

## POSTHARVEST LOSSES AND RECENT TRENDS IN THE PRODUCTION AND UTILISATION OF ACHA (*Digitaria exilis*): A REVIEW

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### ABSTRACT

*Acha (Digitaria exilis) is a grain which is indigenous to African continent. It is part of the culture of people of Africa but despite its importance, knowledge on Acha remains scanty even within West Africa (its ancestral home). Acha is one of the best tasting and nutritious grains in the world. This review focuses on Agronomy, species, structure, food uses, nutritional composition and postharvest losses of Acha from the literature. Recommendation on developing new and convenient food products from acha has been made.*

**KEYWORDS:** *Acha, cereals, endosperm, grains, malnutrition, postharvest.*

### INTRODUCTION

Cereals are defined as the fruits of cultivated grasses members of the monocotyledonous family *Gramineae*. The principal cereal crops are wheat, barley, oats, rice, maize, sorghum and millet (Kent, 1984). Beside these major cereals, there are other minor cereals of which Africa is home to dozens of them and they include *Acha*, finger millet, Teff, African rice etc. Cereals have been important crops which contributed in no small measure to the development of modern civilization (Kent, 1984).

The long term malnutrition problems of poor nations will not be solved by food aid through foreign intervention but rather by dramatic improvements of indigenous food production capacity (Ihekoronye and Ngoddy, 1985). Increasing dependence on cereals as major sources of energy and dietary proteins has necessitated the need to ensure improved production and utilization of these food crops. This can only be achieved when basic information on the cultivated cereals is available (Ihekoronye and Ngoddy, 1985).

Each year West African farmers devote between 300,000 to 380,000 hectares of land to cultivation of *Acha* (National Research Council, 1996; FAOSTAT, 2003 and Crutz, 2004) with an output of 250,000 tons of grains annually supplying food to 3 - 4 million people. But despite its ancient heritage and widespread importance; knowledge on *Acha's* origin, distribution and genetic diversity remains scanty even within West Africa. Part of the reason is neglect of the plant by scientists and the misleading term 'hungry rice'. This has begun to change as African scientists have picked interest in their indigenous crops and reports are emerging in scientific publications (Philip and Itodo, 2006; Dachi and Gana, 2008; Ogbonnoya and Abdulkadir, 2008 ; Ogbonnoya and Ismail, 2009; Ayo *et al.*, 2010; Olapade *et al.*, 2011; Philip and Atiko, 2012).

*Acha* is one of the world's best tasting and nutritious cereal grains (NRC, 1996; Dachi and

Gana, 2008). The grains are rich in Methionine and Cystine and this combination could be of outstanding future importance as Ayo and Nkama (2006) noted that *Acha* grains could not simply be ignored due to its high nutritional value. There are two distinct species of *Acha* (the white and black) and of the two species white *Acha (Digitaria exilis)* is the most widely used from Senegal to Chad and it is grown particularly on the upland Plateau of Central Nigeria as well as other neighboring regions. The other species black *acha (Digitaria iburua)* which is otherwise called *Iburo* in Hausa language is restricted to Jos-Bauchi Plateau as well as some regions of Togo and Benin Republics. However its restricted distribution and dark colour should not be taken as a measure of relative inferiority in fact black *Acha* may eventually have more nutrients than white *Acha* (NRC, 1996).

#### **Agronomy of Acha**

*Acha* can be grown on poor, sandy or ferraletic soils that cannot support the growth of any other cereal crop. The seeds are normally broadcasted and covered by hoeing. It germinates in 3 - 4 days and grows rapidly. This quick establishment and heavy seed rate necessitates frequent weeding (NRC, 1996).

#### **Description of Acha**

The two species of *Acha* are both erect and free tillering annuals. White *Acha* is usually 30 - 75cm tall and its finger shaped panicle has 2.5cm slender recemes up to 15cm long. The black *Acha* on the other hand is taller and may reach 1.4m and it has 2 - 11 sub digitate recemes up to 13cm long. Although both species belong to the same genus cross breeding them seems unlikely to yield fertile hybrids, as they come from different species of the same genus. *Acha* is grown as a cereal throughout the Savannah zone from Senegal to Cameroon. It is one of the chief foods of Guinea Bissau, and it is also intensively cultivated and is the staple of many people in northern Nigeria. *Acha* is not grown for food outside West Africa (NRC, 1996).

