

Technical Bulletin no. 1. Junagadh, Gujarat, India: National Research Centre for Groundnut.

Nandgopal, V. 1991. Integrated pest management. Pages 33–34 in Annual report 1990, National Research Centre for Groundnut. Junagadh, Gujarat: National Research Centre for Groundnut.

Efficacy of Plant Extracts Against Tobacco Caterpillar Larvae in Groundnut

K Sahayaraj and R Sekar (Department of Botany, St. Joseph's College, Tiruchirappally 620 002, Tamil Nadu, India)

Utilization of naturally available plant products in an integrated pest management (IPM) system will be of great benefit to farmers in reducing large-scale use of highly toxic chemicals, and also the money spent on it. Laboratory and field experiments have shown that neem-based insecticides, azadirachtin (Koul 1985, Rao and Subramanian 1987) and margoside CK (AICORPO 1990), reduced *Spodoptera litura* Fabricius growth, and its damage on foliage in groundnut resulting in higher pod yields. Plant extracts from *Vitex negundo* Linn. and *Stachytarpheta urticifolia* (Salish) Sims. were also found to cause mortality to the third-instar larvae of *S. litura* in castor (Subadra Bai and Kandasamy 1985). The present study was undertaken to generate information on the control of *S. litura* with various plant products.

The leaves of *Azadiracta indica* A. Juss and *Vitex negundo* Linn., rind of *Citrus sinensis*, and rhizome of *Zingiber officinale* (10 g of each) were macerated individually in an all-glass mortar and pestle and extracted with small quantities of hot distilled water. The extract was passed through a muslin cloth and the final volume made up to 100 mL to get 10% extracts. Groundnut leaves were dipped in the different extracts to soak them thoroughly, and shade-dried for 15 min. The shoot ends were kept immersed in water to prevent the leaves from wilting. Ten last-instar *S. litura* larvae of uniform age and size were allowed to feed on these leaves for 24 h. The treatments were replicated thrice. After 24 h the larvae were removed from the treated leaves and released into plastic troughs containing nontreated fresh groundnut leaves. Mortality was recorded every 24 h for a period of 4 days. After 96 h the larvae mortality was the highest in *C. sinensis* treated leaves (90%) followed by *V. negundo*

(83%), *A. indica* (80%), and *Z. officinale* (70%). Detailed experiments are necessary to confirm the findings and make use of these products for large-scale field application.

Acknowledgment. The authors are grateful to Rev Fr John Britto, S J Principal, Dr R Selvaraj, Head, Department of Botany, and Dr M Patrick Gomez, Head, Department of Zoology, St Joseph's College, Tiruchirappally, Tamil Nadu, India, for facilities and encouragement.

References

AICORPO (All India Coordinated Research Project on Oilseeds). 1991. Annual Progress Report, Groundnut, 1990. Presented at the 38th Annual Kharif Oilseed Research Workers' Group Meeting, 6–8 May 1991, Gujarat Agricultural University, Junagadh, Gujarat, India. Rajendranagar, Hyderabad 500 030, India: Directorate of Oilseeds Research.

Koul, D. 1985. Azadirachtin interaction with development of *Spodoptera litura* Fab. Indian Journal of Experimental Biology 23:160–163.

Rao, P.T., and Subramanian, B. 1987. Effect of azadirachtin on *Achaea janata* Linn. and *Spodoptera litura* Fab. Journal of Entomological Research 11:166–169.

Subadra Bai, K., and Kandasamy, C. 1985. Laboratory induced mortality of *Spodoptera litura* Fab. fed on the leaf discs of castor treated with the extracts of *Vitex negundo* Linn. and *Stachytarpheta urticifolia* (Salish) Sims. Indian Journal of Agricultural Sciences 55(22):760–761.

Nematode Problems of Groundnut and their Management in Gujarat, India

B A Patel¹, D J Patel¹, S B Sharma², H V Patel¹, and S K Patel¹ (1. Department of Nematology, Gujarat Agricultural University, Anand, Gujarat, India; 2. Crop Protection Division, ICRISAT Asia Region, Patancheru 502 324, Andhra Pradesh, India)

In Gujarat state of India, groundnut is widely cultivated as a rainy-season crop in the Saurashtra region, and to some extent in the Sabarkantha, Banaskantha, and Panchmahals districts. It is grown as a summer crop in

the Kaira and Vadodara districts. Diseases caused by nematodes significantly affect groundnut production. This report highlights the status of nematode problems of groundnut and options for their management in Gujarat.

