THE VANASPATI PROBLEM

V. SUBRAHMANYAN AND S. S. DE

(Department of Biochemistry, Indian Institute of Science, Bangalore)

DURING recent months, a great deal has been said and written on the subject of Vanaspati. Very little of fresh scientific evidence has been adduced, but the public mind is greatly agitated following the publication of varied statements and reports regarding the nutritive value of the product and its possible effects following continued usage as an article of food. The publications come in three categories:—(*i*) expressions of opinion by different consumers which, though not strictly scientific, are still entitled to respect because they are based on actual experience; (*ii*) general statements reported to have been made by scientific workers and which have been cited for or against the industry; (*iii*) letters and summaries bearing on previous work on the subject and which are now appearing in scientific journals. None of these has proved conclusive. The opinions of consumers are divided, the general trend being in favour of a cautious approach, pending definite and conclusive scientific evidence. The statements by scientific workers and important Government members are often misquoted with the result that in some cases the persons concerned have themselves been obliged to issue subsequent corrections and contradictions. On the whole, the general trend of opinion is in favour of reserving judgment pending the collection of more evidence in regard to the various aspects of the subject.

The Vanaspati industry in India is of comparatively recent origin, having started from small beginnings in the early thirties. The product soon gained in popularity as there was a demand for a cheap preparation with a similar appearance, taste and flavour which could wholly or partly replace ghee as a cooking medium. The turn-over increased from year to year and the manufacture now ranks as one of the major food industries in the country. The capital and the equipment already engaged may be valued at twenty crores of rupees and the annual production at about thirty crores. The industry employs a few thousands of hands and has also stimulated a few subsidiary industries[1]. Apart from vanaspati for food, the industry has also produced hardened oil for the soap industry, vegetable tallow and a variety of other products which are finding extensive application. Side by side with these, the industry also produced and is presumably, still producing, a specially hardened product which is in demand for adulterating ghee. Every vanaspati manufacturer may not produce such a product, but there is no doubt that many still continue to do so. It is this last product which led to the earlier prosperity of the industry and subsequently led to a good deal of trouble, disappointment and even diffidence in the future of the industry.

The industry is now awakening to the importance of producing a clean, wholesome product which can stand on its own merits. The Government is also insistent on the marketing of a product which will conform to certain specifications. These will, to a large extent, exercise a check on the use of hardened oil for adulteration. In its own ultimate interests, the industry will also have to exercise strict discipline and discourage the use of vanaspati in any form of adulteration.

STATE DECISION TO EXPAND THE INDUSTRY

Acting on the recommendation of a special Committee and also of the legislature, the Government decided in 1945 to encourage the expansion of the industry to roughly three times its present capacity. A target of 450,000 tons per annum was set up, and it was reckoned that the full expanded capacity will be reached by 1950. The primary reason which led to this decision was the increasing shortage of ghee and its non-availability to the poorer sections of the people. Vanaspati was becoming popular as the poor man's ghee, but there was not enough of that product, though the raw material (crude vegetable oil) was plentifully available. The expansion of the industry was accordingly planned, and the different provinces were allotted their quota of factories. About forty new companies have been floated, and in view of the impending prospects many of them were heavily oversubscribed. Reckoning at an average of about ten lakhs of rupees for each new concern, the capital involved in the new flotations may be estimated at about four crores of rupees. Substantial orders for equipment and accessories have been placed in Europe and elsewhere, and it is expected that some of the new factories will be created and begin production in 1948, if not earlier.

It is not unreasonable to expect that the tripling of the production in such a short period as three years (from 1947) will lead to some temporary glut on the market. Even if the production and distribution are regionalised, there is a fair prospect of the public demanding certain brands of products which have already established their name in preference to others. The preparation of a fully acceptable product is not altogether simple, and some, at any rate, of the new companies will have a certain amount of difficulty in standardising and successfully marketing their products. Although monopoly in industry is unhealthy, the experience gained by the already established firms would have proved very valuable in expanding the industry at a rate in keeping with the actual rise in demand.

THE RECENT CHANGE IN OUTLOOK

About the time that the Interim Government came into office in 1946, apprehension was expressed in several quarters about the possible consequences of the fairly large expansion of the industry. There was also a good deal of objection to the use of vanaspati, in any form, as an article of food. The ghee manufacturers also protested against the proposed increase in the production of vanaspati as that would militate against the interests of their industry. Butter and ghee represent two of the most

Note.—The cost of printing this contribution has been defrayed by a generous grant from the Rockefeller Foundation for the publication of results of scientific work made to us through the kindness of the National Institute of Sciences, India.

