Research Paper

Volume : 4 | Issue : 3 | March 2015 • ISSN No 2277 - 8179

Anthracnose Disease of *Jatropha curcas* L. caused by *Colletotrichum gloeosporioides* Penz. - A new record from North-East India

Botany

KEYWORDS : Anthracnose disease, Colletotrichum gloeosporioides, disease occurrence, Jatropha curcas.

P. Deka Bhuyan — Medicinal, Aromatic and Economic Plants Division CSIR- North East Institute of Science & Technology, Jorhat, Assam-785006

P. Boruah — Medicinal, Aromatic and Economic Plants Division CSIR- North East Institute of Science & Technology, Jorhat, Assam-785006

ABSTRACT

Jatropha curcas L. (family Euphorbiaceae) is an industrially important plant for the source of biodiesel. Anthracnose disease was first observed in J. curcasL during summer season in 2011 in the experimental farm of North East Institute of Science & Technology, Jorhat, Assam. Reddish brown coloured, round to oval shaped spotted symptoms appeared on leaves and brown coloured lesions (rots) in the fruits. Occurrence and spread of the disease was more pronounced during April - July in the summer, particularly in the rainy days. Causal organism was isolated from the affected tissues of both the leaves and fruits. Growth of the fungus on Potato Dextrose Agar medium appeared first as whitish mycelium and later turned into grey to grayish black. Conidia of the fungus were oblong to cylindrical, straight, hyaline, one celled with round ends and 6–14 x 3–6 µm in size. Seta was dark brown and 24–45x 3–6 µm in size. On the basis of mycological characteristics and pathogenicity test, the fungus was identified as Colletotrichum gloeosporioides Penz.This may be claimed as the first record of anthracnose disease caused by C. gloeosporioides on J. curcas in Northeast India.

Introduction

Jatropha curcas L. (family Euphorbiaceae) is an industrially important plant for the source of biodiesel and the plant has immense economic potential and ecological and environmental significance (Agarwal, 2007). Juice of the flowers and the stem of *J. curcas* have very good medicinal properties. The uses of this crop range from traditional medicine for common human and animal ailments; protection against land erosion, as a boundary fence or live hedge to recently reported highly economic potential of fossil fuel replacement (Openshaw, 2000; Agarwal, 2007).Many fungal organisms have been reported to attack this plant causing serious losses to the crop yield. Anthracnose type disease on this plant was first noticed during summer in 2011 in the experimental farm of North East Institute of Science & Technology, Jorhat, Assam. Symptoms appeared as reddish brown coloured, round to oval on leaves and shaped spots brown coloured lesions (rots) on fruits, particularly on ripen fruits(Figure.1). Occurrence and spread of the disease was more pronounced during April - July in the summer, particularly in rainy days. Therefore, the disease was further studied to identify the pathogens for further management strategy.

Materials and Methods

Infected leaves were collected; small pieces of 5 mm square were cut from the margin of the infected lesion. Cut pieces were placed in 1 % Sodium hypochlorite (NaOCl) for surface sterilization and the sections were then washed in sterile water, dried on sterilized blotting paper and finally placed on Potato Dextrose Agar (PDA) plates. Pathogens from infected fruits were isolated by culturing pieces of internal tissues. Infected fruit was wiped with a cotton swab dipped in 70 % ethanol, followed by lightly flaming the tissues. With a sterile scalpel peeled out the back outside layer of the tissues of a freshly exposed area of the advancing margin of the infection and ,placed in PDA plates (Aneja, 2003). Plates were kept in incubator at 28°C. The resulting colonies of the pathogen were then sub-cultured, transferred to PDA tubes aseptically for further use. Freshly isolated fungus grown on PDA was examined under microscope. Detailed microscopic examinations of the particular organism were performed using Olympus Trinocular Microscope (Model CX41 RF) attached with Olympus Digital Camera(Model DP20) and Fluorescence attachment under high magnifications.

