Proximate and Antinutrient Composition of Iru Produced from African Locust Beans and Soybeans Using *Bacillus subtilis A2 as* Starter Culture

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***Abstract*:-African Locust beans seeds (*Parkia biglobosa*) and soy bean seeds (*Glycine max*) were fermented into iru and soy iru using *Bacillus subtilis* A_2. The proximate and the antinutritional composition of the results obtained for the fermented iru and soyiru are as follows: Fibre (9.8 and 12.26%), Fat (19.6 and 13.62%), Moisture (11.24 and 8.6%), Protein (32.2 and 44.70%), Ash (2.6 and 3.69%) and Carbohydrate (24.56 and 20.82%). The anti-nutrient results showed that tannin ranged from (2.3 and 0.66g/100g), phytate (5.96 and 12.62g/100g), oxalate (3.46 and 1.081g/100g), flavonoids (6.09 and 2.09g/100g) and saponin (1.69 and 1.23g/100g) for the iru and soyiru respectively. It can therefore be concluded that the use of *Bacillus subtilis* A_2exhibit potentials of a starter culture in the fermentation of African locust bean and soy bean to produce iru and soyiru.**

I. INTRODUCTION

In Nigeria, soybean is fermented to make soy-dawadawa, a soup condiment and it is also used to make incursion into the diet of many Nigerians, particularly children and nursing mothers (Afolabi, *et al.,* 2016). Soybean seed in rich in plant protein. Soyiru (soy dawadawa) is a food flavouring condiment prepared by fermenting whole beans, it is widely consumed by people of Benue and Plateau states of Nigeria and its consumption is newly extending to the southern part of Nigeria. According to Afolabi and Adewolu (2014), locust beans (*Parkia biglobosa*) has been a traditional raw material for the production of iru, however, emphasis has been shifted to the use of soybeans (*Glycine max*) as a substitute.

The preparation of both soybeans and locust beans condiments involve the natural fermentation of the dehusked cooked seed as explained by Amoa, Awua *et al.,* (2006). Omafuvbe and Abiose (2003) have described the traditional method of preparing soy-iru. The products from such fermentation is sticky with a strong ammonia smell (Ogbadu and Okagbu, 1986). (Farinde *et al*., 2007) explained that Soy-iru (soy dawadawa) is a flavouring condiment prepared by fermenting whole soybeans. It is widely consumed by people of Benue and Plateau states of Nigeria and consumption is newly extending to the southern part of Nigeria. (Anthai and Ibrahim 1986), described fermentation as a complex chemical transformation of organic substances brought about by the catalytic action of enzymes either originally present or secreted extracellularly by the microorganisms fermenting the material. The microbiology of fermentation and some biochemical changes occurring (Odunfa,1985). Fermentation is a proven method to improve flavour, texture and nutritional quality of soybeans.

Besides bringing physicochemical and sensory quality changes, fermentation contributes towards the preservation of food due to release of metabolites that discourage the growth of pathogenic bacteria in foods. Fermentation involves a range of microorganisms such as lactic acid bacteria, acetic acid bacteria, yeasts, moulds and a range of bacteria. It also covers wide range of products such as staples, adjuncts to staples, condiments and beverages that use substrates such as cereals pulses, soybeans, flowers, milk, meat etc, (Tamang and Sarkar, 1988). Tamang and Sarkar (1988) further stated that *Bacillus spp*.is the most dominant naturally fermenting agents in soybeans. These hydrolytic bacteria are associated with utilization and reduction of indigestible oligosaccharide and polysaccharides. The organism has also shown to reduce the activity of anti-nutrients that hinder availability of proteins and phytochemicals present in soybeans.*B subtilis* fermentation is accompanied by covering intact granules with white coloured viscous substance, slimy appearance, softer texture, and unique rotten flavour. It also completely removes the beany odour of the raw soybeans and increases sensory quality of the product (Hu *et al.,*2010). This work was carried out to compare the proximate and antinutrient composition of iru produced from African locust beans and soybeans using *Bacillus subtilis A2*starter culture.

II. MATERIALS AND METHIODS

Source of Material : The African locust bean seeds (*Parkia biglobosa*) and soybean seeds (*Glycine max*) were purchased from Oba market in Owo, Ondo State. They were collected in sterile container/polythene. Pure culture of *Bacillussubtilis* A_2 was obtained from the Department of Microbiology,Ekiti State University, Ado Ekiti.

Preparation of Starter Culture: The starter culture was prepared by inoculating the *BacillusSubtilis* A_2 on nutrient Agar (NA) plate from the stock and the plate was incubated at 37^0C for 24hours.

