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INSECT PESTS OF FORAGE CROPS AND THEIR CONTROL IN BARBADOS

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INTRODUCTION

In the past, livestock producers in Barbados have relied mainly on indigenous grasses and relatively inexpensive by-product feedstuffs to feed their animals. These grasses were usually low in protein and energy, and concentrate feeding was necessary to achieve higher levels of milk and meat production.

Pasture and forage crops productivity could be increased by fertilizer application, but with increases in oil prices--and fertilizer prices--attention is being given to improving pasture productivity and quality by introducing new species. New grass and legume species have therefore been introduced and established on many farms as pure or mixed (grass/legume) stands.

These species are attacked by many insect pests, however. This paper lists the pests recorded on each of the forage species examined, their natural enemies and the insecticides which have been used for control.

SORDAN (**Sorghum vulgare x Sorghum sudanense**)

Noctuidae

Spodoptera frugiperda (J.E. Smith): Fall Armyworm. The pest occasionally appears in outbreak proportions, causing serious crop damage. The eggs are laid in masses on leaves. The newly hatched larvae, initially feed on the leaf epidermis on the underside of the leaves, leaving one side intact. Later on they move into the leaf whorl and feed there. The pest also feeds on Siratro (**Macroptilium atropurpureum**), African star grass (**Cynodon plectostachyus**), pangola grass (**Digitaria decumbens**), maize (**Zea mays**), guinea grass (**Panicum maximum**) and many other cultivated and wild plants.

In 1983 and 1984, plant infestation ranged from 27-84% (average 46%) and 30-76% (average 60%), respectively.

The eggs, larvae and pupae of the pest are attacked by a number of natural enemies. The most important of these are: **Trichogramma exiguum** Pinto and Platner attacking eggs; **Chelonus antillarum** Marshall, an egg-larval parasite; **Cotesia (=Apantales)** sp. (**glomeratus** group) and **Euplectrus platyhypenae** Howard, attacking larvae: and **Archytas analis** (F.), **Archytas divisus** (Walk.) and **Stomatomyia** sp., larval-pupal parasites.

A number of other parasites, viz. **Chelonus formosanus** Sonan and **Chelonus heliopae** Gupta; **Cotesia marginiventris** (Cresson) and **Macrocentrus collaris** (Spinola); **Campoletis flavicincta** (Ashmead); **Trichogramma achaeae** Nagaraja and Nagarkatti, **Trichogramma chilotraeae** Nagaraja and Nagarkatti and **Trichogrammatoidea armigera** Nagaraja; **Telenomus remus**

Nixon; and **Trichospilus diatraeae** Cherian and Margabandhu were introduced into Barbados, some of which are well established and provide good control (Alam, 1978). During heavy attack, laboratory reared parasites, **E. platyhypenae** and **T. diatraeae** were released in the fields, with satisfactory results (Table 1).

Parasitism levels on **S. frugiperda** larvae, recorded between 1982 and 1985, are given in Table 1.

Table 1. Levels of parasitism by the recorded natural enemies of **S. frugiperda** on sordan grass for the period 1982-1985 in Barbados,

Parasite	Per cent parasitism			
	1982	1983	1984	1985
C. antillarum	12	15	9	20
A. sp. **(glomeratus** group)	1	1	N.R.1/	N.R.
E. platyhypenae	2	1	1	N.R.
A. divisus	1	1	2	N.R.
C. flavicincta	1	N.R.	N.R.	N.R.
Stomatomyia sp.	N.R.	N.R.	3	N.R.

1/ N.R. = Not recorded.

To arrest the sudden upsurge of the pest, fields can be sprayed with certain pesticides (Table 5).

Pyralidae (Pyraustinae)

Marasmia trapezalis (Guenée): The larvae fold the leaves and stitch together the sides with silken threads to feed under the shelter thus formed. The damaged leaves can be easily detected from the lack of chlorophyll. However, damage is not usually serious and needs no control measures. The larvae are parasitized by a Braconid - **Apanteles** sp., but the level of parasitism is low.

