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Study on *Alternaria alternata* Causing Leaf Blight Disease in Chrysanthemum (*Chrysanthemum indicum* L.) in Prayagraj City

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A B S T R A C T

The objective of this study was to record the incidence of leaf blight of chrysanthemum caused by *Alternaria alternata* in Prayagraj city based on visual inspection and microscopic observation carried out during 2019-2020. During the investigation of Alternaria leaf blight disease was identified thoroughly and disease was severe. Alternaria leaf blight is one of the most important foliar diseases of chrysanthemum. It has become a major constraint in all the chrysanthemum growing areas. During this, survey was done on the several varieties for their disease incidence. The disease incidence varied from one variety to other, the disease incidence is as follows Puran white (66.66%), Detroit (83.33%), Dazzler (46.15%), White cotton ball (53.33%), Baggi (60%), Haldi ghati (69.23%) and Roll call (78.57%). The Mean plant disease incidence is 65.32%. However the total number of plants tagged is different from variety to variety. The growth characteristics of the varieties were also studied. With the obtained values the chi square test was also done where the value obtained is 2.85 as it is less than the tabulated value 12.59 at p=0.05, showing the results as non-significant as the plants surveyed are disease stressed. The disease needs special attention in devising protection strategies of the crop.

Introduction

Chrysanthemum is one of the most beautiful and perhaps the oldest flowering plant, commercially grown in different parts of the world. Chrysanthemum (*Chrysanthemum indicum* L.) is popular flower meaning *Chryos* – golden, *anthos* – flower, a leading flower crop grown in many parts of the world. It belongs to family Asteraceae (Composite) native to Northern Hemisphere in China (Carter, 1990), chiefly Europe and Asia with a few in other areas. It is one of the most beautiful flowering plant referred to as "Queen of the East" and "Autumn flower". Chrysanthemum flowers are grown commercially for making garlands and for religious offerings (Kher, 1990). The year

1995-96 was celebrated as "International year of Chrysanthemum". The present number of varieties in the world is about 2000 and in India there are about 1000 varieties (Datta and Bhattacharjee, 2001). In International cut flower trade, chrysanthemum ranks next to rose (Bhattacharjee and De, 2003). The chrysanthemum has been recognized in India as one among the five important commercially potential flower crops by the All India Coordinated Floriculture Improvement Project (ICAR) and is most important flower grown on commercial scale. Its commercial cultivation is being done in states *viz*., Karnataka, Maharashtra, Rajasthan, Madhya Pradesh and Bihar and in places *viz.*, Delhi, Kolkata, Lucknow, Kanpur and Allahabad mainly for the sake of decoration and participating in flower shows, with the help of pot grown plants.

The beauty of chrysanthemums is spoiled by many soil-borne and air-borne pathogens. The most important factors responsible are the diseases like Alternaria leaf blight, Septoria leaf spot, Stem rot, Rust, Wilt, Bacterial blight, Powdery mildew, Gray mould (Munmi Borah *et al.*, 2019) and non-availability of leading varieties which are resistant to biotic and abiotic stresses and imbalance use of fertilizers. Among these diseases Alternaria leaf blight caused by *Alternaria alternata* (Fr.) Keissler is one of the most destructive diseases, commonly prevailing in almost all chrysanthemum growing pockets of India, which causes heavy losses under field as well as under market conditions. Dark brown spots surrounded by yellow hallow were observed on lower and upper surface of leaves which later lead to blighting of entire leaf and finally defoliation. Keeping in view of this above survey, observation of fungal leaf spot and screening of *Alternaria alternata* on chrysanthemum at flowering stage around Prayagraj was carried out.

Materials and Methods

The experiment was conducted as a survey in nurseries and various locations of Prayagraj, where different varieties of chrysanthemum cuttings were visually observed and diseased samples was collected and brought to the laboratory for isolation and identification of the pathogen for the studies of chrysanthemum leaf blight (Hegde, 1988).

Chrysanthemum varieties collected and their characteristics

Baggi: It is a white colour flowering variety, Pompon or button mums which are characteristically mass of small blooms, petal-packed blooms, and small miniature button to large ball shaped flower, good for the cut flower and mid-season is October.

Detroit: Red colour flowering variety, it is particularly characteristic by its flat capitulum form or daisy capitulum type, red ray floret colour with a green disc and a small brown dot in the centre of the disc and the diameter across the face of capitulum is 73 to 76 when fully opened.

Dazzler: Red colour variety, micro daisy type- spray type, small flower or a few larger blooms, long lasting as the spray mums last up to 10-12 days. Multiple smaller blooms per stem can be seen. End of September-November.

