Responses of Peanut Genotypes to Fungicidal Control of Early Leaf Spot in Malawi[1]

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ABSTRACT

Early leaf spot (*Cercospora arachidicola* Hori.) is the most destructive disease of peanut (*Arachis hypogaea* L.) in Malawi. Fifteen peanut genotypes were examined for their response to fungicidal control of early leaf spot during the 1990/91 (year 1), 1991/92 (year 2), and 1992/93 (year 3) growing seasons at Chitedze, Malawi. Total rainfall and its distribution in these years were variable, with the most favorable pattern in year 3. Early leaf spot was most severe in year 2, although there was a severe midseason drought during this year. Fungicide application gave excellent control of the disease in all growing seasons. The cultivar Malimba had the most damage and the breeding line ICGV-SM 85053 had the least damage from early leaf spot. Pod yields were higher in year 3 than in the other two growing seasons. Pod yields were significantly higher in fungicide-sprayed (treated) plots than in water-sprayed (control) plots in years 1 and 3. Most peanut genotypes had positive yield responses to disease control in years 1 and 3. However, there were no significant differences in pod yields between treated and control plots of most genotypes in year 2. Although the pod yields were lower in year 2 than in year 1, total biomass production was higher in year 2. It was apparent that biomass partitioning was severely affected in year 2 due to the midseason drought stress that reduced pod yields and vitiated the beneficial effects of fungicidal application. Investment in fungicidal control of early leaf spot on genotypes with low yield potential may not be economical under less than optimal rainfall conditions.

Key Words: *Arachis hypogaea*, *Cercospora arachidicola*, fungicides, groundnut.

Early leaf spot (*Cercospora arachidicola* Hori.) is the most serious and destructive disease of peanut (*Arachis hypogaea* L.) in Malawi (2,8). The disease is widely distributed in all peanut-producing areas of the country, but is especially serious in the central region comprising Lilongwe and Kasungu Agricultural Development divisions. Yield losses are generally substantial, and about 19% of total peanut production in Malawi is lost due to early leaf spot annually. This loss is equivalent to U.S. $5 million of the annual national income (1). Unfortunately, all peanut cultivars grown by the farmers in Malawi are susceptible to early leaf spot. Although early leaf spot can be effectively controlled by certain fungicides, this practice is not economically feasible for small farms. Hence, attempts are being made currently to develop integrated disease management programs using host-plant resistance and cultural practices that lessen the risk of disease severity and minimize its impact on yield (8). The objective of this study was to examine the yield response of peanut genotypes commonly grown by farmers in Malawi and some recently developed high-yielding breeding/germplasm lines to fungicidal control of early leaf spot.

Materials and Methods

Field trials were conducted in the 1990/91 (year 1), 1991/92 (year 2), and 1992/93 (year 3) growing seasons at Chitedze Agric. Res. Stn. located 16 km west of Lilongwe, Malawi. Fifteen peanut genotypes (Table 1) including five cultivars grown by farmers in Malawi and 10 high-yielding breeding/germplasm lines developed at the SADC (Southern African Development Community)/ICRISAT (International Crops Research Institute for the Semi-Arid Tropics) Groundnut Project, Malawi were used in this study. Seed were treated with the fungicide thiram at 3 g/kg seed before sowing. Plots were arranged in a split-plot design with spray treatment as

Table 1. Description of peanut genotypes used in the experiments.

Genotype	Pedigree/other identity	Growth habit[a]	Seed color
Breeding/germplasm lines:			
ICGV-SM 83030	NC Ac 2190/NC Ac 17090	VL	Tan
ICGV-SM 83708	USA 20/TMV 10, ICGMS 42, CG 7, MGV 4	VB	Red
ICGV-SM 85001	Manfredi/M 13	S	Red
ICGV-SM 85038	PI 261911/PI 262092//Egret	S	Tan
ICGV-SM 85048	Goldin 1/Faizpur 1-5//Manfredi/M 13	S	Red
ICGV-SM 85053	Bulk selection from ICG 8528, ICGM 55	VL	Tan
ICGV-SM 86021	USA 20/TMV 10//Robut 33-1-10-3	S	Tan
ICGV-SM 86722	Egret/PI 274190	VB	Red
ICGM 285	ICG 8522, PI 262079	VL	Red
ICGM 550	ICG 6022, PI 162859	VL	Purple
Malawi cultivars:			
Malimba	Introduction from Gambia	S	Tan
Mani Pintar	Introduction from Bolivia	VB	Var.
RG 1	Makulu Red/48-14	VB	Tan
Chalimbana	Selection from a local landrace from Zambia	VR	Tan
Chitembana	Chalimbana/RJ 15	VR	Tan