Aphididae

Rhopalosiphum maidis (Fitch): Corn leaf aphid. Generally a minor pest, this sometimes appears in large numbers and causes some damage. The adults and nymphs suck sap from leaves and tender stems, which causes distorted growth. The pest also attacks maize, guinea corn **(Sorghum vulgare)**, sugarcane and para grass **(Brachiaria mutica)**.

When the pest is at high population density it is heavily parasitized by an Aphidiid - **Lysiphlebus testaceipes** (Cresson). The other natural enemies which keep the pest under excellent control are: **Cycloneda**

sanguinea (L.), **Coleomegilla maculata** (DeGeer), **Diomus thoracicus** (F.), **Hyperaspis festiva** ab. **apicalis** Weise., and **Scymnus (-Pullus)** sp.nr. **apicalis** Mulsant; **Allograpta limbata** (F.), **Allograpta obliqua** (Say), **Ocyptamus dimidiatus** (F.) and **Pseudodoros clavatus** (F.); and **Chrysopa** sp., **Ceraeochrysa valida** (Banks) and **Chrysoperla lanta** (Banks).

Use of pesticides against aphids should be avoided as far as possible, as most of the chemicals destroy the natural enemies and allow the pest to multiply at a much faster rate and to cause more serious damage.

Delphacidae

Peregrinus maidis (Ashmead): Corn leaf hopper. Generally a minor pest in sordan. The adults and nymphs feed on plant sap. The pest breeds in greater numbers on maize, where large colonies of the pest can be seen feeding in the leaf whorl. It also feeds on guinea,corn, sugarcane and other grasses. The pest is known to be a vector of a virus that causes "stripe disease" which can be identified from the longitudinal yellow streaks in the leaves and the stunted growth of the plants.

Generally no control measures are required, but when the population is high, spray with the chemicals mentioned in Table 5.

Cicadellidae

Hortensia similis (Walker): A leaf hopper and generally a minor pest, but occasionally outbreaks occur, when it can cause considerable damage. The adults and nymphs suck sap from stems and leaves. The insect also feeds on other grasses. Soon after the introduction of Sordan and African star grass, heavy populations of this pest were recorded in the field, and chemical control was considered necessary. Since then, the pest population has settled down and seldom requires any control measures.

During heavy attacks, the crop may be sprayed with the chemicals given in Table 5.

AFRICAN STAR GRASS **(Cynodon plectostachyus)**

Noctuidae

Agrotis (=Feltia) subterranea (F.): The granulate or climbing cutworm. A polyphagous caterpillar attacks the seedlings, roots, foliage and fruit of many crops. Besides African star grass, the pest has been recorded on many other crops, including beets, cassava and cotton. The pest is only serious when present in large numbers. Eggs are laid singly on the leaves, and when they hatch, the larvae hide under debris during the day time and feed at night. Pupation occurs in the soil or amongst debris.

Mythimna (=Leucania) latiuscula (Herrich-Schaeffer) **(=M. = L. senescens** (Moeschler)): Generally a minor pest; the larvae feed on leaves, causing significant damage only when present in large numbers. The pest also attacks sugarcane and beans. The larvae are parasitized by an ichneumonid - **Eiphosoma dentator** (F.). When the pest population is high the chemicals recommended in Table 5 may be used.

S. frugiperda (See under sordan grass for details). On African star grass, some 1.3% larvae were parasitized by **E. platyhypenae** and 2.6% by **A. divisus.**

PANGOLA GRASS **(Digitaria decumbens)**

Noctuidae

S. frugiperda (See Sordan).

GUINEA GRASS **(Panicum maximum)**

Noctuidae

Mocis latipes (Guenée): Ger rally a minor pest, but during the rainy season it appears in large numbers causing serious defoliation. It also feeds on sugarcane, African star grass and other grasses, causing some damage.

The larvae are parasitized by an ichneumonid - **Enicospilus flavus** (F.), and the pupae by a **Brachymeria** sp. (Chalcididae). The larvae are also preyed upon by a spider **(Agriope argentata** (F.)) (Araneae) and a centipede **(Scolopendra subspinipes** (Leach)).

