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# Assessment of Awareness on Cashew Insect Pests, Diseases and Management Practices in Tanga Region, Tanzania

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**Abstract:** ***Cashew production in Tanzania suffers from numerous biotic constraints particularly insect pests and fungal pathogens. Different pest management options are available to cashew growers; however, the most devastating diseases and insect pests that attack cashew and management options against these diseases and pests particularly in Tanga region are not well known. We conducted a study to find out the level of knowledge on cashew nuts pests, diseases and the management practices. The results showed that the cashew nut bugs and stem borers were the major (53 %) insect pests attacking cashew crop, whereas Powdery Mildew and Cashew Leaf and Nut Blight were the most (86 %) devastating diseases. Majority of the respondents (45%) controlled these pests and diseases mainly using pesticides. More than 60 % of the respondents did not use protective gears. Most (49 %) of them lacked the knowledge on the importance of wearing protective gears during the application of the pesticides. We recommend that farmers' training is needed to improve awareness among them on insect pests and diseases management, particularly the use of Integrated Pest Management program. Also protective gears should be subsidized and be available to users.***

**Keywords:** Cashew, diseases, insect pests, pesticides, Tanzania

## 1. Introduction

The majority (about 80 percent) of the Tanzanian population lives in the rural areas and largely depends on agriculture for their livelihood [1]. The rural Tanzanians have been engaged in the cultivation of both cash and food crops. In the case of cash crops, the Cashew, *Anacardiumoccidentale* L. (Sapindales: Anacardiaceae) is an important foreign-exchange earner for Tanzanian and ranked the first in the year 2016 [2]. Globally, the crop has been reported for its multiple advantages which include being a source of food and income [3, 4, 5], its use in the reforestation and prevention of erosion [3, 6], its medicinal value [7, 8] and the utilization of the cashew apple in the production of various products such as syrups, juice, wine alcohol, jam, vinegar and candy [9]. Thus, any interventions that aim at improving the agricultural sector and the cashew crop production in particularly can cause a significant impact in improving the livelihood of the majority of people in the country. In this respect, the Government of Tanzania has continued to support cashew farmers in various ways. Among these include; the reduction of unnecessary taxes which negatively affect farmers' motivation, free provision of agricultural inputs such as pesticides (fungicides and insecticides), and planting materials such as seeds and seedlings. The Government through Cashew Board of Tanzania (CBT) established a Warehouse Receipt System (WRS) which seems to benefit majority of cashew farmers [10]. Despite these measures, cashew productivity in Tanzania has not been optimal mainly due to insect pests and diseases [11, 12, 13, 14]. Thus, in order to sustain farmers' morale in engaging in cashew production resulting from Government incentives to cashew farmers, there is a need to reduce and ultimately eliminate huge cashew nut losses which are caused by major insect pests and diseases.

Several insect pests and diseases that attack cashew crop have been reported elsewhere causing significant losses in yields [11, 15, 16, 13, 17). Fungal diseases such as Powdery mildew which is caused by *Oidiumanacardii* and Leaf and Nut blight which is caused by *Cryptosporiopsis* sp. cause yield losses of between 70 and 100 % if no control measures are taken [13]. Similarly, insect pests such as cashew bugs (*Helopeltis spp.,)* andcoconut bug (*Pseudotheraptuswayi*), have been the greatest threat in cashew crop production [18, 19, 20].

Different management strategies have been developed to control insect pests and diseases of cashew. These include the use of resistant cashew variety [13], biological control [21, 22, 23, 24], synthetic chemicals [13], botanical pesticides [11], and ecological management strategies [13]. There is, however scant information on the major insect pests, diseases that affect cash crop and management practices of cashew farming community in Tanga region. This paper presents insect pests and diseases that attack cashew crop in Tanga region. It also looks at the management strategies which are practiced by farmers and reasons for adopting such strategies. The information to be obtained would help in developing appropriate control options which may result to improved cashew productivity in Tanga region.

