Table 1. Performance of some promising groundnut genotypes against insect pests in Vietnam during 1996 and 1997.

Genotype	Insect damage				Pod yield (t ha^{-1})	
	Aphids plant^{-1}	Thrips terminal^{-1}	Jassids plant^{-1}	*Spodoptera* defoliation (%)	1995	1996
ICGV[1] 86030	0.36	15.7	5.3	4.7	1.87	2.20
ICGV 86510	0.50	17.1	3.5	3.0	1.95	1.87
ICGV 87128	0.26	20.9	3.1	3.0	1.79	2.30
ICGV 87141	0.35	17.9	5.2	3.7	2.43	3.80
ICGV 87157	0.41	19.7	6.5	4.0	2.32	1.60
ICGV 90224	0.50	11.6	3.6	2.5	1.89	1.80
ICGV 90228	0.90	10.3	8.7	4.9	1.98	1.60
ICGV 90263	0.70	8.3	5.2	2.1	1.83	1.60
ICGV 91173	0.60	15.3	9.8	5.3	1.78	1.45
LVT[2]	0.70	30.5	32.8	6.4	2.01	1.93
Sen NA (local)	0.90	35.5	12.5	3.6	1.78	1.45
4329 (local)	0.60	31.7	10.8	6.7	1.63	1.51

1. ICRISAT Groundnut Variety.
2. From China.

Table 2. Progress of integrated pest management of groundnut in Vietnam.

Province	Area (ha)		
	1995[1]	1996	1997
Nghe An	2100 m^2 (1)	80 (100)	100 (100)[2]
Ha Tay	2100 m^2 (1)	66 (168)	65 (168)

1. On-farm demonstration.
2. Figures in the parentheses indicate number of farmers involved.

- the role of host-plant resistance on insect pest management.

These studies must be conducted in different cropping systems in order to assess the overall effect of insect management practices on the whole groundnut production system and its sustainability. Groundnut IPM, initiated in 1995, has gained good momentum with the active involvement of farmers and ICRISAT. The IPM technology was accepted by all farmers who attended the demonstrations. Further spread of the technology, and its success and sustainability, will depend entirely on the involvement of various national and international organizations with common goal of improving nature.

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Metarhizium anisopliae (Metschn.): A Potential Biocontrol Agent for Groundnut Leafminer

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The groundnut leafminer (GLM) *Aproaerema modicella* (Deventer) (Lepidoptera: Gelichiidae) is an important pest of groundnut in south and southeast Asia. It has a limited host range of which soybean and groundnut are the most important. The adult is a brownish grey moth with about 10 mm wing span. It lays single, shiny white eggs, usually on the underside of the leaflets, close to the midrib, which are just visible to the naked eye. Each female lays about 200 eggs. As soon as they hatch, the young larvae mine into the leaf and feed on the chlorophyllus tissue. The mines enlarge as the larvae grow. When the larvae grow larger than the size of the mine, they come out and web the adjacent leaflets together and continue to feed on the leaf tissue from inside the webbed leaves. Pupation takes place inside the webbing. Three to four generations have been observed in a single groundnut cropping season. Though it attacks the crop throughout the year, it is more severe under moisture stress conditions (Wightman and Ranga Rao 1994).

Amongst the various control options, natural control agents play a significant role in the population

suppression of this species. Shanower et al. (1992) listed 38 species of natural enemies associated with GLM, of which 17 were reared from larvae. They also indicated that diseases caused up to 30% larval mortality. Oblisami et al. (1969) indicated the infection of leafminer larvae by *Aspergillus flavus* under field conditions. The occurrence of diseases on GLM is well known. However the impact of these diseases on the population dynamics of GLM is not known. Though natural control processes do contribute to the suppression of GLM population, chemical control is the most popular strategy followed by farmers. Indiscriminate use of chemicals have led to the outbreaks of other defoliators such as *Spodoptera* in groundnut crops. Thus, it is necessary to explore alternatives to chemical control in the management of GLM.

During the 1996 groundnut cropping season, several dead larvae of GLM infected by fungus were observed in the field at ICRISAT-Patancheru. The fungus was isolated and successfully multiplied on potato dextrose agar. Healthy final instar GLM larvae collected from the field were sprayed with the conidial suspension prepared in distilled water under laboratory conditions. The larvae died in 24 h and the sporulation started from the 7th day onwards. These studies were repeated twice under laboratory conditions for confirmation. Later, the fungus was sent to the International Mycology Institute (IMI), London, UK, for identification. The IMI identified this fungus as *Metarhizium anisopliae* (Metschn.) which is the first report on GLM. Initial studies on the multiplication of the fungus on artificial media showed encouraging results. This fungus can be mass multiplied on sterilized broken sorghum grain in 7 days at 25°C. This fungus is known for its effectiveness in humid areas on other lepidoptera. Its quick action on the leafminer could be because of the congenial microclimate provided by the pest. Further studies on the epidemiology, field evaluation, and mass production on low cost media need to taken up. Considering its effectiveness in a short period, and its easy mass multiplication, this fungus can be used as an effective natural control component in future integrated groundnut pest management programs.

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Physiology

Effect of Polythene-mulching on Flowering and Yield of Groundnut in Korea

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Growth, development, and pod yield in groundnut are affected by low temperatures. Extensive studies were conducted in 1970 at the National Crop Experiment Station, Suwon, South Korea, to evaluate the effect of polythene-mulching on crop growth and productivity. These results remained largely confined to Annual Reports of the station in the vernacular language. With increasing interest in polythene-mulching in other Asian countries, it was considered appropriate to give wide circulation to some of the important results obtained from these studies. Suwon is situated at 37°16' N latitude and 126°59' E longitude. Soils in Suwon are well-drained sandy loams, with medium fertility. About 15 t compost and 1 t lime ha^{-1} were added to the soil prior to final cultivation. The experiment was conducted in a split-split plot design with three replications. The main plot and sub-plot treatments were as follows:

Main plot : Sowing dates – 10 Apr and 1 May 1970
Sub-plots : Polythene (0.03 mm) mulched, and nonmulched (control)
Sub-sub-plots : Fertilizer application levels:
i) 30 N, 70 P_2O_5, 100 K_2O ha^{-1}
ii) 45 N, 105 P_2O_5, 150 K_2O ha^{-1}
iii) 60 N, 140 P_2O_5, 200 K_2O ha^{-1}

A semi-erect cultivar (Chunyupbanrip) was used. Two seeds $hill^{-1}$ were dibbled at a spacing of 50 × 20 cm. Plot size was 6 × 3 m.