

Full Length Research Paper

Characterization of Damage Symptoms and Spatial Distribution of *Mecocorynus* sp. (Coleoptera: Anthribidae) Infesting Cashew in Ghana

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Cashew (*Anacardium occidentale* Linn.) has become a very important non-traditional tree crop in Ghana. The crop is, however, infested by numerous insect pests at different stages of its growth. Knowledge of the insect complexity associated with the tree is essential for developing pest control strategies for the crop. Following a reported outbreak of an unknown pest by officials of Ministry of Food and Agriculture (MOFA) and farmers in March 2009 in some cashew plantations in the Brong-Ahafo Region, an investigation was initiated to collect and identify the insect species involved and assess the extent of the damage caused by the insect. The cashew bark borer, *Mecocorynus* sp. (Coleoptera: Anthribidae) was identified and found to be responsible for the damage and could kill the attacked trees within weeks after infestation. Observations at Jaman south and Jaman north of death of mature trees within few weeks of infestation were indications of emergence of new pest of cashew in Ghana. Studies on the distribution and damage characteristics of the pest was conducted from April 2009 to December 2010 in 41 major cashew growing areas within five districts of the Brong-Ahafo Region. In the Jaman South District, symptoms of infestation of the insect were found on 14.2% of the tree population and the death rate of tree population was 2.2%. The incidence of the pest in the Jaman north was also high, with death rate of 2.8% and infestation rate of 13.6%. In the Tain district death rate was 0.6%; infestation was observed only at Banda-Biema, Nsawkaw, Mendji, Donkokrom and Brodi. This paper reports the status of a new emerging pest of cashew in Ghana, which needs an urgent attention.

Key words: Damage symptoms, spatial distribution, *Mecocorynus* sp., cashew, Ghana.

INTRODUCTION

Cashew was introduced into Ghana by the government in the 1960s for afforestation in the savannah, coastal savannah and forest-savannah transition zones in Greater Accra, Eastern, Volta and Brong-Ahafo regions (Anonymous, 2005). Its cultivation was also considered essential for tree cover in eroded areas where land reclamation programmes were under way to prevent further erosion. Large scale cultivation of the crop started in

1991 and by 1997, the area under cashew cultivation nation-wide was 12,500 ha. Between 2000 and 2007, incentives were provided to farmers in the form of loans and improved planting materials to establish new and rehabilitate old plantations. Consequently, there was a marked increase in acreage from 18,000 to 75,831 ha, with a corresponding rise in nut yield from 3,600 to 35,915 MT (FAO, 2008).

The cashew tree is, however, infested by numerous insect pests at different stages of its growth (Eguagie, 1972; Pillai et al., 1976; Devasahayam and Nair, 1986; Malipatil and Houston, 1990; Xianli and Van Der Geest 1990;

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Topper et al., 2001; Yidana et al., 2004). In Ghana, surveys were conducted from July 2003 to October 2005 to collect and identify the insect fauna on cashew in 13 major cashew growing areas within ten districts of the Northern, Upper West, Brong-Ahafo and Eastern Regions of Ghana and a total of 170 insect species were collected. Eighty nine species of the total collection were identified to family level, 57 of which were identified to at least the generic level (Dwomoh et al., 2008).

Insects recorded were mostly sap-suckers, defoliators, branch girdlers, stem/twig borers and fruit/nut borers. A few beneficial species were also recorded either as pollinators or predators. The most devastating species belonged to the order Hemiptera, includes: *Helopeltis schoutedeni* Reut. *Pseudothraupis devastans* Dist., *Anoplocnemis curvipes* F., *Homoeocerus pallens* F., *Clavigralla shadabi* Dolling and *Clavigralla tomentosicollis* Stal. Others were the stem and twig girdler, *Analeptes trifasciata* F. and the stem borer, *Apate telebrans* Pall (Dwomoh et al., 2008).

Following a reported outbreak of a new and unknown insect species by officials of Ministry of Food and Agriculture (MOFA) and farmers in March 2009 in some cashew plantations in the Jaman north and south districts of Ghana, a preliminary investigation was initiated to collect and identify the insect species involved and assess the nature and extent of the damage caused by the insect in the reported districts, the knowledge of which will be useful in forming the basis for developing effective control measures in the field.

