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Medicinal plants used as excipients in the history in Ghanaian herbal medicine

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ABSTRACT

Ethnopharmacological relevance: The present study was carried out to investigate the traditional use, pharmacology and active compounds of four plants commonly used as excipients in herbal medicine in Ghana.

Materials and methods: A comprehensive literature search was conducted to gain knowledge about the traditional use, pharmacology and active compounds of the four plant excipients.

The broth dilution antibacterial assay and the DPPH radical scavenging antioxidant assay were used to evaluate the antibacterial and antioxidant activity of the plants, respectively. Ethanol, warm water and cold water extracts were prepared from the dried seeds/fruits of *Aframomum melegueta*, *Piper guineense*, *Xylopia aethiopica* and *Monodora myristica*, and tested in the assays.

Results: *A. melegueta* and *P. guineense* seemed to act as pharmacoenhancers, since they have been shown to inhibit specific CYP-enzymes. *A. melegueta* could act as an antioxidant to preserve herbal preparations. None of the plant excipients had antibacterial activity against the bacteria tested in this study. Compounds with an aromatic or pungent smell had been identified in all the plant excipients. An explanation for the use of the plants as excipients could rely on their taste properties.

Conclusion: The present study suggests that there may be more than one simple explanation for the use of these four plants as excipients. Plausible explanations have been proven to be: (1) a way to increase the effect of the medicine, (2) a way to make the medicine more palatable or (3) a way to preserve the activity of the medicinal preparation over time.

1. Introduction

It has been described how plant medicine in Ghana is administered together with other herbal ingredients (Abbiw, 1990; Schumacher, 1827; Soelberg et al., 2015). These ingredients include *Aframomum melegueta, Piper guineense, Xylopia aethiopica* and *Monodora myristica* (Abbiw, 1990). In a comprehensive research of historical and contemporary medicinal plant uses in Ghana, which included interviews with local traditional doctors and herbalists, respondents explained the use of plant excipients in four different ways: (1) as a way to increase the effect of the medicine, (2) as a way to make the medicine more palatable, (3) as a way to preserve the activity of the medicinal preparation over time or (4) as a way to increase the susceptibility of the body to the medicine (Soelberg et al., 2015).

The present study aimed to find an explanation for the use of these herbal ingredients as excipients in herbal medicine, as part of a larger research collaboration, which aims to examine historical and contemporary medicinal plants in Ghana (Soelberg et al., 2015). This was achieved by investigating the traditional use, pharmacology and active compounds of the four plant excipients. Furthermore the plants were tested for antimicrobial and antioxidant activity.

2. Literature review

In the following section each of the plants *A. melegueta, P. guineense, X. aethiopica* and *M. myristica* are described, and their traditional uses and known chemical constituents are accounted.

The databases EMBASE, PubMed and SciFinder were used as well as books such as the comprehensive survey of economically important plants grown in West Tropical Africa "Useful plants of West Tropical Africa" revised by Burkill (1985, 1997, 2000).

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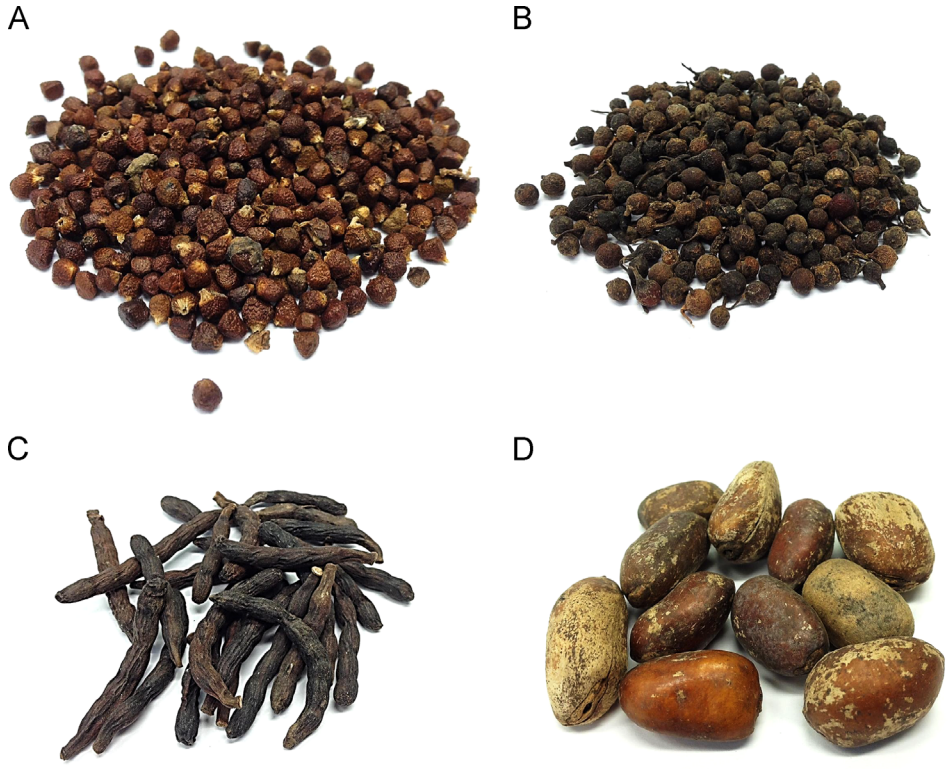

