

Distribution, Infestation and Occurrence of *Noorda blitealis* Wlk. and *Gitona distigma* (Meigen) in *Moringa oleifera* Lam. in the Home Gardens of Jaffna District, Sri Lanka

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Abstract: *Moringa oleifera* Lam. is grown in Jaffna home gardens for pods and leaves. After the introduction of PKM 1 *Moringa* variety, the populations of leaf eating caterpillar (*Noorda blitealis* Wlk.) and pod fly [*Gitona distigma* (Meigen)] were suddenly increased causing severe damage in leaves and pods, respectively. Hence, this study was carried out to map the distribution of the insects and their occurrence in Jaffna District. The infestation of *N. blitealis* was reported in Maruthankerny, Velanai, Karaveddy, Chavakachcheri, Pointpedro, Kaytes, Nallur, Kopay, Kaithady, Jaffna, Uduvil, Thellipalai, Sandilipay and Chankanai Divisional Secretariat (DS) divisions. High infestation score of 4 (defoliation 76% -100%) was recorded in Maruthankerny, Velanai, Karaveddy, Chavakachcheri and Point Pedro DS divisions. *G. distigma* infestation was observed in Maruthankerny, Velanai, Chavakachcheri and Karaveddy DS divisions. The highest score of 4 (pod damage 76 -100%) was reported in Maruthankerny, Karaveddy and Velanai DS divisions. The caterpillar, *N. blitealis* larvae fed on the leaves and barks. It webbed, skeletonised and defoliated the tree completely. The pod fly, *G. distigma* maggots were found feeding in tender pods. The affected pods dried and split from the tips. Gummy exudates were found oozing out from the pods. A questionnaire survey carried out among *Moringa* growers in this district revealed that *N. blitealis* infestation increases in the rainy season during the months of October, November, December, January and February. Families used sanitary measures (92%), pruning (92%), hand picking (84%) and application of ash (33%), leaf extracts (25%), cow urine (16%) and insecticides (32%) to manage *N. blitealis* in their home gardens. Spacing of the plants showed a negative correlation and fertilizer application had a positive correlation with the severity of *N. blitealis*. Spiders, *Chrysoperla carnea*, *Cydonia vicina*, mantis and *Centropus sinensis* were recorded as predators on *N. blitealis*. Creating awareness among the public on these pests and their damage will help identify the pests easily and will also help to manage the problem using non-chemical means.

Keywords: forage-value, growth-stages, leaf weight, nutrient composition

Introduction

Moringa oleifera Lam. (Family: Moringaceae) is one of the commonly grown multipurpose tree in Jaffna home gardens. It can survive in very harsh climate conditions especially the drought (Morton, 1991). All parts of *Moringa* have economic value in nutritional, medicinal and industrial perspective. Fahey (2005) pointed out that *Moringa* is the “natural nutrition for the tropics” as it is frequently used to fight malnutrition among infants and nursing mothers. Annual *Moringa*, Periyakulam 1 (PKM 1) variety, which was introduced from India for leaves and fleshy fruit, grows well in resettled home gardens of Jaffna district and bears continuously especially to fulfill the daily nutrition requirements of the families. The pods and leaves, which are rich of nutrients especially iron, are used for consumption. Seasonal pests have been a major limitation in *Moringa* grown in Jaffna district. After the introduction of PKM 1 variety, *Moringa* trees were severely attacked by a leaf eating caterpillar *Noorda blitealis* Wlk (Family: Pyralidae) and the pods were damaged by a *Moringa* fruit fly *Gitona distigma*

(Meigen). The caterpillar feeds on the *Moringa* leaves and completely defoliates the tree during severe conditions (Satti *et al.*, 2013). Anjaneyamurthy and Regupathy (1992) reported that the *Moringa* fruit fly *G. distigma* (Meigen) attacks the pods and cause gummy exudates from the fruits. Since these pests are emerging as new pests in *Moringa*, information on these pests are lacking under Sri Lankan conditions. The *Moringa* growers in Jaffna are unaware of the pest damage and yield reduction. Considering the plight of the resettled families and others growing *Moringa* in home gardens in Jaffna district, this study was carried out as an initial work to determine the distribution, infestation and occurrence of *N. blitealis* and *G. distigma* in *Moringa* grown in the Jaffna District.

