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Plant Pathology

Sclerotinia Rot of *Ocimum sanctum* and the Host Range of its Pathogen

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Abstract

Sclerotinia rot of *Ocimum sanctum* caused by *Sclerotinia sclerotiorum* has been recorded for last three years during winter season (2011-2014) at Kalyani, Nadia, West Bengal. The disease appeared in first week of December and progress of the disease continued up to the end of February. Drooping of leaves in one or more young twigs was the first symptom of the disease. Light brown discolouration on the twig and presence of white sclerotia might be associated with the initial symptom. Gradually more and more twigs were affected followed by death and drying of the infected twigs. In humid condition, prominent cottony white mycelia developed on the affected tissue. Towards end of February many plants became dead. Black matured sclerotia were found on the dead branches. On artificial inoculation the causal organism, *Sclerotinia sclerotiorum* infected fifty plants indicating that the pathogen did not have host specificity. But susceptibility of seventeen plants (*Capsicum annum* var. *grossum*, *Trichosanthes dioica*, *Cucurbita pepo*, *Abelmoschus esculentus*, *Raphanus sativus*, *Trigonella foenum-graecum*, *Amaranthus tricolor*, *Portulaca oleracea*, *Pachyrrhizus erosus*, *Ipomoea batatas*, *Lathyrus sativus*, *Ricinus communis*, *Allium sativum*, *Foeniculum vulgare*, *Carica papaya*, *Chrysanthemum indicum*, *Chenopodium album*) is recorded first time in India.

Highlights

- Detailed symptoms of Sclerotinia rot of *Ocimum sanctum* is described first time from India.
- *Sclerotinia sclerotiorum*, the causal pathogen of Sclerotinia rot of *Ocimum sanctum* does not have host specificity.
- Infection of *Sclerotinia sclerotiorum* on the seventeen plants is recorded first time in India.

Keywords: *Ocimum sanctum*, Sclerotinia rot, *Sclerotinia sclerotiorum*, host range

Ocimum is a genus with about 35 species of aromatic annual and perennial herbs and shrubs in the family Lamiaceae, mostly native to the tropical and warm temperate regions of the Old World. *Ocimum sanctum* L. (syn. *Ocimum tenuiflorum* L.), commonly called Holy Basil or Tulsi, is a sacred herb in India. A Hindu house is considered incomplete without the Tulsi plant in the courtyard. Tulsi is belived to promote longevity and lifelong happiness. Tulsi is also cultivated for medicinal purposes and for its essential oil. Tea is frequently

blended with Tulsi leaves. It is widely known across South Asia as a medicinal plant. During last three winter seasons (2011-2014), this plant was found to suffer from a serious disease problem which led to death of many plants in Kalyani, West Bengal. This creates an interest to study the detail symptoms of the disease, identify the pathogen. In addition a study was conducted to know the host range of the causal pathogen.

Materials and Methods

Symptoms of the disease and its gradual development were noted in one plantation at Kalyani, West Bengal. The pathogen was isolated in chloramphenicol amended potato dextrose agar medium (PDA) by placing young sclerotia from diseased plant or surface sterilized infected host tissue. The causal pathogen grew well on PDA.

For pathogenicity test young twigs of tulsi plant were selected. A mycelial strip from four days old culture of the pathogen on PDA was placed at the internode of the selected twig. The mycelial strip was wrapped with thin layer of moist cotton. Water was spread over the entire plant and the inoculated branch was covered with polythene packet to maintain moist condition for three days. After three days polythene cover was removed. Observation was taken on the development of symptoms. The work was done in the month of January. Again the pathogen was isolated from inoculated diseased tissue.

For host range study infected twigs of tulsi plant collected from the infested field. Such twigs were kept in moist condition for 48h in room temperature. Prominent white mycelial growth developed on the infected twigs (Fig.12). Such twigs were used as source of inoculum of the pathogen (*Sclerotinia sclerotiorum* (Lib.) de Bary). Fresh plants, branch or fruits (Table 1) were collected from field and water was spayed before inoculation. Three infected twigs of Tulsi plant (Fig. 12) were tied with cotton thread on the stem, branch or fruit. In case of cabbage and cauliflower, infected twigs were placed at the base of petiole in between two leaves. Inoculated plant materials or inoculated plants were kept within wet polythene bag and observation was taken on development of disease. Field inoculation was done in the same manner.

