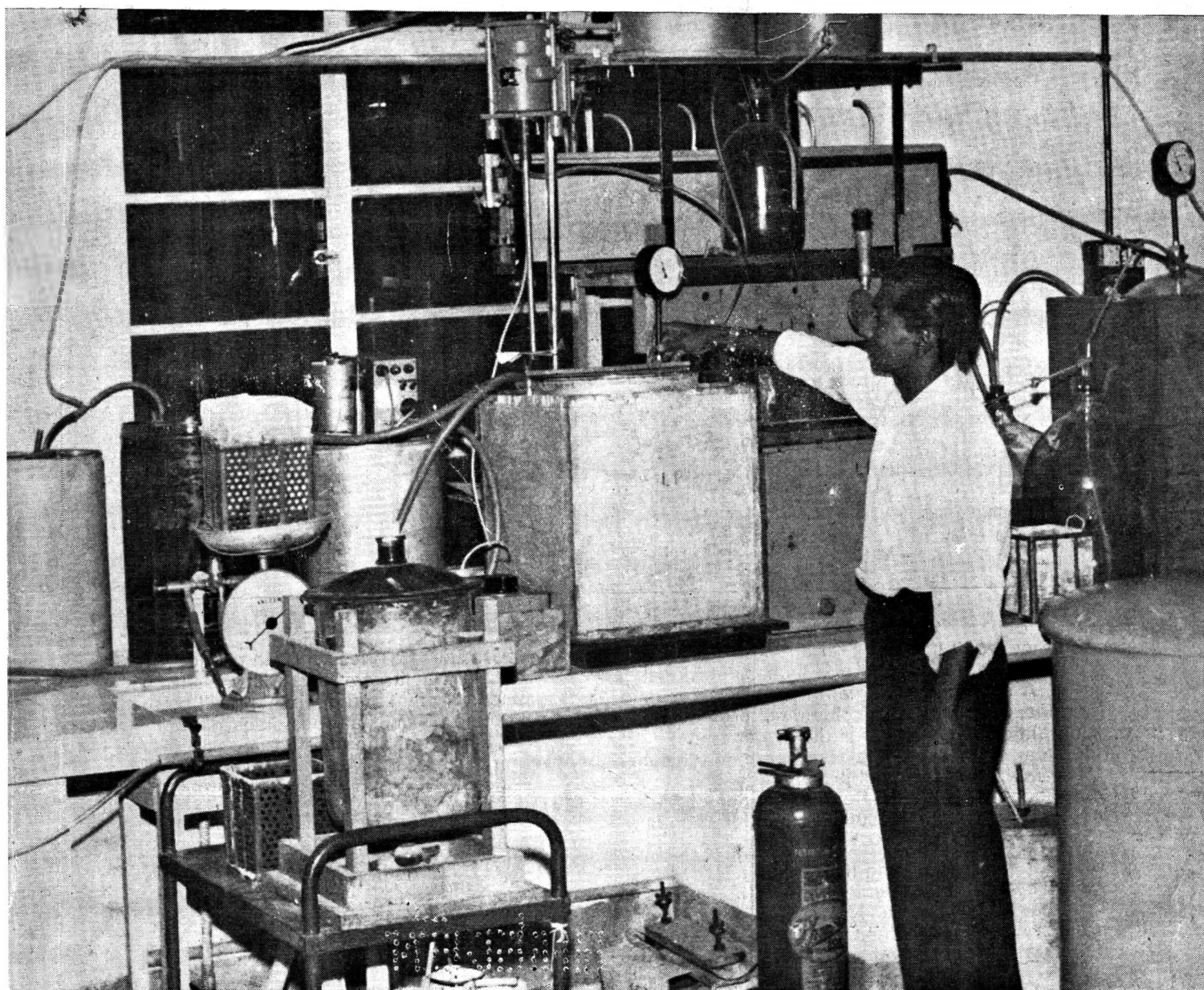


# Journal of Food Science & Technology



Vol. 4

OCTOBER 1967

No. 3

ASSOCIATION OF FOOD TECHNOLOGISTS, INDIA



## One third of the world's children have no milk today

01Y 707

And they won't have milk for a long time to come. Yet the child needs food of a higher nutritional value. A six month old infant needs twice as many calories; five times as much animal protein per kilogram of body weight as the average adult. A four year old needs 50 per cent more calories and 100 per cent more animal protein. Milk meets nutritional deficiencies. But it's just not enough—not for all the world's 500 million children under 15 years of age.

UNICEF aims at meeting their basic needs. One way is by setting up dairies all over the world. In India, we have a string of UNICEF aided projects. The First Amul Dairy at Anand, and the dairies at Worli, Hyderabad, Madurai, Vijayawada

are a few... These dairies range in capacity from 50,000 to 5,00,000 litres of milk a day. UNICEF assistance for plant and equipment will be repaid by distribution of milk at subsidised rates to children, expectant and nursing mothers for a given period of years.

For the First Amul Dairy and the dairies at Worli, Hyderabad and Madurai, L&T carried out the entire mechanical and electrical installation including piping, testing and commissioning.

For Vijayawada Milk Products Factory, L&T will be installing a Niro Atomizer spray drying plant—the second milk powder plant in India to be put up with UNICEF aid.



Dairy Division **LARSEN & TOUBRO LIMITED** P.C. Box 278, Bombay 1

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Orange

Silver  
mist  
Lime



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# Journal of Food Science and Technology

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### Cover picture

Sectional view of the Bench scale plant for Lindane production.

# ASSOCIATION OF FOOD TECHNOLOGISTS (INDIA)

CENTRAL FOOD TECHNOLOGICAL RESEARCH INSTITUTE  
MYSORE

( A professional and educational organization of Food Scientists and Technologists )

AFFILIATED TO THE INSTITUTE OF FOOD TECHNOLOGISTS, USA

## Objects:

1. To stimulate scientific and technological research on various aspects of Food Technology.
  2. To provide a medium for the exchange, discussion and dissemination of current developments in the field of Food Science and Technology.
  3. To promote the profession of Food Technology.
- The ultimate object is to serve humanity through better food.

## Major Activities:

1. Publication of the Journal of Food Science and Technology — a quarterly.
2. Publication of authoritative critical reviews by specialists in different branches of Food Science and Technology.
3. Arranging lectures for the benefit of members.
4. Holding symposia on different aspects of Food Technology.

## Membership:

Membership is open to graduates and diploma holders in Food Science and Technology, and also to others interested in Food Science and Technology and allied fields. Regional branches of the Association are being established.

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**THE HONORARY EXECUTIVE SECRETARY  
ASSOCIATION OF FOOD TECHNOLOGISTS, C.F.T.R.I., MYSORE-2, INDIA**

## THE PROFESSION OF FOOD TECHNOLOGY

The food industry, which is the biggest industry in the country has a turnover of Rs. 10 billion and employs 400 thousand men in its various operations. This figure does not include men involved in the production of food in the agricultural field. Yet, the profession of food technology is still young in the country; it is so even in more advanced countries like England and America. Just a decade ago, the processing industries depended only on personnel trained in chemistry, engineering, physics and other pure sciences; but the needs of the industry are changing and properly trained food technologists have become necessary.

Unlike scientists in other fields, food technologists must have a basic knowledge of subjects like chemistry, physics, biology and mathematics and also possess sufficient competence in engineering, factory management and cost accountancy. The facilities available in the country for such training have been described in earlier issues of the Journal. The time has now come for the industry to recognise that employment of an untrained hand in the place of a food technologist is a highly dangerous venture, though in the initial stages, it may appear to be cheaper. It should be realised that a food technologist can start work as a trained person and need not learn the job at the expense and time of

the employer. It need not be emphasised that the quality of the products produced will depend on the competence of the personnel and it may not be possible to produce a uniformly high standard food product in a factory which is manned only by non-technical people. According to the FPO regulations it is incumbent on all factories which produce fruit products, to employ trained technologists; even so it should be made compulsory for all factories processing food material to employ trained food technologists.

\* \* \* \*

The Association of Food Technologists was started a decade ago with the object of helping the profession. With this in view, the **Journal of Food Science and Technology** was started 3 years ago and it has been the endeavour of this Journal to highlight the difficulties encountered in the profession. But the efforts of the journal and the Association could only be of significance, when all the members come to their aid. We have at present a membership of about 500 but still we are aware that many of the food industries are not well represented in the Association. It will be in the common interest, if the members themselves launch a drive for enlisting more members to the Association so that it will become the forum for achieving common goals.

## FOOD INDUSTRIES JOURNAL, BOMBAY

We welcome the "Food Industries Journal" to the fold of media which disseminate information on food science and technology in the country. This Journal (published from Bombay) is devoted to the problems and achievements of the developing food industries. It gives information on new products and processes and also publishes articles on diverse topics like protein foods, effects of malnutrition on learning and behaviour, protein from coal, development in fruit technology, fish industry, etc. The articles are written by recognised authorities in the field and provide useful information to the technologists and the industrialists in food industry.

The Editor deserves congratulations on the good get-up and timely publication of the Journal. We wish this new Journal all the best in its endeavour.

# Protein Problems and World Malnutrition

AARON M. ALTSCHUL

International Agricultural Development Service, U. S. Department of Agriculture Washington, D. C. 20250

At long last I am in this Institute which is beautiful as it is famous. It is fitting that this meeting on solving protein problems be held in this Institute which has contributed to many of the ideas that will be discussed, and which has provided much leadership.

Let us start with the problem of protein. This has been stressed, by others who have already spoken, let me take up a few special points. There are actually two protein problems: The first is the one we usually talk about most: this is the problem of protein malnutrition. This is difficult enough but the second problem could be even more difficult to solve. As we strive to increase people's income, they will demand more animal protein. There is a direct relationship between per capita income and the demand for animal protein. Satisfying the need for animal protein as the level of income increases, requires very strenuous efforts. Let us take up these two problems in a little more detail.

## The Problem of Protein Malnutrition

The first problem of eliminating malnutrition and its consequences, particularly for the principal sufferers, pre-school age children, has already been discussed by Dr. Parpia and Dr. Scrimshaw. Protein malnutrition is an economic problem as well as a moral and medical problem. Unless children are properly nourished, there cannot be a productive community; the people will not achieve their potential.

An interesting calculation was made by Dr. E. Campbell of the US-AID Mission in Brazil. He calculated the number of expected man-years per million babies born in the Northeast region of Brazil, the city of Sao Paulo, and the United States. For every million babies, there was to be expected, in terms of mature adults 22½ million man-years in Northeast Brazil, 29 million for Sao Paulo, and 47 million for the United States. He divided the group further into adult *literate* man-years: there were only 2.7 million in Northeast Brazil, 19 million in Sao Paulo and 45 million in the United States.

In other words, the United States can expect 45 million man-years of literate, productive adulthood per million births, while Northeast Brazil can expect less than 3 million. It is not clear how much of this is due to malnutrition. But certainly malnutrition is a contributing factor. One wonders how rapidly

Northeast Brazil can solve its vast problems of poverty and inadequate economic growth with such a limited availability of literate mature man-years.

