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Maize quality in markets in four West African countries

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ABSTRACT

The quality of maize offered for sale in West African public markets was evaluated by analysing 281 samples collected in 24 markets in Benin, Togo, Ghana and Burkina Faso from February to March 2014. Grain moisture content ranged from 8.5 to 14.4 percent (wt/wt), while extraneous matter content ranged between 0.0 and 2.0% and the proportion of mouldy grains between 0.0 and 0.6%. Insect pest infestations were noted in about one-fourth of the samples with *Sitophilus* sp., *Cryptolestes ferrugineus* Stephens, *Tribolium* sp. and *Prostephanus truncatus* Horn found at densities varying between 0 and 2.4 individuals per 500 g of grain. Aflatoxin levels exceeding the accepted USA standard of 20 ppb were recorded in only 4.6% of the samples across the four countries. In most locations, grain moisture was within the acceptable range for aflatoxin- and insect-safe storage of maize using hermetic technology such as PICS bags.

1. Introduction

Maize is an important food crop in West Africa. Total production is estimated to be 18.5 million tonnes. Nigeria contributes about 54.5% of the total production followed by Ghana with 9.25%, Burkina Faso with 8.95%, Mali 7.88% and Benin 7.05% (FAOSTAT, 2013). Maize yields have nearly doubled over the past decade thanks to the implementation of agricultural policies that promote crop production and productivity including (1) increased use of fertilizer and (2) use of improved varieties. Almost 60% of maize production in West Africa is for human consumption (Elbehri et al., 2013).

Maize quality in markets has been a concern for decades because of aflatoxin contamination. The upper limit of acceptable aflatoxin levels in maize for human consumption is 20 ppb in the United States and 15 ppb in Ghana. From 744 maize samples collected in Benin in 1993–1994, 38.8% tested positive for aflatoxin with mean contamination of 105 ppb (Hell et al., 2003). In Ghana, in 1999, 8 of 15 maize samples studied had unacceptable levels of aflatoxin and fumonisins (Kpodo et al., 2000). Akrobortu (2008) also noted aflatoxin levels ranging between 9.5 and 153.2 ppb in different localities in Ghana. In Burkina Faso, an analysis carried out on maize-based food products showed aflatoxin B1 in 50% of the samples with a median of 23.6 ppb (Warth et al., 2012). Maize contamination by aflatoxins is a threat to human health and decreases the value of the commodity in international trade. Fungal toxins are responsible of an estimated annual loss of between USD 670–750 million to African countries (Otsuki et al., 2001; USAID and Danya International, 2013).

We conducted the present study to collect data bearing on the quality of maize for sale in some West African markets. Our results shed light on quality issues and may contribute to improving the postharvest storage management and marketing of this important cereal.

2. Materials and methods

This study was conducted in 24 markets located in Benin, Togo, Ghana and Burkina Faso (see Fig. 1 for locations). Participants were selected systematically beginning with the second maize seller in the series of sellers at the market followed by every third seller thereafter. Contact with each participant was initiated in the market or workplace and began with an explanation of the objectives of the study. Grain moisture measurements were carried out on maize stocks on display for sale or stored for later sale. Samples of 1 kg of grain were purchased to evaluate other parameters of the study, described below.