Results and Discussion

Symptoms of the disease

The incidence of the disease on Tulsi plants was recorded in the same garden for last three years in the winter season during December to February (2011-2014). The disease was also recorded from the district of Birbhum and South 24 Parganas. Fist symptom of the disease appeared in first week of December and continued upto the end of February. Drooping of leaves was found in one or more twigs (Fig. 1, 2). From the beginning white sclerotium was formed on such twigs (Fig. 2). Gradually more and more twigs (Fig. 3, 4) were affected leading to death and drying of the infected twigs. In some affected twigs there was distinct discolouration on the branch (Fig. 3). Thin mycelial growth was found on the affected area. In foggy day, prominent cottony mycelial growth developed on the affected branch (Fig. 5, 6). In January, many young pants died in the garden (Fig. 7, 8). At the end of January most of the branches of large plants dried up (Fig. 6). Ultimately many such infected plants were died at the end of February. From the beginning, white sclerotia were formed on the diseased tissue and with the age sclerotia became black in colour (Fig. 10). Dense fog for consecutive few days, cloudy or rainy environment increased severity of the disease. Spread of the disease became fast leading rapid death of plants. Following such environment in January, 2012, entire plant surface of many plants became covered with white mycelial growth (Fig. 9).

The pathogen

The pathogen produced white mycelium with hyaline, branched and septate hyphae. Black sclerotia near spherical to oval, irregular in shape were formed generally within 4-5 days of incubation at 25°C on PDA medium. The sclerotia were silvery white in the initial stages of development but turned dark with increasing age of the culture (Fig.11). The sclerotia had rough and pitted surface. The pathogen was identified as *Sclerotinia sclerotiorum* (Lib.) de Bary as the cultural characteristics were in conformity with the description of the large sclerotial forms of the fungus (Purdy, 1955, 1979). Pathogenicity test on *Ocimum sanctum* with this culture

Table 1. Host range of *Sclerotinia sclerotiorum*, pathogen of Sclerotinia rot of Tulsi (on artificial inoculation in laboratory and field)

	Common name	*Sc. Name*	*Inoculated part*	*Symptom appeared DAI*	*Extent of development of disease*
1	*Brinjal[F]	*Solanum melongena* L.	Branch	3	++
			Fruit	2	++
2	*Tomato	*Lycopersicon esculentum* Mill.	Branch	5	+
3	*Chilli	*Capsicum annuum* L.	Stem		+
			Friut	2-3	++
4	Bell pepper	*Capsicum annum* var. *grossum* L.	Fruit	3	++
5	*Potato[F]	*Solanum tuberosum* L.	Stem	2	+
6	*Tobacco	*Nicotiana tabacum* L.	Stem	3-4	+
7	*Bottle gourd	*Lagenaria siceraria* Standl.	Vine stem	3	++
8	*Cucumber	*Cucumis sativus* L.	Vine	2	++
9	Pointed gourd	*Trichosanthes dioica* Roxb.	Vine	2	+++
			Fruit	3	+++
10	*Ridge gourd	*Luffa acutangula* Roxb.	Vine	3	+++
			Fruit	3	+++
11	Pumpkin	*Cucurbita pepo* L.	Vine stem	2	+++
12	Bhendi	*Abelmoschus esculentus* Moench.	Stem	2	++
13	*Cabbage[F]	*Brassica oleracea* L. var. *capitata* L.	Whole plant	2	+++
14	*Cauliflower[F]	*Brassica oleracea* L. var. *botrytis* L.	Petiole	2	+++
			Whole plant	4	+++
15	*Broccoli	*Brassica oleracea* L. *var***.** *Italic L.*	Whole plant	2	+
16	*Lettuce	*Lactuca sativa* L.	Whole plant	2	++
17	*Carrot[F]	*Daucus carota* L.	Crown	2	+++
			Root	2	+++
18	Radish	*Raphanus sativus* L.	Crown		+++
19	*Knol –khol	*Brassica oleracea* L. var. *gongylodes*	Crown	2-3	+
20	*Freanch bean[F]	*Phaseolus vulgaris* L.	Stem, fruit	2	+++
21	*Dolichos bean	*Dolichos lablab* L.	Stem	2	++
			Fruit	2	+++
22	*Kidney bean	*Phaseolus vulgaris* L.	Young plant	3	+++
23	Methi sak [F]	*Trigonella foenum-graecum* L.	Whole plant	2	+++
24	Spinach	*Spinacia oleracea* L.	Plant with flower stalk		–
25	*Water spinach[F]	*Ipomoea aquatic* Forssk.	Stem	3	+++
26	Lalsak	*Amaranthus tricolor* L.	Stem	4	+
27	Katowa danta	*Amaranthus* sp.	Stem	2	+++
28	Tak palang	*Portulaca oleracea* L.	Whole plant	2-3	++

