

RECENT DISCOVERY OF HOJA BLANCA, A NEW RICE DISEASE IN FLORIDA,  
AND VARIETAL RESISTANCE TESTS IN CUBA AND VENEZUELA

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Summary

Hoja blanca, a potentially destructive new rice disease, was found near Belle Glade, Florida, in September 1957. Previously the disease had been observed and studied in Cuba and Venezuela where it has caused serious losses. The symptoms are similar to the symptoms described for the stripe disease in Japan. It is thought that the causal agent is an insect-transmitted virus. During 1957 a large number of varieties and selections were grown in Cuba and Venezuela. A large number of varieties of the japonica or short-grain type were resistant. All of the United States long-grain varieties and the commonly grown short-grain varieties were susceptible. However, several minor United States short- and medium-grain varieties and selection such as Colusa, Asahi, Lacrosse, and Missouri R-500 were resistant, and Arkrose was moderately resistant.

Hoja blanca, a potentially serious new disease of rice, was recently found for the first time in the United States near Belle Glade, Florida. Symptoms suggestive of hoja blanca were first observed in late August 1957, and definitely identified on September 12. A USDA News Release announcing the discovery of the disease in Florida was issued on September 18. Previously the disease was known from Cuba, Venezuela, Panama, and Costa Rica.

The name of the disease, "hoja blanca", is a Spanish name meaning "white leaf". The disease has been present in Cuba since at least 1954, according to available information. By 1956 it was widespread there and caused severe yield losses of the commonly grown United States varieties, such as Bluebonnet 50 and Century Patna 231, that are used almost exclusively for rice production in Cuba. Hoja blanca appeared in Venezuela in 1956, and caused serious losses in certain rice areas, particularly in the State of Portuguesa. The disease has spread rather rapidly and is probably present in other South or Central American rice-growing areas. In Cuba and Venezuela the writers have estimated yield reductions of as much as 75 percent in affected fields. According to reliable reports some fields were so severely damaged that they were not harvested.

SYMPTOMS

The first symptoms are one or more white stripes on the leaf blade, or the entire leaf blade may be white, or the leaves may be mottled in a typical mosaic pattern. Figures 1 and 2 illustrate the leaf symptoms. Diseased plants are reduced in height, and in severely affected fields the panicles of healthy plants are taller than those of diseased plants. The panicles of diseased plants are somewhat reduced in size and often are not fully exerted from the sheath. The lemma and palea show a brownish discoloration and dry out rapidly, and frequently are distorted in shape. The floral parts are often absent, or if present they are sterile. As a result, panicles of diseased plants contain few or no seeds and remain in an upright position. Infected plants are not killed by the disease, and new tillers of a second or ratoon crop often show no symptoms. Both normal and diseased tillers frequently are observed on the same plant.

Several grasses growing in or adjacent to fields of diseased rice often show symptoms similar to those of hoja blanca on rice. *Echinochloa colomum* and *Panicum fasciculatum* have shown such symptoms in Florida, as well as in the other countries. Malaguti (3) and Malaguti, Diaz and Angeles (4) in Venezuela, and Mukoo and Iida (5) in Cuba have reported grasses with similar symptoms.

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Table 1. Tabulation of resistant entries in Hoja Blanca Nursery No. 1 by country of origin, grown in Cuba and Venezuela, 1957.

Country of origin	Number : entries : tested	Number classed as:	
		Resistant	Moderately : resistant
United States	831	48	29
China	528	135	77
Japan	290	182	45
Korea	105	50	32
Taiwan	49	45	1
Burma	5	0	0
India	29	2	2
Indonesia	10	0	0
Philippines	5	0	0
Thailand	4	1	0
Argentina	11	6	0
Brazil	12	3	0
Br. Guiana	3	0	0
Chile	2	2	0
Peru	16	1	2
Venezuela	16	2	0
Costa Rica	4	2	2
El Salvador	15	2	2
Haiti	15	1	0
Jamaica	2	1	1
Austria	2	0	1
France	11	6	1
Greece	2	0	1
Italy	31	15	4
Portugal	17	13	1
Spain	10	9	0
Yugoslavia	3	1	0
Iran	7	1	0
Turkey	26	7	6
Africa, except Egypt	15	0	0
Egypt	6	3	3
Miscellaneous	8	2	0
"Check varieties"	110	0	0
Totals	2200	540	210

Table 2. Hoja blanca readings for certain resistant varieties and selections along with the reaction of leading United States rice varieties in Cuba and Venezuela, 1957.

