



Sensory Evaluation of Dawa Dawa Produced By the Traditional Fermentation of African Yam Bean (*Sphenostylis Stenocarpa* Harms) Seeds

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ABSTRACT: Dawa dawa condiment was produced by traditional fermentation of African yam bean and soybean seeds. Processed substrates were incubated for 72 hr at room temperature in earthen pots lined with washed fresh banana leaves. Samples of African yam bean dawa dawa (AYBD) were comparatively evaluated with African locust bean dawa dawa (ALBD) sample and two types of soybean dawa dawa samples that were prepared following the procedures used by rural women in Kaduna State (KAFD) and Benue State (BEND). The sensory parameters measured were appearance, aroma, taste, and overall acceptability. KAFD was most significantly ($p = 0.05$) preferred in appearance and taste with scores of 6.4 and of 8.3 respectively. This was followed by AYBD, ALBD and BEND samples, respectively. The panelists highly and equally accepted all four types. The acceptability scores were 7.3, 7.4, 7.1, and 7.3 for ALBD, BEND, KAFD, and AYBD, respectively. Freshness of AYBD samples were lost after 3 days under refrigeration condition ($4\pm 2^\circ\text{C}$) but all the sun-dried condiment samples were preserved for at least 6 months at room temperature ($29\pm 2^\circ\text{C}$). @ JASEM

The stable diet among low-income groups in tropical Africa is usually a mixture of cereals or starchy foods and grain legumes. Sometime other protein-rich seeds are often included. The legumes and protein-rich seeds are added as supplement to high protein foods of animal origin, which are too expensive for the majority of the low-income earners. In Nigeria, the most popularly consumed protein-rich foods include cowpea (*Vigna unguiculata*), groundnut (*Arachis hypogea*), melon (*Citrullus vulgaris*), African oil bean (*Pentaclethra macrophylla*), and African locust bean (*Parkia biglobosa*). The majority of these legumes are cultivated in the Guinea savanna ecological zone.

The African yam bean (*Sphenostylis stenocarpa*) which is well adapted to lowland tropical agro-ecosystems is not as popular as the different varieties of cowpea that are sold in the local markets and is consumed only when the prices of other legumes are prohibitive (Nwokolo 1987). Nutritionally, African yam bean (AYB) is reported to have a total seed protein of 19 to 29% (Ezueh 1984, Nwokolo 1987, Ofuya *et al.* 1991). The crop is not extensively utilized due to its characteristic hard-to-cook phenomenon. Recent increase in the cost of domestic cooking fuel further limits its use in the preparation of meals.

Efforts aimed at providing alternative methods of utilization of the yam bean have resulted in the development of a cheese-like food (Ofuya *et al.*, 1991), tempeh (Njoku *et al.*, 1991), and AYB flour (Eke and Akobundu, 1993, Ene-Obong and Obizoba 1996). Some of these products may have limited use in Nigeria e.g. tempeh which is traditionally an oriental food. In this study, African yam bean seeds were fermented to produce an indigenous dawa dawa con-

diment and its sensory characteristics compared with that of dawa dawa produced from African locust bean and soybean seeds. Indigenously fermented condiments and foods such as dawa dawa, ogiri, and ugba are more widely used and sold.

MATERIALS AND METHODS

Source of legume seeds: Dry seed samples of soybean var. Malayan and AYB var. light grey, were purchased at a local market in Port Harcourt, packaged in polyethylene bags during purchase and stored at room temperature until needed.

Processing of legume seeds: Twenty-five grams of each seed lot was hand sorted to remove stones and debris. Each type of legume seeds was processed by four different methods. Fig. 1 shows the four methods used in the processing of soybean seeds to produce the processed substrate. Methods 3 and 4 of Fig. 1 are the methods used by rural women from Benue State, and Kaduna State, respectively. Flow diagram for the processing of the AYB samples is shown in Fig. 2. Four different methods were also used to process the AYB seed samples prior to fermentation.

Fermentation: The processed substrates were fermented using the traditional procedure described by Popoola and Akueshi (1985), which is outlined in Fig. 3. Processed substrates were transferred to washed earthen pots previously lined with a layer of washed, fresh banana (*Musa sapientum* L) leaves. Another layer of washed, fresh banana leaf was used to cover the substrate after which each pot was covered with an earthen lid. Substrate preparation and fermentation activities were carried out under rural domestic conditions using the facilities of a Benue State dawa dawa producer.

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Storage and shelf life: Dawa Dawa samples were stored at room temperature and in the refrigerator ($4^{\circ} \pm 2^{\circ}\text{C}$) in order to monitor the change in the presentation of the products. Fresh samples were observed for onset of spoilage indicated by production of offensive odour, change in appearance and maggot infestation. To ascertain the keeping time of the dehydrated condiment, samples were sun-dried and stored for at least 6 months at room temperature ($29^{\circ} \pm 2^{\circ}\text{C}$).