[a]VL = valencia, VB = virginia bunch, S = spanish, and VR = virginia runner.

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main-plots and genotypes as subplots (14.4 m^2) and were replicated four times. Sowing of the trial was carried out on 27 Nov. 1990 for year 1, 17 Nov. 1991 for year 2, and 18 Dec. 1992 for year 3. Seed were sown singly at 10-cm (for spanish and valencia types) or 15-cm (for virginia types) spacing along 60-cm wide raised ridges. All trials were conducted under rainfed conditions and were fertilized with 40 kg P_2O_5/ha. Rainfall data were collected for all three seasons.

Chlorothalonil (as Daconil 2787 75 W in year 1 and year 2, or as Kavach in year 3) was applied at the rate of 1.28 kg in 500 L of water/ha on 10-d intervals beginning 30 d after sowing and continuing until 10 d before harvest. Seven sprays were applied in year 1 and eight sprays were applied in years 2 and 3. Control plots were sprayed with water at the rate of 500 L/ha. Three sprays of an insecticide (lambdacyhalothrin at 600 mL in 400 L of water/ha) were applied to all plots to control foliar feeding insects each year.

At 110 d after sowing, five plants were selected at random from each plot to assess their main stems for the proportion of leaf area damaged by early leaf spot. A schematic diagram depicting leaves with known proportions of their areas affected was used as an aid in rating.

Plots were harvested at optimum maturity by hand, and the yields of dried pods and haulms were recorded. Biomass was computed as the total of pod and haulm yield. A 250-g pod sample from each plot was shelled and seed from each sample were weighed. The shelling percentage was calculated as (seed weight/pod weight) × 100. Pod yield response to disease control was calculated as the percent increase in pod yield compared to the control.

Analyses of variance (ANOVA) for pod yield, biomass, shelling percentages, leaf area damage, and pod yield response were performed for each season and over seasons using the GENSTAT software package. The data on all variables were screened to check the ANOVA assumptions of variance homogeneity, normality, and addivity. These assumptions were generally satisfactory for all variables in this data set.

Results

The interaction effects involving season effects for pod yield, pod yield response, biomass, shelling percentage, and leaf area damage were significant ($P \leq 0.001$). Therefore the analyses of data on these variables are presented separately for each season.

Rainfall. Rainfall for the 1990/91 growing season (Nov. 1990 to Apr. 1991) was 628 mm. Although this was only 70% of the normal, it was well distributed for satisfactory crop growth. Rainfall for the 1991/92 growing season (Nov. 1991 to Apr. 1992) was 596 mm, which was only 67% of the normal. This total was not very different from year 1, but the distribution was uneven in year 2. A dry period followed sowing and only traces of rain fell until 11 Dec. 1991. Rainfall in January was only 56% of the normal of 228 mm, while that in February was only 10% of the normal of 214 mm, resulting in a severe midseason drought stress during the pod-filling stage of the crop. Rainfall in March was 85% of the normal 175 mm.

Total rainfall during the 1992/93 growing season (Nov. 1992 to Apr. 1993) was 927 mm, which amounted to 102% of the normal annual rainfall and was well distributed. From a total of only 45 mm (46% of normal) by 30 Nov., rainfall increased to reach 229 mm (79%), 437 mm (84%), and 704 mm (98%) by the end of December, January, and February, respectively.

Leaf Area Damage. The main effects of fungicide application and genotype on leaf area damage from early leaf spot were highly significant ($P \leq 0.001$) in all growing seasons. Fungicide × genotype interaction effects also were significant ($P \leq 0.01$) in all the seasons (Table 2).

