

# Incidence of 'crown fracture' disease of oil palm in Ghana

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## ABSTRACT

An investigation into outbreak of a 'strange oil palm disease' at three locations in the Central and Western regions of Ghana showed the presence of 'crown fracture' disease in the country. Thirty-two cases of the disease were identified in Papagya (near Abakrampa), seven in Dwaboh (near Ayensudu), and six in the farm of the St. John's School, Sekondi. The symptom expression comprised the bending of the inner core of the middle crown at the base just above the growing point, at various angles to the vertical. The fronds of the bent crown core, and those immediately after it died with time, and fruit production ceased. Developing fruit bunches rotted and were covered with thick white mat of *Marasmius mycelia*. The broken crown always rotted away and in some cases a new inner core of fronds grew out to replace the rotted one. However, the regenerated inner crown core was always stunted and showed a compacted appearance with much corrugated leaflets. Fruit production was resumed after regeneration of the middle crown. Six of the seven palms at the Dwaboh farm recovered completely, whereas only six of the 32 cases at the Papagya farm and only one out of the six cases at the St. John's School farm recovered. Affected palms recovered faster when the broken crown was removed by cutting just above the broken point. The crown fracture disease, hitherto unknown in the country, seems to be slowly gaining prominence. The possible causes and significance of the disease are reviewed.

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## RÉSUMÉ

QUAICOE, R. N., YAWSON, G. K. & APPIAH, S. O.: *Incidence de la maladie de 'fracture de couronne' de Palmier au Ghana.* Une enquête sur l'éruption d'une 'maladie étrange de palmier' à trois emplacements dans les Régions Centrale et Occidentale du Ghana révélait la présence de la maladie 'fracture de couronne' dans le pays. Trente-deux cas de la maladie étaient identifiés à Papagya (près de Abakrampa), 7 à Dwaboh (près de Ayensudu) et 6 au champs de l'Ecole d'Évangile Jean à Sekondi. La description de symptôme constitue la courbe de trognon interne de la couronne centrale à la base juste au-dessus du point de croissance aux divers angles à la verticale. Les frondes de trognon de courbée et ceux qui sont immédiatement après lui mourraient avec le temps et la production de fruit a cessé. Les régimes de fruits en croissance pourrissaient et étaient couverts d'un tapis blanc épais de *marasmius mycelia*. La couronne cassée pourrissait petit à petit et en quelques cas un trognon interne neuf de frondes poussaient pour remplacer ce qui est pourri. Le trognon de couronne interne régénéré, cependant, était toujours retardé et montrait une apparition compactée avec beaucoup de folioles ondulées. La production de fruit était reprise après la régénération de la couronne centrale. Six de 7 palmiers au champs de Dwaboh recouvraient leurs santés complètement alors que seulement 6 de 32 au champs de Papagya et seulement 1 sur 6 cas au champs de l'Ecole d'Évangile Jean recouvraient. Les palmiers touchés se recouvraient rapidement lorsque la couronne cassée était enlevée par une coupe juste au-dessus du point cassé. La maladie de fracture de couronne, jusqu'ici, inconnu dans le pays semble gagner de l'importance lentement. Les causes possibles et l'importance de la maladie sont révisées.

## Introduction

The oil palm, like any other crop, is plagued by several pathogen-mediated diseases and genetic disorders. Causative agents that have been reported range from fungi of the *Aspergillus*, *Penicillium* and *Fusarium* genera causing brown germ disease of germinated nuts (Turner & Bull,

1967), *Fusarium oxysporum* causing fusarium wilt (Turner & Bull, 1967; Mepsted, 1992), *Ganoderma* sp. causing basal stem rot (Turner & Bull, 1967), as well as phytoplasmas (MLOs) causing spear rot and blast (Nair & Babu, 2000; Renard & de Franqueville, 1989). Various foliar diseases like anthracnose, cercospora leaf spot, and

helminthosporium leaf blight are also caused by fungal pathogens (Turner & Bull, 1967). Several genetic disorders, including chimaeras, genetic orange spotting, choke, vivipary and sterile palms, are on record (Purseglove, 1983). The alga, *Cephaleuros virescens*, causing algal leaf spot and the bacterial disease, Erwinia spear rot, have been reported (Weir, 1968; Purseglove, 1983; Hartley, 1988).

