

INTERNATIONAL JOURNAL OF AGRICULTURAL INNOVATION IN ECOLOGY AND AGROTECHNOLOGY



Publisher

EcoAgroTex Research Journals



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<https://ecoagrotex.com/index.php/jaiea>

ISSN: 3143-6730

In Manipur, onion species are screened for the white rot disease caused by *Sclerotium rolfsii* Sacc.

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Research Article

Date of Submission: 10-02-2026

Date of Acceptance: 05-05-2026

Date of Publication: 02-06-2026

Abstract

Onion cultivations at many small-scale onion producing places in Manipur have been severely damaged by white rot caused by *Sclerotium rolfsii*. In all onion species, April had the highest incidence of white rot disease, whereas February had the lowest. For the first three months after planting, the disease's symptoms were not noticeable. During the second week of February, yellowing of the leaves began at the tips and progressively spread downward, indicating the presence of white rot. The illness became most noticeable during the final week of March and the first week of April, when the onion plant began to wilt and collapse and the basal portion of the stem began to rot and droop. The pathogen's symptoms, such as sclerotia and white mycelium, are present in the decomposing bulbs of infected plants.

Key words: *Sclerotium rolfsii*, white rot, illness incidence, signs, and symptoms.

Introduction

Allium cepa L., or onions, are a significant vegetable crop utilised for both medicinal and spice reasons. It belongs to the Amaryllidaceae family. According to Selvaraj (1976), Fahima et al. (2019), and Sethupathi & Paramasivan (2019), it is referred to as the queen of the kitchen. One of the major fungal diseases affecting onions in Manipur is white rot. At some onion-growing locations in Manipur, it has destroyed onion crop. It is one of the most damaging fungal infections, resulting in significant losses and significantly lowering the potential yield of onions (Amin et al. 2014). *Sclerotium cepivorum* Berk is the cause of white rot disease. is very damaging to *Allium* crops, including as onion, leek, Welsh onion, shallot, and garlic. The fungus attacks the plant at any stage of the crop and often appears as bulb rot after harvest. It also spreads to sick bulbs or seedlings (Walker 1924). White rot on shallots, garlic, and onions causes the roots to die and the scale to deteriorate semi-watery, which is linked to the fungus's white, fluffy mycelium growing superficially (Tims 1948). Worldwide, it has an impact on allium crops (Entwistle 1990). Before the fungus invades the plant's bulb and causes semi-watery rot, which is followed by yellowing of the leaves, dieback, and wilting, foliage symptoms are not noticeable. The fungus appears as a surface white, fluffy mycelium with sclerotia, and the bulb turns watery squishy. It is simple to remove the infected plant from the ground (Sammour et al. 2011). *Sclerotium rolfsii* Sacc is the cause of onion white rot in Manipur. The fungus affects about 500 plant species, including weeds and economically significant crops (Aycock 1966). There have also been reports of *S. rolfsii*-caused onion white rot in Luknow and Rajasthan, among other regions of India (Mukherji & Tewari 1969; Mathur & Sharma 2002; Konjengbam & Devi 2020). The fungus may live in a variety of environments, although it prefers acidic soil. Sclerotia, the fungus's overwintering structures, serve as a major source of inoculums. In contaminated plant tissues and plant waste, the fungus also endures as mycelium. Two significant factors that affected *S. rolfsii*'s ability to survive in the field were

temperature and moisture (Beute & Rodriguez-Kabana 1981). Rain, irrigation water, wind, vegetative propagation materials, contaminated equipment, infected soil, and other factors may spread sclerotia (Kator et al. 2015). Both the host and volatile chemical substances produced by decomposing plant pieces promote sclerotia germination (Punja 1985). Onion farming in Manipur has been devastated by white rot. The disease first appeared late in the growing season, close to harvest time, and by then the bulbs were severely damaged, with white cottony mycelial growth and fungal sclerotia. Furthermore, comprehensive and detailed information regarding the illness is currently unavailable. As a result, studies were conducted to assess Manipur's frequently grown onion species' resistance to *Sclerotium rolfsii* Sacc-caused white rot.

