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Fighting Fruit Flies Regionally in Sub-Saharan Africa

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Editorial

Fruit flies: the fight continues

Fruit flies seriously threaten agricultural production and productivity, reduce quality, disrupt trade and trigger huge financial losses, thus affecting livelihoods and food security. Importing countries impose strict quarantine measures to prevent the spread of fruit flies, limiting agricultural development and export potential in affected countries. This is why in 2008-2009 the Economic Community of West African States (ECOWAS) initiated a coordinated multi-stakeholder approach to control fruit fly in West Africa, in close collaboration with the European Union, the World Bank and the Standards and Trade Development Facility (STDF)[1].

In September 2009, ECOWAS and the STDF jointly organized a stakeholder meeting in Bamako, Mali. Close to 100 representatives and experts of national governments, research institutes, the private sector, civil society and development partners endorsed a comprehensive five-year Regional Action Plan to Control Fruit Fly in West Africa (based on an initial EU-funded scoping study in June 2008). In 2010, ECOWAS has made efforts to start implementation of the plan and mobilize the much-needed resources in this regard. Once operational, the plan has the potential to become a generic operating framework that could be replicated in other regions.

In the interim-period, the STDF has provided funding for phase II (2009) and phase III (2010) of the West African Fruit Fly Initiative (WAFFI), implemented by the International Institute for Tropical Agriculture (IITA) in collaboration with CIRAD. The project includes a regional training programme encompassing eight countries in the sub-region to control fruit flies in 15 selected agro-ecological regions. With ECOWAS close to starting the implementation of the Regional Action Plan in 2011, it is hoped that the results of the WAFFI project can be sustained in the longer term. Encouraging in this regard is ECOWAS' indication that it is willing to continue funding this valuable and successful newsletter.

Fruit flies is one of the most significant threats posed to international and regional horticulture trade in the past ten years, notably in Africa. The pest is not only spreading rapidly in West Africa but also in East and Southern Africa, where the detection of *B. Invadens* also led to the curtailment of regional fruit exports. It is hoped that through increased collaboration countries in Africa can jointly rise to the challenge of eradicating and controlling the pest. Rest assured that the STDF will continue to play its part, notably by raising awareness about this devastating pest within its vast network and by assisting ECOWAS and other regional bodies in the mobilization of additional resources, for instance within the broader framework of the Aid for Trade initiative and the Comprehensive Africa Agriculture Development Programme[2].

Melvin Spreij, STDF Secretary

[1] For more information on the Standards and Trade Development Facility (STDF), please visit our website: http://www.standardsfacility.org

[2] CAADP—NEPAD programme

Summary:

You can look up all the editions of the information letter on www.coleacp.org

This letter published by COLEACP and CIRAD intends to inform all the public and private operators concerned by the problem of phytophagous flies in Africa. Through facilitating the coordination of initiatives, its aim is to provide the agricultural sector with technically sound and economically sustainable solutions. This letter is sponsored by WTO/STDF.

Fruit fly research at the Royal Museum for Central Africa

"A new approach to fruit fly identification thanks to molecular development."

Despite the name, the Royal Museum for Central Africa (RMCA) is neither based in Central Africa nor is its research activity limited to that part of the continent. It is a Belgian Federal museum/research institution and an historic legacy from when the DR Congo was a Belgian colony. For more than ten years, the RMCA has focused part of its research activities on African fruit flies. We lead or participate in fruit fly research in the following domains: taxonomy and identification services; phylogeny and population genetics; surveying and biogeography; applied research on pest management; and training and information services. Some of these activities have already been highlighted in previous issues of this newsletter. 2010 was a productive year with a number of projects for these themes, most of which will be continued in the course of 2011.