Pathogenicity test was conducted on fruits both in laboratory and in the field by Koch's postulate. In field, six healthy plants with fruits were selected from different six plots for this purpose. Fruits of J. curcas were surface sterilized with 1% NaOCl. Spore suspension was prepared from 8-days old fungal culture and in sterilized water having approximately 200 conidia / ml. This suspension was used for inoculating the healthy fruits and leaves of J. curcas. Another six healthy plants with fruits were taken and sterile water was sprayed over the plants which served as control. For pathogenicity test in laboratory, a number of healthy fruits and leaves were inoculated by drops of conidia suspension. Some fruits were inoculated similarly with sterilized water as the control treatment. Inoculated fruits and leaves were kept in a humid chamber with 95 % relative humidity at 28°C for 12 days. Observations were made at regular intervals for symptom development. The organism was re-isolated from these artificially inoculated materials and the culture was compared with the original one. Identification of fungal colonies was done in CSIR-NEIST Mycology and Plant Pathology Lab. The fungal organism was visually examined for phenotypic characters viz.colour, exudates, growth zones, hyphae (aerial or submerged). Macroscopic studies were done for pycnidia, sclerotia, sporodochia etc. Finally examined under high power microscope for spores, conidia, appressoria,hyphae, mycelium etc.using methods of Barnett and Hunter, 1972; Subramanian, 1972 and authenticated by Plant Pathologist in the Department of Medicinal, Aromaric and Economic Plants Division of the same institute.

Results

Symptomatology

Under natural conditions, anthracnose lesions appeared as brown to reddish brown on fruits. The rind became brown to grayish black with the advancement of the decay and eventually a soft rot occurred on fruits. Under humid conditions pinkish- brown coloured masses of conidia were observed on the decayed region, acervuli were noticed. Lesions were noticed to develop on any area of the fruit surface and sometimes found to have corky surfaces;round to oval shaped spots appeared on leaveswere firm and dry (Fig.2)

Pathogenicity

In pathogenicity test, small, dark lesions were observed on the artificially inoculated fruits after 7 days of inoculation. After 12 days of inoculation dark lesions became dark brown .Pinkish – brown masses of conidia were observed which were similar to the symptoms that occurred under natural conditions, which caused the softening of the tissues. Abundant masses of conidia were observed on the inoculated areas and the areas were found decayed. Symptoms observed on leaves were also similar to the symptoms under natural conditions (Figure 3). On re-isolation and re-examination under microscope the causal pathogen

was found to be *Colletotrichum gleosporioides* Penz.(Figure.4) which was confirmed on the basis of the following morphological characters-Conidia are hyaline, one- celled, ovoid to oblong, slightly curved, 6-15 µm in length and 3-7 µm in width. Masses of conidia appear pinkish brown colored. The acervuli, which were produced in infected tissue were sub-epidermal, typically with setae, and simple, short, erect conidiophores.The fungus grown on potato dextrose agar medium produced whitish mycelia which later turned into grey and then dark grey. Ultimately a grey to dark grey colony appeared,. Acervula present with dark greymycelium.

Conclusion

The outbreaks of anthracnose disease on *J. curcas* plant suggest that C. gloeosporioides is spreading widely and posing a serious threat to this biofuel plant. Investigation with an aim to control this destructive pathogen in biological way is necessary.

Acknowledgements

Authors are grateful to Director, CSIR-North East Institute of Science &Technology, Jorhat, Assam for providing facilities to carry out the investigations in the laboratory.

[a]

[b]

Figure 1: *J. curcas* in field [a]infected fruits[b] infected leaves

Figure: 2 Fungus (*C. gloeosporioides*) grown on *J.curcas* fruits

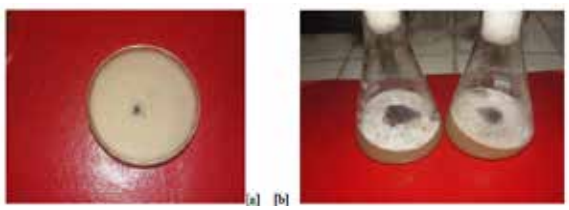

Figure 3: Isolation of *C. gloeosporioidesfrom J. Ccurcas* [a] infected leaf [b]infected fruits [c]infected fruit stalk [c]

Figure 4: Microscopic photograph of *Colletotrichum gloeosporioides*

Volume : 4 | Issue : 3 | March 2015 • ISSN No 2277 - 8179

REFERENCE

1. Agarwal, A.K. (2007) Biofuels (alcohols and biodiesel) applications as fuels for internal combustion engines. Prog. Eng. Combust. Sci., 33: 233–27 it should be 272 | 2. Aneja, K.R. (2003) Experiments in Microbiology, Plant Pathology and Biotechnology (New Age International Publishers, 4th edition), p. 437 – 441. | 3. Barnatt, H. L. and Hunter, B.B. (1972) Illustrated genera of Imperfect fungi. (Third edition): Burgess Publishing Company, 426, South Sixth Street, Minnespolis. Minnesota, 55415. | 4. Openshaw, K. (2000) A review of Jatropha curcas: an oil plant of unfulfilled promise. Biomass Bioenerg., 19: 1–15 | 5. Subramanian, C.V. (1972) Hyphomycetes, ICAR, New Delhi