Materials and Methods

Recording the distribution and infestation Field visits were conducted throughout the Jaffna District to observe and record the distribution and severity of infestation of *Moringa* using the severity score parameter. The infested fields were located and recorded with the help of Geographical Positioning

Table 1: Details of infestation severity score

Score	Infestation level by <i>N. blitealis</i>	Pod damage level by <i>G. distigma</i>
0	No leaf damage	No pod damage
1	1-25% defoliation	1-25% pod damage
2	26-50% defoliation	26-50% pod damage
3	51-75% defoliation	51-75% pod damage
4	76-100% defoliation	76-100% pod damage

(Source: Bedane *et al.*, 2013)

Table 2: Percentage of samples used for questionnaire survey form different DS divisions

DS division	Percentage of samples collected
Nallur	9
Point Pedro	5
Kopay	16
Jaffna	4
Velanai	6
Karaveddy	10
Maruthankerny	14
Uduvil	5
Chankanai	3
Sandilipay	4
Kaithady	2
Kayts	2
Thellipalai	7
Chavakachcheri	13
Total	100

(Source: Survey data, 2014, 2015)

System (GPS) device, the severity scores were given for the infested trees as shown in Table 1. Pointing out the distribution of *N. blitealis* was done using ARCVIEW GIS 3.29 version software. Damage and symptoms of *N. blitealis* and *G. distingma* were carefully observed and recorded.

Questionnaire survey on *N. blitealis* incidence in Jaffna District

A questionnaire based survey was conducted during the period of November 2014 to May 2015 in Jaffna District. The details of *Moringa* cultivators in Jaffna District were taken from Department of Agriculture (Extension). The survey was conducted

with hundred randomly selected *Moringa* cultivators in home gardens to obtain data regarding the infestation level of *N. blitealis*, *Moringa* varieties cultivated, natural enemies association, cultivation practices and management methods. Interviews typically lasted for 20 minutes per *Moringa* grower. Table 2 shows the percentage of samples collected from 100 *Moringa* growers in Jaffna District.

Statistical analysis

The data obtained from questionnaire survey were statistically analyzed using SPSS (SPSS Inc. Released 2007. SPSS for Windows, Version 16.0. Chicago, SPSS Inc.)

Results and Discussion

The infestation of *N. blitealis* was found in Maruthankerny, Velanai, Karaveddy, Chavakachcheri, Pointpedro, Kayts, Nallur, Kopay, Kaithady, Jaffna, Uduvil, Thellipalai, Sandilipay and Chankanai DS divisions. High number of plants received the infestation score of 4 (76% -100% defoliation) in Maruthankerny, Velanai, Karaveddy, Chavakachcheri and Point Pedro DS divisions. Uduvil, Thellipalai, Sandilipay and Chankanai DS divisions received the lowest infestation score of 1 (1% - 25% defoliation) (Figure 1).

G. distingma infestation was observed in Maruthankerny, Velanai and Karaveddy DS divisions. Infestation severity was high in

Maruthankerny, Velanai, Chavakachcheri and Karaveddy DS divisions with the infestation score of 4 (76% -100% pod damage) (Figure 2).

The larvae of *N. blitealis* were found feeding on the ventral surface of the shoots and leaves. During the hot sunny days, the larvae enrolled the leaf blade using the silky thread and were found inside the rolled leaves. The larvae were found hanging with a silken thread which facilitated it to move from the upper branches to the lower branches in order to feed on the new leaves. The webbed leaf blades were translucent. The leaves were skeletonised, dried up and turned into brown in colour.