S. frugiperda (See Sordan grass).

Pyralidae (Pyraustinae)

M. trapezalis (See Sordan grass).

RIVER TAMARIND **(Leucaena leucocephala).**

This species is attacked by a number of insect pests. Those recorded in Barbados and other Caribbean islands were:

Noctuidae

Melipotis famelica (Guenée): The larvae cause severe defoliation of the young tender shoots particularly during the rainy season, when the population usually becomes very high. Some one to two per cent of the larvae are parasitized by an ichneumonid wasp - **Enicospilus flavus** (Fabricius). A Jack Spaniard wasp - **Polistes barbadensis** Richards, feeds on larvae. For chemical control see Table 5.

Bendis bayamona Schaus and **Bendis formularis** Hubner: The caterpillars of these two species have been found feeding on **Leucaena** foliage in Barbados. Populations are not as high as those of **M. famelica.** No natural enemies were recorded. For chemical control see Table 5.

Geometridae

Semiothisa sp. nr. **trientata** Herrich-Schaffer: The dark coloured larvae move with a looping action and feed on the underside of the leaves. Generally the population is low, but it becomes abundant during the wet

season. The pest also feeds on alfalfa **(Medicago sativa)**. The Jack Spaniard wasp, **P. barbadensis**, feeds on the larvae.

Pysyllidae

Heteropsylla cubana Crawford **(Leucaena psyllida)**: In Barbados and other Eastern Caribbean islands, this pest has been recorded attacking terminal shoots of **Leucaena**. Minute, shiny green adults lay their eggs on young shoots and leaves. Newly hatched nymphs settle on the underside of the leaves and tender shoots, where they suck plant sap. In cases of high infestation the shoots wilt and die. The insect also secretes honeydew, which falls on the lower leaves, where sooty mold develops. Photosynthesis is inhibited causing further damage to the plants.

In Barbados, the pest is kept under reasonable control by various predators, which include: **Chrysopa** sp. (Chrysopidae), **Diomus** spp. and **C. sanguinea**. In St. Kitts, **C. sanguinea**, an unidentified maculated ladybird beetle, and **Diomus** sp., were found in large numbers on infested plants feeding on the pest.

The use of pesticides should be avoided, unless the pest population is extremely high. Pesticides like Perfekthion (R) and Orthene (R) will provide good control (Table 5).

CROWN VETCH **(Aeschynomene americana)**: This legume, although not being used as a forage, is widely distributed in the Caribbean and harbours a number of potential pests of **Leucaena** and other forages. Those recorded in Barbados are as follows:

Gelechiidae

Evipe sp.: A leaf stitcher. The larvae stitch the leaves together and feed under the shelter thus formed. Generally the population is not high. No natural enemies have been recorded from this pest.

Geometridae

Semiothisa everiata (Guenée) **(=Semiothisa sochrata** Warren): This looper caterpillar feeds on leaves, causing some defoliation. The pest also feeds on alfalfa, **Leucaena**, wild indigo **(Indigofera suffruticosa)**. Generally not a serious pest. No natural enemies have been recorded from it.

Noctuidae

Anticarsia gemmatalis (Hubner): The velvet bean caterpillar. A few larvae have been recorded feeding on foliage. The pest also feeds on peanuts, pigeon pea, beans, bonavist bean, wooly pyrol, sugarcane and many other cultivated and wild plants. The eggs are laid in clusters on the leaf. The larvae which move with a looping action, defoliate the host and move on to another plant. Pupation occurs in the soil or amongst debris.

The eggs are parasitized by a **Trichogramma** sp. and **T. remus**, and the larvae by an **Apanteles** sp.

Heliocontia = (Pragueia) perstructana (Walker): The larvae feed on the leaves. Usually the population is low, but during wet season when plant growth is lush, the insect increases in number causing some defoliation. In general the pest does not need any control measures. In the field, some 48% eggs were found to be parasitized by a **Trichogramma** sp., and a small number of larvae by an **Apanteles** sp.

