Int.J.Curr.Microbiol.App.Sci (2018) *7*(11): 2593-2596

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 7 Number 11 (2018)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2018.711.295

First Report of *Phoma exigua* Causing Fruit Rot of Brinjal in Northeast India (Assam) with a New Pathogenicity Test Method

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Keywords

Brinjal, Fruit rot, *Phoma exigua*, Pycnidia, Pathogenicity test

Article Info

Accepted:
18 October 2018
Available Online:
10 November 2018

A B S T R A C T

A survey was conducted in some districts of Upper Brahmaputra Valley Zone of Assam for most prevailing diseases in brinjal during the year 2015-16. Apart from the fruit rot disease of brinjal (*Solanum melongena* L.) caused by *Phomopsis*, *Phytophthora*, *Alternaria* etc., a new pathogen, *Phoma exigua* was observed. Initial symptom developed on the fruits as minute, slightly sunken spots, which later produced minute black bodies (pycnidia) scattered and immersed in the infected host tissues. The fungus was isolated from the collected samples and the pathogenicity test was proved by following the Koch's postulates by detached leaf and fruit technique, which is a new method of pathogenicity test adopted. The isolated pathogen was identified as *Phoma exigua* on the basis of morphological and cultural characteristics of the pathogen. This is the first report of Fruit rot of Brinjal caused by *Phoma exigua* on Brinjal in Assam, India.

Introduction

Brinjal (*Solanum melongena* L.) is a major solanaceous vegetable crop of India which is grown in all seasons and almost in all parts of the country. In Assam, brinjal stands 5th among the vegetables covering an area of 16.81 thousand ha with an annual production of 267.94 thousand MT (National Horticulture Production Database, 2012-13). According to National Horticulture Board (2014-15), Indian production of brinjal is highest in West Bengal (2,985.44 tonnes) sharing 23.72% of India's production whereas, Assam (286.41 tonnes) shares only 2.28%. Its production in an unit area is far below as compared to other states of the country due to various biotic and abiotic factors. The crop is known to be attacked by various fungal, bacterial and viral pathogens causing substancial yield loss. Among the fungal diseases, fruit rot is most destructive which causes severe damage to the fruits in the field and considerable losses during storage, transit and marketing. The commercial cultivation of the crop is under serious threat in Assam due to the disease warranting effective management measures.

Materials and Methods

Collection of diseased sample and observation of symptoms

During 2015–2016, a survey was conducted in brinjal growing areas of Sivasagar, Jorhat and Golaghat districts of Assam, where different

samples showing fruit rotting symptoms caused by *Phomopsis, Phytophthora, Alternaria* etc. were observed. Besides these, a new pathogen causing Fruit rot of Brinjal showing initial symptom on the fruits as minute, slightly sunken spots and in later stage firm sunken lesions occur on any part of the fruit but are most common at the stem end (Fig. 1, A- B). Infected tissues become brown, leathery and later black. Minute black bodies (pycnidia) were produced which are scattered and immersed in the host tissue (Fig. 1, C). Later they aggregated producing black crust symptom on the upper layer of the host tissue (Fig. 1, D). The disease incidence was ranging from 30% to 65% in different fields. The objective of the present study was to determine the causal agent and its identification.

Results and Discussion

The causal fungus was isolated on potato dextrose agar (PDA) from diseased brinjal fruits. Colonies observed were generally flocculus, white to off white and sometimes with various grey or brown tinges, produces several acentric broad zones, raised, dense and fluffy growth and the reverse side was light to dark yellowish brown.

Conidiomata pycnidial, semi immersed to immersed, brown, globose, separate or aggregated, occasionally confluent, brown to dark brown and ostiolate. Margin of the colonies are irregularly lobed. Growth rate was slow to moderate, full growth developed after 10 days of incubation at at 28±1°C and for pycnidia formation it took 18 days. The pycnidia were black, scattered to confluent, globose to subglobose or irregular (Fig. 2, A-B). The pycnidia possess conspicuous circular ostiole. Conidia hyaline, aseptate, occasionally with single septation, straight or curved, ellipsoid to cylindrical, biguttulate measuring 5-7.25 x 2.5-3 µm. (Fig. 2, C-D).

Identification of the fungus

The identification of the fungus upto generic level was done based on the morphological and colony characters. The fungus was identified as *Phoma* sp. in the Department of Plant Pathology, AAU, Jorhat. The fungal genus was confirmed as *Phoma* and identified as *Phoma exigua* (Id No.- 8221.16) at the National Centre of Fungal Taxonomy, New Delhi. This finding was in conformity with the findings of earlier workers on fruit rot of brinjal in India and Brazil (Teranishi and Fgueiredo, 1968), on leaves of brinjal in India (Rao and Thirumalachar, 1981), on tomatoes in New Zealand (Laundon, 1971) and on capsicum in Tonga (Jackson, 2010). A critical review of literatures revealed that the fungus, *Phoma exigua* has been reported as the fruit rot pathogen of brinjal from Assam for the first time. However, Ali (1989) had isolated *Phoma medicaginis* var. *pinodella* from brinjal fruit in Assam and recorded as a new host from India.

