

# Testing Farmers Knowledge on the Nymphal Stage of *Anacridium melanorhodon melanorhodon* at Ennohoud Locality, West Kordofan State, Sudan

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## Abstract

This study was conducted at Ennohoud Locality, West Kordofan State during the season 2013/2014 and dealt with nymphal stages of the tree locust, *Anacridium melanorhodon melanorhodon* (Orthoptera: Acrididae) the most devastate insect pest of *Acacia senegal* trees, the major source of Gum Arabic production. This study was designed, generally, to test some local farmer's knowledge at the selected area. A key informant questionnaire was designed and accordingly filled by interviewing the targeted farmers. 100 respondents from Wad Elhelaw, Abumariga, Greawid, Abu Dagal villages and Ennohoud Crop Market were chosen. Twenty respondents were selected from each. The respondents were interviewed for their experience and knowledge in aspects relevant to the nymphal stage of the tree locust in relation to its impact on *Acacia senegal*. Data were statistically analysed using IBM-SPSS (version 20) software package. Descriptive statistics were followed for data manipulation. Results publicized that most respondents cannot differentiate between the different nymphal stages. The nymphal stages climb up the trees at August. The main activity of nymphal stages recorded by 95% of the respondent was eating. Fledgling was reached at September as mentioned by 90% of the respondents. Majority of respondents specify that tree locust leave the area at October, at evening and the migration towards South-east. *Acacia senegal* trees damage was estimated as substantial (< 50% of tree product) and 99% of respondents find severe damage of the tree locust influence on tapping decision. Estimates of crop production damage by tree locust are little. Respondents reported three types of trees affected by tree locust; these were *Acacia nubica*, *Balanites aegyptiaca* and *Ziziphus spp*.

## Keywords

West Kordofan, Acacia Senegal, Tree Locust, Anacridium, Farmers Knowledge

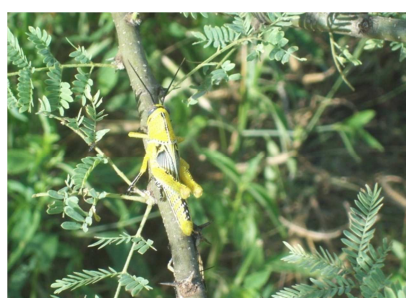
## 1. Introduction

*Acacia senegal* (L.) Willd. Is a major source of Gum Arabic, an important woody tree species, a great socio-economic and environmental importance in the Sudan [9, 11, 12]. Natural stands type of the *A. senegal* is dominating, what is commonly known as, the Gum Arabic belt which is occupying the area between latitudes 10°–14°N, [21]. This belt is considered as an important biome that accommodates around one fifth of the

Sudan's population and two thirds of its livestock population in addition to other living components that enrich the biodiversity. As such, the belt acts as a natural barricade protecting more than 50% of the surface area of Sudan from desertification and desert encroachment [1]. Gum Arabic is the most important product of this low input production system, which significantly contributes to domestic income and hard currency earnings for the Sudan. The country is accounted for production of more than 70% of the globally marketable Gum Arabic [2, 7, 10]. In Sudan, Kordofan is historically very

famous for the production of Gum Arabic, where tree *Acacia senegal* is grown and 70% of the Sudanese Gum Arabic was pruned [7].

Following the recurrent drought episodes that hit the area since the seventies of the last century, Gum Arabic production is considerably decreased as *Acacia senegal* faced multitude of environmental and biological constraints that lead together with other social factors to a rigorous deterioration in the natural stands of tree. As far as the biological constraints are concerned, insect attacks were implicated as the main causal agents in the decline of the Gum production [8]. The tree locust, *A. m. melanorhodon* is the most destructive pest of *Acacia senegal* [1] Serious damage occurred by locust, estimated at 86.5% [4]. The effect of the tree locust was neglected or uncared for; however, this locust received a great attention as a pest of many crops in traditional rain-fed areas of western Sudan [20]. The eggs laid in moist soil during rainy season around mid-July. [6, 19]. Eggs hatched giving nymphal stages that develop during August and early September, while the last nymphal stage which moult into fledgling adult in late September to October towards the end of the rainy season (Figures 1 and 6). Hoppers, which have six stages, appeared between July and October [13].



