CARDI

Review

A compilation of CARDI research papers

Issue 3

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FOREWORD

CARDI Review contains articles of scientific interest based on work done by CARDI scientists. Much of CARDI's work programme is done in a collaborative mode and the two articles in this issue are the results of work coming out of some long-standing collaborative linkages.

The first article looks at the possibilities for the use of alfalfa cultivars for small ruminant forage. As the article explains forage legumes for small ruminants have been promoted for 10 years in Jamaica. This work has been part of CARDI's livestock work in Jamaica which has been done in collaboration with the Ministry of Agriculture at both the Bodles and Hounslow facilities. We in CARDI are very proud of our linkages with the Ministry's research efforts in Jamaica and this article is one of many outputs of that work.

The second article covers a quite different topic. That is the problem of the ratoon stunting disease with sugar cane in Barbados. The article describes a survey which determined incidence of the disease. Again this is only a small part of work which has been output over a number of years of collaboration between CARDI and the sugar industry in Barbados. This is another linkage of which we are very proud.

We hope that all our collaborators enjoy working with CARDI as much as we enjoy working with them.

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August 2003

Observations on non-dormant alfalfa cultivars at two locations in Jamaica

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ABSTRACT
In an effort to expand the resource base of shrubby legumes for small ruminant production in Jamaica five alfalfa cultivars (Creoula, CW-89132, DK-189, DK-191 and FL-99) were evaluated against stylosanthes cultivar Stylo-184 in solid-seed rows at the Hounslow and Bodles Stations. The trial was established in May (Hounslow) and June (Bodles) 2000 as a randomised block design with four replications. Each row was 2 m long and was sown with 1 g seeds. Plant height, number of branches and root and shoot weights were measured 12 weeks post emergence. All cultivars attained significantly ($P<0.001$) greater heights at Bodles (46.7 cm average) than at Hounslow (35.5 cm average). FL-99 and DK-189 grew taller than the average of Creoula, CW-89132 and DK-191 by 3.2 cm. There were no significant ($P>0.05$) cultivar x site interactions for branches, but root dry weight per plant was higher at Bodles (2.22 g average) and shoot dry weight lower (8.2 g) than at Hounslow (1.61 and 13.4 g, respectively). Compared to Stylo-184 the alfalfa cultivars, on average, had significantly ($P<0.001$) fewer branches (4.5 vs. 10.5 per plant) and lower root (1.74 vs. 2.81 g) and shoot mass (6.4 vs. 32.9 g) per plant. Among the alfalfa DK-189 and FL-99 were better for all parameters. The values for DK-189, FL-99 and the average for the other three cultivars were: 10.6, 6.1 and 5.7 for branches/plant, 2.2, 2.4 and 1.4 g for root mass/plant, and 8.4, 9.4 and 4.7 g for shoot mass/plant.

INTRODUCTION
During the past 10 years forage legumes have been promoted for use in the feeding systems for sheep and goat production in Jamaica. Studies initially focused on the trailing legumes glycine *(Neonotonia wightii),* siratro *(Macroptilium atropurpureum)* and centrosema *(Centrosema pubescens)* in pasture grazing systems while leucaena *(Leucaena leucocephala)*, a shrubby/tree legume, was evaluated for zero grazing systems. In order to expand the resource base of shrubby legumes trials were initiated to evaluate stylosanthes cultivars of which cultivar CIAT 184 showed high potential for hay production (Asiedu 2000). The study reported here is consistent with our quest to identify alternative shrubby legumes for small ruminant production in Jamaica. Alfalfa, *Medicago sativa* L., is the most valuable cultivated forage crops in North America and other temperate regions (Fick and Mueller 1989; Twidwell et al. 1996; Acharya et al. 1997).

