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NEW OR UNUSUAL RECORDS

A plant rhabdovirus associated with peanut veinal chlorosis disease in India

R. A. NAIDU, S. K. MANOHAR, D. V. R. REDDY *and* A. S. REDDY
International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru (PO), Andhra Pradesh 502 324, India

A disease of peanut characterized by stunting of plants, veinal chlorosis, outward bending of leaflets, and proliferation of axillary buds has been observed in several parts of Peninsular India since 1977. The disease was restricted to peanut crops raised during the post-rainy season. A rhabdovirus was associated with this disease. This appears to be the first record of natural occurrence of a rhabdovirus in peanut.

INTRODUCTION

Stunted peanut (*Arachis hypogaea* L.) plants with leaflets showing veinal chlorosis, outward bending and pointed tips were first observed in India in 1977. The disease was named peanut veinal chlorosis. Surveys in 1985–88 showed that this disease occurred only on peanut crops raised during the post-rainy season (October/November–March/April) in the states of Andhra Pradesh, Tamilnadu, Karnataka and Maharashtra, and that the incidence was up to 60% in some areas. The disease was thought to be caused by a virus, but the symptoms did not resemble those of any peanut virus disease previously described in India (Iizuka & Reddy, 1986; Reddy, 1988). We report the symptoms and transmission of this disease, and its association with a rhabdovirus.

MATERIALS AND METHODS

The disease was established in a glasshouse (20–30°C) by graft-inoculating healthy plants of peanut cv. TMV. For mechanical inoculation, young leaflets showing systemic symptoms were triturated in 0·01 M phosphate buffer, pH 7·2, containing either 0·02 M 2-mercaptoethanol or 0·04 M Na_2SO_3, and inoculated to healthy peanut and other species. All inoculated plants were observed for symptom development and for presence of virus particles by electron microscopy of leaf-dip preparations.

For vector transmission, the aphid *Aphis craccivora* was maintained on peanut, the whitefly *Bemisia tabaci* on cotton, and *Orosius albicinctus* on *Sesamum indicum*. Different acquisition access periods ranging from 1 h to 2 days were given on infected plants showing early symptoms. Exposed insects were transferred to healthy peanut seedlings in groups of five to ten.

For yield loss estimates, yield of pods from randomly collected plants showing stunting and typical symptoms were compared with the same number of randomly collected apparently healthy plants. Graft-inoculated peanut plants maintained in a glasshouse were grown to maturity and pod yields were compared with uninoculated plants. To determine the seed transmission, seeds collected from infected plants were raised in sterile soil in a glasshouse and observed for symptoms. Leaf-dip preparations were made by triturating leaflets in 0·01 M phosphate buffer, pH 7·2, containing 0·04 M Na_2SO_3. A droplet of the extract was transferred to 300-mesh carbon-film-coated copper grids, fixed with 10 g/l buffered glutaraldehyde, stained with 10 g/l uranyl acetate, and examined under a Philips 201C electron microscope.

RESULTS AND DISCUSSION

Symptoms appeared as chlorosis along the veins of young leaflets 2–3 weeks after grafting (Fig. 1). Leaflets subsequently produced were of reduced size and showed outward curling. The diseased plants also had short internodes and proliferation of axillary shoots, resulting in stunting and bushy growth (Fig. 2). Pod yield from 200 field-infected peanut plants was 555 g as compared to 1530 g from 200 apparently healthy plants. Pod yield from 90 graft-infected peanut plants was 210 g as

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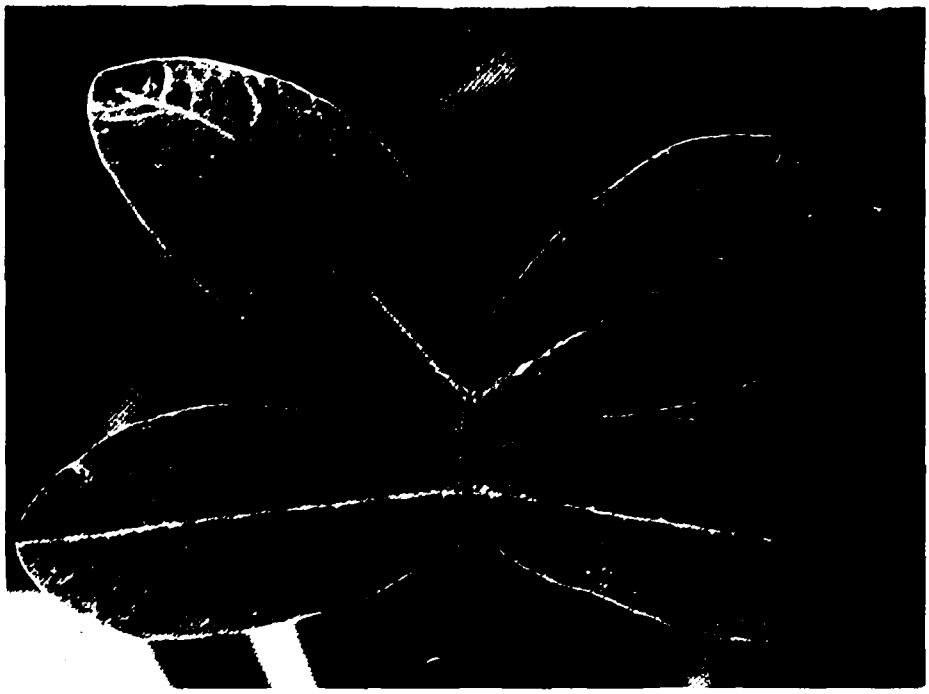

Fig. 1. Peanut leaf showing veinal chlorosis symptoms.

