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Screening Wild *Arachis* for Resistance to Groundnut Plant Hopper *Hilda patruelis* in Malawi

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The groundnut plant hopper (*Hilda patruelis* Stål) is a destructive but sporadic pest of groundnut (*Arachis hypogaea*) and other crops in Southern Africa (NRI 1996). A number of non-crop host plants have recently been documented as alternative hosts of groundnut hopper in Malawi and Zimbabwe (Minja et al. 1999). *Hilda* infests 2–5% groundnut plants in most countries of southern Africa during the normal growing seasons, but extensive damage (up to 80%) has been observed in some groundnut fields during prolonged dry spells or in off-season crops (Weaving 1980, Minja et al. 1999). Research on the groundnut plant hopper has been undertaken in Zimbabwe (PPRI 1982) and South Africa (Van Eeden 1993). The research efforts in South Africa resulted in the identification of some wild *Arachis* and cultivated groundnut genotypes with resistance to *H. patruelis* (PS Van Wyk, Agriculture Research Council, Portchefstroom, South Africa, personal communication). Some of those lines were sent to Malawi for field screening (Table 1).

The genotypes were first planted in single row plots of 6 m, during the long rainy season (December–March) in 1999 to increase the seed and preliminary assessment for *Hilda*, termites, and groundnut rosette incidence. Seed germination was poor, particularly in *A. arasterio*, where only one seed per row germinated and survived to harvest (Table 1). All the lines were compared to JL 24 as a local check, which matured almost at the same time as the test genotypes. In the results, only the means are shown because the variations were too large due to mortality and poor germination. These preliminary observations indicated that *Hilda* infested all the test genotypes (Table 1). Termites and rosette incidence were also observed in all the test genotypes except on *A. arasterio*. Due to heavy rainfall, most of the plants remained green till harvest, but due to poor plant stand, no comparisons were made.

In the winter crop (off-season) planted in June 2000, seed germination was >95% and there was no termite or rosette incidence. But *Hilda* infestation was observed on all plants at the late podding stage (Table 2). JL 24, ICG 8740, ICGV 90082, and ICGV 93437 were included in the trial as local checks. There were two rows per plot of 6 m. All *A. arasterio* plants were green and healthy at the time of assessment, whereas ICG 8740 had the highest number of dead and wilted plants. The 6 wild species as well as PC 205 DB and

Table 1. Insect pest and disease incidence (% plants attacked) in wild *Arachis* and cultivated groundnut genotypes at crop maturity during 1999 cropping season at Chitedze Research Station, Malawi.

Genotype	Registration no.	Origin	Collection (year)	*Hilda*	Termites	Rosette
Wild *Arachis*						
A. villosulicarpa	RG 296	USA	1971	50	56	22
A. erecta	RG 294	Tanganyika	1971	28	6	61
A. arasterio[1]	RG 293	Zimbabwe	1971	100	0	0
A. monticola	RG 373	USA	1971	44	8	40
A. sp 1	RG 591	USA	1987	30	9	9
A. sp 2	RG 593	USA	1987	18	15	9
Cultivated checks						
Sellie	(= Natal Common × Namark)	South Africa	1999	33	13	47
PC 205 DB	(= Harts × (Sellie × (Guat × Atete)))	South Africa	1999	26	9	49
PC 186 K2	(= Swallow (Sellie × (Guat × Atete)))	South Africa	1999	54	44	26
JL 24		India		36	18	48
ICGV 93437	(= ICGV 86063 × ICGV 86065)	ICRISAT				
ICGV 90082	(= NCAc 343 × (OG 69 × NCAc 17090))	ICRISAT				
Mean (with *A. arasterio*) ± SE				41.9 ± 17.4	17.8 ± 13.6	31.1 ± 21.7
Mean (without *A. arasterio*) ± SE				35.4 ± 11.6	19.8 ± 14.0	34.6 ± 22.3

1. Only 1 plant survived in a 6-m row.

Table 2. Reaction of wild *Arachis* and cultivated groundnut genotypes to natural *Hilda patruelis* infestation in winter-sown (off-season) field trial at late podding stage at Chitedze, Malawi during mid-October 2000.

