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MISSION AND ACCOMPLISHMENTS OF THE ST. CROIX GERmplasm
INTRODUCTION AND RESEARCH UNIT

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ABSTRACT

The USDA-ARS Germplasm Introduction and Research Unit (GIRU) is located on a 58-acre farm adjacent to the University of the Virgin Islands on St. Croix. From its inception in 1951 until 1987, the facility was operated as the St. Croix Federal Experiment Station. Between 1952 and 1965, the Station research was devoted to improving agriculture in the Virgin Islands. From 1965 to 1986, pilot tests were conducted at the Station for the control of economically important pests through nonchemical means. The main objective of GIRU since its beginning in 1987 has been to grow, evaluate, and increase seed of quarantined introductions of tropical and subtropical cereals such as sorghum, corn, and rice for the National Plant Germplasm System (NPGS) under USDA-APHIS protocols. The current quarantine program allows restricted germplasm to be evaluated and increased under field conditions rather than the greenhouse conditions required in northern areas of the United States. Information on the germplasm evaluated at GIRU is available to scientists and researchers worldwide through the USDA's Germplasm Resources Information Network (GRIN) system.

INTRODUCTION

The USDA-ARS Germplasm Introduction and Research Unit (GIRU) is situated adjacent to the University of the Virgin Islands, St. Croix. Its present facilities include a laboratory and administration building, an annex storage building, a nearly completed outgoing seed storage building, living quarters, and a cistern and farm pond with a combined capacity of 1.5 million gallons for drip irrigation and other purposes. Its farm consists of 58 acres, 42 of which are suitable for mechanized agriculture. Of these, 20 acres have a drip irrigation system. The locality has an average annual rainfall of 110 cm and mean minimum and maximum temperatures of 20 and 32°C, respectively.

PAST RESEARCH

The facility began as the St. Croix Federal Experiment Station. It was established in 1951 under Public Law 82-228, and the land was transferred from the Virgin Islands Corporation to the USDA in 1955. From 1952 to 1965, the Station sought to upgrade the islands' agriculture through such diversified programs as crop adaptation, soil fertility, animal breeding, and pasture management (Table 1). During 1965 to 1986, research concentrated on testing and evaluating novel biological and physical control methods that served to implement broad USDA programs on natural pest control for cattle and cotton (Table 2).

GIRU'S OBJECTIVES AND RESEARCH

In 1987, the facility's name and objectives were changed. It became the Germplasm Introduction and Research Unit. The main objective of the new Unit was to grow, evaluate, and increase seed of prohibited tropical and subtropical cereal introductions (corn, sorghum, and rice) for the National Plant Germplasm System (NPGS). A protocol was established between USDA-ARS and USDA-APHIS-PPQ (Table 3) to ensure that all the material grown at the Unit would be completely free of exotic diseases not yet detected in the United States that could cause severe damage to major crops. Targeted diseases include types of ergot, downy mildew, smut and leaf blight (Table 4).

Preharvest evaluations of agronomic traits of the introductions are included in the Germplasm Resources Information Network (GRIN) system of the USDA (Table 5). Plant breeders, agronomists, and interested scientists worldwide have access to this information through the GRIN system. These are the first compiled evaluations of restricted germplasm in the Western Hemisphere and provide valuable new information for utilization in breeding programs.

An annual survey is made of local corn, sorghum and related plants prior to the GIRU planting to determine the extent and diversity of targeted and other diseases on them. The Unit's corn and sorghum crops are also monitored and inspected periodically and before harvest by a plant pathologist from TARS, GIRU's agronomist, and personnel from the USDA-APHIS, PPQ (Animal and Plant Health Inspection Service, Plant Protection and Quarantine Agency). Routine pest management programs and the eradication of specific pests or predators are also part of GIRU's efforts to maintain disease-free plant material.

Table 1. Research programs at the St. Croix Federal Experiment Station from 1952 to 1965.

Soil fertility
Sugarcane evaluations and trials
Grasses and legumes for forage
Corn and sorghum as feedstock
Vegetables
Tropical fruits: avocado, bananas, mango,
papaya, sapodilla
Cattle and swine feeding trials
Animal breeding
Pasture management

Table 2. Research programs at the St. Croix Federal Experiment Station from 1965 to 1986.

1965-1974: Pilot tests for insect control through the development of:
Pheromone attractants
Light attraction devices
Color attraction devices
Physical configuration of insect traps
1974-1977: Biological control for the screw worm in cattle
1977-1986: Pilot tests for budworm and pink bollworm control and sex pheromone attractant for sweet potato weevil control

Table 3. Highlights of the procedures for field growing prohibited propagative material at GIRU, St. Croix, USVI.

1. Corn seeds from the following countries are not authorized to be grown out at GIRU:

Bangladesh
Bulgaria
China
Egypt

India
Nepal
Pakistan
Thailand

2. All quarantined seeds received by GIRU are routed through the Plant Germplasm Quarantine Center and then the National Seed Storage Laboratory in Fort Collins, Colorado, to be inspected and certified free of exotic pests and pathogens and to be surface sterilized.
 3. The incoming seeds must be processed and handled in physically separate facilities from those of the outgoing seeds.
 4. Prior to each year's planting, cereals and related host plants on the island of St. Croix must be surveyed by ARS and PPQ personnel to detect the presence of diseases, particularly those targeted on the protocol.
 5. Routine inspections should be performed several times during the growth stage and at the time of harvest of the quarantined material .
 6. A rotational plan should be established to avoid planting corn, sorghum or related crops on the same land for at least three years.
 7. All field crop residues should be burned or deep plowed, and those from threshing or shelling disposed of by autoclaving or incinerating them.
 8. If any targeted disease is detected, GIRU's location director shall immediately coordinate with APHIS-PPQ to establish and carry out an eradication plan.
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Table 4. List of exotic pathogens targeted for exclusion in the corn and sorghum quarantine program at GIRU.