29	*Gram[F]	*Cicer arietinum* L.	Stem	2	++
30	* Pea[F]	*Pisum sativum* L.	Stem, Fruit	2	+++
31	Yam bean	*Pachyrrhizus erosus* (L.) Urb.	Vine	2	++
32	Sweet potato	*Ipomoea batatas* (L.) Lam.	Vine	2	+++
33	*Lentil[F]	*Lens esculentum* Moench.	Young plant		
34	Lathyrus	*Lathyrus sativus* L.	Stem	2	+++
35	* Mustard[F]	*Brassica juncea* Coss.	Sak (young plant), stem	2	+++
36	*Sunflower	*Helianthus annuus* L.	Stem	2	+++
37	*Safflower	*Carthamus tinctorius* L.	Young plant	2	++
38	Castor	*Ricinus communis* L.	Branch	3	+++
39	*Onion	*Allium cepa* L.	Young plant	3	+
			Dev. plant	2	+
			Flower stalk	2-3	+
40	Garlic	*Allium sativum* L.	Dev. plant	2	+
41	*Coriander[F]	*Coriandrum sativum* L.	Young plant	2-3	++
42	Fennel	*Foeniculum vulgare* Miller	Stem	3	++
43	Papaya	*Carica papaya* L.	Petiole	2-3	+++
44	Betel vine	*Piper betle* Linn.	Vine stem	3	RS
45	*Lanka jaba[F]	*Malvaviscus arboreus* var. *arboreus* cav.	Branch	4	++
46	*Marigold[F]	*Tagetes erecta* L.	Branch	3	++
47	Chrysanthemum[F]	*Chrysanthemum indicum* L.	Branch	4	++
48	*Daisy[F]	*Bellis perennis* L.	Stem/petiole	2	++
49	*Gerbera[F]	*Gerbera* spp.	Stem/Petiole	2	,++
50	Bathua	*Chenopodium album* L.	Young plant	2	+
51	*Parthenium	*Parthenium hysterophorus* L.	Stem	2	+++

DAI- days after inoculation, [F]Inoculated in the field, *Disease on these host reported earlier from India, + Severity of disease, - No disease, RS Restricted rotted lesion

was successful. Seven days after inoculation discoloured lesion appeared on the inoculated area. In next 3-7 days, portion of the vine above the point of inoculation wilted and dried.

Host range of the pathogen

Forty nine plants showed symptom when inoculated with *Sclerotinia sclerotiorum* in laboratory condition. Spinach (*Spinacia oleracea* L.) did not show any symptom (Table 1), whereas in betelvine, small restricted rotted lesion was developed. Visible symptom appeared at 2-4 days after inoculation and the fungus produced white mycelial growth on the affected tissue. Seventeen plants were inoculated at field condition (marked [F] in Table 1). The pathogen, *Sclerotinia sclerotiorum* successfully produced disease symptoms on the inoculated plants in the field. Twenty two plants showed highly susceptible (+++) reaction under laboratory condition. This result indicates that Tulsi isolate of *Sclerotinia sclerotiorum* is not host specific. Kumar *et al*., (2003) got similar result in a study on host range of *Sclerotinia sclerotiorum* of broccoli. Datta *et al*., (2009) reported severe damage of potato crop by *Sclerotinia sclerotiorum*. But the isolate from Tulsi plant was not so