The size of the protein malnutrition problem, is rather difficult to measure. The general procedure has been to relate quantitative and qualitative standards to average availability of food. If the average person should have 15 g. per day of animal protein or so many grams per day of total protein, it is possible to calculate the per capita protein consumption and determine whether he has more or less than needs. There are all kinds of estimated world protein deficits: one figure is 5 million tons of animal protein annually, another figure is 10 million tons of total protein, and so forth.

This procedure has several difficulties. First, if the deficit is specified as animal protein, then for certain areas of the world, particularly Asia, it is in terms of unattainable goals. Moreover, one cannot rely on averages since they do not take into account the range either in a nation or within a family unit. While a nation, on the average, is getting enough protein, some people may not be getting enough and others may be getting too much.

## The Demand for Protein from Increasing Income

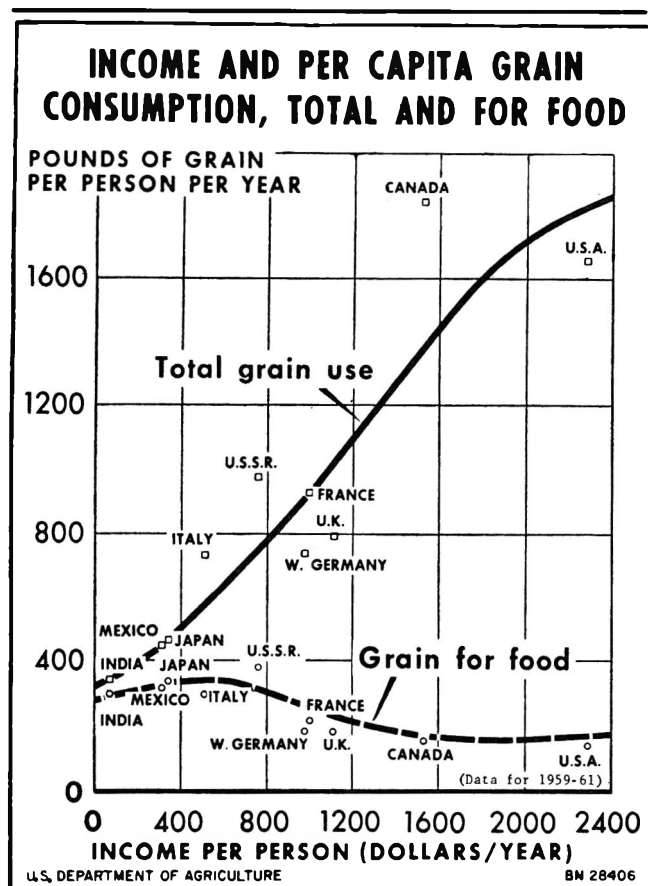
The second problem arises from increasing income. Lester Brown of the U. S. Department of Agriculture showed that higher per capita income results in increased demand for animal products as opposed to an increase in demand for grain. In the United States, per capita consumption of grains is 1,650 pounds a year, mostly indirect consumption in the form of meat, milk, or eggs. Direct consumption is only 157 pounds per person per year. The remainder of the calories and protein are obtained from the balance of grains, about 1500 pounds, fed to animals. In the United States, for an average of about 3000 calories per person per year, almost a ton of grain is required. In India, per capita grain consumption is 340 pounds a year, of which 298 is direct consumption; and the rest is for seed.

As the per capita income rises (and in some countries this has happened), the people wish to approach the kind of standard of living that other countries with higher per capita incomes have achieved. Then they will require much more grain.

Table 1: AVERAGE ANNUAL INCOME PER PERSON AND GRAIN USED PER PERSON, FOR FOOD AND IN TOTAL, 1959 - 61

Country	Annual income	Grain used per person per year	
	per person	Food	In total
	Dollars	Pounds	Pounds
Canada	1,532	152	1,848
United States	2,288	157	1,654
Mexico	312	315	445
France	1,003	219	928
Germany, West	982	181	739
Italy	511	298	732
United Kingdom	1,111	181	792
Soviet Union	762	377	979
India	68	298	340
Japan	346	337	463

Source: Food Balances for 1959-61 prepared by Foreign Regional Analysis Division, Economic Research Service, U. S. Department of Agriculture.



### Fortification of Cereals

It would seem that the most effective way to increase the supply of protein would be via the grains. Grains are the basic food in almost all the hungry regions of the world. The most important approach, the simplest

and the cheapest approach, is to fortify — with protein — the food presently fed to infants and children. Under such circumstances there would be no change in the cultural pattern. This can be done quickly by a few people and does not require the education of the masses.

It is worth taking a little time and talking about the philosophy of fortification, be it fortification for improvement of protein or fortification to relieve a vitamin deficiency? Suppose a large number of children in a given population have a vitamin deficiency. There are two alternatives for treating the problem. First, seek out every child with the deficiency and give him adequate vitamin because you only give it to those who need it. It has certain disadvantages, namely the expense of seeking out these individuals. Another difficulty is that of introducing a new social pattern, of taking these vitamins.

The second alternative is to fortify the entire food supply—admittedly a broad-based alternative. It has the advantage that it reaches all the people who need it quickly. It has the disadvantage that those who do not need it also receive it.

These are the real alternatives; it seems that if there is no harm in receiving extra rations of a vitamin, economics would dictate that fortification is the least expensive and most practical approach. Yet there are many societies that deny this, because of providing for supplements to people who do not need it. Yet, in the United States, this is how a number of deficiency diseases were eliminated, by fortification. Bread and milk are enriched, for example. So, if we can relieve diseases of vitamin and trace mineral deficiency by fortification, why cannot we employ this kind of principle for protein fortification, and why cannot we make foods given to children complete with all needed vitamins, minerals and amino acids.

Thus, one can convert rice or wheat or corn into a truly complete and adequate food for children, by improving protein quality.

I was in Japan and spoke to one of its leading pediatricians who has recognized certain borderline malnutrition cases in his own district where infants are fed rice. He advocates fortification of the rice with amino acids, to make food complete.

Some of the work that has been done in *INCAP* indicates that wheat and corn, properly supplemented, may be adequate foods for children. These are issues that would profit from more research.

In many less developed countries protein malnutrition is combined with sub-optimal calorie supply. What happens when cereals are fortified under conditions of sub-optimal calorie nutrition. There are some who



say that such fortification will be useless. This is an open question and ought to be seriously investigated.

Another question, raised by people who have honest differences of opinion, is, "What is the real limiting amino acid in people's diet? Do we go by averages or do we examine specific foods?" It is very simple when you are developing a ration for an animal, and control everything that the animal needs. But how do you do it for human beings? Do you fortify on the basis of national statistics, or what do you do?

It would seem that one ought to learn something from the housewife in Western society. She has been getting a lot of credit for her ability as a homemaker and as a good feeder of her family. Unless she is completely ignorant or very poor, she cannot possibly give her family bad nutrition because there is enough milk or meat or eggs to go around; she cannot help but have her family well-fed. Something ought to be done for the housewife in those countries where there is not enough good food to make her as "smart" as her "Western" counterpart. If we convert the major cereal food in the hungry country into a protein as good as casein, then may be the housewife would look smarter. This can be made possible by adding amino acids to corn, wheat, or rice flour, or to whole wheat, for example.

The technology is possible. We should start now and see how far we can go, and what kind of impact we could make. We have recommended large scale feasibility tests and demonstrations. Our objective is to find out how effective fortification might be, from the standpoint of both acceptance, and economic feasibility. Someone must prove if possible that with fortification there is less illness, less death, better work performance: all of these are economic benefits. These are things that must be demonstrated; but more precise information may be gained from smaller scale, longer term experiments. This is not solely a research exercise; it is intended to go from demonstrations to action programs as quickly as practicable.

Last year, we invited several countries to participate in such demonstration programs. This was a joint United States Government operation between the U.S. Department of Agriculture and the U. S. Agency for International Development.

In Iran and Tunisia there are discussions on fortifying wheat with lysine.

In India there have also been discussions and a number of plans for studies on fortification of wheat.

We have an invitation from a University in Northeast Brazil to start fortification of corn with lysine and tryptophan for children. We have an invitation from a leading nutritionist in Brazil to study fortification of rice with lysine and threonine for children.

One of the leading manufacturers of amino acids is now planning to investigate means of fortification of rice in Thailand and the Philippines.

We have received an inquiry on fortification of wheat with lysine in Israel.

I am planning to go to Peru to discuss the alternatives of fortification of wheat with lysine as against fortification of wheat with fish protein concentrate.

In the meantime, a number of agencies have issued favourable pronouncements on this subject. Secretary of Agriculture Freeman wrote to the National Academy of Science asking their opinion of these demonstration programs, and they have encouraged it.

Under the guidance of Professor Scrimshaw and others, the Protein Advisory Group of the United Nations issued a similar statement.

A very important document is the report to the President of the United States of his Science Advisory Committee on the *World Food Problem*, a well-written report—something which must be studied by everyone.

I would like to read to you one section of this report: "If the fortification of wheat with lysine being studied on a large scale is found to be feasible and effective as a means of improving the protein supply to the target area, consideration may be given to fortification of all cereal grains and flours shipped from the United States."

Very recently, a report was issued by an *ad hoc* Committee of the United Nations — a committee which worked under the guidance of Professor Scrimshaw — and it too recommended a very serious study of this issue.

### **New Protein Foods**

I have spent much time on fortification, I am going to take less time on the new protein foods, but there are several points that I would like to make.

We need new protein foods from low cost sources. When we talk about low cost sources we mean oilseeds, fish protein concentrate, and we might mean in time micro-organisms, algae, and leaf protein. It has already been demonstrated that these new foods are nutritionally adequate. The major problem now is that a person gets no benefit from food until he eats it. Thus, a food must have certain appealing taste, sight, and smell qualities; this is what we mean by a food.

### **Need for Private Investment**

In the last several years it has become clear that in order to feed the world properly, we must use the talent of the private sector. We must also make good nutrition a self-supporting project, a project that will make money because people will want to buy the food. We have been working to influence the private sector to

become involved. They want to, but they need encouragement and some financial assistance.

The Agency for International Development has developed a High Protein Food Program...Pillsbury was the first company involved. Generally, the amount of money involved per company is \$60,000, as part of a three-phase program. 1) to study the market—to find out who would like the product and who would buy it, and how it should be distributed, 2) to design a prototype food; then 3) to market-test the product. AID funds are used for Phase 1 and Phase 3.

Five contracts have been signed since the establishment of the program. Pillsbury has a contract to study, design, and market a protein beverage; Swift and Company has a contract to study in Brazil what can be done with soybean protein; Monsanto has a contract for studying soy beverages; Krause Milling signed a contract to improve protein impact of corn. International Milling is to go into Tunisia and study what can be done with high protein wheat milling byproducts.

