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DISTRIBUTION AND INCIDENCE OF A NEW PEST (DIPTERA: CECIDOMYIIDAE) IN WESTERN PARISHES OF JAMAICA.

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ABSTRACT

Most recently, a gall midge (Diptera: Cecidomyiidae) was detected in shipments of hot pepper to the United States. This was the first record of the pest in hot peppers in Jamaica. Its discovery and quarantine significance prompted the formation of a national task force which had the mandate of identifying and implementing a strategy to reduce infestation levels. Under the directive of the task force, the Caribbean Agricultural Research and Development Institute conducted a survey to determine the distribution and incidence of the midge in the Western parishes of the island where, based on interceptions, the incidence appeared to be highest. A relationship between infestation levels and fruit maturity was observed; mature fruits had the highest levels of infestation. The gall midge was present in all parishes visited with the highest level of infested mature fruit being found on farms in Hanover (100%). Based on the production systems and the levels of the pest observed, possible strategies, which may assist in reducing the levels of infestation, are identified and discussed.

INTRODUCTION

In February 1997 the APHIS representative in Jamaica was notified that larvae of the genus *Contarinia* were detected in shipments of hot pepper to the United States. As there is zero tolerance for this pest, shipments in which the pest was detected were rejected and a warning given that the crop may be removed from the preclearance list. This had serious economic/social implications and thus it was critical that basic information on the pest was obtained so that appropriate management options could be developed.

The report of *Contarinia* was the first record of its presence in Jamaica. Subsequent to the survey, adult specimens were reared and sent through APHIS to the USDA where they were identified as *Prodiplosis longifila*. At present it is uncertain whether one or both pests are present in the island. Detection of the pest was highest in export produce from western parishes. The survey was, therefore, conducted in this section of the island in the parishes of St Elizabeth, Westmoreland, Hanover and St James to determine the distribution of the pest.

Biology of the pest

The genera *Contarinia* and *Prodiplosis* belong to the Dipteran family Cecidomyiidae which includes gall midges. Adult gall midges are minute delicate flies with hairy wings and long moniliform antennae bearing conspicuous whorls of hairs. The larvae are white at first but when fully grown they are bright yellow and are able to leap several centimeters into the air (Barnes, 1946). Successful pupation demands damp soil. The larval stage is approximately 8-10 days; the pupal stage 9-10 days. The total cycle is 18-22 days (Barnes, 1946).

Barnes (1946) lists *Contarinia lycopersici* as a pest of tomato in the West Indies. This pest is reported to attack the flower buds leading to premature bud fall or malformed fruits. There are no reports, however, of this pest attacking the pedicel of the fruit as occurs on peppers in Jamaica. A scar on the pedicel of the pepper usually marks the site of infestation. However, the pest could also be present in fruits without scarring.

MATERIALS AND METHODS

Description of Survey Area

St Elizabeth

The main pepper growing districts in the parish of St Elizabeth were located in the northern hilly interior (Elderslie and Maggoty), and in the south in an area to the north of and extending into the Santa Cruz mountains (Leeds and Malvern). These areas experience differing rainfall conditions; the north has relatively high annual rainfall while the south experiences low annual rainfall. Farmers in the north grew mostly Scotch Bonnet for export while those in the South grow red peppers for processing.

Westmoreland

Most hot pepper farmers in this parish were planting hot pepper for the first time. The main pepper growing districts were located to the east of the parish (Belvedere and Mackfield). This area is hilly, enjoys high annual rainfall and is relatively cool. The western end of the parish is flat.

Hanover

The main hot pepper districts in this parish were Pell River and surrounding districts in the West and Haughton Grove in the east. Pell River is hilly with small swampy valleys while Haughton Grove is located in an undulating interior plateau.

St James

The main hot pepper districts were located to the south of the parish around the districts of Catadupa and Maroon Town. Both areas are in the hilly interior and experience high annual rainfall.

Farm Selection

A list of hot pepper farmers within the main hot pepper growing districts in the parishes of Westmoreland, St James, Hanover and St Elizabeth was obtained from the Rural Agricultural Development Authority (RADA). Based on the distribution of farms within the parishes, a total of thirty farmers were selected; eleven from St Elizabeth, seven each from Hanover and Westmoreland and five from St James (Table 1). North St James was not assessed because it was not identified as an important hot pepper growing area.

Production and Marketing Systems

A questionnaire was developed to determine production and marketing systems as well as farmer knowledge/perception of the pest. The questionnaire included both open and closed qualitative and quantitative questions.

Distribution and Incidence of the midge.

On each farm, twenty plants were selected systematically. One branch on each plant was selected and the total number of fruits recorded. Fruits were separated into three size categories (button, immature green and mature) and the proportion infested in each category recorded. On farms where the pest was not detected after the assessment of 20 plants, fruits on additional plants were examined until the pest was found or all plants examined.

Data Analysis

The incidence of the midge on each farm was calculated as a percentage of the total number of fruits. The farms were grouped by parish and means and

Table 1 . Location of farms visited in the survey.