Pieridae

Eurema daira palmira Poey: This pest breeds freely on crown vetch plants and becomes seasonally abundant. Small, yellow coloured eggs are laid singly on the underside of the leaves. On hatching, the larvae feed on foliage. Full grown larvae pupate on the plant. The upper side of the wings of adults are yellow or white with variable amounts of black border, and the male has black and orange bars along the inner margin of the forewings.

In the field, over 33% eggs were found to be parasitized by **Trichogramma chilonis** (Ishii) and **Trichogramma pretiousum** Riley. A small number of pupae were attacked by **Horismenus** sp. nr. fraternus (Fitch) (Eulophidae); and **Metadontia** sp. and **Spilochalcis** sp. prob. **femorata** (F.) (Chalcididae).

Pseudococcidae

Pseudococcus elisae Borchsenius: A mealybug: A small population of the pest was recorded infesting young shoots and leaves. The mealybug sucks sap from the plant causing some damage. The insect also attacks cotton and croton (**Codiaeum variegatum**) in Barbados.

Cerambycidae

Neocompsa sp.: Only a few adults were recorded feeding on leaves.

SITRATO (**Macroptilium atropurpureum**)

Pyralidae (Pyraustinae)

Omiodes (=Hedylepta - Lamprosema) indicata (Fab.): The bean leaf webber. An important pest of beans, this also breeds freely on **Teramnus labialis** and **Amaranthus** spp. The eggs are laid singly on the leaves. At first the young larva feeds on the tissues of only one side of the leaf and folds over the edge to form a shelter, securing it with a few strands of silk. It remains in the shelter as it grows, enlarging it by pulling in surrounding leaves. Pupation takes place within the feeding shelter. The larvae are parasitized by a **Bracon** sp.

Pyralidae (Pycitinae)

Fundella sp.: A pod borer. The larvae bore into the pods and feed on developing seeds. The eggs are laid on young pods, flowers and terminal leaves. The newly hatched larvae feed on the leaf-epidermis and on the surface of young pods. Later they bore into the pods and feed on the developing seeds. Pupation also occurs inside the pods. A small nubmer of larvae are parasitized by a braconid - **Apanteles** sp.

Noctuidae

A. gemmatalis (See Crown Vetch).

RABBIT VINE **(Teramnus labialis)**

Pyralidae (Pyraustinae)

O. (=H. = L.) indicata: During the rainy season over 25% leaves can be damaged by this pest. (See Syratro).

Noctuidae

Anomis editrix (Guenée): A small population of the pest has been recorded. The larvae feed on leaves and the pupation occurs in the soil.

A. gemmatalis: During rainy season, this pest causes considerable defoliation, and will require insecticidal control (Table 5).

Pterophoridae

Megalorrhipidae defectalis (Walker) **(=Trichoptilus congrualis** Walker): The small, greenish, hairy larvae feed on the young leaves. Usually the population is very low. The insect has also been recorded feeding on pigeon pea and **Indigofera** spp.

Pentatomidae

Edessa meditabunda (F.) : A small population of the pest has been recorded. Eggs are laid in two linear rows on the underside of the leaves. The nymphs and adults suck sap from leaves and tender shoots causing spotting and wilting of the plants. It also attacks many vegetable crops, fruits and wild plants.

In the field over 30% of the eggs may be parasitized by **Trissolcus** sp. and **Trissolcus basalis** (Wollaston) (Scelionidae). In the Leeward Islands, a tachinid - **Trichopoda pennipes** F., lays eggs on some 50 per cent of adults, many of which are successfully parasitized.

BLUE PEA **(Clitoria ternatea)**

Noctuidae

Janseodes (=Proxenus) melanospila (Guenée): This feeds on the leaves. The population is usually low.

Tropiduchidae

Neotangia angustata (Uhler): A small population of this bug has been recorded. The nymphs and adults suck sap from the leaves.

ALFALFA **(Medicago sativa)**

In 1982, alfalfa was planted at Springhead Plantation in St. James,

and at the Animal Nutrition Unit at the Pine in St. Michael. The crop was attacked by a number of insect pests. These were as follows:

Gelechiidae

Dichomeris acuminata (Staudinger): A bud worm. The eggs are laid on young buds, and on hatching the larvae stitch the young leaves with silken threads and feed in the hollow thus made. Pupation occurs in the leaves. The pest also feeds on **Indigofera suffruticosa.** On alfalfa, the level of bud infestation ranges from 1-95 per cent, averaging 26 per cent. Details of monthly observations in 1983 are given in Table 2.

