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# Effect of Mycotoxins on Seed Germination and Length of Its Root and Shoot *Allium Cepa L. (Onion)*

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### Abstract

Onion is one of the most important commercial vegetable crop properties throughout the world including India, and it is cultivated in three session it present anti-inflammatory anticancer properties and it cause virus, bacteria, Mycoplasma and fungi are the major causing disease of onion. So present investigation was studied to effect of mycotoxin to seed germination, root shoot length and seedling growth on selected fungi on three varieties of onion seeds, *Stemphylium vesicarium* was hampered on Nashik red, *Colletotrichum gloeosporioides* is less seed germination local red onion seeds. Root length on Nashik red due to short toxin on *botrytis cinerea*, *Fusarium* and *Penicillium*, *Fusarium oxysporum* is reduce the shoot length. In seedling growth chlorosis was observed in culture filtrate third day of *Aspergillus niger*, *Fusarium equiseti* and fifth day curling and wilting was observed on *Alternaria porri* and *Aspergillus niger*.

**Keywords:** Mycotoxin, seed germination, root shoot length, onion.

### Introduction

Onion is one of the most important bulb crops belongs to family Alliaceae and also the importance of cash crop in recent years because of its very high export potential and grown throughout the world for its food and cuisinal value. Onion is characterized by its distinctive flavour and pungency, which is the due to *Allyl Propyl-disulphide*, a sulphur containing compounds found in the scales of the bulb. The red and yellow colour of outer skin of onion is due to presence of *Anthocyanin* and *Quercetin*. Anti-fungal activities due to present in Phenolic factor (Desh Raj 2018) [3]. The vegetable and spices onion also called as "Queen of kitchen. Major onion producing countries include China, India, Pakistan, USA, Iran, Turkey, Brazil, Russia, Mexico and Spain. Area and Production China is the large amount of onion producer with 26.30% of all onions being produced in China and India. India ranks first in area (16.39 m/h) and second in production (26.83 m/t) (NHB 2021). The major onion growing states in India is the Maharashtra, Bihar Orissa, Andhra Pradesh, Karnataka, Rajasthan Tamil Nadu, Haryana, and Madhya Pradesh. Maharashtra is the pioneer state in onion production contributing 25% of country's onion (Gadge and Lawande 2012) [4]. In Maharashtra the major onion producing districts are Pune, Solapur Ahmednagar, Satara, Dhulia, and Nashik. Nashik district contributes 35 to 40% of the onion production. Onions are cultivated in three different seasons' *Kharif* and *Rabi*. In Maharashtra, the

production of onion likewise season, late *Kharif* (35-40%), and *rabbi* (40-45%) *Kharif*, (20%), respectively. (Data source: NHRDF, Nashik 2006).

Onion bulb contains anti-inflammatory, anticancer anticholesterol, Anti-inflammatory, anti-cholesterol, and antioxidant compound quercetin (Augusti, 1996) [2] and antioxidant properties such as quercetin (Slimestad *et al* 2007) [7]. The fungicidal and insecticidal properties of onion are also well identified. (Mishra 2014) [6]. It is used as row the onion also losses due to the causes of same Virus, Mycoplasma, bacterial, Nematode and fungi are cause the major nursery diseases of onions. These concept understanding, chosen the most important think Effect of Mycotoxin on Seed Germination its Root and Shoot Lengths of Onion.

### Materials and Methods

**Production of Mycototoxic:** The test fungi isolated from different varieties onion seeds were grown on G.N. medium 25 ml of the medium was added in 100 ml conical flasks and autoclaved at 15 lbs pressure for 15 min. on cooling, flasks were inoculated separately with 1 ml of spore suspension of test fungi prepared from 7 days old cultures grown on PDA slants. The flasks were incubated at 25°C for six days and were harvested by filtering their contents through Whatman No.1 filter paper. The filtrates were collected in pre-sterilized bottles and termed as crude toxin preparations. These preparations were tested for their toxicity.

**Assay Method:** The toxicity of culture filtrate was determined by using following methods.

**Seed Germination Method:** Surface sterilized hundred seeds of each variety were soaked in crude toxin preparation for 24 hours. They were then placed on moist blotter paper in Petri plates. Seeds soaked similarly in freshly prepared inoculated liquid medium served as control. Percent germination or Percent inhibition of germination, root and shoot length of seedling was measured after 7 days of incubation at room temperature.

**Wilting Shoots:** Shoots of onion grown in the field were used for the test. Freshly prepared 5 ml culture filtrate was taken in a vial in which shoot was dipped to the level of culture and incubated for 24 hours at room temperature. Shoots kept in freshly prepared sterile medium served as control. The wilting symptoms caused due to the culture filtrates were recorded.