Table 2. Mean squares for pod yield, biomass, shelling percentage, leaf area damage, and pod yield response for peanut genotypes with and without fungicide sprays during the 1990/91 to 1992/93 growing seasons in Malawi.

		Mean square				
Source	df	Pod yield	Biomass	Shelling	Leaf area damage	Pod yield response[a]
			1990/91			
Spray (S)	1	94.06**	788.04**	587.74**	84461.57**	-
Block	3	3.14	6.73	13.81	128.83	2663
Error (a)	3	0.57	2.12	6.43	5.21	-
Genotype (G)	14	1.91**	16.59**	287.44**	58.64**	12599*
S × G	14	1.01**	1.13	15.65*	36.39*	-
Error (b)	84	0.36	0.88	6.30	16.04	6285
			1991/92			
Spray	1	0.00	214.91**	207.59	45074.15**	-
Block	3	1.72	8.83	120.20	76.95	739
Error (a)	3	0.12	6.94	100.99	30.41	-
Genotype	14	3.61**	9.05**	360.05**	202.63**	1798
S × G	14	0.48*	3.07*	27.34	23.61**	-
Error (b)	84	0.26	1.67	33.07	16.13	1112
			1992/93			
Spray	1	159.74**	938.37**	22.84	43523.08**	-
Block	3	2.34	8.38	16.14	20.11	7990
Error (a)	3	1.26	0.54	7.11	46.33	-
Genotype	14	7.71**	3.89**	160.55**	103.40**	3243**
S × G	14	1.68**	3.64**	8.03	28.59*	-
Error (b)	84	0.23	0.59	6.74	12.94	1035

*,** Significant at $P \leq 0.01$ and $P \leq 0.001$, respectively.

[a]An RCBD analysis. Pod yield response from early leaf spot control was calculated by using the formula: [(PYF-PYC)/PYC]*100, where PYF is pod yield in treated plots and PYC is pod yield in control plots.

Early leaf spot was severe in all growing seasons and caused extensive leaf area damage to the foliage of all genotypes in the control plots (mean = 71.3%). Fungicide application gave excellent control of the disease in all growing seasons (mean leaf area damage = 9.0%). Leaf area damage in control and treated plots was 69.7 and 1.1% in year 1 (Table 3), 76.5 and 16.2% in year 2 (Table 4), and 67.7 and 9.6% in year 3, respectively (Table 5). Early leaf spot was more severe in year 2 than in year 1 or year 3, although there was a severe midseason drought in Feb. 1992.

Among the Malawian cultivars, Malimba had most

Table 3. Responses of peanut genotypes to fungicidal control of early leaf spot for pod yield, biomass, shelling percentage, and leaf area damage during the 1990/91 growing season in Malawi.

	Yield							Leaf area	
	Pods		Biomass			Shelling		damage	
Genotype	C[a]	F[b]	C	F	Mean	C	F	C	F
	--- t/ha ---		--- t/ha ---			-- % --		-- % --	
ICGV-SM 83030	1.99	4.81	4.53	10.75	7.64	72.9	69.0	67.5	0.8
ICGV-SM 83708	3.06	5.25	7.42	13.03	10.22	73.5	73.6	65.8	2.0
ICGV-SM 85001	3.00	4.45	6.19	10.94	8.57	67.6	59.0	75.3	0.8
ICGV-SM 85038	2.56	5.54	5.20	10.40	7.80	72.9	69.9	71.0	0.3
ICGV-SM 85048	2.88	4.40	4.85	9.00	6.93	73.0	68.9	75.5	1.5
ICGV-SM 85053	2.83	4.76	6.64	11.77	9.21	66.3	63.4	57.8	0.5
ICGV-SM 86021	2.43	4.31	4.48	8.99	6.73	76.5	73.1	62.0	0.8
ICGV-SM 86722	2.54	3.68	6.98	11.23	9.10	60.5	53.0	69.5	4.3
ICGM 285	2.33	4.11	5.12	9.22	7.17	74.3	70.3	66.5	0.3
ICGM 550	1.62	3.56	3.65	8.97	6.31	73.6	63.1	67.5	1.5
Malimba	1.53	4.36	3.35	9.15	6.25	79.6	77.9	82.3	3.5
Mani Pintar	2.81	4.11	7.10	13.39	10.25	68.4	62.0	67.8	0.3
RG 1	2.52	3.81	7.74	12.44	10.09	66.1	64.1	71.5	0.0
Chalimbana	2.38	3.29	6.73	12.84	9.78	63.8	58.5	70.5	0.0
Chitembana	2.24	2.83	6.34	11.09	8.70	63.6	60.4	74.5	0.3
Mean	2.45	4.23	5.76	10.88	8.32	70.2	65.7	69.7	1.1
LSDs:									
Spray (S)			0.84						
Genotype (G)			0.93						
G (for any given S)	0.59		0.93			2.50		3.98	
Other G × S means	0.86		1.38			3.53		5.50	
CV (%)	18		11			4		13	