The root-knot nematode, *Meloidogyne arenaria* is widely distributed in the groundnut-growing areas in Supedi, Sanala, Kathrota, Upleta, and Patanvav regions in Rajkot district, and Khadia and Dhoraji in Junagadh district of the Saurashtra region. *Meloidogyne javanica* infests groundnut fields in the Khalvada, Telnar, Betawada, Lalpur, Pariana Muvada, and Narsipur regions of Napadvanj mandal of Kaira district. A pathotype of *M. javanica* which reproduces on groundnut and produces severe galls is present in the Kapadvanj area (Patel et al. 1993). Root-knot nematode affected fields show stunting, reduced number of branches and internodes, burning of leaf margins, reduced leaf size, and yellowing of foliage. Other widespread pathogenic nematodes in groundnut fields are *Tylenchorhynchus mashhoodi*, *Pratylenchus coffeae*, *Rotylenchulus reniformis* and *Helicotylenchus* spp, but their importance as production constraints is not known.

Work done at the Gujarat Agricultural University indicates that the damage thresholds of *Meloidogyne* spp are 0.1–1.0 juveniles cm⁻³ soil at the time of sowing. Yield losses range between 10 and 23% due to *M. javanica*, and 13–50% due to *M. arenaria*. Application of carbofuran @ 2 kg ha⁻¹ in *M. arenaria* or *M. javanica* infested soils reduces the root-knot disease by 16–96% and increases the pod yields by 15–53%. Carbofuran is more effective than phorate and phenamiphos. The presence of *M. arenaria* along with *Fusarium solani* advances wilting of groundnut plants (Patel et al. 1985), and reduces the number of *Rhizobium* nodules (Patel 1983). Seed treatments with 3–6% aldicarb sulfone or 6% carbofuran reduce *M. arenaria* damage (Patel et al. 1986). Organic cakes of castor, mustard, and neem (1000 kg ha⁻¹ and above) significantly reduce the root-knot disease and increase pod and haulm yields; neem cake is most effective. Groundnut seed soaked for 12 h in phenamiphos, monocrotophos, phosalone or oxamyl (each @ 125, 250, and 500 ppm) inhibits the penetration of *M. arenaria* larvae into groundnut roots and increases the plant biomass. Phenamiphos @ 125 and 250 ppm is highly effective.

More than 1200 groundnut lines have been screened against root-knot nematodes in Gujarat and resistant sources have been identified (Table 1). These promising sources require further testing for confirmation of resistance before they can be used in breeding programs.

It is evident that root-knot nematodes are important constraints to groundnut production in Gujarat.

Table 1. Groundnut lines identified as resistant to *Meloidogyne arenaria* or to *M. javanica* pathotype 2 in Gujarat, India.

Species	Groundnut line	
	Highly resistant	Resistant
<i>Meloidogyne arenaria</i>	None	A3, Abuarbaa, Ah 25, Ah 3328, Ah 4515, Ah 6902, Ah 6719, Ah 7188, Ah 7299, Ak 10-2, 55-437, C 83, C 149, EC 24118, Kigung, Khargaon 3, NC Ac 50.
<i>Meloidogyne javanica</i>	ICG 5341	Apexy, B 1, C 162, C 166, Dangi, EC 85994, ICGs 411, 852, 859, 1268, 2248, 2496, 3053, 3104, 6323, 6826, 10047, JH 223, KG 61-22, PI 268594, PI 270787, S 7-2-1, S 7-24-3, U 4-7-3, No 923, No 523.
	ICG 6330	

Farmers and policy makers are not sufficiently aware of this problem in the state, and consequently the options available for nematode management are not commonly used. Awareness programs such as multilocational demonstrations of the advantages of nematode management, and guidance to farmers and extension staff with the help of radio, television, and videocassettes are needed.

References

- Patel, H.R. 1983. Studies on root-knot nematodes of groundnut. PhD thesis. Gujarat Agricultural University, Sardarkrushinagar, Gujarat, India. 125 pp.
- Patel, H.R., Vaishnav, M.U., and Dhruj, I.U. 1985. Interaction of *Meloidogyne arenaria* and *Fusarium solani* on groundnut. Indian Journal of Nematology 15:98–99.
- Patel, H.R., Vaishnav, M.U., and Dhruj, I.U. 1986. Efficacy of aldicarb sulfone and carbofuran flowable seed treatment on plant growth and against *Meloidogyne arenaria* on groundnut. Pesticides 20:29–31.
- Patel, D.J., Patel, B.A., and Patel, H.V. 1993. Pathotypes of *Meloidogyne javanica* in India. Nematologia Mediterranea 21:207–208.