

## Studies on Fermentation of African Locust Beans (*Parkia biglobosa* L.) for the production of Food Tasty Condiment (Daddawa)

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Received: January 08, 2019, Accepted: February 24, 2019, Published: February 23, 2019.

### ABSTRACT:

African Locust Bean (*Parkia biglobosa*) is among the leguminous plants used by man particularly in some African countries for the production of local condiment. Samples of locust bean were fermented under laboratory conditions to produce condiment by using cultures of *B. subtilis*, *B. licheniformis* and *M. varians* that were previously isolated from locally fermented daddawa. The isolates were prepared at various concentrations of 0.2, 0.5 and 0.8 respectively. The pH and temperature were recorded at twelve hour interval. Fermentation has occurred in all the concentration of inoculum used as starter culture. Best fermentation with right organoleptic properties (aroma/flavor) was achieved in all the concentration used in the fermentation. The consortium of three isolates yielded best result in the laboratory fermentation.

**Keyword:** Fermentation, African Locust Beans, Condiment, and Bacterial isolates,

### INTRODUCTION:

African Locust Bean (*Parkia biglobosa*) is among the leguminous plants used by man particularly in some African countries for the production of local condiment. Fermentation is one of the oldest methods of food preservation known to man. In Nigeria and most African countries, condiments such as fermented locust bean (Iru), fermented melon seed (Ogiri), fermented bambara seed (Daddawa), fermented cotton seed (Ogiri) and fermented pigeon pea were widely used to season food. The production of condiment is largely on a traditional small-scale, household basis under highly variable conditions contact with appropriate microorganisms at the ambient temperature of the topics. Appropriate starter cultures are widely applied as inoculants across the fermented food sector, from the household to industrial level in low-income and lower-middle-income economies [1]. These starter cultures are generally produced using a backslipping process which makes use of samples of a previous batch of a fermented product as inoculants [2]. Appropriate starter cultures are widely applied in the production of fermented fish sauces and fermented vegetables in Asia and in cereal or grain fermentations in African and Latin American countries. The inoculation belt [2] used in traditional fermentations in West Africa serves as a carrier of undefined fermenting micro-organisms, and is one example of an appropriate starter culture. It generally consists of a woven fibre or mat or a piece of wood or woven sponge, saturated with "high" quality product of a previously fermented batch. It is immersed into a new batch, in order to serve as an inoculant.

It has been suggested that even though hitherto most fermentation processes used in developing countries do not use inocula or extrinsic cultures, these processes could be improved by using starter cultures, and also by back-slopping, which entails application of brine from prior fermentation cycles [2, 3]. This study was therefore undertaken to investigate the effects of different concentration of culture starter isolates in the fermentation of African locust bean seeds in relation to the temperature and pH.

### MATERIALS AND METHODS

#### Sample Collection

African locust bean seeds (*Parkia biglobosa*) were obtained from Sokoto Central market. The seeds were authenticated at Herbarium of Biological Science of Usmanu Danfodiyo University, Sokoto and assigned the Number: UDUH/ANS/0184. The samples were taken to Postgraduate laboratory, Department of Microbiology, Usmanu Danfodiyo University, Sokoto for Analysis.

#### Laboratory Fermentation of African Locust Bean

The dried seeds of African locust bean were cooked in a pressure pot for 2hours and the swollen seeds were rubbed in between palms to remove the testa, the hard seed was removed during washing. The cotyledons was boiled for another 30minutes and drained in a sieve. Fifty (50g) grams of boiled dehulled seeds were weighed into small plastic buckets with air tight cover and sterilize at 121°C for 15minutes, and was allowed to cool down. 0.5ml of the starter cultures (both singly and in consortium) was added to the cooked beans. The beans were incubated at 37°C for 40hours. The experiments were carried out in triplicate [4].

#### Preparation of Inoculum

The organisms used as starter cultures were *Bacillus subtilis*, *Bacillus licheniformis* and *Micrococcus varians*. The selected microorganisms were grown in nutrient broth for 24hours. After incubation, 0.1ml each of broth culture was placed on appropriate agar plates using the pour plate technique to determine cell concentrations.

Broth cultures containing approximately the same concentration of viable cells in the range of 10<sup>5</sup> were centrifuged at 4000rpm for 10 mins, washed in sterile distilled water and centrifuged again. The turbidity of the cells was compared with Mcfarland standard of 0.2, 0.5 and 0.8 concentration.

