

Symptomatological, Cultural and Morphological Variability of *Alternariabrassicae* (Berk.) Sacc. Infecting Different *Brassica* Host Crops

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Abstract

The present investigation was carried out to know the symptomatological, cultural and morphological variations among *Alternariabrassicae* isolates collected from different *Brassica* host crops i.e. mustard, cauliflower, cabbage and radish. These *A. brassicae* isolates were collected from university farm and designated on the basis of their host as *Acae M*, *Acae Cf*, *Acae Ca* and *Acae R*, respectively. These isolates collected from different hosts showed variations in their symptoms. The symptoms were small to large, circular to irregular and light to dark brown colour spot with concentric ring or yellow hollow. The spots size ranged from 1.0 to 11.0 mm in diameter. The minimum spots size observed from *Acae R* isolate i.e. 1.0 to 3.0 mm and the maximum size of spots i.e. 4.0 to 11 mm observed from *Acae Ca* isolate. The cultural characteristics such as colony colour, growth pattern and radial growth, and morphological characteristics such as its conidia length, breadth, number of septations (horizontal/vertical) were also recorded. Colony colour of these isolates also showed variation on PDA (Potato Dextrose Agar), when compared from one and another. The average conidial length ranged from 132.9 to 191.7 μm and breadth 13.5 to 18.3 μm . The maximum length of conidia were recorded from *Acae M* isolate and minimum from *Acae R* isolate. While, the maximum breadth were measured in *Acae M* isolate followed by *Acae R* isolate and *Acae Cf* isolate. The number of horizontal and vertical septa have also been recorded.

Keywords: *Alternariabrassicae*; cultural variability; morphological variability

Introduction

Brassica crops are of economic and nutritional importance and play an important role for its uses as vegetable as well as edible oil. The important *Brassica* crops include vegetables like *Brassica oleracea* (vegetables), *B. rapa* (vegetables, oilseeds, and forages) and oilseed like *B. juncea* (vegetables and seed mustard), *B. campestris* (Rapeseed) and *B. napus* (oilseeds). India is one of the leading oilseeds producing country in the world accounting for 11.2 % of the world's rapeseed-mustard production, and rank third in the world next to China (22%) and Canada (20%). In India, oilseed *Brassic*as are grown over an area of about 6.3 mha with an annual production of 7.4 million tonnes and an average yield of 1176 kg/ha. India is the also second largest vegetable producer in the world, next only to China with an annual

production of 81 million tonnes from 5.1 million hectares of land and it accounts for about 15% of the world production of vegetables. *Alternaria* blight caused by *Alternariabrassicae* (Berk.) Sacc., is an economically important disease of oilseed *Brassica* as well as vegetable *Brassica* in many parts of the world which cause severe losses both in terms of quality and quantity of the produce. Worldwide, Brassicaceous plants are severely affected^[7,8,9] by the *Alternaria* spp. viz., *A. brassicae* (Berk.) Sacc., *A. brassicicola* (Schw.) Wiltsh., *A. raphani* Groves and Skolko, and *A. alternata* (Fr.) Kreissler. Out of these, *Alternariabrassicae* (Berk.) Sacc. is able to infect most *Brassica* crops^[10] and cause 60% yield loss only in rapeseed-mustard in India^[4]. The disease first appears on the cotyledons and hypocotyls in

the form of small light brown lesions, which soon turn black due to the appearance of spore masses. The initial infection of the lower leaves starts as minute brown to blackish lesion and later spread to the upper leaves,

Materials and Methods

Different *Brassica* crops i.e. Mustard, Cauliflower, Cabbage and Radish, growing during rabi season 2014-15 at experimental fields in the premises of Faculty of Agricultural Sciences, were observed for the infection of *Alternaria* blight. Such infected plants of *Brassica* host crops showing spots were collected for symptomatic observations and for isolation of causal pathogen *A. brassicae* (Berk.) Sacc. These isolates were designated on the basis of their host crops as Mustard (Acae M), Cauliflower (AcaeCf), Cabbage (Acae Ca) and Radish (Acae R). The selected infected spots from diseased leaves were washed 3 to 4 times in sterilized distilled water and then surface sterilized by dipping in 4% NaOCl solution for 1 min, followed by washing with sterilized water 3 to 4 times. Surface sterilized leaf spot pieces were then aseptically transferred into 9 cm Petri dishes containing potato dextrose agar (PDA) and incubated at 25±1°C. The fungal colonies showing characteristics of *A. brassicae* was

