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## AMERICAN FOULBROOD DISEASE AND OTHER BEE PESTS IN THE CARIBBEAN WITH SPECIFIC EMPHASIS ON JAMAICA.

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### ABSTRACT

The Caribbean has been plagued by bee pests with each island taking steps to eradicate and or control these pests. In an effort to determine the status of American Foulbrood Disease and other bee pests in Jamaica, 3901 hives in 185 randomly selected apiaries were inspected over two successive periods, August - December, 1996 and June - August, 1997. The results of the survey suggested that the disease is still not wide spread as it was only found affecting 43 hives in three apiaries; all in one parish (Manchester). Wax moth was the most frequently found and widely distributed pests affecting 39 apiaries.

### INTRODUCTION

The occurrence of Pests and diseases affecting bees is not unique. Some of these are slightly , while others though they attack only individual bees, can so weaken a colony that its very existence is threatened and its entire population may be killed in a year or two (FAO, 1986).

The plant pests of economic importance reported in the region covered by the Caribbean Plant Protection Commission (1989) has listed *Acarapis woodi*, *Apis mellifera scutellata*, *Ascospaera apis*, *Bufo marinus*, *Melissococcus pluton*, *Nosema apis*, and *Bacillus larvae* as some of the bee pests present in the region.

*Acarapis woodi* (Acrine mite) has been reported in Colombia, Mexico, United States of America and Venezuela. It is of quarantine importance as it can be serious.

Trinidad is in close proximity to Venezuela. This enabled the flying of *Apis mellifera scutellata* (Africanized bees) from South America into Trinidad (Taylor, 1985).

*Ascospaera apis* (Chalk Brood) has been reported in the Caribbean Plant Protection Commission (CPPC) areas such as North and Central America, and Jamaica. In addition both *Bufo marinus* (Giant toad) and *Nosema apis* (*Nosema* disease) has been reported in Bermuda. The latter was reported in Cuba ( FAO, 1986).

*Melissococcus pluton* (European Foul Brood disease) has been identified in North and Central America, Bermuda , Columbia, and Venezuela. In 1987, *Varroa jacobsoni* (Varroa mite) was found in U.S.A., in 1990 it was found in Canada and in 1997 the United Kingdom. It is now present in Grenada (Murillo-Yepes, 1998).

American Foul brood disease has been reported by the CPPC affecting areas such as Bermuda, Belize, Colombia and Panama. It has also been found in Cuba, Haiti and Jamaica.

American Foulbrood Disease (AFB) is caused by a bacterium, *Bacillus larvae*. The disease affects only the immature stages of the honey bee and can be highly contagious (Canadian Association of Professional Apiculturists, 1990)

Morse and Nowogrodzki, (1990), stated that the American Foul brood Disease is one of the most dreaded bee disease in the world. The micro-organism is a spore former, capable of developing a protective cover around

itself. In the spore stage, the bacteria are able to exist for long periods away from their host. They can live in honey, and may even withstand boiling in water for twenty minutes.

The spore forming characteristics of *Bacillus larvae* makes it difficult to destroy (Anonymous , 1997)

Larvae feed on bee milk. The bacterial spores are ingested as a contaminant of royal jelly. The incubation period (24-48hrs), is preceded by the germination of spores and the growth of vegetative cells. This occurs under less than a 2% sugar content. The process is inhibited as long as the sugar content is in excess of 3 and 4 percent (Anonymous 1997).

In the pre-pupal stage, a bee body utilizes sugar in the metabolism connected with its metamorphic processes. This results in a drop in the sugar content below 2% . An increase in bacterial growth produces toxins which kill the larvae . (Anonymous 1997)

Dadant and Son's (1992) in a review indicated that, a comb with AFB diseased larvae may exhibit the pepper box symptom. This may not appear when the infection is light. The same review made it clear that cappings over diseased broods are dark brown, usually punctured and sunken into the cells. The infected cells change from dull white to brown and finally black with progress of the disease. A match stick will show aropy remains.

Jamaica is one of the few countries where AFB disease is not endemic. Outbreaks only occur when contaminated bee, honey, pollen or used beekeeping equipment have been introduced into the country (Murray , 1990).

Murray (1994) indicated that there have been six recognized outbreaks of AFB disease in Jamaica since 1918. The worst was in 1943 and most recent in 1989. The Ministry of Agriculture inspection records (1996/97) indicated that AFB disease has been found in small pockets of St. Andrew, St. Thomas, Manchester and St. Elizabeth.

Jamaica's policy is aimed at eradicating AFB disease. The present emphasis is on the prompt destruction of all diseased hives by burning. Apiaries in which AFB hives have been identified are quarantined for six months. The ban is lifted or extended based on monthly re-inspection results.

The importance of other bee pests to the country has recently been recognized by beekeepers. These pests include Wax moths, Termites, Black ants, Red ants and Chalk Brood.

The present status of American Foul brood Disease and other bee pests is one of great importance to both local beekeepers and other interest groups. This has prompted the Ministry of Agriculture to conduct an Island wide survey of AFB and other pests.