Fig. 1. Seeds of (A) *Aframomum melegueta,* K. Schum., (B) *Piper guineense,* Schumach., (C) *Xylopia aethiopica,* A. Rich. and (D) *Monodora myristica* Dunal.

2.1. Botanical description and use as spices in Europe of the four plant excipients

A. melegueta K. Schum. is a species in the family Zingiberaceae (Burkill, 2000) (Fig. 1). It is an herbaceous plant with leafy stems that grow to 1½ m with pink or white inflorescences at the base. Seeds from this plant are also known as Grains of paradise, Alligator pepper, Melegueta pepper, Guinea grains or Guinea pepper (Burkill, 2000). The plant is native to West Africa where the seeds are commonly used as a spice and as a general medicinal panacea ("*wonder drug*") (Abbiw, 1990; Burkill, 2000). Earlier, the spice was also commercially traded in Europe, but it was later replaced by black pepper (*Piper nigrum*) when imports from India became common (Ekanem et al., 2007).

P. guineense Schumach. is a species in the family Piperaceae (Burkill, 1997) (Fig. 1). The plant is a climber, which can grow to 10 m or more in length. The plant has black berries or peppercorns. The peppercorns are also called West African black pepper, Ashanti pepper, Benin pepper, Guinea cubebs or bush pepper (Burkill, 1997).

X. aethiopica A. Rich. is a species in the family Annonaceae (Burkill, 1985; Obiri and Osafo, 2013) (Fig. 1). The plant is a tropical evergreen tree that can grow as high as 20 m (Burkill, 1985; Obiri and Osafo, 2013). It has short prop roots and smooth gray bark (Burkill, 1985). It is largely found in West, Central and Southern Africa (Somova et al., 2001). The most important part of this plant is the fruits, which are commonly used as a spice and are also known as African pepper, Guinea pepper or Ethiopian pepper (Burkill, 1985; Obiri and Osafo, 2013).

M. myristica Dunal is a species in the family Annonaceae (Burkill, 1985) (Fig. 1). It is an edible plant that grows wild in evergreen West African forests (Ekeanyanwu and Etienajirhevwe, 2012), and it grows as high as 35 m (Burkill, 1985). The seeds are usually embedded in a white sweet smelling pulp (Burkill, 1985; Ekeanyanwu and Etienajirhevwe, 2012). The seeds are aromatic and are used in food resembling the taste of nutmeg. The seeds are also known as African nutmeg, false nutmeg, calabash nutmeg and calabar nutmeg (Burkill, 1985).

2.2. Traditional uses of the four plant excipients

In Ghana seeds/fruits of *A. melegueta, P. guineense, X. aethiopica* and *M. myristica* are used as spices for flavoring food, but they are also used in medicine especially as an excipient to many other medicines (Abbiw, 1990; Adetutu et al., 2011; Agbonon et al., 2010; Asase et al., 2012; Burkill, 1985, 1997, 2000; Schumacher, 1827; Udoh, 1999).

In the 19th century *A. melegueta* was described as an ingredient in herbal mixtures, often used along with lemon juice together with various other plants. These other plants include: macerated root bark of *Senna occidentalis* (L.) Link. made into an ointment for ringworm; macerated root of *Clausena anisata* (Willd.) Hook.f. ex Benth. smeared over the face for facial swellings; macerated root of *Lantana camara* L. rubbed on the whole body in case of snake bites; crushed leafs of *Cissus quadrangularis* L. rubbed into the whole body to treat an illness called Anasarea (a kind of dropsy) (Schumacher, 1827).

Dropsy is also treated with other mixtures containing *A. melegueta*; seeds are finely ground together with the root of *Ipomoea mauritiana* Jacq. and mixed with water for drinking and rubbed over the whole body; seeds are crushed along with *Phyllanthus amarus* Schumach. and Thonn. and rubbed over the whole body (Schumacher, 1827).

Other mixtures of *A. melegueta* are: seeds are finely grated along with root bark of *Zanthoxylum zanthoxyloides* (Lam.) Zepern. and Timler. and rubbed on the painful place in gout-pains; seeds are pounded with leaves of *Solanum americanum* Mill. and used as an ointment for rheumatic pains; seeds are chewed together with leaves of *Byrsocarpus coccineus* Schumach. and applied to a poisonous snakebite; seeds in a decoction together with leaves

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