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Early dispersals of maize and other food plants into the Southern Caribbean and Northeastern South America

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ABSTRACT

Grindstones from Eva 2 and St. John, two of the earliest sites in northeastern South America and the southern Caribbean respectively, were subjected to starch grain analysis. Results of this study revealed that these stone artifacts were utilized to process a variety of cultivars such as maize (*Zea mays*), sweet potato (*Ipomoea batatas*), chili pepper (*Capsicum* spp.), achira (*Canna* spp.), legumes (Fabaceae), and yams (Dioscoreaceae), coupled with wild resources, most notably *marunguey* (*Zamia* spp.). Radiocarbon dates indicate that the use of plants identified at these two sites were much older than previously considered, going back to at least 7790 cal. BP at St. John and 5990 cal. BP at Eva 2. This new evidence showcases the importance of the Caribbean basin as an arena for early phytocultural dispersals. It also focuses attention on the role of navigation as a mechanism for crop diffusion in the Neotropics.

1. Introduction

The domestication and dispersal of food crops in the Neotropics has gained significant attention in the past three decades as a result of the widespread application of novel methods for the identification of the plants that were consumed in ancient times in the region. Of particular importance has been the analysis of the starch grains that became trapped in the fissures and pores of artifacts. Starch grains constitute a type of microbotanical remain that is highly resistant to the taphonomic conditions of the tropics which tend to significantly diminish many of the other organic evidences of plant use in the area.

The plant that has received the most attention in this regard has been maize, which has been documented in a much wider array of settings than previously envisioned. Recent data indicate that the tempo of maize dispersal was rather quick, being perhaps the cultivated plant that spread across the longest distance in the least amount of time in the tropics. All the information that has been generated thus far suggests that once maize was first domesticated in México (Central Balsas watershed, Guerrero) around 9500 to 8800 BP (Matsuoka et al., 2002; Piperno et al., 2009) it spread south, reaching Panamá at least around 8010–7620 cal. BP or even earlier (Piperno, 2011). It then dispersed to coastal Ecuador where phytolith evidence indicates its arrival around 8050–7820 cal. BP (to Las Vegas; see Piperno, 2011; Stothert and Sánchez, 2011). Early evidence for this plant has also been recovered in Colombia, where it has been dated to 8000–7700 cal. BP (Middle Cauca river basin; see Aceituno and Loaiza, 2014). These various lines of evidence seemingly indicate that maize went down to South America via the Panamanian Isthmus and eventually dispersed into the interior of the landmass across the river systems of Colombia. In the case of Ecuador, maize was apparently dispersed first using overland coastal routes along the Pacific, subsequently spreading to the highlands of the Andes probably through the rivers.

Thus far, most of the research that has been conducted on early food crops has concentrated on the central and Pacific sides of

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Central and South America (Dickau et al., 2007; Pearsall et al., 2004; Piperno, 2011). In contrast, the areas bathed by the Caribbean Sea have received quite limited attention in this regard. This lack of careful archaeological consideration of Caribbean coastal contexts as important scenarios for early plant dispersals not only applies to the continental portions of the Caribbean but also to the Antillean archipelago (Pagán-Jiménez, 2011a), a lineal group of islands that create an encapsulated maritime basin which connected the insular territories and the surrounding mainlands in a similar fashion as that noted in the Mediterranean (Guilaine, 2015; Zeder, 2008). With regard to ancient plant cultivation, northeastern South America and the Antilles have been considered as adhering to the manioc (*Manihot esculenta*) phytocultural template in contrast to the maize-driven cultures of western South America and Central America (Pagán-Jiménez, 2013; Piperno, 2006). The idea commonly accepted is that sweet potato, yampee (*Dioscorea trifida*, or true domestic yam), and manioc, once domesticated in the southern Amazon or adjacent areas, were dispersed to the west and then north (Piperno and Pearsall, 1998), subsequently spreading northward from northwestern South America toward the Isthmus, eventually reaching Yucatán Peninsula where manioc has been documented as early as 5800 cal. BP (Pope et al., 2001). There is general agreement that the Caribbean coast of South America was bypassed in these plant diffusion processes, thus not having constituted an important route for early cultivar dispersals in the Neotropics.