[a]Control sprayed with water at 500 L/ha.
[b]Fungicide spray with chlorothalonil at 1.28 kg in 500 L of water/ha.

Table 4. Responses of peanut genotypes to fungicidal control of early leaf spot for pod yield, biomass, shelling percentage, and leaf area damage during the 1991/92 growing season in Malawi.

	Yield							Leaf area	
	Pods		Biomass			Shelling		damage	
Genotype	C[a]	F[b]	C	F	Mean	C	F	C	F
	--- t/ha ---		--- t/ha ---			-- % --		-- % --	
ICGV-SM 83030	3.63	3.54	8.98	11.84	56.0	56.1	56.1	74.5	17.0
ICGV-SM 83708	1.75	2.44	8.15	11.61	60.1	58.6	59.3	72.8	17.3
ICGV-SM 85001	3.40	2.48	9.11	10.71	57.3	54.9	56.1	81.3	18.3
ICGV-SM 85038	2.56	2.46	7.55	10.10	64.7	57.8	61.2	70.0	15.3
ICGV-SM 85048	3.10	2.83	6.99	8.49	64.0	61.8	62.9	86.8	16.3
ICGV-SM 85053	2.09	2.31	9.37	11.35	53.4	53.3	53.3	60.5	12.8
ICGV-SM 86021	2.56	2.95	6.75	9.84	63.9	66.8	65.3	75.3	13.8
ICGV-SM 86722	2.32	2.51	8.38	11.05	49.8	45.8	47.8	76.8	12.5
ICGM 285	3.40	2.58	8.48	8.27	66.7	64.5	65.6	78.8	16.0
ICGM 550	1.72	1.74	5.94	9.05	52.0	49.7	50.9	71.5	17.3
Malimba	2.96	3.22	8.02	9.64	69.6	72.9	71.2	100.0	21.0
Mani Pintar	1.20	1.00	7.12	10.43	55.5	44.2	49.9	73.5	19.3
RG 1	2.36	3.20	8.26	12.78	60.5	56.4	58.4	82.3	15.5
Chalimbana	1.76	1.34	8.25	11.88	53.4	47.3	50.4	66.8	14.8
Chitembana	1.97	1.89	8.57	13.04	58.8	55.8	57.3	77.0	16.0
Mean	2.43	2.43	8.00	10.67	59.0	56.4	57.7	76.5	16.2
LSDs:									
Spray (S)						NS[c]			
Genotype (G)						5.72			
G (for given S)	0.51		1.29			5.72		3.39	
Other G × S means	0.70		2.03			8.70		5.83	
CV (%)	21		14			10		9	

[a]Control sprayed with water at 500 L/ha.
[b]Fungicide spray with chlorothalonil at 1.28 kg in 500 L of water/ha.
[c]Not significant.

severe leaf area damage both in control (ranging from 82.3 to 100% with a mean of 89.3%) and treated (ranging from 3.5 to 21.0% with a mean of 12.4%) plots over all growing seasons. Mani Pintar (ranging from 67.0 to 73.5% with a mean of 69.4%), RG 1 (ranging from 70.8 to 82.3% with a mean of 74.8%), Chalimbana (ranging from 66.8 to 72.5% with a mean of 70.0%), and Chitembana (ranging from 73.0 to 77.0% with a mean of 74.8%) had less leaf area damage than Malimba in control plots. ICGV-SM 85053 had the least damage from early leaf spot both in control (ranging from 51.8 to 60.5% with a mean of 56.7%) and treated (ranging from 0.5 to 12.8% with a mean of 5.3%) plots.