Table 2. Monthly alfalfa tiller/stem infestation levels with **D. acuminata** (100 stalks samples)

Month	Per cent infestation	Month	Per cent infestation
January	12	July	97
February	51	August	40
March	68	September	10
April	15	October	23
May	52	November	9
June	20	December	15

The pest is attacked by an egg-larval parasite, **Chelonus** sp., nr. **meridionalis** (Ashmead) and the levels of parasitism recorded are given in Table 3.

Table 3. Monthly parasitism levels of **D. acuminata**, by **Chelonus** sp. nr. **meridionalis**, in Barbados during 1983.

Month	No. larvae collected	Per cent parasi-tism	Month	No. larvae collected	Per cent parasi-tism
January	26	12	July	20	15
February	203	5	August	172	6
March	108	10	September	24	0
April	30	0	October	28	0
May	234	18	November	9	0
June	159	37	December	11	36

Geometridae

S. everiata (=S. sochrata): A looper caterpillar: For details see under Crown Vetch. In the field, about 5 per cent of the larvae have been parasitized by a bethylid - **Goniozus** sp., 7 per cent of pupae by a **Brachymeria** sp. and 2 per cent of pupae by a **Spilochalcis** sp. (Chalcididae). A few eggs were parasitized by a **Tetrastichus** sp. (Eulophidae).

Noctuidae

S. frugiperda and **Spodoptera eridania** (Cramer): Army worms. These lay eggs on the leaves. The young larvae feed on foliage and terminal shoots, and in heavy infestations the plants are serious defoliated, leaving only stalks. Infestation by these pests range from 0 to 20 per cent averaging 5 per cent. Usually **S. frugiperda** was more prevalent than **S. eridania.** Monthly stalk infestation levels by **Spodoptera** spp. are given in Table 4.

Table 4. Monthly alfalfa stalk infestation levels by **Spodoptera** spp. (100 stalks samples).

Month	Per cent infestation	Month	Per cent infestation
January	7	July	7
February	6	August	1
March	15	September	2
April	9	October	0
May	2	November	20
June	1	December	9

In the field, **Telenomus remus** Nixon, which had already provided good control of **Spodoptera** spp. on various crops and vegetables in Barbados, was released to augment parasite populations in alfalfa fields. The average parasitism levels during 1982, 1983 and 1984 were 75 per cent, 66 per cent and 30 per cent, respectively. **Trichogramma exiguum (=T. fasciatum)** attacked 8 per cent and 6 per cent of eggs during 1982 and 1983. An egg-larval parasite, **C. antillarum,** accounted for 12 per cent parasitism during 1982 and 10 per cent during 1983.

The young larvae were parasitized by **Cotesia (=Apanteles) (glomeratus** group). The average parasitism levels recorded were 42 per cent in 1982, 5 per cent in 1983 and 1 per cent in 1984.

An ecto-larval parasite, **E. platyhypenae** attacked 1 to 2 per cent of caterpillars in the field during the same period.

A larval-pupal parasite, **A. divisus**, attacked up to 27 per cent of the pest populations. Two larval parasites, **Campoletis flavicincta** (Ashmead) and **Campoletis chlorideae** Uchida, from Uruguay, and India and Pakistan, respectively, were obtained from the Commonwealth Institute of Biological Control, West Indian Station, Trinidad. The parasites were reared in the laboratory at Edgehill, St. Thomas, and released in alfalfa fields. A few recoveries were made.

A. gematalis: Small populations of this pest were recorded feeding on the leaves. A fungus, prob. **Nomuraea rileyi,** usually infested high larval populations in the field, providing excellent control.

The other lepidopterous insect pests feeding on alfalfa foliage were: **Semiothisa** sp. prob. **trientata; Heliothis zea** Boddie, **Agrotis (=Feltia)**

subterranea (Fab.) and **Pseudoplusia includens** (Walker) (Noctuidae). Generally the populations of these pests were low. No natural enemies were recorded from them.