Establishment of pathogenicity

The Pathogenicity test was done on fruits and leaves (Fig. 3, A-E). For this purpose, a polythene sheet (45cm x 35cm) after surface sterilisation with Ethyl alcohol was placed on a wooden tray (35cm x 30cm x 12cm) which was also sterilized. Moss (*Brachythecium rutabulum*) was collected from AAU campus, washed three to four times with tap water and kept in blotter paper for sometimes to remove the excess water. A thick layer of moss (5cm) was spread over the bottom of the tray and 4% Formaldehyde was sprayed over the moss and kept for four days covering with a sterilized polythene sheet. On the fifth day, the polythene sheet was removed and it was left open for two days until the smell of formaldehyde was completely removed. Healthy brinjal leaf and fruits were collected and surface sterilized with 70% ethyl alcohol.

Injury was made on leaves and fruits by gentle scraping with sand paper. Then the leaves and fruits were placed on sterilized filter papers. One brinjal fruit and leaf was kept as control and without any injury. To enhance the shelf life of leaves, a cotton swab soaked with nutrient solution (20% sugar solution) was placed at the end of leaf stalk. The leaves and fruits were inoculated by placing pycnidia on the injured part of the leaf/fruit collected from 18 days old culture maintained in the laboratory. High humidity was maintained by sprinkling fine mist of water with the help of hand sprayer. Then the tray was covered with a transparent polythene sheet. The observations on symptom development were recorded after 7 days of inoculation and no any symptom was observed in the control (Fig. 3, D-E). Reisolation of the fungus (*P. exigua*) was carried out and Koch's postulates established.

Fig.1(A-D) Fruit rot of brinjal caused by *Phoma exigua* showing sunken lesions (A-B) and pycnidia formation (C-D) on the fruit

Fig.2(A-D) Colony of *Phoma exigua* on PDA after 18-day of incubation at 28°C (A), reverse side of the culture (B), pycnidia and conidia (C-D) under microscope (40X)

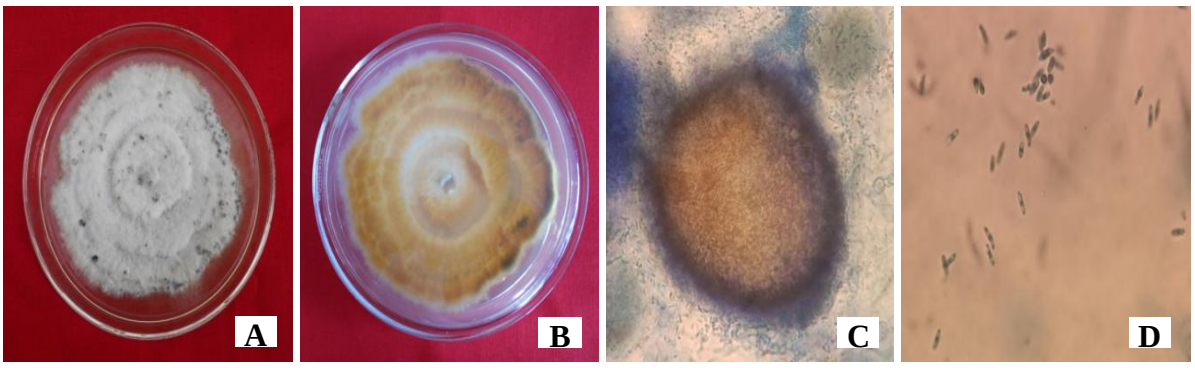

Fig.3(A-E) Pathogenicity test on detached fruits and leaves showing symptom development after 7 days of inoculation (D-E)

Acknowledgement

Authors are grateful to Proff. S. Ali, Professor and Head, Department of Plant Pathology, Assam Agricultural University, Jorhat, Assam for his encouragement and kind suggestion during the course of investigation and also to the National Centre of Fungal Taxonomy (NCFT), New Delhi for providing confirmation of the pathogen.

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How to cite this article:

Sukanya Gogoi and Daisy Senapoty. 2018. First Report of *Phoma exigua* Causing Fruit Rot of Brinjal in Northeast India (Assam) with a New Pathogenicity Test Method. *Int.J.Curr.Microbiol.App.Sci.* 7(11): 2593-2596.
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