**Figure 1.** *Anacridium melanorhodon melanorhodon* 5th nymphal stage on *Acacia senegal* (Source: Field work of the current study, 2013).

After hatching, hoppers climb the nearest bush or tree and may form groups. Feeding occurs at night. During the day adults normally roost in trees, and if disturbed, they will fly from branch to branch or to a nearby tree [18]. The hatching hoppers climb the nearest bush or tree and may form groups [10]. Hoppers appeared in July, August, September and October and their number increased with increase in rainfall and relative humidity [15]. Eggs hatched during June-July whereas fledglings were observed in August-October [19]. Most feeding and flight activities occur at night, both adults and nymphs roost on acacia trees [17].

The majority of the producers (55%) assured that the Tree locust reduces the production of *Acacia senegal* and they estimated the loss to be ranged between 50% and 74% from total Gum production [5, 15].

Gum Arabic producers in the study area confirmed that the tree locust cause noticeable loss in the production [5]. Only 7% of them classify the loss in Gum production as (less than 50%) and 55% of the producers estimate that they lose between (50% - 74%) of Gum production, while 38%

of the respondents classify the loss between (75% and 100%). Tree locust outbreak affected the time of tapping from first October or November to the end of January in some areas and to the first of March in another area [3]. In Kordofan and Darfur, where tree locust may cause harm to Gum *Acacia senegal* and *Balanites aegyptiaca* (Higleeg) [16]. Tree locust roost and feed on trees, *Acacia spp.*, *Ziziphus spp.* and *Balanites aegyptiaca* [14].

## 2. Materials and Methods

A questionnaire was designed to interview rural communities involved in Gum Arabic production (*Acacia senegal* owners and Tappers) for their experience and knowledge with the nymphal stage of tree locust infestation at West Kordofan State, Ennohoud locality in season 2013/2014. Pre-test was conducted to the questionnaire. Hundred respondents from Wad Elhelaw, Abumariga, Greawid, Abu Dagal villages and Ennohoud Crop Market. Twenty respondents were randomly selected from each. Interviews were conducted and data was collected and summarised for analysis. To fulfil the objectives of the study, descriptive and inferential statistics methods were applied. The study used IBM-SPSS version 20 software for data analysis.

## 3. Results

### 3.1. Differentiation Between the Different Nymphal Stages

Table 1 shows farmer's knowledge of differentiation of the different nymphal stages.

Only 8% of the respondents can differentiate between the different stages.

**Table 1.** Differentiation between the different nymphal stages.

Categories	Frequency	Percent
Yes	8	8.0%
No	92	92.0%
Total	100	100.0%

### 3.2. The Month of Nymphal Stage Climb up Trees

92% of the respondents said that nymphal stages climb up to trees in August (Table 2).

**Table 2.** The month of nymphal stage climb up to the trees.

categories	Frequency	Percent
August	92	92.0%
September	8	8.0%
Total	100	100.0%

### 3.3. The Main Activities of the Nymphal Stages

Table 3 showed that the main activities of the nymphal stages were eating (95%).