Keywords: Alfalfa, stylosanthes, plant height, branches, root and shoot weights

However, the present day synthetic cultivars of the crop are derived from diverse genotypic sources that some of them are adaptable to the sub-tropics and the tropics. In Jamaica several alfalfa cultivars were evaluated in the mid 1960s and late 1980s and dry matter yields of 5.8-69.6 t/ha - and crude protein concentrations of 16-19% were recorded (Richards 1970; Chauvet 1995). The cultivars of then time were, however, predominantly dormant ones. Now with the availability of non-dormant cultivars it is necessary to revisit the role of alfalfa in our livestock production systems. Besides, there has been no study in Jamaica on the morphological characteristics, such as plant height (Schmidt, 1993), leaf:stem ratio (Rotili et al. 1993)or stem architecture (Kephart et al. 1993) that influence nutritive value of alfalfa. This trial was undertaken to determine the establishment and potential for survival and production in Jamaica of recently released dormancy 9 (low dormancy) alfalfa cultivars through the assessment of their morphological characteristics.

MATERIALS AND METHODS

Sites and experimental design

The study was conducted at the Bodles (17°56′N, 77°7′W) and Hounslow (18°00′N, 77°37′W) Research Stations in south-central and south-western Jamaica on, respectively, Bodles Clay Loam (slow internal drainage, poor surface runoff, soil, pH 6.8) and St Ann Clay Loam (very rapid internal drainage, soil , pH 6.5) soils (Stark 1963). Average (over 30 years) annual rainfall is about 1,100 mm and 900 mm for Bodles and Hounslow respectively with 21% and 24% falling in May/June and 43% and 51% in September/November.

The five alfalfa cultivars (Creoula, CW-89132, DK-189, DK-191 and FL-99) and the Stylosanthes CIAT 184 (Stylo-184, control) were sown on 4 May (Hounslow) and 9 June (Bodles) 2000 in four replicates of solid-seeded observation rows in a randomised complete block design. Each row was 2 m long with 1 m inter row space. The seeds were drilled in the rows at the rate of 0.5 g/m. The alfalfa seeds were dusted with commercial alfalfa rhizobium before sowing. The crop was grown under rain-fed conditions, with no fertilizer application and weeding as necessary. The plants were sprayed with Diazinon® after the sporadic infestation of fall armyworm (*Spodoptera frugiperda*) was recorded.

Measurements

Plant characteristics measured from the inner 1 m of each row were plant height, number of branches, and root and shoot biomass. Observations were also made on the incidence of pests and diseases. The measurements were taken following 12 weeks of uninterrupted growth. The alfalfa plants were, on average, at 20% bloom at Hounslow and 27% bloom at Bodles (Table 1). At both sites the height of the plants was measured. The plants were then dug out and 8-15 samples selected and the soil cleaned from the roots. The roots and shoots were separated and weighed. A second sample of 8-15 plants was taken and the number of primary branches on the shoots was counted. The roots and shoots were dried in a forced-draught oven at 65 °C for 48 hours for dry weight determinations. The data on the plant characteristics were analysed using GENSTAT 5 Release 3.2 statistical package (Lawes Agricultural Trust 1996) and the means compared by LSD.

Table 1 Bloom stage at sampling, 12 weeks growth, of alfalfa cultivars at Hounslow and Bodles, Jamaica, 2000

Cultivar	**Site**			
	Hounslow (%)	**s.e.m.**	**Bodles (%)**	**s.e.m.**
Creoula	40.7	5.02	39.8	4.48
CW-89132	13.8	3.38	21.5	2.52
DK-189	9.5	2.46	17.7	1.90
DK-191	20.8	9.87	35.2	3.86
FL-99	17.3	3.29	19.9	2.38
Mean	20.4		26.8	

RESULTS AND DISCUSSION

Weather

Climatic conditions during the study are presented in Table 2. Rainfall was about 15 mm higher and relative humidity 4 percentage points lower at Hounslow than at Bodles. During the first eight weeks of the crop establishment, Bodles experienced very dry conditions (April-May 2000 rainfall, 74 mm) compared to Hounslow (April-May 2000 rainfall, 345 mm).

Plant height

All cultivars, including the control Stylo 184 attained significantly ($P<0.001$) greater heights at Bodles than at Hounslow (Table 3). The overall means of the two sites indicate that DK-189 (43.6 cm) and FL-99 (44.4 cm) grew taller than Creoula (39.2 cm), CW-89132 (39.1 cm) and DK-191 (39.7 cm). Stylo-184 (40.5 cm) was intermediate between DK-189 and FL-99 and Creoula and CW-89132.

