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International Research Journal of Biological Sciences _____ ISSN 2278-3202
Vol. **4(11),** 34-37, November **(2015)** *Int. Res. J. Biological Sci.*

Common Fungal Leaf spot diseases of *Allium cepa L.* and *Allium sativum L.* Crop from Maharashtra state, India

Dongre Mayur A. and Borse K.N.
Post Graduate Department of Botany, S.S.V.P. Sanstha's L. K. Dr. P.R. Ghogrey Science College, Dhule, Maharashtra, INDIA

Available online at: www.isca.in, www.isca.me
Received 14th October 2015, revised 28th October 2015, accepted 7th November 2015

Abstract

Onion (Allium cepa L.) and Garlic (Allium sativum L.) are the two crops grown throughout Maharashtra These are the main crop of khandesh region especially Dhule and Nasik districts. These crops are taken throughout the year. Bulbs and bulbils are the main product of plant but plants leaves are also important source of vegetable. Onion and Garlic plant leaves are affected by three most important fungi, which cause heavy loss to the crop. These three pathogens are Alternaria porri (Ellis), Stemphyllium vesicarrium (Wallr) E.G. Simmons, and Cercospora duddiae Welles.

Keywords: Fungal diseases, allium, vegetables.

Introduction

Onion, *Allium cepa* is an herbaceous biennial plant belongs to family *Liliaceae* grown for its edible leaves and bulb. The leaves are erect and 4 to 8 per plant.

Garlic, *Allium sativum* is an herbaceous annual bulbous plant belongs to family *Liliaceae* grown for its edible leaves and bulb. The plant possesses 6 to 12 flat blade like leaves with pungent smell.

Onions and Garlic crops are grown throughout the world for food purposes. In India, Maharashtra stand first in Onion production (30.22% of total onion production in India: ICAR Directorate of onion and Garlic research[1], 2013-14), while in Garlic production Maharashtra stand seventh among Indian states (3.20% of total Indian garlic production: ICAR Directorate of onion and Garlic research[1,] 2013-14).

Material and Methods

For pathological study on onion and garlic plant samples were collected from 12 Onion and Garlic growing areas of Maharashtra. These includes Khandesh (Site labelled as K1, K2, K3 and K4), Vidharbha (V1, V2, V3 and V4) and Marathwada (M1, M2, M3 and M4). (table-1).

Table-1
Abbreviation of sample collection sites (+ indicate the appearance of pathogen while – indicates its absence from that site)

Abbreviation for site	Pathogen on Onion leaves			Pathogen on Garlic leaves		
	A. porri	S.vasicarium	C. duddiea	A. porri	S.vasicarium	C. duddiea
K1	+	+	_	+	+	_
K2	+	+	_	+	+	_
K3	+	_	+	+	+	+
K4	+	+	+	_		+
V1	+	+	+	+	+	_
V2	+	_	+	+	_	_
V3	+	_	_	+	+	+
V4	_	+	_	_	+	+
M1	+	+	_	+	+	_
M2	_	_	+	+	+	_
M3	+	+	_	_	_	+
M4	_	_	+	_	_	+

Isolation of plant pathogen: Leaves showing spot diseases are collected from fields directly in a plastic bag. These bags were stored at room temperature for incubation. Sample was brought to laboratory for isolation of disease associated pathogen.

Growth (Culturing) of pathogen: The plant with pathogen were kept on sterilised PDA media, then the plates was incubated at room temperature. After three days of incubation the mycelium growth was reported in some plates, while in other the growth was seen on plant material.

Identification of pathogen: Morphological and cultured characters of isolated fungi were identified on the basis of literature available in text online as well as offline. Identification is based on align work comparison with standard text establishing their identity[2-8].

Test for pathogenicity: The pathogen isolated from the incubated sample were again inoculated in healthy leaves of Onion and Garlic under in-vitro condition. The same spot disease development confirms its pathogenicity.A. porri and S. Vasicarium rapidly grow on green leaves in field under moist condition[9].

Isolation and identification of pathogen: Isolation made from the infected leaves shows three pathogens namely *Alternaria porri, Stemphyllium vesicarrium and Cercospora duddiae*. The pure culture of Alternaria and Stemphyllium were established on PDA. Characteristics of pathogenic fungi culture character and microscopic examinations are described below.

Results and Discussion

Colony and Morphological characters: *Alternaria porri* (Ellis): On PDA pure culture initially shows greyish which later converted to dark brown and black. On the backside of culture plate black colour is prominent (figure-1D).

The young hyphae were hyaline slender and septed. Radiating hyphae are initially white in colony later it converted to brown in colour (figure-1.C and D).