**Table 3.** The main activities of the nymphal stages.

categories	Frequency	Percent
Eating	95	95.0%
Eating & Roosting	5	5.0%
Total	100	100.0%

### 3.4. The Time of the Year for Locust Fledgling

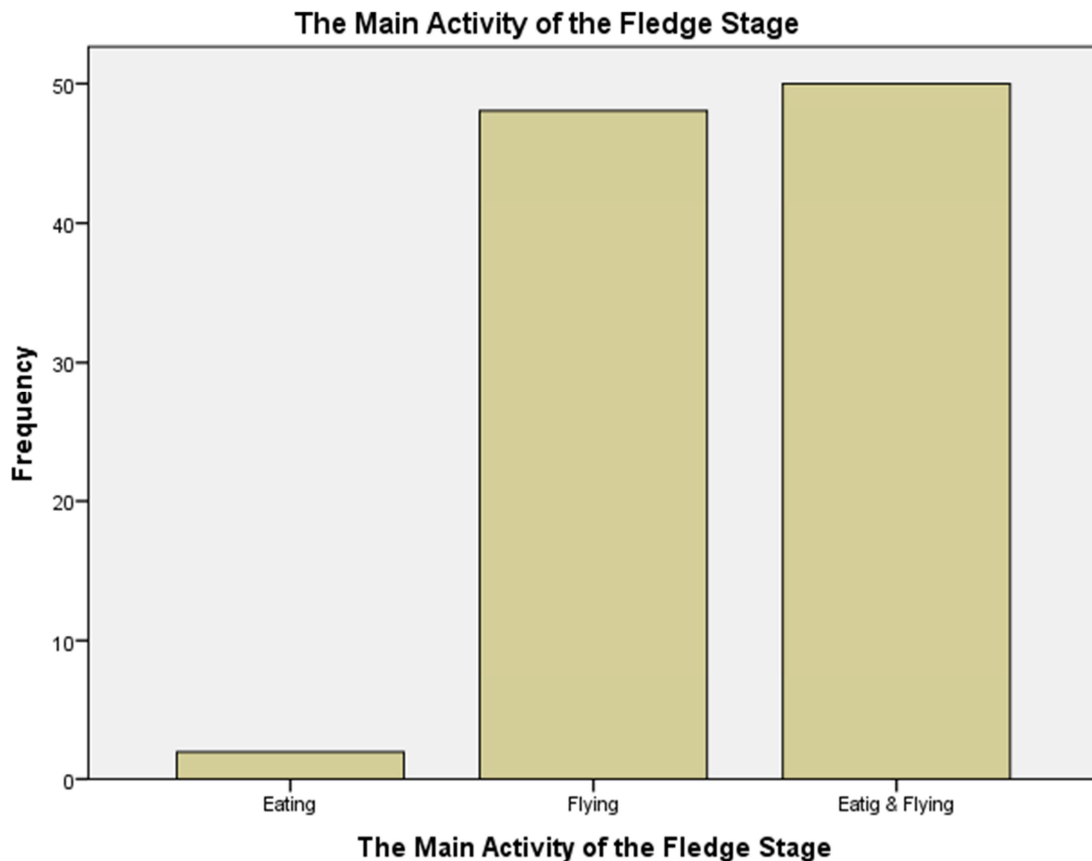
The month of the year for locust fledgling from the study showed in Table 4. Most of the respondents (90%) said it was in September.

**Table 4.** The time of the year for locust fledgling.

categories	Frequency	Percent
September	90	90.0%
October	10	10.0%
Total	100	100.0%

### 3.5. The Main Activity of the Fledgling Stage

Figure 2 showed the main activities of the fledgling, was eating & flying, flying and eating, these were observed on 50%, 48% and 2%, respectively.

**Figure 2.** The main activities of the fledgling stage.

### 3.6. The Month of Tree Locust Leaving the Area of Study

Most of the respondents (82%) said that the tree locust leave the area of study in October (Table 5). The other group (18%) said they leave in November.

**Table 5.** The month of tree locust leaving the area of study.

categories	Frequency	Percent
October	82	82.0%
November	18	18.0%
Total	100s	100.0%

### 3.7. The Time of the Day for Tree Locust Leaving the Area of Study

All the respondents (100%) mentioned that the tree locust leave the area of study at evening (Table 6).

