

THE MANUFACTURE OF COCONUT TODDY VINEGAR BY THE 'GENERATOR' PROCESS

By W.R.N. NATHANAEL,
Chemist, Coconut Research Institute.

The use of vinegar as a food commodity is universal. It is indispensable in every household, finding extensive use in the preservation of fruits and vegetables and the preparation of pickles, sauces, chutneys and other manufactured food products.

In general terms, vinegar may be defined as a condiment made from watery solutions of sugar or starchy materials by two separate microbial processes. The first is an alcoholic fermentation of naturally occurring (or converted) fermentable sugars by certain species of yeasts called *Saccharomyces*. The second is the so-called oxidative fermentation of alcohol so produced by species of bacteria called *Acetobacter*.

Owing to the fact that a wide variety of sugary or starchy substances can be used for the production of vinegar, its exact composition would depend on the raw material that has undergone these fermentations, apart from the actual conditions of manufacture, aging and storage. Essentially however, the finished product is a dilute solution of acetic acid containing salts and extracted matter from the source material and certain aromatic minor constituents produced during the fermentations.

COCONUT TODDY AS RAW MATERIAL

Nearly every writer who has dealt with the subject of the useful products of the coconut, alludes to the vinegar prepared from the juice. Doubtless, coconut toddy by itself is an excellent raw material for the manufacture of high grade vinegar. It needs no fortification with adventitious sugar or salts and possesses the overriding advantage of being a well balanced medium containing sufficient nutriment for the growth and activity of yeasts and bacteria.

A survey conducted about eight years ago of the quality of vinegar produced by the existing industry in Ceylon revealed that much improvement is necessary both in methods of production and the quality of the manufactured product. It was particularly evident that in a number of factories wasteful losses of alcohol and acid took place owing to injudicious handling of the raw material during the various stages of manufacture. The writer has expressed the opinion elsewhere¹ that the

chief difficulty experienced by vinegar makers is their inability to get proper acetification of their toddy, due partly to lack of control during processing, and partly, to the fact that the popular 'Vat Process' of manufacture is not well suited for commercial production.

On the basis of successful laboratory and pilot plant investigations (the results of which have been published in full²), recommendations have been made that by employing the "Generator Process" the aforementioned disabilities of the vinegar industry could be gainfully surmounted.

ADVANTAGES OF THE "GENERATOR PROCESS"

The vinegar 'generator' is designed to provide the maximum surface exposure for a volume of vinegar stock in order to supply enough air for the acetic acid bacteria to efficiently and quickly oxidise the alcohol to acetic acid.

The generator assembly is actually comprised of a feed (or supply) vat, an acetifier and a receiving trough. The constructional and operational details of these have been fully described in one of the Coconut Research Institute Advisory Leaflets³.

In essence, the generator is a counter-current gas absorber wherein the acetic bacteria cause the oxidation of alcohol to acetic acid. Air for the alcohol oxidation is admitted to the generator below the false bottom through air vents and it circulates naturally owing to the heat of oxidation in the packing chamber.

The vinegar stock from the feed vat is uniformly sprayed over the surface of the inert porous packing medium (maize cobs) at the surface of which the oxidation takes place. The stock which drains off from the packing by gravity into the base of the generator is run out and pumped (or poured) back into the feed vat, from which it is recycled until acetification is complete.

When the vinegar has reached its maximum strength it must be aged before it is bottled, and is at its best quality for table use. The aging is best done in wooden maturation casks or barrels that are kept full and closed, so that destruction of acid by oxidation by the vinegar bacteria does not occur. During the period of aging which should range between 3-6 months, a certain amount of sedimentation takes place which improves the appearance and clarity of the vinegar.

The re-circulating generator has several economic advantages. It may be operated at low cost and is relatively simple and easy to control. There is a distinct saving of factory storage space and equipment. An average size generator assembly could replace about nine vats—each of

thousand gallon capacity. The process is continuous and provides a steady and efficient production of vinegar with low working losses. The process combines speed of action with high fermentation efficiencies resulting in higher acid strengths of the finished vinegar. The medium used in the packing chamber is inexpensive and easily procured. It would not require renewal for at least a year.

The quality of the vinegar produced is good and uniform and the process is hygienic as it takes place in a closed acetifier, whereby insects and putrefactive organisms are excluded.

The analytical characteristics of coconut toddy vinegar manufactured by this process compare very favourably with reputed imported brands of vinegar.

NEW VINEGAR FACTORY

Laboratory, pilot plant and factory scale experiments, on the 'Generator' process have clearly revealed the potential possibilities of producing a high grade vinegar from the sap of the coconut palm. It has shown promise of removing the principal disabilities of the existing industry by combining speed of action with economy of labour and ease of operation.

A new vinegar factory (Figures I to IV) has been erected at Nainamadama with a Generator and is now in full scale commercial production.