Fruit fly identification has known a novel approach by developing molecular tools such as DNA barcoding (see Newsletter 2008, Nr 6). As indicated in newsletter 2010 Nr 2, together with the Joint Experimental Molecular Unit, we are now verifying whether material that is being intercepted in Europe or collected during surveys in Africa, can be identified in this manner. The first analyses are very promising showing that barcodes can, in many cases, be used for an accurate identification. Molecular tools are also used in population genetics studies but on a different level (between populations, rather than species). Recent studies focus on two elements: the colonization history of invasive species in and out of Africa, and the possible existence of host or geographic races in polyphagous and widespread species. Both activities also link up with the IAEA initiative on cryptic species that was discussed in the last newsletter (2010 Nr 11) and that will be a major research objective for this and the forthcoming years whereby the RMCA will collaborate with several other partners involved in this IAEA Co-ordinated Research Programme.

Recent surveys have been conducted in parts of the continent. One of these, monitoring the occurrence and spread of *Bactrocera invadens* in Mozambique, is discussed elsewhere in this newsletter. Another major survey took place within the framework of an international expedition along the Congo River (jointly organized by Belgian Federal research institutions and Congolese universities). Along a transect on the Congo River, the fruit fly diversity was compared between areas under agricultural development and natural rain forest. First indication shows that differences among locations, rather than between habitats represent the main source of variability. A similar study, in collaboration with Sokoine University of Agriculture (SUA, Tanzania) and the Belgian University of Ghent, looked at the diversity along an altitudinal transect. A clear spatial and temporal difference was observed, which seems at least partially the result of interspecific competition between indigenous and exotic fruit flies. SUA is also the main partner of RMCA with regard to ecological and applied research in Africa. This research has been going on with, in previous years, gathering baseline data (see, for example Newsletter 2009, Nr 1) and is now in the final stages of the development of an IPM programme against fruit fly pest on mangoes in Tanzania.

Last but not least, training is considered a vital component of the activities of the RMCA. In 2009 we organized for the first time a group training for African scientists in fruit fly taxonomy and ecology, an initiative we hope to repeat in 2011. In addition, we participated in fruit fly training courses in Panama, Kenya and Madagascar. Such transfer of knowledge through training is considered a prerequisite to allow African researchers and growers to independently monitor and control fruit fly related problems on their continent.

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(References to publications highlighting the scientific results of the above mentioned activities can be found on the museum's website (www.africamuseum.be)

The collaborative work between the USDA/APHIS and the FAO/IAEA on developing phytosanitary treatments against *Bactrocera invadens*

The purpose of the work is to compare the efficacy of quarantine treatments approved against insects with known treatment tolerance responses (i.e. *Ceratitis capitata*) against those where there is minimal knowledge of treatment dose responses (*Bactrocera invadens*, *Bactrocera zonata* and *Anastrepha grandis*). Preliminary, *in vitro*, work on cold treatment was carried out by USDA and IAEA workers in 2009 and the resulting data along with some kindly supplied by ICIPE were used to obtain interim approval from the USDA that cold treatments schedules against *Ceratitis capitata* would also effectively treat fruit against *Bactrocera invadens* pending the results of confirmatory trials. Confirmatory trials will be carried out for cold treatment schedules in early 2011 when USDA and IAEA workers will carry out in-fruit disinfestation trials of large numbers of fruits infested with *Bactrocera invadens*, *Bactrocera zonata* and *Ceratitis capitata* to produce scientifically valid cold disinfestation quarantine treatments which would then be submitted to the USDA for approval. The first results should be available by the middle of 2011 subject to data clearance by USDA/APHIS and FAO/IAEA. Similar work is envisaged for the development of a quarantine treatment based on fumigation with methyl bromide but the start date for this is as yet unknown due to the difficulties in obtaining the fumigant. Work on *Anastrepha grandis* will commence when the insect colony is large enough for meaningful work – maybe mid to late 2011.

Andrew Jessup

Bactrocera invadens surveys in Mozambique

Testimonies in various issues of this newsletter have highlighted the destructive impact of the invasive fruit fly, *Bactrocera invadens,* on fruit production and export in Eastern and Western Africa. However, the occurrence and consequences in Southern Africa are less well known. Mozambique, stretching from 11° to 27° Southern latitude, forms a bridge between the Eastern and Southern regions of the continent, geographically as well as ecologically. It has an important horticultural industry with an enormous potential for production and export of several fruits, especially banana, mango, citrus, chilies and cashew. The horticulture sector in Maputo (South) and Manica (Central region) Provinces, for example, could generate revenues of more than US$ 20.75 millions per year.