### Nutritional Composition of *Acha*

In gross nutritional composition, *acha* differs little from wheat. The husked grain of white *Acha* contained 8% protein and 1% fat while black *Acha* contain 11.8% protein and the difference lies in the amino acid content of the two species. In white *Acha* sample, the protein contained 7.3% methionine plus cystine. The amino acid profile compared to that of whole egg protein showed that except for the low score of 46% lysine, the other scores were high: 72 for Isoleucine; 90 - 100 for valine, tryptophan, threonine and phenylalanine; 127 for leucine, 175 for total sulphur and 189% for methionine. This last figure means that *Acha* protein contains almost as twice methionine as egg protein contains. Thus *Acha* has important potential not only as survival food

but also as a complement for standard diets (NRC, 1996). Ogbonnoya and Abdulkadir (2008) have comprehensively reported the proximate composition of the two Nigerian species of *Acha*.

### The structure of *acha* grain

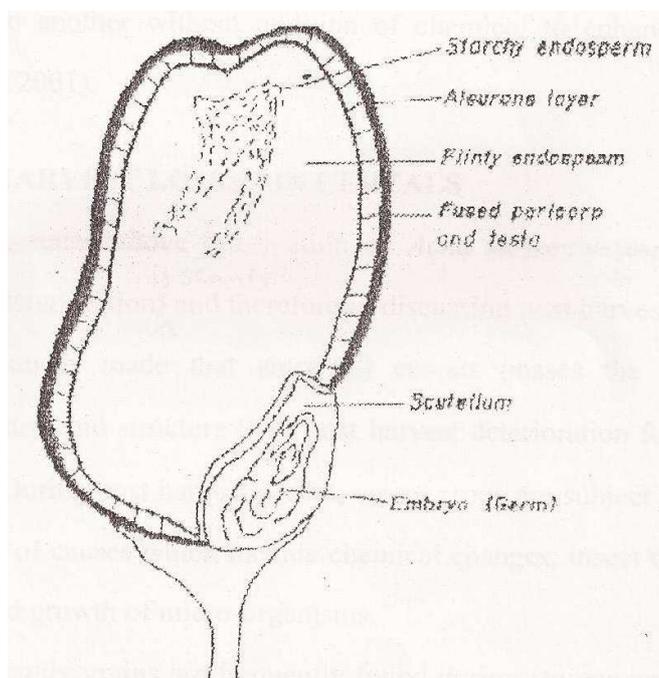
The structure of all cereal grains is basically similar differing from one cereal to another only in detail (Kent, 1984). The grains are characterized by a large centrally located endosperm which is also rich in protein, a protective outer coat and an embryo or germ. (See fig. 1) grains of maize, millet, sorghum and wheat have naked caryopses while those of rice and *Acha* with coated caryopses have outside the seed coat the fused glumes referred to as the husk (Okoh, 1998).

**Table 1: Nutritional Composition of *Acha***

Components		Essential amino acids	
Moisture	10	Cystine	2.5
Food energy (kcl)	367	Isoleucine	4.0
Protein (g)	9.0	Leucine	10.5
Carbohydrate (g)	75	Lysine	2.5
Fat (g)	1.8	Methionine	4.5
Fibre (g)	3.3	Phenylalanine	5.7
Ash (g)	3.4	Threonine	3.7
Thiamin (mg)	0.47	Tryptophan	1.6
Riboflavin (mg)	0.10	Tyrosine	3.5
Niacin (mg)	1.9	Valine	5.5
Calcium (mg)	44		
Iron (mg)	8.5		
Phosphorus (mg)	177		

Note: Proximate composition is g/100g dry basis, vitamins and mineral composition mg/100g and amino acids g/100g protein.

Source: National Research Council (1996)



**Figure 1: General Structure of a cereal grain**

Source: Okoh, (1998).

### Harvesting and Handling of *Acha*

*Acha* grains are handled in traditional ways where the plants are usually cut with a knife or sickle, tied into sheaves, dried under sun and stored under cover. Good yields of *Acha* are normally 0.6 - 0.8 Tons/ha but more than 1 Ton/ha has been recorded Ogbonnoya and Ismail (2009). Traditionally, the grains are threshed by beating or trampling and it is dehulled in a mortar. These postharvest operations are difficult and time consuming but the grains stores well in local granary called *Rhumbu*. This facility can keep *Acha* grains from one harvest period to another without addition of storage chemicals (Olaoye, 2001).

