Table 3. Results of field trials to control Phymatotrichum root rot of cotton by injecting the EC formulation of propiconazol into the root zone of established plants, using anhydrous ammonia as a carrier

Treatment	Upland 1/		Pima 2/
(lbs a.i./A)	Percent Disease	Yield (seed cotton)	Percent Disease
Control	74a	2,000a	85a
0.5	59a	2,548a	78a
1.0	64a	2,081a	61a
2.0	64a	2,622a	64a

1/ Upland cotton (DPL-55). Means for percent disease from 2 field plots, yield from 1 field plot. Treatments made 5/25/82 and 6/10/82. Percent disease readings made 9/28/82 and and 10/5/82. Yield data collected 10/28/82.
2/ Pima cotton (S-5). Means from 1 test plot. Treatment made 6/3/82, percent disease data collected 10/14/82.
3/ Means followed by the same letter are not significantly different (LSD=0.05).

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Estimating Cotton Crop Loss Caused By *Phymatotrichum omnivorum*.

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Summary

In September, 1981, 37 fields of Upland and 9 fields of Pima cotton were surveyed as part of the cotton crop loss assessment project. Total seed cotton yields for Pima and Upland cotton were reduced by 13% and 10%, respectively by *Phymatotrichum omnivorum* infection. Losses were most severe in Upland fields in cotton monocultures. Fiber and seed quality were also significantly lower on infected plants of both varieties.

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Phymatotrichum root rot continues to be a major production constraint for Arizona cotton growers. In the Marana area, it is the single largest contributor to yield reduction. While there is an abundance of literature on fiber losses attributable to root rot, a precise measurement of the economic losses associated with this disease have been elusive. Other potential loss factors, such as fiber and seed quality, have not been adequately studied.

Accurate crop loss information can be an essential management tool in assisting growers in deciding: whether to plant cotton or rotate; whether cultural and chemical disease control strategies can economically be employed; how best to manage his cost inputs relative to his estimated yields; and what financial return he can expect from his crop. The data summarized in this report represents the initial phase of what is intended to be a long term project aimed at the development of accurate and economical methods of cotton crop loss assessment. A total of 37 fields of Upland (2454 acres) and 9 Pima fields (532.3 acres) in the Marana area were surveyed on September 18-19,

1981. In each field, counts were replicated 4 times in infested and healthy cotton, to determine the number of plants and bolls per experimental unit (1/2000 acre). Thirty fully fluffed bolls were collected from healthy and diseased plants in each field for quality analysis. Fiber samples were analyzed by the fiber laboratory at the Cotton Research Center. Other data collected included plant density, boll density, crop rotation history, field size and location.

Results

Upland plant stand densities in diseased and healthy areas were comparable as would be expected with stands ranging from 21,600 to 70,600 plants/acre. Boll densities were significantly lower in root rot areas, averaging 3.95 mature bolls/ infected plants compared to 6.54 bolls/healthy plants. Fewer bolls on diseased plants reflects the lack of late season boll set due to plant stress and wilting. Bolls matured on diseased plants contained significantly less lint (1.44 g/boll) than bolls from healthy plants (1.77 g/boll). Yield loss then had two major components: lower total boll set and less fiber/boll. Total seed cotton yields for Upland cotton were significantly lower in root rotted areas of fields with an average loss of about 10% (Table 1). When yield estimates (based on field survey data) were compared to growers' gin records, calculated yields proved to be extremely accurate. Calculated Upland yields averaged 0.1 bale/acre lower than actual yields and estimated yields for Pima cotton were 0.18 bale/acre lower than actual.

Cropping histories, compiled through grower interviews and previous research records, were used to evaluate the effect of crop rotation on yield loss. Of the Upland fields, 27 were in cotton monocultures, 5 in cotton-small grain rotations and 1 in lettuce-small grain-cotton rotation. No cropping records could be found for 4 of the fields.

Yield reductions associated with plant diseases could be calculated by dividing the total amount of loss by the total number of acres and expressed as loss/acre. Such calculations are made based on the assumption that the disease (and subsequent loss) is uniformly distributed throughout the acreage. For several reasons, unique to root rot, this method of loss evaluation is not applicable. Root rot consistantly occurs in well defined areas within a field that are surrounded by healthy or symptomless plants. Consequently, root rot yield losses were calculated and expressed as loss/acre infested, on the assumption that losses occurred primarily in the infested areas.

Statistical evaluations of yield loss in Upland cotton relative to rotation practices were restricted to cotton monoculture versus cotton-small grains, as there were too few fields in the other rotations to make meaningful comparisons. Significantly greater losses could be attributed to cotton monoculture with average losses of 1.14 bales/infested acre. Fields in small grain rotations suffered only 0.64 bale loss/infested acre.

Fiber and seed quality was significantly lowered by root rot infection (Table 2). Seed index (weight g/100 seed) was lower in infected cotton, while lint turnout was unaffected. These data indicate that the ratio of seed weight to fiber weight was comparable to healthy cotton, but both seed and fiber weights were lower in infected cotton. Statistical differences were observed in all fiber length perimeters (2.5% and 50% span length and uniformity). However, all fiber lengths fell within the range considered acceptable for general textile use. Fiber fineness', as measured by micronaire readings, were lower, with diseased plants producing slightly finer fiber than healthy. Quality differences have not yet been related to rotational practices. Root rot infection also decreased the germination percentage and seedling vigor of seeds collected from diseased cotton plants (Table 3). About 79% of seed from infected plants germinated with an average seedling weight of 0.85 g after 21 days. "Healthy" seed germinated at 90% with seedlings weighing 1.03 g.