However, recent data recovered from northeastern South America and the Antilles (e.g., Chinique de Armas et al., 2015; Pagán-Jiménez, 2012, 2013; Pagán-Jiménez et al., 2005) have seriously challenged this conventional perspective of the Caribbean, underscoring the region's importance for addressing issues relating to the introduction and spread of maize and other important cultivars, as well as the mechanisms that led to their adoption in both continental and insular settings. In this work, we present the results of the analyses of materials from two of the earliest sites in the insular southern Caribbean and northeastern South America, St. John (SPA-11) and Eva 2 respectively, which showcase the importance of this region for understanding the early dispersal and adoption of food crops in the Americas. Based on the finding of early maize, as well as other cultivars and wild species such as sweet potato, chili pepper, achira, wild yam, *marunguey*, and Fabaceae (including *Canavalia* spp.) at these locations in contexts that are almost as early as those from Lower Central America and northwestern South America, we argue that the Caribbean littoral was also an important point of convergence and dispersal of early phytocultural traditions that not only included cultivars but also culinary traditions that were negotiated by culturally and socially diverse peoples.

2. Contexts, samples, and methods

The materials that form the basis of this study were recovered from St. John, located in the southwestern portion of the island of Trinidad and Eva 2, situated in Malmanoury, central French Guiana (Fig. 1).

2.1. St. John

St. John, together with Banwari Trace, are the oldest documented sites in the insular Caribbean. The seven dates obtained thus far from St. John range between 7790–7670 cal. BP (UGAMS-12303) and 5460–5300 cal. BP (UGAMS-13634) (Table 1). This site is located on terrace soils and intermediate upland sediments with free drainage near the South Oropouche wetlands. However, the soils around it, relating to the Oropouche and Godineau rivers and wetlands, are categorized as poorly drained, low-lying hydromorphic and alluvial soils (Boomert, 2000; Reid, 2011).

The archaeological matrix of this site consists of a relatively deep shell midden, which is around 1.2 m high and 38.1-m in maximum diameter. Excavations at this site, which were undertaken in arbitrary levels of 10 cm, were conducted by the Archaeology Unit of the Department of History at The University of the West Indies (U.W.I.), St. Augustine under the direction of Basil A. Reid. These excavations resulted in the recovery of an abundant representation of shells, fish, and mammal bones, suggesting that the ancient peoples who inhabited St. John had a wide-spectrum protein diet, exploiting a range of resource habitats that were in close proximity to the site (Reid, 2014). Mammals such as collared peccary, nine-banded armadillo, paca and red brocket were the commonly hunted (Ali, 2012). The St. John midden bears a shell deposit that is quite similar to that of Banwari Trace, which suggests that the inhabitants of both sites shared a similar food procurement template (Boomert, 2000).

Archaeological excavations at the site were limited to two 1-m × 1-m units (referred to as Units 1 and 2) and two 2-m × 2-m unit (referred to as Units 3 and 4) (Fig. 2a). Three millingstones and two conical pestles were recovered from these units, all of which were subjected to starch grain analysis. Two of the millingstones are discoidal in shape with broad central concavities while the remaining one has an irregular shape with an ablated use area from which sediment samples were obtained (Fig. 3). These millingstones, all of which were made of locally available sandstones, were rather voluminous ranging in weight between 600 and 3200 g. The two sandstone pestles that were studied are partially or completely pecked and ground into shape, adhering to the technological style for the production of these stylized ground objects observed in other early sites in Trinidad including Banwari Trance and Ponah Road (Boomert, 2000; Harris, 1976).

2.2. Eva 2

The Eva 2 site is situated on top of a bean-shaped hill located between the neo-tropical forest of the Precambrian Shield and the coastal Pleistocene savannahs of French Guiana. The analyzed materials come from a layer associated to the Late Archaic period of the area, with dates that range from 6090–5740 cal. BP (ETH-31228) to 4150–3920 cal. BP (KIA-27630) (Table 1). Crude pottery was recovered from a rock-filled pit from which the latter date was obtained, being likely linked to the Alaka and Mina pottery traditions documented in this part of South America. In contrast to St. John, this site does not contain a mounded midden; instead, it is characterized by the presence of more than 200 cooking pits often found in an alignment that are quite similar in appearance to those of Plateau des Mines in western French Guiana and San Jacinto in Colombia (Bel, 2010; Mestre and Delpuech, 2008; Oyuela Caycedo and Bonzani, 2014). These pits have been interpreted as food-processing ovens, considered to be emblematic for the Late Archaic Period in French Guiana and other parts of northern South America during this period.

Only the northeastern portion of the White Sand hilltop was excavated during rescue work conducted by members of Institut National de Recherches Archéologiques Préventives (INRAP) led by Martijn van den Bel. A macro-block excavation was conducted, being divided into 76 1 × 1m units which were dug in arbitrary layers of 5 cm (Fig. 2b). The materials that form the basis of this study were obtained from a paleosol, which consists of a dark grey layer of approximately 10–15 cm thickness at approximately 1 m in depth, containing abundant lithic artefacts, charcoal and some weathered pottery. This stratum was naturally sealed by an overlying sand sterile layer of eolian origin ranging in thickness from 10