Table 1. Bioefficacy of *Paecilomyces lilacinus* in controlling *Meloidogyne javanica* on groundnut, 1990–92.

Treatment	Fresh weight (g plant^{-1}) Shoot		Root		RKI[1]		Nodulation index[2]	
Seed treatment								
0.05%	3.82 a	(14.59)	1.95 a	(3.80)	1.79 a	(2.20)	1.48 b	(2.19)
0.1%	3.82 a	(14.59)	1.96 a	(3.84)	1.74 a	(2.02)	1.54 ab	(2.37)
0.2%	3.87 a	(14.98)	1.90 a	(3.61)	1.75 a	(2.06)	1.55 a	(2.40)
Control	3.66 a	(13.40)	1.85 a	(3.42)	1.82 a	(2.31)	1.50 ab	(2.25)
SE	±0.09		±0.06		±0.04		±0.02	
Soil application (w/w)								
1%	3.71 c	(13.76)	1.79 ab	(3.20)	1.86 ab	(2.46)	1.47 ab	(2.16)
2%	3.82 bc	(14.59)	1.99 ab	(3.96)	1.84 ab	(2.39)	1.51 ab	(2.28)
3%	3.86 bc	(14.90)	1.99 ab	(3.96)	1.73 bc	(1.99)	1.54 ab	(2.37)
4%	3.95 ab	(15.60)	2.00 ab	(4.00)	1.66 bc	(1.76)	1.53 ab	(2.34)
5%	4.10 a	(16.81)	1.62 a	(2.62)				
5% (neem cake only)	3.81 bc	(14.52)	1.77 b	(3.13)	1.81 ab	(2.28)	1.52 ab	(2.31)
Control	3.30 d	(10.89)	1.85 ab	(3.42)	2.00 a	(3.00)	1.44 b	(2.07)
SE	±0.07		±0.08		±0.07		±0.05	
Interaction (seed treatment × soil application) not significant								
Year effect[3]	s		s		s		ns	
CV (%)	11.0		14.0		10.0		11.8	

1. Root-knot nematode index on a 0–5 scale, where 0 = no knots on root, 5 = maximum knots on root.
2. On a 0–3 scale, where 0 = no nodulation, 3 = heavy nodulation.
3. s = significant, ns = not significant.

Figures in parentheses are transformed values, $\sqrt{x}$ transformation for shoot/root mass and nodulation index, $\sqrt{x+1}$ transformation for RKI.
Figures in a column followed by the same letter(s) are not significantly different at P = 0.05 according to DMRT.

Groundnut Virus Identity Problem?

J W Demski[1] and **D V R Reddy**[2]
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Groundnut workers in many countries often confront a suspected virus disease problem but are unable to verify the viral nature of the disease or to identify the causal virus(es). At the 1993 meeting of the International Working Group on Groundnut Viruses, it was suggested that laboratories currently investigating groundnut viruses should serve as diagnostic centers. While this approach has its advantages, there are likely to be problems too.

- Sending live virus-infected tissue from one country to another poses plant quarantine problems, unless the material is exported under permit to non-groundnut growing countries (e.g., UK, Netherlands).
- Some laboratories have diagnostic capabilities only for a limited number of viruses.
- Most laboratories with good diagnostic capabilities are research laboratories, and may have restrictions on undertaking 'service' related activities.

These problems can be overcome by cooperation between laboratories. International cooperation can provide data on virus distribution and incidence, identify institutions where proper identification facilities are available, help formulate appropriate control practices, and increase training opportunities for groundnut researchers.

The International Working Group on Groundnut Viruses has recommended that the following procedure be followed when a groundnut virus is suspected. Write to the following address (do *not* send a sample unless you are specifically asked to do so).

Dr D V R Reddy
Principal Scientist (Virology)
ICRISAT Asia Center
Patancheru 502 324, Andhra Pradesh, India
Telephone +91 40 596161
Fax +91 40 241239

The letter should include the name of the groundnut variety (if known), description of symptoms on groundnut, the place of occurrence of the disease, information on its incidence and distribution; your address, telephone, and fax number (if available); and results from any tests conducted on the samples. Dr Reddy will then give advice on how to proceed. If you are asked to send the material for further examination, follow the procedure outlined below; this will help you export the samples without any quarantine risk. Suggestions are also provided on how to transport samples. Dr Reddy can provide groundnut virus identification at ICRISAT Asia Center, or can call on the assistance of the Working Group members listed in the box below.

Data to be recorded

Symptoms

- Distribution of diseased plants in the field—individual plants affected or 'patches' of disease, around edges of field, etc.
- Plant symptoms—stunting, chlorosis, mosaics, necrosis, axillary shoot proliferation, etc.
- Symptoms on—young leaves, older leaves, petioles, stems, roots, pods, seeds (compare with adjacent healthy plants).

Incidence and distribution

- Distribution of suspected virus disease in country/region
- Incidence of diseased plants in affected crops
- Effects on yield (if known).

Other information

If some research has already been carried out, provide data, even tentative indications, on:

- Host range
- Serological reactions
- Vector system.