Liriomyza sp. prob. **trifolii** (Burgess): Agromyzid leaf miner. This pest mines the leaves but populations have been low. Some 31 per cent pupae were parasitized by **Opius** sp. (Braconidae) and 19 per cent by **Chrysocharis** sp. (Eulophidae). The combined parasitism was 50 per cent.

Miridae

Rhinacloa forticornis Reuter: A Mirid bug. A small population of the pest was recorded in alfalfa fields. The nymphs and adults suck sap from leaves and stems. It is an important pest of cotton and also feeds on beans, potatoes, **Ambrosia artemio·ioides** and **Crotalaria juncea**. The insect is also a known predator of the eggs of **Heliothis, Spodoptera, Anticarsia** and other pests.

The eggs are laid singly into the plant tissue. Early instar nymphs are creamy-brown in color and the later ones are pale green. Adults are dark brown with a distinct buff-coloured "V" on the back, and the tips of the antennae are white. In Barbados, **Chrysopa** sp. was found feeding on nymphs and adults.

Tetranychidae

Tetranychus gloveri Banks: Red spider mite. Generally a small number of leaves were found to be attacked by this pest, but during dry weather the population increased considerably. Eggs are laid on the underside of the leaves, alongside the mid-ribs. Nymphs and adults feed in colonies on cell sap, causing mottling of the leaves. Heavily infested leaves drop prematurely. A ladybird beetle, **Pullus** sp., and the larvae of the lacewing bug, **Chrysopa** sp., feed on the pest.

Cicadellidae

Empoasca sp. prob. **fabalis** (DeLong): Leaf hopper. Adults are about 3 mm long, slender and wholly green. The young nymphs are bright green. Adults and nymphs feed on cell sap on the under surface of the leaves. When disturbed, the adults and nymphs run rapidly. The pest is a vector of a virus disease, and needs special attention to avoid serious plant damage. It also feeds on various grasses, beans, peas and other cultivated and wild plants. Ladybird beetles, **C. sanguinea** and **Nephus** sp., and lacewing bug, **Chrysopa** sp. feed on nymphs and adults.

INSECTICIDES

Table 5. Insecticides used against various insect pests of the forage crops grown in Barbados, between 1982 and 1985.

Insecticide	Rate of Application	Target Pests
Diazinon(R)	1-2.1 l/ha (3/4-1 1/2 pt/ac	Leaf feeding caterpillars, aphids, leaf hoppers, mealybugs.
Orthene(R)	740g-1,490 g/ha (11-21 oz/ac	Caterpillars, aphids, mealybugs, leaf-miners, leaf hoppers, psyllids, mites.
Decis(R)	280-490 ml/ha (4-7 oz/ac	All leaf feeding caterpillars.
Perfekthion(R)	500-800 ml/ha (7-11 1/2 fl. oz/ac	Leaf hoppers, psyllids, aphids, mites.

SUMMARY

Detailed observations were done mainly on Sordan and alfalfa, but other forages were examined periodically to record their insect pests and associated natural enemies.

From our studies on the pest complexes of the various forages grown in Barbados, it appears that some of the insects are more or less specific to certain forage types, whereas others are more general in their feeding habits.

The insect pest of greatest significance was the fall armyworm **Spodoptera frugiperda** (J. E. Smith), which feeds on Sordan and other grasses, and is their principal defoliator. Although it has a large complex of natural enemies attacking it in the field, the pest still requires insecticidal control, particularly in the establishment phase of the crops.

Other insects, such as **M. famelica** and **H. cubana** on **Leucaena, A. gemmatalis** on Siratro, **D. acuminata** on alfalfa, and **M.latipes** on Guinea grass, tend to be significant only when new growth flushes appear on the host plants.

Alfalfa ceased to be grown in Barbados because of its poor yields and its high management skills to control insect pests. However, reasonable control of some of its insect pests was achieved through the timely releases of parasites.

Overall, the majority of the insect studied on the forages are parasitized and preyed upon by a wide range of natural enemies, and require little or no additional control measures.

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