

Peanut stripe virus in Indonesia

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Abstract

During a survey of groundnut in 1986 and 1987 in South Sulawesi, West and East Java and West Sumatra a disease was frequently observed which is characterized by the presence of green blotches. These blotches were either randomly distributed over the entire leaflets or concentrated along the veins; sometimes they were surrounded by light green rings. On the basis of test plant studies, serology and electron microscopy it was concluded that the causal agent of the disease is peanut stripe virus (PStV). This virus has been described for the first time in the USA in 1984. Some potyviruses described earlier in Indonesia, viz. groundnut mottle-y and peanut mottle virus (PMV) probably are also PStV. The similarity of symptoms caused by PStV and peanut mottle virus was the reason why blotching on groundnut in Indonesia was ascribed for many years to PMV.

As PStV causes severe yield losses, further research is being done on the epidemiology of the virus, on yield loss assesment and on testing breeding lines of groundnut for resistance.

Additional keywords: *Arachis hypogaea*, peanut mottle virus.

In Indonesia, 500000 ha groundnut (*Arachis hypogaea*) are grown each year. Seventy procent of the production takes place in Java. Another important production area is South Sulawesi. Average yields are approximately 1000 kg ha⁻¹, much less than the experimental ones of 3000 kg ha⁻¹ in Indonesia. The most important limiting factors include drought stress and diseases. Among the latter, most important are leaf spots, rust (Triharso, 1972), bacterial wilt (Machmud, 1985) and some virus diseases.

In 1986 and 1987, surveys of farmers' fields for the presence of virus diseases in groundnut were conducted in South Sulawesi, East and West Java and West Sumatra. Many plants had green blotches, either randomly distributed over the entire leaflet or concentrated along the main and lateral veins (Fig. 1). Sometimes, these blotches were surrounded by light green rings. Such blotching was previously ascribed to peanut mottle virus (PMV, Triharso, 1975; Roechan et al., 1978). We provide prove that it is caused by peanut stripe virus (PStV) on the basis of host range, serological relationships and electron microscopy.

Samples collected from South Sulawesi, East and West Java and West Sumatra were tested with antisera to blackeye cowpea mosaic virus (BICMV), clover yellow vein virus



Fig. 1. Symptoms of blotching on groundnut caused by peanut stripe virus.

(CYVV), soybean mosaic virus (SMV), peanut stripe virus (antisera supplied by J.W. Demski) and peanut mottle virus (antiserum from ICRISAT). These serological tests were done with direct antigen coating ELISA (DAC-ELISA) as described by Hobbs et al. (1987). They reacted strongly with antisera to PStV, BICMV, CYVV and SMV and failed to react with antiserum to PMV. The causal virus was easily sap-transmitted and it produced typical symptoms on groundnut, as observed in field infections, and chlorotic lesions on *Chenopodium amaranticolor* and *C. quinoa*. An isolate from a single lesion on *C. amaranticolor* was obtained and maintained in groundnut. Its host range is given in Table 1. The host range is similar to that of PStV, reported from the USA (Demski et al., 1985) and the symptoms on groundnut resembled those of one of their isolates. Leaf dip preparations stained with uranyl acetate showed flexuous, filamentous particles typical of potyviruses. In an initial test with seeds from greenhouse-infected groundnut plants, cv. Gajah, approximately 1% of the seedlings showed typical PStV symptoms.

The virus isolated from groundnut plants in Indonesia reacted positively with antisera to SMV, BICMV, CYVV and PStV, as is known for PStV (Demski et al., 1984). It has been demonstrated that BICMV, CYVV and SMV do not infect groundnut (Demski et al., 1984). Additionally, only PStV is known to produce symptoms on groundnut, similar to those observed in this study. The virus isolated from groundnut in Indonesia did also not infect *C. quinoa* systemically unlike CYVV (Hollings, 1974). For these reasons and from the symptoms on test plants (Table 1) it is clear that the virus isolated from groundnut in Indonesia is PStV. However, the characteristic stripes along the veins as reported by Demski et al. (1985) were only observed occasionally in Indonesia.

Peanut stripe virus was first detected in the USA from seeds imported from the

Table 1. Symptoms on test plants inoculated with the virus that causes blotching on groundnut.

