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Processing agar from seaweeds

Aquaculture Department, Southeast Asian Fisheries Development Center

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Item Four

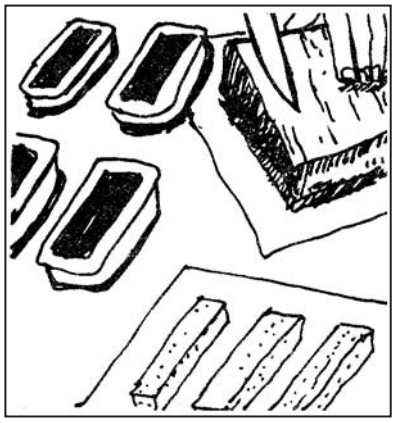
Processing Agar from Seaweeds

A seaweed extract, agar has broad commercial use. In the food industry, agar is used in making jellied desserts, as stabilizer in pie fillings, piping gels, meringues, icings, cookies, cream shells, anti-staling agent for bread and cakes, and as thickening and gelling agent in poultry, fish, and meat canning. It is also utilized as bacterial culture media and liquid media for culture of anaerobes in microbiology. In the medical-pharmaceutical industry, agar serves as laxative, suspending agent for barium sulfate in radiology, ingredient for slow-release capsules and in suppositories and surgical lubricants, and as a disintegrating agent and excipient in tablets. It is also used as impression materials to make accurate casts in prosthetic dentistry, criminology, and tool manufacturing. Very much used in tissue culture of orchids, teaks and anthuriums, agar serves in specialized laboratory applications in turbidimetric determinations involving suspensions of dense solids and in microtomy of plant tissues. In its purified form, bacteriological agar (agarose) is used in electrophoresis and immunology as in the isolation of viruses and genetic engineering for disease diagnosis.

Agar is extracted from some algae of Division Rhodophyta or the red algae. Some species of these seaweeds found locally are *Gracilaria, Gelidiella, Gelidium, Pterocladia,* and *Laurencia.*

How is agar produced out of the seaweeds?

Complete agar production involves two steps although agar produced after the first step is readily utilizable The first step involves washing of the freshly harvested seaweeds in freshwater. The seaweeds are dried to about 10% moisture, either by sun-drying or oven-drying. Bleaching and removal of salts is done on the seaweed samples with intermittent washing with freshwater and seawater. The samples are sun-dried once more to about light-brown color. These are boiled (30 min to 1 h) then strained using cheesecloth. The mixture is poured into trays and allowed to freeze while in cold storage. The crude extract is then thawed and cut into agar strips or "gulaman" bars. These agar strips are ready for use in several food recipes. The Industrial Technology Development Institute of the Department of Science and Technology has a pilot plant on agar processing.



The second step involves the refining of the crude agar into high-grade, high-quality purified form. This is achieved by subjecting samples of the crude agar to basic/alkaline solutions (3-5%); the samples are allowed to stand at room temperature tor three days. The samples are then washed with water. The residual alkali present in the solution is neutralized with dilute acids (i .e., 0.01 % HCI), washed with water and dried. Basically, the refining of agar means the reduction, if not removal, of sulfate to levels of about 0.02-0.3%. The entire process is both complex and expensive and should take place within a central processing plant which is still non-existent in the Philippines. The purified form could be used for bacteriological culture, biotechnology, genetic engineering, and specialized medical diagnosis.

Is there a bright prospect for the agar processing industry?

Yes. There is a high demand in the world market for this phycocolloid. In 1987, agar-producing seaweeds and their products accounted for roughly 9% of the total fish and fishery product exports of the Philippines. About 12 million metric tons of the seaweeds and their products, valued at around ₱-193 million, were exported. The purified form of agar known as agarose commands a price of US$1,000 per kilogram. In the event that advanced seaweed processing is successfully done locally, the country would be less dependent on expensive imports of agar products. This would in turn benefit the other local industries which depend highly on agar.

Source: **PCAMRD-DOST Technology Primer,** No. 4, March 1990.

Item Five

A Village Level Technology of Extracting Agar

Modifications in agar extraction were made to adapt the technology for use in Indian villages.

Materials

To conduct agar extraction trials, the following materials were used: clean seaweed; fresh water; tubs to soak and wash the seaweed; a pan (50 l) to boil the seaweed; wooden spoons; a kerosene or wood-fuelled stove; a screw press; two planks and some heavy stones; filter cloths; trays and a platform to dry the agar in the sun. All materials were purchased locally. The screw press was a larger version of the coconut press used in Thailand.

Agar extraction procedure

Seaweed collected from natural seaweed grounds, or from a seaweed farm, was cleaned and fully dried in the sun, so that it could be stored for (3-6 months). Before processing, the seaweed was washed and then soaked in fresh-water for several hours until soft. It was then heated in freshwater, the time depending on the amount and variety of seaweed. After heating, the sea-weed was filtered through a cloth with a screw press. The filtration had to be done quickly, and the screw press pre-heated with hot water to prevent the agar solution from setting during the process. The agar formed a gel after cooling. To remove the water from the agar, the gel was enclosed in a thick filter cloth and put under pressure either in the screw press or between two planks weighted with heavy stones for larger quantities. This process takes at least half a day, after which the agar needs drying in the sun for several days.

Village folks dry seaweeds for agar processing.