

Occurrence of white rot disease of garlic in Himachal Pradesh

MEENU GUPTA and NARENDER K BHARAT*

Department of Vegetable Science, *Department of Seed Science and Technology
Dr YS Parmar University of Horticulture and Forestry
Nauni, Solan 173230 Himachal Pradesh, India
Email for correspondence: meenugupta1@gmail.com

© Society for Advancement of Human and Nature 2017

Received: 4.3.2016/Accepted: 13.7.2016

ABSTRACT

White rot disease was noticed in some garlic fields during routine surveys of garlic growing localities of Solan and Sirmour districts of Himachal Pradesh during 2014-15. Affected plants showed yellowing and wilting of leaves with stunted growth. The affected plants were easily uprooted from the soil. White and fluffy mycelial growth was observed on bulbs and underground stem in affected plants. On the white mycelia mat, small black coloured sclerotia were also seen which were about the size of a poppy seed. Highest disease incidence was recorded at Nauhradhar (27.0%) followed by Lanapalar (25.0%) areas of Sirmour district while minimum incidence was observed at Nauni (2.0%) area of district Solan. The pathogen was isolated in pure culture from infected plant tissue on to potato dextrose agar (PDA) medium. Pathogenicity was proved by artificial inoculation of one month old garlic seedlings grown in pots containing sterilized soil. On the basis of the cultural and morphological characters of the fungus it was identified as *Sclerotium cepivorum* Berk. This probably constitutes the first report of occurrence of white rot of garlic caused by *S cepivorum* in Himachal Pradesh.

Keywords: Garlic; white rot; *Sclerotium cepivorum*; disease; soil

INTRODUCTION

Garlic (*Allium sativum* L) is an important bulbous spice crop grown extensively throughout the world. India ranks second in area (2.45 lakh hectares) and production (12.26 lakh tonnes) next to China. Garlic is the integral component of culinary preparations. In hilly state of Himachal Pradesh this crop occupies an important place in the economy of poor farmers and is cultivated as a cash crop in Sirmour, Solan, Shimla, Kullu and Mandi districts of the state. The crop is attacked by various diseases caused by fungi, bacteria, viruses etc. Stemphylium blight (*Stemphylium vesicarium*), purple blotch (*Alternaria porri*) and rust (*Puccinia allii*) are of common occurrence on garlic (Bharat and Gupta 2011). But during 2014 a new disease causing severe yellowing of foliage was observed in some garlic fields of Solan and Sirmour districts. In the preliminary observations it was suspected to be the attack of white rot disease. Therefore present investigations were undertaken to study the incidence, symptomatology and etiology of the disease in important garlic growing

localities of Solan and Sirmour districts of Himachal Pradesh.

MATERIAL and METHODS

The present studies were undertaken in the Department of Vegetable Science, Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh and various localities of Solan and Sirmour districts during 2014-15. The plants showing typical disease symptoms like severe foliar yellowing as described by Bakonyi et al (2011) were observed in garlic fields and the incidence of the disease was recorded by using the following formula:

$$\text{Disease incidence (\%)} = \frac{\text{Number of infected plants}}{\text{Total number of plants}} \times 100$$

The diseased plants were brought to the laboratory for isolation and identification of the associated fungal pathogen. The fungus was isolated on potato dextrose agar (PDA) medium following

standard procedures. The infected plant tissues were observed under microscope for observations on the morphological characters of the pathogen. The identification of the fungal pathogen was done on the basis of morphological characters as described by Mordue (1976). The pathogenicity tests were conducted by artificially inoculating one month old garlic seedlings in pots using sterilized soil. The inoculated seedlings were observed for typical symptoms of the disease as described by Bakonyi et al (2011).

