

Original Research Article

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First Report of *Alternaria* Leaf Spot (ALS) and Flower Heads Spot (FHS) Disease on *Heliconia rostrata* Plant Caused by *Alternaria alternata* from India

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ABSTRACT

Keywords

Leaf spot, Flower heads, bracts, Foliar disease, *Heliconia rostrata* plant, *Alternaria alternata*

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A *Alternaria* leaf spot (ALS) and flower heads spot (FHS) disease of *Heliconia rostrata* plants is prevalent in India. *Heliconias* plants are known for their beautiful, brilliant colorful flowering bracts. Breathtaking and unusual flower heads (bracts) rise from clumps of banana like leaves, sometimes very large or slender. They are also known as the birds of paradise which are found mostly in Indian gardens. Symptomatic can be seen on the leaves and flower heads like to be small and circular spots with concentric rings at first which later became irregular lesions. These circular spots were dark black coloured along the margins which encircled the necrotic region. With the spread of disease, these necrotic spots turned to appear as blight. Purified fungal suspension (1×10^5 cfu/ml) was sprayed on healthy plants for the confirmation of pathogenicity test. Koch's Postulates were established. This fungus was identified as *Alternaria alternata* and is the first report of 'leaf spot and flower heads spot disease' on this host from India.

Introduction

Heliconia rostrata plants are known for their beautiful, brilliant colorful flowering bracts. Breathtaking and unusual flower heads (bracts) rise from clumps of banana like leaves, sometimes very large or slender. *Heliconia* flowers are actually highly modified leaves and bracts. *Heliconias* belonging to the family Heliconiaceae, are among the most provocative of all exotic tropical flowering plants. The family comprises of 250-300 species distributed mainly in Neotropical areas from the North of Mexico to the South of

Brazil (Kress, 1990). They are native to Central and South America, the Caribbean Islands and some of the islands of the South Pacific. Originally, *Heliconias* were included in the family Musaceae, but the genus was always considered to be homogeneous and with its own characteristics, such as inverted flowers, the presence of a single staminode and drupe-type fruits. Nakai (1941) raised *Heliconia* to the family level (Heliconiaceae), and today, this family has only one genus (*Heliconia*), belonging to the order Zingiberales, which comprises eight families: Musaceae (bananas), Strelitziaceae (the birds

of paradise), Lowiaceae (no common name), Heliconiaceae (heliconias), Zingiberaceae (the ginger), Costaceae (the costus), Cannaceae (the cannas), and Marantaceae (the prayer plants) (Berry and Kress, 1991). They have pendent inflorescence of alternating bracts each 6-10 cm long, scarlet red tipped with cream to yellow colour. The bract has deep red colour with yellow green tips, boat shaped. Each inflorescence has 6 to 20 bracts. It grows well in up to 50 % shade. Height ranges from 3' to 18'. It blooms throughout the year. It is one of the hardiest varieties (Goel, 2004). However many disease causing organisms have been detected in heliconia plants which might be an indication that they may be acting as alternate hosts for the pathogens. *Cercospora heliconiae* was isolated from *Heliconia caribaea* by Chowdhry *et al.*, (1983). *Glomerularia heliconii* sp. nov. is described from *Heliconia* sp., used primarily as an ornamental plant in Cuba by Herrera Isla (1994).

Heliconia rostrata plants were grown in Horticulture Garden, C.S. Azad University of Agriculture and Technology, Kanpur for production of ornamental nursery for beautification purpose. In the continuation of disease observation during 2007, the garden plant (*Heliconia* spp.) leaves and flowers were showing leaf spot symptom on aerial parts of plants. Symptoms appeared to be small and circular spots with concentric rings at first which later became irregular lesions. These circular spots were dark black coloured along the margins which encircled the necrotic region. With the spread of disease, these necrotic spots turned to appear as blight. In severe infections, the leaves were blighted and defoliation occurred (Fig. 1, 2 and 3). Mortality due to the disease was found to be 28-40%. The samples were placed in separate polyethylene bags and transported to the laboratory and processed by following the standard techniques (Hawskworth, 1974). The

