

RESEARCH ON COCONUT PRODUCTS

A review of past laboratory-scale research

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IT does not appear to be generally appreciated what a large amount of laboratory-scale research on coconut products has been carried out at this Institute by my predecessor, Dr. R. Child and Mr. W. R. N. Nathanael, Chemist, and that results of commercial and practical value, such as the work on soap, shell distillation products, refined vinegar and double-distilled arrack have already been applied industrially. Work has also been done on coir, copra, coconut oil, toddy and coconut water. The following is a detailed account of the work done up to July, 1949 :—

Soap.—During the early years of the Scheme, the first major laboratory investigations were in support of the local soap industry.¹ Analyses were carried out on all available samples of Ceylon made soaps and possible new sources of raw materials for soap-making were investigated. Many improvements were suggested in local soap-manufacture, and the whole of the results of this work with suggestions relative to the soap industry have been published.²

Coconut Shells.—Fundamental analytical work on shells⁶ has provided the basis for subsequent work on the commercial utilization of coconut shell products.⁵ The original experiments on the dry distillation of coconut shells were done on a laboratory scale and the results were summarised in a paper published in 1939.⁴ The work was continued during the war years when the process for the dry distillation of coconut shells on a commercial scale was developed at the Government Acetic Acid Factory by Government and C.R.S. officers working in co-operation. The various products of shell distillation, namely acetic acid, creosote, carbolic acid, wood naphtha, tar and pitch have been carefully investigated. A special study has also been made of shell charcoal⁸ and a leaflet has been produced on this subject, including plans and specifications of suitable kilns for charcoal production.

Vinegar.—The work on vinegar derived from toddy has been of use to the local industry, and one firm is now successfully marketing a superior brand of coconut vinegar as a result of our advice. A method for rapid clarification has also been discovered which is now being adopted by a number of manufacturers. Distilled or refined vinegar has been prepared by distilling coconut vinegar under reduced pressure because it was found that distillation under ordinary pressure is not satisfactory.

Analytical methods have been worked out and it is now possible to lay down criteria for genuine samples. No analyses had previously been recorded on genuine samples, so that no standard of comparison was available. A method has been worked out for the Excise Department for detecting adulteration of natural vinegar with synthetic acetic acid. An article on this subject is in course of preparation and will be published in due course.

Arrack.—Between 1939 and 1942, much useful work was done in collaboration with the Government Analyst and the Excise Commissioner involving an extensive and successful series of experiments on the production of an improved grade of arrack by double distillation. There are now no technical difficulties in the way of the production of a superior grade of arrack and further developments may be confidently anticipated with the opening of the State Distillery at Seeduwa. The laboratory investigations have added considerably to the knowledge of the chemistry of arrack. None of this work has so far been published.

Copra.—A thorough examination involving large numbers of analyses have been carried out on copra, obtained from various sources. The object was to ascertain whether there is any difference in the oil content of copra produced in various districts of Ceylon, and also whether there is any seasonal variation in the oil content of copra. A full account of this investigation was published in the *Tropical Agriculturist*.⁷

The effect of manuring on the oil content of copra has also been studied. This investigation involved the analyses of samples of copra from each pick from the Institute's comprehensive manurial experiment, to which N.P.K. fertilizers were separately and collectively applied. The full details of this work which was carried on from 1937-1938 have been published.¹¹

The work on No. 1 estate copra was supplemented later by the examination of No. 2 and No. 3 grades. These results have also been published.⁸ A study of copra from fallen nuts also gave some interesting figures. It was found that the copra yield was higher and the out-turn better, but the quality otherwise not so attractive.

The production of white copra using patent kilns became an important problem when the overseas market for this commodity developed. A number of enquiries were received, and a large number of analyses were carried out to assist producers to bring their product up to standard.

Copra from the Malayan Dwarf Palms on Bandirippuwa and Ratmalagara Estates was made the subject of special study. The productivity of dwarf palms was found to show much more variation throughout the year than does that of tall palms.

