

Healthy Millets, Healthy Future: The Role of Plant Pathology in India's Shree Anna Revolution

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Beyond nutrition and climate resilience, the future of millets also depends on keeping the crop healthy from seed to harvest

India is rediscovering something it never truly lost. Across drylands, tribal regions and traditional farming communities, millets have been cultivated and consumed for centuries. Once pushed to the margins by the dominance of rice and wheat, these hardy grains are now returning to the centre of conversations on nutrition, climate resilience, sustainable agriculture and farmer livelihoods. The revival has given millets a new identity—"Shree Anna". But there is another story that deserves equal attention: the story of the health of the millet plant itself. Millets may tolerate difficult production environments better than many conventional cereals, but they are not immune to diseases. This is where plant pathology enters the Shree Anna story.

The Shree Anna renaissance

The renewed interest in millets is much more than a change in food preference. Millets are being positioned as crops that can contribute to nutritional security, diversified farming systems, climate resilience and rural enterprise development. ICAR–Indian Institute of Millets Research continues to work on crop improvement, climate-resilient technologies, seed systems, post-harvest management, value addition and millet-based enterprises. This is an important shift. The future of millets is no longer simply "grow a traditional crop". It is becoming "build a complete millet ecosystem". And every successful crop ecosystem begins with a healthy plant.

Climate resilience does not mean disease immunity

Millets are often described as climate-resilient crops. That description has merit—but it can easily be misunderstood. A crop that performs reasonably well under drought or low-input conditions can still be affected by pathogens, pests and diseases. Changes in temperature, rainfall, relative humidity and extreme weather can influence pathogen survival, reproduction, geographic distribution, host susceptibility and disease severity. Future millet resilience therefore needs to include both abiotic-stress tolerance and the capacity to withstand important biotic stresses.

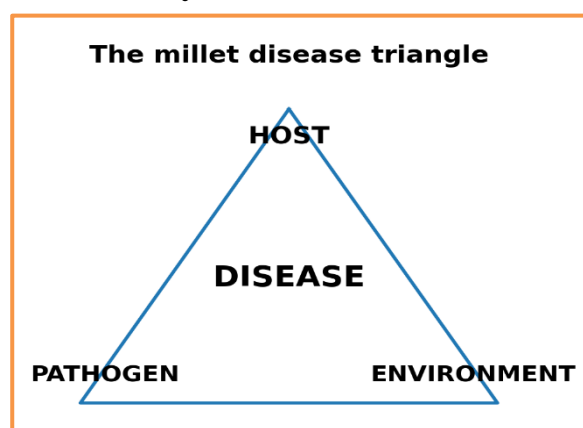


Figure 1. The millet disease triangle: host, pathogen and environment interact to determine disease development

The invisible battle in a millet field

A farmer sees a crop waving in the field. A plant pathologist sees something more: early lesions, possible sources of inoculum, weather conditions favouring infection and the interaction between the crop genotype and a pathogen. By the time symptoms become obvious, a disease may already be established. This is why plant pathology is not simply about identifying a disease after it appears. It is about understanding the interaction among the host, pathogen and environment and using that knowledge to prevent or manage economically important disease.

Millets have their own disease story

Different millet crops have different disease profiles. Pearl millet can be affected by downy mildew, blast, rust, smut and ergot. Finger millet is particularly associated with blast, which can affect leaves, necks and fingers. Sorghum can encounter anthracnose, grain mould, rust, downy mildew and smuts. Small millets also face crop-specific disease and biotic-stress challenges. The practical lesson is important: there is no single “millet disease management package”. Management needs to be crop-, variety-, pathogen- and location-specific.

Millet crop	Important disease examples	Pathology focus
Pearl millet	Downy mildew, blast, rust, smut, ergot	Resistance, surveillance and integrated management
Finger millet	Blast	Leaf, neck and finger infection; resistant genotypes
Sorghum	Anthracnose, grain mould, rust, downy mildew, smuts	Field management and grain quality
Small millets	Crop-specific fungal and other biotic stresses	Diagnosis, surveillance and stress-resilient varieties

The climate–disease connection

Imagine two seasons. In the first, rainfall is limited and the crop experiences dry conditions. In the second, intermittent rainfall is followed by warm, humid weather. The same millet variety may experience very different disease pressure in these two environments. This is why climate information can become a valuable component of plant disease management. Instead of waiting for farmers to see symptoms, future disease management can increasingly combine weather information, field observations, pathogen surveillance and crop resistance to provide earlier warnings.

From looking at symptoms to reading the pathogen

Traditional plant pathology often begins with a simple question: “What disease is this?” Modern plant pathology increasingly asks which pathogen or strain is involved, how it interacts with the host and under what environmental conditions the disease will develop. Molecular diagnostics, genomics, phenotyping and multi-omics can help researchers understand resistance mechanisms and pathogen diversity. For millet improvement, the long-term opportunity is to combine better disease resistance with a deeper understanding of the biology behind that resistance.

The new plant pathologist: from diagnosis to prediction

Plant pathology is becoming increasingly digital. Artificial intelligence, image recognition, remote sensing and predictive modelling are being explored for crop protection. A farmer photographing a suspicious lesion on a finger millet leaf with a smartphone could, in a future advisory system, receive assistance with probable disease identification and management options. Such systems should support—not replace—trained plant pathologists. The strongest model is a combination of field expertise, laboratory confirmation, digital tools and timely extension advice.

Healthy seed: the first line of defense

One of the simplest principles in disease management remains one of the most important: start with healthy planting material. Quality seed, resistant varieties and appropriate seed treatment can reduce initial disease pressure for diseases where these measures are recommended. If infected seed introduces a pathogen into the field, the farmer may spend the entire season trying to control a problem that began before sowing. Seed health therefore deserves a central place in the Shree Anna production system.