Conidiophore arise in group as well as in single, it is brown, erect cylindrical and septet (figure-1.A).

Conidia were 100 to 300 µm long and 15 to 20 µm in diameter. Solitary in origin, generally straight but sometimes curved with 7 to 9 transverse septa and 1 to 3 longitudinal septa (figure-1B).

The above characters are supporting to identify the fungus *as Alternaria porri:* Ellis[10].

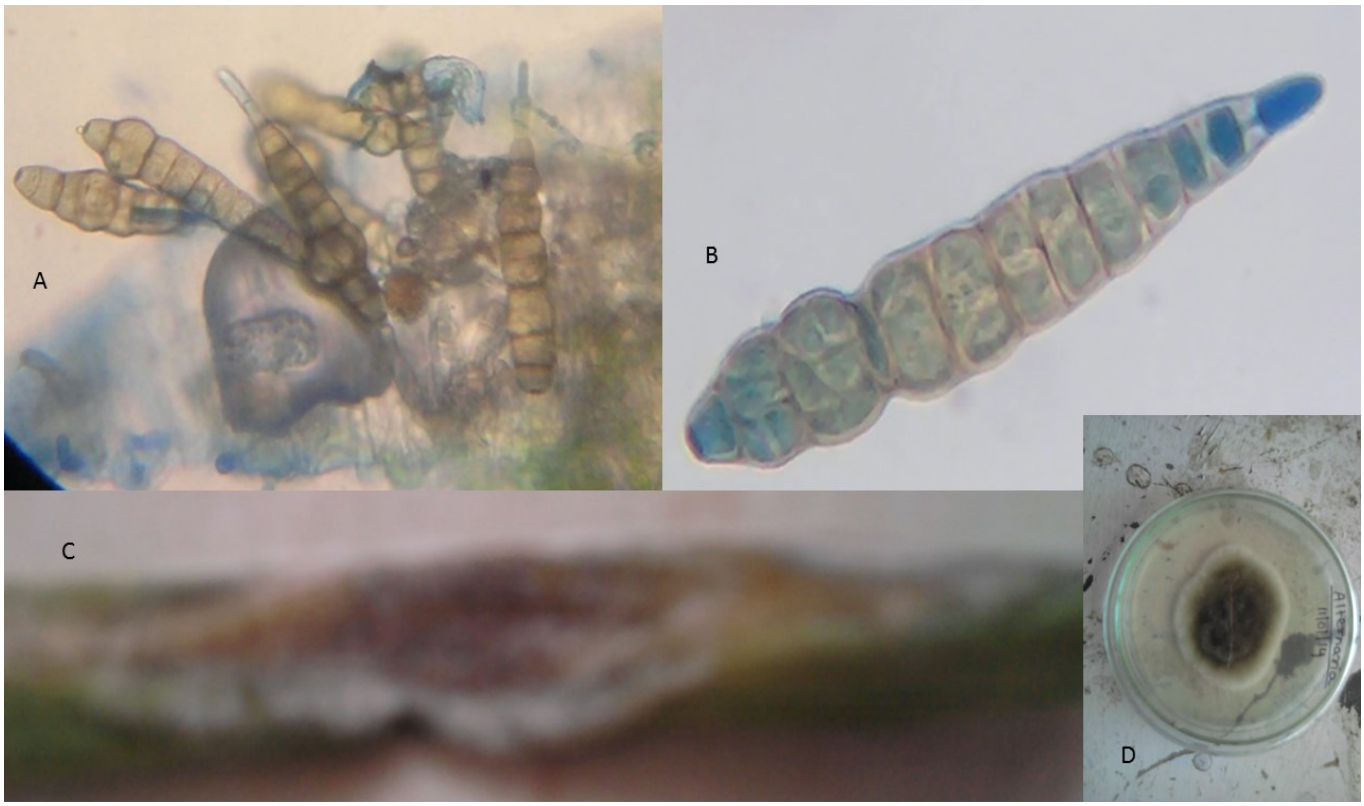

Figure-1
***Alternaria porri* (A- conidia and conidiophore; B- A single conidia; C- Infected leaf of Onion and D- Pure culture on PDA media isolate from plant material)**

Stemphyllium vesicarrium (Wallr) E.G. Simmons: The colony on PDA shows brown colour which darken as the age of culture, the yellowish brown margin of colony clearly seen from above and backside of culture. Hyphae septed and brown in colour (figure-2A).

Conidiophore often arise in group, light to dark brown, up to 70 µm long, smooth, with one or more swellings and dark band from which conidia arise (figure-2E).

Conidia solitary straight or slightly curved, ellipsoidal or oval 20 – 50 µm in length and 15 – 26 µm in diameter, brown in colour 3 to 6 transverse septa and several longitudinal septa, often constricted in middle[11] (figure-2B, C and E).