MATERIALS AND METHODS

To find out and identify the insect responsible for the damaged cashew trees as reported, the bark of the trunks, branches and twigs of infested cashew trees in 10 selected plantations in each of the districts were initially examined for eggs, larvae and the adults of the insects. Furthermore, the barks of some identified infested trees from each of the plantations were carefully slashed using machete to search for eggs, larvae, pupae and adults. Samples of frass and gum exudates were also collected from branches and trunks in search of eggs, larvae, pupae and adults of the insect. Photo documentations of the different life stages of the insect were collected as well as the various parts of the infested/dead stands were made using a digital camera. Adult specimens collected were pinned and oven-dried at 80°C for 48 h and preserved with naphthalene balls for identification. The immature stages of the insect were preserved in 70% ethyl alcohol, following the techniques described by Dwomoh (2003).

Preliminary studies on the distribution and damage characteristics of the insect was conducted from April 2009 to December 2010 in 41 major cashew growing areas within five districts of the Brong-Ahafo Regions of Ghana (Table 1). To ascertain the incidence and the confines of the insect in the cashew growing communities in the region, cashew plantations in two neighbouring cashew growing districts, Tain and Wenchi were also included in the scope of assessment of the insect's distribution.

Preliminary assessment of 10 cashew plantations in 10 locations within Jaman south (Table 1) (*Kofiko, Kofidomo, Nsuansa, Kubease, Sebreni, Famkw a, Kotokware, Dwenem, Ponko and Gonosua*) and Jaman north (*Duadaso, Kabile, Jamar, Buko,*

Bonakira, Adabiem, Jinini, Kokoaa, Koofosua and Buni) as well as Tain (*Banda-Biema, Banda-Boasi, Brohani, Nsawkaw, Mendji, Sabie, Donkokrom, Bofie, Banda-Ahenkro and Brodi*) and Wenchi (*Awisa, Asuogya, Nkonsia, Wurompo, Nchiraa, Subinso, Branam, Perho, Droboso and Abotreye*) districts as well as *Mim* in the Asunafo district was carried out to determine the incidence and infestation levels of the pest by counting and recording numbers of dead stands in each plantation as well as noting symptoms associated with of the pest's feeding.

RESULTS AND DISCUSSION

The field assessment revealed the presence of only one insect species in all the infested trees found in all the 41 cashew growing communities surveyed. The insect was identified to the generic level as *Mecocorynus* sp. Earlier surveys conducted from 2003 to 2005 in the Northern, Brong-Ahafo, Central, Greater Accra, Upper West and Eastern Regions of Ghana to catalogue the insect species associated with cashew did not capture *Mecocorynus* sp. The activities of this pest, however, have been reported in Tanzania, Mozambique and other cashew growing East African countries (Topper et al., 2001). In Tanzania and Kenya, *Mecocorynus loripes* has been reported as a very serious insect pest of cashew (Millanzi, 1997; Topper et al., 2001; Anonymous, 2002). The larva, a typical weevil grub tunnelled down beneath the bark, eating the sapwood of the tree causing damage to the crop. Heavily infested trees died in a short period of time. The adult appeared to lay eggs at multiple sites of the trees and this resulted in the larvae causing extensive multiple entry/exit holes and also making irregular tunnels inside the trunk, which resulted in gum leakage and death of affected trees.

In the present study, the various life stages of the insect (egg, larva, pupa and adult) were not found in the soil samples collected from the base of the trees and also in the frass/exudates collected from the tree trunks. Larvae (Figure 1) and adults (Figure 2) were mostly found in the frass collected by chiseling the entry/exit holes observed on the branches and trunks of the infested trees.

The number of larvae collected from both branches and trunks of cashew trees was as high as 136 and 124 for Jaman north and Jaman south, respectively, while the number of adults was as low as 16 and 19 for Jaman north and Jaman south, respectively. The eggs were conspicuously absent at the time of this assessment as they might have all hatched and developed into other life stages (larva, pupa and adult).

The larva has a curled creamy-white body with wrinkled thoracic and abdominal cavities and brown head capsule (Figure 1). Larvae are typical weevil grubs which tunnelled down beneath the bark, eating the sapwood of the tree causing substantial economic damage to the crop. The adult is a large weevil with an average length of 20.5 ± 0.6 mm long. It is greyish-brown in colour. Heavily infested trees were found dead. Generally, cashew

Table 1. Forty-one cashew-growing communities selected for *Mecocorynus* sp. incidence and distribution studies in the Brong-Ahafo Region of Ghana, April 2009 to December 2010.