Materials and Methods

Isolation and identification of the pathogen

Onion bulbs with diseases that were grown at the experimental location during the previous crop season were gathered. Potato dextrose agar medium (PDA) was infected with white, fluffy mycelium from the bulbs' basal plate, and it was cultured for four days at $28 \pm 10^\circ\text{C}$. Throughout the course of the study, the pathogen was preserved for identification by comparison with pertinent monographs after being purified using the hyphal tip cut procedure and re-isolated on PDA.

Planting materials

In order to test for white rot, commonly grown onion species were gathered. We bought seeds from the store for two types of *Allium cepa* L., often known as bulb onions: Prema and Nasik Red N-53. Small-scale commercial onion producers also provided bulbs of one local cultivar of common onion (small bulb size), multiplier or potato onion, *Allium cepa* L. var. *aggregatum*, spring or bunching onion, *Allium fistulosum* L., and shallot, *Allium cepa* L. var. *ascalonicum*.

Assessment of onion species against white rot under field condition

The current study was conducted at the Central Agricultural University's College of Agriculture in Imphal, India. Imphal has a subtropical climate. The experimental site's soil has an acidic pH of 5.6 to 5.8 and a clayey texture. The study used a randomised block design with three replications on a $2\text{ m} \times 1.5\text{ m}$ plot with $10\text{ cm} \times 10\text{ cm}$ spacing. A single plot may hold 266 plants. Prema and Nasik Red were grown from seeds, and during the second week of December, 45-day-old seedlings were moved for screening. On the same day that the seedlings of Prema and Nasik Red were transplanted, bulbs were employed for propagation in the case of common onion local cultivar, multiplier onion, spring onion, and shallot for screening against white rot. In a field that was already afflicted with the pathogen, the onions were grown consistently by following the necessary cultural methods under natural epiphytotic conditions. Before harvesting, the crops were monitored for disease intensity from February to April. The following formula was used to get the percentage of illness intensity.

Per cent disease incidence Results and Discussions

Based on physical traits and taxonomic keys found in the literature, the isolated fungus was recognised as *Sclerotium rolfsii* Saccardo (Saccardo 1913; Mordue 1974). In 2014–15 and 2015–16, spring onions had the greatest prevalence of white rot disease (62.61% and 63.22%), followed by shallots (61.50% and 63.03%) and multiplier onions (59.88% and 60.66%). Prema had the lowest incidence of white rot (48.43% and 50.14%), followed by Nasik Red (52.52% and 54.88%) and the local cultivar (53.19 and 54.98%). February had the lowest illness incidence (43.35%). All onion species evaluated for white rot showed the highest disease prevalence in April (72.13%). As the weather increased and became warmer in March and April, the sickness spread quickly.

$$= \frac{\text{Total number of diseased plants}}{\text{Total number of healthy plants}} \times 100$$

The white rot disease incidence in all the onion species tested increased more rapidly in April after the onset of rainfall.

Table 1. Meteriological data of the cropping season

Month	Rainfall (mm)	Mean relative humidity(%)		Mean air temperature (°C)		Mean daily bright sunshine (hours)
		Morning	Evening	Maximum	Minimum	
November	0.0	85.2	53.8	28.0	11.6	8.0
December	0.0	89.3	56.4	23.5	6.3	6.9
January	1.5	87.2	51.0	22.7	7.5	7.5
February	0.6	85.6	43.7	24.7	6.6	6.8
March	0.7	77.7	42.5	28.5	11.0	7.0
April	7.1	86.6	63.2	26.4	16.0	3.5

*Weather data from ICAR, Imphal, Manipur

Table 2. Meteorological data of the cropping season

Month	Rainfall (mm)	Mean relative humidity (%)		Mean air temperature (°C)		Mean daily bright sunshine (hours)
		Morning	Evening	Maximum	Minimum	
November	0.4	89.3	55.6	25.6	11.4	7.7
December	0.0	90.8	55.4	21.7	5.8	5.3
January	0.3	91.1	47.8	22.1	4.6	6.6
February	1.2	88.2	48.5	25.1	9.6	6.1
March	2.2	88.1	48.6	27.6	12.6	6.7
April	7.2	85.7	65.1	28.4	17.1	5.8