Resistance is powerful—but it is not permanent

Plant breeders have long relied on disease resistance because it is one of the most economical and environmentally compatible approaches to disease management. However, resistance should not be treated as a permanent shield. Pathogen populations can vary genetically, and changes in pathogen populations may reduce the effectiveness of particular resistance sources. The long-term strategy should therefore combine resistance breeding, pathogen monitoring, genetic diversity and sound agronomic practices rather than depending indefinitely on a single resistant variety.

The future is integrated disease management

No single method can solve every disease problem. Integrated Disease Management brings together resistant or tolerant varieties, healthy seed, crop rotation, field sanitation, balanced nutrition, appropriate crop establishment, biological control where suitable, monitoring and early diagnosis, need-based chemical management and post-harvest care.

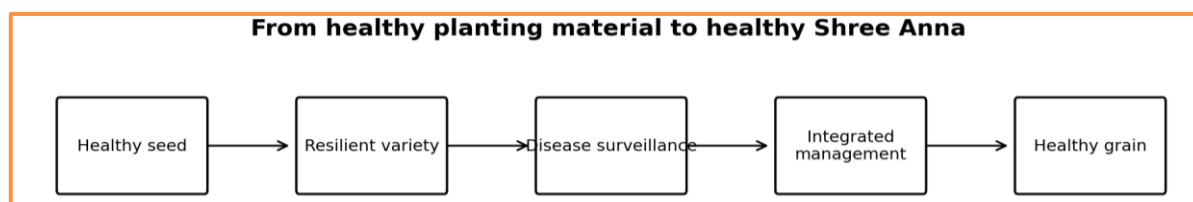


Figure 2. A practical pathway from healthy planting material to healthy Shree Anna

The story does not end at harvest

Plant pathology also matters after the crop leaves the field. Poor drying and storage can compromise grain quality, and fungal growth or other post-harvest problems can reduce shelf life and market value. This becomes particularly important as millets move from household consumption to processing, packaging, retail, institutional markets and exports.

A healthy millet value chain therefore extends from seed to field, field to harvest and harvest to safe food.

From field health to value-chain health

The millet story is increasingly becoming a business story. Processing, value addition, branding and organised marketing can create additional opportunities for farmers and producer organisations. FPOs can also support collective access to quality seed, expert diagnosis, demonstrations, common grading, processing and market-quality management.

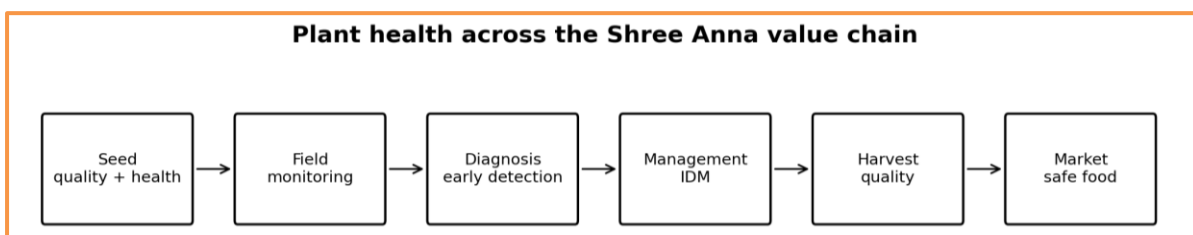


Figure 3. Plant health across the Shree Anna value chain

The role of agricultural extension

Scientific knowledge has little value if it remains inside laboratories. This is particularly true for plant diseases because disease management is often time-sensitive. Farmers need to know

what a symptom means, whether it is likely to spread, what action is appropriate and what practices should be avoided. Agricultural extension can connect farmers with plant pathologists, diagnostic laboratories, weather information, resistant varieties and recommended management practices. The future extension worker therefore needs to function not only as a messenger but also as a facilitator of diagnosis, interpretation, advisory support, technology transfer and farmer capacity building.

From Shree Anna to healthy Shree Anna

India's millet movement has established an important foundation. The next stage is to make the system more scientifically integrated. Millets need better varieties, better seed, better agronomy, better disease surveillance, better diagnostics, better processing, better markets and better extension. The objective should not be to portray plant diseases as enemies that make millet cultivation impossible. The more useful message is that disease management is part of building a resilient millet production system. Climate resilience without plant health is incomplete. Nutrition without food safety is incomplete. Higher production without profitability is incomplete. And technological innovation without farmer access is incomplete.

A new definition of millet resilience

For years, millet resilience has largely been discussed in terms of drought tolerance, low water requirements and adaptation to marginal environments. The next generation of millet research should broaden that definition. A truly resilient millet system should be able to withstand multiple stresses: climate stress, pathogen pressure, production constraints and market demands. The future may therefore belong not simply to the millet that survives drought, but to varieties that can maintain productivity under variable environments, resist important pathogens and deliver grain that meets the quality requirements of modern markets.

Conclusion

The return of millets to Indian agriculture is an opportunity to reconnect traditional crops with modern science. The “Shree Anna” movement has brought attention to their nutritional and agricultural value, while current research and extension programmes are expanding production technologies, processing, entrepreneurship and value chains. The next chapter needs another dimension: plant health. A millet field should not be judged only by how much grain it produces. We should also ask whether the crop was healthy, whether disease was managed sustainably, whether the harvested grain maintained quality and whether farmers captured enough value from the final product. The plant pathologist therefore has a place at every stage of the Shree Anna journey—from seed to field, field to harvest and harvest to food. The future of millets is not merely about bringing an old grain back. It is about combining traditional wisdom with modern plant science to create crops that are nutritious, productive, resilient and healthy.

Because a healthy millet revolution begins with a healthy millet plant.

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