RESULTS and DISCUSSION

Disease occurrence and symptoms

The disease was observed in all the localities surveyed during the course of present investigations. The data on disease incidence recorded and presented in Fig 1 depict varied incidence of white rot disease at various localities in both the districts. The overall incidence of white rot ranged between 2.0 to 27.0 per cent at different localities in Solan and Sirmour districts. The disease incidence was observed highest (27.0%) at Nauhradhar followed by Lanapalar (25.0%) areas

of Sirmour while minimum incidence of 2.0 per cent was at Nauni (Solan). The disease appeared in pockets within the fields and the scattered patches of diseased plants in affected fields were visible from a distance. Affected plants showed stunted growth along with yellowing and wilting of the older leaves followed by yellowing and wilting of all the aerial parts (Fig 2a). On closer examination of the affected plants white fluffy mycelial growth was evident at base of leaf sheath at ground level and such plants could be uprooted easily. The uprooted infected plants showed white mycelial mat on the bulbs, base of the stems and roots. On the white fungal mycelial mat black sclerotia about the size of a poppy seed of 200-500 μm in diameter were also found embedded (Fig 2b). In most of the affected bulbs black sclerotic crusts were formed. The disease symptoms observed under present investigations were similar as described by Bakonyi et al (2011), Crowe et al (1980) and Crowe (2008) on white rot of garlic.

Etiology and pathogenicity test

The colonies were white on PDA. The mycelium was hyaline, branched and septate. Small