## 2. Materials and Methods

### Description of the study area

The current study was conducted in Tanga region which is located in the Eastern zone of Tanzania. The region lies between latitudes $4^{o}$ and $6^{o}$ south of the Equator, and between longitudes $37^{o}$ and $39^{o}$ east of Greenwich. Nighty eight (98) Cashew stakeholders (Farmers = 57, Extension officer = 19 and blower operators = 22) from Muheza, Korogwe, Pangani, Mkinga and Tanga districts in Tanga region were involved in the study. The districts were selected based on their potential in cashew production. The respondents were purposively selected by the District


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Agriculture, Irrigation and Cooperative Officer, on the basis of engagement in cashew farming (farmer), working as agricultural field officer or working as a blower operator who was applying pesticides against cashew insect pests and diseases using motorized blower machine. A semi structured questionnaire was administered to the respondents between June and July 2017. The respondents were allowed to give their opinions freely and without being interrupted. Samples of the common insect pests and disease symptoms attacking cashew crops were displayed in order to remind the respondents and help them to explain the real pests and diseases attacking cashew crop in their area. In this case, the respondents were brought together but interviewed individually. The information gathered included major insect pests and diseases attacking cashew in their area, and management tactics which were used against insect pests and diseases.

**Data analysis**

The data which were collected were analysed using Statistical Package for Social Sciences (SPSS 16.0 for windows) computer software. Descriptive statistics which were obtained were summarized and presented in the form of tables and graphs. Secondary data were collected from various sources including NARI annual reports, proceedings, review of published papers and official reports, and online information.

## 3. Results

The study included cashew farmers, blower operators and agricultural field officer from Muheza, Mkinga, Pangani, Korogwe and Tanga districts. As presented in Table 1, 81 % of the respondents were males while 19 % were females. The majority of the respondents were aged between 31 and 45 years with the minimum age of 25 years.

**Table 1:** Socio economic characteristics of respondents

| *Characteristics* | *Frequency* | *Percent* |
|---|---|---|
| **Gender** | | |
| Male | 79 | 80.6 |
| Female | 19 | 19.4 |
| **Age** | | |
| 25-30 years old | 18 | 18.4 |
| 31-45 years old | 39 | 39.8 |
| > 46 years old | 38 | 38.8 |
| Don`t know their age | 3 | 3.1 |
| **Occupation** | | |
| Farmers | 57 | 58.2 |
| Blower Operators | 22 | 22.4 |
| Agriculture Field Officer (AFOs) | 19 | 19.4 |
| **Districts** | | |
| Muheza | 9 | 9.2 |
| Mkinga | 26 | 26.5 |
| Pangani | 18 | 18.4 |
| Korogwe | 32 | 32.7 |
| Tanga | 13 | 13.3 |

Table 2 (a) and (b) present the respondents' knowledge on diseases and insect pests attacking cashew farms in the selected districts of Tanga region. Majority of the respondents had knowledge on cashew insect pests and diseases. However, the respondents from Korogwe region had the least knowledge (ranges from 16 and 40%) on cashew diseases and insect pests attacking cashew crop.

**Table 2a:** Knowledge on diseases attacking cashew in Tanga region

| Cashew diseases | District (%) | | | | |
|---|---|---|---|---|---|
| | Muheza | Mkinga | Pangani | Korogwe | Tanga |
| Powdery mildew and Leaf and nut blight | 8.3 | 22.9 | 22.9 | 35.4 | 10.4 |
| Only Powdery mildew | 12.5 | 41.7 | 20.8 | 16.7 | 8.3 |
| Powdery mildew, Leaf and nut blight, die back and Anthracnose | 8.3 | 25 | 0 | 33.3 | 33.3 |
| Don`t know | 0 | 20 | 20 | 40 | 20 |
| Powdery mildew and Anthracnose | 25 | 25 | 25 | 25 | 0 |
| Leaf and nut blight | 0 | 0 | 0 | 75 | 25 |
| Anthracnose | 0 | 0 | 0 | 100 | 0 |

**Table 2b:** Knowledge of insect pests attacking cashew in Tanga region

| Cashew insect pests | District (%) | | | | |
|---|---|---|---|---|---|
| | Muheza | Mkinga | Pangani | Korogwe | Tanga |
| Cashew bugs and Stem borers | 9 | 24.4 | 17.9 | 32.1 | 16.7 |
| Cashew and coconut bugs, Stem borers | 0 | 50 | 25 | 25 | 0 |
| Cashew and coconut bugs | 50 | 50 | 0 | 0 | 0 |
| Only Stem borers | 0 | 37.5 | 25 | 37.5 | 0 |
| Don`t know | 16.6 | 16.7 | 16.7 | 50 | 0 |

The majority (53 %) of the respondents indicated that, the major insect pests attacking cashew were cashew nut bugs (*Helopeltisanacardii* and *H.* schoutedeni) and stem borer (*Mecocorynusloripes*); while 2% of the respondents mentioned coconut bug (*Pseudotheraptuswayi*) as the least insect pest problem attacking cashew. On the other hand, Powdery Mildew Disease (PMD) and Cashew Leaf and Nut Blight (CLNB) were mentioned by 86 % of the respondents as the major diseases attacking cashew crop (Table 3).