I have been emphasizing beverages, although not excluding other foods. Beverages are acceptable equally to the rich as well as the poor; and have no social status. You can give them to children; they can be part of special programs for children at clinics or schools.

### Realistic Goals

Let's talk about the relationship between needs and goals. We must set up goals. We can no longer be satisfied to go from one meeting to another and say we are going to do something with fish protein concentrate, with cottonseed protein concentrate, or peanut flour. We must set goals that we hope will be realistic and, perhaps, can be achieved. I would like, therefore, to talk about the protein deficit, not in terms of statistics or calculations, but in terms of goals. I would like to give you goals not because they are really exact, but because they are something we should aim at. I have four:

- 1) Fortify emergency foods by 1969.
- 2) Fortify all grain imports in countries with a protein shortage by 1970.
- 3) Fortify cereal foods in urban centers of countries lacking protein by 1970.
- 4) Make one billion additional cups of protein beverage per day by 1970. This is equivalent to adding one million tons of protein to the world supply annually.

The marketplace ultimately will determine how

much additional protein people need. If everybody in the world had all the money he could use and all the food he could buy, we could find out how much protein we need.

You may accept these goals or reject them. If you reject them, you ought to substitute other goals. But don't neglect them. I do not think we should come to meetings in the future without a goal and some means of measuring our achievements.

### Oilseeds

I would like to make a few comments about oilseed.

A key question concerning protein in India involves soybeans. Shall India import soybeans? Can India ultimately grow her own? What role can soybeans play in filling India's protein gap? Maybe a situation could develop such as in Japan. Japan decided that it is cheaper to grow soybeans in the United States rather than in Japan.

A member of the faculty of the University of Illinois, working on soybean culture in India, told me that certain high yielding varieties can grow in India. The situation perhaps is hopeful.

There is the possibility of a new approach to cottonseed. One equipment manufacturer, whose representative is here in the audience, has found that his equipment can separate pigment glands (the site of gossypol storage) from the main body of the protein meal. There is the real possibility, with more work, that a high protein food with good color and other nutritional advantages can be developed from cottonseed.

There is a new possibility for coconuts. Coconut protein has a high lysine content. There exist methods that show promise of producing useable protein concentrates.

With these three short examples it is possible to see still other alternative solutions to the protein problem.

### Conclusion

The mere fact that we can present specific ways of increasing protein supplies and talk about goals does not mean that the problem is solved, or even that we are making progress. All it means is that technology provides the means for doing things not possible a few decades ago. It is in our hands to do something about proteins besides the conventional approaches. But it is also in our hands to do nothing, to fail.

The spirit of this Symposium is one of optimism, because there are solutions, there are things to do. It is also a spirit of challenge. Our failure would be the greater because of what we might have done.

# Physico-Chemical Studies of Five Australian Wheat Varieties

A. K. KAUL

Cumings Laboratory, Indian Agricultural Research Institute,  
New Delhi - 12

*Manuscript Received: 1 June 1967*

An attempt was made to investigate into the factors responsible for the quality differences in five, widely different, Australian wheat varieties. The characteristics studied were: thousand-kernel-weight, sedimentation value, farinograph visco-elasticity, protein content, sulphur content, phosphorus content, electrophoretic mobility, and electron microscopy of gluten. The velorimeter values appeared to be better indicators of accepted quality standing of the varieties studied as compared to other test values. Though differences in the electrophoretic patterns could not, in any way, be correlated with quality, these could be used as fingerprint identification marks for the varieties. Electron micrographs revealed a stacked sheet structure of gluten, the sheets in turn being constituted of macromolecules of protein.

The term 'quality' as applied to wheat and flour intended for bread, biscuit, and macaroni purposes is related to many different physico-chemical properties. Many tests have been proposed to measure the suitability of different wheats for different purposes, and these have been extensively reviewed. The tests applied on strong wheats intended for bread making have been discussed by Miller and Johnson.<sup>1</sup> The principles of evaluation of *Durum* wheats and their products, namely macaroni and semolina, have been reviewed by Fabriani<sup>2</sup> and by Cubadda *et al.*<sup>3</sup> The potentialities and limitations of the sedimentation test<sup>4</sup> and farinogram<sup>5</sup> in the evaluation of quality for bread-making have also been discussed in detail.

Among all the factors responsible for quality, those concerned with the mixing behaviour of flour seem to be of primary interest<sup>6</sup>. Mullen and Smith<sup>7</sup> concluded that the proteins of wheat flour are chiefly responsible for differences in the rheological properties of dough. The significance of the gluten fraction of protein has been pointed out by several workers<sup>8-10</sup>. The Starch-gel electrophoresis technique has been employed by several workers to study the nature of wheat proteins<sup>7, 11-13</sup>.

Traub *et al.*<sup>14</sup> on the basis of electron microscopic studies of gluten suggested that protein fibers of gluten are held together by layers of phospholipids in the form of bimolecular leaflets. Grosskreutz<sup>15, 16</sup> obtained x-ray crystallographs and electron micrographs of freeze dried gluten and concluded that a lipo-protein 'sheet' configuration was responsible for the unique visco-elastic properties of gluten.

In the present investigation, the quality characters and chemical composition of five widely different varieties of Australian wheat have been studied. An attempt has also been made to study the change in the ultra physical structure of wheat gluten during its gradual degradation using fat and protein solvents.

## Materials and Methods

Bulked samples of genetically uniform grain grown

side by side in the same season were tempered to 15% moisture before milling. The tempered samples were milled to 65% extraction on an experimental flour mill.

## Quality and Chemical Data

(i) *Sedimentation*: The sedimentation value was determined by the method of Pinckney *et al.*<sup>17</sup>. Three random samples of each variety were tested at 14% constant moisture level.

(ii) *Farinograph*: A single speed 50g. capacity farinograph was used. Triplicate samples of 50g. ± .01 g. (14% moisture basis) were analysed. The bowl was maintained at 30°C.

(iii) *Protein percentage*: The protein content was determined by the micro-Kjeldahl method<sup>18</sup>, using the conversion factor 5.7.

Sulphur and phosphorus were determined colorimetrically<sup>19</sup>.

## Electrophoresis

Starch-gel electrophoresis was carried out in vertical trays<sup>13</sup>. The gels were prepared by heating 48 g. starch (Connought Medical Research Lab., Toronto, Canada) with 400 ml. aluminium lactate buffer (pH 3.2) containing 48 g. urea.

10 g. samples of whole meal were extracted with 20 ml. freshly prepared 2M urea for 2 hours at 4°C and later centrifuged at 5000G. Only 0.2 ml. supernatant samples were loaded into gel slots. Electrophoresis was carried out at 11 volts/cm. for 7 hours. Gels were sliced horizontally and stained for 12 hours with nigrosine. The nomenclature used by Smith and Mullen<sup>7</sup> and Woychick *et al.*<sup>11</sup> was adopted in these studies.

## Electron Microscopy

(i) *Preparation of gluten samples*: Glutens, washed from freshly prepared flour-water doughs in the usual way under running distilled water, were stretched as thin continuous sheets on the ends of blunted glass tubes. These were kept in brief contact with dry ice

for a few seconds before lyophilization for 36 hours. The round white flakes thus obtained retained the size and shape of original stretched specimen.

(ii) *Preparation of grids*: Dried flakes were pressed on nearly polymerized Araldite (CY 212-10 ml., HY 964-10 ml., Dy 064-0.5 ml., and dibutyl phthalate 1.0 ml.). Araldite was hardened by storing the microcup containers at 60°C for 24 hours.

Gluten was washed from Araldite alternatively with 75% ethanol and 2% potassium hydroxide using a camel brush. The steps followed from here onwards were the same for all seven samples.

A drop of methyl acetate, and sufficient acetyl cellulose film to cover it, was placed on the Araldite and allowed to dry.

with consumers' quality grading. Within the farinograph observations, the velorimeter value seems to be the most reliable. The kernel weight is positively correlated with protein, sulphur, and phosphorus contents. However, the data are too meagre to establish the relationship conclusively.

Fig. 1 gives the electrophoresis patterns.

These patterns represent intermediate and some slow-moving fractions of proteins. Fast-moving, *i.e.* water soluble or non-storage proteins and some high molecular weight globular proteins are not represented here.

The patterns serve as fingerprints of the varieties studied as they are hundred-per-cent heritable and reproducible. It should, however, be pointed out that differences in terms of number of bands could not be

Table 1: QUALITY AND CHEMICAL DATA OF FIVE AUSTRALIAN WHEAT VARIETIES

Variety	1000 kernel weight	Sedimentation Value (ml.)	D.T. min.	St. min.	Farinograph*					
					To BU.	Ve. VU.	Abs. mls.	Protein %	Sulphur %	Phosphorus %
Dural†	46.07	20.6	3.0	6.5	40	50	62.5	11.96	0.130	0.168
Wongoondy	43.01	29.5	5.0	8.0	45	60	61.5	10.50	0.098	0.095
Gamenya	36.16	38.0	4.5	6.5	50	56	56.6	9.48	0.092	0.109
Insignia	37.49	32.5	3.0	7.0	50	56	55.4	9.94	0.102	0.097
Olympic	29.68	40.0	2.5	5.5	60	48	51.4	9.12	0.094	0.089

\* D.T.=Development time, St.=Stability, To.=Tolerance, Ve.=Velorimeter value, Abs.=Absorption.

† Dural is a durum wheat. All tests are reported at 14% constant moisture basis except the sulphur and phosphorus, which were determined on oven dry samples.

The cellulose film was peeled off from Araldite and fastened on to a glass slide with durex tape. Carbon was evaporated on to the plastic replica and shadowed with chromium at 30°C under vacuum. The carbon-chromium replica was cut away and fastened (carbon side down) on to a glass slide with warm wax (45°C). The slide was kept in an oven (45°C), in a cup containing methyl acetate, to float the carbon-chromium replica free of wax and plastic so that the replica could now be picked upon the grid and washed in xylol before viewing.

A Philips 100-C electron microscope was used in these studies. The resolution was of the order of 15Å°.

## Results

The data relating to the five wheat varieties are given in Table 1.

Dural, a durum wheat, gave the highest values for protein content, sulphur content and phosphorus content; it had the lowest sedimentation value and farinograph tolerance. Except for its low sedimentation value, Wongoondy could be considered to be the best among the four hexaploid varieties. The farinograph values of the different varieties were in close accord

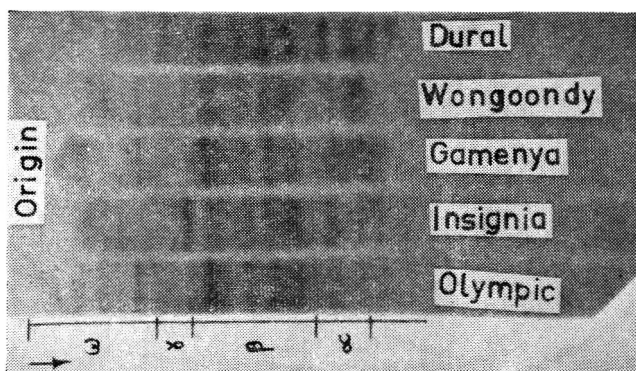


Fig. 1 Protein components of extracts from *T. durum* cv. Dural and *T. aestivum* cv. Wongoondy, Gamenya, Insignia, and Olympic as separated by vertical starch-gel electrophoresis.

correlated with quality characters. Intervarietal variations were more pronounced in the  $\alpha$ ,  $\gamma$  and  $w$  regions than in the  $\beta$  region.