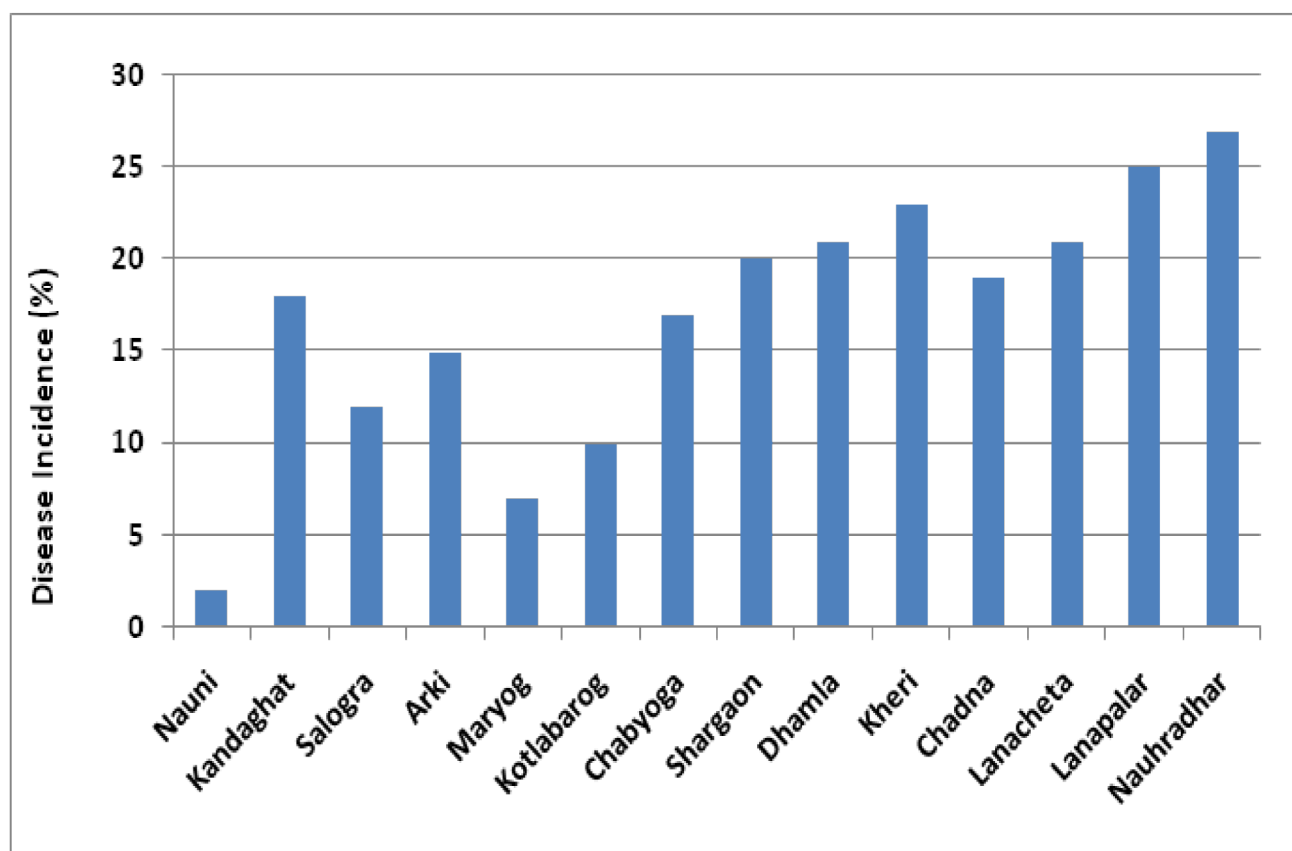


Fig 1. Incidence of white rot on garlic crop growing at different localities in Solan and Sirmour districts of Himachal Pradesh