### Postharvest Losses in *Acha*

Information on *Acha* Postharvest operations are scanty and therefore in discussing postharvest losses of *Acha* assumption is made that since all cereals possess the same chemical composition and structure and therefore their post harvest deterioration follows the same pattern. During post harvest period, cereal crops suffer losses due to a variety of causes which include harvesting and threshing losses, chemical changes, insect damages, rodent attack and growth of micro-organisms etc. Philip and Itodo (2006) have reviewed the various postharvest operations of *Acha*. According to the report almost all postharvest operations of *Acha* are manually done in Africa. The report outlined harvesting and dehulling as the most tedious operations which constitute a major bottle neck in processing and utilization of *Acha* grains.

*Acha* grains according to various reports (NRC, 1996; Philip and Itodo, 2006) stores well in local granaries provided it is dry and the major storage problem are the rodents. Rodents are responsible for large losses of grain. Large numbers of rodents, mainly rats are found in the markets of West Africa, where they feed on the grains and contaminate them, with their feaces and urine. This means that in addition to reduction in quantity, there is also deterioration in the quality of the grain. Poor handling of the grains also leads to spoilage and contamination with dirt. Clearly, the metabolic changes that occur in food crops cause a reduction in their nutrient content and therefore became a loss to the consumer. The growth, multiplication, feeding and other metabolic activities of insects, rodents and micro-organisms also causes losses of valuable nutrients such as protein, carbohydrates and vitamins and usually the food unfit for human consumption. Estimates of storage losses have been put between 10 - 30% in cereal grains (Ayo and Nkama, 2006).

### Food Uses of *Acha*

*Acha* grains is used in a variety of ways, for instance, it is made into porridge and couscous (Fig.2) ground and mixed with other flours to make bread, popped and also used in brewing of beer. It has been described as a good substitute for semolina-the wheat product used to make spaghetti and other pastas (Ayo and Nkama, 2006).

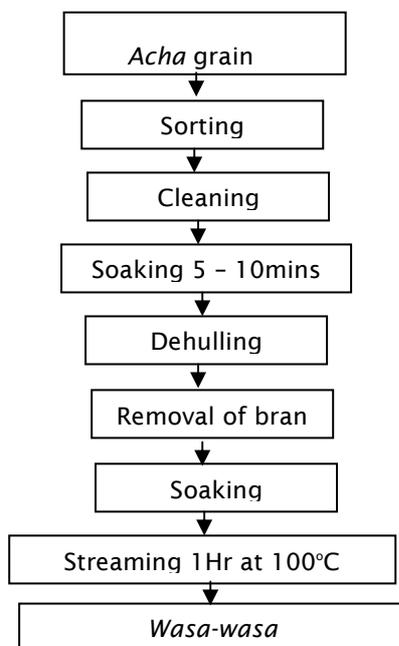


Fig 2: Flow chart for the production of wasa-wasa (a couscous product in Northern Nigeria)

In the Hausa region of Nigeria and Benin, people prepare a couscous product (*wasa-wasa*) out of both types of *acha*. In Northern Togo, the Lambas brew a famous beer (*Tchapalo*) from white *acha* and in the Southern part they prepare *Acha* with beans a dish reserved for special occasions (Okoh, 1998).

*Acha* grains are digested efficiently by cattle, sheep and goats; and it is also valuable for monogastric animals like pig and poultry because of its methionine content. The straw and chaff of *acha* are also fed to animals, they make excellent fodder and indeed the crop is sometimes grown for its hay (NRC, 1996).

#### Recent Trends and Future research in *Acha* Utilization

In recent years the awareness of the importance and nutritional quality of *acha* in the production of convenience foods such as biscuits, cookies, breads, beverages and starch has increased drastically in recent years (Bolaji *et al.*, 1993; Jideani *et al.*, 1994; Olaoye, 2001; Ayo and Nkama, 2003; Ayo and Nkama, 2004; Ayo *et al.*, 2007 and Ayo *et al.*, 2008).

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In Southern Mali, a project backed by Malian Association for the Promotion of the Young (AMPJ) have developed fast cooking *acha* that will challenge parboiled rice and pasta products in Bamako markets. The new 'Instant Fonio' comes in 1 kg plastic bag and is ready for use. It requires no pounding or cleaning and can be used to prepare all traditional dishes (NRC, 1996).

#### CONCLUSION AND RECOMMENDATIONS

From the foregoing it can be seen that *Acha* is one of the small seeded cereals with very good potential to the Africa. All hands must be on deck to enhance the processing and utilization of this indigenous cereal into various value added products.

Proper processing of food is an urgent necessity in Africa. Food Technology must be developed both by the study and improvement of indigenous processing methods and by adoption of modern technological activities that conserve nutrients and preserve food.

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