Districts	Location	Latitude	Longitude	Location	Latitude	Longitude
Jaman North	Duadaso	7°55'SW	2°39'NW	Adabiem	8°05'SW	2°33'NW
	Kabile	7°59'SW	2°42'NW	Jinini	8°07'SW	2°34'NW
	Jamara	7°59'SW	2°40'NW	Kokoaa	7°52'SW	2°42'NW
	Buko	8°05'SW	2°42'NW	Koofosua	7°50'SW	2°41'NW
	Bonakira	7°59'SW	2°33'NW	Buni	7°48'SW	2°41'NW
Jaman South	Kofiko	7°30'SW	2°52'NW	Famkwa	7°34'SW	2°52'NW
	Kofidomo	7°32'SW	2°50'NW	Kotokware	7°35'SW	2°50'NW
	Nsuansa	7°32'SW	2°48'NW	Dwenem	7°42'SW	2°47'NW
	Kubease	7°35'SW	2°48'NW	Ponko	7°41'SW	2°47'NW
	Sebreni	7°36'SW	2°52'NW	Gonosua	7°37'SW	2°50'NW
Tain	Banda-Biema	8°10'SW	2°23'NW	Sabie	8°04'SW	2°22'NW
	Banda-Boasi	8°11'SW	2°24'NW	Donkokrom	7°46'SW	2°13'NW
	Brohani	7°57'SW	2°33'NW	Bofie	8°02'SW	2°26'NW
	Nsawkaw	7°53'SW	2°21'NW	Bamda-Ahenkro	8°10'SW	2°23'NW
	Mendji	7°56'SW	2°25'NW	Brodi	7°52'SW	2°37'NW
Wenchi	Awisa	7°50'SW	2°07'NW	Subinso	7°55'SW	2°03'NW
	Asuogya	7°38'SW	2°43'NW	Branam	7°58'SW	2°08'NW
	Nkonsia	7°43'SW	2°03'NW	Perho	7°55'SW	2°08'NW
	Wurompo	7°54'SW	2°07'NW	Droboso	7°43'SW	2°05'NW
	Nchiraa	7°55'SW	1°58'NW	Abotreye	7°55'SW	2°09'NW
Asunafo-North	Mim	6°55'SW	2°35'NW			



Figure 1. A larva (grub) of *Mecocorynus* sp.

farmers interviewed indicated that attacked or infested trees always died after a short period of time and infested trees had their leaves becoming yellowish and dropping before death (Figure 3). This observation might be due to their feeding activities which probably damage the vascular tissues, arrest the sap flow and weaken the stem thereby resulting in yellowing and shedding of leaves, drying of

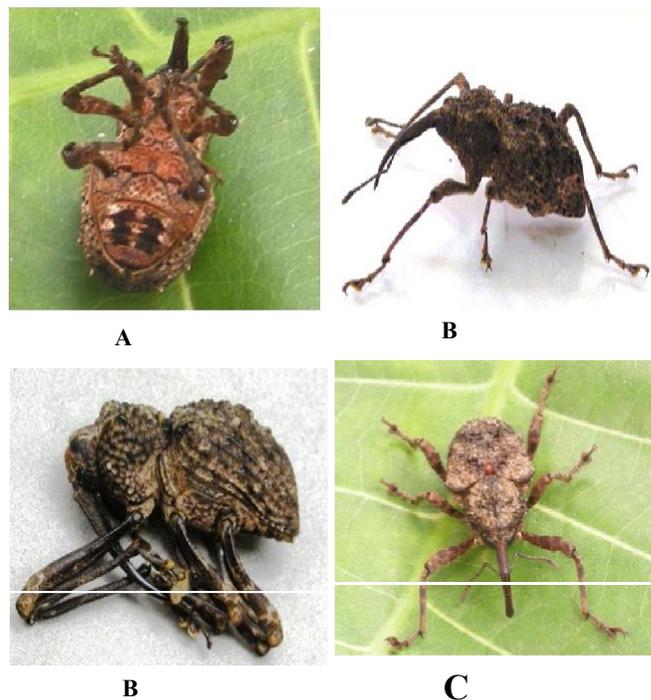


Figure 2. (a) Ventral, (b) lateral and (c) dorsal views of the Adult *Mecocorynus* sp.



Figure 3. Cashew tree killed by *Mecocorynus* sp infestation at Kofiko near Drobo in the Brong-Ahafo region.