Analytical checks kept over a period of several months at this factory, have shown that the quality of vinegar produced there is very good, with acetification efficiencies in the region of 85 per cent and over.

Every country in the world has its own distinctive liquor industry, and in Ceylon coconut toddy forms the base for the manufacture of arrack. In considering the economics of vinegar production, it is important to note that hitherto this industry has been of subsidiary importance in comparison with arrack manufacture. With the introduction of the continuous generator process, there is every possibility of producing a vinegar from coconut toddy of a standard comparable with the expensive imported proprietary vinegars.

LITERATURE CITED

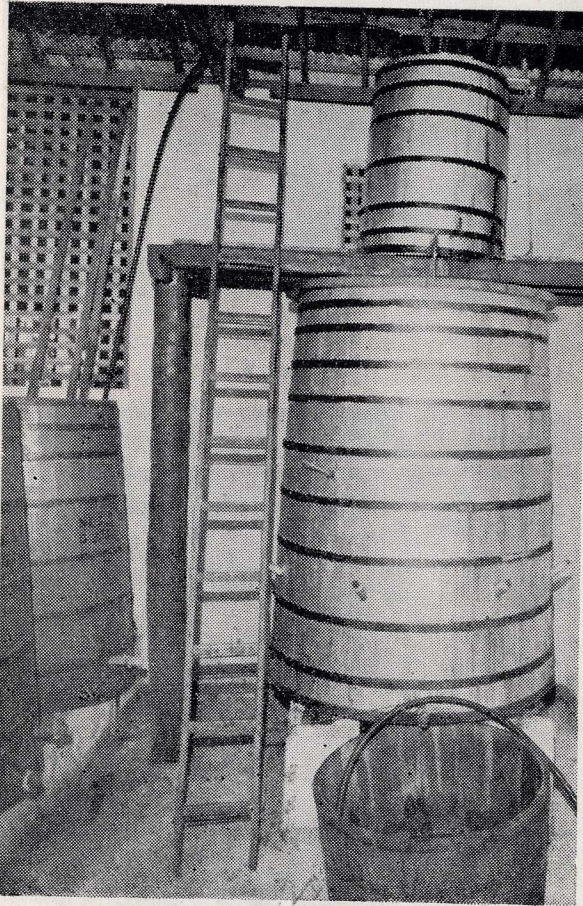
1. NATHANAEL, W.R.N., The Commercial Possibilities of Manufacturing High Grade Vinegar from Coconut Toddy. Ceylon Coconut Quarterly, **6**, (3/4), 1955, 81-85.
2. Acetic Acid Fermentation and the 'Generator' Process for the Manufacture of Coconut Toddy Vinegar. Coconut Research Institute Bulletin No. 17 (February 1958).
3. The Manufacture of Coconut Toddy Vinegar by the 'Generator' Process. Coconut Research Institute Advisory Leaflet No. 22.

Figure I



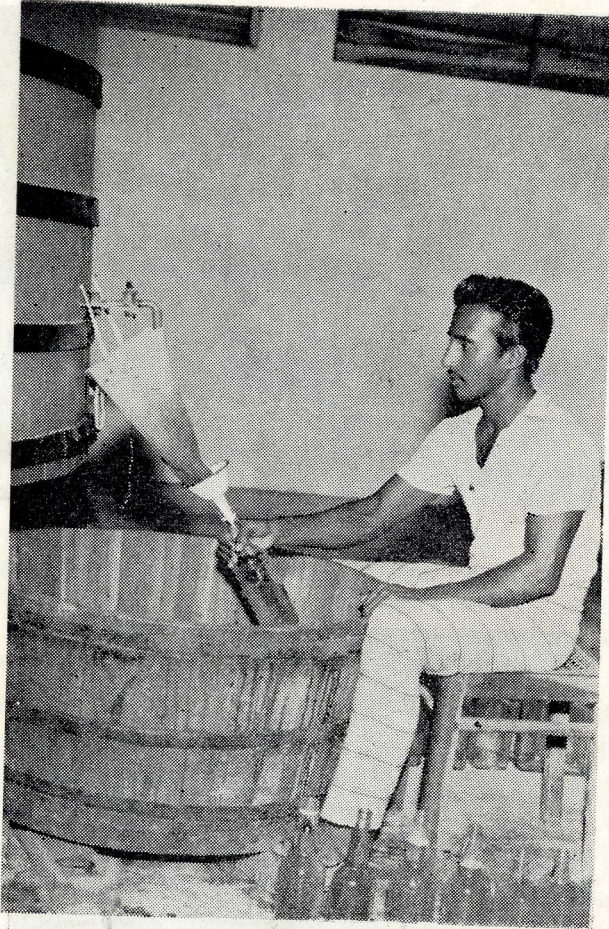
The New Vinegar Factory

Figure II



The Vinegar Generator

Figure III



Bottling Generator Vinegar

Figure IV



Bottled Vinegar Ready For Sale