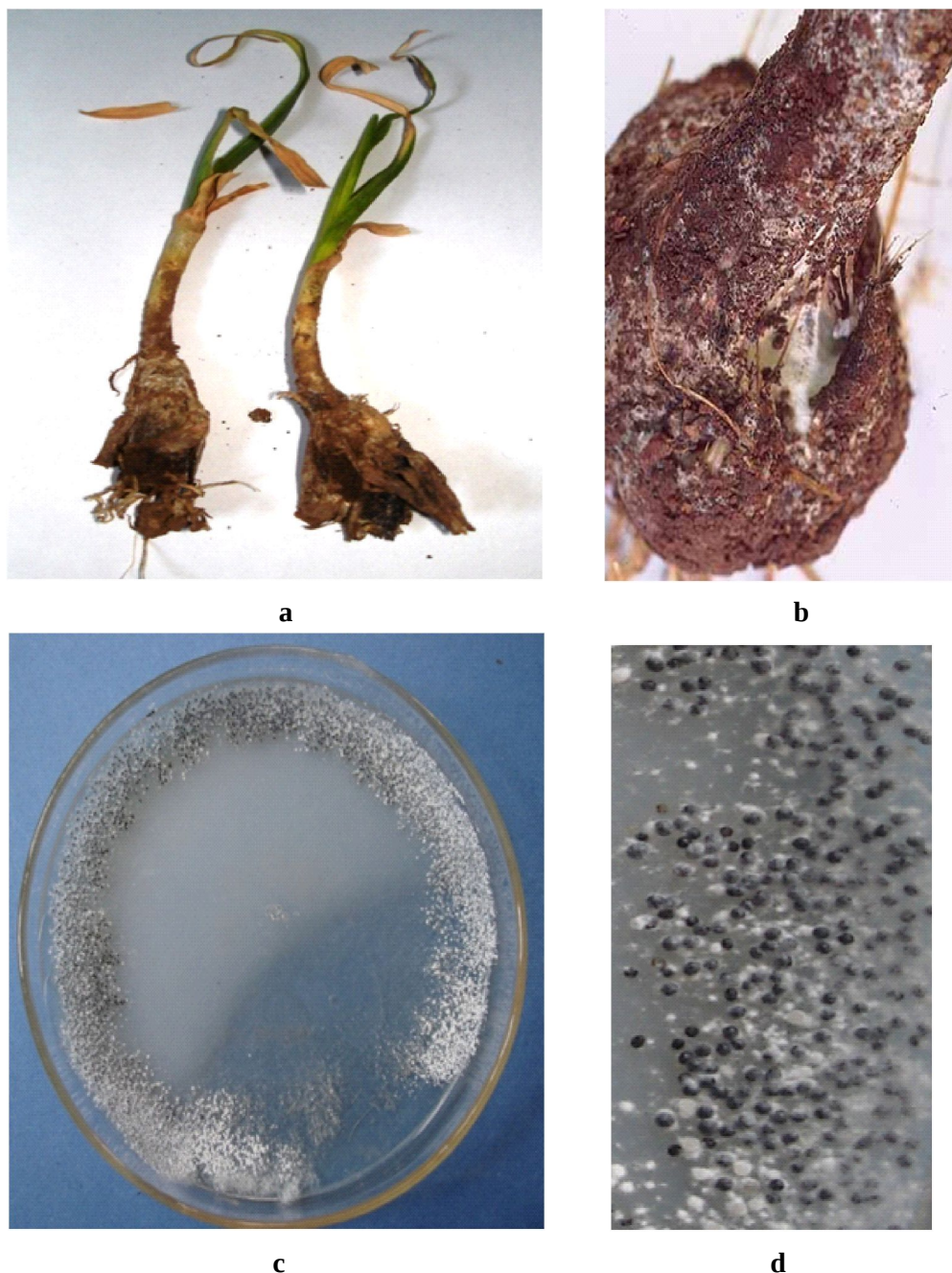


Fig 2. a) White rot symptoms on garlic plant, b) White rot symptoms on garlic bulb, c & d) Fungus culture having mycelia and sclerotia on PDA medium

black coloured sclerotia appeared on sides of the Petri plates after few days (Figs 2c and 2d). While testing the pathogenicity of the fungus by artificial inoculation of the garlic plants the disease symptoms appeared within three weeks of inoculation. The un-inoculated (control) plants did not show such symptoms.

On the basis of the morphological characters and pathogenicity test of the fungus and their analogy with that of described by Mordue (1976) and Bakonyi

et al (2011) it was identified as *Sclerotium cepivorum* Berk. The fungus *S cepivorum* has been reported as causal agent of white rot of *Allium* species in most of the garlic producing countries in Europe, Africa, Asia, Australia, North America and South America (Anon 1990, Crowe 2008, Bakonyi et al 2011). This probably constitutes the first report of *S cepivorum* infecting garlic in Himachal Pradesh, India. The pathogen has been reported to cause losses up to 100 per cent under severely infested soil (Ulacio-Orsorio et al 2006). White

rot outbreaks could also occur in fields that were not planted with susceptible hosts for many years and such outbreaks have been attributed to the long term survival of the sclerotia of the fungus (Coley-Smith et al 1990). Due to this characteristic white rot is considered as one of the most economically important and limiting diseases of garlic. Sclerotia are the major sources of primary inoculum (McLean et al 2005). Under present investigations also there was profuse formation of the sclerotia on affected bulbs. Such affected bulbs if used for plantation can spread the disease to new and unaffected areas. Therefore investigations on management aspect of the disease are urgently needed.

REFERENCES

- Anonymous 1990. *Sclerotium cepivorum*. Distribution Maps of Plant Diseases, 5th edn, CAB International, Wallingford, UK, pp 331.
- Bakonyi J, Vajna L, Szeredi A, Tímar E, Kovacs GM, Csosz M and Varga A 2011. First report of *Sclerotium cepivorum* causing white rot of garlic in Hungary. New Disease Reports **23**: 5.
- Bharat NK and Gupta SK 2011. Outbreak of garlic rust in Shimla district of Himachal Pradesh. Journal of Mycology and Plant Pathology **41(1)**: 132-133.
- Coley-Smith JR, Mitchell CM and Sansford CE 1990. Long-term survival of sclerotia of *Sclerotium cepivorum* and *Stromatinia gladioli*. Plant Pathology **39(1)**: 58-69.
- Crowe FJ 2008. White rot. In: Compendium of onion and garlic diseases and pests (HF Schwartz and SK Mohan eds), 2nd edn, The American Phytopathological Society, Minnesota, USA, pp 22-26.
- Crowe FJ, Hall DH, Greathead AS and Baghott KG 1980. Inoculum density of *Sclerotium cepivorum* and the incidence of white rot of onion and garlic. Phytopathology **70**: 64-69.
- McLean KL, Harper GE, Frampton CM and Stewart A 2005. Dormancy of *Sclerotium cepivorum* sclerotia in New Zealand soils. Proceedings, Conference on New Zealand Plant Protection, Wellington, New Zealand, 9-11 August 2005, **58**: 245-250.
- Mordue JEM 1976. *Sclerotium cepivorum*. CMI Descriptions of Pathogenic Fungi and Bacteria, Vol 512, Commonwealth Mycological Institute, Kew, Surrey, UK.
- Ulacio-Osorio D, Zavaleta-Mejia E, Martinez-Garza A and Pedroza-Sandoval A 2006. Strategies for management of *Sclerotium cepivorum* Berk in garlic. Journal of Plant Pathology **88**: 253-261.