Figure 5. Gummosis and extrusion of chewed up cashew trunk by *Mecocorynus* sp.

The incidence of *Mecocorynus* sp on cashew plantations at Kofiko and the surrounding villages near Drobo in the Jaman South District of the Brong-Ahafo region is shown in Figure 6. Symptoms of infestation of the insect were found on 14.2% of the total tree population. The death rate of trees was 2.2%. In the Jaman South District, tree death and infestation were observed on plantations at Kofiko, Kofidomo, Kubease, Sebreni, Famkwa, Dwenem, Ponko and Gonosua, but no tree deaths were recorded at Nsuansa, and Kotokware (Figure 7).

The incidence of *Mecocorynus* sp. on cashew plantations in the Jaman North District was also high, with death rate of 2.8% and infestation rate of 13.6% (Figures 8 and 9). The insect occurred on all plantations inspected in the Jaman North District.

In the Tain District death rate was as low as 0.6% (Figure 10) while infestation was observed at only Banda-Biema, Nsawkaw, Mendji, Donkokrom and Brodi with no tree death in plantations at Banda-Boasi, Brohani, Sabie, Bofie and Banda-Ahenkro (Figure 11). Cashew plantations in the communities within Wenchi District did not record any death of trees though a few trees were found to be infested at Wurompo, Nchiraa and Droboso.

The recent pest outbreak and highest tree infestation and death rates by *Mecocorynus* sp in the Jaman North and South Districts could be possibly attributed to migration of the pest from Cote d'Ivoire, a major producer of cashew in the Sub-Saharan Africa, since the two districts are closer and share territorial boundaries on the west with the former. According to Anon (2002) efficient control approach should mainly target larval stage during early stages of infestation. However, the whole control approach is basically physical confrontation, whereby adults should be collected and destroyed. Also, it is recommended that the bark around the infested area could be removed to expose the larvae, which when they are washed or blown down are never able to climb up the trunk again as they have no legs. The pupae could be destroyed by inserting a sharp object inside the chambers. Further studies will be conducted to determine the seasonal incidence, alternative host plants and probably control measures of this new emerging insect pest of cashew in Ghana.



Figure 4. (a) and (b) Small entry holes in the trunks of cashew, (c) and (d) cracks and multiple entry/exit holes on cashew tree trunks caused by *Mecocorynus* sp infestation at Kofiko near Drobo in the Brong-Ahafo region.

twigs and death of the tree.

Their attack could easily be recognized by the presence of small entry holes on the trunks and branches, Figures 4a to d, gummosis, extrusion of chewed up frass and excreta at the base of infested trees as the larvae expels the frass and excreta out (Figure 5).

