SUGGESTIONS FOR THE IMPROVEMENT OF NEW GUINEA COPRA.

By E. Caulfield Kelly.

THE EMPLOYMENT OF SULPHUR DIOXIDE GAS IN THE CURING OF COPRA.

Introduction.

The poor general average quality of New Guinea copra, as compared with Ceylon estate copra, to quote a single example, is due, primarily, to faulty drying and careless and improper handling of the product during the whole process of manufacture from the time the shell is split.

There are two methods of curing in general use in the Territory, viz.:—(1) Hot air drying, and (2) sun drying. Smoke drying may be disregarded for the purpose of this paper for the reason that a product, cured by this method, cannot presume to attain any category other than low-grade in the international markets, and if copra dried by hot air and sun methods were of sufficiently and consistently good quality as to command the market price of, say, Ceylon estate copra, no planter who at present advocates and adheres to the smoke-drying method could afford to disregard the advantage of discarding that crude and primitive process in favour of the more modern and lucrative hot air and sun-drying processes.

A great deal of the difficulties of turning out a really good, high-grade copra, can be traced to the handling of the product during the first few hours, after the cutting of the nuts. The extraordinary rapidity with which moulds form on freshly cut coco-nut meat must never be lost sight of, if stain or discolouration—or even worse defects—in the final product are to be avoided. This is especially so in the case of the sun-drying method, as it is not always possible to make provision for the immediate commencement of the drying process after the copra has been cut, and so counteract the growth of moulds.

Even in the case of hot air drying method, many hours frequently elapse between the cutting of the nut and the commencement of drying, especially where the copra is cut in the various paddocks of the plantation, and has to be carried in to the drier. Rainy weather adds to the trouble in such cases, as fresh water and a rain-saturated atmosphere increases the rapidity of mould action.

The Process.

The value then of some process which will at once arrest mould growth in freshly cut coco-nut meat will be appreciated and it is proposed to deal here with a simple method, which was developed some years ago by the Philippine Bureau of Science, viz., the preparation of the product by treatment with sulphur dioxide gas.

Messrs. Brill, Parker and Yeates,[1] Officers of the Bureau's Laboratory of Organic Chemistry, in describing the sulphuring process, state that the fumes not only destroy the mould spores, but remain in the meat for a sufficient time to allow for the escape of water, and prevent the growth of new mould spores. Further,

during the process of sulphuring, there is a very considerable loss of water, due to the softening of the cell walls through the action of the sulphur dioxide, which has a marked affinity for water.

Freshly cut coco-nut meat treated by this gas, may be successfully dried under cover, even without exposure to the heat of the sun or artificial heat, in two weeks (provided that there is free access of air to the product during that time), and no mould action, stain, or discolouration will take place. Naturally, of course, spreading of the meat in the sun, will greatly hasten the drying as will also the use of a hot air drier after treatment.

The Apparatus.

The sulphuring process is a very simple and inexpensive method of ensuring the out-turn of a high-grade product, and the preliminary experiments made by the Bureau of Science have been furthered by Messrs. Wells and Perkins, the Senior Officer and Chemist, respectively of the Bureau, to make possible the commercial application of the process, on small estates or plantations.

The apparatus consists of a wooden box provided with a door in one end to admit a four-wheel truck or trolley mounted on wooden or steel rails. The track is twice the length of the box. The car is provided with a framework to take a number of trays to hold the coco-nut meat to be treated. These trays may be made with split bamboo bottoms, wicker work, or even woven wire, as used in hot air driers, and they should be sufficiently separated to allow of free circulation of the gas. When the trays are loaded the car is pushed inside the box on its tracks and one kilogram (approximately 2½ lb.) of sulphur is placed in a shallow pit between the rails and under the car. If the box is made comparatively tight this amount of sulphur, when ignited, will burn for about 4 hours, liberating sufficient sulphur dioxide gas for the treatment.

At the end of the sulphur treatment the car is rolled into the open and the sulphurated material is then dried by any desired process. If spread out under cover with free access of air for a period of two weeks, it will dry slowly and produce a clean white copra, free from mould or any discolouration, which will yield an oil which is practically colourless, and free from rancidity and acidity.

The residual sulphur dioxide after one month's time may be completely disregarded, as only very slight traces will be found, and no traces will be detected in the expressed oil.

The period of two weeks for drying, mentioned above, is described only to demonstrate the preserving effect of the gas on freshly cut coco-nut meat. Naturally, if sun or artificial drying is used, the period will correspond to that required to dry copra, in the ordinary way, as if the sulphuring process had not been used.

Dimensions of Apparatus.

Wells and Perkins[2] describe in detail a handy size apparatus, capable of dealing with the meat of 3,000 nuts at one charge.

The sulphuring box inside measures 4 feet wide by 8 feet 10 inches long, by 7 feet high, made with 1 inch tongued and grooved timber, and was erected in a shed with a galvanized iron roof and dirt floor.