important products of the dairy industry in India, and it was naturally argued that large supplies of vanaspati would reduce the demand for ghee or otherwise lower the market value of the latter. Added to this, the more recent observations reported by Ray and Pal[2] regarding the prolonged effect of feeding vanaspati as the main source of fat to successive generations of experimental animals led to further misgivings about the use of vanaspati as an article of human food. Other laboratories in India did not report similar effects; but their conditions of experimenting were not quite the same: nor were the observations made over such long periods as that reported from Izatnagar. The Izatnagar observations were also apparently at variance with those reported by scientific workers in other parts of the world[3-5]; but they had nevertheless been made by experienced workers of standing whose opinion is entitled to respect. It is possible that there may have been some peculiar features about their experimental conditions or about the products they had compared; but their work revealed the need for a careful examination of the position with special reference to the conditions prevalent in India. This naturally led to a good deal of uneasiness in the minds of the consuming public. The Government was also greatly perplexed. While on one side, they stood committed to expanding the industry, they were led to doubt whether even the existing industry was justified. They were nevertheless very cautious and in his address to the Food Technical Panel on 26th November 1946 Dr. Rajendra Prasad, the Member for Food and Agriculture, stated that though he felt very uneasy about the position, he was nevertheless prepared to await the conclusive and concerted opinion of scientists in regard to the subject. Acting on his advice, a Committee composed of representatives of the different laboratories interested in food and nutrition problems was appointed to go fully into the question and to conduct such fresh research as may be needed prior to making its final report to the Government.

The Present State of Our Knowledge Regarding the Nutritive Value of Margarine and Vanaspati

There is extensive literature regarding the relative nutritive values of margarine and butter. It is now generally accepted that high-melting fats (m.p. 45° C. or more) are rather difficult to digest, though, even recently evidence has been obtained to show that fats with melting points up to 50° C. are digested to nearly the same extent as those with lower melting points.[6-9] Even starting with fats of the same melting point, butter-fat would appear to be superior to the vegetable product[10-12] though in actual practice, the difference is not much seen when the diet is otherwise quite adequate. Theoretically, a similar observation should apply to vanaspati of melting point which is of the same order as that of ghee. Quantitative data with vanaspati of m.p. 37° C. are not yet available, but the earlier products on the Indian market which were of higher m.p. have not produced the same response as ghee even when moderate supplements of vitamins are provided. These observations require to be confirmed.

Ghee prepared out of good dairy butter may be regarded as an ideal form of fat. While that may be maintained as the standard, comparison of vanaspati should also be made with vegetable oils to determine whether the process of hydrogenation and the materials employed therein have produced any marked difference in regard to the food value of the oil and the utilisation of the other food constituents. In this direction also, some literature is available.[13] When the diet is adequate, there does not seem to be much difference between oil and vanaspati.[14] A good brand of vanaspati contains less than 0·5 p.p.m. of nickel* which is non-injurious. The iso-oleic acids formed during hydrogenation do not appear to have any pronounced effect,[15] though, here again, more scientific evidence is needed. The nature and proportion of iso-oleic acids can vary, depending on the procedure followed.

Most of the earlier studies have been with experimental animals receiving adequate diets. Such diets are not normally consumed even in the most prosperous countries which are also comparatively free from religious and sentimental restrictions in regard to the choice of diet. In India where the great majority of people consume a predominantly cereal diet which is also deficient in regard to various food accessories the position in regard to fats would require careful investigation. This would be particularly true of the poor rice diet of South India which is highly lacking in proteins, minerals and vitamins. The evidence already obtained would suggest that with such a diet, there would be poor response even to butter-fat.[16]

Programme of Vanaspati Research

The above facts were fully appreciated by the Special Research Committee appointed by the Technical Panel to go into the question. The Committee which met on 28th January 1947 decided that, before pronouncing any opinion about the nutritive value of vanaspati, there should be an extensive series of comparative studies both with experimental animals and with human subjects. The animal experiments, as now planned, are probably the most elaborate ones yet carried out on the subject. The following five products, fed at 5 per cent. level, will be compared:—(*i*) ghee as prepared out of dairy butter; (*ii*) crude groundnut oil; (*iii*) refined groundnut oil as prepared out of (*ii*); (*iv*) vanaspati of m.p. 37° C. as prepared out of (*iii*): (*v*) vanaspati of m.p. 41° C. as prepared out of (*iii*). The basal diets would be the following:—(*i*) synthetic diet adequate in regard to protein, minerals and vitamins; (*ii*) poor rice diet as used in South India and adopted in a number of earlier researches;[17] (*iii*) poor rice diet plus extra vitamins; (*iv*) poor rice diet plus extra protein

* In some of the preparations on the market nickel upto 10 p.p.m. or more is encountered. This is due to faulty neutralization. As nickel in more than minimum quantities imparts a bad taste and hastens rancidity, there should be rigorous control over the permissible quantity. The permissible limit should be fixed by the Government.