Pod Yield. Spray, genotype, and spray × genotype effects on pod yields were highly significant ($P \leq 0.001$) in years 1 and 3 (Table 2), but there were no effects of spray treatment in year 2. Pod yields were higher in year 3 (mean 5.10 t/ha) than in years 1 (mean 3.33 t/ha) or 2 (mean 2.43 t/ha). Mean pod yields were significantly higher in fungicide-sprayed plots both in years 1 (4.23 t/ha) and 3 (6.26 t/ha) than in control plots in years 1 (2.45 t/ha) and 3 (3.95 t/ha). However, there were no significant differences between fungicide-sprayed (2.43 t/ha) and control (2.43 t/ha) plots in year 2.

All genotypes except Chitembana in year 1 and ICGV-SM 86722 in year 3 had significantly greater pod yields in treated plots than in control plots (Tables 3 and 5). Pod yields ranged from 1.53 to 3.06 t/ha in control plots and 2.83 to 5.54 t/ha in treated plots in year 1 and from 2.35 to 5.01 t/ha in control plots and 4.12 to 8.0 t/ha in treated plots in year 3. The pod yield increase due to control of early leaf spot varied from 33% for Chitembana to 207% for Malimba in year 1, and from 9% for ICGV-SM 86722 to 113% for Malimba in year 3 (Fig. 1). Genotypes ICGV-SM 83030, ICGV-SM 85038, ICGM 550, and Malimba gave over 100% pod yield response to fungicide in year 1. In year 3, only ICGV-SM 86021 and Malimba gave yield response over 100% (Fig. 1). Among the Malawian cultivars, Malimba showed highest yield response in years 1 (207%) and 3 (113%). Chitembana (33%) and Mani Pintar (41%) showed the least responses in years 1 and 3, respectively (Fig. 1). In year 2, two genotypes ICGV-SM 83708 and RG 1 had significantly greater pod yields in treated plots than in control plots. However, two genotypes ICGV-SM 85001 and ICGM 285 had significantly lower pod yields in treated plots than in control plots (Table 4).

Table 5. Responses of peanut genotypes to fungicidal control of early leaf spot for pod yield, biomass, shelling percentage, and leaf area damage during the 1992/93 growing season in Malawi.

Genotype	Yield				Shelling		Leaf area damage	
	Pods		Biomass					
	C[a]	F[b]	C	F	C	F	C	F
	-- t/ha --		-- t/ha --		-- % --		-- % --	
ICGV-SM 83030	4.43	6.92	8.09	14.92	71.3	69.9	66.3	5.3
ICGV-SM 83708	4.02	6.73	9.00	14.81	72.7	73.3	64.8	9.3
ICGV-SM 85001	3.45	6.47	7.15	15.37	65.1	65.2	70.3	12.3
ICGV-SM 85038	5.01	8.00	8.44	15.12	73.0	72.5	65.0	9.0
ICGV-SM 85048	4.96	7.86	8.43	14.02	69.8	68.4	72.8	11.8
ICGV-SM 85053	4.98	6.60	10.04	15.14	65.0	64.1	51.8	2.8
ICGV-SM 86021	4.05	7.70	7.33	14.26	72.2	68.8	64.5	7.8
ICGV-SM 86722	4.57	4.92	11.10	13.65	63.4	59.1	65.5	9.4
ICGM 285	4.80	6.30	8.85	13.39	73.9	68.7	62.3	9.8
ICGM 550	4.38	6.45	7.42	13.63	68.2	69.9	63.5	13.8
Malimba	3.41	7.15	6.95	13.10	74.5	74.8	85.8	12.8
Mani Pintar	3.20	4.50	8.77	13.15	65.5	66.7	76.0	11.3
RG 1	2.90	5.19	8.98	14.08	66.7	67.2	70.8	11.8
Chalimbana	2.35	4.12	8.10	12.92	60.7	60.8	72.8	11.3
Chitembana	2.80	4.84	8.60	13.57	62.0	61.3	73.0	7.8
Mean	3.95	6.26	8.48	14.08	68.3	67.4	67.7	9.6
LSDs:								
Spray (S)					NS[c]			
Genotype (G)					2.58			
G (for given S)	0.47		0.76		2.58		3.58	
Other G × S means	0.79		1.07		3.66		5.54	
CV (%)	9		7		4		10	