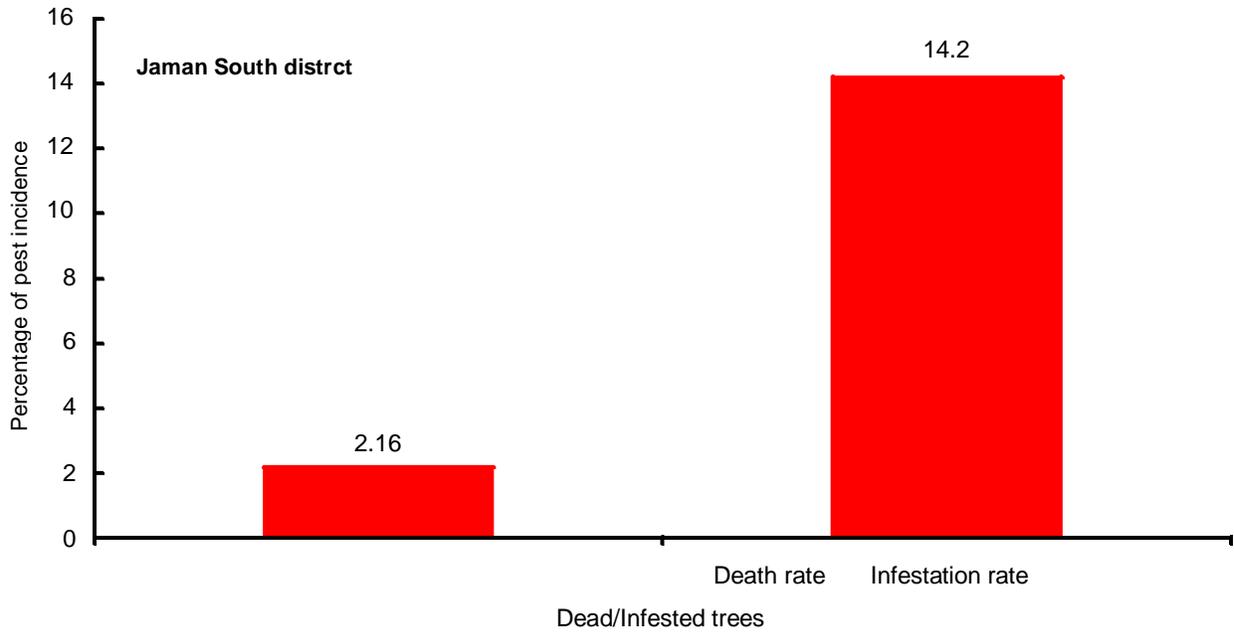


Figure 6. Mean infestation and death rates of *Mecocorynus* sp. at Jaman south district in the Brong-Ahafo region of Ghana.

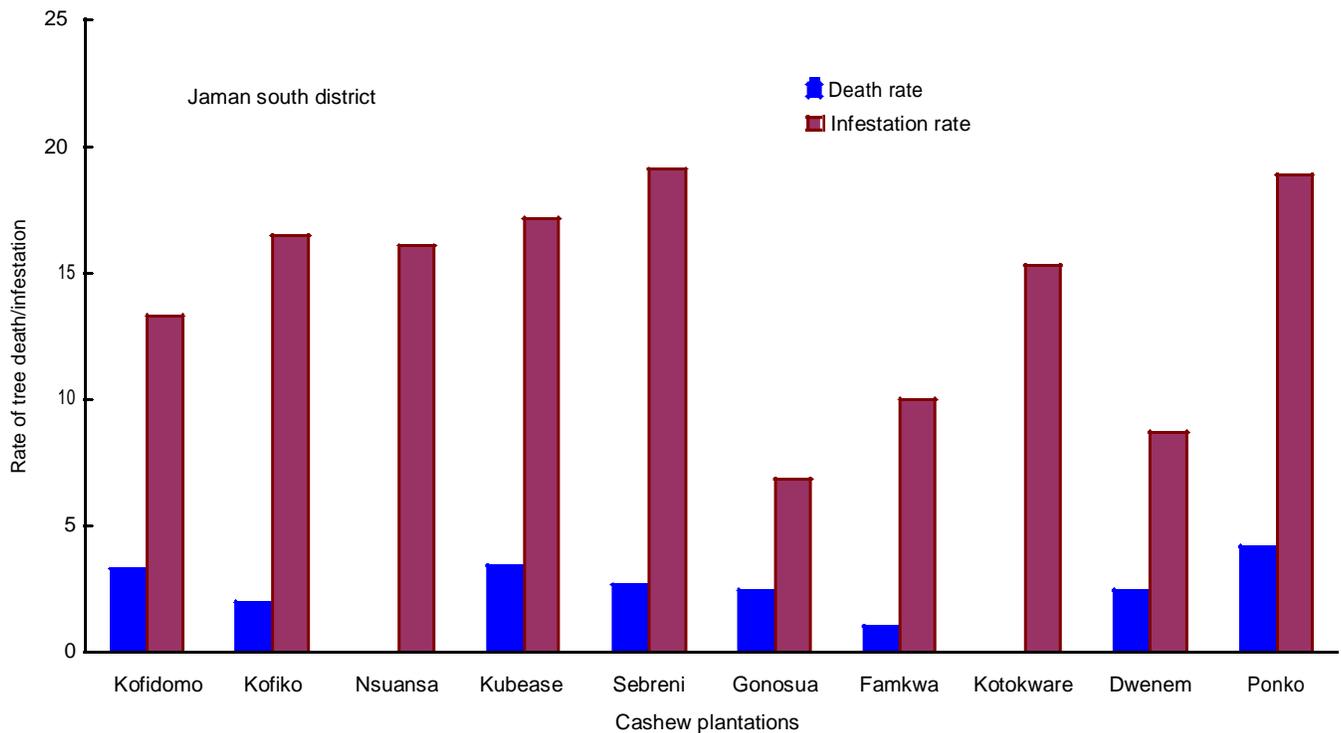


Figure 7. Incidence of *Mecocorynus* sp. in cashew plantations at Jaman south district in the Brong-Ahafo region of Ghana.