as casein; and (*v*) poor rice diet plus calcium. Apart from growth measurements there will also be metabolism studies following the extent of utilisation of fat, protein and minerals in the different cases. The reserve of vitamin A in livers will also be followed on completion of each series. Representative animals of each group would be bred and the offsprings, after weaning, placed on similar diets for a further series. In this manner, the experiments would be continued for three generations. As now programmed, the animal experiments following the same details will be carried out in four laboratories— the University College of Science, Calcutta, the Indian Dairy Research Institute, Bangalore, the Indian Veterinary Research Institute, Izatnagar and the Indian Institute of Science, Bangalore. The results obtained by all the laboratories will be pooled together before drawing any final conclusion.

The Committee was conscious of the difficulties in maintaining experimental animals on a poor rice diet. The difficulties in breeding animals reared on such a diet was also realised. Albino rats do even more poorly than human subjects on the South Indian rice diet. This is an aspect which requires careful investigation. There are of course some features which differentiate the experimental diet from the diet as actually consumed in South Indian homes. They may be more important as factors in nutrition than has hitherto been realised.

The human metabolism experiments which would be detailed studies bearing not only on the utilisation of the different preparations, but also the attendant protein and mineral metabolism would also be followed. As in the case of the animal experiments, the poor South Indian rice diet would form the basal diet for these studies. The experiments, as now planned, are being carried out at Coonoor, Bangalore and Calcutta. The third series of studies would consist of institution feeding experiments at Bombay, Delhi and Mysore. For these studies, children under fifteen from institutions receiving a predominantly poor cereal diet have been selected.

In this case the comparison will be only between the crude oil and vanaspati of m.p. 37°C. and the object primarily to determine whether any characteristic effect which is not observed in the case of oil is noticeable in the case of vanaspati. Here again, the oil or vanaspati will form five per cent. of the total solid matter in the diet. The children, who will number a few hundreds at each centre will be under experiment and systematic health observation for at least six months. Where facilities exist, metabolism studies will also be carried out.

It is difficult to forecast whether even an elaborate study such as represented by the above programme will give a conclusive answer in a short time. The animal experiments will cover the best part of two years. The human feeding trials may have to be prolonged, and some may even require repetition at other levels. There will, nevertheless, be a useful amount of evidence which would be a pointer for such further work as may be needed.

The programme of research, as now planned, will, among other things, help to throw some fresh light on the fat metabolism of people who are on a predominantly vegetarian diet composed mostly of cereals or millets. The fat requirement of people on such a diet seems to be considerably less than has hitherto been assumed. The work will also throw further light on the nature of factors assisting in the utilisation of fat in the human body.

The Outlook for the Future

One might well ask as to what should be the State policy in regard to the vanaspati industry till some conclusive evidence is obtained. In addition to the older factories, the new ones will also be soon coming into production. What should be done with all the output? This will be a very difficult question to answer. The industry should not be paralysed and, at the same time, the interests of the public should be safeguarded. Acting on proper technical advice, the Government has already legislated that the melting point of vanaspati should be less than 37° C. This would be lower than that of buffalo ghee obtained in some parts of the country, particularly during certain seasons. It has also been legislated that all brands of vanaspati should contain 5 per cent. sesamum oil so as to permit of easy detection when used for adulteration of ghee; that the product should not be labelled or advertised as vegetable ghee and that ghee vendors should not sell it. These are desirable controls, and the industry has also accepted them. *Any further reform or control could be introduced only on the basis of fresh scientific evidence.*

The State and the industry will have to face the problem of an immediate glut on the market when the new factories come into production. Even at the present level of production, there seems to be no shortage of vanaspati. A consumer can purchase any desired quantity without much hardship though here and there, temporary shortage may be noticed. The present position would suggest that vanaspati is chiefly consumed by a section of the community whose number is not large and which is not increasing at a fast rate. It would be very useful if, side by side with the scientific study, some statistics could also be collected regarding the class of users of vanaspati and their approximate consumption *per capita*. Such information will not be difficult to obtain, and, when obtained, it would be very helpful both to the Government and the industry.

In the event of there being a marketable surplus from the expanded industry, there should be plans for the best utilisation of the product. Solid fats have a variety of applications, and it should be the joint effort of both science and industry to find the best possible uses for the products. From this point of view, the decision of the industry to institute Research Fellowships and to establish a Faculty for oil-seeds, oils and fats should be welcomed. It would be useful to consider the hydrogenation of not only edible oils, but also non-edible ones. The latter do not seem to have been well exploited.

The scientific evidence now collected by the different laboratories would only help to show whether refining and hydrogenation carried to a certain point have any pronounced effect on the nutritive value of the vegetable oil. Even