[a]Control sprayed with water at 500 L/ha.
[b]Fungicide spray with chlorothalonil at 1.28 kg in 500 L of water/ha.
[c]Not significant.

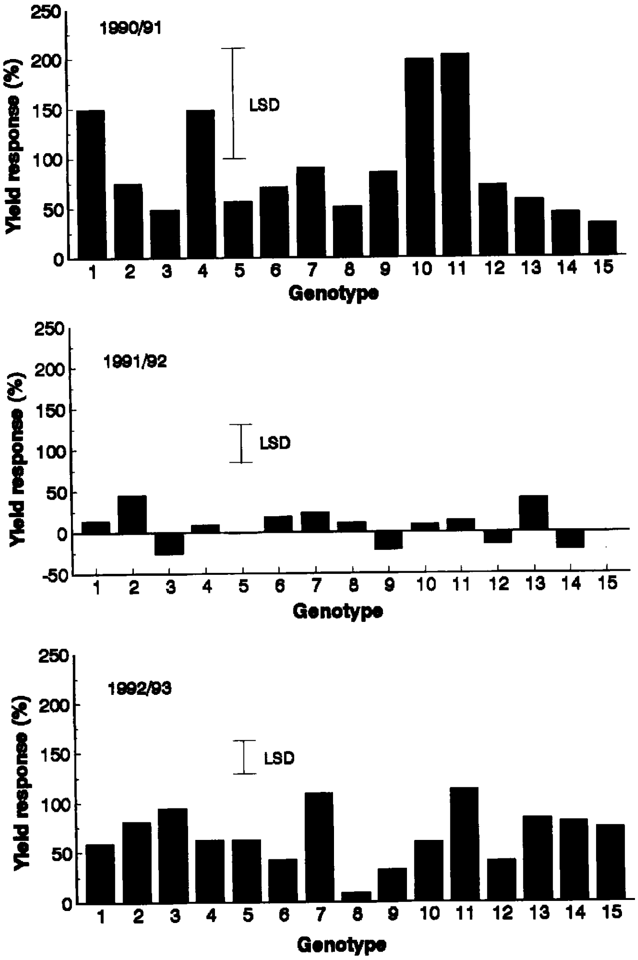

Fig. 1. Pod yield response (%) of peanut genotypes to fungicidal control of early leaf spot during the 1990/91, 1991/92, and 1992/93 growing seasons in Malawi. Key to genotypes: 1 = ICGV-SM 83030, 2 = ICGV-SM 83708, 3 = ICGV-SM 85001, 4 = ICGV-SM 85038, 5 = ICGV-SM 85048, 6 = ICGV-SM 85053, 7 = ICGV-SM 86021, 8 = ICGV-SM 86722, 9 = ICGM 285, 10 = ICGM 550, 11 = Malimba, 12 = Mani Pintar, 13 = RG 1, 14 = Chalimbana, and 15 = Chitembana.

None of the breeding lines significantly outyielded the highest yielding Malawian cultivar Mani Pintar in control plots in year 1. However, two breeding lines, ICGV-SM 83708 and ICGV-SM 85038, significantly outyielded the Malawian cultivars in treated plots. In year 2, one breeding line, ICGV-SM 83030, outyielded Malimba in control plots. In year 3, several breeding lines outyielded the highest yielding Malawian cultivar Malimba. ICGV-SMs 85038, 95048, and 86021 gave pod yields over 7.50 t/ha in treated plots (Table 5).