**Inhibition of Seedling Vigour:** The method for this was applied the Luke and wheeler (1975)<sup>[12]</sup> for studying the toxic effect of culture filtrates on root length inhibition. It involved the use of germinated seeds of uniform root length, kept at 25±2°C in 90mm sterilized Petri plates containing 2.5 ml of crude toxin preparation. The root length was measured after 72 hours of incubation. The amount reduction in treated seedling root length in comparison to the control (Sterilized water) was calculated. This reduction was expressed in terms of percent inhibition of seeding vigour.

**Experimental Results**

**Effect of Fungal Toxin (C.F.) on Percent Seed Germination of Onion Varieties:** Culture filtrates of selected fungi were tested to study the percent seed germination of three onion varieties and obtained results are given in table 01 and photo plate

Seed germination of Nashik red onion variety was hampered due to fungal toxin of *Stemphylium vesicarium* and *Penicillium notatum*. Similarly, toxin of *Alternaria porri* and *Stemphylium vesicarium* was found to be responsible for the reduction of Bhima white variety seed germination. Seeds of Local red onion variety were less germinated in number due to culture filtrate of *Colletotrichum gloeosporioides* and *Sclerotium rolfsii*.

**Effect of Toxin (C.F.) on Roots and Shoots Length of Different Onion Varieties:** Roots and shoots length of different onion varieties under the influence of fungal toxins were checked and results are noted in table 02 and photo plate. Root length of Nashik red variety was short due to toxins of *Botrytis cinerea*, *Fusarium equiseti*, *Colletotrichum gloeosporioides* and *Penicillium chrysogenum* whereas, shoot length of Nasik red variety was reduced due to fungal filtrate of *Fusarium equiseti* and *Stemphylium vesicarium*. Toxins of *Fusarium equiseti*, *Aspergillus niger*, *Botrytis cinerea* and *Penicillium notatum* were responsible for the less percentage of seed germination of Bhima white variety whereas, *Fusarium oxysporum* drastically reduced the shoot length. As far as Local red variety of onion is concerned, seed germination was hampered due to *Penicillium chrysogenum* followed by *Colletotrichum gloeosporioides* and *Penicillium notatum* whereas; shoot length was minimum due to fungal filtrate of *Penicillium chrysogenum* and *Sclerotium rolfsii*.

**Effect of Toxin (C.F.) on Onion Seedling Growth:** To study the effect of toxin culture filtrate (CF) on seedling growth, young seedling of onion were kept in the culture filtrate of selected fungi and results are given in table 03. and photo plate.

At third day some seedling showed leaf curling in the culture filtrate of *Alternaria porri*, *Botrytis cinerea*, *Sclerotium rolfsii* and *Stemphylium vesicarium* whereas, Chlorosis was observed in the culture filtrate of *Aspergillus niger*, *Fusarium equiseti*, *Fusarium oxysporum*, *Penicillium notatum* and *Penicillium chrysogenum*. At fifth day wilting and curling was observed in the culture filtrate of *Alternaria porri*, *Aspergillus niger*, *Fusarium oxysporum* and *Sclerotium rolfsii* whereas, curling and wilting symptoms were noted in the culture filtrate of *Botrytis cinerea*, *Colletotrichum gloeosporioides* and *Penicillium chrysogenum*. It is interesting to note that, at seventh days culture filtrate of all the fungi caused curling and wilting to the seedlings.

**Table:** Effect of various onion fungi on capacity of germination.

Fungi	Percent (%) of Seed Germination		
	Nashik Red	Bhima White	Local Red
<i>Alternaria porri</i>	43	30	45
<i>Aspergillus niger</i>	47	35	43
<i>Botrytis cinerea</i>	42	36	45
<i>Colletotrichum gloeosporioides</i>	45	43	30
<i>Fusarium equiseti</i>	52	55	45
<i>Fusarium oxysporum</i>	45	42	53
<i>Penicillium notatum</i>	40	43	35
<i>Penicillium chrysogenum</i>	47	45	47
<i>Sclerotium rolfsii</i>	43	37	39
<i>Stemphylium vesicarium</i>	38	30	48
Control	65	65	67

**Table 2:** Effect of various onion fungi on capacity of root and shoot length.

Fungi	Effect on root & shoot length (mm) on Different Onion Varieties					
	Nashik Red		Bhima White		Local Red	
	Root Length	Shoot Length	Root Length	Shoot Length	Root Length	Shoot Length
<i>Alternaria porri</i>	08	20	10	20	12	19
<i>Aspergillus niger</i>	10	22	08	23	09	19
<i>Botrytis cinerea</i>	05	21	08	21	12	23
<i>Colletotrichum gloeosporioides</i>	07	22	10	24	08	17
<i>Fusarium equiseti</i>	06	17	07	19	13	23
<i>Fusarium oxysporum</i>	11	18	09	16	10	18
<i>Penicillium notatum</i>	08	15	08	23	08	22
<i>Penicillium notatum</i>	08	15	08	23	08	22
<i>Penicillium chrysogenum</i>	07	19	11	21	07	16
<i>Sclerotium rolfsii</i>	12	21	10	18	12	16
<i>Stemphylium vesicarium</i>	09	17	11	19	13	18
Control	14	34	12	25	15	24