Cotton ball: Solid white colour variety, Spray pompon, head is globe-shaped and has short petals that hide their disc completely; they are also called button mums as they are small. Good for the cut flowers. Mid-season is October.

Haldighati: Dark yellow variety, semi double flower type, flower size is medium, they have clear ray florets, flowering duration is nearly

60 days, the plant spreads up to 35cms. Flowering time is Mid November to Mid-January.

Roll call: Orange bronze flowering variety, Decorative type, flower is a flattened full bloom, it may need support for growing and it can be grown as a good garden mum and also a good cut flower. Early and mid-season - September and October.

Puran white: White colour early flowering variety with the ray florets showing pink colour at the edge of the florets. Decorative variety with flattened full bloom and can be grown as garden mums and also for the cut flowers. It requires good support for growing. Large to medium size flowers. Early season variety for September.

The leaf blight incidence was assessed by recording the number of plants showing the disease symptoms and the total number of plants examined. In each location different plants were examined and scored for the disease incidence by using the following formula (Mayee and Datar, 1986).

$$\text{Per cent disease incidence} = \frac{\text{No. of diseased plants}}{\text{Total no. of plants examined}} \times 100$$

Isolation of the collected samples was done in the PDA media and after attaining the culture, purification of the culture was done. After the pure culture is obtained then the culture is taken on to a slide for the Microscopic observation to identify the fungus. After that the observation it is identified as the *Alternaria alternata*.

Results and Discussion

Survey for the incidence of alternaria leaf blight of chrysanthemum

The results of the present study for the incidence of the leaf blight disease in chrysanthemum of all the samples which are of different varieties /cultivars (Negi *et al.*1984) collected recorded as follows, 12 out of 15 plants showed disease incidence of the Puran white variety collected from the Horticulture field of SHUATS showing an incidence of 66.66%, 10 plants showed incidence from the tagged 12 plants of the Detroit variety from plant arena nursery has shown the highest incidence of 83.33%, 7 plants showed incidence from the tagged 13 plants of the Dazzler variety collected from the Allahabad nursery has shown the incidence of 46.15%, 8 plants has shown incidence from the tagged 15 plants of the White cotton ball variety collected from the Maa nursery with an incidence of 53.33%, 6 out of the 10 tagged plants has shown disease incidence from the Baggi variety collected from the Sam Higginbotton University of Agriculture, Technology and Sciences garden has shown an disease incidence of 60%, 69.22% of disease incidence was recorded from the Haldi ghati variety collected from the Plant hobby centre nursery in which 9 of 13 plants tagged showed disease incidence and 11 plants out of 14 plants tagged has shown disease incidence from the Roll call variety collected from the company gardens with a disease incidence of 78.57%. Arunkumar (2008) carried out survey during kharif/rabi 2007 on the incidence of *Alternaria* leaf blight on chrysanthemum (Fig. 1).

The disease appeared in the form of small, scattered dark brown to black spots, oval to irregular or angular on the leaf. Later these spots increased in size and coalesced covering larger leaf area, with dark brown margin and yellow halo inciting leaf blight and blossom blight and defoliation.

Applying Chi square to the observed diseased samples

$$x^2 = \sum \frac{(O-E)^2}{E}$$

After carrying out the survey for disease incidence and after performing chi square test in Chrysanthemum it is found to be disease stressed. The data analyzed according to (Rao and Scott, 1987) in each of the *Alternaria alternata* disease samples in the period of 2019-2020 was compared using Chi square test, where degree of freedom is 6 and the test statistic value is 2.85, the probability being 0.05, the tabular value is 12.59. The chi square test statistic value is lesser than the tabular value and it's non-significant, as all the varieties have been infected by the pathogen according to the survey recorded (Table 1 and 2).

Table.1 Disease incidence of Alternaria leaf blight of chrysanthemum in different varieties collected from Prayagraj during 2019-2020

Sl.No	Variety	No. of plants tagged	No. of diseased plants identified	Disease incidence (in %)
1	Puran White	15	10	66.66
2	Detroit	12	10	83.33
3	Dazzler	13	06	46.15
4	White Cotton ball	15	08	53.33
5	Baggi	10	06	60.0
6	Haldighati	13	09	69.23
7	Roll call	14	11	78.57
		Mean PDI	**65.32**	

Fig.1 Disease incidence percentage of leaf spot in the chrysanthemum varieties collected from the Prayagraj City