Results and Discussion

Symptomatological variations

The collected samples of *Alternariabrassicae* from different hosts varied in their symptoms. In Acae M isolate, symptoms appeared as small rounded light brown to dark brown spots with yellow hallow, while small circular spots with blackish centre were observed in Acae R isolate. In Acae Ca isolate, small dark brown to large dark brown irregular spots with concentric rings were found. whereas, small to large dark brown colour spots with blackish margin were recorded in AcaeCf isolate. The

stem and siliquae^[5]. The present investigation was undertaken to find out the variation in symptoms, cultural and morphological characters in *A. brassicae* isolates collected from different *Brassica* host crops.

picked up and sub cultured in another Petri plates containing Potato dextrose agar (PDA) medium. These plates were incubated in BOD incubator at 25±1°C for 10 to 15 days. On the basis of their conidiophore and conidial morphology as described by Simmons (2007), the pathogen was identified as *A. brassicae* (Berk.) Sacc. Isolates were then purified by single spore technique. Isolates were maintained on PDA slants in a refrigerator at 5°C for further studies. The spot/lesion size on leaves and spot colour of each collected sample was observed. Cultural characteristics of each isolates such as colony colour characteristics and growth behavior was observed after 7 days of inoculation by direct observation of culture-grown Petri plate on PDA which was incubated in B.O.D incubator at 25±1°C. Morphological characteristics of each isolates such as conidia length, breadth, no. of septations were also measured at 40X magnification using calibrated filler micrometer in the microscope.

spot size ranged from 1.0 to 11.0 mm in diameter. The minimum spots size were observed from Acae R isolate i.e. 1.0-3.0 mm and the maximum size of spots i.e. 4.0-11.0 mm were observed from Acae Ca isolate followed by AcaeCf isolate with 4.0-9.0 mm and Acae M with 3.0-8.0 mm (Table 1). The spot size of this fungi was reported upto 1.8 mm with light olivaceous, brown colour and profuse sooty spores. The current results also describe that collected *A. brassicae* isolate have lot of symptomatological variations^[2,3].

Table 1 Symptoms and spot size of *Alternaria* isolates collected from different brassica host crops

Hosts	Spot size range (mm)	Symptoms
Acae M	3.0-8.0	Small rounded light brown to dark brown spot with yellow hallow
AcaeCf	4.0-9.0	Small to large dark brown spot with blackish margin
Acae Ca	4.0-11.0	Small to large dark brown irregular spot with concentric ring
Acae R	1.0-3.0	Small circular spot with blackish centre

Cultural variability among *A. brassicae* isolates

The cultural characteristics such as colony colour, growth pattern and radial growth were also studied at 25±1°C. Highest radial growth was found in Acae M isolate i.e. 76.66 mm followed by Acae Ca (70.33 mm) and AcaeCf isolate (63.33 mm). Whileas lowest was found in Acae R isolate (58.00 mm). Colony colour of Acae M isolate had creamy white to light brown with fluffy

pattern and dark brown in AcaeCf isolate with compressed pattern, whileas rough whitish in Acae Ca isolate with fluffy pattern and light to dark brown in Acae R with slightly compressed growth pattern (Table 2). Such kind of variability among the different *A. brassicae* isolates were also reported by many investigators^[10,11].