B. invadens was first observed in Northern Mozambique in Cuamba (Niassa Province) in 2007. The Mozambican government realized the impact that the presence of this fly could have on its economy, including closure of export to neighbouring countries such as South Africa and Zimbabwe. A temporary closure of market access for three weeks during October 2008 already resulted in a loss of 2.5 million USDollars. Financial assistance, therefore, was sought and obtained from the World Bank Group and FAO to establish surveillance work in different high risk zones of the country. Since October 2007, the Eduardo Mondlane University, and the Ministry of Agriculture, in collaboration with the private sector, has been monitoring the presence of the fly at 289 trapping sites at high risk areas throughout the country using Methyl Eugenol baited traps. In addition, support was given by USDA (USDA/APHIS office Pretoria, South Africa) with assistance from the Royal Museum for Central Africa (Tervuren, Belgium) to monitor along selected transects in the country. Both activities focus on the main transportation routes in the country (North to South axes, from Pemba and Tete to Maputo; and West to East, from Zimbabwean frontier to Beira) as well as the main fruit production areas in Nampula, Manica, Maputo and Inhambane provinces. Traps are put up in different locations such as orchards, villages, town markets, and sites along the highways. In addition, other measures such as road blocks to control movement of fruit products were also implemented by the Mozambique government.

"The studies carried out for the last 3 years have provided a reliable image of the territorial distribution of B. invadens."

These surveys over the last three years provide us with a fairly good picture of the current distribution and spread of the fly. Ever since its detection, it has been present in high numbers in the Northern part of the country (Cabo Delgado, Nampula and Niassa provinces; red dots on in fig. 1) similar to its presence in countries like Kenya and Tanzania. Catches in mango orchards during the high season, run in the hundreds of specimens per week. Descending southwards, its occurrence is becoming less frequent. Most traps in Zambezia, Manica, Tete and Sofala provinces show infrequent captures of a few specimens (orange dots in fig. 1). It is unclear whether these single captures reflect permanent establishment of the fly in these regions or that they are the result of accidental introductions by humans commuting along the main transport routes. The southernmost provinces (Inhambane, Gaza, Maputo) have proven to be free of *B. invadens* thus far (green dots in fig. 1).

However, it is clear that the occurrence of the fly is a dynamic process. For example a permanent baiting station in a forest concession (courtesy TCT Dalmann) near the Zambezi river and the main highway, yielded one specimen in the period March 2009 – March 2010 and nine specimens between April 2010 – November 2010. Captures in Manica and along the Beira Corridor also seem to increase. These tendencies need to be monitored continuously in order to define pest free areas in the country that could still be allowed to export their horticultural commodities.

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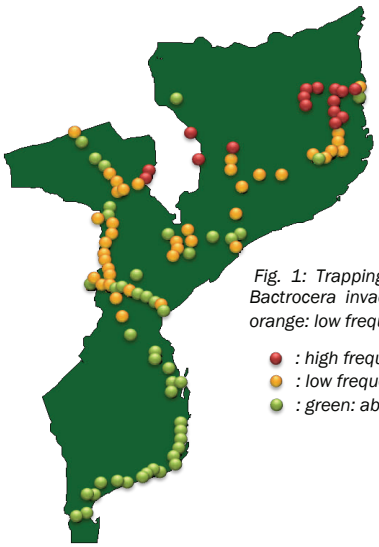

Fig. 1: Trapping sites in Mozambique for Bactrocera invadens (red: high frequency, orange: low frequency, green: absence)

The cost of invasive species

A study by CABI (a British not-for-profit organisation for scientific information and development) has evaluated the cost of the presence of invasive exogenous species for the British economy. For the agricultural and horticultural sectors, it amounts to £1 billion (€1.15 billion) per year!! Bear in mind that this sum includes all animal species (insects as well as rodents) and plant species (including weeds). However, indirect damage to the ecosystem and loss of biodiversity are not included...