**Table 3:** Effect of various onion fungi on capacity of seedling growth.

Fungi	(% Seedling Rot (7 <sup>th</sup> Day)	Shoot abnormalities		
		3 <sup>rd</sup> Days	5 <sup>th</sup> Days	7 <sup>th</sup> Days
<i>Alternaria porri</i>	20	Leaf curling	Wilting & Curling	Curling & Wilting
<i>Aspergillus niger</i>	10	Chlorosis	Wilting & Curling	Curling & Wilting
<i>Botrytis cinerea</i>	10	Leaf curling	Curling & wilting	Curling & Wilting,
<i>Colletotrichum gloeosporioides</i>	30	Chlorosis	Curling & wilting	Curling & Wilting
<i>Fusarium equiseti</i>	30	Chlorosis	Chlorosis & wilting	Curling & Wilting
<i>Fusarium oxysporum</i>	30	Chlorosis	Wilting & Curling	Curling & Wilting
<i>Penicillium notatum</i>	25	Chlorosis	Leaf curling	Curling & Wilting
<i>Penicillium chrysogenum</i>	20	Chlorosis	Curling & wilting	Curling & Wilting
<i>Sclerotium rolfsii</i>	40	Leaf curling	Wilting & Curling	Curling & Wilting
<i>Stemphylium vesicarium</i>	20	Leaf curling	Chlorosis & curling	Curling & Wilting
Control		Normal	Normal	Normal Chlorosis



**Fig 1:** Photo plate shows Effect of toxin (C.F.) on seed germination



**Fig 2:** Photo plate shows Effect of toxin (C.F) on root and shoot length



**Fig 3:** Photo plate shows Effect of toxin (C. F.) on seedling growth Curling & Wilting of onion

**Discussion**

Effect of various onion fungi on seed germination, root and shoot length, seedling growth was studied and it has been found that, fungal metabolites causes reduction in seed germination, leaf chlorosis, wilting, curling of leaves. From these obtained results it can be concluded that the fungal metabolites having properties of chlorophyll degradation or inhibition of chlorophyll synthesis which ultimately produce these symptoms. Vijayalakshmi and Rao (1988) [11] reported that *Alternaria alternata* toxin at low concentration reduced the Brinjal seed germination. Conversely, at higher concentration it stimulated Brinjal seed germination and

wilting to the leaves of Brinjal. Gour and Agrwal (1988) [8] tested *Fusarium oxysporum* toxin against fenugreek plant. Where they found that, yellowing of leaves ultimately renders the plant to wilt. Similar results in soybean by *Fusarium solani* were reported by Roy *et al.*, (1989) [9] and Rupe (1989) [10]. On the other hand, wilting in chick pea by *Fusarium oxysporum* have been reported by Wheeler (1975) [12]. Fungal infections to onion bulbs can also increase the chances of contamination by mycotoxins which are potential hazards to human and animal health. During their metabolic process fungi secrete their metabolites in medium in which it grows. These toxic products formed by several fungal species which

readily colonize crops in the field or after harvest under special conditions of moisture and temperature.

### References

1. Agricultural Statistics at a Glance. 2021. p. 159.
2. Augusti K. Therapeutic values of onion and garlic. *Indian J Exp Biol.* 1996;34:634-640.
3. Choudhary DR. *Scientific Cultivation of Onion (Allium cepa L.)*. Brillion Publishing science everywhere; 2018.
4. Gadge SS, Lawande KE. Crop damage due to climatic change a major constraint in onion farming. *J Indian Res Ext.* 2012;2:3841.
5. Kritzman G. Identification of latent *Botrytis allii* Munn in onion bulbs. *Crop Prot.* 1983;2:243.
6. Mishra RK, Jaiswal RK, Kumar D, Sabale PR, Singh A. Management of major disease and insect pests of onion and garlic. *J Plant Breed Crop Sci.* 2014.
7. Slimestad R, Fossen T, VagenIm. Onions a source of unique dietary flavonoides. *J Agric Food Chem.* 2007;55(25).
8. Gour HN, Agrwal S. A wilt toxin from *Fusarium oxysporum* F. sp. *cumini*. Patel and Prasad. 1988;57(15):849-851.
9. Roy KW, Lawrence GW, Hodges HH, McLean KS, Killebrew JF. Sudden death syndrome of soybean: *Fusarium solani* as incitant and relation of *Heterodera glycines* to disease severity. *Phytopath.* 1989;79:191-197.
10. Rupe JC. Frequency and pathogenicity of *Fusarium solani* recovered from soybean with sudden death syndrome. *Plant Dis.* 1989;73:581-584.
11. Vijayalakshmi M, Rao AS. Toxin production by *Alternaria alternate* pathogens to brinjal (*Solanum melongena* L.). *Curr Sci.* 1988;57(3):150-151.
12. Wheeler H. *Plant pathogenesis*. Berlin: Springer-Verlag; 1975.