Schmidt (1993) recommended the use of plant height of alfalfa as the criterion for determining the nutritive value, yield and optimal use span because of the close correlation between plant height and biomass production and nutritive value. Our observations on plant height at the two sites did not support this recommendation. Overall plant height was greater but above ground dry weight was lower at Bodles than at Hounslow. The apparently more rapid elongation of the plants at Bodles might have been induced by stress caused by moisture deficit during the first eight weeks of growth (Table 2), and therefore was not accompanied by increase in cell mass. In contrast the plant height data for the cultivars is in conformity with the recommendation of Schmidt (1993). Cultivars FL-99 and DK-189 which grew tallest among the alfalfas also produced highest shoot dry wt.

Branching

There was no significant ($P>0.05$) interaction between cultivar and site for number of branches produced per plant. Creoula and DK-189 had the same number of branches per plant as Stylo-184 (Table 3) but that of FL-99 was about 40% lower. CW-89132 and DK-191 produced the least number of branches. The crops produced twice as much branches ($P<0.001$) at Hounslow as at Bodles (Table 3).

The consistently low incidence of branching at Bodles for all cultivars reinforces the hypothesis that moisture stress could have caused the plants to elongate without sufficient tissue accretion at that site.

The cultivars differed in their branching abilities, with Creoula, DK-189 and Stylo-184 exhibiting higher branching tendency than CW-89132, DK-191 and FL-99. This is perhaps an intrinsic cultivar characteristic which was expressed under the local conditions. What is more important is the possible implication of the expression of the characteristic. High incidence of branching may result in improved forage quality in alfalfa as a result of the dilution of stem bases with less lignified branch tissue (Kephart et al. 1993). Therefore it can be surmised that Creoula and DK-189 could have high nutritive value as the control Stylo-184, while CW-89132, DK-191 and FL-99 could have low nutritive value under Jamaican conditions.

Table 2 Meteorological conditions at Hounslow and Bodles during the study

Month	Hounslow			Bodles		
	Rainfall	Temperature	RH[1]	Rainfall	Temperature	RH
	(mm)	(°C)	(%)	(mm)	(°C)	(%)
Apr-00	155.7	26.0	69	11.5	31.6	70.5
May-00	189.3	26.5	76	62.5	26.7	75
Jun-00	48.5	28.0	76	9.9	27.5	71
Jul-00	25.2	28.0	64	21.6	27.7	70
Aug-00	21.3	28.2	65	86.4	28.1	75
Sep-00	77.7	28.1	72	232.1	27.9	83
Mean	86.3	27.4	70	70.7	28.3	74

[1] RH = Relative humidity

Table 3 Plant height and branching of alfalfa and stylosanthes cultivars, 12 weeks growth, at Hounslow and Bodles, Jamaica, 2000

Cultivar	Height			Branches		
	Hounslow	Bodles	Mean	Hounslow	Bodles	Mean
	(cm)			(per plant)		
Creoula	34.3	44.0	39.2	13.4	3.5	8.4
CW-89132	36.5	41.8	39.1	5.7	4.0	4.8
DK-189	34.6	52.5	43.6	13.4	7.8	10.6
DK-191	35.0	44.5	39.7	4.4	3.2	3.8
FL-99	36.5	52.3	44.4	7.4	4.9	6.1
Stylo-184	35.9	45.0	40.5	12.5	8.4	10.5
Mean	35.5	46.7		9.5	5.3	

s.e.d. (33 df) for comparing:

	Height	Branches
Cultivar means:	1.38 ($P<0.001$)	1.88 ($P=0.002$)
Site means:	0.80 ($P<0.001$)	1.08 ($P<0.001$)
Body of table:	1.95 ($P<0.001$)	2.65 ($P=0.217$)

Biomass production

There was significant (P<0.001) cultivar x site interaction for both root and shoot dry weights (Table 4). Root dry weight per plant of Stylo-184 was 74% higher than the average for the alfalfas at Hounslow and 54% higher at Bodles. Similarly, Stylo-184 shoot dry weight per plant was about seven times higher at Hounslow and three times higher at Bodles than the averages of the alfalfa cultivars. All the alfalfa cultivars had higher root weight at Bodles except for DK-189 which had higher root dry weight at Hounslow. At Hounslow FL-99 had the second highest root dry weight. DK-189 and Fl-99 had the highest shoot dry weight per plant at Hounslow (Table 4). Similar, though non significant, trends were also detected at Bodles.