Dr Deck Peters
Wageningen Agricultural University
POB 8045 6700 EM
Wageningen, The Netherlands
Telephone 31 83 70 8 30 90
Fax 31 83 70 8 48 20
Expertise—all tospoviruses
Permit requirement—unknown

Dr D J Robinson
Scottish Crop Research Institute
Invergowrie, Dundee
Scotland DD2 5DA
Telephone 44 382 562731
Fax 44 382 562426
Cannot offer diagnostic services

Dr Xu Zeyong
Oil Crops Research Institute
Chinese Academy of Agricultural Sciences, 430062 Wuchang
Wuhan, Hubei Province, China
Expertise—serology for PStV, PSV, CMV; indicator hosts for PBNV, PStV, PSV, CMV
Permit requirement—not needed

Dr Roberta Smith
Department of Soil and Crop Sciences
Texas A&M University
College Station, TX 77843-2472, USA
Telephone 01 409 845 3041
Fax 01 409 845 0456
Expertise—ELISA for TSWV
Permit requirement—not needed

Dr Jim Demski
Georgia Experiment Station
1109 Experiment Street
Griffin, GA 30223-1797, USA
Telephone 01 404 412 4011
Fax 01 404 228 7305
Expertise—identification of TSWV, PMV, PStV, PSV
Permit requirement—not needed

Dr Michel Dollet
LPRC-CIRAD
BP 5035 34032, Montpellier, France
Telephone 67 61 58 00
Fax 67 51 59 86
Expertise—identification of most viruses including PCV, TSWV, PStV, PMV, groundnut eyespot, groundnut crinkle
Permit requirement—not needed

Dr Ralf Dietzgen
Queensland Agricultural Biotechnology Centre, Gehrmann Laboratories
University of Queensland
St. Lucia, Q 4072, Australia
Telephone 07 365 4988
Fax 617 365 4981
Expertise—identification of PStV, PMV
Permit requirement—not needed

Abbreviations: CMV = cucumber mosaic virus, PBNV = peanut bud necrosis virus, PCV = peanut clump virus, PMV = peanut mottle virus, PSV = peanut stunt virus, PStV = peanut stripe virus, TSWV = tomato spotted wilt virus.

Collection and treatment of samples

- Collect only young leaflets showing symptoms (retain petioles). Blot excess water using newspaper or any absorbent paper and place in plastic bags. Ideally, use 'Ziplock' plastic bags. If these are not available, use ordinary plastic bags sealed carefully, or securely closed with cellophane tape. Water transpired from leaflets helps to maintain humidity within the bag.
- Collect and bag the samples as close as possible to the day of despatch.
- Leaflets in sealed plastic bags can be stored for up to a week in a refrigerator without undue deterioration.
- If leaflets cannot be collected within a week before departure, rinse the leaflets in water containing 0.01% sodium azide, blot, and then store. This reduces rotting. **Caution—sodium azide is a poison; handle with care.**
- If fresh leaflets are not available, collect about 5 g of infected leaf material, cut it into small pieces, and place the bits directly into a plastic vial containing approximately 10 g calcium chloride ($CaCl_2$). Place a small amount of non-absorbent cotton wool on top of the $CaCl_2$ so that the chemical does not touch the plant material.

Transport of virus-infected material

- Use courier mail if possible. Send a fax or e-mail message to the addressee indicating the date on which the samples were despatched.
- Insulated covers (Jet Packs) or sheets of styrofoam are suitable for packing the material.

Evaluation of an Aphid-Resistant Groundnut Genotype (EC 36892) in China

Xu Zeyong[1], J A Wightman[2], D V R Reddy[2], Zhang Zongyi[1], Chen Kunrong[1], Chen Jinxing[1], and Hu Jiapeng[3] (1. Oil Crops Research Institute, Chinese Academy of Agricultural Sciences (CAAS), Wuhan, Hubei 430062, China. 2. ICRISAT Asia Center, Patancheru 502 324, Andhra Pradesh, India. 3. Institute of Crop Germplasm Resources, CAAS, 100081 Beijing, China)

Aphids are major groundnut pests in China, causing direct damage and also acting as vectors for virus disease transmission (Li Yuanlian 1981, Xu Zeyong 1987). Three of the four major groundnut viruses in China are transmitted by aphids in a non-persistent manner; peanut stripe virus (PStV), cucumber mosaic virus (CMV), and peanut stunt virus (PSV). An aphid-resistant groundnut genotype, EC 36892, was introduced from ICRISAT Asia Center in 1990 and evaluated in China for resistance to aphids and PStV. Three local groundnut cultivars, Huohua No. 1 (spanish type), Hua 37, and Yihua No. 1 (both hybrids between virginia and spanish types), were also evaluated in the experiment.

Greenhouse tests. Five plants of each genotype were sown in 10 cm diameter pots in a greenhouse. Each plant was inoculated with two aphids (*Aphis craccivora*), and aphid population was recorded 3 days later. Aphid multiplication rates were much lower on EC 36892 than on two local varieties (Table 1). For example, in three tests in 1991 and 1992, the average number of aphids on EC 36892 was 0.6 aphid plant^{-1} compared with 6.9 aphids plant^{-1} on the local variety Huohua No. 1.

Field trials. Field trials were conducted at the farm of the Oil Crops Research Institute, Chinese Academy of Agricultural Sciences (CAAS), Wuhan, in 1991 and 1992. The trials were sown in a randomized block design with five replications. Each plot was 3.3 × 2.0 m, and contained 10 rows, with a spacing of 33 × 10 cm. Inspection of aphid population and PStV disease incidence was first conducted 5 days after emergence of groundnut, and continued at 10-day intervals. Virus-free seed was used in the 1991 trial. Two rows of a susceptible groundnut variety with high seed transmission of PStV were sown between plots, to provide the primary inoculum. PStV-infected seeds of the test genotypes were used in the 1992 trial.

Table 1. Aphid resistance in three groundnut genotypes in greenhouse tests, Oil Crops Research Institute, Wuhan, China, 1991–92.

Year	Genotype	Number of aphids plant^{-1} Test 1	Test 2
1991	EC 36892	0 (22)	1.5 (16)
	Huohua No. 1	6.7 (9)	10.0 (8)
1992	EC 36892	0.2 (20)	– (–)
	Yihua No. 1	1.2 (25)	– (–)
	Huohua No. 1	3.9 (18)	– (–)

Figures in parentheses show number of plants tested