infected leaves and flowers should be disinfected /surface sterilized in 10% Clorex (0.5%) solution for 2 minutes. Thereafter, wash the material thoroughly using sterilized distilled water. Then small leaf bits from margin of newly emerged spot were cut with the help of a sterilized scalper. The leaf bits were dipped in 0.1% HgCl₂ solution for 30 seconds with the help of sterilized forceps and washed thoroughly 4-5 times with sterilized water to remove the traces of HgCl₂. The pieces were transferred with the help of sterilized forceps into Petri dishes already poured in with sterilized 2% potato dextrose agar (PDA) medium and were kept in B.O.D. chamber at 25⁰+1⁰C for incubation of the pathogen. The mycelial growth was viable around the pieces; hyphal tips from the advancing mycelium were transferred aseptically into the sterilized culture tubes containing 2% PDA medium. The culture was purified by single spore technique method (Vishnavat and Kotle, 2008). The pure culture of the fungal colony appeared to be grayish white at first and became black later on. The fungus produced abundant, conidia having mycelium was septate, branched, dark olive buff, measuring 3.1–5.2µm in diameter; conidiophores septate, simply sometimes branched, erect, geniculate, dark olive buff, measured 23.8-78.5 x 3.4-6.3 µm; Conidia muriform, ovoid to obclavate, arranged in long branched chains, dark olive buff, smooth, sometimes verruculose, measured 15.5-43.3 x 8.6-14.1 µm with 1-5 transverse and 0-4 longitudinal septa; beak usually light in colour, measured 3.2 –18.7 x 3.1-5.3 µm with 0-2 cross septa. The morphological characters of the pathogen observed are more or less, the same as described by Keissler (1912), Simmons (1967) and Ellis (1971) for various isolates of *Alternaria alternata* and it was identified as such (Fig. 4). For confirmation of the pathogenicity test, it was prepared to homogenous suspension from one week's old culture in sterilized water. The suspension

containing conidia and mycelia bits was churned in warring blender and strained with muslin cloth. The suspension containing approximately 1×10^5 cfu/ml was sprayed on 3 month old healthy plants with the help of automizer and sterile water was used as a control. Treated plants were covered for 24 h

with plastic bags to maintain 100% relative humidity and kept under observation for 10 days in the laboratory garden at $30 \pm 5^\circ\text{C}$. The pathogenicity test were repeated three times. The characteristic lesions developed within 7 days of inoculation and Koch's postulates were fully established.

Fig.1 Infected plants of *Heliconia rostrata* in horticulture garden



Fig.2 Infected leaves of *Heliconia rostrata* plant



Fig.3 Infected flowerheads (bracts) of *Heliconia rostrata*



Fig.4 Conidia and mycelium of *Alternaria alternata*



On the basis of pathogenicity, morphological and cultural characteristics of fungus were identified *Alternaria alternata*. The fungus was also confirmed by Indian Type Culture Collection, Department of Mycology and Plant Pathology, Indian Agricultural Research Institute, New Delhi, India and they provide to me an accession number (ITCC - 6472).

A survey of the literature reports the occurrence of only a few fungal diseases on *Heliconia* spp. These include *Phyllosticta musae* [*P. musarum*], *Glomerella cingulata*, *Alternaria alternata*, *Gloeosporium musarum* [*Colletotrichum musae*], *Guignardia musae*, *Curvularia* sp., *Fusarium oxysporum*, *Mycosphaerella musicola*, *Drechslera musae-sapientum* and *Pestalotiopsis* sp. were isolated from lesions on leaves and inflorescences of *Heliconia* sp. grown in parks, gardens and indoors in Venezuela by Madriz *et al.*, (1991). Kelvin *et al.*, (1995) have done detailed study of diseases of heliconia in Hawaii. They have recorded those diseases as per causal organisms. Therefore, to the best of our knowledge, the *Alternaria* leaf spot and Flowerheads spot disease on *Heliconia rostrata* caused by *Alternaria alternata* is the first report from Uttar Pradesh (India).

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