**Table 3:** Major insect pests and diseases attacking cashew in Tanga region

| Insect pests | Frequency | Percent |
|---|---|---|
| Cashew nut bugs and stem borers | 52 | 53.1 |
| Only Stem borer | 22 | 22.4 |
| Only cashew nut bugs | 12 | 12.2 |
| Only coconut bugs | 2 | 2.0 |
| Cashew nut and Coconut bugs | 5 | 5.1 |
| Diseases | | |
| PMD and CLNB | 85 | 86.7 |
| Anthracnose and CLNB | 4 | 4.1 |

The study revealed that 45%) of the respondents controlled these pests and diseases mainly through the application of pesticides. Other methods of pest control used included sanitation only (reported by 24 %), sanitation and pesticide application (11 %), sanitation and biological control (8%), and the use of pesticides, improved cashew planting materials and sanitation (5%). About 7% of the respondents


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did not use any insect pests and diseases control methods (Figure 1). The results in Figure 2 indicate that both Ninja and Duduall were the most pesticides used to control insect pests. Other insecticides were Karate, Selecron, Subachlo and Fastac. Majority of the respondents control PMD using either Sulphur dust or a mixture of spraying regimes of Sulphur dusts and other water based fungicides such as Bayfidan, Anvil, Transmute, Acanto, Subatex, and Nativo.

