

Recent rodent infestations on sugar estates in Guyana and the effectiveness of an integrated management approach to the problem

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ABSTRACT

Rodent infestation and resultant damage are a major problem in the Guyana Sugar Industry (Guysuco), resulting in severe sugar loss and increased cost for control. The predominant rodent species is *Holochilus braziliensis*. In recent years major outbreaks have occurred periodically with varying intensities on various sugar estates and at different locations on the estates. During the last two years an integrated approach promoting pro-active strategies has been emphasized. New strategies being implemented include improving the quality and intensity of surveillance, lowering of the current threshold level for baiting, improving on the efficiency and effectiveness of baiting, maintenance of a good sanitation programme, the re-introduction of “circle burning” as a routine practice in harvesting and the use of safer formulations of acute baits when infestation levels are threatening. This programme culminated in the production of a rodent management manual to ensure a continuous and effective management strategy for maintenance of low rodent activity across the industry.

Keywords: *Holochilus sp*, integrated management, surveillance, rodenticides

INTRODUCTION

Rodent infestations, which cause severe crop damage/sugar loss and increase the cost of production continues to be a problem in the Guyana Sugar Industry. Historical data have revealed an irregular trend of periodic widespread outbreaks and seasonal eruptions at various estate locations in the sugarcane eco-system. Major epidemics occurred at Blairmont in 1935, Uitvlugt in 1951, Blairmont, Rosehall and Wales in 1958-59, and again at Blairmont in 1966. Following these years of epidemic occurrences, isolated population eruptions, somewhat endemic in nature, continued to occur at Wales estate. During the 1958-59 outbreaks it became obvious to management that there was a lack of basic knowledge of the predominant *Holochilus* species and initial steps were taken to initiate research/investigations on the biology, behavior & management of this predominant and prolific rodent species (Bates, 1962). These research efforts (Twigg, 1960s and Murie, 1970s), including studies on the life cycle, habit and population dynamics of *Holochilus* contributed to the development of a management programme based mainly on the strategic use of prophylactic chemical baits and guided by various activity determinant surveillance strategies (Bates, 1962, 1966; Dasrat, 1986). However, major outbreaks due to migration and seasonal eruptions tended to recur. The frequency

of outbreaks remains unpredictable and circumstances leading to increased infestations such as reproductive peaks, movement and migration patterns are still not fully understood.

Severe damage reported from upsurges have been attributed mainly to the predominant sugar cane rat, *Holochilus spp.*, identified in 1937 as *Holichilus sciurens berbicensis* (Cleare, 1937) and then re-classified in 1963 as *H. brasiliensis* (Dasrat, 1986; Bates, 1966). Further research and investigations (Murie, 1976) revealed large numbers of other species present, notably, *Oryzomys navus* & *Mus musculus* (house mouse)

Holochilus is native to the low-lying coastal savannah areas of the Guianas, composed of large areas of pegasus swamps from which sugar cane lands have been developed by empoldering and drainage. From their natural un-developed habitat, that borders and/or surrounds now established farmlands, the species frequently makes incursions into cane fields in response to periodic floods and droughts. Severe damage occurs as the species takes up residence within cane fields and in surrounding grassy areas. Sugar cane is very vulnerable to damage; it provides an excellent cover in the mature crop, a readily available source of high-energy food, good protection from avian predators and appropriate sites and material for nesting. The long interval between harvest, (often one year or more), also gives time for a substantial population to develop, and although harvesting destroys many, staggered harvesting allows rodents to move to neighboring fields. It nests within cane fields mainly during the wet season. Under dryer conditions and when ground trash cover is heavy, nesting may occur at in fissures in the soil. The choice of nesting sites is usually dependent on the quantity of grass and trash cover and the presence of soil fissures.

Damage by *Holochilus spp* affects both the weight and sugar content of canes. It feeds nocturnally by gnawing on basal internodes causing stalk death through mechanical injury and desiccation followed by infestation by fungi, bacteria and/or insects. Hampson (1982) noted that sugar loss in the region of 10-30% is common. Bates (1969) quantified the relative importance of weight loss and reduction of sugar content in damaged cane stalks in Guyana as being 21.3% and 11.93% respectively.