Fig. 2. Peanut branch showing stunting, axillary bud proliferation and outward curling of leaflets.

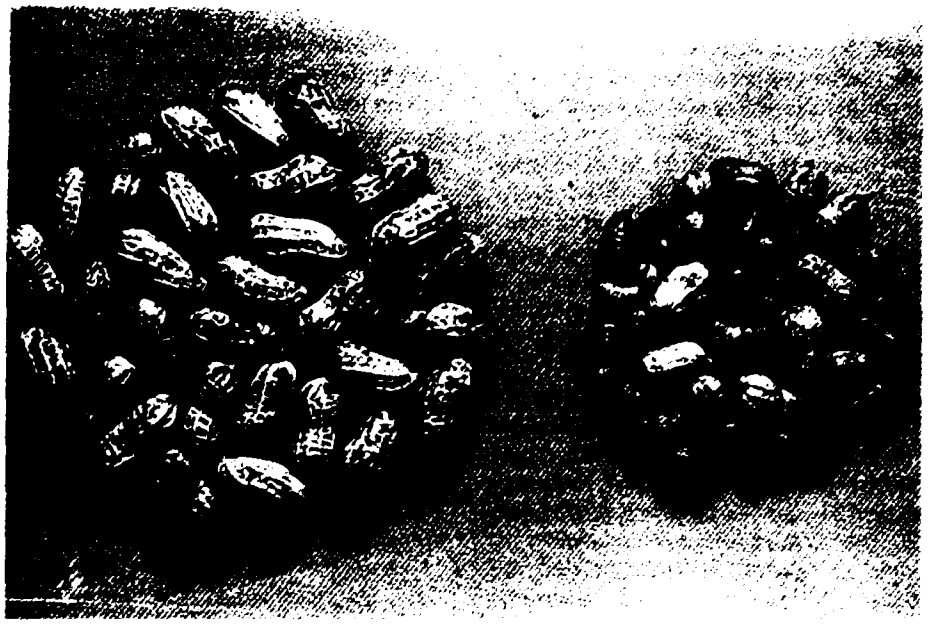

Fig. 3. Pods from early infected peanut plant (right); pods from healthy plants (left).

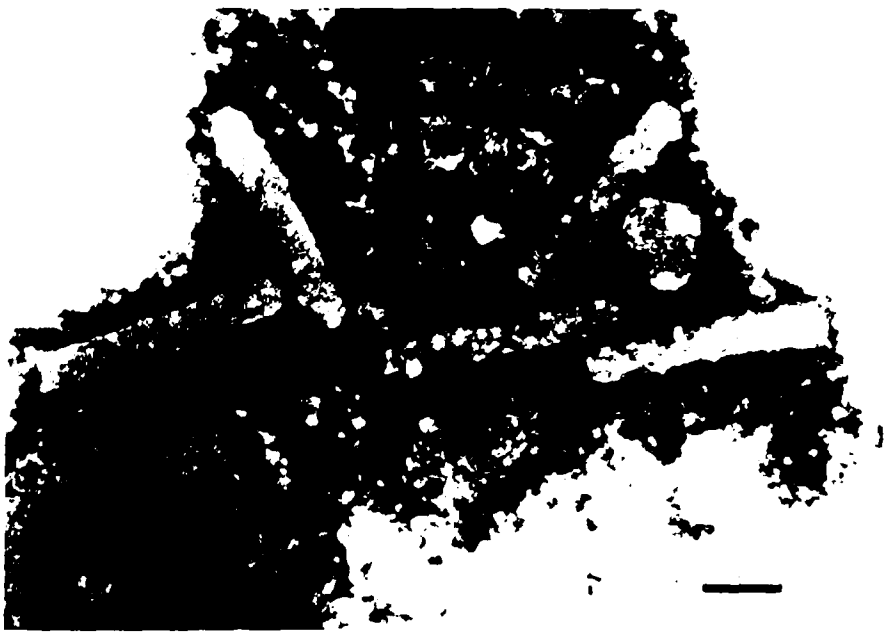

Fig. 4. Bacilliform particles in leaf-dip preparations. Bar represents 100 nm.

compared to 720 g from 90 uninfected plants. These data show that the virus has potential to cause severe losses to yields of peanut. Additionally, the pods and kernels from infected plants were very small when compared to those from healthy plants (Fig. 3). Of 453 seeds collected from infected plants, 381 germinated; none of the plants that grew from them showed disease symptoms. Attempts to transmit the disease by mechanical inoculation to peanut and to several

other species of plants have so far been unsuccessful. Fauquet & Thouvenel (1987) reported a disease with similar symptoms on peanut in Ivory Coast, but neither the vector nor the causal agent was identified. Bacilliform particles resembling rhabdoviruses were observed in 21 out of 45 field-infected samples and in 47 out of 60 graft-inoculated plants (Fig. 4). However, their concentration was low. On average, the particles were 330 nm long and 60 nm wide. They showed a nucleocapsid with cross striations surrounded by an envelope membrane. Attempts to purify the rhabdovirus have not so far succeeded.

Temperature markedly influenced the appearance of symptoms and occurrence of rhabdovirus particles. When the diseased plants were raised with day temperatures exceeding 35°C, the newly developed leaflets appeared healthy and lacked rhabdovirus particles in several samples tested. The disease could not be graft-transmitted from such apparently healthy leaflets. This may be one reason for the disease being restricted to peanuts grown in the months from November to January, when ambient temperatures seldom exceed 35°C.

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