**Bulletin of Environment, Pharmacology and Life Sciences**
Bull. Env. Pharmacol. Life Sci., Vol 9[2] January 2020 : 111-115
©2020 Academy for Environment and Life Sciences, India
Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD
Global Impact Factor 0.876
Universal Impact Factor 0.9804
NAAS Rating 4.95


**ORIGINAL ARTICLE** **OPEN ACCESS**

# Studies on foliar fungal diseases of Gerbera (*Gerbera jamesonii*)in high humid condition of Assam

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**ABSTRACT**
*Floriculture is the fastest growing sector in North Eastern Region of India including Assam. Among economically important flowers, marigold (Tageteserecta), gladiolus (Gladiolus grandiflorus), tuberose (Polyanthus tuberosa), anthurium (Anthurium andrenum), gerbera (Gerbera jamesonii) etc are commercially cultivated in Assam. Like field crops, incidence of different diseases in gerbera including other important flower crops have also been observed. Hence to record the incidence of different foliar fungal diseases followed by the identification of causal organisms on field grown as well as protected cultivated gerberas, a random survey covering three major agro-climatic zones of Assam viz. Upper Brahmaputra Valley Zone, Lower Brahmaputra Valley Zone and Hills zone was conducted. Incidence of light brown to deep brown coloured leaf spots and blight disease (12.33- 45.00%) were predominantly recorded in almost all the gerbera varieties studied. Six numbers of fungal pathogens viz. Alternaria alternata, Colletotrichum gloeosporioides, Botrytis cinerea, Ascochyta gerberae, Botryodiplodia theobromae and Fusarium oxysporum were isolated from the infected gerbera leaves. Among the encountered foliar fungal diseases, botrytis blight was the most serious ( 40.50-45.00% PDI) both in open and protected condition, particularly in Hajo area of Kamrup followed by Jorhat and KarbiAnglong districts of Assam.*
***Key words*****:** *Assam, Gerbera, foliar fungal diseases*

Received 26.11.2019 Revised 1912.2019 Accepted 02.01.2020

## INTRODUCTION

Floriculture is the fastest growing sector in North Eastern Region including Assam. Owing to diversity in topography, altitude, congenial agro-climatic condition coupled with fertile soil, well distributed rainfall and assured domestic and national market. The importance of commercial floriculture is gaining momentum in Assam like other Indian States. Flowers under commercial cultivation in Assam are Marigold, Gladiolus, Tuberose, Anthurium, Gerbera etc. In India, flower is cultivated in an area of 272.01 thousand ha with 1.651 million MT of loose flower and 47504 million number of cut flower [1]. In Assam, flower is cultivated in an area of 1200 ha (2011-12).Gerbera(*Gerbera jamesonii*) also known as Transvaal daisy, Barberton or African daisy, is the most popular florists flower with increasing commercial significance. It has a wide applicability in the floral industry as cut flower and potted plant.Among all the cut flower, gerbera occupies 5$^{th.}$ position among the top ten cut flowers of the world. The name 'Gerbera' was given by Jan Frederik Gronovius in 1737 in the honour of German Naturalist Traugott Gerbera.

*Gerbera jamesonii* is a perennial flower crop with daisy-like flower of order Asterales, family Asteraceae. It is ideal for flower beds, borders, pots and rock gardens. Gerbera is also used as a model plant in studying flower formation. It contains naturally occurring coumarin derivatives. Gerbera daisy can mean innocence, purity and cheerfulness. These largedaisy variations come in vibrant colours and sending them is a perfect way to bright someone's day. Having a long vase life, gerbera flowers are widely used in the cut flower industry and it adds colour to any room or gardens.

Gerbera is affected by a number of fungal diseases like *Alternaria alternata*, *Colletotrichum gloeosporioides*, *Botrytis cinerea, Ascochyta gerberae, Botryodiplodia theobromae* and *Fusarium oxysporum* were isolated from the infected gerbera leaves etc[2,3,4,5].

## MATERIAL AND METHODS

### Survey and collection of diseased samples

A random survey was conducted in three major agro-climatic zones of Assam *viz.* Upper Brahmaputra Valley Zone, Lower Brahmaputra Valley Zone and Hills zone( Fig. 1) during 2018-19. For each zone one district with two to three sites location were selected at random.