Strategies for managing rats over the years have developed through knowledge and experiences gained under local conditions and generally included the extensive use of chemical baits, various trapping and hunting approaches, exploiting natural biological processes and cultural practices that ensure the maintenance of good sanitation (minimum trash and weeds in fields, canals and drains). These and other methods have been used routinely to minimize the build-up of rat populations. The severity of infestation during any one season varies widely among the estates and areas within an estate; this variability adds to the difficulties in controlling this pest.

Guysuco's management strategy has in recent years emphasized an integrated approach, utilizing current effective strategies and promoting a pro-active management intervention

This paper highlights recent rodent infestation trends across the industry and integrated management strategies being promoted for effective control.

INFESTATION & MANAGEMENT TRENDS

In recent times major outbreaks occurred at Wales estate in 1983 to 1985, and at Blairmont and Albion estates in 1993 to 1994 with high activity/minor outbreaks at Wales in 1990 and 1993-1994. In 1997-98 an outbreak was evident across the industry (Guysuco Agriculture Research Annual Reports.). During these years, routine fortnightly rodent surveillance was carried out on the perimeter and/or surrounding dam beds of 6-month or younger cane fields. An assessment of rat damage was done based on evidence of fresh rat bites on stalks from cane stool taken at intervals of 10 rows. This information was used to guide management in the use of prophylactic chemicals for baiting with rodent damage at or above the set 1% threshold level. In canes older than 6 months and in the surrounding borders, rats were hunted manually with the use of a wooden baton, with the aim of destroying nests and reducing populations. During 2003 to 2005 surveillance revealed widespread infestations (**Figs. 1 & 2**), and severe losses to the industry (**Table 1**).

Measurement of rodent activity using Fresh Stalk Damage (FSD) and rat catches as the indicators revealed that in 2003 there was a 59% increase in rodent damage and a 25% increase in rat catches compared with the 2002 figures. The highest levels of infestation/damage were evident at Wales (0.91% F.S.D.), Blairmont, Uitvlugt and Skeldon. In 2004 damage levels again exceeded the threshold on some estates ranging from 1.3% at Skeldon to 1.01% and 0.9% at Blairmont and Albion respectively. Number of rats caught was 262,312, at an average of 8 rats per man per day. Outbreaks were greatest at Albion, Wales and Skeldon (**Fig. 3**). Damage was also observed in the first crop of 2005 (**Figs. 1 & 2**).

The series of outbreaks prompted a review of the industry's rodent management programme and led to an investigation into the possible causes of the build up. Investigations revealed that the increase was attributed to several factors including the reduced intensity of several important management strategies. There was reduced baiting in efforts to cut costs. Also, there were inadequate and untrained surveillance personnel. Less than 20% of the industry's expected surveillance programme was achieved. The unavailability or reduced supply of chemical baits was also a factor. Poor sanitation in large sections of cane cultivations and uncultivated surrounding areas would also have resulted in conditions favourable for *Holochilus*.

Review of the industry's rodent management strategies led to adoption of a proactive integrated approach. An industry-wide programme was started to support the estates efforts. Senior estate field management personnel were educated/trained in the general biology and behaviour of the *Holochilus*. They were reminded of the importance of good record keeping and information feedback systems to ensure efficiency in management. Workers were also given on-the-job training in rodent management. Technical and research personnel embarked on studies/investigations in population dynamics with development and use of active-barrier systems utilizing live fences, and acute baits.

The revised recommended strategies being promoted on Estates since 2005 include improvement of the programme through (i) increased frequency of surveys, (ii) formal reporting of stale damage (SD) to give guidance for baiting and movement patterns, (iii) the introduction of routine infield surveys in high activity situations, (iv) surveillance in older canes, (v) lowering the current damage threshold for baiting from 1.0% to 0.5%, (vi) improving efficiency in the use of anti-coagulant baits through a regular and more accurate post baiting assessment programme to avoid over use of baits and (vii) the extensive use of bait boxes to protect the baits from elements of the weather, especially in rainy seasons and in periods of high activity . Other strategies include the maintenance of a good sanitation programme, the re-introduction of circle burning as a routine practice to curtail large scale movement of rats during pre-harvest burning, the use of other barrier systems where and when possible and the use of safe formulations of acute baits when infestation levels are threatening.