Pima cotton yields averaged 13% lower in root rot areas when compared to healthy portions of the same fields (Table 1). Infected plants set only about half as many bolls (4.29 boll/plant) as healthy cotton (8.12 bolls/plant) but there were no differences in amount of lint/boll (average 1.17 g/boll). Rotation practices were compiled for 7 of the 9 fields studied. The effect of rotation on loss could not be assessed as 6 of these 7 fields were in cotton monocultures. The quality was generally more durable than Upland with significant losses observed on seed index and fiber fineness (Table 4). Seed germination was comparable for both healthy and diseased plants and averaged approximately 85%. Seedling vigor, however, was significantly lowered for seeds from root rotted plants, with average fresh weights of 1.08 g/seedling compared to 1.2 g/seedling from "healthy" seed (Table 3).

Discussion

Yields of both varieties studied were significantly lowered by Phymatotrichum infection, with cotton grown in monoculture being the most severely affected. The relative accuracy of calculated yields indicated that the basic survey procedures and yield estimating formuli were reasonably reliable. Assuming an Upland seed cotton price of $0.65 per pound (1981 price), loss per acre averaged $198.73. The results of fiber quality analysis suggests that while infected Upland plants produce inferior cotton, the quality generally falls well within the range considered acceptable. Unless quality perimeters become more stringent, it is unlikely that growers in root rot areas will be penalized on the basis of fiber quality. In years when the disease is extremely severe, it may be prudent to co-mingle cotton from the root rotted portions of fields with healthy cotton prior to ginning.

Loss of seed quality presents a slightly different situation. Seed index data showed that plant infection lowered seed weights. However, the overall economic impact of reduced seed yields is negligible. At present, the price paid for cotton seed by processors does not even cover ginning costs. The factors influencing price are aflatoxin contamination and the general economic environment. Seed germination and seedling vigor data strongly suggest that seed growing contracts should not be awarded to growers in severe root rot areas.

Table 1. Cotton fiber yields and acres infested by *Phymatotrichum omnivorum*[a]

	Acres			Yield		Loss	
	Healthy	Infested	(%)	Optimal	Actual	Bales	(%)
Short Staple (*Gossipium hirsutim*)							
Total	2417.3	657.46		3291.4	2960.2	331.15	
Average	67.15	18.76	(28)	91.4	82.2	9.20	(10.0)
Long Staple (*Gossipium barbadense*)							
Total	532.3	126.1		728.9	634.5	94.5	
Average	59.4	14.0		81.0	70.5	10.5	(13.0)

[a]Data represent samples taken from 36 short staple cotton fields and 9 long staple cotton fields with 6 replications/field.

Table 2. Fiber quality analysis from diseased and healthy Upland cotton[a] (Marana 1981)

	Healthy	Diseased
Wt. seed cotton[b]	138.1A	114.2A
% lint turnout	39.7A	38.9A
Seed index	9.1A	7.6B
Length (M)	60.5A	56.7B
(UHM)	1.19A	1.17B
Uniformity	50.4A	48.3B
Strength	3.3A	3.3A
Fineness	4.9A	3.9B

[a]Quality data represents the average from 37 fields.
[b]Number in each row followed by the same letter were not significantly different at p = 0.05.

Table 3. Seed germination and seedling vigor of seed collected from healthy and Phymatotrichum infected cotton plants[a]

	Seed Germination		Seedling First Wt (grams)	
	Infected	Healthy	Infected	Healthy
Upland[b]	23.5/30	27.1/30	80.9	99.2
%	78.3	90.3		
Pima[c]	25.2/30	26.4/30	08.0	120.9
%	84.0	88.0		

[a]Seed germination and fresh weights were determined 21 days after planting.
[b]Data represent averages for the 37 Upland fields sampled.
[c]Data represents averages for the 9 Pima fields sampled.

Table 4. Fiber quality analysis from healthy and diseased Pima cotton[a] (Marana 1981)

	Healthy	Diseased
Wt. seed cotton[b]	97.6A	84.8A
% lint turnout	38.4A	39.4A
Seed index	11.9A	10.7B
Length (M)	72.7A	71.3A
(UHM)	1.4A	1.4A
Uniformity	51.9A	52.6A
Strength	4.6A	4.9A
Fineness	4.5A	4.1B

[a]Quality data represent the average of 9 fields.
[b]Numbers in each row followed by the same letter were not statistically different at p = 0.05.

NEMATOCIDE TRIALS

C. R. Farr

The withdrawal of DCBP from commercial use caused concern among farmers about cost and effectiveness of other nematocides against root knot nematodes in cotton. Need for tests in 1981 and 1982 also seemed apparent because acreages over 225,000 in Maricopa County contributed to considerable continuous cotton history in fields. This aids the development of nematode populations and may show greater response to nematocide use.

Amount of yield increase varied from farm to farm, according to infestation levels. This emphasizes the need to inspect the previous crop for infestation levels. Gross return per acre varied from $94.20 to $291.60 when 60 cents per pound of lint is used for value. The third farm treatment was not profitable because of low nematode populations.

PHILLIPS FARMS-GOODYEAR

Treatment	Seed Cotton, Lbs per Repl.				Ave Seed Cotton/rep	Seed Cotton Per Acre	Lbs. Lint 1/ Per Acre
	I	II	III	IV	Ave.		
Telone 5.7 gal	1485	1430	1380	1500	1449	3926	1370
EDB 3.0 gal	1175	1225	1210	1350	1240	3360	1173
Check	935	--	--	--	935	2533	884

1/Lint Turnout: 34.9% Plot size: 4 rows 1270 Hilong