*Electromicroscopy*: Different varieties did not show any significant differences in the basic microstructure of gluten. A folded platelet configuration was evident in the micrographs (Fig. 2).

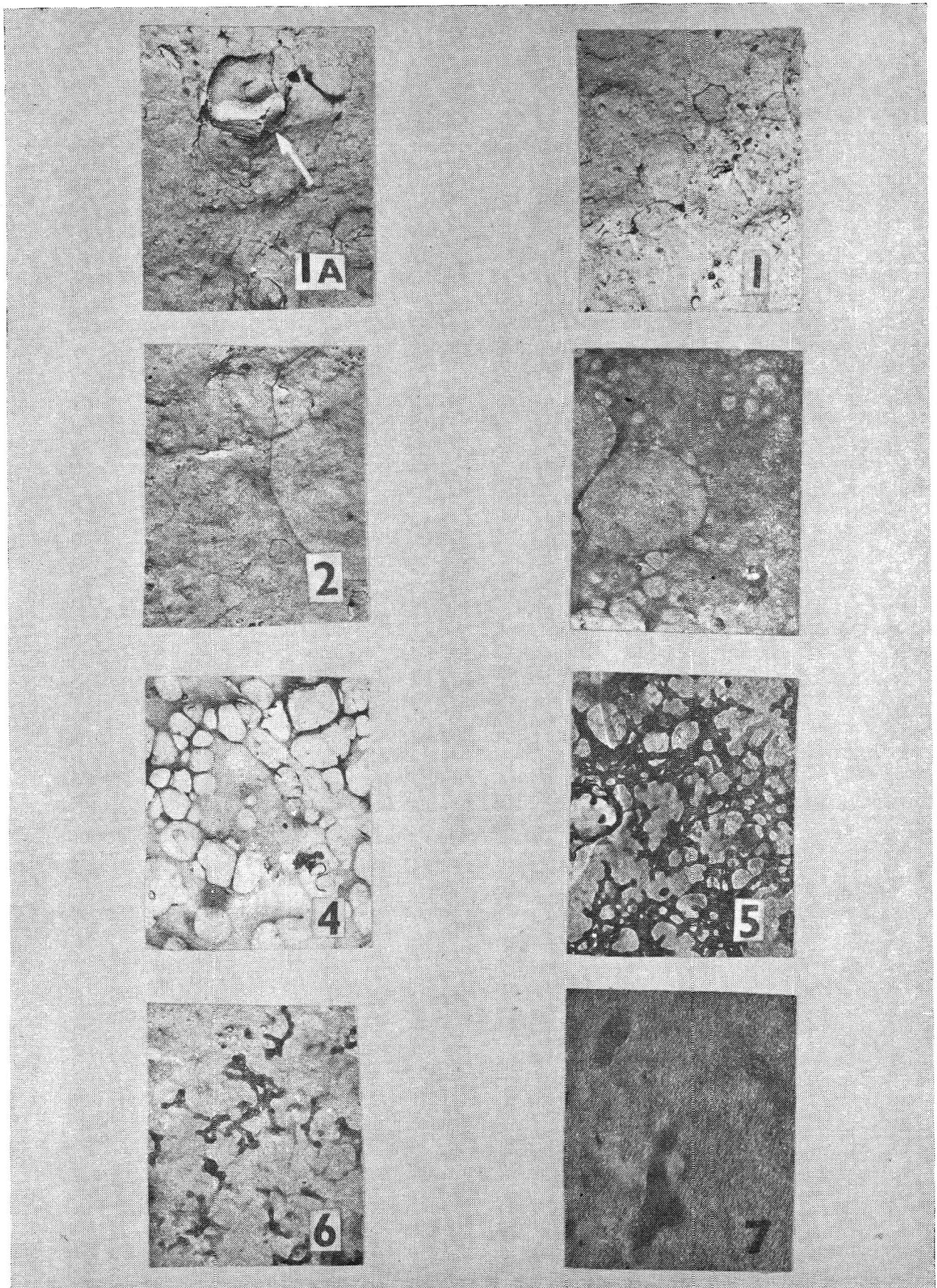


Fig 1A to 7 Magnifications: 1A(5000X), 1(3300X), 2(7000X), 3(12500X), 4(12500X), 5(25000X), 6(26000X) and 7(100000X). Electroh micrographs showing shadowed carbon replicas of the surface of stretched and lyophilized crude gluten of *T. aestivum* cv. Insignia.

1A(5000X): Unmodified crude gluten surface showing the sheet structure. Artifact marked with an arrow was accidentally upturned revealing the stacked sheet structure of gluten in cross section. Pictures 2 to 7 show the successive stages of degradation of sheet structure.

There was a gradual degradation of the sheet structure of stretched gluten when washed with 75% ether alcohol and 2% potassium hydroxide. As disintegration progressed, the gluten sheet (Fig. 2-1) developed holes which gradually increased in size (Fig. 2-2 to 4). Towards the end, a filamentary network was left (Fig. 2-5) which was further reduced to, what could be interpreted as, free macromolecular chains with secondary and tertiary branches (Fig. 2-6). Fig. 2-7 shows three macromolecules.

### Discussion

Kaul and Sosulski<sup>19,20</sup> found that the sedimentation test was a better indicator of quality than protein percentage.

It is well known that-SH compounds soften the gluten and decrease the viscosity, plasticity and mixing time of flour doughs<sup>21, 22</sup>. The nature of -SH compounds in flour is not known, but it is believed that they are located in the water-soluble fraction of flour<sup>23</sup>. The determination of -SH compounds was not included in the present study. However, the total sulphur content appears to have no significant bearing on the quality of wheat.

The protein pattern as revealed by electrophoretic analysis appears to be typical of each variety. This finding is in conformity with that of Coulson and Sim<sup>24, 25</sup>. Electrophoretic patterns can be used as a quick method for the identification of wheat varieties and also for establishing genotypic purity.

Intervarietal similarity between the fast moving components and components of the  $\beta$  region has been reported by Coulson and Sim<sup>25</sup> and Clusky *et al*<sup>26</sup>.

The protein species characterized by these two electrophoretic mobilities appear to be significant from the point of view of the metabolism of the wheat plant. No correlation has been found between the electrophoretic protein pattern and rheological behaviour of varieties.

Electron micrographs did not reveal any differences in the structure of proteins of the five varieties of wheat; the washed gluten of the five varieties appear to be similar.

### Acknowledgement

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# Preparative Trials on Roller Dried Weaning Foods

M. R. CHANDRASEKHARA, M. MADHAVA KRISHNAIAH  
H. N. CHANDRASEKHAR and S. R. SHURPALEKAR  
Central Food Technological Research Institute,  
Mysore - 2

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The preparation of weaning foods based on groundnut flour, Bengalgram, green gram and wheat flour has been described. Two processes namely roller drying and macaroni process have been adopted. Roller drying gave a more acceptable product. The protein efficiency ratio of the product was 2.3; it was enhanced to 2.5 and 2.7 by supplementation with methionine and milk solids respectively.

It is now recognised that children of the preschool age constitute a vulnerable group of the population and protein malnutrition at this age, if unremedied, leads to permanent ill effects. Several laboratories throughout the world have been engaged in devising foods for weaned children<sup>1</sup>. Work on malt foods<sup>2</sup> and roller dried weaning foods have been reported<sup>3</sup> from this Institute. A weaning food based on groundnut flour, Bengalgram (*Cicer arietinum*) flour, green gram flour and corn starch has been formulated and tested. The present paper deals with pilot plant studies on the production of weaning food and its quality assessment.

## Materials and Methods

A blend of the raw materials (Table 1) was made by mixing finely powdered (40 mesh) flours in a paddle mixer. Vitamin premix and salts were mixed with an aliquot of wheatflour (10 kg.) and this was added to the mixer so that a uniform distribution of vitamins and minerals in the blend was achieved. Wheat flour was used in preference to corn flour, as it was more easily available in the country and had a higher protein content.

Four batches of roller dried weaning food and two batches of macaroni press extruded food were prepared. In addition, two small experimental batches were prepared to find out whether precooking can be avoided.

**Roller drying:** The flow diagram of the process is shown in Fig. 1. The ratio of water to flour mixture was 5:1 (total solids 16.6%). The major portion of the water was taken in the steam-jacketted vessels (a) provided with stirrers. The pump (b) was started and the powder fed in through the funnels (c) so that a continuous stream of powder was sucked into the main stream of circulating water through the inlet of the pump and delivered into the vessel. In this way, thorough mixing of the ingredients was assured within a very short time (10 to 15 minutes). In one trial, hot water (60°C) was tried, but as it resulted in lump formation and clogging of

the pump inlet, it was given up. After mixing, the circulation was continued and the stirrers in the vessels started. Steam was let in and the temperature of the slurry raised to 60-70°C (20 minutes). The material was held at this temperature for 10 minutes. The three-way valve (d) was now turned to block the recirculation pipe and open the pipe leading to an overhead insulated storage tanks (e) provided with stirrers. The material from the tank was fed by gravity flow to the roller drier through a trough with perforations at the bottom.

Table 1 COMPOSITION OF BLEND USED FOR ROLLER DRYING

	<i>Parts used</i>
Roasted groundnut flour . . .	35
Roasted Bengalgram flour . . .	15
Roasted greengram flour . . .	15
Maida . . .	25.0
Cane sugar . . .	4.9
Calcium carbonate . . .	1.0
Calcium phosphate . . .	1.0
Common salt . . .	1.6
Vitamin premix . . .	1.5

*Blend A:* Plain Weaning food (W. F.)