RESULTS

Some estates have implemented most of the recommended strategies with positive effects. The 2006-2007 rodent surveillance data indicated a gradual decline in rat activity over the period. There was a 34% increase in surveillance. There was also the introduction of bait uptake surveys from 2006, which contributed to improved efficiency in bait use and hunting strategies. Average Fresh Stalk Damage (0.25%) by the end of 2007, showed a 43% reduction in rodent activity from 2005, with damage well below the revised 0.5% threshold (**Fig. 4a**). An increase in areas hunted (mainly by boat) and post circle-burning hunting, resulted in a total of 285,211 rats caught, representing a 55% reduction from 2005, under a similar rainfall regime to that in 2004 (**Figs. 4a & 4b**). Trends indicated some stability on most estates. Some 40% of total rats caught were retrieved from the Wales rodent endemic eco-system. Rat activity/infestation peaks were prevalent mainly during high rainfall periods (**Figs. 4a & 4b**). The highest recorded damage level in 2006/2007 was obtained at Uitvlugt estate where poor sanitation and low yields are major issues.

Surveys conducted in 2007 revealed a further general decline in the rodent populations. Improvements in the quality and quantity of surveillances conducted were evident across the industry resulting in improved baiting and hunting efficiencies. Practices, such as boat surveillance/hunting and circle burning/hunting contributed significantly to the reduction of the rodent population at some estates.

DISCUSSIONS

The wide and varied experiences garnered in Guyana over the years resulting from the management of periodic upsurges in rat populations, along with new technical developments and experience gained from cane growing countries with similar problems, have successfully contributed to the development of an integrated approach to the management of this pest with emphasis on a pro-active strategy. These developments culminated with the publication of a manual for guiding effective rodent management across the industry.

ACKNOWLEDGEMENTS

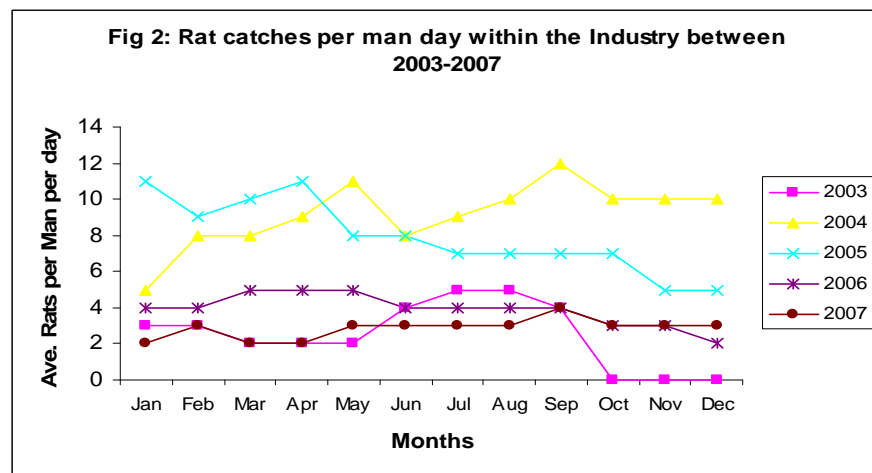
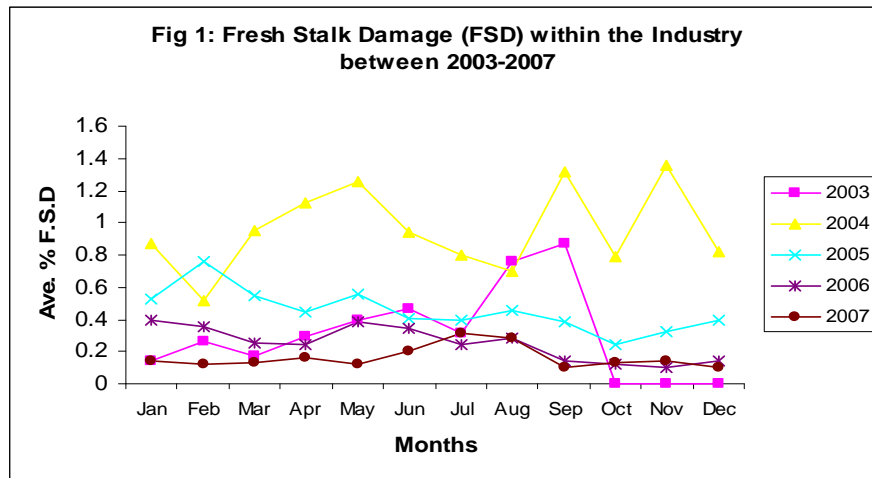
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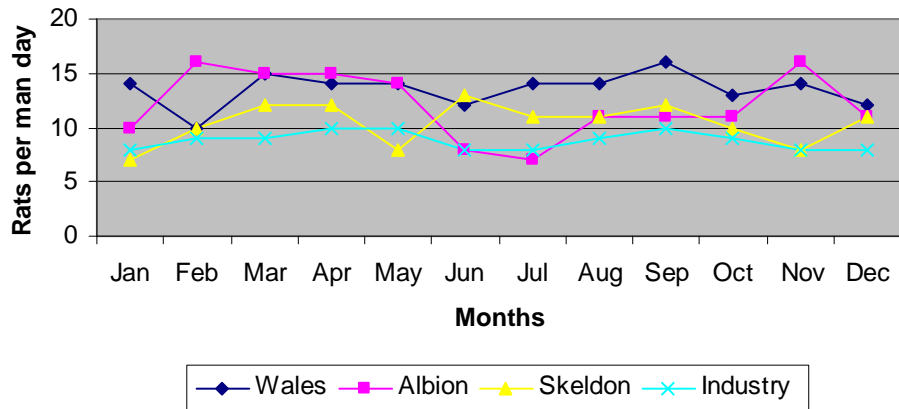
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Table 1: Management cost & sugar loss during periods of rodent outbreaks