Sensory evaluation: Sensory tests were carried out on products that were characteristic in aroma and appearance and comparable to the commonly sold dawa dawa condiments. They were obtained using methods 3 and 4 as shown in Fig.1 and Method 4 in Fig. 2. Okro (okra) soup containing African yam bean dawa dawa (AYBD) condiment was comparatively evaluated with soups containing soybean dawa dawa (BEND, KAFD) or African locust bean dawa dawa (ALBD). The ALBD was purchased from a local producer. The soup recipe is listed in Table 1. The control soup contained ALBD. Sensory analyses were performed using a panel of 10 judges, five male and five female whose ages were between 23 and 30 years. They were students of the Department of Microbiology, University of Port Harcourt. A 9-point hedonic scoring scale in which 9 corresponded to like extremely and 1 to dislike extremely (Njoku *et al.*, 1991) was used to assess four attributes: appearance, aroma, taste and acceptability. Data were subjected to analysis of variance ANOVA) and significant differences at the 5% level of probability were determined using Tukey's test.

RESULTS AND DISCUSSION

Of the several methods used to process soybean and AYB seeds, only three methods yielded characteristic dawa dawa products. Unsatisfactory products had offensive smell, rotted unattractive appearance, sometimes hard and often variable in texture and colour. The satisfactory products hereafter referred to as BEND for Benue State dawa dawa (Fig. 1, method 3), KAFD for Kaduna State soybean dawa dawa (Fig. 1, method 4), and AYBD for African yam bean dawa dawa (Fig. 2, method 4). The AYBD had a milder aroma. Fresh dawa dawa products stored at room temperature were highly perishable with BEND showing the most pronounced signs of spoilage with a rapid onset of loss of fresh appearance, production of offensive odour, and maggot infestation. Shelf life was extended at refrigeration temperature with KAFD having the longest shelf life of 5 to 6 days. BEND and AYBD retained their freshness in the refrigerator for 3 to 4 days. After sun drying, the three

types of dawa dawa were stored for six months without change in appearance and aroma.

Fig. 4 shows the sensory evaluation of the four types of dawa dawa viz.: African locust bean (ALBD, control), soybean KAFD, soybean BEND and African yam bean (AYBD). The scores for appearance and aroma were similar in trend, with KAFD being the most desirable in appearance and aroma. This was followed by AYBD, ALBD, and BEND, respectively. For the four condiments, there was no significant difference in taste and overall acceptability. In addition, all the soup formulations were highly and equally acceptable, although it was observed that the Southerners in the panel preferred the African yam bean dawa dawa soup. In general, BEND was consistently given the least rating by the panel of judges. The dawa dawa produced from African yam bean was highly desirable in appearance, aroma, taste and overall acceptability thus indicating that it could compete favourably with other types of dawa dawa that are sold locally. It was also more appealing to Southerners in the sensory panel that may have a natural affinity for meals prepared from the yam bean, since the crop is cultivated in the southern agro-ecological zone.

Although the seeds for the yam bean are hard to cook and dehull, previous studies have shown that boiling with potash (*kaun*) reduces cooking time (Njoku *et al.*, 1989), hence the addition of potash during boiling increased its softness and reduced its cooking time. Mashing the cooked yam bean seeds before fermentation resulted in exposure of the cotyledons to the microorganisms involved in fermentation since the seed were not previously de-hulled. This step in the treatment enabled the microorganisms, especially bacteria, which previously have been implicated in different yam bean fermentation (Njoku *et al.*, 1991) to readily act on the substrate. The microorganisms involved in the traditional fermentation were natural inoculants from the air, banana leaves, and utensils used during preparation of the substrate. We have monitored the microbiological changes during fermentation and noted that pathogenic staphylococci and coliforms were absent throughout the fermentation process. Besides, studies on the nutritive changes occurring during natural fermentation showed an increase in the digestibility and nutritive value of the fermented beans (Wokoma and Aziagba 2001). The ease with which the African yam bean dawa dawa was produced, coupled with its sensory acceptability indicates that the bean could serve as a raw material source for the cottage industrial production of dawa dawa. The seeds are readily available and could increase the raw material base for dawa dawa production. In Nigeria, commercially produced "daddawa" cubes are widely sold and accepted.

Table 1. Quantities of ingredients used for the preparation of okro (okra) soups seasoned with different dawa dawa condiments.

Ingredients	Formula (g)
Beef	1000
Okro	5
Green vegetable	3
Ground ogbono seed	10
Onion	4
Ground dry pepper	2
Palm oil	2 Tablespoons
Ground dry shrimps	5
Dawa dawa	4
Water	600 ml
Salt added to taste	

CONCLUSION

Dawa dawa was produced by natural fermentation under local domestic conditions, using African yam bean as fermentation substrate. It can be concluded from this study that African yam bean dawa dawa would readily gain acceptance, especially in southern Nigeria, where the legume is produced and widely consumed. It is also evident from this study that the African yam bean is a suitable substrate and raw material base for the production of dawa dawa in the cottage industry. Although the samples lost freshness after three days under refrigeration conditions, the sun-dried condiments were preserved for up to six months at room temperature and moisture conditions characteristic of the humid tropics.

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