*Blend B:* W. F. with methionine

*Blend C:* W. F. with milk solids

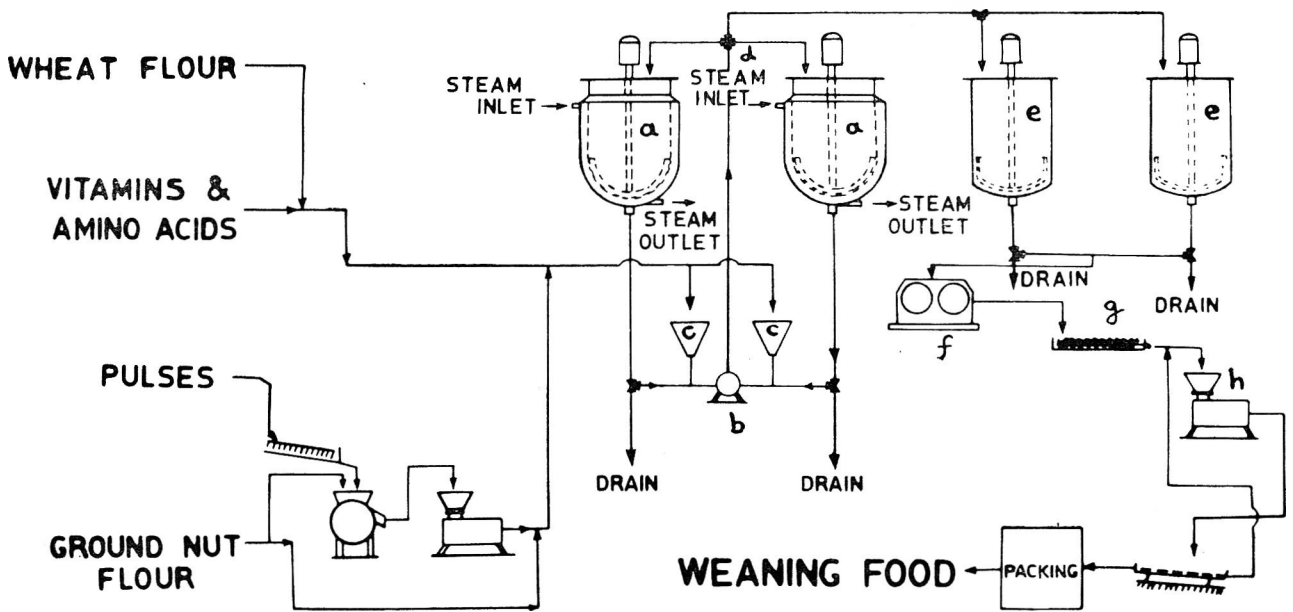
*Blend D:* W. F. with malt solids

Blend A was used for preparing the macaroni-like product.

A twin drum roller drier, Bertram type (f) with rollers of 18 in. x 18 in. working at a steam pressure of 110 to 120 psig and revolving at 16 rpm was employed. Dried flakes scrapped from the surface of rollers were collected in a trough provided with a screw conveyer (g) The flakes were screened through a 20 mesh sieve and packed in tins.

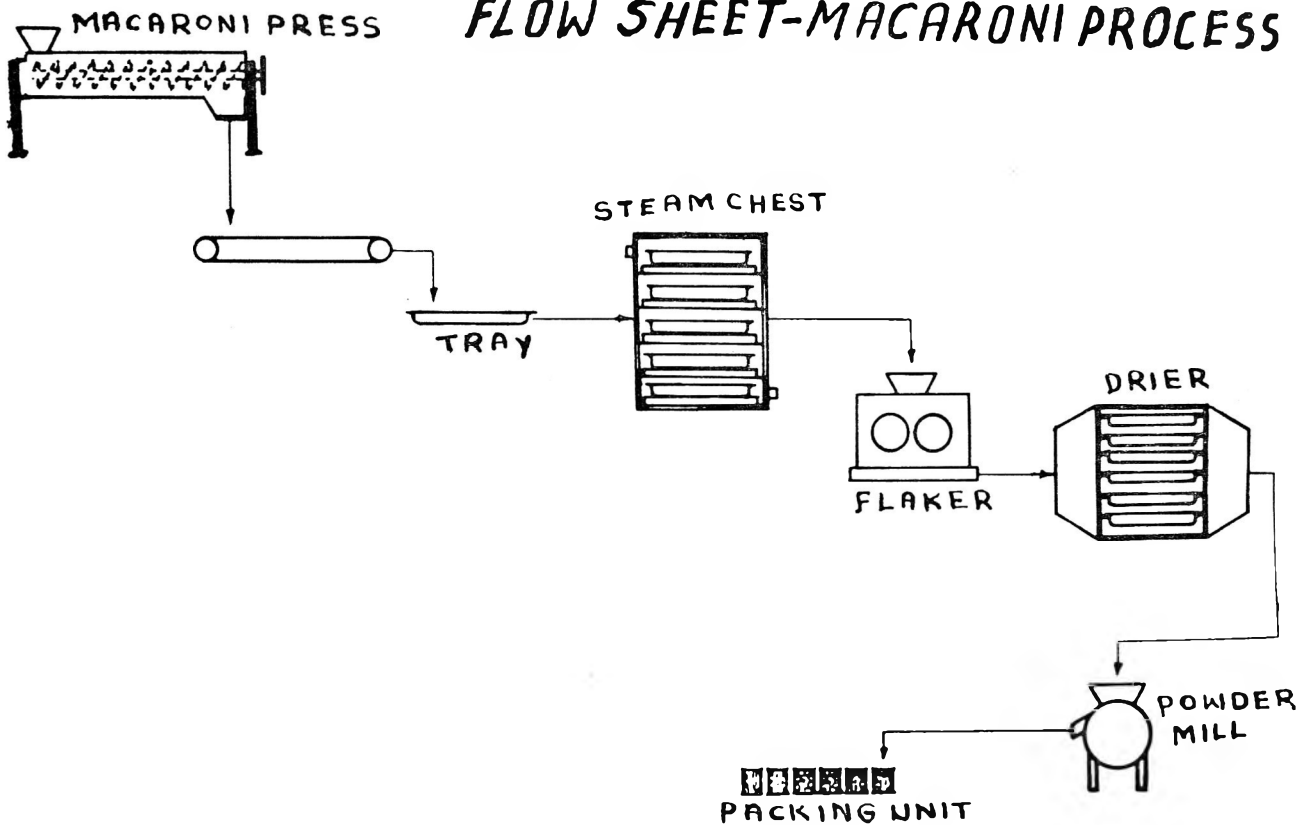
In the first batch(A), the flour mix after slurring was dried as such without any additions. In the second

### FLOW SHEET FOR WEANING FOOD



a) Steam Jacketed Kettle; b) Pump; c) Mixing funnels; d) 3 way valve; e) Holding tanks; f) Roller drier; g) Screw conveyor; h) grinder.

### FLOW SHEET-MACARONI PROCESS





batch (B), dl-methionine hydrochloride, dissolved in a small quantity of dilute hydrochloric acid (AR), was added to the slurry at 0.5% level on the weight of the mix. In the third batch (C), 90 parts of the blend were mixed with defatted milk equivalent to 10 parts of solids-not-fat and the quantity of water was suitably reduced to allow for the water present in the milk. In the fourth batch (D), 90 parts of the blend were mixed with 10 parts of barley malt powder\* (40 mesh). This was mixed with water in the usual way and was kept at 70°C for ½ hr. before pumping to the holding tank. The conditions of drying were the same for all the four batches.

Trial batches of the food were prepared by roller drying the slurry (with increased total solids) without any pre-cooking. In one the total solid content was raised to 20% by the addition of one part of blend to 4 parts of water; in the second the ratio of blend to water was 1:3 and the total solid content was 25%. Viscosity data relating to the different slurries subjected to roller drying are presented in Table 2.

Table 2 VISCOSITY OF SLURRIES FED TO THE ROLLER DRIER

Ratio of blend to water	Temp. of cooking °C	Temperature for viscosity measurement °C	Viscosity in Centipoise
1:5	75	70	623.7
do	do	60	843.9
do	do	50	935.6
do	do	40	972.3
do	do	30	1046.0
1:5	No cooking	30	5.0
1:4	do	30	10.6
1:3	do	30	67.6
1:2	do	30	341.7

*Weaning food using macaroni press:* The flow diagram of the processes is presented in Fig. 2. Blend A (Table 1) used for roller dried batches, was mixed with one-third its weight of cold water in a horizontal dough mixer. The dough was passed by a screw conveyor into a macaroni press provided with a cutter. The grains were collected on trays and cooked in a steam chest (steam pressure 5 psig. in. time 10 min.). The material coming out of the chest was cooled to about 40°C, transferred to a revolving flaker. The flakes were dried in a through-flow drier at 100°C for half an hour.

*Chemical composition:* The chemical composition of the products were estimated by standard AOAC methods<sup>4</sup>. Available lysine was estimated by Carpenter's method<sup>5</sup> and other amino acids, by micro

biological techniques<sup>6</sup>. The data are presented in Tables 3 and 4.

Table 3 CHEMICAL COMPOSITION OF WEANING FOOD

	Weaning Food (W.F.) per 100 g.	W.F. + methio-nine	W.F. + milk solids	W.F. + malt solids
Moisture g	3.8	3.9	4.3	3.4
Protein g	27.2	27.0	27.5	27.4
Fat g	3.4	3.4	3.9	3.8
Ash g	5.5	5.5	5.8	5.5
Carbohydrate g (by diff)	60.1	60.2	58.5	59.9
Calories	380	380	379	383
Calcium g	0.8	0.9	1.0	1.0
Phosphorus g	0.6	0.6	0.7	0.6
Iron mg	3.1	3.0	2.5	3.1
<i>Vitamins added</i>				
Vitamin A I.U.	3000	3000	3000	3000
Thiamine hydrochloride mg.	1.1	1.1	1.1	1.1
Riboflavin mg.	1.8	1.8	1.8	1.8
Vitamin D I.U.	300	300	300	300

Table 4 AMINO ACID COMPOSITION OF WEANING FOODS

Amino acid	W.F.	W.F. + methio-nine	W.F. + milk solids	W.F. + malt solids	FAO Amino acid pattern
S. amino acids	3.1	3.8	3.0	2.2	4.2
Phenylalanine	4.6	4.5	4.5	4.5	2.8
Leucine	3.1	3.2	3.0	3.0	4.8
Isoleucine	4.5	5.5	4.8	3.8	4.2
Valine	5.5	5.4	5.5	4.5	4.2
Arginine	7.5	8.3	4.2	4.5	—
Threonine	3.5	4.0	4.0	4.2	2.8
Tryptophan	1.3	1.4	1.3	1.3	1.4
Lysine	4.9	3.7	4.4	3.2	4.2
Available lysine	3.4	3.3	3.6	2.6	—

*Organoleptic acceptability:* The foods were made into porridge by mixing the flakes with hot water in the ratio of 1:3. Organoleptic acceptability was judged by a panel of 6 members. The results are presented in Table 5.

*Nutritive value:* The protein efficiency ratio (PER) of the roller dried products were determined at protein levels of 10% and 15% by the method of Osborne, Mendel and Ferry<sup>7</sup>, using 21 day old weanling male rats each weighing about 42 g. Data on the composition of the diets are presented in Table 6. Two control groups of skim milk powder at 10% and 15% protein

\* The barley malt was supplied by Jagatjit Distilleries and Allied Industries, Hamira, Punjab.

