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RESEARCH ARTICLE

IMPACT OF UNSEASONAL RAIN AND HAILSTORM ON SPOILAGE OF ONION (*ALLIUM CEPA L*)

***Subhash B. Pawar and Ashok M. Chavan**

Seed Health and Fungal Biotechnology Laboratory, Department of Botany, Dr. Babasaheb Ambedkar Marathwada University Aurangabad- 431004

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ABSTRACT

An attempt has been made to identify and study the impact of environmental factors i.e. natural calamities on the onions crop. Severe storms with high winds, hail, rain, and under unprecedented hail storms and unseasonal rainfall. Hailstorms at the end of December 2014 injured onion (*Allium cepa* L.) late kharif crop as well as rabi onion nursery. The kharif onion ready for harvest was affected by 30-40%. Late kharif which was planted in September-October got affected by 15-20% and rabi nursery damaged by 20-25%. The hailstorm strokes showing optimum climate which caused damage to the onion crop in different stages. At that stages damage caused by the different fungi like, *Alternaria porri, Fusarium oxysporum, Sclerotium rolfsii, Stemphylium vesicarium,, Aspergillus niger, Penicillium sp, Rhizopus stolonifer* was found to be severe.

INTRODUCTION

Onion (*Allium cepa*) is one of the most important commercial vegetable crops grown in the world as well as India. It belongs to family Alliaceae and about 300 species of *Allium* are reported (Gaikwad, 2014). India is the second largest producer of onion after the China and leader in production. In India occupies an area of 1.05 million hectare with the production of 16.81million tones (DACHD, 2013). The major onion growing states in India are Maharashtra, Orissa, Bihar, Andhra Pradesh, Karnataka, Tamil Nadu, Rajasthan, Haryana, Madhya Pradesh and Maharashtra. Maharashtra is a pioneer state in onion production contributing 25% of country's onion (Gadge and Lawande, 2012). In Maharashtra the major onion producing districts are Ahmednagar, Pune, Satara, Dhulia, Solapur and Nasik. Nasik district contributes 35 to 40 % of the onion production. Onions are cultivated in three different seasons namely Kharif, late Kharif and Rabi/Summer. In Maharashtra, the production of onion likewise season, Kharif, (20%), late Kharif (35-40%), and Rabi/Summer (40-45%) respectively (Data source: NHRDF, Nasik 2006). Rabi crops like Wheat, Chick pea, Cotton, Jowar and Summer onion are lost. For many farmers the tragedy is unbearable as majority of crops are at growing stage. According to report from Nasik district headquarter, harvested cash crops like grapes, pomegranates, wheat, chilly and onions, were extensively destroyed the cash crops. Most of damage was standing onions crops in this region. The onions were 50% damaged due to the unseasonal rain and hailstorm (Current news India T.V. Dated.19 Dec 2014). Nasik district have popular cash crops i.e. Onion was at harvesting stage and nurseries were laid in the fields. There was unseasonal heavy rain in many onion growing pockets of Maharashtra, caused damage to onion crop at different stages. Due to rain and hailstorms, leaf and bulbs are damaged in one hand but second thing is that this unseasonal calamity have increased the humidity (about 70 to 95%) and decreased the temperature (about 10 to 20□C) showing optimal growth of plant this reason. It has been observed that the Kharif crop planted in flat beds, which is a regular practice by farmers, gets affected by *Stemphylium* causing leaf blight, basal rot, foliage damage by *Alternaria* cause the purple blotch and disease due to water stagnation. Bulb development was affected due to soil borne diseases like bulb rot of onions at field, besides this gave rise storage fungal diseases. Our aim of this research paper is appearance of impact of unseasonal rain and hailstorm on spoilage of onions.

****Corresponding author: Subhash B. Pawar***
Seed Health and Fungal Biotechnology Laboratory, Department of Botany, Dr. Babasaheb Ambedkar Marathwada University Aurangabad- 431004

MATERIALS AND METHODS

Collection of samples

Damaged onion leaf, field bulbs and stored onions were collected in separate polythene bags with different varieties

and from different locations. Samples were brought in to the laboratory conditions.