**Table 6.** The time of the day that tree locust leaving the area of study.

categories	Frequency	Percent
Morning	0	0
Mid-day	0	0
Evening	100	100%
Total	100	100%

### 3.8. The Direction of Tree Locust Migration

Figure 3 showed that 73% of the respondent said that direction of tree locust migration is South-east.

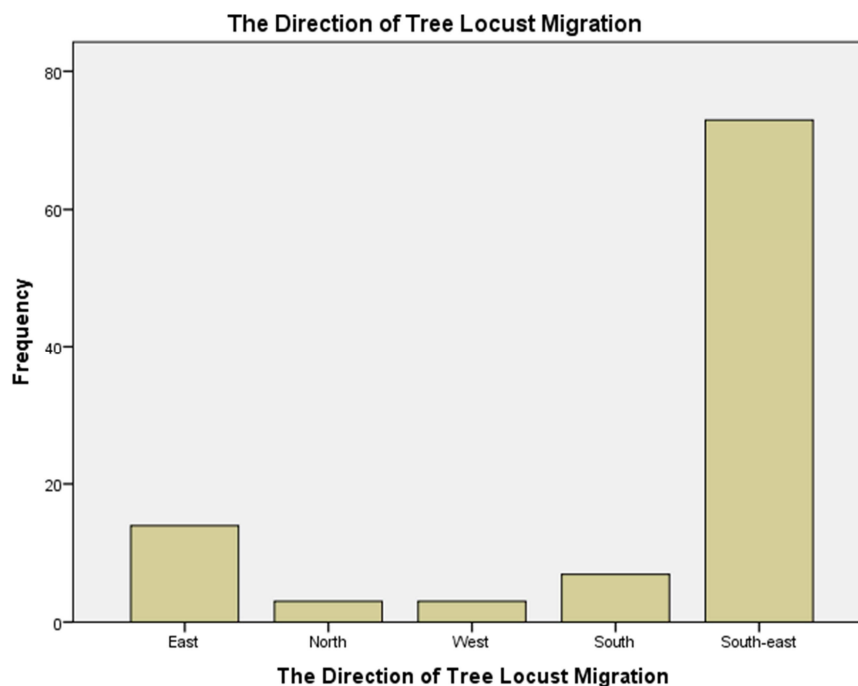


Figure 3. The direction of tree locust migration.

### 3.9. *Acacia senegal* Injuring by Tree Locust and Its Damage on Hashab Tree and Crops Production

Table 7 showed that 100% of the respondents agree that *Acacia senegal* was injured by tree locust.

Table 7. Hashab tree injury by tree locust.

Categories	Frequency	Percent
Yes	100	100.0%
No	0	0

Damage of *Acacia senegal* by tree locust as estimated by respondents based on prescribed categories in the questionnaire viz: little, substantial and much (61%, 33% and 6%, for the three mentioned groups, respectively as showed at (Figure 4).