On the whole root mass was about 40% higher at Bodles than at Hounslow, whereas shoot mass was lower by the same magnitude. This could be due to the stress the plants suffered at Bodles at the start of the growing period. It appears the accumulation of root mass at Bodles by almost all the cultivars was a survival and conservation reaction to the moisture stress. On the other hand the high accumulation of above ground biomass by DK-189 and FL-99 at both sites clearly indicates the adaptability of the two cultivars to the local conditions. Like the control Stylo-184 the two cultivars apparently remained longer in the vegetative state compared with the profuse reproductive structures of Creoula (Table 1).

Creoula, CW-89132 and FL-99 are cultivars selected in areas with warm, humid summers, while DK-189 and DK-191 are considered traditional California cultivars (Lauren Johnson, Cal/West Seed Company, personal communication, 2000). Creoula, CW-89132 and FL-99, therefore, were expected to establish and grow well under Jamaican conditions. Creoula established but rapid attainment of physiological maturity (Table 1) precluded the accumulation of enough vegetative matter. However, the lower branching and shoot dry weight of DK-191 and especially CW-89132 compared with DK-189 are not readily explainable. Perhaps CW-89132 is just not adaptable. But both DK-189 and DK-191 have similar genotypic profiles (NAAIC 2002) and were not expected to have been starkly different in biomass production. The difference in potential biomass accumulation under our conditions could be related to the early development of reproductive tissues by DK-191 (Table 1).

Pest and diseases

All the alfalfa cultivars were infected to a limited extent with leaf spots and Phytophthora root rot and/or Fusarium wilt (Table 5). There was also sporadic infestation of fall armyworm (Spodoptera frugiperda) on alfalfa cultivars CW-89132 and DK-189, and on Stylo-184 but the pest was controlled successfully with Diazinon®.

Phytophthora root rot and/or Fusarium wilt, and leaf spot were the dominant disease conditions while fall armyworm (*Spodoptera frugiperda*) was the only pest observed on the plants. These are among the known diseases and pests that infect alfalfa plants (University of California 2002) and their control should be considered in any attempt to establish the crop commercially in Jamaica. Phytophthora root rot, Fusarium wilt and leaf spot are common fungal diseases that affect a variety of crops in Jamaica and there several fungicides on the market, e.g. Benlate® and Dithane M-45®, (Caribbean Marketing and Consulting Ltd, 2002) that are used to control them. Similarly, there are several insecticides that used to control fall army worms in Jamaica. These include Belmark®, Diazinon®, Lannate® and Xentari® ((Caribbean Marketing and Consulting Ltd, 2002). Therefore, it should be possible to control these same diseases and pest on alfalfa.

Table 4 Root and shoot dry weight per plant of alfalfa and stylosanthes cultivars, 12 weeks growth, at Hounslow and Bodles, Jamaica, 2000

Cultivar	Root dry weight			Shoot dry weight		
	Hounslow	Bodles	Mean	Hounslow	Bodles	Mean
	(g/plant)			(g/plant)		
Creoula	0.94	1.77	1.35	3.8	5.4	4.6
CW-89132	0.94	2.22	1.58	4.7	5.6	5.2
DK-189	2.69	1.73	2.21	10.5	6.3	8.4
DK-191	0.67	1.69	1.18	3.0	5.6	4.3
FK-99	1.95	2.77	2.36	11.5	7.4	9.4
Stylo-184	2.49	3.13	2.81	46.8	19.0	32.9
Mean	1.61	2.22		13.4	8.2	

s.e.d. (33 df) for comparing:

	Root dry weight	Shoot dry weight
Cultivar means:	0.165(P<0.001)	1.24 (P<0.001)
Site means:	0.095 (P<0.001)	0.72 (P<0.001)
Body of table:	0.234 (P<0.001)	1.75 (P<0.001)