Laboratory Preparation of Iru from African Locust Bean Seeds and Soybean Seeds using Bacillus substilis A_2 : The dried seeds of Soybean and African Locust bean were processed by adopting the method of (Ikenebomeh and Kok, 1984).

Proximate Composition: The proximate composition of the fermented samplewas determined using standard procedures of AOAC (2000). The parameter determined were protein, ash, crude fibre, fat and carbohydrate.

III. RESULTS AND DISCUSSION

Table 1: Proximate Composition of iru produced from Locust bean and soybean with *Bacillus subtilis* A_2.

Samples	Protein	Fibre	Fat	Ash	Moisture	Carbohydrate (by difference)
A^{iru}	32.2	9.8	19.6	2.6	11.24	24.56
$B^{soybean}$	44.70	12.26	13.62	3.69	8.6	20.82

A^{iru}: Iru produced from Locust bean

$B^{soybean}$: Iru produced from soybean

Table 2: Anti-nutrient Composition of iru produced from African Locust bean and Soybean with *Bacillus subtilis* A_2.

Samples	Tannin	Phytate	Oxalate	Flavonoids	Saponin
A^{iru}	2.3	5.96	3.46	6.09	1.69
$B^{soybean}$	0.66	12.62	1.081	2.09	1.23

A^{iru}: Iru produced from Locust bean

$B^{soybean}$: Iru produced from soybean

The Tables 1 and 2 showed the results of the proximate and anti-nutrient composition of African Locust bean (iru) and soyiru fermented with Bacillus subtilis A_2. The moisture content of the fermented iru (11.24%) was higher than that of the soyiru (8.6%), the increase in the moisture content of the fermented iru may be due to the addition of water during cooking and washing of the cotyledon.It may also be due to the activity of the fermenting organisms on the substrate, this result is in agreement with the result of (Omafuvbe *et al.*, 2004) while carrying out similar research on African Locust bean and melon. Protein was found in high level in the fermented soyiru (44.70%) than the iru (32.2%), thehigh protein content in these condiments could be a good and cheap source of dietary protein where animal proteins are presently highly unaffordable to many of the populace. The ash content of the iru (2.6%) was low than that of the soyiru (3.69%), the decrease in the ash content of the iru may be due to lost in ash because of the leaching of the solute inorganic salt into the processing water during the boiling of the bean. The fat content of the iru (19.6%) was high than that of the soyiru (13.62%),the increase in fat content of the fermented iru product may be attributed to increase activities of lipolytic enzymes, which hydrolyze fat to glycerol and fatty acid, similar observations were reported by (Obizoba and Atii, 1991). There is a significant difference in the fibre of iru (9.8%) and soyiru (12.26%). There is also a significant difference in the carbohydrate of the iru (24.56%) and the soyiru (20.82%) respectively, the reduction in the total carbohydrate content of fermented product could bebecause of the utilization of some of the sugars by fermenting organisms for growth and metabolic activities.

The level of anti-nutrients in the produced iru and soyiru are shown in the table 4.2. The phytate content of the condiments ranged from (5.96g/100g) and (12.62g/100g) for the iru and the soyiru respectively, the phytate content is seen to reduce with fermentation and further reduction is expected with cooking. The oxalate valves for the fermented iru, soyiru was found to be (3.46g/100g), and (1.081g/100g) respectively, oxalate reduces calcium availability both in man and in non-ruminants at higher dose. The tannin content of African iru and soy iru are (2.3g/100g) and (0.66g/100g) respectively. Flavonoid had high valve in iru (6.09g/100g) compared to soyiru which has a low valve (2.09g/100g), it prevents oxidative cell damage, have strong anti-cancer activity and protect against the different level of carcinogenesis. The saponin contents are (1.69g/100g) and (1.23g/100g) for iru and soyiru respectively, the saponin serves as natural antibiotics, helping the body to fight infections and microbial invasions, and this is in agreement with the work of (Okwu,2004; Okwu and Emenike, 2006).

IV. CONCLUSION

From this research, it has been confirmed that *Bacillus subtilis* A_2 can be used as a starter culture in the fermentation of African Locust bean and soybean to produce iru and soyiru. The use of *Bacillus subtilis* A_2 increased percentage protein ofiru and the soyiru that makes it an excellent diet supplement

and can be used to combat malnutrition. The use of starter culture also improved the safety and consistency of the locust (iru) and the soyiru. Soybean could be used as an alternative to *Parkia spp*. traditionally used for iru production and thus eliminating the laborious dehulling and the time needed to ferment *Parkia* seed to iru.

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