*ICAR, Imphal, Manipur weather data In the second week of February, the disease's symptoms were apparent in every species that had been checked for white rot. The first signs were yellowing and drying of the tops of the leaves, which later spread downward to cause blighting (Mathur & Sharma 2002). The last week of March marked the beginning of the disease's symptoms. Following showers in April, the disease's

symptoms peaked. The plants wilted, drooped, and the diseased bulbs became mushy, watery, and deteriorated as the leaf sheath and basal portion of the stem began to rot. The pathogen's indicators, such as fungal white mycelial development and sclerotia strewn about the rotten bulbs and basal portion of the stem, also accompany these symptoms (Mukherji and Tewari, 1969). According to Utkhede and Rahe (1978), every one of the 64 common and bunching onion cultivars that were examined for white rot had the disease and were not immune. Significant variations in sensitivity to *S. cepivorum* Berk were also noted by Utkhede and Rahe (1980). In every onion cultivar that was examined for white rot resistance. When Utkhede and Rahe (1984) screened five seed batches and the self- and open-pollinated offspring of the cultivar Ailsa Craig, they found variations in white rot infection. According to Hovius and Goldman (2004), eight long-day onion breeding lines and hybrids that were screened for white rot under both field and greenhouse conditions were all impacted by the disease. The disease incidence of white rot in all of the onion lines and hybrids tested ranged from 0.3% to 100% under field conditions and from 0.4% to 54.7% under greenhouse conditions. According to El-Nagar et al. (2013), *S. rolfsii* exhibited a high level of pathogenicity on onions.

able 3. Disease intensity of white rot on onion species

Serial number	Varieties/ Cultivars	Per cent disease incidence			Mean
		February	March	April	
1	Prema	38.00	47.50	59.80	48.43
2	Nasik Red	40.20	53.35	64.00	52.52
3	Local cultivar	39.67	54.77	65.14	53.19
4	Multiplier	40.15	61.25	78.25	59.88
5	Spring	44.97	63.00	79.85	62.61
6	Shallot	41.54	62.95	80.00	61.50
Mean		34.93	48.97	60.99	
SE(d)		5.51			
CD(5%)		12.01			

Table 4. Disease intensity of white rot on onion species

Serial number	Varieties/ Cultivars	Per cent disease incidence			Mean
		February	March	April	
1	Prema	40.00	50.30	60.10	50.13
2	Nasik Red	43.35	55.15	66.15	54.88
3	Local cultivar	42.50	55.75	66.70	54.98
4	Multiplier	44.15	60.78	77.05	60.66
5	Spring	45.90	62.68	81.05	63.22
6	Shallot	44.25	63.05	81.78	63.03
Mean		43.35	57.95	72.13	

SE(d)	5.21
CD	11.36
(5%)	

According to Punja (1985), warm temperatures and damp circumstances promote *S. rolfsii* mycelial growth, sclerotia formation, and germination, which in turn enhances disease progression and raises disease incidence. According to Crowe and Hall (1980), when moist soil is combined with rising temperatures between 6 and 24°C, disease development proceeds more quickly. According to Mukherji and Tewari (1969), following rains, *S. rolfsii*-caused onion white rot became severe in Lucknow and nearby places. According to Pawar & Chavan (2015), *S. rolfsii*-caused southern blight and onion bulb decay advanced quickly in Maharashtra as a result of an increase in relative humidity and a drop in temperature brought on by unseasonal heavy rainfall and hailstorms. The potential of *S. rolfsii* to survive and grow on harvested infected host tissues was also seen throughout the study period when healthy-looking harvested onion bulbs left in storage rooms developed white rot. Therefore, further study is seen to be essential to comprehending the pathogen's ability to survive.