Table 5 Diseases infecting alfalfa accessions at Hounslow, Jamaica, 2000

Cultivar	Organism	Associated disease
Creoula	*Fusarium oxysporum*	Wilt
	Phytophthora sp	Root rot
CW-89132	*Xantomonas campestris*	Leaf spot
	Alfalfae sp	
	Phytophthora sp	Root rot
DK-189	*Curvularia sp*	Secondary root rot
	Xantomonas campestris	Leaf spot
	Alfalfae sp	
DK-191	*Fusarium oxysporum*	Wilt
	Phytophthora sp	Root rot
FL-99	*Phytophthora sp*	Root rot
	Alternaria sp	Secondary leaf spot

CONCLUSION

Non-dormant alfalfa cultivars DK-189 and FL-99 have potential for adaptation and herbage production for hay in Jamaica, particularly if moisture stress can be avoided during the growing period.

ACKNOWLEDGMENTS

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Survey of sugarcane ratoon stunting disease in Barbados

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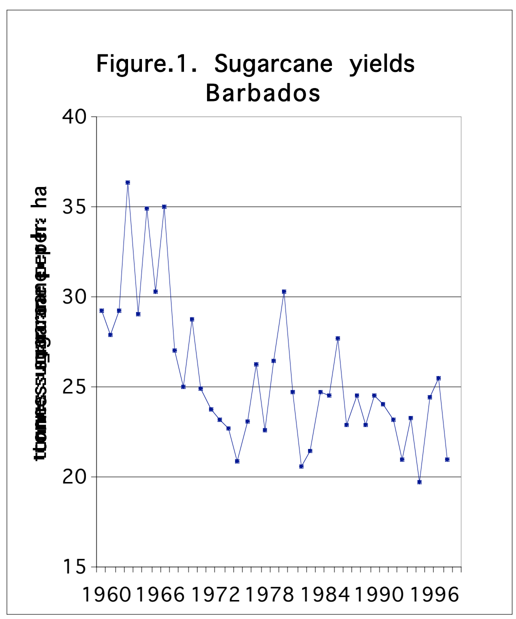
ABSTRACT
Sugarcane yields have declined dramatically since 1968 in Barbados, and there was an urgent need for determination of the cause. The Ratoon Stunting Disease (RSD) was seen as one possible cause. In order to determine the incidence of RSD in the fields in Barbados, 3,100 plant samples were taken from the fields across the island and were tested using Evaporative Binding-Enzyme linked Immuno Assay (EB-EIA). This survey showed the widespread occurrence of the disease in the commercial fields. Five of the commercial varieties showed more than 10% positive samples. In addition, significant differences were observed between ratoons for the five major commercial varieties. Some of the new varieties under selection also tested positive for RSD.

INTRODUCTION
In Barbados, sugarcane (*insert scientific name here*) was planted on about 8,000 hafrom which approximately 45,000 - 60,000 tonnes of sugar is produced. Yields of sugarcane have declined dramatically since 1968 (Figure 1), and there was an urgent need for determination of its causes. RSD was one of the possible causes, and this needed to be verified.

RSD is caused by the bacterium *Clavibacter xyli* pv. *xyli* (Cxx), and is known to be an economically important disease of sugarcane in most countries where the crop is grown. The bacteria survive on plant debris.



Keywords: sugarcane, ratoon, disease, varieties, yield

RSD is difficult to diagnose in the field because of the absence of visible symptoms, and its presence can only be positively determined by laboratory analysis of sap samples. Field experiments in South Africa have shown an average 20-40% yield reduction due to RSD (Bailey and McFarlane, 1998). Studies on the ultrastructure of the RSD-infected plants have reported the bacterium to be in the xylem vessels frequently adjacent to the vessel wall (Kao and Damann, 1980). Discoloration within the vascular bundles associated with RSD occurs in fully differentiated nodes of relatively matured stalks, or, less commonly, in young stalks (Gillaspie and Teakle, 1989). RSD is mainly transmitted through cutting tools and harvesters. Currently, about 80% of the sugarcane plants in Barbados are harvested by machine. Mechanical harvesting increases the chance of the disease spread within a field as well as between the fields.

Davis (1986) conducted a survey of RSD in Barbados and confirmed its presence. A survey of the current incidence of the disease in Barbados as well as information on the susceptibility of the different varieties to the disease is important for the future development of the sugar or sugarcane industry.