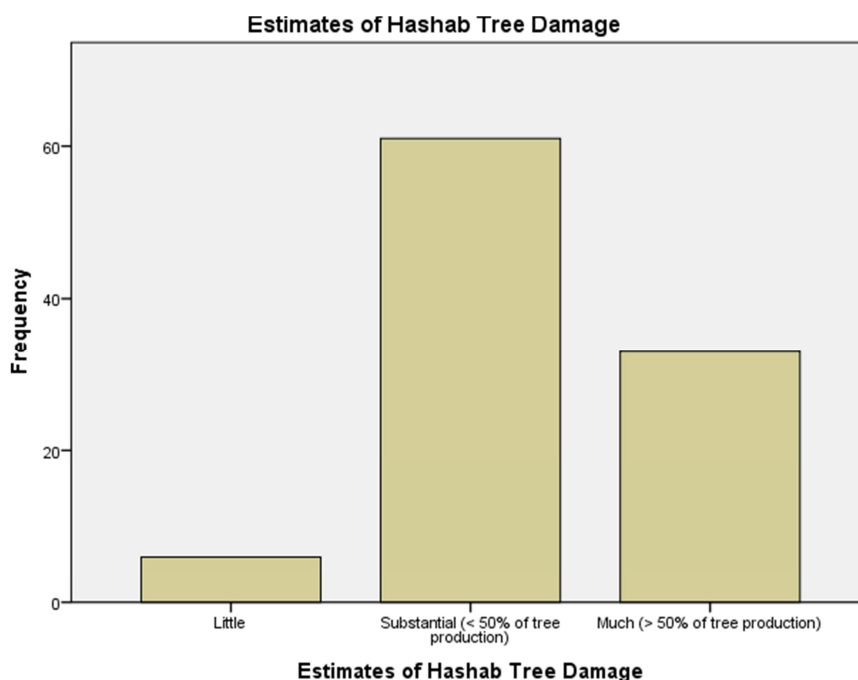


Figure 4. Estimates of *Acacia senegal* damage.

Figure 5 estimates of crop production damage by tree locust. 47% of the respondents agreed that the damage is little, 44% of them said it was substantial and only 9% said it was much.

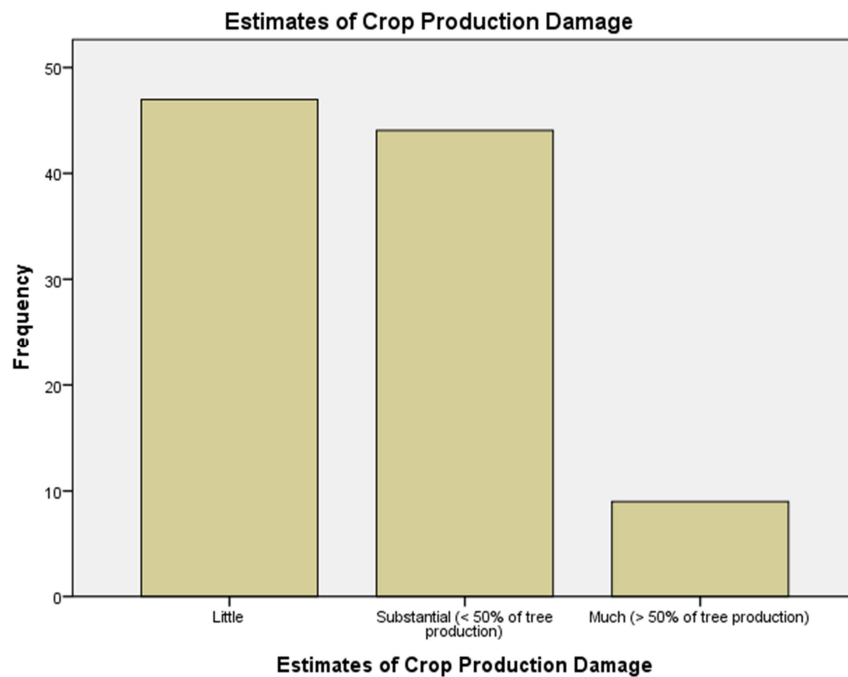


Figure 5. Estimates of crop production damage.

### 3.10. Effect of Severe Damage by Tree Locust on Tapping Decision and Other Trees Affected by Tree Locust

Table 8 indicated that 99% of the respondents agreed that the severe damage of tree locust influence on tapping decision by delaying it.

Figure 6 showed that 60% of the respondents reported three types of trees are affected by tree locust. These were

Lout, Higlieg and Sidir, while 35% identify only two trees that were affected by tree locust. These were Higlieg & Sidir.

