DEVELOPING DRY MECHANICALLY DEHULLED COWPEA FLOUR

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FLORENCE E. DOVLO
FOOD RESEARCH INSTITUTE
C.S.R.R., ACCRA,

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INTRODUCTION

Cowpeas (Vigna unguiculata) commonly called beans are the most popular leguminous grains used in Ghana. As in many other countries where protein malnutrition is a major problem; the use of legumes as a low cost protein food, is stressed in nutrition programmes. Legumes have appreciable quantities of protein ranging from 20-25gms per 100 gms. However, the quality of legume protein based on its Amino Acid pattern, is low, having a score of 53% compared to 100% for egg. Fortunately, the sulphur containing Amino Acids - methonine, cystine and Tryptophane which are short in legumes, are sufficiently supplied in cereals. Likewise, the Lysine in which cereals are also deficient, is abundant in legumes. Therefore, a combination of these foods supplement each other to provide a good protein diet. A study of our traditional meals indicate various combinations of legumes with cereal foods and the use of legumes as supplement to meat and fish for a variety of meals. Plainly cooked cowpea served with fried oil and gari for breakfast, is a popular meal among workers and school children for its satiety value.

A combination of cowpea with rice is a favourite household as well as a vendor food for lunch. Another popular menu especially among resident students, is a cowpea stew served with fried ripe plantain. Cooked cowpea blended with roasted corn meal and cooked into a thick porridge, is served with meat or fish stew on occasions.

'Akla' is a favourite cowpea snack food, prepared by dehulling the grains and grinding into paste which is whipped and fried in balls. This snack food is also mashed with 'gari' adding oil, pepper and salt and served for breakfast. Other snack foods are combinations of cooked cowpeas and maize and or groundnuts.

Previous studies (3) show that apart from 'Akla', other processed cowpea dishes such as 'Olele', Tubani or Moimoi (steamed cowpea paste) are little known in most parts of Ghana except the North, and need to be popularised.

The consumption of legumes on the whole, has been found to be very low (2) The reasons for the low consumption, even though cowpeas are of relatively low cost, are found to be among other factors, difficulties related to processes that are necessary in preparing some of the delicious and easily digestible cowpea dishes such as Akla, Tubani or Moimoi. The drudgery in removing the

husk from the grains and gridding on stone for home food preparation were mentioned as contraints in frequent consumption of these dishes (2).
In spite of these difficulties, the Ghanaian consumer has a variety of cowpeas to use. These are of varying colours and sizes and different cooking characteristics. Some have good swolling capacity and binding quality, others have colour appeal whilst some are preferred for their taste or quick cooking or ease of manual dehulling for processed foods (3). Cooking tests show that some types of cowpeas take 2-3 hours to cook unless dehulled.(3). Some types have very thick skin coats and cannot be manually dehulled even with long hours of soaking.

Dehulling the grains, is a necessary process for the preparation of some cowpea dishes. Besides, the removal of the hull or seed coat, renders the dish more easily digestible and is known to reduce the incidence of flatulence(1). Traditionally therefore, dehulling of the grains is done through laborious processes of soaking and manually rubbing off and washing to remove the hull. The dehulled grains are then ground into paste for immediate use or dried thoroughly and ground into flour to be conveniently available for later use. The flour is then endowed with properties such as whipping capacity, sponginess and lightness that are preferred for 'Akla'.

Project Objectives

The cowpea project aims at producing cowpea flour by mechanically dehulling the grains in the dry form and thereby eliminating labour and drudgery in home processing of cowpea flour, and preventing microbial contamination during drying.

The ultimate out come of the project is to make cowpea flour readily available for household and commercial uses.

The project was initiated with financial and technical support from the International Development Research Centre (IDRC) of Canada. Its specific objectives were:-

- to develop a standard cowpea flour from suitable cowpea varieties for ready use.
- to evaluate mechanically produced cowpea flour in relation to traditional standards for cowpea flour.

- to evaluate the acceptance of the standardised mechanically milled cowpea flour for traditional food uses and in composite flours and

- to establish facilities to produce cowpea flour in a rural producing area.

A mill consisting of a Cleaner, a Dehuller and Hammer mill was supplied by the IDRC for the project, and was installed at Ohawu Agriculture College, in the Volta Region.

The Cleaner is of a series of cylindrical perforated holes equal to an average size of a cowpea seed.