Table 5. ORGANOLEPTIC ACCEPTABILITY OF RECONSTITUTED WEANING FOOD

	A*	B*	C*	D*	E*
Colour	Cream white	Cream white	Cream white	Greyish brown	Greyish brown
Taste & flavour	3	3	3	4	2
Consistency†	3	3	3	3	1
Overall acceptability	Good	Good	Good	Good	Not acceptable as there is a separation into two layers

† 4=Highly acceptable; 3=Acceptable; 2=doubtful; 1=Not acceptable. \*A=Weaning Food (W.F.); B=W. F.+methionine; C=W. F.+milk solids; D=W. F.+malt solids; E=Macaroni product.

Table 6. COMPOSITION OF DIETS USED FOR PER EXPERIMENTS

Diets	10% protein <sup>1</sup>		15% protein <sup>1</sup>	
	Infant food in diet (g)	Corn starch in diet (g)	Infant food in diet (g)	Corn starch in diet (g)
A	1428	1252	2142	538
B	1428	1252	2142	538
C	1412	1268	2118	562
D	1412	1268	2118	568
Control	1176 <sup>2</sup>	1504	1764	916

<sup>1</sup> The diet contained in addition 360 g. groundnut oil, 40 g. shark liver oil, 40 g. vitamin starch, 80 g. salt mixture, and 800 g. powdered cane sugar. <sup>2</sup> Control diet contained skim milk powder in place of infant food.

Table 7. PER OF WEANING FOODS  
(DURATION OF EXPERIMENT, 4 WEEKS—MEAN INITIAL BODY WEIGHT OF RATS 41.7 G.)

Diet	10% protein level				15% protein level				
	Weight gain g.	Protein intake g.	PER	PER when recalculated on the basis of 3 for milk protein at 10% level	Weight gain g.	Protein intake g.	PER	PER when recalculated on the basis of 3 for milk protein at 10% level	
A. Weaning food	77.0	31.8	2.41	} ± 0.081 36 df.	109.1	47.6	2.29	} ± 0.082 36 df.	
B. Weaning food methionine	86.5	32.9	2.62		123.8	50.8	2.44		
C. Weaning food milk solids	89.6	32.1	2.78		122.8	53.9	2.28		
D. Weaning food +malt solids	37.7	22.6	1.83		72.5	45.1	1.60		
Control SMP	107.8	34.3	3.14		110.1	42.0	2.61		
<b>Results</b>									
Diets	D	A	B	C	Control	D	C	B	Control
Mean PER	1.83	2.41	<u>2.62</u>	<u>2.78</u>	3.14	1.60	2.28	<u>2.44</u>	<u>2.61</u>

Any two means underscored by the same line are not significantly different.

levels were also maintained alongside. The PER of foods was recalculated on the basis of a value of 3.0 for skim milk powder at 10% protein level (Table 7).

### Results and Discussion

Weaning foods are now being manufactured in several countries to correct protein malnutrition in preschool children. In South Africa, Hind Brothers are producing a Weaning Food under the trade name Pronutro<sup>8</sup>. In other countries like Algeria and Yugoslavia, weaning foods are being manufactured under UNICEF aid<sup>9</sup>. Three different processes are generally employed in their production. In the first, the blend is suspended in

water, cooked and roller dried. In the second process, a dough (with 30% or less of water) is extruded through a macaroni press and the grains are steamed and dried. The third process, known as the Wenger Process<sup>10</sup>, involves the use of an extrusion press with high pressure cooking. The advantage of using the macaroni press or the Wenger process is that comparatively little water is added to the blend while processing and the energy expended for drying the product is small. On the other hand, in roller drying, the amount of water to be removed ranges from 1½ times to four times the weight of the product. However the organoleptic acceptability

of the roller dried product is rated higher than that of pressed and flaked macaroni (Table 5). Also roller dried flakes reconstitute into a smooth paste, unlike the product from the macaroni press which 'sits down' showing a clear whey above.

In the roller drying process, it is important to ensure a smooth flow of the material from the storage tank to the rollers and the viscosity of the slurry is critical. The viscosities of slurries at different ratios of blend to water and at different temperatures are shown in Table 2. A precooked slurry with a solid: water ratio of 1:5 has been found to possess satisfactory flow properties. If pre-cooking is avoided, slurries with 25% total solids can be processed satisfactorily. The addition of milk solids in the form of skim milk ensured easy mixing and smooth working. The use of barley malt in the blends resulted in considerable caramelization during drying; the resulting product, had excellent flavour.

When used as supplement to normal diets 50g of roller dried weaning food (WF) supplies 13g. of protein and 190 calories; it provides also substantial amounts of vitamin A, thiamine, riboflavin and calcium. The amino acid composition of WF protein (Table 4) is comparable to the FAO amino acid pattern except in the case of total S-amino acids.

The PER of the weaning food was 2.3; with supplementation with methionine or with milk, the ratio was enhanced to 2.5 and 2.7. Addition of malt solids, however, depressed the PER to 1.7. Available lysine content of this sample was only 2.6 as compared to 3.3—3.6 for other blends. At 15% protein level, the PER of the blend supplemented with methionine was not significantly different from the PER of milk.

Estimates of cost made on the basis of pilot plant trials show that 1 kg. of the product packed in polyethylene bags costs Rs. 2.45 (ex-factory). Out of this 52% is the cost of the raw material, about 22% of packing, 6.6% indirect costs, 14.0% utilities, 1.2% maintenance and about 3.0% labour and supervision. A supplement of 50 g .per day costs about 12 paise.

### Acknowledgement

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# Intestinal Synthesis of B-Complex Vitamins in Rats as Influenced by Feeding of Curds

B. R. BALIGA and R. RAJAGOPALAN  
Central Food Technological Research Institute,  
Mysore - 2

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The influence of supplementing casein-starch diet fed to rats with curds with respect to the intestinal synthesis of thiamine, riboflavin, pantothenate, pyridoxine, vitamin B<sub>12</sub> and choline, as also the benefit accruing to the host at two levels of B-vitamin intake (a low level and half-optimum level) has been studied.

Even at low level of intake of B-vitamins, curds supplementation produced a marked improvement in feed efficiency; the improved feed efficiency was not significantly different from that of the group receiving B-vitamins at the optimum level.

The order of efficiency of curds-induced intestinal synthesis of B-vitamins was as follows: pyridoxine, thiamine, choline, pantothenate, vitamin B<sub>12</sub> and riboflavin.

In a previous study<sup>1</sup> it was shown that feeding rats with curds along with rice diet increased the liver store of thiamine and also its excretion in urine and feces. In another study<sup>2</sup> it was shown that curd supplementation to an acid-washed casein diet fed to rats improved efficiency and increased liver store of thiamine; faecal and urinary excretion was also increased.

Earlier studies<sup>3,5</sup> by the present authors have dealt with intestinal synthesis of thiamine in rats fed on diets supplemented with curds. The results of curds supplementation when all B-vitamins are fed at low and half-optimum levels on the intestinal synthesis of B-vitamins are presented in this paper. The effect on all B-complex vitamins was studied because generally only multiple deficiencies are encountered in practical nutrition.

## Experimental procedure

Thirty weanling rats were divided into five comparable groups on the usual basis of weight, age, litter and sex, and fed according to the following schedule:

Group I—Optimum vitamin intake + basal diet.

Group II— $\frac{1}{2}$  optimum vitamin intake + basal diet.

Group III—Low vitamin intake + basal diet.

Group IV—13 g. curds/rat/day + basal diet.

Group V—13 g. curds/rat/day with optimum vitamin intake + basal diet.

The basal diet was compounded of acid-washed casein<sup>6</sup> (18%), groundnut oil (10%), sugar (10%), Osborne-Mendel salt mixture (4%), and low nitrogen tapioca starch (make up to 100%).

The intake of food and vitamins (including vitamin K) of the animals was controlled as far as possible so that there was not too much difference between different groups. The total solids and the vitamins content of curds were taken into account while adjusting the food and vitamin intake of IV and V groups. The optimum concentration and mode of administration of vitamins

were the same as in our earlier study<sup>3</sup>. The supplement of curds provided (per g.): thiamine 0.3  $\mu$ g.; riboflavin 1.0  $\mu$ g.; niacin 0.85  $\mu$ g.; pantothenate 3.4  $\mu$ g.; pyridoxine 1.3  $\mu$ g.; choline 147.0  $\mu$ g.; vitamin B<sub>12</sub> 2.9 m $\mu$ g.; folic acid 2.0 m $\mu$ g.; and biotin 35.0 m $\mu$ g. The basal diet provided (per g.): thiamine 0.19  $\mu$ g.; riboflavin 0.7  $\mu$ g.; niacin 2.0  $\mu$ g.; pantothenate 4.4  $\mu$ g.; pyridoxine 1.2  $\mu$ g.; choline 221.5  $\mu$ g.; vitamin B<sub>12</sub> 2.9  $\mu$ g.; folic acid 1.8 m $\mu$ g.; and biotin 36.4 m $\mu$ g. The rats in Group III received extra vitamins equivalent to those present in 13 g. of curds.

The duration of the experiment was eight weeks. Weight and food intake records were maintained. Excreta were collected during the fourth and eighth week of the experiment and preserved as in our previous studies, for estimation of thiamine<sup>7,9</sup>, riboflavin<sup>10,11</sup>, pantothenate<sup>12</sup>, pyridoxine, choline<sup>13</sup> and vitamin B<sub>12</sub><sup>14</sup>. At the end of eight weeks, the rats were sacrificed and livers taken out for the estimation of the same six vitamins. Extracts for microbiological estimation of pantothenate, pyridoxine, vitamin B<sub>12</sub> and choline were prepared in accordance with the method of Snell<sup>15</sup>. The same methods were used for the estimation of vitamins in the diet as well as curds. Niacin was estimated by the cyanogen bromide method<sup>16</sup>. Folic acid and biotin were estimated by microbiological methods<sup>17</sup>.

