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Effect of pathogens on onion seed germination and vigour

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Abstract
The present investigation was carried out with the objectives, identification of causal organism, Effect on germination and vigour. The pathogen was isolated from seeds of onion. The pure culture of pathogen was obtained by single spore isolation method. On the basis of morphological studies, the pathogens were identified as *Aspergillus niger*, *Aspergillus flavus* and *Fusarium oxysporum f. sp. cepae*. Then the effect of Pathogens was studied on basis of germination and vigour index shows the result of lowest germination and vigour index in *Aspergillus niger* which is followed by *Aspergillus flavus* and *Fusarium oxysporum f. sp. cepae.*

Keywords: *Aspergillus niger, Aspergillus flavus* and *Fusarium oxysporum f. sp. cepae*

Introduction
Onion (*Allium sepa*) is an important vegetable crop. Microorganisms carried on the surface of seeds or in seed tissues are known as seedborne microorganisms. Seed infection can affect germination, resulting in a decrease in plant population in the field. Microorganisms carried on the surface of seeds or in seed tissues are known as seedborne microorganisms. Seed infection can affect germination, resulting in a decrease in plant population in the field. The low germination capacity of vegetable seed is thought to be caused by the association of various fungi with the seed, either externally or internally.
Kaul (1972) made primary observations on onion seed-borne fungi and their potential control. Onion seed viability generally declines after a short period of storage and germination becomes uneconomical after a year. This decrease in viability is governed by a variety of factors, including genetic, pathological, physiological, and storage factors. Pathological causes of viability reduction are primarily due to seed-borne mycoflora carried with the seeds. The low germination capacity of vegetable seed is thought to be caused by the association of various fungi with the seed, either externally or internally, the present investigations were carried out on during 2020-21 at Plant Pathology Section, College of Agriculture, Pune-05 with the objectives *viz*., identification of causal organism, Effect on germination and vigour.

Materials and Methods
1. Isolation of mycoflora from seed
Isolation of seed-borne mycoflora from onion seed was carried by blotter paper method (ISTA, 1976) under two heads.
a. Untreated seed
b. Seed treatment with $HgC1_2$ (0.1%) solution

To isolate seed-borne fungus, seeds were surface disinfected by dipping them in mercuric chloride ($HgCl_2$) solution @0.1% concentration for one minute, then washed four times in sterile distilled water to eliminate any remaining mercuric chloride. After that, the seeds were dried and plated. Seeds were also utilized to isolate seed-borne mycoflora without being disinfected on the surface.

2. Blotter paper method
Seed-borne fungus were detected using the standard blotter paper method. This approach involved cutting a disc of blotter paper the size of a Petri plate. At the bottom of each Petri plate, a thin layer of absorbent cotton and two layers of blotter paper were laid. Sets of Petri plates were then wrapped in blotter paper and autoclaved for 15 minutes at 15 lbs pressure.

3. Effect of Seed-borne mycoflora on seed germination, shoot and root length and seedling vigour index

To determine the influence of seed-borne mycoflora associated with onion seeds from various samples, disinfected seeds were soaked in each culture's spore suspension for 2 hours and then dried in the shade. The paper towel method was employed to record seed germination, according to ISTA. In this approach, 25 seeds were placed on a wet double-layered towel paper 45x30 cm lined with butter paper, The papers were then placed in a Petri plate and incubated at 27°C in a seed germinator. At seven days of incubation, seed germination, shoot length, root length, and seedling vigour index were measured. To keep track of the length of the radicle and plumule. The average shoot and root lengths of 10 randomly selected seeds from each replication were measured. A formula was used to determine the seed germination index and seedling vigour index.

Seedling germination index= No of seed germinated/ Total no of seeds x100

Seedling vigour index = Germination % x [Shoot length (mm) + Root length (mm)]

Results and Discussion

Effect of seed borne mycoflora on seed germination and seedling vigour index in Onion

The results in respects of effect of seed borne mycoflora on seed germination and seedling vigour index in onion are presented in Table 1.

Seed germination

Results presented in Table 2 shows isolated seed-borne mycoflora significantly reduced seed germination. *Aspergillus niger* seed inoculation resulted in the lowest seed germination rate of 77.33%, while *Aspergillus flavus* and *Fusarium oxysporum f sp. cepae* inoculation resulted in 81.33% and 83.00% seed germination rates, respectively. The highest per cent age reduction in seed germination was observed in seeds inoculated with *Aspergillus niger*, which was 14.7% greater than the control. It was followed by *Aspergillus flavus and Fusarium oxysporum f. sp. cepae*, which were 9.63% and 7.77% higher than the control, respectively.

Seedling vigour index

Results presented in Table 2 shows seed-borne mycoflora significantly reduced the seedling vigour index of Onion seeds. *Aspergillus niger* inoculation resulted in the lowest seedling vigour index, 541.33, compared to 630.0 in the control. It was followed by *Aspergillus flavus* and *Fusarium oxysporum* f. sp. *cepae* which were 569.31 and 581.00 respectively.

