. Swetha by rolled paper towel method during 2022 -2023

S. No	*M. phaseolina*	Germination (%)	Seedling length (cm)	Seedling vigour index (I)	Dry wt (mg)	Seedling vigour index (II)	Moisture content (%)
1.	Pathogen treated	70.75 (57.24)	9.42	667	8.71	599.30	5.410 (13.44)
2.	Untreated	82.50 (65.27)	14.25	1175	13.30	1097.50	4.720 (12.54)

	Mean	**76.62**	**11.83**	**921.09**	**11.00**	**848.40**	**5.06**
	S.Em±	**1.07**	**0.42**	**31.12**	**0.36**	**27.33**	0.13
	CD at 5%	**3.72**	**1.47**	**107.70**	**1.24**	**94.58**	0.45

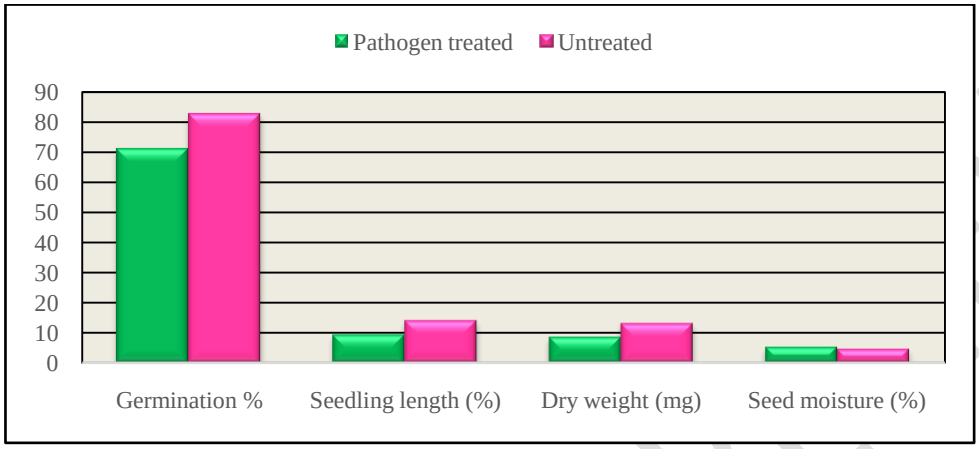

Fig 2 Effect of *M. phaseolina* on seed quality parameters in sesamum cv. Swetha

Plate 3. Germination of *M. phaseolina* treated and untreated seeds in sesamum cv. Swetha by Rolled paper towel method during 2022-23

Plate 4.*Macrophomina phaseolina* culture on PDA

Significant differences were observed between treated and untreated seeds of sesamum cv. Swetha. The treated seeds showed less seed germination percentage (70.75%) when compared to the untreated seeds(82.5%) with mean germination percentage was recorded as 76.62%.

The effect of *M. phaseolina* in artificially inoculated seeds of sesamum cv. swethatilrecorded germination percentage(70.75%) as compared with untreated seeds(82.5%). In case of seedling length of treated seeds was 9.42 cmand untreated seeds recorded14.25 cm. Whereas seed vigour index I in treated seeds was 667 and the untreated seeds recorded SVI-I of 1175. Untreated seeds recorded dry weight of 8.710 mgand untreated recorded 13.30 mg. Seedling vigour index –II of treated and untreated seeds were observed. The untreated seeds showed less SVI -II (1097.5) as compared to treated seeds (599.3) (Table 2 and Fig 2) The pathogen treated seed recorded highest seed moisture content (5.410%) than the pathogen untreated seeds (4.720%).

The reduction in seed germination might be due to the enzymes and/ or toxins produced by the fungi. Similar findings were reported by Lakhran *et al*., (2018) in chick pea and Rahman *et al*.,(2002) Mungbean.

Conclusion

Hence, from the results it is concluded that seed borne fungi *A. alternata* and *M. phaseolina* inhibits seed germination, seedling length, seedling dry weight, and vigour of sesamum seedlings to a great extent. Hence farmers are advised to take preventive measures

including selection of sesame seeds from healthy fields followed by treating the seeds with recommended fungicides to achieve good germination, vigour, and optimum plant population in the field for realizing higher yields.

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