MATERIALS AND METHODS

Collecting samples

Ten stalks per field at random were sampled. The field name, sugar cane variety, date of sampling, plantation name, crop (plant cane or ratoon), acres and rainfall zone were recorded for each sample. Equipment was sterilised between each sampling. Xylem fluid was collected from a sample of sugarcane stalk, either from an internode or a piece containing one node and internodal tissue on either side. One end of the sugarcane was cut at a right angle and the other at a 45^{o} angle. The right angle cut was pressed into a rubber milking machine teat sheath and compressed air (small 12-volt air pressure pump) was used to express the xylem extract which dripped directly into the collection tube. Samples were placed in a cooler with ice and transported to the laboratory.

The samples were brought to the laboratory where the Evaporative Binding-Enzyme linked Immuno Assay (EB-EIA) procedure was carried out. Australian and South African sugar researchers use this procedure routinely (Bailey and McFarlane, 1998 and Croft et al., 1994).

Testing samples (EB-EIA procedure)

Xylem extract samples in the laboratory were centrifuged at 3000 rpm for 30 minutes after which the supernatant was discarded. The pellet was resuspended in 200 µL of coating buffer. A quantity of 100 µL/well sample was then added to the 96 well micotitre plates and placed in an incubator at 37 ^{o}C overnight. For each sample three wells were used. The plate was then blocked with 200 µL per well of an antibody 5% skim milk phosphate buffered saline tween (PBST) for 30 minutes, followed by one wash with PBST-ween and incubated for 1 hour. RSD-specific antiserum (100 µL of 1/1000 dilution) was added to each well and incubated for 1 hour; the plate was then washed once with PBST. The second antibody, goat anti-rabbit alkaline phosphatase conjugate, was added at a 1/1000 dilution to each well and incubated for one hour and followed by five washes of PBST. Finally, 100 µL of substrate (0.1% 4-nitophenyl phosphate in 10% diethanolamine buffer pH9.8) was added and the absorbance of 405 nm was measured at 1 hour with a microplate reader (Unikan II).

Chi-square analysis was done using only plantations where 50 or more samples were taken.

RESULTS AND DISCUSSION

A sample was considered positive when the EB-EIA absorbance value was greater than the average absorbance value of the negative control plus 3 standard deviations.

There was a widespread occurrence of RSD in the commercial fields in Barbados. The data are presented in Table1.

Table 1 Percentage positive fields and percentage positive samples of commercial fields for ratoon stunting disease in Barbados in 1999-2000 crop

Plantation	**Total No of fields Sampled**	**Percentage of RSD-positive fields**	**Total no. samples**	**Percentage of RSD-positive samples**
Lancaster	5	80	50	22
Sunbury	5	60	50	16
Redland	9	45.0	90	20
Kendal	4	50.0	40	12.5
Edgecombe	26	46	260	11
Three Houses	9	44.4	90	12.2
Malvern	7	42.8	70	12.8
Clifton	5	40	50	10.0
Warleigh	5	40	50	12
Dukes	3	33.3	30	6.6
Valley	3	33.3	30	6.6
Todds	3	33.3	30	10
Brighton	3	33.3	30	10
Lears	6	33.3	60	8.3
Staple Grove	6	33.3	60	10
Vineyard	9	33.3	90	5.5
Broomsfield	9	25	90	2.5
Hannys	4	25	40	5
Vaucluse	8	25	80	5
Spencers	6	16.6	60	3.3
Pleasant Hall	6	16.6	60	3.3
Rock Hall	8	12.5	80	3.8

RSD – Ratoon stunting Disease

Chi-squared test for plantation = $P \leq 0.001$

The percentage positive samples based on commercial varieties planted in Barbados are presented in Table 2 (*Give p value*)

Table 2 Percentage positive number of samples of major commercial varieties for ratoon stunting disease in Barbados in 1999 – 2000 crop