Genotype	Green and healthy plants (%)	Wilted plants (%)	Dead plants (%)
Wild *Arachis*			
A. villosulicarpa	93	7	0
A. erecta	87	13	0
A. arasterio	100	0	0
A. monticola	95	5	0
A. sp 1	89	4	7
A. sp 2	86	10	4
Cultivated checks			
Sellie	41	29	30
PC 205 DB	92	8	0
PC 186 K2	57	23	20
JL 24	44	33	23
ICG 8740	12	20	68
ICGV 93437	90	10	0
ICGV 90082	51	15	34
Mean	72.1	13.6	14.3
SE ±	12.7	10.2	13.8

ICGV 93437 were quite healthy at the late podding stage despite *Hilda* infestation. The number of dead plants in these entries ranged from 0 to 7%, compared to a mean of 14.3% dead plants at podding. ICGV 93437 has been released in Zimbabwe under the name Nyanda (van der Merwe et al. 2001). This variety is tolerant to drought and resistant to aphids; perhaps its resistance to *Hilda* has contributed to its release in Zimbabwe, where this pest is sporadic but one of the most serious sucking pests on the crop (Weaving 1980, PPRI 1982). These genotypes could be considered for further screening and use in groundnut improvement in southern Africa.

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Correlation Studies on the Attraction of Groundnut Leaf Miner *Aproaerema modicella* Moths and Weather Factors

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The groundnut leaf miner *Aproaerema modicella* is one of the most important and widely distributed foliage feeders of groundnut (*Arachis hypogaea*) crop in Asia (Wightman et al. 1990). It affects the growth and yield of the plants, especially in rainfed groundnut. Logiswaran and Mohanasundaram (1985) reported pod yield losses of >50% due to leaf miner. Groundnut leaf miner populations fluctuate widely between seasons. Abiotic factors, principally rainfall, humidity, and temperature are frequently suggested as causes of population fluctuations. An early detection of the pest is often the key to its effective management. The trapping technique may be a more effective method of detection of the pest than the visual method to determine the intensity of incidence. Adult populations of *A. modicella* have been monitored so far through light trap. The identification of female sex pheromone of *A. modicella* has made it possible to use traps baited with synthetic pheromone for monitoring this pest. We worked out the relationship between moths caught in the light trap as well as pheromone trap and weather factors to assess the influence of these weather factors on the field incidence and moth catches.

The study was conducted at the Oilseeds Research Station, Tindivanam, Tamil Nadu, India during 1996 rainy season (kharif) at 30 days after sowing. The pheromone traps (Delta trap) were placed in the groundnut field and the number of moths caught was recorded daily for 50 days. The moths caught in the light trap were also recorded daily for the same period. Multiple regression equations were fitted with weather factors to define their relationship with the number of moths caught in the light trap and pheromone trap.

The results of the multiple regression analyses are presented in Tables 1 and 2. While considering pheromone trap catches for a period of 50 days, relative humidity alone exerted a significant positive influence whereas the maximum and minimum temperature and rainfall exerted a negative influence on adult emergence and was not significant (Table 1). The multiple regression equation fitted with the weather factors (X) for pheromone trap catches (Y) of leaf miner moths is:

$$Y = -11.55 - 0.39^{NS} X_1 - 0.65^{NS} X_2 + 1.63^{*} X_3 - 0.28^{NS} X_4$$

where X_1 is maximum temperature, X_2 is minimum temperature, X_3 is relative humidity, and X_4 is rainfall constant.

While considering light trap catches of leaf miner moths for the same period of 50 days, the relative humidity alone exerted a significant positive influence whereas the maximum and minimum temperature and rainfall exerted a negative influence on adult emergence which