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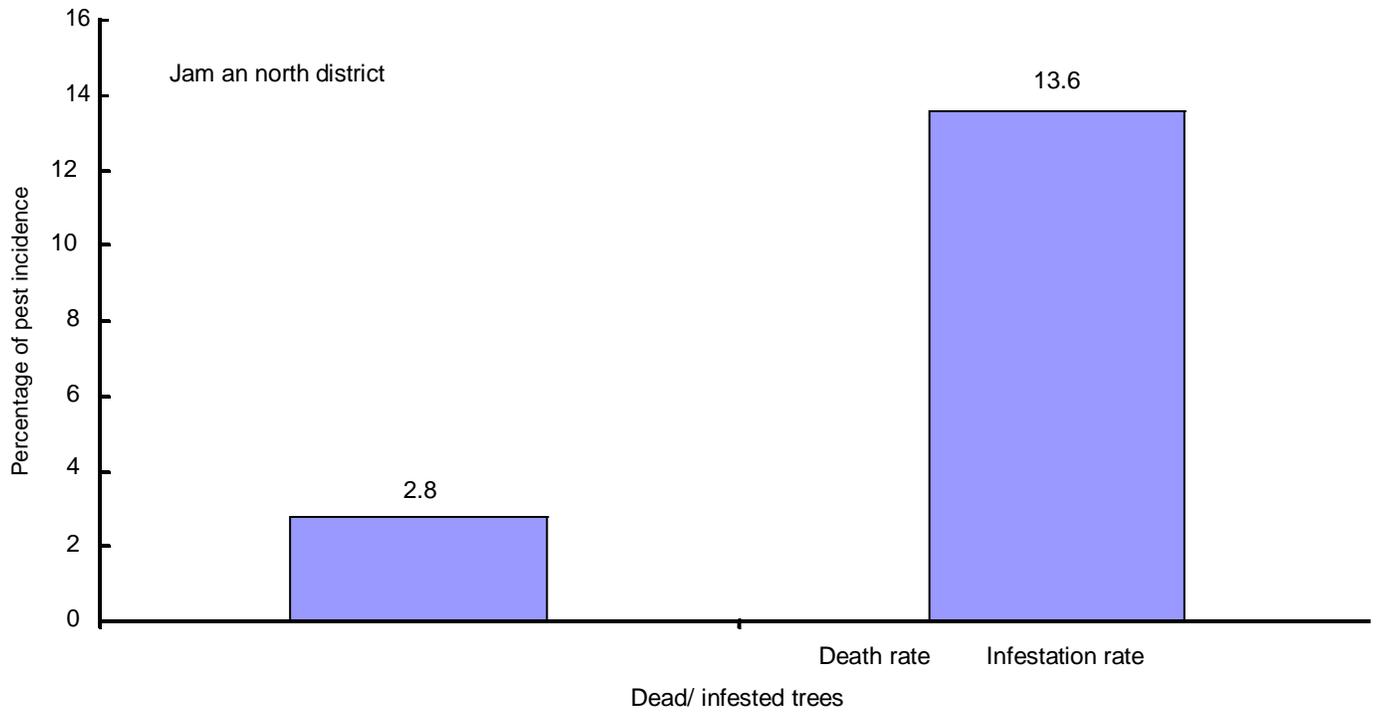


Figure 8. Mean infestation and death rates of *Mecocorynus* sp. at Jaman north district in the Brong-Ahafo region of Ghana.

