Farming will never be a success unless the farmer had more voice in the disposal of his produce—P. Morrel.

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# THE PREPARATION IN THE HOME OF INFANT AND INVALID FOODS FROM *CHOLAM*

BY

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Synonyms for *Cholam* (*Andropogon sorghum*).

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| English | .... | *Great millet.* |
| North Indian | .... | *Juar.* |
| Tamil | .... | *Cholam.* |
| Telugu | .... | *Jonna.* |
| Kanarese | .... | *Jola.* |
| Burmese | .... | *Pyoung.* |

Many people are acquainted with products of the types of Benger's Food, Mellin's Food, Horlick's Malted Milk, Grape nuts, Force and Malt Extract. These foods are called infant and invalid foods as they are predigested by a series of chemical and bio-chemical processes in the factory and put up in a form in which they are easily digested and assimilated by infants and people with weak digestive powers. The basis of all these foods is *Malt*, a product usually prepared from Barley, which is not cultivated in South India with the exception of a few acres on the Nilgiris.

To find a substitute for barley for malting purposes, Mr. B. Viswanath, the Government Agricultural Chemist, Coimbatore, conducted a series of researches and in the end proved that cholam can easily replace barley. He prepared and exhibited several kinds of malted foods prepared from cholam at the Industrial Exhibition held at Madras in 1917. As a token of high appreciation of his efforts, his exhibits won a gold medal. He showed it was possible to imitate the various imported malted products like Horlick's Malted Milk, Mellin's Food and Malt Extract. But these investigations were only on the laboratory scale dealing with very small quantities under conditions admitting of strictest control. It remained to be seen whether laboratory experiments could be translated into large scale operations.

In 1922, the Department of Industries, Madras interested itself in the problem of the preparation of malted foods in India and entrusted to Mr. Viswanath the investigation of the possibilities of large scale operations with cholam. This time the scope of the inquiry was limited to (1) the lowering and control of temperature at Coimbatore and (2) successive production of malts of fairly uniform quality from bag-lots of cholam. The experiments were conducted on a semi-industrial scale using lots of 1 cwt. of cholam which could easily be handled by a small factory. The results of these investigations were published in the Report of the Malting of Large Quantities of Cholam, as Bulletin No. 1 of the Department of Industries and Agriculture, Madras.

It has been shown as a result of these experiments that control of temperature is possible even in the hottest part of the year at Coimbatore and that malts of uniform quality can be successfully manufactured from cholam. 100 lbs. of cholam on an average yield 80–85 lbs. of dry malt of which 60 to 65 per cent is capable of being extracted with hot water. Every portion of the malt is capable of being utilised in some form or another. The finished malt is ground into grists and then passed through a sieve. The fine meal that passes through the sieve is easily digestible and possesses high diastasic activity and can enter into the composition of any kind of malted food product. The coarse fraction retained by the sieve when extracted with hot water gives up about 30 per cent of its material as an extractive. This extract still possesses a considerable amount of *diastase*—an active substance responsible for the digestion of starch. It can, therefore, be utilised along with gelatinised starch for the preparation of Malt Extract. The residue, after extraction with water forms a

nutritive food for milch cattle and poultry. Different samples of these products were submitted to the Government Hospital, Royapuram and some were reported upon favourably.

We have so far considered the investigations establishing the possibilities of malting cholam on the laboratory and the semi-industrial scale. Encouraged with the results so far obtained, the attention of the Chemical Research Laboratories at Coimbatore was next directed to the simplification of the different processes and the reduction of them to very simple methods so that each home can prepare its own malt and obtain fresh foods possessing all the qualities attributed to the malted products of the market. Efforts in this direction have been successful. The simple methods so developed, which will be described presently, were demonstrated at the Health Week Exhibition at Madras in 1929. At the request of the London Mission School at Kamalapuram in Cuddapah, another demonstration was held in November 1929, when a few boys were taught the methods of preparing malt and simple malted foods from cholam. As regards the value of cholam malt in breakfast, and for infants and invalids for continuous use, it can best be described by a quotation from Mr. Viswanath's report published in 1925.

'Since the time cholam malt was discovered in 1917, I have been using it for myself and my children and no untoward results have been noticed. In one instance, in the case of a patient in my own household cholam malt was continuously used as the sole food for over two months with considerable benefit to the patient when other foods were out of question. It was also used and is still in use by adults and children among a large number of my friends at the Agricultural College and Research Institute and elsewhere.'

The process of malting may now be described with a brief and simple explanation of the chemical and bio-chemical changes involved therein.