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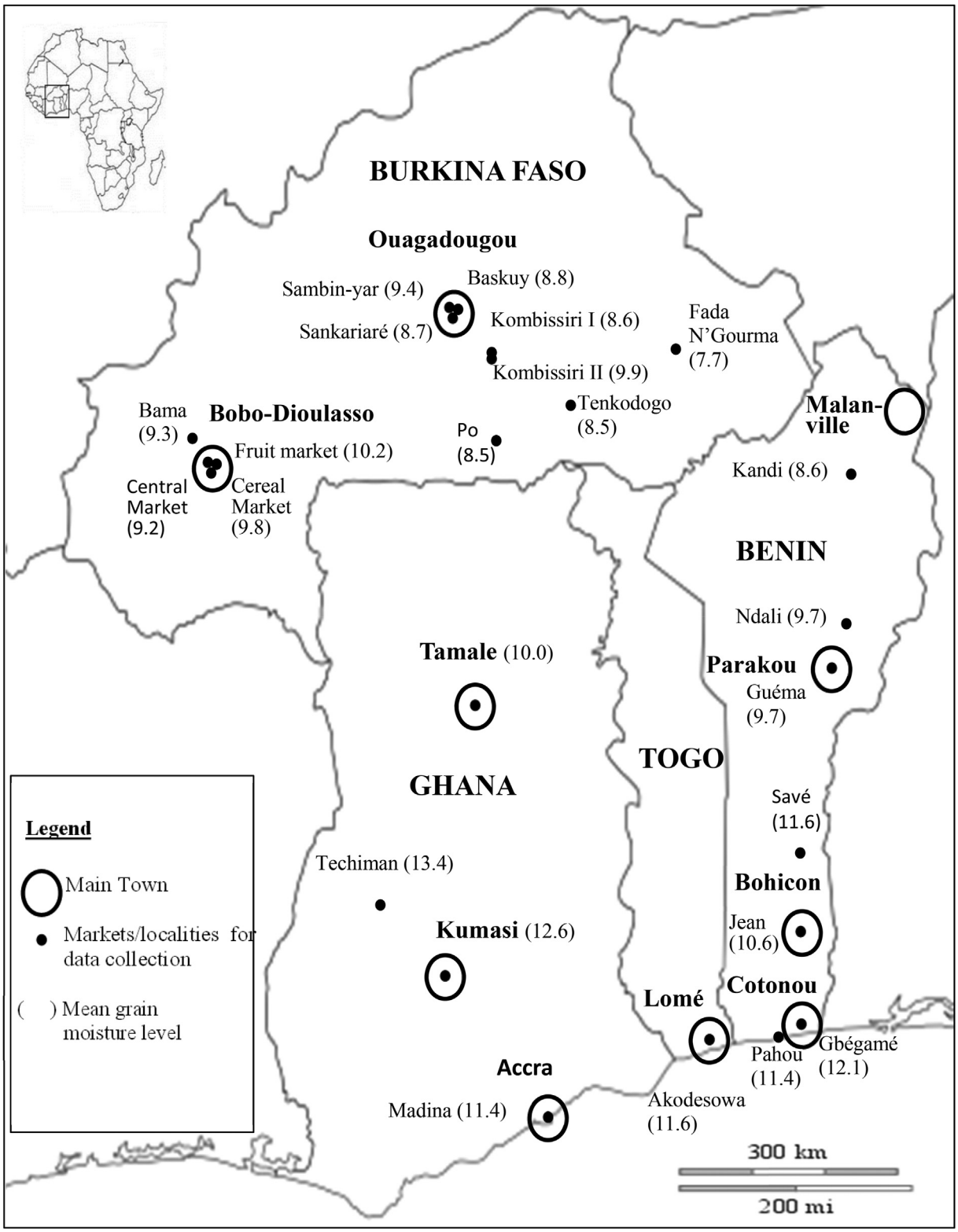

Fig. 1. Locations of cities and markets where maize samples were collected and mean grain moisture content determined; in Benin, Togo, Ghana and Burkina Faso.

Seed moisture was determined using a direct-reading portable device, the DICKEY-John mini GAC (http://www.dickey-john.com/product/mini-gac/) (DICKEY-John Corp., Auburn, IL, USA) following the company's recommended procedure and using the calibration setting for maize. Measurements were made using three separate maize samples from each of the traders or producers.

To determine total aflatoxin content, each sample was taken using a fresh pair of gloves to avoid contamination. Approximately 200 g of maize seed was collected and then divided into two samples of 100 g each. These were repackaged individually in