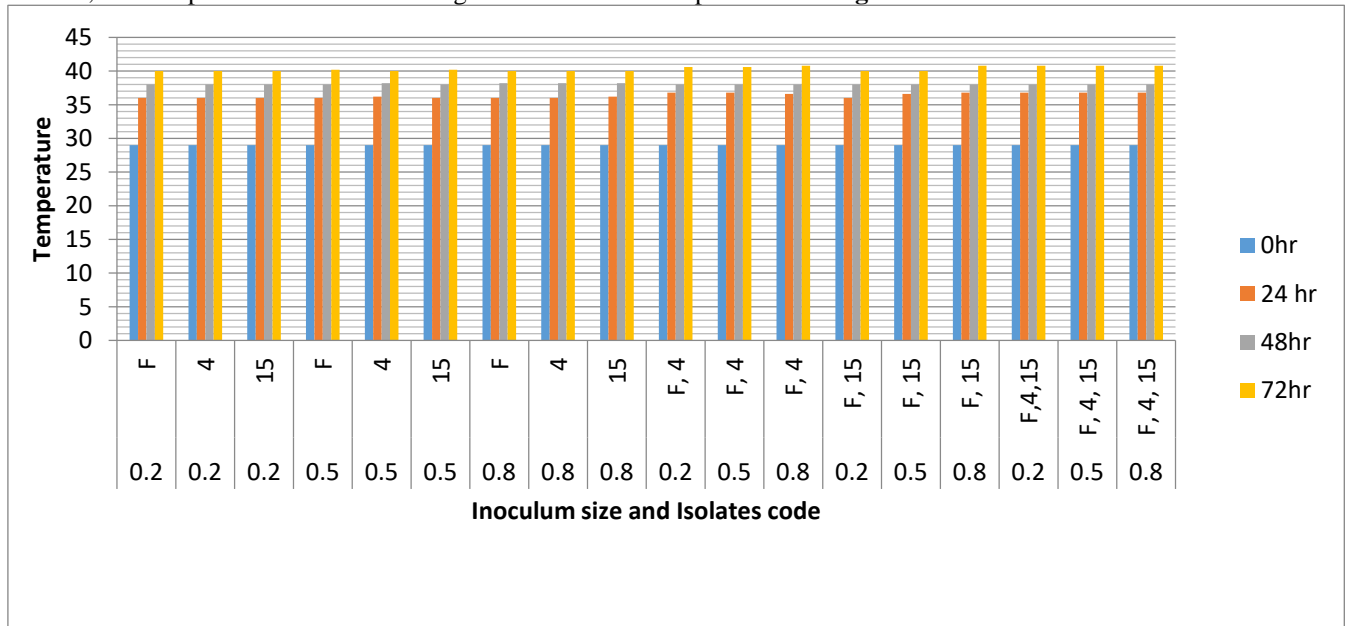
The cells were then used as inoculum, singly and as mixed combinations in the laboratory fermentation of African Locust Beans.

## RESULTS

Fermentation of tasty food condiment (Daddawa) from African Locust Beans (*Parkia Biglobosa*) on the effects of inoculum size in the analysis of the pH and temperature, the results shows that temperature changes during the fermentation of the various seeds using the bacteria isolated previously as inoculum, the temperature increased during the fermentation

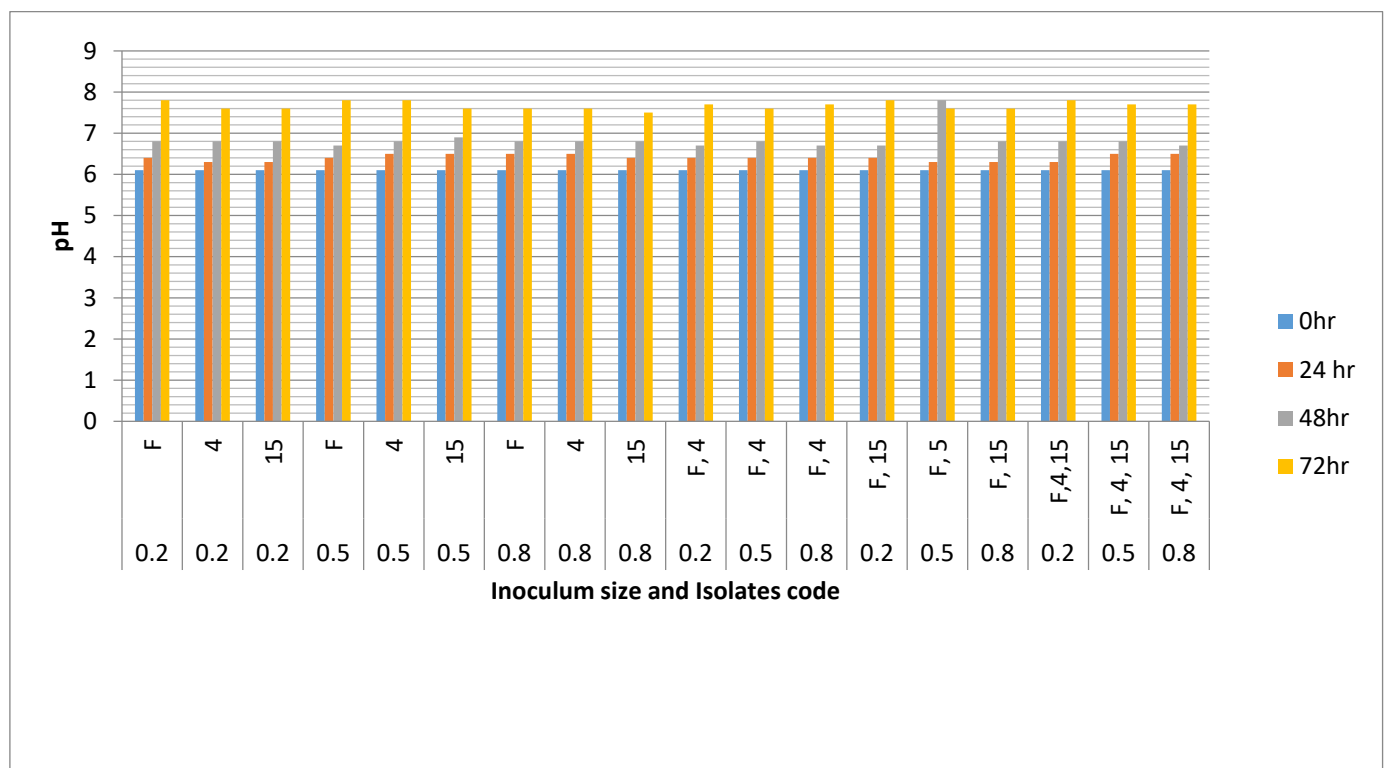
period with an initial temperature of 29<sup>0</sup>C to 40.8<sup>0</sup>C after 72 hours. The result is presented in **Figure 1**.