Parish ^a	Section	District	Number of Farmers	Variety ^a
Hanover	West	Pell River	2	Scotch Bonnet
		Orange Bay	1	Trinidad Red
		Santoy	1	Scotch Bonnet
East	Burnt Ground	1		Scotch Bonnet
		Haughton Grove	2	Scotch Bonnet
St James	South	Horse Guards	1	Scotch Bonnet
		Garlands	1	Scotch Bonnet
		Croydon	1	Scotch Bonnet
		Seven Rivers	2	Scotch Bonnet
St Elizabeth	South	Roseberry	1	Round Red
		Roseberry	1	Goat Horn Red
		Ginger Ground	1	Goat Horn Red
		Emmaus	1	Goat Horn Red
		Emmaus	2	W1 Red
	North	Baptist	1	Scotch Bonnet
		Elderslie	1	Scotch Bonnet
		Retirement	1	Scotch Bonnet
		Maggotty	2	Scotch Bonnet
Westmoreland	West	Delveland	1	Scotch Bonnet
	East	Mahogany Estate	1	Scotch Bonnet
		Bath	1	Scotch Bonnet
		Haddo	1	Scotch Bonnet
		Happy Retreat	1	Scotch Bonnet
Belvedere	2	Scotch Bonnet		
Total			30	

** Variety name as supplied by farmer*

standard errors calculated. Analysis of variance was used to compare the incidence of the midge among fruit size categories. Analyses were done using JMP statistical software.

RESULTS

Production and Marketing Systems.

Forty six percent of farmers reported that they were growing hot peppers for the first time. The median years of experience was 15 months.

Thirteen percent of the pepper farms visited were mixed stands; intercropped with either coffee or corn. The

remaining 87% of the farms visited were pure stand. Crop ages ranged from 3 to 16 months with the median age being 7 months.

One of the farmers had not reaped for two weeks because his peppers had been rejected due to infestation with the pest. He reported that levels of the pest increased after he stopped reaping.

Pest and Pest Management

Seventy nine percent indicated that they had seen the pest damage ("scarring") before and 50% referred to it as "Blackstem". Only two of the farmers interviewed were aware of the pest associated with the damage. They had been visited by personnel from the Plant Quarantine Unit. In relation to management tactics employed, although most of the farmers used chemicals to manage pests on the peppers none were directed to the midge.

Distribution and Incidence of the midge

The midge was present in all parishes visited; however, interparish differences were observed. The midge was detected on 100% of farms in Hanover and St James, 86% in Westmoreland and 27% of farms in St Elizabeth. It should be noted that South St Elizabeth, was the only area where the midge was not detected.

Incidence on farms.

The incidence of the midge on all fruits on farms across parishes was 2.8% while the incidence on mature fruits was 16.5%. The highest incidence on mature fruit (57%) was observed in Hanover (Table 2). No fruits were infested on 50% of farms. Thirty percent of farms had incidence >0-5%, whereas 7% of farms had gall midge incidence between 5 and 10% and 13% had >10% (Table 3).

Table 2. Incidence of the gall midge across parishes.

Parish	No. of farms	Infestation levels (%)			
		All fruits		Mature fruits	
		Mean	Range	Mean	Range
St Elizabeth	11	0.27	0-1.5	0.29	0-1.7
Westmoreland	7	2.2	0-10	4.02	0.20
Hanover	7	4.6	0-16	57	0-100
St James	5	6.4	0-18	13	0.32
Overall	30	2.8	0-18	16.5	0-100

Table 3. Incidence of the gall midge on three stages of hot pepper fruit development.

Category	Incidence of the gall midge on stages of the hot pepper fruit (%)			
	All fruits	Button	Immature green	Mature fruits
0%	50%	(100%)	(93.3%)	(57%)
0-5%	(30%)	(0%)	(3.3%)	(17%)
5-10%	(7%)	(0%)	(0%)	(3%)
>10%	(13%)	(0%)	(3.3%)	(23%)
Overall	(100%)	(100%)	(100%)	(100%)

Significant differences in infestation were observed among the various stages of the fruit. The highest level was in mature fruits (17%; Table 4). No infestation was detected in button fruits.

Table 4. Gall midge infestation of three development stages of the hot pepper fruit.

Development stage of fruits	Mean No. of infested fruits	% infested
Button	11.7	0.00
Immature Green	39.9	3.36
Mature	51.3	16.5
SE (87 df)	5.73	4.09
P	<0.001	0.0133

DISCUSSION

Based on farmer reports and the widespread distribution of the pest, it appears that the midge is not a new pest. Although infestation levels on the majority of farms were below 5%, the pest was detected in all parishes. The zero tolerance ruling by USDA/APHIS meant that shipments were rejected on detection of one pepper with the midge. As a result of this some farmers were avoided by exporters when the pest was detected on their farm. Based on farmer reports, yield per week per 1000 plants range from 18 to 360 kg. Those farmers who were prevented from selling their crops because of the pest, lost between J\$1260 and J\$25,000 per 1000 plants per week at \$70 per kg.

Current practices characterised by poor field sanitation favour the pest. Twenty-three percent of farms had mature fruit with incidence greater than 10%. Some of these farmers had not reaped for some time. This condition may have in part, facilitated the increased levels observed. One of the farmers with high levels had not reaped for two weeks because his peppers had been rejected due to infestation with the pest. He reported that the levels increased after he stopped reaping. The use of cultural practices such as removal and destruction of all infested fruit at harvest, close monitoring of the crop especially in areas which are conducive for the pest (shaded areas where the soil is likely to retain moisture) may therefore assist in keeping the pest at manageable levels. Poor post harvest procedures and the lack of adherence to quality standards observed in the districts visited may have also contributed to the interception levels within the western region. Sensitisation of farmers within the major pepper growing communities to the pest, the associated damage, field sanitation and the market requirement is critical in the control of the pest. In addition, a rigid inspection and sorting programme at packing houses would also be useful in reducing the number of interceptions. However, post harvest protocols need to be developed which outline more stringent sorting procedures. Training of packing house staff will also be vital.

Very little information is known locally on the behaviour of the pest. Confirmation of the identity of the pest, symptomology, as well as further studies to determine the relationship between crop phenology and infestation levels are therefore critical. These studies will assist in developing an Integrated Pest Management (IPM) strategy for the control of the pest.

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