Copra from giant varieties such as San Ramon and Marandique has also been examined. Other varieties studied include samples from Cocos Islands, Maldives,¹⁰ Papua and Malabar. Based on this work the general conclusion was that the oil content of copra is mostly affected by the maturity of the nut. Varietal differences are not large nor do manuring and other treatments appear to have much effect.

An important piece of work was the study of copra obtained from rejected seedlings published in the *Tropical Agriculturist*⁹ and translated into Sinhalese. Though all of No. 2 and 3 grades, this copra proved to be abnormally rich in oil and contained over 77 per cent. (dry basis).

Coconut Oil.—Work on this included :—

- (a) Investigations on the methods of producing superfine edible oil.¹² Many enquirers showed interest in the preparation of oil of this quality but no commercial developments have occurred.
- (b) The laboratory-scale investigation of the refining, bleaching and deodorizing of inferior grades of coconut oil, including drain oil.

- (c) The use of coconut oil as a fuel for Diesel engines. Trials were carried out on an 18 h.p. Lister Diesel engine using commercial coconut oil, refined coconut oil and mixtures of coconut oil and kerosene. Observations on coke deposits, fuel consumption and effect on lubricating oil were made and published.¹³ This use has not been found economic.

Desiccated Coconut.—Work on this included tests on the keeping qualities,¹⁴ the use of various packing materials and the production of white oil from desiccated coconut. The use of a patented rubber product “Pliofilm” for packing was discouraged, as it was found on trial to have a tendency to “age” and become brittle on exposure to sunlight.

Coir and Coir Dust.—Work was carried out in conjunction with the Rubber Research Scheme¹⁵ on the possibility of using powdered coconut shell and coir fibre dust in combination with rubber to form composition flooring, ceiling board and similar materials. Samples, made in connection with this work, are still in good condition and have not deteriorated. This work, although it gave encouraging results, has not yet been applied commercially in Ceylon.

Fire-proofing Coir Fibre.—During the war, coir netting was used by the military authorities for camouflage but was found very inflammable. A method of fire-proofing coir, using sodium silicate and lime, which was evolved, proved to be very cheap and effective and was adopted by the Army.

CONCLUSION

With the inadequate funds, hitherto provided, it has not been possible for the Coconut Research Scheme to carry this work into the field of middle-scale research, and so extend and widen the scope of these investigations. With pilot plants and small-scale mechanical equipment, it is possible to carry out practical trials and special operations to discover new uses which are impossible on the small-scale in the laboratory.

Middle-scale research is an essential stage in industrial research and one which can hardly be omitted before any scheme involving heavy capital expenditure is initiated, because results obtained in the laboratory are not always repeated in full-scale operations in the factory and furthermore the operating efficiency cannot be correctly determined in investigations in glass or other small equipment.

A most urgent need also is processing research to improve the efficiency of operation and to establish and maintain the quality of production in existing coconut mills, so that the mills will be able to produce at a competitive price and the good name of Ceylon as a producer of quality products is established internationally.

It is the decision of Government that the Coconut Research Scheme will continue to carry on laboratory-scale research on coconut products and will co-operate with the newly-created Department of Industrial Research by passing on its results and giving advice to the Officers of that Department.

This decision is sound because middle-scale industrial research is a most expensive business. By centralising equipment, it will be possible to apply the same mechanical plant for various uses in widely different industries and at the same time cover the whole field of chemical engineering operations, e.g., crushing, grinding and mincing, mechanical separation and grading; evaporation

and concentration; drying and crystallizing; fractional vacuum and destructive distillation; high temperature operations and refrigeration; extraction, hydrogenation and refining; high-pressure and low-pressure operations; and specialised industrial operations such as canning and deep-freezing, and so on.

There is a tendency, especially during a period of trade depression, to exaggerate the possibility of developing new uses and of adding new products to the already long list of useful commodities provided by the "Tree of Life." Laboratory-scale research has its limitations but there is every possibility that by the application of new methods and the use of special equipment, new processes and entirely new products can be developed.

Officers of this important new Department of Industrial Research have been sent on special courses of study overseas and with their return, the work of industrial research on coconuts can now be further developed on the lines required by the coconut industry.

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