*What is malt?* During the germination of cholam after soaking in water, a series of chemical changes take place resulting in the formation of active constituents called *enzymes* which act on the starchy and proteinous matter of the grain. The result is the production of easily digestible sugars, dextrines from starch and peptones and amino-acids from proteins. Thus the malted grain is not only a product which has already been digested but is one rich in the enzymes which assist the digestion of other foods that might be mixed with it. The active agent or the enzyme 'diastase' is present in considerable quantities in malted cholam. In broad outline,

malting consists of three operations (1) steeping, (2) spreading and (3) drying. These three operations are very susceptible to slight changes especially in temperature. The object of malting is to so regulate the conditions to bring about bio-chemical changes that the largest yield of extract is obtained on putting the malt in hot water.

*Selection of Grain.* The cholam selected for malting should be of a good variety and uniformly big in size. It should germinate up to at least 90 per cent and to ensure this the cholam should not be more than a few months old. Burying for a month or two would not interfere with the germination if the grain is new. In no case should the husk be removed as in that case the grain would never germinate. The grain is well graded by freeing it from weevil attacked or broken grain and foreign matter.

*Steeping.* Convenient lots of cholam, 5 lbs. or about 2 Madras measures are taken in a bucket or any other vessel. Water, preferably drinking water, is poured to a level six inches higher than that of the grain. The lighter seeds and glumes which rise to the surface of the water, are skimmed off. A thorough washing is given by stirring the cholam with a wooden rod. After a short interval, which depends on the external conditions of temperature—usually an hour—the water is poured off and the contents of the vessel poured on to a sieve with meshes just small enough, or on a cloth, the object being to draw off the water. The seed is thus automatically aerated (or exposed to air) and this aeration may be assisted by gentle stirring. The grain is ready for a second steep in another half an hour. It must be remembered that when the temperature is above 90° F, the steeping period has to be reduced say to half an hour and the aeration period to quarter of an hour. At such regular intervals the cholam is alternately steeped and aerated until incipient germination is noticed. This takes from 30 to 40 hours depending on the quality and variety of cholam.

*Spreading.* At the end of the steeping period the grain suffers very little perceptible changes in composition and it is ready for the next operation of spreading, technically called *Couching*. This is nothing but allowing the wet seed to germinate *very slowly* and *uniformly* in a dark, cool place inside a room. A sieve twice as big as the aerating sieve is used, but with the same meshes. The grain is spread out to stand about an inch thick, the adhering water having been completely drained off by keeping the

sieve in a slanting position for some time. During the hotter part of the day, a moist cloth is spread on the sieve without touching the cholam to prevent abnormal rise of temperature and too rapid germination. Moisture is supplied at intervals to keep the germinating process continuous and when the radicles are about ½ to ¾ inch, the supply of moisture is cut off. Usually it takes 4 or 5 days for getting to this stage of germination. It must be pointed out that too high an outside temperature affects the malt and results in the destruction of larger amounts of carbohydrates by too rapid a germination. So it is recommended that malting be done in the cool months.

*Drying.* At the end of the spreading or *couching* period, the malted grain is sun-dried for a day or two until it is perfectly air-dry, else the starch will get cooked on further drying at a higher temperature and thus complete the diastasic conversion of the same into sugars and dextrines. The improvisation for such drying at 60°-70° C is to use a slow fire of charcoal and to put small quantities of the malt in a frying pan. Stirring must be continuous and as soon as it gives a fine aroma characteristic of cholam malt, the grain is immediately thrown on a piece of gunny for rubbing and removal of radicles. The drying requires some experience and whenever the colour of the fine malt after grinding is not white, it is to be understood that the temperature was higher than 70° C. So care must be taken not to caramelise the malt, as otherwise it gives a coloured product with a slightly bitter taste.

*Grinding.* The final product is now ready for grinding for which a coffee grinder or a stone mill can be used. At first the malt is ground coarse—into grists—and passed through a sieve, to get fine meal with the highest diastasic activity and nutritive value. The coarse fraction is winnowed to remove a portion of the husk, and ground a second time into a fine powder. Sieving again will give a second grade flour which contains a portion of the husk. The portion retained by the sieve may be fed to cattle or poultry.

*Preparation of the food.* The first grade fine meal may be mixed with twice its quantity of arrowroot flour and the second grade malt with its own quantity of arrowroot flour, and the intimate mixtures bottled perfectly air-tight. For domestic purposes, it is better to grind a fresh, or a quantity required for a week's use may be prepared at a time. To serve the food, the malt is made into a thin paste with hot water and the paste, after standing for 2 to 3 minutes, is poured on to some boiling water with constant

stirring. After boiling for another two minutes, and allowing to settle, the clear liquid is strained through a cloth; milk and sugar are then added to taste. If the second grade malt is not desired the coarse fraction may be boiled with water for a few minutes and strained through a cloth and served as before with addition of milk and sugar. The residue may be fed to cattle.

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