Similarly, the pH profile during the fermentation of African Locust Beans (*Parkia Biglobosa*) using bacteria isolated previously as inoculums, the pH value move slightly acidic to neutrality during the fermentation period. The result is presented in **Figure 2**.



**Figure 1:** Temperature changes during fermentation of *Parkia biglobosa*

Key: F= *Bacillus subtilis*, 4 = *Bacillus licheniformis*, 15 = *Micrococcus varians*



**Figure 2:** pH changes during fermentation of *Parkia biglobosa*

Key: F= *Bacillus subtilis*, 4 = *Bacillus licheniformis*, 15 = *Micrococcus varians*

## DISCUSSION

Tasty Food Condiment (Daddawa) was produced from the laboratory fermentation of African locust beans (*Parkia biglobosa*), after 72 hours of fermentation; the mash became

soft and dark with a strong ammonical odour. The organism growing in the fermenting daddawa produced a whitish mucilaginous substance that covered and linked the individual cotyledons during fermentation. The increase in temperature

during fermentation agrees with report of Jonathan *et al*, [5], which showed significant increase in the temperature of the fermenting mash from an initial temperature of 28<sup>0</sup>C to around 30<sup>0</sup>C at the 96h during the spontaneous fermentation of Bambara nut to produce Iru. The change in pH in the fermenting daddawa varied. This result is in agreement with result of Odunfa [6] who reported an increase in pH from the beginning to the end of fermentation. This result also agree with the result of Omafuvbe [7] who reported an initial pH of 6.50 – 6.55 which increased to between 7.50 – 8.00 after 72 hours of fermentation, but the result disagree with that of Jonathan *et al.*, [5] who reported that the PH decreased from 6.7 at oh to 4.4 at the end of fermentation of bambra nut for the production of Iru. The result disagree with that of Jonathan [5] who reported that pH decreases from 6.7 at oh to 4.4 at the end of fermentation of bambara nuts for the production of Iru, the result of Ibrahim *et al.*, [8] who reported an initial pH of 8.10 which decreased after second fermentation to 7.63 in production of daddawa botso. The result of inoculum size used in laboratory fermentation of the seeds shows that in all the concentration of the microorganisms (inoculum size) used (both singly and consortium), fermentation has taken place. But the best fermentation with right/best organoleptic properties (aroma/flavor) was achieved in all the concentration/organisms used in the fermentation, this also explain the reason why daddawan botso was used as starter culture in local fermentation of *parkia biglobosa* seeds. Another reason is *B. spp* spores are resistant to high temperature and pressure even after long cooking to soften the seeds, and autoclaving to sterilize the seeds. And also the consortium of three (3) organisms yielded best result in the fermentation of *Parkia biglobosa*.

## CONCLUSION

Tasty Food Condiment (Daddawa) was produced in the laboratory from African Locust Beans (*Parkia Biglobosa* L.) using Bacterial isolates through single and mixed cultures of *B. subtilis*, *B. licheniformis* and *M. varians*. Increased in pH and temperature throughout the fermentation was observed. Best

fermentation was achieved using both single and mixed cultures of isolates; since ‘Dawadawa’ could be considered as an affordable fish or meat substitute particularly for low income earners in developing countries such as Nigeria. There is need to developed standard Biotechnological protocols in the fermentation process for microbiological safety and nutritional quality of the condiments.

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**Citation:** Shahida Adamu Ahmad *et al* (2019). Studies on Fermentation of African Locust Beans (*Parkia biglobosa* L.) for the production of Food Tasty Condiment (Daddawa), J. of Advancement in Medical and Life Sciences. V7I2.05. DOI: 10.5281/zenodo.2577164.

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