The case studies all revealed **exponential growth in costs as invasion progresses**. Therefore they confirm the benefit of intervening at the earliest possible stage of the invasion process, to enable significant long-term savings.

https://secure.fera.defra.gov.uk/nonnativespecies/index.cfm?sectionid=59

Impact of the fly *Bactrocera invadens* on the 2009-2010 mango season in Guinea

By virtue of the diversity of its climate, Guinea offers favourable conditions for a highly varied range of fruit crops. Historically, the country is renowned for the quality of its fruits; which made it the foremost fruit exporter to Europe, particularly France, in the 1950s. These exports were primarily focused on the banana and pineapple. In the country's post-independence years, these exports fell abruptly due to a variety of factors (political, agricultural, commercial, phytosanitary, etc.)

In an attempt to take up the challenge of revitalising fruit exports, from the 1960s to 1980s a vast programme was undertaken with the aim of promoting other fruit crops, such as the mango. This programme, which has been stepped up over the past ten years by additional actions carried out under certain projects such as the Project for Promotion of Agricultural Exports (PCPEA) and the Mamou/Kindia Fruit and Vegetables Project, has resulted in a substantial increase in mango production, up from approximately 83,000 tonnes in 2000 to more than 144,000 tonnes in 2005 (FAOSTAT, 2005).

In Guinea, beyond the gain in revenue for small producers, who own most of the orchards (more than 80%), the mango contributes to the food security of the most deprived strata of the population. Indeed, it is universally recognised that in the mango harvesting season, the populations' requirements in primary foodstuffs (rice, maize, cassava and fonio) fall by nearly 40% in favour of mango consumption in various culinary forms (stewed, soup, strips, preserves, juices, etc.), especially in rural zones (Italtrend. 2008).

Among the many phytosanitary constraints that influence mango production in Guinea, fruit flies definitely pose the most serious threat. This threat has been intensified since the detection in June 2005 of the invasive fruit fly species *Bactrocera invadens*. (Traoré et al., unpublished data).

The damage caused by *B. invadens* is a painful burden for the mango industry players, especially the small producers. This is illustrated by the cry for help made by a housewife from Siguiri, more than 800 km from the capital Conakry. Mrs Mariama TRAORE, listening devotedly to a local researcher sell the beneficial effects of parapheromone trapping combined with sanitary inspection of the harvests, exclaimed: "Is it really possible to combat flies effectively using these methods? We are ready to do more than that." "Five years ago," she continued, "my husband was selling five 10-tonne lorry loads of mangoes to Mali and the gold mines. This 2010 season didn't get off the ground - he couldn't even sell a cart load. In general, the farmers have ended up with enormous quantities of rotten mangoes (60 to 70%). God help those who can help the farmers relieve the suffering caused by the flies."

The threat of *B. invadens* is also of concern to exporters, such as the export company SIPEF-Guinée, which lost six (6) containers, i.e. 126 tonnes out of one thousand tonnes (1,000 T) of KENT and KEITT variety mangoes, despite the great efforts made by the mango industry players in Kindia (the region from where most mangoes exported by SIPEF come) through the Regional Project for Emergency Fruit Fly Management, using parapheromone trapping combined with sanitary inspection of the harvests.

This is sufficient proof that other management methods (biological, spot treatment with Success Appat (GF 120), soaking fruits in hot water, etc.) deserve to be tried out over vast areas.

The cry for help from Mrs TRAORE comes on behalf of all players in the West African mango industry, and is aimed at States concerned by the fruit fly problem and at the development partners to combine their efforts in order to minimise the impact of these flies, within the framework of a well coordinated sub-regional strategy. It remains true that whatever management method is adopted, it cannot achieve the expected success if the initiative is left to the producers alone, or if pest management is applied to a limited zone.

Let's combat fruit flies together to banish them from the borders of West Africa.

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Bactrocera invadens

Infested fruits

Dropped infested fruits

A batch of pheromone traps

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