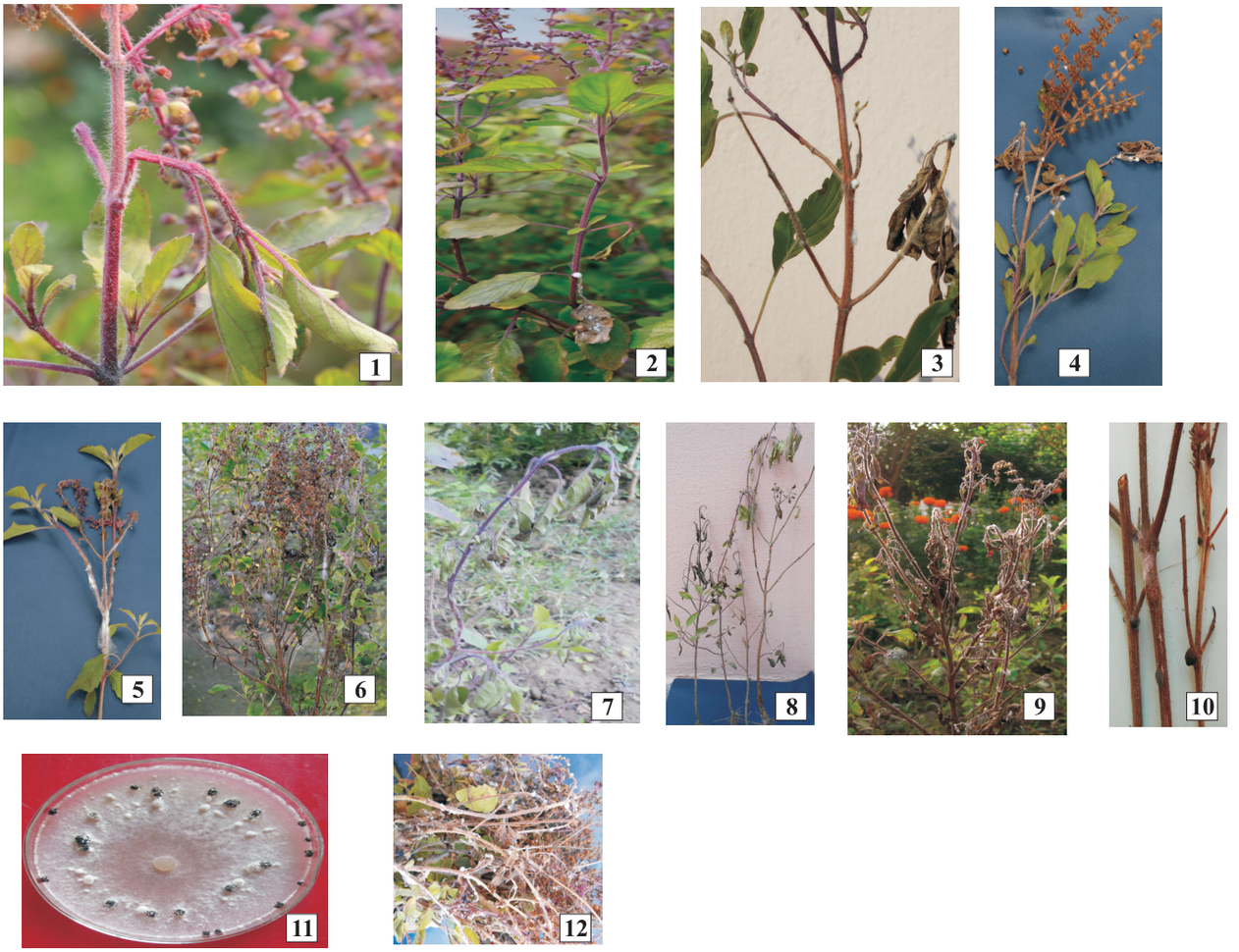

Fig. 1-10. Different stages of development of Sclerotinia rot of Tulsi
1-2. First appearance of disease with drooping of leaves, 3-4. Drying of twigs with white sclerotia; 5. Prominent cottony growth on the infected twig, 6. Drying of many large branches, 7-8. Death of young plants, 9. Entire plant is covered white growth of the pathogen, 10. Sclerotia formed on host, 11. Growth of the pathogen, *Sclerotinia sclerotiorum* **on PDA, 12. Inoculum for artificial inoculation**

virulent on potato. Sclerotinia rot has been recorded on thirty one crop plants (marked * in Table 1) from different parts of India (Hansda *et al*., 2014 and Mondal *et al*., 2012, Saharan and Mehta, 2008). But susceptibility of seventeen plants (*Capsicum annum* var. *grossum*, *Trichosanthes dioica*, *Cucurbita pepo*, *Abelmoschus esculentus*, *Raphanus sativus*, *Trigonella foenum-graecum*, *Amaranthus tricolor*, *Portulaca oleracea*, *Pachyrrhizus erosus*, *Ipomoea batatas*, *Lathyrus sativus*, *Ricinus communis*, *Allium sativum*, *Allium sativum*, *Foeniculum vulgare*, *Carica papaya*, *Chrysanthemum indicum*, *Chenopodium album*) is recorded first time in India. Incidence of Sclerotinia rot is increasing day by day in West Bengal. Susceptibility of wide variety of plants towards *Sclerotinia sclerotiorum* will help in survival of the pathogen in field condition. Sclerotia produced by

this fungus can survive for a long period in soil (Saharan and Mehta, 2008). Due to the soil survival potential of this pathogen, Sclerotinia rot of Tulsi appeared for last three years in winter season in the same garden. Care should be taken to remove and destroy the affected plant immediately after appearance of the disease to reduce the source of inoculum for the next season.

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