



AGRI MAGAZINE

(International E-Magazine for Agricultural Articles)

Volume: 03, Issue: 08 (August, 2026)

Available online at <http://www.agrimagazine.in>

© Agri Magazine, ISSN: 3048-8656

Southern Rice Black-Streaked Dwarf Virus: An Emerging Threat to Rice in North India

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Southern Rice Black-Streaked Dwarf Virus (SRBSDV) is a planthopper-transmitted rice virus that appeared for the first time in India in the kharif season of 2022, causing widespread dwarfing of paddy in Punjab and Haryana. The disease resurfaced with similar intensity in 2025, once again drawing attention of scientists, farmers and the media. This article traces the first appearance of SRBSDV in North India, its symptoms and yield losses, the media and scientific reports documenting the outbreaks, and the vector-based management strategies recommended by agricultural universities to reduce future crop losses.

Introduction

Rice is a staple food and a major economic crop of North India, with Punjab and Haryana together contributing a large share of the rice procured for the national foodgrain pool. In August 2022, farmers across several districts of Punjab and Haryana began noticing an unusual and hitherto unrecorded problem: patches of paddy in their fields remained severely stunted, with narrow, stiff, dark green leaves and shallow roots, while surrounding plants grew normally. Because the cause was unknown at the time, the problem was widely referred to in the press and among farmers as a "mystery dwarfing disease" of paddy. Scientists at Punjab Agricultural University (PAU), Ludhiana, and the Indian Agricultural Research Institute (IARI), New Delhi, investigated the affected fields and confirmed that the disorder was caused by Southern Rice Black-Streaked Dwarf Virus (SRBSDV), a Fijivirus of the family Reoviridae transmitted by the white-backed planthopper (WBPH), *Sogatella furcifera*. This was the first confirmed report of SRBSDV in India; the virus had previously been known only from China, Vietnam and Japan, where it had caused serious rice losses since it was first detected in Guangdong Province, China, in 2001 and formally characterized in 2008.

First Appearance and Recurrence in North India

The 2022 outbreak was concentrated in the paddy belt of Punjab, particularly in early-transplanted fields, and was also reported from parts of Haryana, together accounting for roughly one-sixth of India's total rice production. News reports at the time noted that infection levels in badly affected fields ranged from about 30 to 40 percent on average, with pockets showing infection as high as 50 percent, forcing many farmers to uproot and replant affected patches wherever nursery stock and time permitted. After the initial 2022 outbreak, the disease was largely absent for two subsequent seasons before reappearing in the 2025 kharif season across roughly eight districts of Punjab. PAU scientists studying the recurrence noted that the weather pattern of 2025, marked by overcast skies, high humidity and rainfall and daylight conditions similar to 2022, closely mirrored the conditions that had favoured the earlier outbreak, pointing to a climatic link in the resurgence of the disease and its planthopper vector. The repeated appearance of SRBSDV in successive years since 2022, along with its detection in weed hosts surrounding paddy fields, indicates that the virus and

its vector may now be establishing a recurring presence in the rice ecosystem of North India rather than remaining a one-time incursion.

Symptoms of the Disease

Infected plants show pronounced dwarfing, with plant height reduced to about one-half or even one-third of that of healthy plants, along with dark green, stiffened and narrow leaves that often have twisted or ragged tips. Roots of infected plants remain shallow and poorly developed, so affected hills can be uprooted easily by hand. Excessive unproductive tillering is common, and at later growth stages nodes may show small white or blackish waxy swellings along the stem, sometimes accompanied by aerial rootlets. Plants infected early, at the seedling or early tillering stage, generally fail to produce panicles or set grain, while those infected later may produce panicles with poor exertion and a high proportion of chaffy grains. Because these symptoms can resemble zinc deficiency or other nutrient disorders, agricultural scientists have cautioned farmers against self-diagnosis and advised confirmation through extension services before taking any control measures.

Extent of Losses

Yield losses from SRBSDV depend heavily on the crop stage at infection, being most severe when planthoppers colonize young seedlings in the nursery or shortly after transplanting. Global experience from China and Vietnam has shown that severe SRBSDV epidemics can reduce rice yields by 30 to 50 percent over large areas. In the Punjab outbreaks, normal paddy yields of around 30 to 32 quintals per acre fell to as little as one or two quintals per acre in the worst-affected fields, effectively resulting in near-total crop failure in those patches. Because visible symptoms typically appear only about a month after transplanting, by which time re-transplanting fresh seedlings is often no longer feasible, affected farmers have repeatedly sought crop-loss assessment (girdawari) and compensation from the state government, underlining the significant economic distress caused by the disease.

Causal Virus and Its Transmission

SRBSDV possesses a genome of ten linear double-stranded RNA segments and is transmitted exclusively by the white-backed planthopper in a persistent, circulative and propagative manner, meaning the virus multiplies within the insect vector and, once acquired, the vector remains infective for life. The virus is not transmitted through rice seed. Besides rice, SRBSDV can infect maize and several grassy weed species growing along field bunds and irrigation channels, which act as alternate hosts and a source of re-infection between seasons. Long-distance dispersal of viruliferous planthoppers on seasonal winds is believed to be responsible for introducing the virus into new areas, including its likely entry into North India.

Management Strategies

Because there is no curative treatment once a plant is infected, management of SRBSDV depends almost entirely on preventing and reducing the vector population before and during the vulnerable seedling and early-tillering stages. Agricultural universities recommend that farmers avoid unnecessarily early nursery sowing and adhere to the recommended transplanting window, generally between mid to late June in Punjab, since crops transplanted after this period have shown consistently lower disease incidence. Regular monitoring of nurseries and young transplanted fields for white-backed planthopper populations is essential; farmers are advised to gently tap plants near the base to dislodge nymphs and adults for easy detection. Where planthoppers are detected, need-based application of insecticides recommended by the state agricultural university, such as pymetrozine, dinotefuran, triflumezopyrim and related molecules, applied at the plant base with proper spray volume and nozzle type, has been advised in place of routine calendar-based spraying, to avoid promoting insecticide resistance and harming natural enemies. Maintaining weed-free bunds and channels around paddy fields reduces the alternate host reservoir for both the virus and its vector. Farmers are also advised against sourcing seedlings from fields that showed

symptoms in the previous season and to promptly report suspected cases to the nearest Krishi Vigyan Kendra for confirmation and guidance, since prompt, accurate diagnosis prevents both unnecessary panic and delayed action. Continued varietal screening and breeding for tolerance, along with coordinated regional surveillance of planthopper migration, are being pursued by researchers as longer-term components of an integrated management strategy.

Conclusion

The emergence of Southern Rice Black-Streaked Dwarf Virus in Punjab and Haryana since 2022, and its recurrence in 2025, marks the arrival of a serious new viral threat to rice cultivation in North India, one capable of causing near-total crop failure in severely affected fields when infection occurs at the seedling stage. As there is no direct cure once infection sets in, the future course of this disease will be decided largely by how effectively farmers, scientists and extension agencies work together on prevention: timely transplanting, vigilant monitoring of the white-backed planthopper, judicious and recommended insecticide use, weed management, and rapid reporting of suspected cases. Sustained surveillance linking weather patterns, vector migration and disease incidence, together with the development of tolerant rice varieties, will be essential to keep SRBSDV from becoming a recurring annual menace to the food security and livelihoods of rice farmers in the region.

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