Table 2 Colour and growth pattern of *A. brassicae* isolates

Isolates	Radial growth (mm)	Colour	Growth pattern
Acae M	76.66	Creamy white to light brown	Fluffy
AcaeCf	63.33	Dark brown	Compressed
Acae Ca	70.33	Rough whitish	Fluffy
Acae R	58.00	Light to dark brown	Slightly compressed

Morphological variability among *A. brassicae* isolates

Morphological variations revealed that these isolates differed in their conidial size. Variation was also observed in spore morphology in respect to conidial length, breadth and no. of septations. The average length of conidia varied from 132.9 to 191.7 µm, being maximum of Acae M isolate from mustard with 191.7 µm and minimum of Acae R isolate from radish with 132.9 µm. However, conidial size ranged from 86.8 to

233.5 µm. The average breadth of conidia of these isolates varied from 13.5 to 18.3 µm showing a range from 8.1 to 25.7 µm. Its maximum breadth was measured in Acae M isolate i.e. 18.3 µm followed by Acae R and AcaeCf isolates from Mustard, Radish and Cauliflower, respectively (Table 3, Fig.1). Whereas minimum breadth was 13.5 µm noted in Acae Ca isolate. Horizontal septation range varied from 5-12 and vertical from 0-5 (Table

3, Fig. 1). Acae M isolate exhibited maximum average horizontal septation i.e. 7.8 followed by Acae R (7.7), AcaeCf (7.2) and Acae Ca (5.6) isolates. Contrary to this, maximum average of vertical septation was observed in

Acae R isolate (2.6) followed by Acae M isolate (1.3), whileas minimum was in Acae Ca isolate i.e. 0.8 (Table 3, Fig. 1). These results are in agreement with earlier workers^[1,6,12,13].

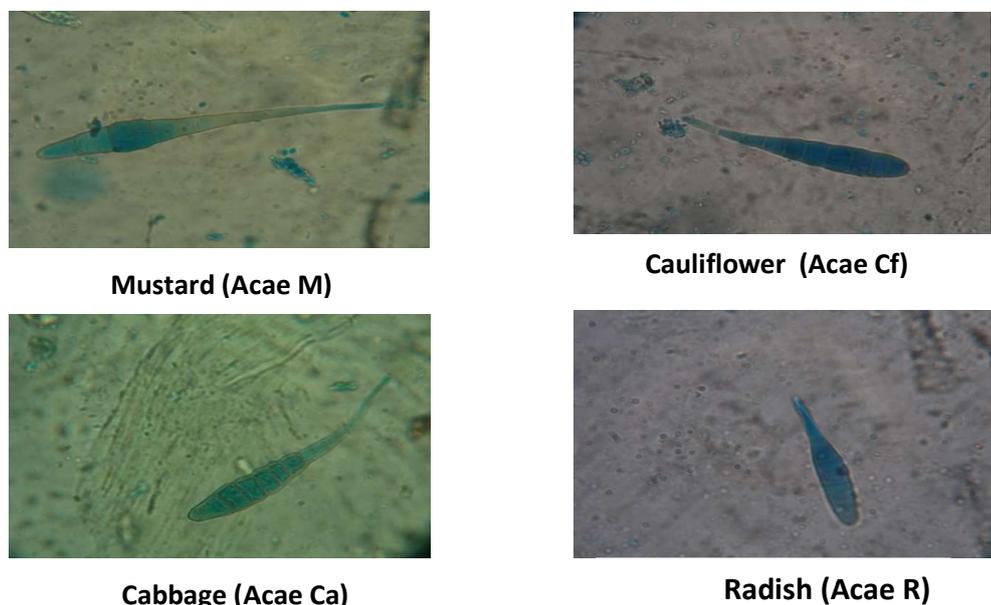


Fig. 1. Morphological variability in *Alternaria brassicae* isolates

Table 3 Variation in conidia of *A. brassicae* isolates

Isolates	Length (μm)		Breadth (μm)		Septation (No.)			
	Avg.	Range	Avg.	Range	Horizontal		Vertical	
					Avg.	Range	Avg.	Range
Acae M	191.7	135-233.5	18.3	14.8-18.3	7.8	5-12	1.3	0-4
AcaeCf	137.7	89.9-180.8	16.8	10.1-25.7	7.2	6-10	1.2	0-3
Acae Ca	148.5	108-186.5	13.5	8.1-20.2	5.6	5-8	0.8	0-3
Acae R	132.9	86.8-207.8	17.5	16.6-20.8	7.7	6-11	2.6	0-5

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