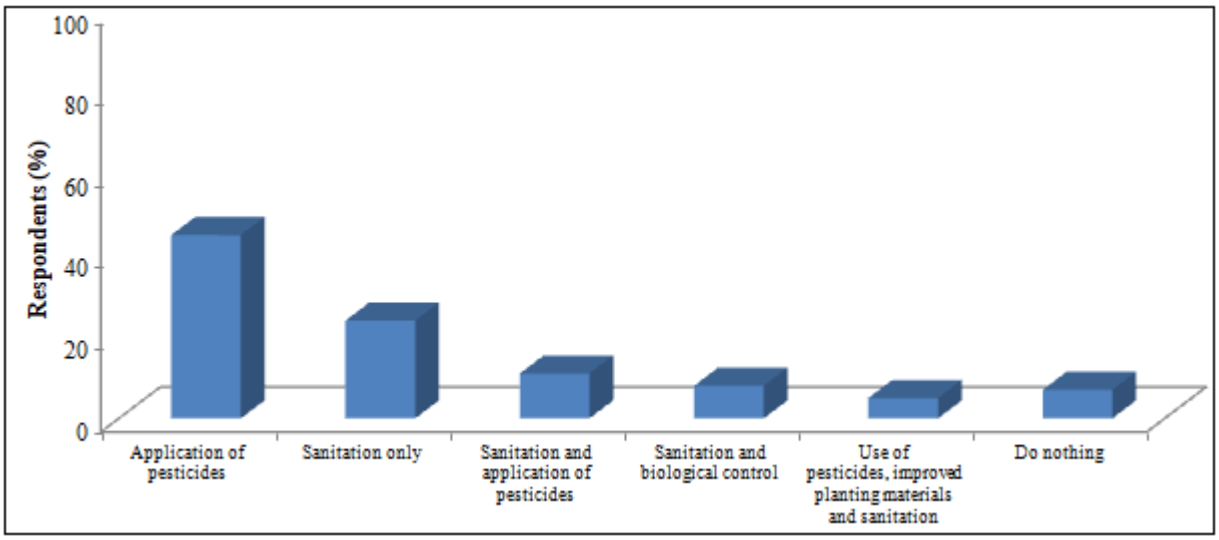


**Figure 1:** Knowledge on different methods used to control cashew insect pests and diseases

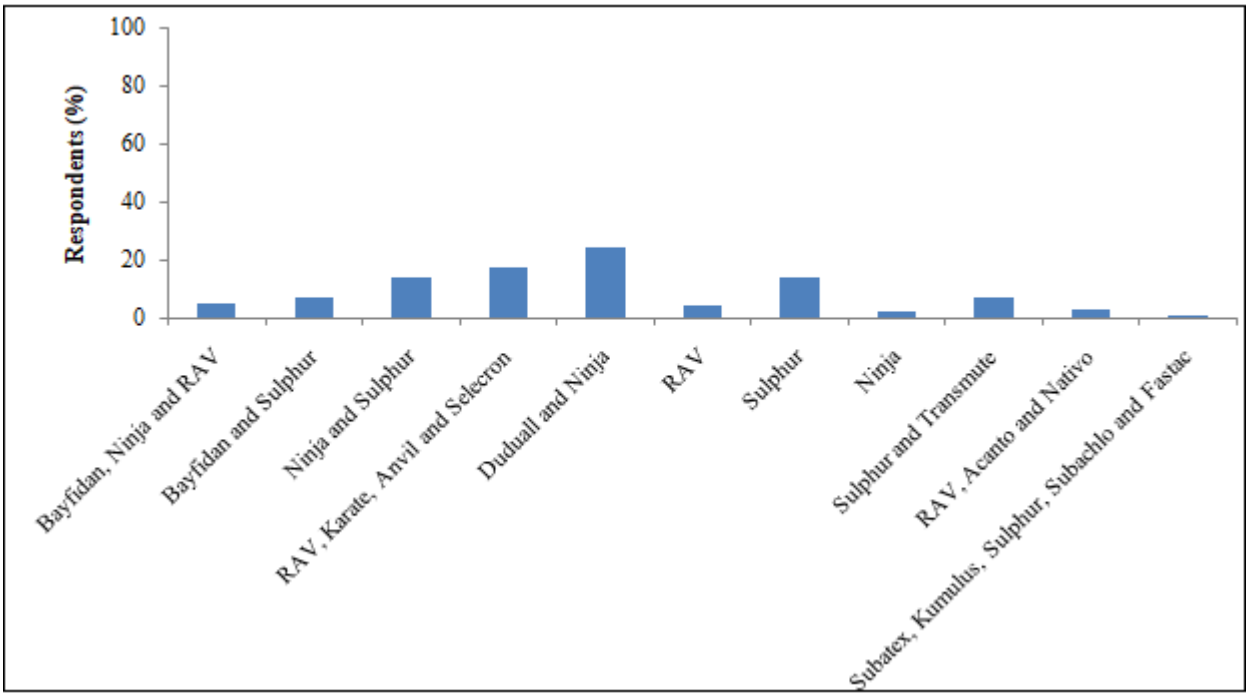


**Figure 2:** Common/trade names and level of pesticides use in cashew diseases and insect pests control in Tanga region

The results in Table 4 indicate that, more than 60 % of the respondents do not use protective gears. Most of them (49 %) lack knowledge on the importance of wearing protective gears during the application of pesticides (Table 5a). More than 50 % of farmers being interviewed (Table 5b) show that, high cost of protective gear, lack of knowledge or a combination of both are the major constraints of using protective gears during the application of pesticides.

**Table 4:** Knowledge on the use of protective gears

| Level of protective gears use among the operators | Gender | | Frequency | Percent |
|---|---|---|---|---|
| | Male | Female | | |
| Protective gears are used | 75.8 | 24.2 | 33 | 33.6 |
| No use of protective gears | 83.9 | 16.1 | 62 | 63.3 |
| Don`t know | 66.7 | 33.3 | 3 | 3.1 |


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**Table 5a:** Reasons for not using protective gears

| Reasons for not using protective gears | Frequency | Percent |
|---|---|---|
| High cost of protective gears | 17 | 17.3 |
| Lack of knowledge | 48 | 49 |
| Lack of knowledge, poor cooperation and high cost | 33 | 33.7 |

**Table 5b:** Reasons for not using protective gears among Cashew stakeholder

| Stake holders | High cost of protective gears | Lack of knowledge | Lack of knowledge, poor cooperation and high cost |
|---|---|---|---|
| Farmers | 50.0 | 87.5 | 54.5 |
| Operators | 16.7 | 12.5 | 24.2 |
| AFOs | 33.3 | 0.0 | 21.3 |