Collected samples shown different types of leaf symptoms like light brown irregular lesions initiate either at margin or leaf tip .Later, turning brown in colour progresses towards midrib. Scattered brown, oval, small spots which are gradually enlarge and coalesced to form large, oval, circular or irregular brown to blackish lesions . For isolation of the fungus small thin section of the diseased tissue along with some healthy portions cut with the help of sterilized blade (Plate 1).

The infected section were surface sterilized with 1% sodium hypochlorite for 30sec [6] and then section were rinsed with sterile water thrice under aseptic condition for remove the sodium hypochlorite. After that section were inoculated in sterilized petri plate containing potato dextrose agar(PDA) media and kept for incubation at room temperature 23±1°C for upto full growth of the fungus into the plate.

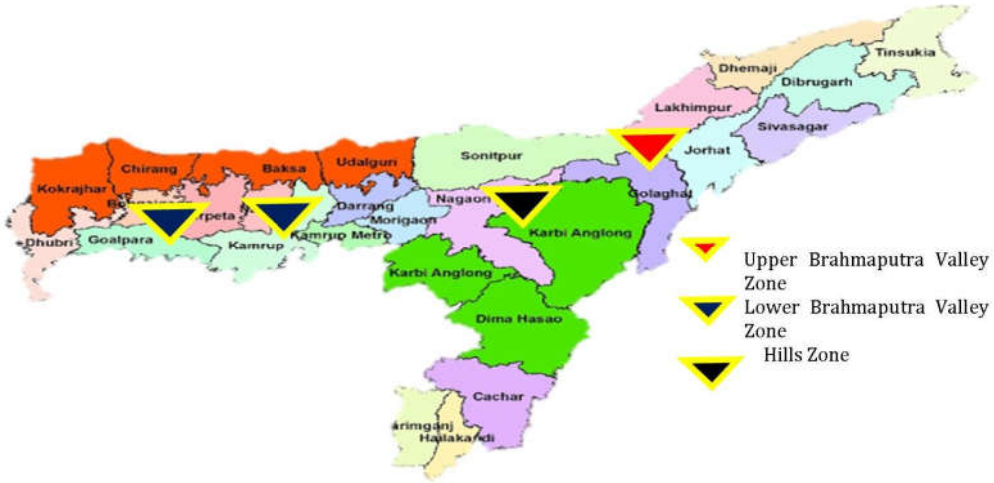



Fig. 1. Site of sample collection.

**Plate1. Symptomatological studies for infection on gerbera plants.**

**Characterization and identification of pathogen**

Identification of isolate pathogen done by cultural and morphological methods.Cultural characters of the isolated pathogens were studied while it was grown in PDA media. For Morphological character like shape of the conidia, colony character, type and shape of the fruiting body.The culture were identified upto genus level with the cultural and morphological characters where it was confirmed from NCFT, New Delhi.

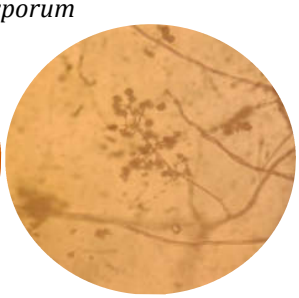
Plate 2. Colony morphology of *Colletotrichum gleosporoides*