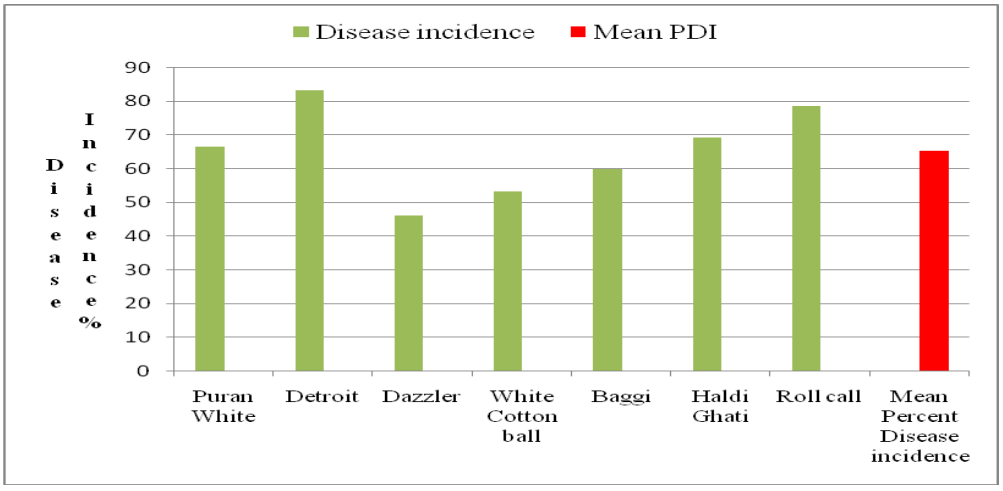


Table.2 Chi square test for observed varieties of chrysanthemum

S.No	Variety surveyed	Observed value	Expected value	$\frac{(O-E)^2}{E}$
1	Puran White	10	8.57	0.23
2	Detroit	10	8.57	0.23
3	Dazzler	06	8.57	0.77
4	White cotton ball	08	8.57	0.03
5	Baggi	06	8.57	0.77
6	Haldi ghati	09	8.57	0.13
7	Roll call	11	8.57	0.69
χ^2				**2.85**

Plates.(a-g) Surveyed varieties of Chrysanthemum at flowering stages

(a) Puran White

(b) Baggi

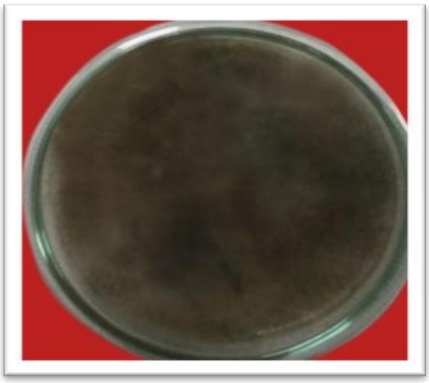
(c) Cotton ball

(d) Detroit

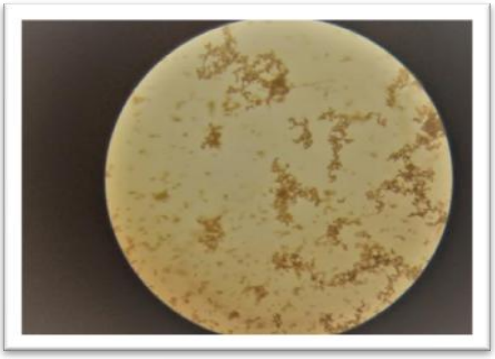
(e) Dazzler

(f) Haldighati

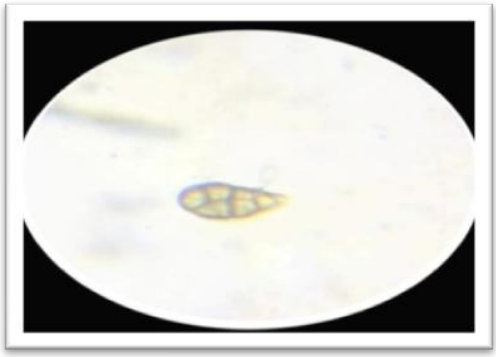
(g) Roll call



Pure culture of the Fungus



Microscopic view of Alternaria alternata under (10X)



Microscopic view of *Alternaria alternata* under (40X)

Diseased leaves of chrysanthemum showing Alternaria symptoms

In conclusion the survey conducted in Prayagraj city during October 2019 to February 2020 to study the (*Alternaria alternata*) causing leaf blight on chrysanthemum revealed that out of seven surveyed. Dazzle variety recorded maximum

disease incidence per cent whereas minimum in Detroit variety. Chi square test revealed that the test statistic value obtained value was less than the tabular value at probability (0.05) was non-significant where all the plants were attacked by pathogen. The findings of the present investigation are limited to one crop season (October 2019 to February 2020) under Prayagraj city agro-climatic conditions as such to validate the findings more such trails should be taken in future.

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