<u>Pathogen name</u>	<u>Disease</u>	<u>Group</u>
<u>Cephalosporium maydis</u> Samra, Sabet and Hingoraniwilt	Late wilt of corn	F(H)
<u>Claviceps gigantea</u> Fuentes, de la Isla Ullstrop, and Rodrigues	ergot	F(A)
<u>Claviceps sorghi</u> Kulkarni, Seshadri, and Hegde (c.s. <u>Sphacelia sorghi</u>)	ergot	F(A)
<u>Curvularia penniseti</u> (M. Mitra) Boedijn	seed mold	F(H)
<u>C. tuberculata</u> P.C. Jain	seed mold	F(H)
<u>Peronosclerospora maydis</u> (Racib.) C.G. Shaw	downy mildew	F(O)
<u>P. philippinensis</u> (Weston) C.G. Shaw	downy mildew	F(O)
<u>P. sacchari</u> T. Miyaki Shirai & K. Hara	downy mildew	F(O)
<u>P. spontanea</u> (Weston) G.W. Shaw	downy mildew	F(O)
<u>Sclerophthora rayssiae</u> var. <u>zeae</u> Payak and Renfro	crazy top	F(O)
<u>Sorosporium simii</u> Pole-Evans	smut	F(B)
<u>S. taianum</u> (Sydow) Zundel	smut	F(B)
<u>Sphacelotheca transvaalensis</u> Zundel	smut	F(B)
<u>Tolyposporium ehrenbergii</u> (Kuhn) Pat.	long smut	F(B)
<u>Ustilago bulgarica</u> Bubak	smut	F(B)
<u>U. kenjiana</u> Ito	smut	F(B)
<u>U. porosa</u> Langdon	smut	F(B)
<u>U. sorghi-stipoidei</u> Ling	smut	F(B)
<u>U. wynaadensis</u> Sundarum	smut	F(B)
<u>Erwinia herbicola</u> (Lohnis) Dye	leaf blight	B
<u>Striga asiatica</u> (L.) Kuntze	parasite	P

Pathogen group: B=Bacteria, P=Plant, F=Fungus (A=Ascomycete; B=Basidiomycete; H=Hyphomycete; O=Oomycete)

Table 5. Agronomic traits of sorghum and corn grown and evaluated at GIRU.

<u>Characteristics of sorghum</u>	<u>Characteristics of corn</u>
mid-rib color	plant height
plant height	ear height
stalk juiciness	height to the tallest node
head shape	number of tillers
head exertion	number of ears
grain color	total number of leaves
race	number of leaves above ear
	flowering date
	kernel color
	endosperm type
	cob color
	plant and ear count

To date, the program at GIRU has succeeded in growing, evaluating, and selling 2,948 and 129 sorghum and corn introductions, respectively. The sorghum and corn seed produced during this time (1,563 and 631 kg, respectively) has been sent to the Southern and Northern Plant Introduction Stations of the USDA for distribution to breeders (Table 6).

The GIRU quarantine program will extend beyond 1995, and the value of its contribution to the sorghum and corn germplasm bank of the United States will be recognized as the released materials become incorporated into commercial lines.

COOPERATION WITH OTHER AGENCIES

Approximately 20 acres of GIRU's land is being utilized by the University of the Virgin Islands for its research program. This cooperation makes possible numerous research activities aimed at improving the agriculture of the Virgin Islands and neighboring countries. In addition, GIRU collaborates with other local and Federal agencies having common interests with the USDA-ARS mission on St. Croix (Table 7).

Table 6. Seedstock production during the first three years of GIRU.

<u>Year</u>	<u>Crop</u>	<u>No. of Introductions planted</u>	<u>No. of Introductions harvested</u>	<u>Seed weight</u>	<u>Destination</u>
1987	Sorghum	506	473	279 kg	SRPIS ^{1/}
1988	Sorghum	997	957	522	SRPIS
1988	Sorghum	1023	840	408	SRPIS
1989	Sorghum	693	678	354	SRPIS
1989	Corn	79	79	336	NCPIS ^{2/}
1989	Corn	50	50	295	NCPIS

1/ Southern Regional Plant Introduction Station, Experiment, Georgia

2/ North Central Plant Introduction Station, Ames, Iowa

Table 7. List of local and Federal agencies with which GIRU cooperates actively.

University of the Virgin Islands

Department of Agriculture of the Virgin Islands

USDA-APHIS-PPQ

USDA-ARS, U.S. Livestock Insects Laboratory, Kerrville, Texas

USDA-SCS, St. Croix

NOAA (National Oceanic and Atmospheric Administration), Climatic Information Center, San Juan, Puerto Rico

USGS (U. S. Geological Survey), Department of Interior