

Solutions to a Mite(y) Problem

Pigeonpea is an extremely important drought-tolerant legume grown by smallholder farmers in marginal farming systems in the Indian subcontinent. This low-input crop is cultivated mainly for its nutritious seed that contains around 30% protein and comprises the major source of protein for 1.1 billion people. Pigeonpea leaves are used for animal feed and the branches for firewood, and the plant itself improves soil fertility.



Healthy pigeonpea plants bring many benefits to farmers

Infection with sterility mosaic disease (SMD), known as the 'green plague of pigeonpea', is a serious threat to pigeonpea production in the subcontinent. In India and Nepal alone, annual losses due to SMD exceed US\$280 million. Diseased plants grow thick vegetation but the leaves show a distinctive yellow 'mosaic' pattern. However farmers may not notice a problem until flowering time as it is the absence of flowers which causes the sterility inflicted by SMD. Infection at an early stage in growth can result in nearly 100% sterility; late infection results in only partial sterility but affects seed quality and causes yield losses of 20–60%. Like a plague, the SMD virus is spread rapidly in the field by its vector, the eriophyid mite, *Aceria cajani*. Identification of the virus, its diversity and its role in respect of host/plant resistance, vector was a unique discovery

of the project and solved a problem which had baffled scientists for a number of years.

With funding from DFID's Crop Protection Programme, researchers at the Scottish Crop Research Institute (SCRI) and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) achieved a breakthrough in identifying the causal agent of SMD as a novel virus, the aptly named pigeonpea sterility mosaic virus. Knowledge was also obtained on the mode of transmission of the virus by its mite vector and on the biology of the virus in the field. This vital information led to the development of simple, cost-effective diagnostic tools, and has allowed the development of refined screening methods to select broad-based resistance to the disease from collections of pigeonpea accessions from cultivated and wild gene pools. Two resistant pigeonpea varieties, ICP7035 (with broad-based durable resistance to SMD) and ICP96058 (with resistance to mild virus strains and Fusarium wilt) tested under endemic conditions, have performed very well and show the potential to mitigate losses due to SMD at no extra cost to the farmer.

These recent advances allow the development of high-yielding pigeonpea varieties with lasting resistance to SMD – and other biotic constraints – that are suitable for a range of farming systems. Such varieties produce increased yields and, additionally, seed quality is improved with a consequent increase in income to the hapless pigeonpea farmers living in SMD-endemic regions in the dry tropics. These varieties are now being promoted through the DFID KAWAD (Karnataka Watershed Development).



Success from despair: farmer holding a flowering branch from the field of SMD-resistant pigeonpea variety – encircled is a branch of a flowerless, susceptible variety

R8205: Combating sterility mosaic for sustainable pigeonpea production

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