## **MATERIALS AND METHODS**

Thirteen experienced beekeepers were trained in the identification of American Foulbrood Disease and other bee pests. Data for the survey were collected during two consecutive periods namely, August 1 to December 31, 1996 and June 10 to August 16, 1997.

In the first year, 316 (20%) of the apiaries of Agriculture records for inspection. A minimum of two frames with sealed worker brood cells, was inspected for each single hive 'body' colonies with one extra frame per additional hive 'body' occupied by bees.

The same method was applied to 290 apiaries selected for inspection in 1997.

## **RESULTS**

In 1996, 106 apiaries were inspected from ten of the 13 parishes (using Kingston and St. Andrew as one). Two

thousand, one hundred and thirty five out of 2367 hives present were inspected for AFB Disease and other bee pests. (Table 1)

During the second year inspection was conducted in seven parishes. One thousand seven hundred and sixty six (94%) of the hives present in 79 apiaries were inspected.

Results showed that a total of five AFB positive hives were found in two apiaries in 1996. An additional thirty eight diseased hives were found in one apiary in the following year. All AFB disease hives were found in Manchester.

The data collected revealed the presence of wax moths, red ants, black ants, chalk brood and termites.

Twenty nine percent (31) of the apiaries inspected in 1996 had wax moth with Westmoreland accounting for just over 25 percent wax moth found in ten percent (8) of the apiaries inspected in 1997.

Fifteen (16) and ten percent (8) of the apiaries had red ants in 1996 and 1997 respectively. Portland accounted for in excess of 15 percent of the red ants found in both years.

Black ant which is a nuisance to bees, were found in eight (8) and ten percent (8) of the apiaries inspected over the two inspection periods.

Kingston and St. Andrew had three apiaries with chalk brood.

Excluding AFB Disease, in 1996, 50 percent (53) of the apiaries inspected revealed the presence of other bee pests. Just over 37 percent (40) of the apiaries inspected were found to have one pest per apiary.

During the second inspection year, twenty six percent (21) of the apiaries inspected revealed the presence of other bee pests. Fifteen apiaries had in excess of one pest per apiary.

Wax moths and red ants were the most prevalent combination, of other bee pests found over the two inspection periods.

Rustic hives accounted for 0.5 percent (10) hives in four of the apiaries which were inspected in 1997. Kingston and St. Andrew accounted for two apiaries having three rustic hives. The others were identified in the parish of Hanover.

## **DISCUSSION**

Not all apiaries selected from the Ministry of Agriculture's record were inspected. Some of these apiaries were no longer in existence, sold and or relocated. On the other hand One hundred and thirty two and One hundred and thirty six of the apiaries selected in 1996 and 1997 respectively were not inspected as persons employed did not collect data for the program.

American Foulbrood disease can quickly spread to other colonies in an apiary as a result of robbing, drifting workers, or contamination through the beekeepers hive manipulation (Akranakul, 1987). Although an outbreak of AFB in Jamaica occurred nine years ago, the results indicated that only a few colonies in Manchester were diseased. This could have been due to the bees ability in resisting AFB. Another possibility is the strategy of inspection and the burning of diseased hives with their contents, employed by the Ministry of Agriculture. This method has been used successfully by many countries. The help of antibiotics in preventing the disease is not a factor presently, as the use of chemotherapeutic methods in controlling AFB is not acceptable in Jamaica. No data were obtained from St. Elizabeth for 1996. However in February, 1997 it was discovered that AFB was

present in the parish. All 200 apiaries in the parish were inspected. AFB was identified in 38 apiaries.

Thirty one were quarantined and the other seven apiaries completely burnt. No apiaries were selected from St. Elizabeth for the 1997 period as all were inspected at the same time the survey was in progress.

The results indicate that AFB is not widespread in Jamaica while wax moth is widely distributed. More than twice the number of wax moths were found during the period August to December 1996 when compared to that of June to August 1997. The difference in results could have been due to Westmoreland having most apiaries with the pest in 1996 and no results available for 1997.

The level of other pests present in Jamaica is minimal as the results indicate. Not surprisingly the level of toad infestation was low as they are nocturnal creatures (as data were collected during the days and not at nights).

The use of rustic hives in Jamaica is illegal, but some beekeepers do maintain these hives because of high equipment cost for replacement.

**Table 1. Number of Apiaries and hives selected and inspected in 1996.**

Parish	Number of Apiaries			Number of hives		
	Select.	Inspect.	AFB+	Present	Inspect	AFB+
Kingston & St. Andrew	32	6	0	145	145	0
St. Thomas	66	0	0	*	*	*
Portland	16	8	0	119	80	0
St. Mary	15	13	0	373	305	0
St. Ann	9	8	0	143	143	0
Trclawny	6	6	0	198	198	0
St. James	18	14	0	225	225	0
Hanover	23	11	0	169	169	0
Westmoreland	27	19	0	428	428	0
St. Elizabeth	37	0	*	*	*	*
Manchester	11	9	2	232	213	5
Clarendon	27	12	0	335	240	0
St. Catherine	29	0	*	*	*	*
<b>Total</b>	<b>316</b>	<b>106</b>	<b>2</b>	<b>2367</b>	<b>2135</b>	<b>5</b>