Cercospora duddiae **Welles:** Mostly this disease is seen in mature plant but it sometimes occurs during young stages in some plant. Leaf spot initially yellowish (Ash coloured) in colour which later converted to brownish or dark brown and finally black (figure-3B).

Conidiophores emerging in cluster of 6 to 18. base of conidiophore is brown and tips are somewhat hyaline. Conidiophore straight scars are visible at tips. It is multiseptate 4-8 X 60- 176 µm in size. (figure-3A and D). Conidia are hyaline long straight sometimes curved, multiseptate with broad base and pointed acute apex (figure-3C).

Conclusion

Various parameters like symptoms on plant, microscopic and macroscopic examination and culture characters prove the three pathogens are dominating the field of garlic and onion. *Alternaria porri* and *Stemphyilium vasicarium* mostly grow together in field of above crops. *Cercospora duddiae* infect the garlic and onion leaves at the time of harvesting season. Alternaria is most abundant among the field of both crops in Maharashtra.

Acknowledgements

Author is thanking to farmers and shopkeepers who permit for visiting and collecting samples and also thankful to principal of S.S.V.P. S's L.K. Dr. P.R. Ghogrey Science College, Dhule for providing laboratory.

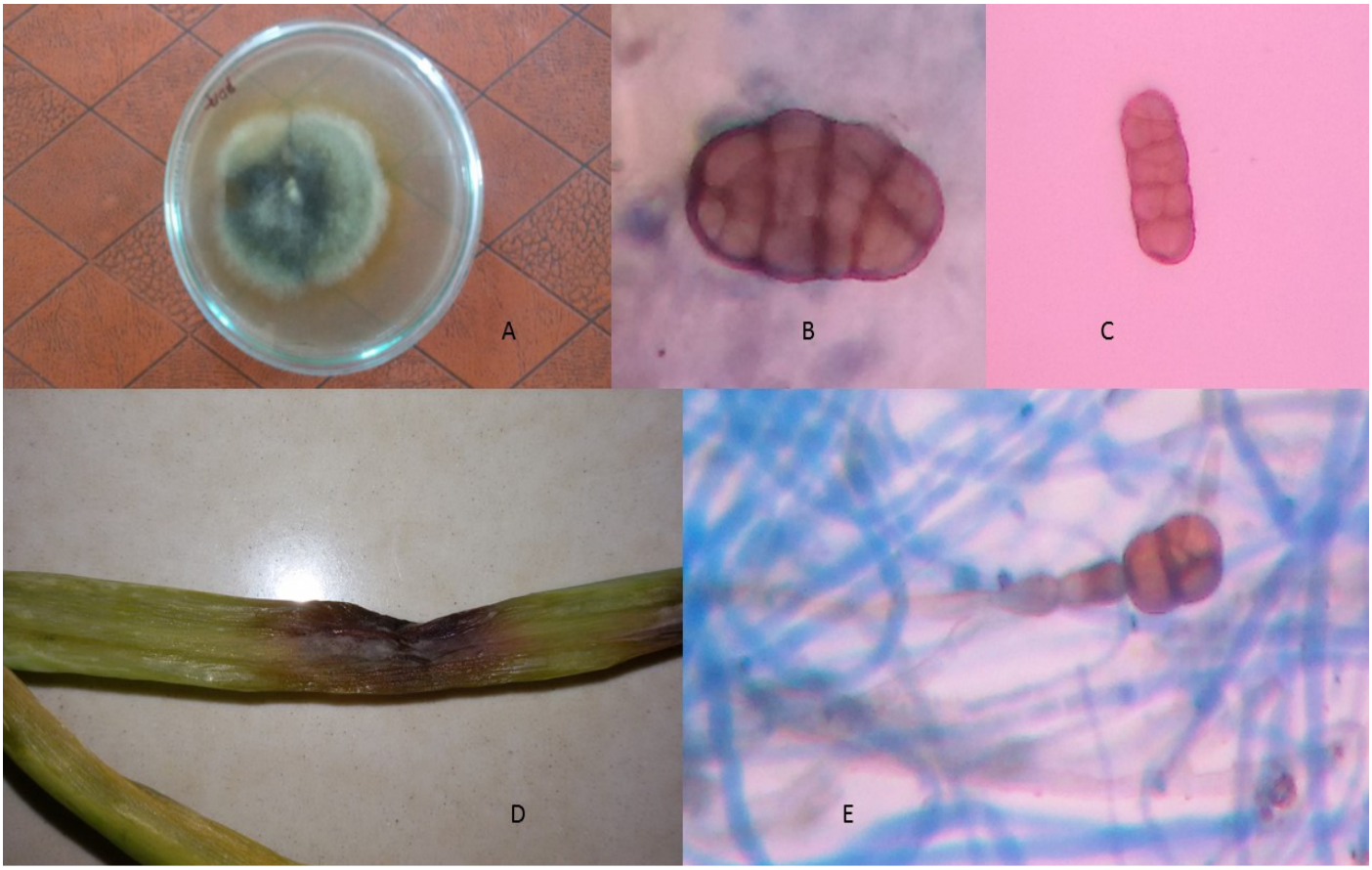

Figure-2
Stemphyilium vasicarium **(A- Pure culture isolate from plant material; BandC- A single conidia; D- Onion leaf with infection and E- Conidia with conidiophore)**

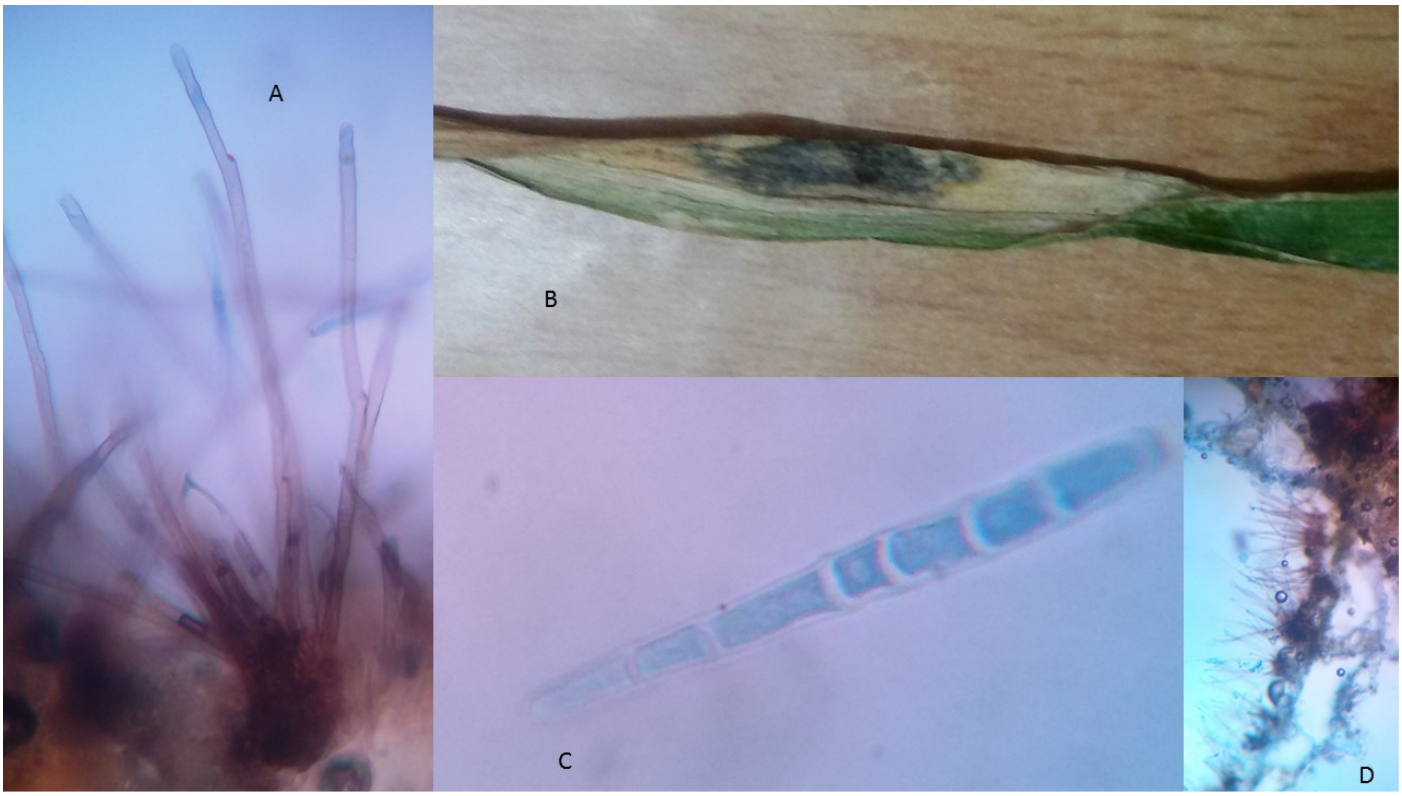

Figure-3
Cercospora duddiae **(A- Conidiophores; B- Infected leaf of Garlic plant; C- A single conidia and Section of leaf through infection)**

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