Isolation and Identification of causal pathogen

The infected onion leaves and bulbs were collected from different places in polythene bags from fields, and storage places from different areas of Maharashtra like Nasik, Pune, and Aurangabad districts. These collected samples were cleaned and washed by sterilized water then surface sterilized with 2% sodium hypochlorite solution for two minutes, then rinsed several times in sterilized water and dried. The surface sterilized sample were placed on to Potato Dextrose Agar (PDA) medium and incubated at 27^0C. After 4-5 days incubation period, the developed fungal colonies were purified by hyphal tip and single spore isolation technique. Identification of the fungal isolates was carried out by using the morphological characteristic of mycelia and spore as described by (Ellis, 1971 and Kritzman, 1983).

RESULTS AND DISCUSSION

Three onions varieties, Nasik red (N-53), Baswant 780 and Bhima Kiran were used for isolation of fungi. It is clear from Table 1 that, the three different varieties of onions showed occurrence of seven fungal species.

Table 1. Occurrence of fungi from different varieties of onions

Name of fungi	Nasik red N-53	Baswant 780	Bhima kiran
Alternaria porri	+	+	-
Aspergillus niger	+++	+++	+++
Fusarium oxysporum	++	++	++
Penicillium sps	++	++	++
Rhizopus stolonifer	++	+++	+++
Sclerotium rolfsii	+	-	+
Stemphylium vesicarium	++	++	++

Table 2. Occurrence of fungi from different localities of onions

Name of fungi	Vaijapur	Sirur	Rajgurunagar	Lasalgaon	Yaola	Niphad	Manmad
Alternaria porri	+	-	-	++	+	+	-
Aspergillus niger	++	++	++	++	+++	+++	++
Fusarium oxysporum	++	+	++	++	++	++	+
Penicillium sps.	++	+	++	++	++	++	++
Rhizopus stolonifer	+++	++	++	+++	+++	+++	+
Sclerotium rolfsii	-	+	++	+	++	++	+
Stemphylium vesicarium	++	+	++	++	+	++	+

(+++)= High, (++)= moderate, (+) = less, (-) = Absent

Photo plates: Fungal Diseases of Onions, Pure Culture and Microphotograph

Purple blotch

Pure culture

Alternariaporri

Black mold

Pure culture

Aspergillus niger

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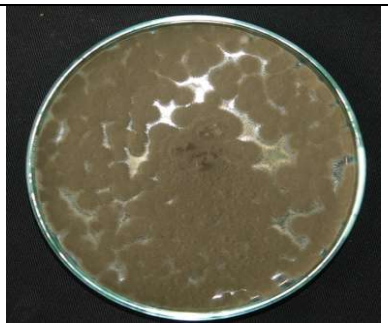
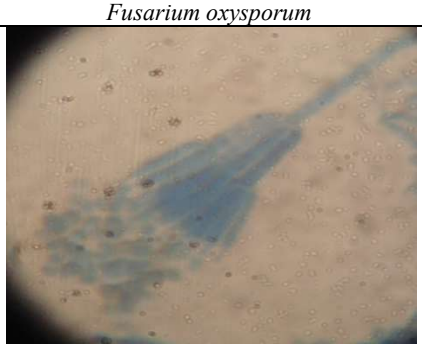
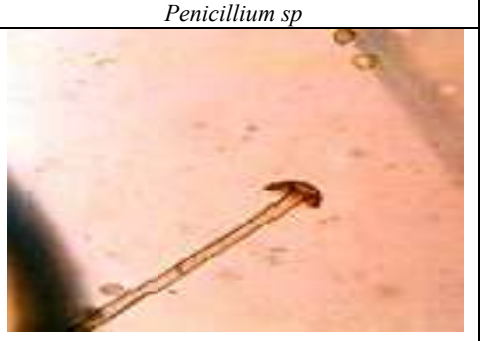
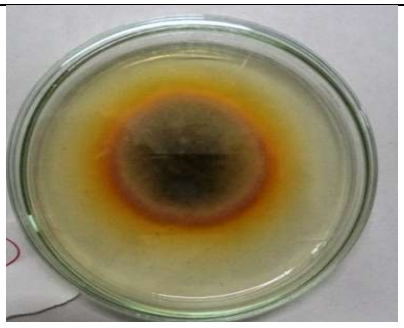
Basal rot	Pure culture	*Fusarium oxysporum*
		