The whole of one of the 4-feet ends comprised a well-fitting door. Seventeen feet of wooden track was laid in a trench 8 inches deep, running into the box to take two pairs of bogey wheels of 2 feet gauge.

Sixteen trays, outside measurement 7 feet 8 inches x 3 feet x 2 inches deep, were constructed of light timber, the bottoms being made of bamboo strips, placed so as to leave a mesh of ½ inch. A light frame work was constructed on the two pairs of bogey wheels to carry these sixteen trays, with just sufficient space between them to allow of free circulation of air.

The sulphur is burned on a pan which may be made from a cut down kerosene tin or other suitable container, placed on the dirt floor under the car, when in position in the box. The loaded truck is rolled into the box, the sulphur ignited and the door tightly closed. One kilogram of sulphur is usually sufficient for one charge, and six hours in the box are sufficient for the full effect of the fumes, although the sulphur itself may only burn for four hours. It is important to note that the box should be comparatively (but not absolutely) air-tight, to permit of the slow combustion of the sulphur.

Advantages of Treatment.

Sulphured copra, properly dried, has a lighter appearance than the whitest sun-dried copra, because the sulphur partially bleaches the dark outer skin of the meat as well as preserves the natural whiteness of the inside surface. The moisture content when the copra is later dried is about 5 per cent., and the free fatty acid content less than 1 per cent. The sulphur dioxide partly evaporates during drying and partly oxidizes into sulphuric acid, but the sulphuric acid thus formed, does not remain in the oil or injure it in any way.

The direct protection afforded by sulphur dioxide does not last more than a month, but this is more than ample time to complete drying even by the most lengthy process.

Time of Treatment.

Sulphuring should be done very soon after the nuts are opened if rainy weather prevails or is anticipated. If coco-nut meat is rained upon unexpectedly, it can be sulphured even if slight mould growth has started; the mould can thus be killed and further damage prevented, but the fullest protection is afforded if nuts are cut near the box, and the meat sulphured within an hour or two of exposure.

Sulphuring is valuable, chiefly as an adjunct to the sun-drying process of curing. With well-built and systematically-operated hot air driers in good weather conditions, and where the copra is cut at the drier, it should not be necessary, but it can well be employed to supplement hot air drying in adverse weather conditions, or with home-made or faulty kilns.

It frequently happens too, that through circumstances of labour, or weather conditions, a fresh batch of meat is cut and ready to be dried before the preceding batch has been sufficiently dried to remove it from the kiln. In such cases the fresh batch of meat can be preserved against mould or discolouration by sulphuring at once, when it can be stored aside to await its turn in the drier.

Drying.

It must not be inferred that the sulphuring process in itself will dry copra, or that meat which has been treated may be bagged or even stored in heaps with impunity. Whilst sulphured coco-nut meat requires no artificial heat, or exposure to the heat of the sun for a long period after treatment, it must have free access of air, in a covered place, free from rainy weather, or extreme damp. It follows therefore, that until drying has been completed it must be spread out on a dry floor or on trays where the air can freely circulate through the pieces.

Cost of Sulphur.

The expense of sulphuring is negligible when the superior quality of the copra obtained is considered. The sulphur need not be of very refined grade; in fact crude sulphur is preferable, as impurities retard the rate of combustion, and so prolong the period of treatment, from a given weight of sulphur.

Sulphur is available in quantity either from Japan or the Philippines, and could be landed in New Guinea for approximately 15s. per cwt.—a sufficient quantity to treat about 25 tons of copra. There are also sulphur deposits in the territory itself, which could be made perhaps to yield crude sulphur at a very low cost.

REFERENCES.

(1) H. C. Brill, H. O. Parker and H. S. Yeates; "Copra and Coco-nut Oil"—*Philippine Journal of Science*, XII. A; 11, 1917, 80.

(2) A. H. Wells and G. A. Perkins; "Use of Sulphur Fumes in Copra Drying"—*Philippine Journal of Science*, XXI., 1, 1922, 49.

PESTS OF COCOA IN THE TERRITORY OF NEW GUINEA.[1]

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Although cocoa has been planted for a number of years in various parts of the Territory, it is only in the last few years that any appreciable expansion in the planting of this crop has taken place.

To date, this crop has been comparatively free of serious insect pest infestation, some of the trunk, stem and branch borers being the only ones of major economic importance.

Pests of the Trunk, Branch and Stem.

The most serious pest of cocoa recorded to date is the weevil or snout beetle, *Pantorhytes plutus, Oberth.*[2] (*Curculionidae*). Although this species has been collected in most parts of the Territory, it has, so far, only been recorded as a cocoa pest on portions of New Britain.

Owing to the difficulty, in many cases, of attacking the pest with mechanical measures, inquiries are in hand in reference to possible biological control.