Generally, most diseases tend to be of local importance (Purseglove, 1983), and the cause of such a discontinuous distribution could be attributed to climatic conditions and husbandry practices (Turner, 1976). The distribution of three severe lethal diseases of oil palm is of particular interest. A group of diseases of unknown aetiology, commonly termed bud rot, occur only in Latin America. The stem rot disease caused by *Ganoderma* sp. is found in South East Asia alone, and *Fusarium* wilt occurs only in Africa (Turner, 1976; Anon., 2003). Each of these diseases poses a great threat to the oil palm industry where it occurs only, and are of insignificant importance elsewhere. Much resource is directed toward the study of the aetiology and management of these diseases wherever they occur, but on local basis (Anon., 2003). The appearance of a new disease anywhere, therefore, requires serious attention.

One field disease that has received very little attention is the 'crown fracture' disease also called the 'crown break' or 'head bending' disease (Varghese, 1962). The disease has been recorded in several widely separated localities in Malaysia; however, its incidence was reported to be very low. Although the 'crown fracture' disease killed some affected palms in Malaysia, it was not considered to be economically important (Turner & Bull, 1967). The exact cause of 'crown fracture' is unknown; however, it is thought to be a physiological disorder which results in the formation of a weak point at the basal portion of the crown (Turner & Bull, 1967). Nutrient disorder has been implicated in the aetiology of the disease; however, this view was not confirmed by analysis of diseased tissues. In Malaysia, the

disease, which usually affected 10 to 16-year-old palms, was found to be more prevalent on coastal estates subjected to occasional abnormally high wind velocities, compared to inland estates (Turner & Bull, 1967). No record of 'crown fracture' outside Malaysia has been reported.

Recent survey of oil palm plantations by a team of scientists from the Plant Pathology Division of the Oil Palm Research Institute (OPRI) indicated that certain diseases hitherto unknown occurred in the country. A single case of *Ganoderma* stem rot was diagnosed in 1996 at Kusi in the Eastern Region (Anon., 1996).

This paper reports the incidence of another new disease, 'crown fracture' (crown break or head bending disease), observed during another survey.

#### Materials and methods

The farmers whose farms were affected were interviewed to find out the source of planting material and year of establishment. The terrain and husbandry practices were also noted. A walk-through survey was used to identify the affected palms. They were then critically examined and monitored during the dry and rainy seasons to establish the symptom expression, which was then compared with standard description in reference text (Turner & Bull, 1967; Hartley, 1988) for diagnosis.

#### Results and discussion

The disease was detected in three locations, namely Dwaboh near Ayensudu, Papagya near Abakrampa (both in the Central Region), and St. John's School farm in Sekondi (Western Region). All the farms surveyed were 8 to 14 years old, but the source of planting materials could not be established because they were not collected from the OPRI, the only source of certified commercial oil palm planting material in the country. The terrain of the Papagya and St. John's School farms consisted of highly gravelly soil on very steep slopes. The two farms in the Central Region were overgrown with *Chromolaena* and *Panicum*

species. No fertilizer had ever been applied on any of the farms. Seven palms at the Dwaboh farm, 32 at the Papagya farm, and six at the St. John's School farm were affected by the disease. There was no sign of insect attack on any of the affected palms.

Fig. 1, 2, and 3 show some affected palms at the St. John's School farm. The symptom expression comprised the bending of the inner core of the middle crown at its base just above the growing point, at various angles to the vertical (Fig. 1 and 2). The fronds of the bent crown core and those immediately after it died with time, and fruit production ceased (Fig. 3). Developing fruit bunches rotted and were covered with a thick white mat of fungal mycelia, identified to be *Marasmius* by CABI Bioscience Centre, UK (Fig. 2). The broken crown always rotted away, and in some cases a new inner core of fronds

grew out to replace the rotted one. However, the regenerated inner crown core was always stunted and showed a compacted appearance, with much corrugated leaflets (Fig. 4). Fruit production was resumed after regeneration of the middle crown.