## Results and Discussion

The growth data summarised in Table 1 show that there was no significant difference in the feed efficiency between the optimum vitamin intake group and groups IV and V receiving curd supplement; it was independent of the supply of extra B-vitamins to half-optimum level. The feed efficiency of group III on low vitamin intake was significantly less than that of the two control

Table 2 INFLUENCE OF CURDS FEEDING ON THE URINARY AND FECAL EXCRETION OF B-VITAMINS

Vitamin	I - Optimum vitamins		II - $\frac{1}{2}$ Optimum vitamins		III - Low vitamin intake		IV - 13 g. curds		V - 13 g. curds with half optimum intake		
	First Collection	Second Collection	First Collection	Second Collection	First Collection	Second Collection	First Collection	Second Collection	First Collection	Second Collection	
Thiamine	2.2 ± 0.04	2.6 ± 0.03	1.2 ± 0.04	1.6 ± 0.04	0.9 ± 0.03	1.2 ± 0.04	1.2 ± 0.03	2.1 ± 0.03	2.3 ± 0.05	3.2 ± 0.09	
Riboflavin	5.7 ± 0.19	5.6 ± 0.15	3.7 ± 0.17	4.6 ± 0.17	3.9 ± 0.15	4.5 ± 0.05	5.9 ± 0.12	5.5 ± 0.09	6.2 ± 0.09	6.3 ± 0.06	
Pantothenate	41.4 ± 1.1	40.6 ± 0.6	27.0 ± 0.4	27.1 ± 0.1	7.9 ± 0.1	8.1 ± 0.2	13.7 ± 0.2	14.3 ± 0.1	39.0 ± 0.7	41.3 ± 0.4	
Pyridoxine	2.6 ± 0.06	2.6 ± 0.04	1.4 ± 0.04	1.4 ± 0.04	1.1 ± 0.03	1.1 ± 0.03	5.4 ± 0.02	5.4 ± 0.02	6.5 ± 0.03	6.5 ± 0.03	
Vitamin B <sub>12</sub> (in m μg)	25.0 ± 0.9	23.7 ± 0.3	17.2 ± 0.2	16.4 ± 0.2	17.9 ± 0.2	17.6 ± 0.2	22.4 ± 0.5	24.5 ± 0.7	34.6 ± 0.7	36.2 ± 0.3	
Choline	41.8 ± 0.6	40.7 ± 0.5	17.7 ± 0.6	17.9 ± 0.9	9.8 ± 0.3	9.7 ± 0.2	15.0 ± 0.2	14.8 ± 0.2	24.7 ± 0.3	24.7 ± 0.2	
			Urinary excretion (μg/day)								
			Fecal excretion (μg/g.)								
Thiamine	1.1 ± 0.04	1.0 ± 0.03	1.4 ± 0.06	1.1 ± 0.04	0.8 ± 0.03	1.0 ± 0.02	1.4 ± 0.08	1.5 ± 0.03	2.4 ± 0.1	2.5 ± 0.06	
Riboflavin	39.5 ± 0.5	42.9 ± 1.3	33.9 ± 0.9	31.3 ± 0.5	26.2 ± 1.0	26.8 ± 0.05	34.7 ± 1.3	36.3 ± 0.7	47.2 ± 1.8	46.7 ± 1.0	
Pantothenate	59.7 ± 0.4	60.0 ± 0.5	48.1 ± 0.8	48.4 ± 0.7	40.7 ± 0.3	41.5 ± 0.6	60.5 ± 1.6	60.2 ± 1.1	75.1 ± 0.9	74.6 ± 0.9	
Pyridoxine	1.5 ± 0.03	1.6 ± 0.05	1.6 ± 0.13	1.6 ± 0.02	1.5 ± 0.02	1.5 ± 0.02	3.0 ± 0.01	3.4 ± 0.05	3.9 ± 0.02	4.8 ± 0.02	
Vitamin B <sub>12</sub>	0.40 ± 0.02	0.40 ± 0.01	0.33 ± 0.006	0.33 ± 0.004	0.15 ± 0.003	0.15 ± 0.003	0.35 ± 0.008	0.37 ± 0.005	0.46 ± 0.005	0.4 ± 0.6	
Choline	712.8 ± 15.2	732.0 ± 97.4	717.0 ± 11.0	639.2 ± 19.2	733.6 ± 47.3	642.9 ± 12.8	855.5 ± 69.8	854.0 ± 79.8	1061 ± 9.0	1232 ± 10.5	

Table 3 INFLUENCE OF CURDS FEEDING ON THE LIVER STORAGE OF B-VITAMINS BY RATS ON CASEIN-STARCH DIET.

Vitamin	I - Optimum vitamins		II - $\frac{1}{2}$ Optimum vitamins		III - Low Vitamin intake		IV - 13 g. curds		V - 13 g. curds with half optimum intake	
	μg/g	μg/g	μg/g	μg/g	μg/g	μg/g	μg/g	μg/g	μg/g	μg/g
Thiamine	1.4 ± 0.05	1.1 ± 0.07	1.1 ± 0.07	0.5 ± 0.04	0.5 ± 0.04	1.2 ± 0.04	1.2 ± 0.04	2.4 ± 0.08	2.4 ± 0.08	2.4 ± 0.08
Riboflavin	54.4 ± 1.0	26.3 ± 0.7	26.3 ± 0.7	21.5 ± 1.1	21.5 ± 1.1	38.3 ± 0.8	38.3 ± 0.8	48.4 ± 1.0	48.4 ± 1.0	48.4 ± 1.0
Pantothenate	1.5 ± 0.03	1.2 ± 0.02	1.2 ± 0.02	0.6 ± 0.02	0.6 ± 0.02	1.1 ± 0.03	1.1 ± 0.03	1.6 ± 0.02	1.6 ± 0.02	1.6 ± 0.02
Pyridoxin	1.6 ± 0.05	1.1 ± 0.07	1.1 ± 0.07	0.5 ± 0.02	0.5 ± 0.02	2.9 ± 0.05	2.9 ± 0.05	3.2 ± 0.04	3.2 ± 0.04	3.2 ± 0.04
Vitamin B <sub>12</sub> (m μg)	10.5 ± 0.09	7.3 ± 0.05	7.3 ± 0.05	4.4 ± 0.06	4.4 ± 0.06	6.3 ± 0.07	6.3 ± 0.07	10.5 ± 0.08	10.5 ± 0.08	10.5 ± 0.08
Choline (in mg.)	5.4 ± 0.2	2.9 ± 0.1	2.9 ± 0.1	1.4 ± 0.05	1.4 ± 0.05	1.9 ± 0.1	1.9 ± 0.1	3.1 ± 0.08	3.1 ± 0.08	3.1 ± 0.08

groups and of groups IV and V receiving supplement of curds.

Table 1 INFLUENCE OF FEEDING CURDS AS A SUPPLEMENT TO CASEIN-STARCH DIET ON THE GROWTH OF RATS

Group	Initial weight	Final weight	Gain in weight	Food intake	Feed efficiency
I. Optimum intake vitamin	50.0	212	162	539	0.3010 ± 0.004
II. Half-optimum vitamin intake	50.0	194	144	521	0.2764 ± 0.005
III. Low vitamin intake	49.7	176	126	530	0.2377 ± 0.009
IV. 13 g. curds	50.0	201	151	525	0.2880 ± 0.008
V. 13 g. curds with half-optimum vitamin intake	50.2	200	150	508	0.2950 ± 0.009

The data on B-vitamins excretion are presented in Table 2. The feeding of curds (Group IV) increased urinary excretion of B-vitamins even at low vitamin intake (Group III); the excretion of B-vitamins, except pantothenate and choline, was higher than in the half-optimum control group and excretion was at par with optimum control (Group I) in the case of riboflavin and Vitamin B<sub>12</sub>, less for thiamine, pantothenate and choline and more in the case of pyridoxine. The response was higher when vitamin intake was at half-optimum (Group V) and the increased excretion was higher than the excretion of the control at optimum intake (group I) except in the case of pantothenate and choline.

The feeding of curds also increased fecal excretion of B-vitamins even at low level vitamin intake (Group IV) to a level higher than that obtaining in the control half-optimum vitamin intake Group II and at par with the excretion of pantothenate and vitamin B<sub>12</sub>, higher with thiamine, pyridoxine and choline and lower with riboflavin in the optimum control group (group I). Feeding of extra vitamins to half-optimum level to rats receiving the supplement of curds (Group V) produced an increase in fecal excretion to a level higher than that obtaining in the optimum control group (Group I). The results show that the increases induced by curds supplementation were not primarily a matter of raising the B-vitamins to half-optimum level except in the case of riboflavin. The difference in fecal excretion of B-vitamin between low vitamin intake control (Group III) and vitamin supplemented control groups (I and II) was slight.

Considering the data on urinary and fecal excretion together, it may be observed that a substantial part of B-vitamins resulting from increased intestinal synthesis due to curds feeding is absorbed and eliminated in urine. The synthesis induced by curds is sufficient to sustain urinary excretion of thiamine at a level higher than that at half-optimum vitamin intake, of riboflavin and vitamin B<sub>12</sub> at par with and pyridoxine at twice

the level of optimum vitamin intake. Curds supplementation with half-optimum vitamin intake increased urinary excretion of pantothenate to a level equal to that obtaining in optimum intake control. Only in the case of choline, urinary excretion does not attain the level obtaining in optimum intake. This is due to the comparatively inefficient absorption of choline. The data show that the efficiency of absorption of B-vitamins follows the order: pyridoxine, riboflavin and vitamin B<sub>12</sub>, thiamine, pantothenate and choline.

The data on liver storage of B-vitamins are presented in Table 3. The feeding of curd (Group IV) increased liver storage of B-vitamins even at low vitamin intake (Group III). The liver stores were at a higher level or at par with those in the half-optimum control (Group II) in the case of all vitamins except vitamin B<sub>12</sub> and choline; the liver stores were at a lower level than those in the optimum control (Group I) in the case of B-vitamins except pyridoxine. The feeding of curds with half-optimum vitamin intake (Group V) raised the liver storage of thiamine and pyridoxine to a higher level and of pantothenate and vitamin B<sub>12</sub> to a level which is at par with liver stores of these vitamins in the optimum vitamin intake control group (I); in case of riboflavin and choline the storage level was lower.

In the feeding experiments reported in this paper, the possibility of coprophagy was eliminated by housing the rats individually in cages with large mesh substantially at a higher level from the bottom. It may be presumed, therefore, that the vitamins were absorbed through the lumen of the cecum and large gut and have been utilized by the organism.

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## Colorimetric Method for the Determination of Dichlorovos - (DDVP)

Dichlorovos (DDVP), O, O dimethyl 2, 2 dichloro-vinyl phosphate has been finding increasing use in fly control, in tobacco warehouses for the control of *Lasioderma serricorne*, air-craft disinfection, empty warehouses, empty shipholds and public health measures.

Hodgson and Casida<sup>1</sup> during their investigations on the mammalian enzymes involved in the degradation of DDVP made use of the reaction of the formed aldehyde with 2:4 dinitrophenyl hydrazine, the product forming a blue solution with excess of alkali and a mutual solvent. The authors also stated that the hydrolysis of DDVP is complete with 0.2N NaOH at 27°C in 15 min. However, following this procedure Hughes<sup>2</sup> obtained as low as 50% recovery which was attributed by him to the secondary alkaline decomposition of the aldehyde. He modified the condition of reaction viz., 0-1°C for 20 min. using 0.2N NaOH, which gave recoveries of the order of 90%. The present communication deals with the use of borate barbiturate buffer (pH 9.0) with 0.1M glycine<sup>3</sup> for converting DDVP to dichloroacetaldehyde for overcoming the difficulties experienced earlier. The aldehyde formed was estimated according to the method of Lippin<sup>4</sup>.

