

Study on host range and susceptible stage of the leaf spot of palak caused by *Cercospora beticola* Sacc.

■ POORNIMA* AND YASHODA R. HEGDE

Department of Plant Pathology, University of Agricultural Sciences, DHARWAD (KARNATAKA) INDIA

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ABSTRACT

Leaf spot disease is one of the major diseases of palak caused by *Cercospora beticola*. Symptoms of the leaf spot disease of palak were noticed on both leaf and petiole. On leaf brown coloured spots with circular or irregular margin or straw coloured centre with brown margin were observed. On petiole, brown coloured lesions were noticed. To know the alternate hosts of *C. beticola*, five different leafy vegetables viz., *Amaranthus* spp. *Beta vulgaris*, *Coriandrum sativum*, *Trigonella foetum graceam*, *Lactuca sativa* were tested. Among these *Amaranthus* and *Beta vulgaris* showed the positive reaction to *C. beticola* and to know the susceptibility stage of the palak to *C. beticola* different ages of the plants like 7, 14, 21, 28, 35, 42, 49, 56, 63 days old plants were tested among these 28 days old plants showed the highest disease severity.

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*Corresponding author:

Palak (*Beta vulgaris* var. *bengalensis* Hort.) is one of the most popular leafy vegetables widely grown in India. It is closely related to beetroot (*Beta vulgaris*) and the name, *Beta vulgaris* var. *bengalensis* is derived because its leaves were used first in Bengal. It is rich and cheap source of vitamin A, vitamin C, and Iron. Palak is the store house of useful minerals and vitamins at the cheapest price and are now-a-days considered as the corner stores of health care system due to presence of many helpful phytochemicals or phytofactors in scavenging the deadful free radicals generated as metabolic by products in alleviating many serious diseases (Kaur and Main, 2001). This crop is severely affected by leaf spot disease caused by *C. beticola*. Symptoms of the leaf spot disease are characterized by production of small brown spots with circular or irregular margin. Closely situated spots coalesced and formed large necrotic patches. Sometimes symptoms appeared on petiole as brown coloured spots. *C.*

beticola is known to have other alternate hosts. Verma *et al.* (1968) reported the occurrence of *C. beticola* on *Datura fastuosa*, *Trifolium alexandrium*, *Chenopodium urale* and *Amaranthus polygamous*. In order to know the ability of the pathogen to infect and survive on different hosts, the host range study was conducted. Besides environmental conditions, age of the host plant plays an important role on the incidence of a disease. Because at a particular stage of crop growth, plant may be more vulnerable to the attack of the pathogen than the other growth stages. Hence, in the present investigation susceptible stage of the host study was conducted.

Host range studies :

Host range experiment was undertaken with an objective of knowing whether the pathogen can infect any host other than palak. Inoculum suspension containing mycelial bits

were smeared on the plants. Prior to inoculation these plants were predisposed to high humid conditions by keeping in a humidifier for 24 hours. Palak plants were similarly inoculated to serve as control. Regular observations were made for the development of symptoms at every two days. The following hosts were tested in the study:

Common name	Botanical name	Family
Amaranthus	<i>Amaranthus</i> spp.L.	Amaranthaceae
Beet root	<i>Beta vulgaris</i> L.	Chenopodiaceae
Coriander	<i>Coriandrum sativum</i> L.	Apiaceae
Fenugreek	<i>Trigonella foenum graecum</i> L.	Fabaceae
Lettuce	<i>Lactuca sativa</i> L.	Asteraceae

Susceptible stage of the host :

Palak plants of different ages viz., 7, 14, 21, 28, 35, 42, 49, 56, 63, 70 days old were raised in pots under green house conditions prior to inoculation with the pathogen. The plants were predisposed by subjecting to a spray of distilled water and covered with a polythene bag for 24 hours. The mycelial bits from sixteen days old culture were smeared on the leaf surface and suitable control was also maintained by spraying with sterile distilled water to each case. The plants were then covered with polythene bags to provide necessary humidity for 120 hours to ensure successful penetration of the pathogen into the host. The polythene bags were removed and the observations were made regularly for appearance of the symptoms.