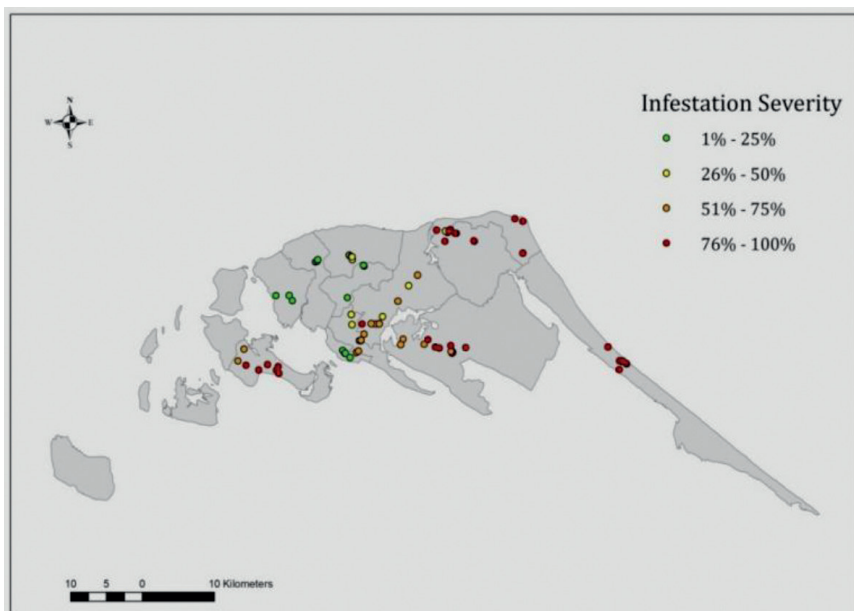


Figure 1: Distribution of *N. blitealis* Wlk. in Jaffna District

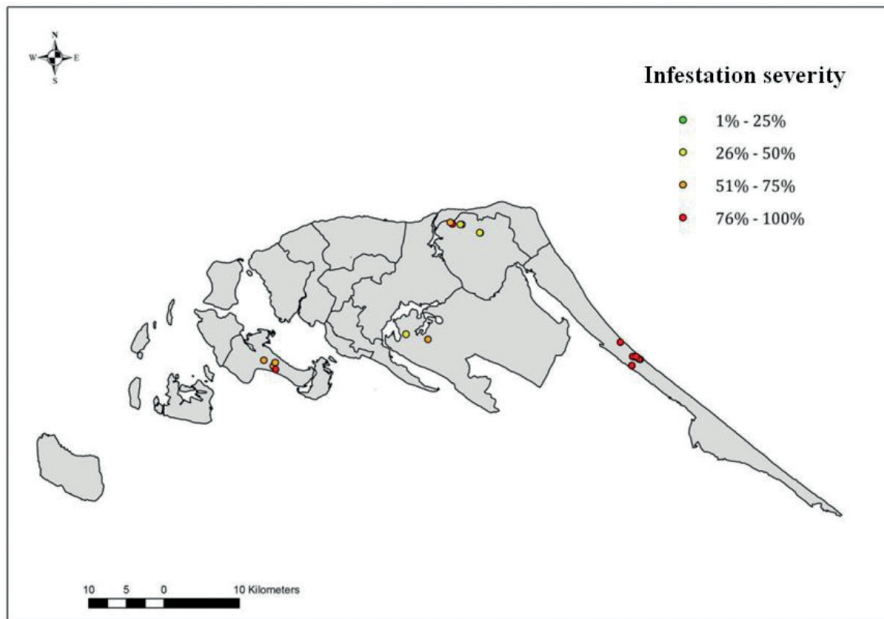


Figure 2: Distribution of *G. distigma* (Meigen) in Jaffna District

In severe infestation, complete defoliation was observed. Black faecal materials were found on the leaflets and were stuck with the silken threads on the tree. In pruned *Moringa* trees the larvae were found feeding on the stem (Figure 3).

The maggots of *G. distigma* were found in the *Moringa* pods. The maggot entered the pods through bored hole at the terminal end of the fruit. The pods turned to brown in colour and dried up. The pods split from the tip and the flesh of the fruit was exposed. Oozing of brown gummy exudates was observed. The flesh of the pod was found rotten due to the damage of the maggot and microbial infection. *Moringa* leaves and drumsticks were used for edible purposes. Both PKM

1 and traditional varieties were cultivated in the home gardens and commercial levels. Seedlings and stem cuttings were used as planting materials. Out of 100 *Moringa* cultivators, 86% used seedlings and 14% used cuttings as planting material. Among the 100 home gardens, 18% and 14% of planting materials were distributed by Grama Niladhari (GN) divisions and Non-Government Organization (NGO).