References

- Selvaraj T, Shiberu T, and Amin M. (2014). In Ethiopia, white rot (*Sclerotium cepivorum* Berk) is a severe pest of garlic and onions. *Agricultural Biotechnology and Sustainable Development Journal*, 6(1): 6-15. doi: 10.5897/JABSD2013.0210.
- R. Aycock, 1966. *Sclerotium rolfsii*-related illnesses, including stem rot. North Carolina State University Technical Bulletin, 174: 202.
- Rodriguez-Kabana R. and Beute K. 1981. *Sclerotium rolfsii* survivability in Alabama and North Carolina is influenced by temperature, field conditions, and soil moisture. *Phytopathology*, 71:1293–1296.
- Hall DH & Crowe FJ. 1980. *Sclerotium* germination and *Sclerotium cepivorum* infection of onion seedlings are influenced by soil temperature and moisture. *Phytopathology*, 70:64-69.
- Yassin MA, El-Nagar AAA, and Sabry AMB. 2013. *Sclerotium rolfsii* and *S. cepivorum* virulence and host range. 7(3):1693-1705, *Journal of Pure and Applied Microbiology*.
- 1990; Entwistle AR. The management of aluminium white rot. *Manage Soil Use*, 6: 201-209.
- Lakshmanan V, Venkatesan K, Paramaguru P, and Fahima FA. 2019. Genotypes of aggregatum onions (*Allium cepa* L. var. aggregatum Don.) are evaluated for quality and yield characteristics. *Agriculture and Ecology Journal*, 8: 75-83.
- Goldman IL & Hovius MHY. 2004. Using laboratory and greenhouse methods, long-day onions are evaluated for their resistance to white rot infection. *American Society for Horticultural Science Journal*, 129(2), 258-265. 10.21273/JASHS.129.2.0258 is the doi.
- Hosea ZY, Oche OD, and Kator L. 2015. White mould, stem rot, southern blight, and sclerotia rot are all caused by *Sclerotium rolfsii*. *Biological Research Annals*, 6(11): 78-89.
- Devi RT and Konjengbam R. 2020. The cost-benefit ratio of fungicide, botanicals, and bio-control agents for managing onion white rot in Manipur caused by *Sclerotium rolfsii* Sacc. *Agriculture and Ecology Journal*, 10: 83-89.
- In 2011, Kwon JH, Kim HD, Choi O, Kwak YS, Lee YH, and Shim HS. *Sclerotium rolfsii* Causes Onion Sclerotium Rot. *Research in Plant Disease*, 17(2):222-224. 10.5423/RPD.2011.17.2.222 is the doi.
- Sharma SN and Mathur K. 2002. *Sclerotium rolfsii*-induced onion bulb rot is a new hazard to Rajasthani onion farming. *Mycology and Plant Pathology Journal*, 32(1), 132-133.
- JEM Mordue. 1974. *Rolfs of Sclerotiumii*. CMI descriptions of microbes and fungi that cause harm. No. 410, Commonwealth Mycological Institute, Kew, Surrey, England.
- Tewari JP & Mukerji KJ. 1969. Onion white rot in Lucknow. *Articles & News Summaries on Pests*, 15(2), 235-236. 10.1080/04345546909415124 is the doi.
- Chavan AM & Pawar SB. 2015. Unseasonal rain and hailstorms' effects on onion (*Allium cepa* L.) deterioration. 7(4):14935-14938, *International Journal of Current Research*.
- Z K Punja. 1985. *Sclerotium*

rolfs biology, ecology, and managementii. *Phytopathology Annual Review*, 23: 97-127. Saccardo PA, 1913. *Sclerotium rolfsii*. *Sylloge Fungorum XXII*. Pavia, Italy, pages. 1500. Alhozeim R, Mahmoud YAG, Mustafa AA, and Ammour RH. 2010. The biology, regulation, and genetic diversity of *Sclerotium cepivorum* Berk, the pathogen that causes *Allium* White Rot. *Microbiology Current Trends*, 7(11): 101-110.

Selvaraj S. (1976). The queen of the kitchen is the onion. *Kishan World*, 3(12): 32-34. Paramasivan M. and Sethupathi S. 2019. Zinc and boron's effects on onion (*Allium cepa* L.) production and quality in Tamirabarni tract alfisols. *Agriculture and Ecology Journal*, 7: 96-102. Tims EC. 1948. white shallot rot. 38: 378-394; *Phytopathology*.

Rahe JE & Utkhede RS. 1978. checking commercial onion varieties for white rot resistance. 68: 1080-1083; *Phytopathology*. Rahe JE & Utkhede RS. 1980. cultivar resistance to onion white rot that is stable. *Journal of Plant Pathology in Canada*, 2: 19–22.

Rahe JE & Utkhede RS. 1984. Bulb onion seed lots are resistant to white rot diseases. Walker JC, *Scientia Horticulturae*, 22(4), 315-320, 1924. *Allium* white rot in America and Europe. *Phytopathology*, 14 (7), 315-322.