The Dehuller performs by mode of abrasion and the Hammer Mill has four meshes of dimensions 850,600, 430 and 250 microns, and three screen sizes: 2/64" 3/60" and 4/64".

Preliminary Studies

Studies were undertaken to establish the traditional methods of making cowpea flour. The various methods were classified and coded as SMAD ie. Soaked Manually Dehulled and DMED (L) ie. Wetted Dry Mechanically Dehulled. Samples of these flours were collected for comparative studies on the physical and functional properties of the flour to be developed.

MILLING TRIALS

CLEANING

Quantities of cowpeas purchased from the local market were fed to the cleaner which rejected any stones. Dust was trapped by a cotton wool material over which the cowpea grains flowed, and any metal was attracted by magnet in the cleaner. The end result was cowpea free from dust, weevils, metals and stones. It took on the average ten minutes to clean 100 kilograms of cowpea with an average of 95 per cent recovery of clean cowpeas. (Table I).

MILLING

The Hammer Mill was fitted with three screens of perforations 2/64" 3/64" and 4/64" designated as Fine, Medium and Coarse respectively. The flours from the three screens were accordingly coded DMED (0) ie. Dry Mechanically Dehulled and classified as Fine, Medium and Coarse.

TABLE III

PARTICLE SIZE COMPOSITION OF OHAWU FLOURS AND TRADITIONAL ONES

TYPE	40GG(gm) 475 Mic.	10XX(gm) 129 Mic.	11XX(gm) 117Mic.	12XX (gm) 112 Mic.	Below 122 Mic.
DMED(0) Coarse	36.2	2.4	10.6	29.4	21.8
% Through	64.2	61.8	51.2	21.8	
DMED(0) Medium	32.7	2.1	7.8	32.1	25.1
% Through	67.1	65.0	57.2	25.2	
DMED (0) Fine	26.3	3.9	7.0	39.3	23.3
% Through	73.5	69.6	62.6	23.3	
SMAD (L)	5.8	4.0	56.2	33.4	0.5
% Through	94.2	90.2	34.0	0.6	
DMED (L)	5.3	4.9	56.5	33.0	0.8
% Through	95.2	90.3	33.8	0.8	

PREFERENCE STUDIES

Studies were conducted among Akla processors in nine selected areas to determine which type of the Ohawu flour would be acceptable for Akla. By simply feeling the flour between fingers, the processors were able to tell which one they preferred. The results are presented in Table IV.

TABLE IV

TYPE	OHAWU		ABOR		AKATSI		AGBOZUME		DABALA		HC	KPANDO	NIMA			OSU	AVERAGE
	A	B	A	B	A	B	A	B	A	B	A	A	A	B	C	A	
DMED (O) Coarse	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
DMED (O) Medium	2	2	2	1	2	2	1	1	2	1	1	2	1	2	2	2	1.70
DMED (O) Fine	1	1	1	2	1	1	2	1	1	2	2	1	2	1	1	1	1.29

Scale: 1 = Like very much 2 = Like 3 = Do not like.

DISCUSSION

The predominant particle sizes in the Ohawu mill samples were 112 and 475 microns. The sample DMED (O) medium had equal percentage composition of these particle sizes ie. 32% for both 475 and 112 microns. The DMED (O) Coarse has an increase in the 475 micron particle size above 32 percent, meaning a decrease in the 112 micron percentage. The DMED (O) fine had a composition of 26.3 percent of 475 micron particles and 39.3 percent of 112 micron particles.

The traditionally processed samples ie. DMED (L) and SMAD (L) showed respectively, 5.3 and 5.8 percent of 475 micron particles and 33 and 33.4 percent of 112 micron particle composition. In these samples, the predominant particle sizes were 117 and 112 microns. The manually dehulled flour samples were therefore much finer and smoother than even the DMED (O) fine.

In the preference studies, although the DMED (O) fine, scored highest, the general comment was that it should be a little smoother to achieve the desired quality characteristics of 'Akla'.

In order to make the Ohawu flour comparable to the traditionally processed flour, it is necessary to reduce the 475 micron particle size composition from 32 percent to 5 percent with consequent increase in the 117 micron percentage composition above 55 percent.

As a follow up, then, screening tests will be undertaken using different mesh sizes to investigate which one when fitted onto the medium screen would produce screen flour of comparable texture and particle size distribution to the traditionally processed ones.

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