Blue mold	Pure culture	*Penicillium sp*
		
White rot	Pure culture	*Rhizoctonia stolonifer*
		
Southern blight	Pure culture	*Sclerotium rolfsii*
		
Stemphyllium leaf blight	Pure culture	*Stemphylium vasicarum*

All the three varieties of onion showed high growth of *Aspergillus niger*. Whereas, *Rhizopus stolonifer* showed its high growth on Baswant 780 and Bhima Kiran. All the varieties showed moderate growth of *Fusarium oxysporum, Penicillium sps.* and *Stemphylium vesicarium.* Nashik red N-53 and Baswant 780 showed less growth of *Alternaria porri.* Growth of *Alternaria porri* was absent on Bhima Kiran. On the other hand Baswant 780 was not yielded *Sclerotium rolfsii.* Ara *et al*. (2008) isolated *Aspergillus niger*, *Aspergillus flavus*, *Penicillium* spp., *Fusarium oxysporum* and *Fusarium moniliforme* from Taherpuri, Faridpuri, Kalashnagari, and Zitka Fungi were also isolated from different onion samples collected from seven different localities and results are summerzed in Table 2.

All fungi except *Alternaria porri* showed moderate growth on sample collected from Rajgurunagar. Growth of *Alternaria porri* was absent on samples collected from. Sirur, Rajgurunagar and Manmad while, moderate growth was found on sample from Lasalgaon. Less growth was observed on samples collected from Vaijapur, Yaola and Niphad. *Rhizopus stolonifer* showed high growth on samples from Vaijapur, Lasalgaon, Yaola and Niphad. Only two samples collected from Yaola and Niphad showed high growth of *Aspergillus niger* while, other showed moderate growth. *Fusarium oxysporum* showed moderate growth on samples collected from Vaijapur, Rajgurunagar, Lasalgaon, Yaola and Niphad. On the other hand, *Penicillium sps.*showed moderate growth on all samples except sample from Shirur. *Stemphylium vesicarium* was moderately grown on Vaijapur, Rajgurunagar, Lasalgaon and Niphad. Similar types of observations were reported by several researchers. Aiyer (1980) reported the most destructive diseases are black mould rot (*Aspergillus niger*), blue mould rot (*Penicillium* spp.), *Fusarium* bulb rot (*Fusarium* spp.), basal rot (*Fusarium monilifome*), *Aspergillus* rot (*Aspergillus* spp.) etc.

He found that, *A. niger* and *A. flavus* infect bulbs at high temperature with high relative humidity while *Penicillium* spp. may damage onion bulbs at low temperature. Visser (1999) tested the varietal susceptibility of 11 onion cultivars against *Fusarium oxysporum* f. sp. at field, at harvesting and after storage. Tyson *et al.* (2004) isolated *Aspergillus niger* on onion sample collected from onion fields in the Pukekohe/ Waikato regions of New Zealand during 2002 and 2003. Srivastava *et al.* (2005) reported an increase in onion leaf purple blotch disease incidence with increasing irrigation frequency. Shahanaz *et al.* (2007) reported losses about 50 to 100 per cent due to purple blotch disease.

CONCLUSION

The survey indicates that unseasonal rain and hailstorm, spoils onions. Onions are collected from the fields and market places of different variety and different localities that infected plants from the isolates. The pathogen were confirmed to be causal organisms of the diseases. Important role of the diseases development done by the unseasonal rain and hailstorm, heavy loss of onions of that particular pathogen.

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