According to the Figure 5, the *N. blitealis* infestation started to increase in October and reached the peak in December, then gradually reduced up to March. It is obvious that infestation started with the onset of rainy season. Similar results were also reported by Bedane *et al.* (2013).

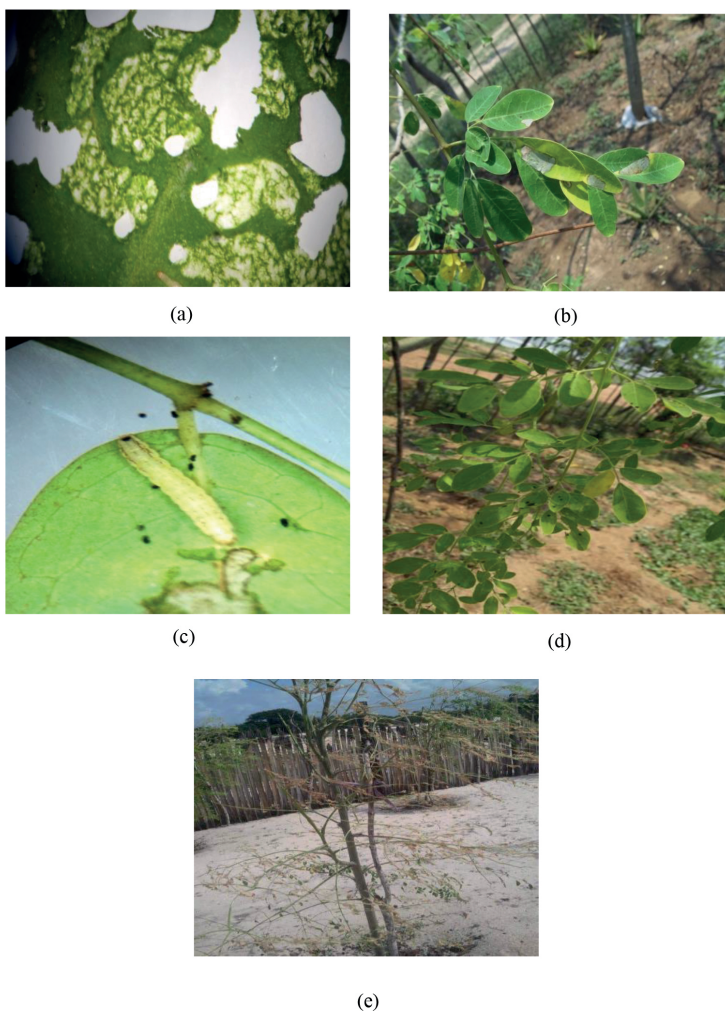


Figure 3: Damaged symptoms of *N. blitealis* [(a): Larva in the enrolled leaf, (b): Dried up leaves, (c): Faecal material of the larva, (d): Larva feeding on the ventral surface of the leaf, (e): Defoliated plant]

The survey revealed that, *Moringa* cultivators adapted chemical treatment (32%), hand picking (84%), purring (92%), sanitary measures (92%) and applied cow urine (16%), leaf extracts such as *Azadirachta indica* and *Gliricidia sepium* extracts (25%) and ash (33%), whereas, 6% of the *Moringa* cultivators did not take any control measures

against the pest. Around 68 % of the *Moringa* cultivators used non chemical method of treatments and 32% used chemical treatment to control the pest population. Among the *Moringa* cultivators 63% of the cultivators applied both inorganic and organic fertilizers, 27% applied only organic, 2% solely inorganic and 8% did not apply any fertilizers.