<i>Arachis hypogaea</i> 'Gajah'	systemic chlorotic lesions, systemic blotch
<i>Chenopodium amaranticolor</i>	local chlorotic lesions, sometimes local ringspot lesions
<i>Chenopodium quinoa</i>	local chlorotic lesions
<i>Cucumis sativus</i>	none*
<i>Glycine max</i> 'Wilis'	local chlorotic lesions, systemic interveinal chlorosis and green vein banding
<i>Gomphrena globosa</i>	none*
<i>Nicotiana glutinosa</i>	none*
<i>Nicotiana tabacum</i> 'Samsun NN'	none*
<i>Phaseolus vulgaris</i> 'Top Crop'	none*
<i>Phaseolus vulgaris</i> 'Bataaf'	local chlorotic lesions, local vein necrosis
<i>Phaseolus vulgaris</i> 'Kintoki'	local chlorotic lesions, local vein necrosis
<i>Pisum sativum</i> 'Koroza'	none
<i>Pisum sativum</i> 'Juweel'	none
<i>Vicia faba</i> 'Kompakta'	none
<i>Vigna radiata</i> 'Merak'	none
<i>Vigna unguiculata</i> 'Blackeye'	none

* No virus could be detected by backinoculation to *C. amaranticolor* and *A. hypogaea* 'Gajah', The other symptomless plants were not tested.

Peoples' Republic of China (Demski et al., 1985; Demski and Lovell, 1985). Furthermore, PSTV has also been found in Thailand, the Philippines, the Peoples' Republic of China and Malaysia (Reddy et al., 1988).

Several potyviruses have been reported earlier occurring on groundnut in Indonesia (Triharso, 1975; Roechan et al., 1978). Triharso (1975) reported groundnut mottle-y with symptoms similar to those of PSTV. The causal virus was not fully characterized. Roechan et al. (1978) reported the occurrence of PMV. However, its host range resembled that of PSTV and not of the PMV isolates of Paguio and Kuhn (1974). Therefore, the PMV reported by Roechan et al. (1978) is probably PSTV. Recently, Fukumoto et al. (1978) described peanut chlorotic ring mottle virus; this virus resembles PSTV in symptoms on groundnut, host range and serological properties, but could not be shown to be seed-transmitted (Demski et al., 1988).

This constitutes the first authentic report of PSTV in Indonesia. Distribution and incidence of the virus and various reports on the presence of symptoms typical of PSTV suggest that the virus has been present in Indonesia for many years. The similarity of the symptoms caused by PSTV and PMV has, however, delayed accurate identification of PSTV in Indonesia.

PSTV is believed to cause serious yield losses because the incidence in farmers' fields in East Java is up to 100% and possible high yield losses have been reported from Thailand (Wongkaew et al., 1988). Observations in Indonesia support this. Therefore more information on this virus is needed. Currently seed and aphid transmission of

PStV are being studied, a yield loss assessment is done and groundnut lines are being screened for resistance.

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Samenvatting

'Peanut stripe virus' in Indonesië

Tijdens een inspectie in 1986 en 1987 in Zuid Sulawesi, West en Oost Java en West Sumatra werd in aardnoot (*Arachis hypogaea*) veelvuldig een ziekte aangetroffen, die opviel door donkergroene vlekkerigheid. De vlekken waren onregelmatig over de bladeren verspreid of kwamen voornamelijk voor rond de nerven. Soms waren de vlekken omgeven door een lichtgroene ring. Op grond van symptomen op toetsplanten, serologische verwantschap en elektronenmicroscopische eigenschappen werd geconcludeerd, dat deze ziekte veroorzaakt wordt door het 'peanut stripe virus'. Dit virus is voor het eerst beschreven in 1984 in Amerika. Dit is de eerste officiële melding van het virus in Indonesië.

Enkele eerder beschreven potyvirussen van aardnoot in Indonesië, 'groundnut mottle-y' en 'peanut mottle virus' (PMV) zijn waarschijnlijk ook PStV. De gelijkenis van de door PStV and 'peanut mottle virus' veroorzaakte symptomen heeft ervoor gezorgd dat de vlekkerigheid op aardnoot in Indonesië jarenlang aan PMV werd toegeschreven.

Aangezien PStV veel schade veroorzaakt, wordt verder onderzoek gedaan aan de epidemiologie van dit virus, aan het oogstverlies en aan het toetsen van aardnootlijnen op resistentie.

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