Variety	**Total number of fields in each variety Sampled**	**Percentage of RSD-positive fields**	**Total number of samples**	**Percentage of RSD-positive samples**
85764	3	66.6	30	16.6
80251	17	52.9	170	16.4
71383	4	50	40	17.5
84930	7	42.8	70	11.4
82238	37	37.8	370	10.5
74541	28	35.7	280	9.2
80689	21	33.3	210	8.5
77602	36	25	360	5
62163	10	20	100	4
78436	5	20	50	4
85266	6	16.6	60	5

RSD –Ratoon stunting Disease

Chi-square test for variety = $P \leq 0.001$

The percentage infestation levels of crop stages for five of the major commercial varieties planted in Barbados are presented in Table 3. There was significant difference between the ratoon crops in the major commercial varieties. Also, there was significant difference between the varieties but there was no significant interaction between the variety and crop stage.

Table 3 Percentage infestation of major commercial varieties crop stages to ratoon stunting disease in Barbados

Crop stage	Variety									
	B74541		B77602		B80251		B80689		B82238	
	Total no of samples	% infestation	Total no of samples	% infestation	Total no of samples	% infestation	Total no of samples	% infestation	Total no of samples	% infestation
I Ratoon	120	41.6	150	2.7	80	16.25	80	8.57	120	9.09
2Ratoon	120	20.0	140	1.6	60	18.3	90	2.5	170	10.5
3Ratoon	80	50.0	80	7.14	20	20.0	30	23.3	70	15.7
4Ratoon	20	*	60	15.0	10	*	30	10.0	30	*

<u>data not available</u>

Chi square test for ratoon = $P \leq 0.001$
Chi square test for variety = $P \leq 0.01$

The percentage infestation of new varieties (stage 4 trial plots) is presented in table 4. These varieties were still under selection. Only the promising varieties were selected and further trials will be conducted

Table 4 * Percentage positive samples of stage 4 varieties from Agronomy Research and Variety testing Unit variety trials

Variety	No of fields sampled	Total no. of samples	Percentage RSD-positive samples
B 85747	2	20	20
B 86699	1	10	30
B 87163	1	10	60
B 881104	2	20	25
B 881602	2	20	5
B 881607	2	20	10
B 881911	2	20	25
B 88812	2	20	35
B 901027	1	10	50
B 901227	1	10	20
B 90666	1	10	50
B 92534	2	20	10
B 93141	3	30	10
B 93143	3	30	16.6
B 93216	2	20	10
B 93220	2	20	25
B 93261	2	20	10
B 93310	2	20	35
B 93334	3	30	10
B 93440	3	30	6.6
B 93528	2	30	20
B 9356	3	30	23.3
B 93638	3	30	23.3
B 93775	3	30	13.3
B 93796	3	30	10
B 9380	3	30	20
B 9387	3	30	20
B 93873	2	20	15
B 93902	3	30	10
BR8230	2	20	25
D8415	2	20	3.3
DB75159	2	20	35

*No analysis was done on this table.

RSD – RATOON STUNTING DISEASE

The study confirms the reports by Davis (1986) and Daugrois (1999) indicating the presence of the disease in Barbados. This survey showed the widespread occurrence of the disease in the commercial fields in Barbados. There was a widespread occurrence of RSD in the plantations sampled. Out of the 22 plantations sampled 19 plantations, percentage positive fields were above 25%. The highest recorded was Lancaster, with 80% of the fields RSD-positive. The data showed that, out of the 11 commercial varieties, 5 of the varieties had RSD-positive samples that were greater than 10%. Among the five major commercial varieties, there was a very significant difference ($P \leq 0.001$) between the ratoons as well as there was a significant difference between the varieties. The interaction between the ratoon and varieties was not significant. Table 4 showed that the new varieties on trial were infected with the RSD bacteria. The results show that the RSD could be one of the contributing factors for the sugarcane yield decline in Barbados.

CONCLUSIONS

It is recommended that trials to assess the yields be conducted on the major commercial varieties. Screening the new varieties for the presence of RSD before they are released is worth considering. The new varieties on trial should be screened for RSD susceptibility before the promising varieties reach the final stages of evaluation.

Clean planting material, (seedcane) programme will help to reduce further spread of the disease. Specific information, such as seedcane sources and the extent of the disease in the fields, will aid growers to make practical management decisions. A disease free nucleus seedcane programme is also recommended.

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