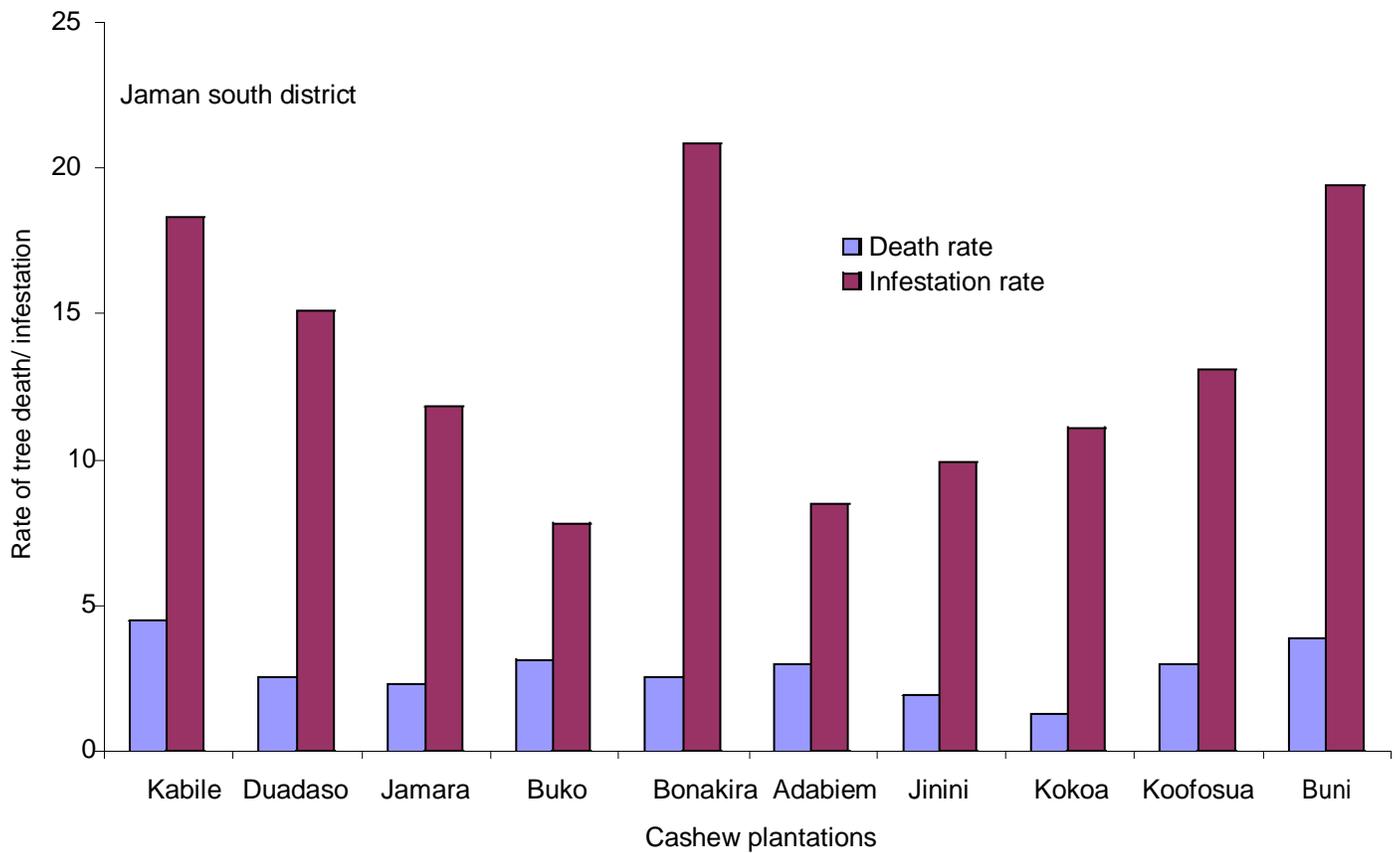


Figure 9. Incidence *Mecocorynus* sp. in cashew plantations at Jaman north district in the Brong-Ahafo region of Ghana.