Estate Location & Area (ha)	Labour Cost (G\$ M)	Cost of Baits. (G\$ M)	Total Mangt. Cost (G\$ M)	Estimated Loss Sugar(G\$ M)	Total Loss (G\$ M)
Albion:					
2004	26.6	11.6	38.6	160.6	198.8
2005(Jan-May)	55.9	56.2	112.1	1237	1349.1
Skeldon:					
2004	7.7	3.4	11.1	36.6	47.7
2005	13.5	11.5	25.0	101.8	126.8
Wales:					
2004	8.0	3.0	11.0	84	95
2005	16.1	16.5	32.6	245	227.6



**Fig 3: Infestation trend on "Endemic" estates
2004 / 2005**



**Fig. 4a: Rat catches per manday in relation to
rainfall between 2004/2005 & 2007**

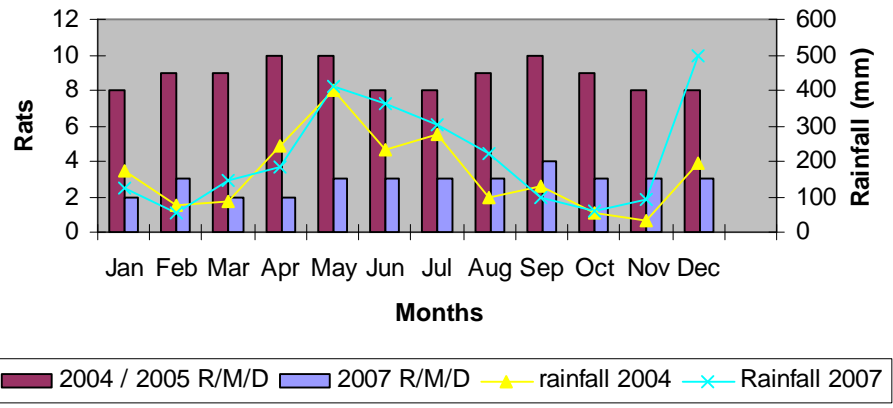


Fig 4b: Fresh Stalk Damage (FSD) in relation to rainfall between 2004/2005 & 2007