Biomass. Effects of spray and genotype on biomass production were highly significant ($P \leq 0.001$) in all growing seasons, but the spray × genotype interaction was significant only in years 2 and 3. Total biomass production was higher in the year 3 (8.48 t/ha in control and 14.08 t/ha in treated plots with a mean of 11.28 t/ha) than in the years 1 (5.76 t/ha in control and 10.88 t/ha in treated plots with a mean of 8.31 t/ha) or 2 (8.00 t/ha in control and 10.67 t/ha in treated plots with a mean of 9.33 t/ha). Biomass production was significantly higher in treated plots (mean 11.87 t/ha) than in control plots (mean 7.41 t/ha). All genotypes produced more biomass in fungicide-sprayed plots in all the growing seasons.

Shelling Percentage. Genotypic effects significantly ($P \leq 0.001$) affected shelling percentages in all growing seasons. However, the effects of spray and spray × genotype interaction also were significant in year 1.

Mean shelling percentages were lowest in year 2 (59.0 in control and 56.4 in treated plots with a mean of 57.7) compared to year 1 (70.2 in control and 65.7 in treated plots with a mean of 60.0) and year 3 (68.3 in control and 67.4 in treated plots with a mean of 67.8). In general, shelling percentages were lower in treated plots (63.2) than in control plots (65.8). Malimba had highest shelling percentage in both control and spray treatments in all seasons.

Discussion

Total rainfall and its distribution during years 1, 2, and 3 were variable, with conditions in year 3 most favorable of all. Early leaf spot was more severe in year

2 than in years 1 or 3 although there was a severe midseason drought in year 2. Drought stress during the process of host-pathogen interaction might have stimulated the leaf senescence resulting in greater reduction in the available leaf area in year 2 and pod yields were lower than in years 1 and 3. Drought stress during the pod filling stage coupled with relatively high disease severity during this season accounted for low pod yields. There were also no significant differences between yields in treated and control plots of most genotypes in year 2. Other foliar diseases including late leaf spot [*Cercosporidium personatum* (Berk. & Curt.) Deighton] and rust (*Puccinia arachidis* Speg.), were present only towards the end of the crop season. However, they were not severe enough to cause any appreciable damage to foliage.

During years 1 and 3, most peanut genotypes had positive pod yield response to early leaf spot control (Fig. 1). However, during year 2, most genotypes did not show any beneficial effects on pod yield due to disease control. In year 1, shelling percentages were adversely affected due to fungicidal spray as observed by other workers (3,4). Although pod yields were lower, the total biomass production was higher in year 2 than in year 1. This indicates partitioning of photosynthates to the reproductive parts was severely affected resulting in poor pod-filling and low pod yields.

These results illustrate the risk of fungicidal control of early leaf spot under rainfed agricultural systems. Under normal and well distributed rainfall patterns or in areas where the crop is grown under supplementary irrigation, there should be substantial increase in pod yields due to fungicidal control of early leaf spot. However, under low rainfall and/or erratic distribution, partitioning may be affected resulting in an adverse benefit-cost ratio. Early leaf spot control under such conditions may not be economical. Foliage retention due to early leaf spot control in drought situations may lead to excessive loss of water due to transpiration.

In addition, genotypes respond differently to disease control (4,5,6,7,9). In this study, some genotypes responded more positively to chemical control of the disease than others even under optimum rainfall situations. For instance, among the Malawian peanut cultivars, Chalimbana and Chitembana in year 1 and Mani Pintar in year 3 had the lowest pod yield responses to disease control even under optimum rainfall situations. This clearly indicates their low yield potentials. On the other hand, Malimba had the highest pod yield response to chemical control under similar situations. Investments in chemical control of early leaf spot on genotypes with low yield response may not be economical. Recommendations to the growers on fungicidal control of early leaf spot need careful consideration of agroclimatic conditions under which the crop is grown, the genetic yield potential of cultivars used, and their response to disease control.

Unfortunately, chemical control is not economically feasible to small farms in Malawi. Hence, development of integrated disease management programs using host-plant resistance and cultural practices is underway. The results of this investigation will assist the breeders in selecting genotypes with high pod yield response to chemical control of early leaf spot. Genotypes such as Malimba which had high pod yield response are being used in crosses with early leaf spot-resistant germplasm.

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