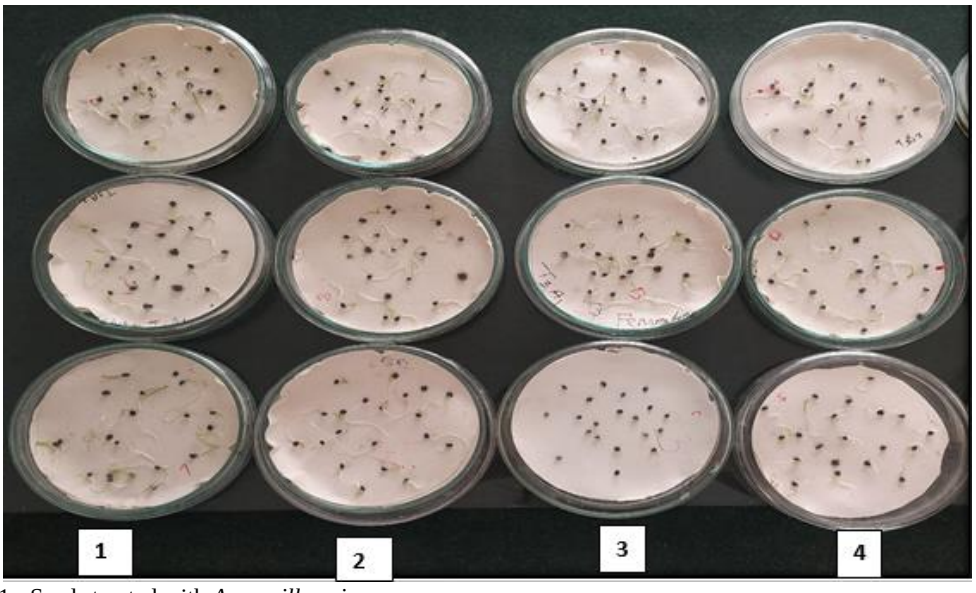
The highest per cent reduction in seedling vigour index, 14.07 per cent was recorded with *Aspergillus niger* seed inoculation, followed by *Aspergillus flavus* and *Fusarium oxysporum* f. sp. *cepae*, which were 9.63 and 7.77per cent respectively over control.

The similar result was reported by Tiwari (1993), Pushpawati *et al.* (2012), who reperted that *Aspergillus niger* highly affect on seed germination and seedlling vigour index.

Table 1: Effect of Seed borne mycoflora on germination per cent age and vigour index

Sr. no.	Seedborne mycoflora	Seed germination %	Reduction in seed germination over control %	Seedling vigour Index %	Reduction in seedling vigour Index over control %
1.	*Aspergillus niger*	77.33 (61.57)	14.7	541.33	14.07
2	*Aspergillus flavus*	81.33 (64.40)	9.63	569.31	9.63
3	*Fusarium oxysporum*	83.00 (65.65)	7.77	581	7.77
4	Contol	90.00 (75.57)	00	630	00
	S.E. (m)±	0.37		**0.25**	
	CD (at 1%)	1.77		**1.19**	

Note: Values in parentheses are arc sin transformed.



1. Seeds treated with *Aspergillus niger*
2. Seeds treated with *Aspergillus flavus*
3. Seeds treated with *Fusarium oxysporum f sp. cepae*
4. Seeds without any treatment

Plate 1: Effect of seed borne fungi on seed germination and vigour

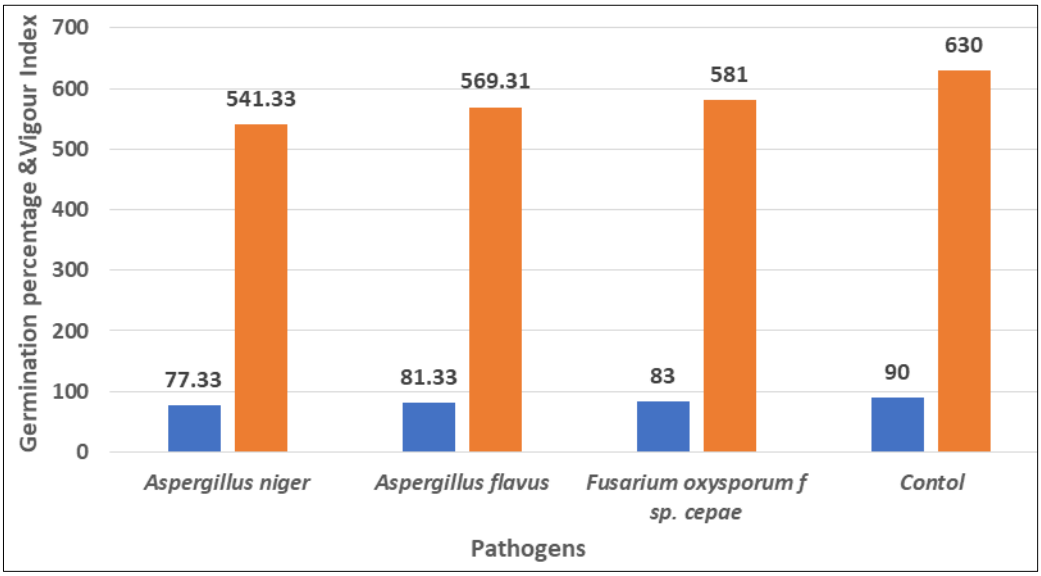


Fig 1: Effect of Seed borne fungi on germination per cent and vigour index

Conclusion

During present investigations, all the seed borne pathogens showed harmful effect on seed germination and seedling vigour index. It was observed that all the seed borne pathogens significantly reduced seed germination. The lowest seed germination was noticed in case of seed inoculated with *Aspergillus niger* i.e. 77.33 per cent, it was followed by *Aspergillus flavus* and *Fusarium oxysporum* f sp.*cepae* were 81.33 and 83 per cent respectively. Regarding seedling vigour index, the lowest seedling vigour index was observed with the inoculation of *Aspergillus niger* i.e., 541.33 as against 630 in control. It was followed by *Aspergillus flavus* and *Fusarium oxysporum* f sp.*cepae* were 569.31 and 581, respectively. The maximum per cent reduction in seedling vigour index i.e., 14.07 per cent was recorded with the seed inoculation with *Aspergillus niger* followed by *Aspergillus flavus* and *Fusarium oxysporum* f sp.*cepae* were 9.63 and 7.77 per cent respectively.

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