Variety or selection	C. I. number	Hoja Blanca Ratings <sup>a</sup>				Probable reaction
		Cuba		Venezuela		
		May	July	May	August	
Fortuna	1344	3	8	7	9	S
Raxoro	1779	2	7	8	8	S
Zenith	7787	3	8	5	8	S
Magnolia	8318	2	7	8	8	S
Texas Patna	8321	2	7	8	8	S
Bluebonnet 50	8990	2	7	7	9	S
Century Patna 231	8993	3	5	7	8	S
Nato	8998	3	6	6	9	S
Toro	9013	3	8	6	9	S
Colusa	1600	0	0	0	--	R
Arkrose	8310	2	1	3	tr	MR
Asahi	8312	tr	0	0	0	R
Lacrosse	8985	0	0	1	0	R
Lacrosse x Magnolia	9001	2	0	0	0	R
Missouri R-500	9155	1	0	1	0	R
Bruin Sel. x Zenith	9209	0	0	tr	0	R
Hgb. Mix. 11-49-19-5	9368	0	0	0	0	R
B53-2604, B438A Rogue	9369	0	0	0	0	R

<sup>a</sup>Visual rating scale: 0-9 -- 0 = No disease. 9 = Severe disease.

The writers have noted that the symptoms of hoja blanca and those described for the disease known as the stripe disease (*Oryza Virus 2*) in Japan are similar. Mukoo and Iida (5) as well as Malaguti and co-workers (3, 4) also have pointed out this similarity. The illustration of the stripe disease given by Kawada et al. (2) indicates further that at least certain symptoms of the two diseases are similar or identical. Because of the nature of the symptoms of hoja blanca and their similarity to those of the stripe disease, it has been assumed that, like stripe disease, hoja blanca also is caused by a virus that probably is transmitted by insects. In Venezuela, Malaguti, Diaz and Angeles (4) have reported transmission of hoja blanca by leafhoppers (at present not otherwise identified).

#### VARIETAL REACTION

On the basis of surveys made in Cuba and Venezuela in late 1956 and early 1957 (1), it was concluded that hoja blanca was a serious rice disease in those countries and that it constituted a threat to the rice industry of the United States. In 1957 the reaction of a large number of United States rice varieties, selections, and introductions from the United States Department of Agriculture world rice collection was determined in tests conducted in Cuba and Venezuela<sup>2</sup>. Hoja blanca Nursery No. 1, consisting of 2200 entries, was sown on two dates near Acariqua, Venezuela. Ratings were made on the two plantings approximately 100 and 95 days, respectively, after seeding. The nursery of 2200 entries and an additional nursery of 1725 entries were grown in a test area near Jobabo, Cuba, where observations were made at approximately 40 and 95 days after seeding. Certain United States varieties were included every 20 rows as "check" varieties throughout the nurseries. Rice selections and varieties included in these tests consisted of diverse types from several countries of the world. Natural infection was

<sup>2</sup>The writers acknowledge the assistance and cooperation of Mr. William C. Davis, Vice President, Arrozal Bartes, S. A., Jobabo, Cuba; and Mr. Rufus K. Walker, Research Director, Narfarm, Valencia, Venezuela (Superintendent, Rice Experiment Station, Crowley, Louisiana, on leave of absence).