\* No data collected

**Table 2. Number of Apiaries and hives selected and inspected in 1997.**

Parish	Number of Apiaries			Number of hives		
	Select.	Inspect.	AFB+	Present.	Inspect	AFB+
Kingston & St. Andrew	24	11	0	188	188	0
St. Thomas	42	0	*	*	*	*
Portland	22	5	0	105	90	0
St. Mary	24	14	0	376	376	0
St. Ann	19	19	0	370	370	0
Trelawny	6	0	*	*	*	*
St. James	20	15	0	463	463	0
Hanover	25	12	0	150	150	0
Westmoreland	24	0	*	*	*	*
St. Elizabeth	0	0	*	*	*	*
Manchester	20	3	1	129	129	38
Clarendon	31	0	*	*	*	*
St. Catherine	33	0	*	*	**	
<b>Total</b>	<b>290</b>	<b>79</b>	<b>1</b>	<b>1881</b>	<b>1766</b>	<b>38</b>

\* No data collected

**Table 3. Other pests found during the 1996 inspection.**

Parish	Number of Apiaries having other pests.			
	Wax moths	Termites	Red ants	Black ants
Kingston & St. Andrew	0	0	0	0
St. Thomas	*	*	*	*
Portland	2	1	4	1
St. Mary	5	5	2	4
St. Ann	5	0	0	2
Trelawny	1	1	0	0
St. James	4	0	1	0
Hanover	3	2	2	1
Westmoreland	8	2	4	0
St. Elizabeth	*	*	*	*
Manchester	0	3	2	0
Clarendon	3	1	1	0
St. Catherine	*	*	*	*
<b>Total</b>	<b>31</b>	<b>15</b>	<b>16</b>	<b>8</b>
<b>% of apiaries inspected</b>	<b>29</b>	<b>14</b>	<b>15</b>	<b>8</b>

\* No data collected

**Table 4. Other pests found during the 1997 inspection.**

Parishes	Apiaries inspected	Number of Apiaries having other pests			
		Wax moths	Red Ants	Black Ants	Chalk Brood
Kingston & St. Andrew	11	1	0	0	3
St. Thomas	0	*	*	*	*
Portland	5	1	4	3	*
St. Mary	14	0	1	5	0
St. Ann	19	0	0	0	0
Trelawny	0	*	*	*	-
St. James	15	2	1	0	0
Hanover	12	3	0	0	0
Westmoreland	0	*	*	*	*
St. Elizabeth	0	*	*	*	*
Manchester	3	1	2	0	0
Clarendon	0	*	*	*	*
St. Catherine	0	*	*	*	*
<b>Total</b>	<b>79</b>	<b>8</b>	<b>8</b>	<b>8</b>	<b>3</b>
<b>% of apiaries inspected</b>		<b>10</b>	<b>10</b>	<b>10</b>	<b>4</b>

**Table 5. The number of Pests per Apiary in 1996.**

Parishes	Apiaries Inspected	Number of pests per Apiary				Total	Infected Apiaries (%)
		One	Two	Three	Four		
Kingston & St. Andrew	6	0	0	0	0	0	
St. Thomas	0	*	*	*	*	*	
Portland	8	3	1	0	1	62.5	
St. Mary	13	2	2	2	1	53.8	
St. Ann	8	5	1	0	0	75.0	
Trelawny	6	3	0	0	0	50.0	
St. James	14	3	1	0	0	28.6	
Hanover	11	6	1	0	0	63.6	
Westmoreland	19	8	3	0	0	57.9	
St. Elizabeth	0	*	*	*	*	*	
Manchester	9	0	0	0	0	55.5	
Clarendon	12	5	0	0	0	41.7	
St. Catherine	0	*	*	*	*	*	
<b>Total</b>	<b>106</b>	<b>40</b>	<b>9</b>	<b>2</b>	<b>2</b>	<b>53</b>	<b>50.0</b>

\* No data collected.



**Table 6. The number of other pests per apiary in 1997.**

Parishes	Apiaries Inspected	Number of pests per Apiary				Total	Infected Apiaries(%)
		One	Two	Tbree	Four		
Kingston & St. Andrew	11	2	1	0	0	3	27.3
St. Thomas	0	*	*	*	*	*	*
Portland	5	0	3	0	1	4	80.0
St. Mary	14	6	0	0	0	6	42.8
St. Ann	19	0	0	0	0	0	0
Trelawny	0	*	*	*	*	*	*
St. James	15	1	1	0	0	2	13.3
Hanover	12	3	0	0	0	0	25.0
Westmoreland	0	*	*	*	*	*	*
St.Elizabeth	0	*	*	*	*	*	*
Manchester	3	3	0	0	0	3	100.0
Clarendon	0	*	*	*	*	*	*
St.Catherine	0	*	*	*	*	*	*
<b>Total</b>	<b>79</b>	<b>15</b>	<b>5</b>	<b>0</b>	<b>1</b>	<b>21</b>	<b>26.6</b>

\* No data collected.

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