Table 8. The severe damage of tree locust influence on tapping decision.

categories	Frequency	Percent
Yes	99	99.0%
No	1	1.0%
Total	100	100.0%

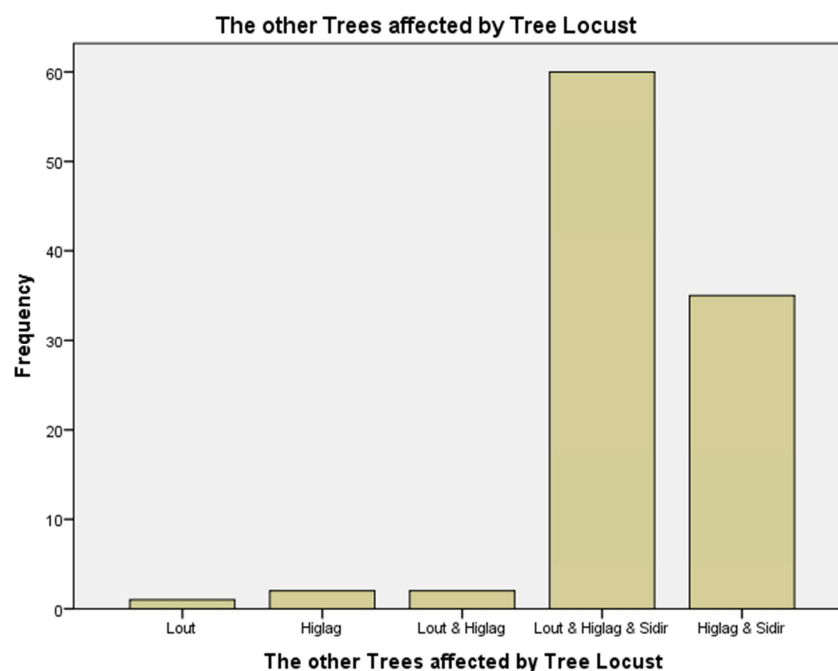


Figure 6. The other trees affected by tree locust.

## 4. Discussion

The availability of the different stages of the tree locust, *Anacridium melanorhodon melanorhodon* (Walker 1870), was discussed by many authors. Hatching occurred in July to September and fledgling was reached on August to October [19]. Adults tree locusts were found throughout the year except in February, March and April and hoppers appeared in July, August, September and October [15]. Nymphal stages develop during August and early September, while the last nymphal stage moulted into fledgling adult in late September to October towards the end of the rainy season [6, 13]. The results of this study showed nymphs were available in September and October, while fledgling stage was reached in September and October. The tree locust then leaves the area in October. The results reported herein, from interviewees, are more or less in line with what was earlier indicated by the aforementioned authors. The slight differences, however, may be attributed to the fact that such type of studies maybe influenced by fluctuation of environmental factors from place to place and from season to season.

In October, fledgling chief activity was flying. These results were proved by the respondents. The locust infests the tree and makes a severe damage by defoliation which in turn reduce the surface area of leaves and hence reduction of effective surface area for photosynthesis and hence interference with the tree physiology which in turn affects the Gum production as reflected earlier by many authors [3, 4, 5].

About 96% of respondents confirmed that tree locust outbreaks affected their decision of tapping *Acacia senegal* and most of them (80%) delay the taping date [5]. All reviewed farmers (100%) of the selected villages confirmed that tree locust outbreak affected their decision to tap s by delaying the time of tapping from October to January or March as well as reducing the production [3]. The results of this study is in line with the results obtained from this study; in which 99% of the respondents said that severe damage to *Acacia senegal* affected the taping decision.

Majority of the respondents (61%) stated that the crop production damage was less than 50%, 31% of them said that the production damage was much than 50%. This result was confirmed, as these results, 55% of the producers stated that the loss was between 50% to 74%, while 38% classify the loss between 74% - 100% of the Gum production [5].

Majority of the respondents (60%) replied that tree locust affected, *Acacia nubica*, *Balanites aegyptiaca*, and, *Ziziphus spp.* 35% of them concentrate on *Balanites aegyptiaca* and *Ziziphus spp.*. These results were confirmed by [14, 16].

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