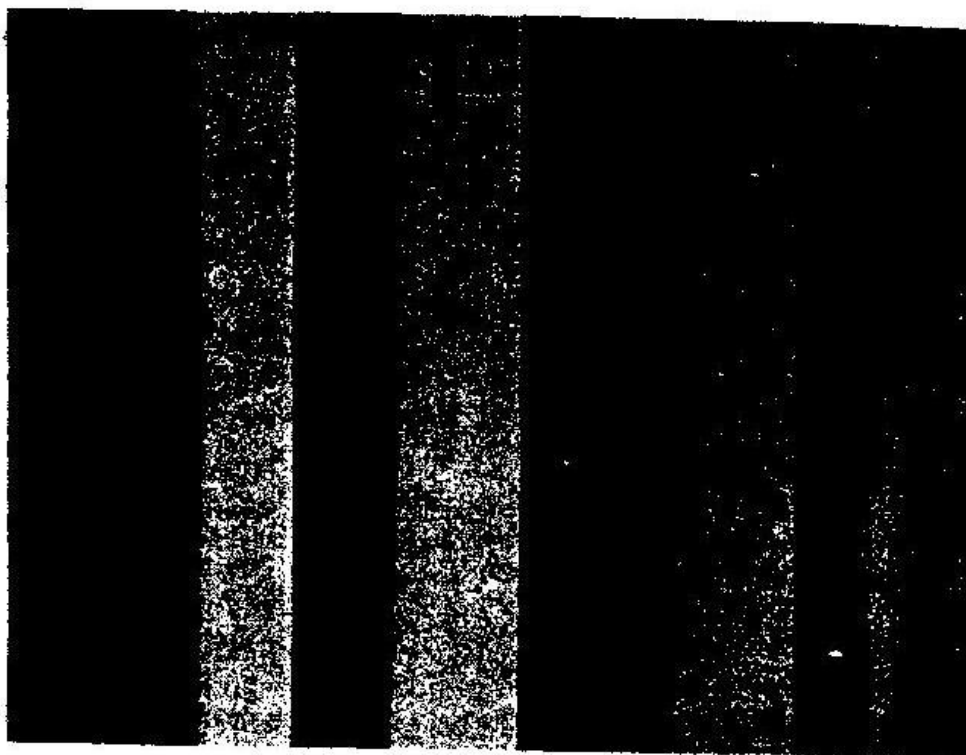


FIGURE 1. Leaf symptoms of hoja blanca. Normal leaf at left.



FIGURE 2. Typical appearance of hoja blanca in the field.

(NOTE: The dark leaf spots, caused by Helminthosporium oryzae, in the figures represent a separate disease.)

Photographs by Henry M. Spelman, III, Everglades Experiment Station, Belle Glade, Florida.



heavy on susceptible entries at both locations. A scale of 0 to 9 was used for rating severity.

A fairly large number of the entries were rated as resistant to hoja blanca, since they showed few or no foliar symptoms and growth and grain development were normal. A large number of the resistant entries listed in Table 1 came from Japan, China, Taiwan, or Korea. Most of the resistant entries are japonica types, which may be characterized as short-grain types with rough, fairly narrow, dark green leaves. Varieties from other countries were of this type, which indicates Japanese origin. Probably, if the origin of all the resistant entries included in the tabulation were known, the total number of resistant varieties listed from Japan and, perhaps, China would be larger, or else there would be many duplications. Included among the resistant United States rices in the tabulation are several that derived their resistance from foreign varieties. Many of the entries listed as resistant are undesirable types because of agronomic or grain characteristics or of susceptibility to blast (*Piricularia oryzae*).

A few of the United States short- and medium-grain varieties of minor importance, and several selections, were found to be resistant. However, all of the more widely grown United States rice varieties were susceptible. The one possible exception is Colusa, which was resistant. No long-grain varieties were found to be resistant to hoja blanca. Readings for the most important rice varieties of the southern rice area are given in Table 2. All of these were definitely quite susceptible. Caloro, the leading California variety, also was susceptible. A few types that were consistently resistant in all tests are listed in Table 2, together with their disease ratings for comparison with ratings for the susceptible varieties. Some of the resistant selections are adapted types and, if necessary, they could be grown in the United States.

One of the objectives of the 1957 tests was to screen the United States Department of Agriculture rice collection for sources of hoja blanca resistance. As shown in Table 1, a rather large number of entries which might be used in a breeding program to develop hoja blanca resistant varieties is available. The very few long-grain varieties that were rated as resistant are of undesirable plant types. A check as to the origin or parentage of the resistant United States varieties and selections indicates that japonica or short-grain types are the sources of their resistance. Asahi is an introduced variety from Japan, while Colusa was selected from an introduction from Italy that originally came from China. Possibly the resistance of Lacrosse, Missouri R-500, and certain other selections came from short-grain parents. Selections with Colusa as a backcross parent were generally resistant. A number of resistant selections had Lacrosse as one of the parents. Some of the selections from each of two crosses between Lacrosse and a susceptible parent were resistant like Lacrosse, whereas others were completely susceptible. These results indicate that it should be possible to obtain resistant strains of all grain types.

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