After the development of the symptoms on different age groups of plants, the plants were graded by using 0-5 scale and then most susceptible stage was recorded by calculating per cent disease index (PDI) by using formula given by Wheeler (1969).

The findings of the present study as well as relevant discussion have been presented under the following heads :

Symptomatology :

The symptoms of the leaf spot disease are characterized by production of small brown spots on leaves in the beginning, later they turned to dark brown coloured spots with circular or irregular margin. Closely situated spots

coalesced and formed large necrotic patches. Later they became papery thin and spots had straw coloured centre and brown margin. Sometimes symptoms appeared on petiole as brown coloured spots.

Host range of *C. beticola* :

The data presented in Table 1 indicated that two hosts viz., *Amaranthus* sp. and *Beta vulgaris* were infected by *Cercospora beticola* isolated from palak. The symptoms of the disease observed were similar to that of Palak. *Trigonella foenum graecum*, *Lactuca sativa*, *Coriandrum sativum* did not show any infection by *C. beticola*. Symptoms were expressed on *Amaranthus* spp. and *Beta vulgaris* within 7 to 8 days. On *Amaranthus* sp., brown coloured spots with whitish centre were observed. On *Beta vulgaris*, brown coloured spots with circular or irregular margin were formed which enlarged later and coalesced to form large necrotic area. Results indicated that *Beta vulgaris* and *Amaranthus* sp. act as collateral hosts for *C. beticola*.

Susceptible stage of the host for infection :

The data presented in Table 2 indicated that the plant became vulnerable to the infection of *C. beticola*, when it is 28 days old. The results of the experiment indicated that, the plants of all the age group were susceptible to the infection, but there was a progressive decrease in disease severity with

Age of crop	Per cent disease index
7 days	06.63
14 days	10.16
21 days	13.86
28 days	27.24
35 days	22.60
42 days	21.00
49 days	20.40
56 days	12.40
63 days	11.70
70 days	10.50
S.E ±	01.01
C.D. (P=0.01)	02.98
CV (%)	11.19

Common name	Botanical name	Days taken for symptom expression	Symptoms
Amaranthus	<i>Amaranthus</i> sp.	8 days	Brown coloured spots with whitish centre
Fenugreek	<i>Trigonella foenum graecum</i>	--	No infection
Coriander	<i>Coriandrum sativum</i>	--	No infection
Lettuce	<i>Lactuca sativa</i>	--	No infection
Beetroot	<i>Beta vulgaris</i>	7 days	Brown coloured spots with definite margin which later enlarged and coalesced.

the increase in age of the host. The highest per cent disease index was noticed when the crop was 28 days old (27.24) which was significantly superior to all other treatments. Disease severity was minimum when inoculation was done 7 days after planting (DAP) was followed by 70 DAP.

In the present investigation the symptoms of disease are observed initially on lower leaves as small spots either circular or irregular with brown colour or straw coloured centre having definite margin which was often darker in colour than the surrounding tissues. Closely situated spots coalesced and formed large circular or irregular necrotic patches. Later, they become papery thin in the centre. Similar symptoms were also reported on spinach beet infected with *C. beticola* (Gill and Singh, 1962; Dange and Patel, 1968).

In case of host range study, the present investigation indicated that two hosts namely, *Amaranthus* sp. and *Beta vulgaris* were susceptible to *C. beticola* and can be considered as collateral hosts. In absence of palak, pathogen can survive in these two hosts and can act as primary source of inoculum whenever the crop is grown.

It is well known fact that, for a disease to occur in an epiphytotic form, the pathogen should have favourable conditions in which it can gain entry and establish into host successfully. One of these favourable conditions is the age of the host at which it will be most susceptible for the infection. In present study, it was observed that, infection occurred at all the ages of the plants but more per cent disease index was observed in 28 days old plants. As the age of the plants increased the disease severity decreased. It may be due to the presence of some nutrients in the plant which favour the development of the pathogen in seedling stage. These results

are in conformity with the results obtained by Rath and Grewal (1973) and Benagi (1995).

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