## 4. Discussion

The study revealed the presence of insect pests and diseases attacking cashew crop. The major insect pests which were revealed include cashew nut bugs (*H. anacardii* and *H.* schoutedeni) and stem borer (*M. loripes*) while PMD which is caused by *O. anacardii*Noack and CLNB diseases which is caused by a fungal pathogen known as *Cryptosporiopsis*spp were the major diseases in cashew crop. Cashew nut bugs and stem borers are serious pests reported to cause significant losses of cashew nuts [13]. Cashew bugs feed on tender leaves and shoots. These pests may cause death of the leaves or shoots under intense feeding [25, 26]. Adult weevils of the stem borers (*M. loripes*) lay their eggs beneath the bark of cashew tree branches. When the larvae hatch they burrow into the cambium making large tunnels, eating the sapwood of the tree and this may cause death of the tree. *Mecocorynus* sp. was also reported as a new serious pest in Ghana [27]. Similarly, PMD [28] and CLNB [29] were cited as the leading devastating diseases of cashew crop in the country. These diseases can cause cashew nut losses of between 70 and 100 % if no any control measures have been taken [13].

This study found that majority of cashew farmers control insect pests and diseases using pesticides. It was mentioned that, Ninja and Duduall are the insecticides which are mostly used to control insect pests. Ninja 5EC is a synthetic pyrethroid containing Lambda cyhalothrin as an active ingredient, whereas Duduall contains Cypermethrin 150g/L+Chlorpyrifos 300g/L. These insecticides have been registered by Tropical Pesticides Research Institute (TPRI) to control cashew sucking pests such as cashew nut and coconut bugs [30]. Other insecticides which are used by cashew farmers in Tanga region and registered by TPRI are Karate (Lambda cyhalothrin 50g/L, Subachlo (Chloropyrifos 500g/L+Cypermethrin 55g/L), Fastac (Alphacypermethrin 100g/L) and Selecron (Profenofos 720g/L). Fungicides which are used by most of farmers in the study area to control diseases include Sulphur or Sulphur with other fungicides. Other water based fungicides used contain Triadimenol (Bayfidan and Transimute), Hexaconazole (Anvil), Tebuconazole and Triadimenol (Subatex), Trifloxystrobin and Tebuconazole (Nativo) and Picoxystrobin (Acanto). The Naliendele Agricultural Research institute (NARI) has recommended several options of controlling insect pests and diseases, and these include the use of pesticides, cultural practices including sanitation, the use of resistant varieties, and biological control such as the use of weaver ant (*Oecophyllalonginoda*Latreille) [13].

Our findings established that majority of the respondents had knowledge on insect pests, diseases and management practices. However, their level of knowledge varied across districts. Respondents from Korogwe District had the least level of knowledge (16 to 40 %) compared to other districts. This implies that training is needed particularly in Korogwe district.

The results of the present study also revealed that, majority of the respondents use a single technique; in this case, it is the application of chemicals to control insect pests and diseases. If only chemical are used for a long time, this can result to negative impacts such as pest resurgence, secondary pest outbreak, and pest resistance to chemicals [31]. Thus, Integrated Pest Management (IPM) strategies which involve a combination of more than one technique in pests and diseases management are recommended. Few of the interviewees were observed using biological methods such as weaver ant, *Oecophyllalonginoda*Latreille to control insect pests. Weaver ants have been utilized as potential bio agents for protecting crops from attack by insect pests [23, 24,32, 33]. Thus, optimizing the use of weaver ant in an IPM program could not only reduce yield losses caused by insect pests but also it could also reduce the costs incurred by farmers to buy chemicals [2015].

We also found that, most of the respondents do not use protective gears during the use of pesticides. This can cause negative impact to their health. The Government is subsidizing motorized blowers; however, the protective gears are not included by the suppliers in the package for the subsidy. Thus, it is suggested that subsidized motorized blowers should be supplied with protective gears. Furthermore, farmers should be trained to create awareness among them on the importance of wearing protective gears while using the chemicals.

## 5. Conclusion

This study looked at insect pests and diseases that attack cashew crop in Tanga region. It also looked at the management strategies which are practiced by farmers and reasons for adopting such strategies. The study found that cashew nut bugs and stem borers were the major insect pests attacking cashew crop; and PMD and CLNB diseases were the major diseases causing significant loses of cashew. The application of chemicals was the main technique used to control cashew pests and disease, and majority of respondents do not use protective gears during chemical usage. Awareness creation is needed to improve farmers' knowledge on insect pests, diseases and their management strategies particularly the use of IPM program. Protective gears should be available and subsidized to enable users access them. Furthermore, farmers' training on the importance of protective gears usage is essential so as to reduce health risks which might occur from neglecting their usage particularly during the application of these synthetic chemicals.


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