Six of the seven palms at the Dwaboh farm recovered completely, whereas only six of the 32 cases at the Papagya farm, and only one of the six cases at the St. John's School farm recovered. The Papagya farmer indicated that affected palms recovered faster when the broken crown was cut just above the broken part.

In Malaysia, no microbial agent was implicated in the occurrence of 'crown fracture' disease, and although the actual cause was unknown, it was thought to be genetically determined (Turner & Bull, 1967). Many diseases of oil palm, including 'crown disease' (this is different from crown



Fig. 1. A palm at St. John's School farm affected by 'crown fracture'. Early disease stage (note the bent inner crown core).



Fig. 2. A palm at St. John's School farm affected by 'crown fracture'. Mid-disease stage (note white covering of *Marasmius* mycelia on the palm fruits).



Fig. 3. A palm at St. John's School farm affected by 'crown fracture'.  
Late disease stage (note absence of the inner crown core and wilting of all lower fronds).



Fig. 4. A palm at St. John's School farm recovering from 'crown fracture'.  
Note the new fresh leaves of the regenerated inner crown core (the broken crown was cut to remove).

fracture disease), 'rachis internal browning disease' and 'leaf base wilt', are of unknown aetiology, but no microbial agents could be implicated in these conditions (Turner & Bull, 1967). Similarly, no pathogens could be implicated in investigations on palms affected by a group of lethal diseases including the 'oil palm Manakara frond blight', 'oil palm Tamatave decline', and 'oil palm Andalamahitsy frond drop' (Dabek, 1993).

There was no attempt to culture microbial agents from the diseased palms in this study; neither was there any microscopical examination of the diseased tissues. However, the symptom expression of the disease studied exactly conformed to that of standard descriptions of the 'crown fracture' disease in other reports (Turner & Bull, 1967; Hartley, 1988; Hesdy, Personal Communication). The new disease is, therefore, strongly suspected to be 'crown fracture'.

However, the need for more studies on the new condition was suggested, including assessing its economic importance in the country.

The 'suspected crown fracture' disease, until recently, was unknown in the country. However, as indicated in this study, the disease is slowly gaining prominence. Already, 45 cases of the disease have been recorded in just three farms in the Western and Central regions alone, and a more extensive survey may show more cases.

For the 'crown fracture' disease, Turner & Bull (1967) think that the ability of an affected palm to recover depends on the extent of damage to the stem apex (apical meristem). They theorized that after the fracture, wound-invading microbes colonise the wound, leading to the rotting of the bud. However, if the fracture is not extensive, then the defensive mechanism of the plant produces a callus over the wound, thereby arresting the rotting of the bud and allowing the palm to recover



through regeneration. When the fracture is extensive, callus formation is not fast enough to arrest the ensuing bud rot, which eventually kills the palm.

The steep slopes and highly lateritic soils of the Papagya and St. John's School farms are likely to cause leaching of nutrients and moisture deficit in the soils. The Dwaboh farm was heavily overgrown with weeds. These conditions could have predisposed the palms to deficiencies, which probably precipitated the physiological disorder leading to the disease. Nutrient deficiency seems inevitable on these farms, because fertilizers are not applied.

No control is known for 'crown fracture'; however, debilitating conditions of seriously affected palms could allow their colonization by even feeble pathogens, which could then be a threat to healthy palms. Also, the dead palms could serve as breeding sites for *Oryctes* sp. (rhinoceros beetle), which could cause serious damage to healthy palms. It is, therefore, advisable to eliminate dead or seriously affected palms by cutting the palm into pieces, heaping them on the stem stump and burning (must be under control to prevent the fire from going wild). Selecting good planting site and using certified planting materials, coupled with good husbandry practices, may help check the spread of this disorder.

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