Plate 3.Colony morphology of *Fusarium oxysporum*

Plate 4.Colony morphology *Botrytis cinerea*

Plate 5. Microphotograph of *Colletotrichum gleosporoides*

Plate 6. Microphotograph of *Botrytis cinerea*



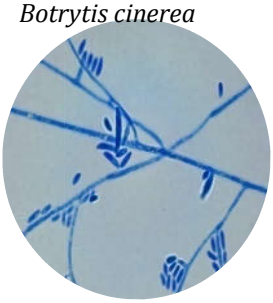


Plate 7. Microphotograph of *Fusarium oxysporum*

**Pathogenicity test**

The pathogenicity test of the isolated fungus was conducted on healthy leaves of the plant. First washed the leaves with sterilized water and two method was followed i.e., spray inoculation and pin prick method.In spray method 4 to 5 days old pure culture, grown in PDA media was used for inoculation on the plants. Culture was mixed with sterile water and used immediately.The suspension containing $1X10^9$ spore per ml of water was sprayed on plants with hand spryer. Control was sprayed with sterile distilled water. Plants were then covered with perforated polyethylene bags to maintain the humidity upto 85-90%. In pin prick method leaves were injured with the help of needle and/sand paper and spore suspension was then atomized on the leaf surface. The plants were watered at regular interval and observed the development disease symptoms. Regular observation on symptom development was recorded. After development of typical symptom, the associated pathogen was reisolated from the artificially inoculated plants and characterized.

Plate 8. Spray inoculation

Plate 9. Pin Prick Method

Plate 10. Covering with polyethylene

**RESULTS AND DISCUSSION**

The symptomatological, pathogenicity, morphological and cultural analysis have revealed the association of six different species of fungal pathogens *viz*. *Alternaria alternata*, *Colletotrichum gloeosporioides*, *Botrytis cinerea, Ascochytagerberae, Botryodiplodia theobromae* and *Fusarium oxysporum.* All these organism were from the infected gerbera leaves collected during the survey programme. Among the encountered foliar fungal diseases, botrytis blight *(Botrytis cinerea)* was the found most serious ( 40.50-45.00% PDI) both in open and protected condition, particularly in Hajoarea of Kamrup followed by Jorhat and KarbiAnglong districts of Assam (Table 1). This was further followed by *Alternaria alternate* (30.00%PDI) and *Colletotrichum gloeosporioides* (25.00%PDI).

As the infection of *B. cinerea* was found highest so, pathogenicity test was conducted for this pathogen and found positive result. Hence it can be concluded that *B. cinerea* is a foliar pathogen of gerbera. The disease caused by this pathogen is of serious one causing 40.50 to 45.00%. Similarly, Zaccaria *et al.* [7] observed the most devastating pathogens in Italy under open field conditions were *Botrytis cinerea, Sphaerotheca fusca*, *Sclerotinia sclerotiorum,* besides, *Phytophthora cryptogea* under hydroponics. Similar to our study Ferronato *et al.* [8] found eight plant pathogenic fungi infecting gerbera *viz., Erysiphecichoracearum, Pythium* sp., *Phytophthora* sp., *Fusarium oxysporum, Cercospora gerberae, Botrytis cinerea, Albugo tragopogonis* (*Pustulatra gopogonis*) and *Capnodium* sp.

Earlier, Bhat *et al*., (2013) [9] reported the association of *Alternaria alternate* of gerbera from Kashmir valley with disease incidence of 60.72%. They reported circular spots with brown colour and irregular margins with a size of 23-26 mm. On the other hand, Sen and Gupta [10] recorded two new pathogenic fungi, *Alternaria tenuis* and *Colletotrichum gloeosporioides* infecting leaves of gerbera from Himachal Pradesh, India.

The present study showed association of *B. cinerea* as most important fungal pathogen causing foliar disease of gerbera. So, research on its management practice is utmost important to save the flowering plant more particularly gerbera both in indoor and outdoor condition.

**Table1:** Percent disease incidence of different foliar diseases of gerebera

| Name of the disease | Percent disease incidence |
|---|---|
| *Botrytis cinerea* | 40.50-45.00 |
| *Alternaria alternata*, | 30.00 |
| *Colletotrichum gloeosporioides* | 25.00 |
| *Ascochyta gerberae,* | 20.00 |
| *Botryodiplodia theobromae* | 11.60 |
| *Fusarium oxysporum* | 10.97 |

**ACKNOWLEDGEMENT**

The author acknowledges the support received from the Director of Post Graduate Studies and Director of Research (Agri) AAU, Jorhat during the study period.

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**CITATION OF THIS ARTICLE**

B Saikia, N Mazumder and P Dutta· Studies on foliar fungal diseases of Gerbera (*Gerbera jamesonii*)in high humid condition of Assam· Bull . Env. Pharmacol. Life Sci., Vol 9[2] January 2020 :111-115