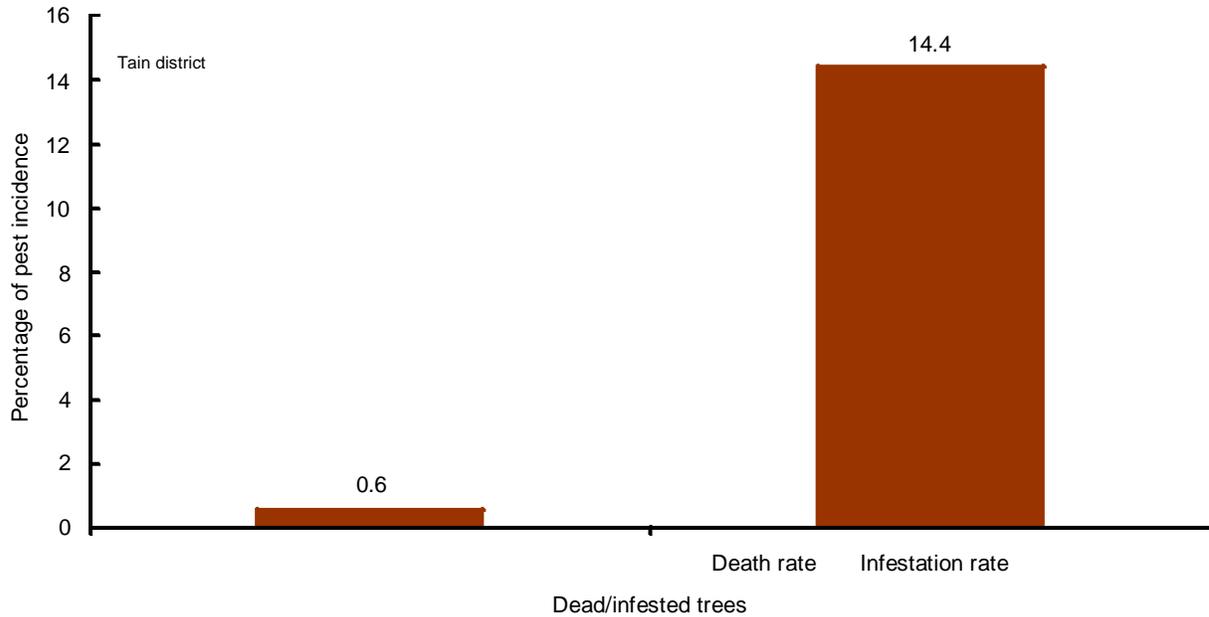


Figure 10. Mean infestation and death rates of *Mecocorynus* sp. at Tain district in the Brong-Ahafo region of Ghana.

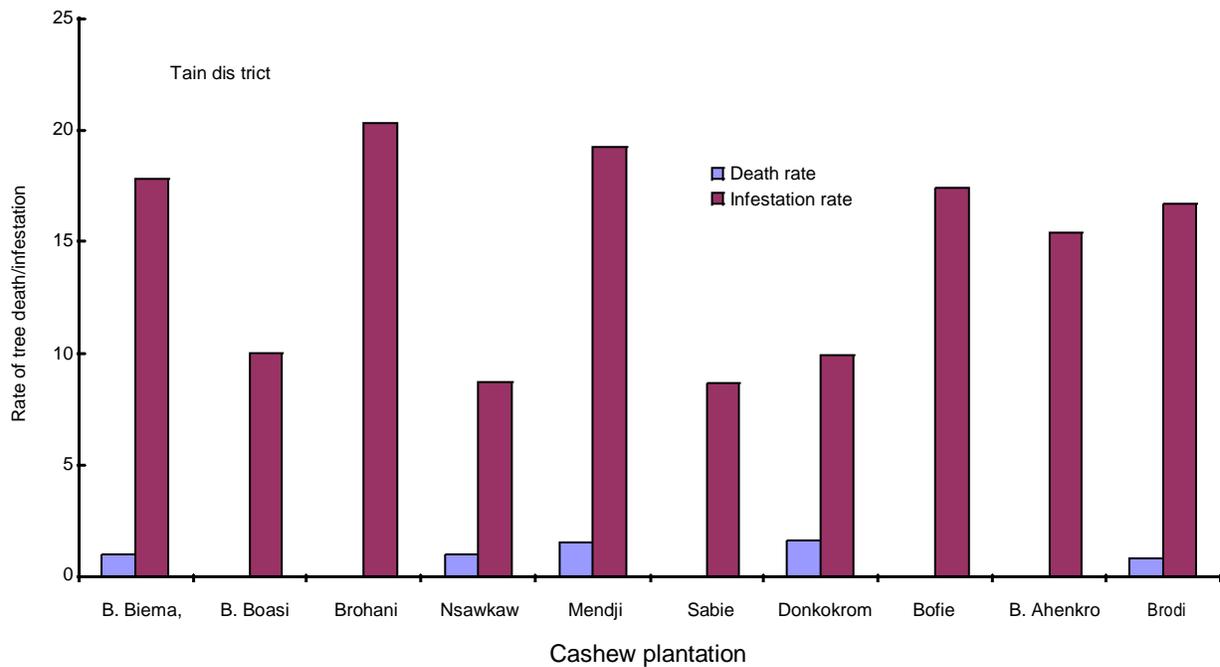


Figure 11. Incidence of *Mecocorynus* sp. in cashew plantations at Tain district in the Brong-Ahafo region of Ghana.

of the Executive Director of Cocoa Research Institute of Ghana.

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