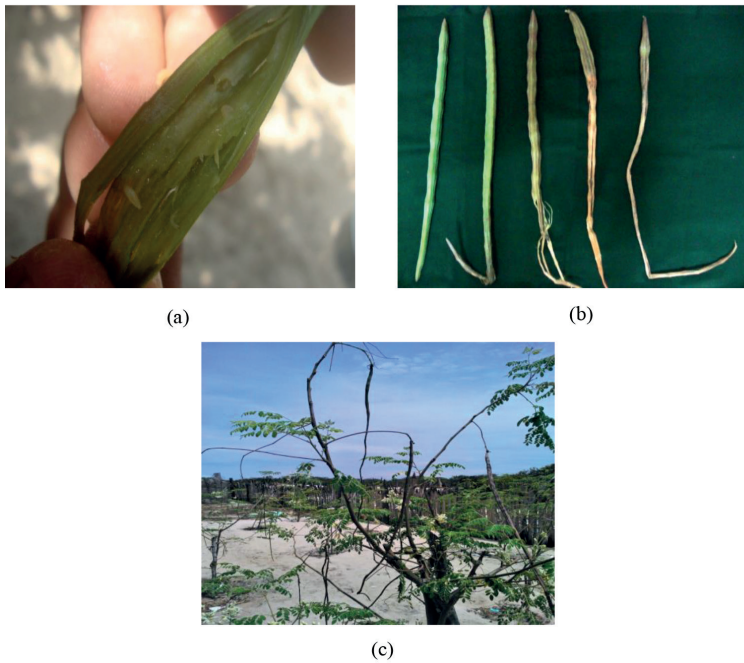


Figure 4: Damaged symptoms of *G. distigma* [(a): Maggots of *G. distigma*, (b): Damaged pods compared with a normal pod, (c): Infested pods on the *Moringa*]

The infestation severity of the pest for organic and inorganic fertilizations showed positive weak correlations of 0.10 and 0.40, respectively. Increased nitrogen, water

and sugar content of the host plant might significantly influence the fecundity, survival and efficacy of food consumption by pest (Slansky, 1982).

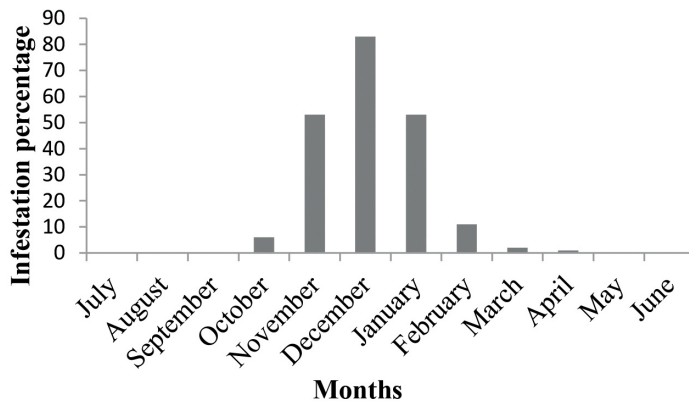


Figure 5: Infestation pattern of *N. blitealis* in a year

According to the survey, the plant spacing showed a negative weak correlation of 0.28 with the *N. blitealis* infestation. When the spacing between the plants decreased, the pest infestation was high, that is, in intensive cultivation the pest infestation was high. There were many natural enemies associated with *N. blitealis* on *Moringa*. According to the survey, 98% of the fields had spiders preying on the larval stages of the pest. In addition there were *Chrysoperla carnea*, *Cydonia vicina*, mantis and a bird predator greater coucal (*Centropus sinensis*) preying on the pest. Spiders were observed as major predators of *N. blitealis*.

Conclusion

N. blitealis infestation was found in fourteen DS divisions and *G. distingma* was recorded in four DS divisions of the Jaffna District. Severe infestation of *N. blitealis* caused complete defoliation, hence death of the plant. *G. distingma* maggots fed on the flesh of the pods, which reduced the market quality of the pods. Pruning and sanitary measures were the common pest management practices in the home gardens. In the intensive cultivation, *N. blitealis* damage was recorded high. Home gardens harboured the natural predators of *N. blitealis*. Awareness of these pests should be created among the public in order to identify the pests and their damage for pest avoidance and management.

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