The reaction mixture consisted of 3.5 ml. buffer, 0.5 ml. of 0.5M glycine and 1 ml. of water containing graded amounts of DDVP (AR) in test tubes (18 x 150 mm) covered with loose stoppers. The hydrolysis was carried out at 37°C for 3 hours. At the end of hydrolysis 0.1 ml. of 6N HCl was added followed by 0.5 ml. of saturated solution of 2:4 dinitrophenyl-hydrazine in carbonyl-free methanol. The tubes were

then kept in boiling water bath for 5 minutes. After cooling the tubes (in running tap water) 2.5 ml. of 10% methanolic KOH was added. The intensity of the violet colour developed was measured in a Klett Summerson Photoelectric Colorimeter using 54 filter. The blank had a yellow colour. The mean optical density (x 500) values of ten estimations at each of three levels (20, 40 and 100 µg.) were 54.3, 112.5 and 287.7 respectively with a standard error of 0.85 (27 d.f.). By this method 10-20 µg. DDVP could be estimated.

### Acknowledgement

The Author thanks Dr. H. A. B. Parpia, the Director of the Institute and Shri S. K. Majumder, Chairman, Infestation Control & Pesticides, for the interest and encouragement in the work. The Author's thanks are also due to CIBA and Shell Chemicals for the gift of the chemical.

Infestation Control & Pesticides                      S. B. KADKOL  
Central Food Technological  
Research Institute  
Mysore - 2, India.  
26 July 1967

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## SYMPOSIUM

# Nutrition and Hormones

A symposium on 'Nutrition and Hormones' was held under the auspices of the Nutrition Society of India at the Nutrition Research Laboratories, Hyderabad on the 11 July, 1967. The following papers were presented:—

1. Control of protein synthesis in Animal tissues by hormones and by amino acids *Dr. G. P. Talwar*
2. Impairment of reproductive performance in vitamin deficient animals with particular reference to vitamin A deficiency *Dr. N. R. Moudgal*
3. Effect of hormones on lactation *Dr. K. R. Laumas*
4. Nutritional status and hormone therapy *Dr. Shanta S. Rao*
5. Estrogen levels in pregnancy *Dr. Leela Iyengar*

Dr. Talwar dealt with the role of hormones on protein synthesis in mammalian tissue and discussed the association between estrogen status and synthesis of RNA in the uterus. It was suggested that the stimulation of RNA synthesis by estradiol was a key step in the ultimate manifestations of the hormone effect and that the effects could be selectively blocked by inhibiting RNA synthesis. Dr. Talwar discussed the action of thyroxine on protein synthesis in liver and other organs.

Nutritional deficiency, whether it be protein or vitamin, is known to result in an impairment of reproductive function. Discussing the role of vitamin in reproduction in rats, Dr. Moudgal laid stress on the role of vitamin A in steroid hormone synthesis. He pointed out that in conditions of vitamin A deficiency, reproduction in rats was impaired and there was increased resorption of fetuses. When the animals were maintained on estradiol 17 and pregnanalene, pregnancy could be effectively maintained. Dr. Moudgal postulated that vitamin A deficiency in rats led to a deficiency of an enzyme  $\Delta^5$ -3 $\beta$ -olsteroid dehydrogenase which is essential to the bio-synthesis of steroid hormones.

Feeding with retinoic acid resulted in (i) the ovary being refractory to the action of circulating gonadotropins and (ii) there was a failure of pregnancy due to inadequate availability of steroid hormones like pregnanalene and estrogens.

Dr. Laumas reviewed the effect of hormones, particularly progesterone on lactation. He elucidated the role of various factors on the initiation and maintenance of lactation. In view of the increasing use of oral contraceptives, studies on the excretion of hormonal factors in human milk were considered significant. It

was shown that orally active progestogens were effective in inhibiting lactogenesis when given in high doses. Using the radio-isotope technique with labelled progesterone, it was observed that this compound was transported from stomach to breast within 4-6 hours. A significant uptake of radioactivity was seen in mammary tissue. The biological activity of excreted progesterone and its metabolites in the breast milk need careful study from the point of view of their effect on the infant.

Dr. Shanta Rao discussed the role of oral contraceptives in the control of fertility. In view of protein malnutrition in the vast majority of people who need a measure of fertility control and in view of reports published in literature regarding liver damage produced by oral contraceptives, Dr. Rao studied the effect of contraceptives on liver functions in rats. Her observations indicated that the activity of some of the liver enzymes was altered. Further studies are necessary to understand the significance of these changes. In a small group of women receiving oral contraceptives no significant changes could be observed in liver function.

Dr. Leela Iyengar presented her observation on the role of protein nutrition on estrogen levels in Indian women. In view of the poor nutritional status and low birth weights of infants in a large segment of the population, it is essential to know the levels of urinary estrogen, which is an index of placental function. Dr. Leela Iyengar discussed the efficacy of the use of 2-hour urine samples for determination of estrogens since it could be used as a routine antinatal procedure to determine placental efficiency.

It was observed that as pregnancy advanced to term, the levels of urinary estrogens were significantly lower in low socio-income groups as compared to women belonging to high socio-income groups. On supplementation with proteins and calories in the last four weeks of pregnancy, a considerable improvement in birth weights and urinary estrogens could be brought about in the malnourished group. During discussion, Dr. Iyengar brought to light the role of various nutritional factors which could alter the synthesis and metabolism of estrogens by the fetus, placenta and the mother.

Since all the papers presented at the symposium concerned primarily with nutritional implications of the hormone actions, the symposium was of interest to nutritionists as well as endocrinologists.



## Book Reviews

*World Protein Resources* Advances in Chemistry Series 57, Edited by Robert F. Gould, American Chemical Society Publications, Washington, D. C., 1966, pp 385, price \$ 7.00.

The book under review is a publication of the proceedings of a symposium sponsored by the Division of Agricultural and Food Chemistry at the 150th meeting of the American Chemical Society held in Atlantic City, N. J. in September 1965, under the Chairmanship of Dr. Aaron M. Altschul.

The problem of providing adequate quantities of good quality protein in the diets of the population in developing countries of the World is truly an immense one and it is said that more than twice as much protein will be needed by the year 2000 A.D. even if there is no improvement in diets. Against this background, it is appropriate that the symposium on World Protein Resources has tried to discuss the prospects of increasing the supplies of conventional and new protein foods on the basis of accumulated knowledge and technology in this field in recent years. The symposium has been aptly dedicated to the memory of Maurice Pate of UNICEF, who pioneered the cause of relief feeding programme for children, all over the world. Many well known and active workers from different countries have participated in the 2-day conference.

The papers presented have been divided into four main sections. The first of these contains six papers, five of which discuss the general outlook for animal proteins *viz.* beef, poultry, pigs and meat, fish protein concentrates and seed protein concentrates with the leading article on "Protein supplies and prospects: The problem" by Dr. J. C. Abbott of the FAO. The sixth paper on the production of lysine and methionine discusses the chemical and fermentation methods of production of these amino acids which are in large demand for supplementation of food and feed proteins. The second section listing five papers deals with seed protein products based on cottonseed, soya and groundnut and the developments in the technology of lipid-protein isolates. The concept of alurins in seed materials and their characteristics are detailed in the last paper of this section. The third section has four papers, one of which discusses the methods of measurement of nutritional availability of amino acids in foods. Another paper by Dr. Leiner reviews the intrinsic toxic substances associated with seed proteins. The remaining two papers deal with mycotoxin contamination of foods and approaches to the elimination of aflatoxin in protein concentrates. The last five papers in the final section of the book consider future developments

on maize, safflower, bacteria, fungi and coal as protein resources. While the introduction of high quality protein gene into high yielding hybrid maize varieties will have a great impact upon agriculture and human nutrition in many areas of the world, much remains to be done to develop suitable high quality edible protein from lower plant forms such as bacteria, fungi and mold.

The wide range of possibilities of solutions to fill the protein gap, now and in future, are thus focussed in the twenty different chapters of this book and this should be of great interest to protein chemists, nutritionists and technologists, the world over. The book has an excellent get-up but has a few printing errors though of little consequence.

The objectives of the symposium to stimulate greater interest and development in plant and animal protein foods are thus accomplished by this timely publication.

N. SUBRAMANIAN

*Sulfur Dioxide—Applications in Foods, Beverages and Pharmaceuticals* by LOUIS S. SCHROETER, Pergamon Press First Edition, (1966) Pp. x+342, Price Sh. 70/-

This book is a useful addition to the series of recent publications on food science and technology. The topic dealt with is of considerable importance, since chemical preservatives, of which sulphur dioxide forms an important member, play a highly significant role in food technology. In recent years, a considerable amount of data has been collected on the chemistry as well as on the application of sulphur dioxide in a variety of food products. In order to highlight these findings, the author has dealt in great detail the basic knowledge concerning the preparation, properties, reactions—inorganic as well as organic—of sulphur dioxide in the first four chapters which occupy nearly half the book.

Chapters V and VI describe at some length a variety of analytical techniques that have been developed for the estimation of sulphur dioxide employing iodometric, polarographic, colorimetric and chromatographic techniques, as well as X-ray and spectrophotographic methods. Recent developments in the estimation of sulphur dioxide in beverages employing special techniques, have also been dealt with. Under specific applications, practically all types of food products ranging from fruits to meat, fish, dairy products, spices, starches, etc., have been included. The data given and the references to literature cited are of considerable interest and importance to the food technologist.

Chapter VII, which deals with pharmaceutical applications, is fairly exhaustive and refers to a variety

of topics, such as, effect of sulphur dioxide on oxygen absorption by solid drugs, pH and buffer capacity, sulphite antioxidant activity, kinetics and mechanism of drug-sulphite reactions and specific applications of sulphite antioxidants in the case of typical drugs, like antibiotics, steroids, vitamins, etc.

In Chapter VIII, which deals with the toxicity of sulphur dioxide, Government regulations, with special reference to plants, animals and human beings, when sulphites are administered through inhalation—oral and parenteral methods, etc.—have been fully dealt with. Chapters VII and VIII will thus be of value to the pharmacologist as well as to the food scientist. The subject index, which covers nearly 45 pages, is exhaustive.

On the whole, the book is a welcome addition to the reference library of persons engaged in research as well as developmental aspects of food science and technology, especially in relation to the use of chemical preservatives.

G. S. SIDDAPPA

*Food Processing & Packaging Directory 1967-68.* Edited by R. De Giacomo, F.R.I.C., Editor of the monthly journal "Food Processing & Marketing". Published by Tothill Press Ltd. (1039 pages. Obtainable from N. T. P. Sales & Distribution Ltd., 40 Bowling Green Lane, London, E.C. 1., Price 70s. plus postage 3s 6d.

The compilation of the eighth edition of the Directory involved a complete revision of the contents, with a number of new entries, and a few deletions. The section which gives a summary of food standards and regulations of 69 countries, has been revised so as to represent the position at March 1967. The form of presentation, which has been built up over the years, has been retained as this has not merely been found convenient but has now become familiar to users of this Directory. The main sections are: Food processors, suppliers of packaging materials, suppliers of commodities, brand names, suppliers of plant, equipment and packaging machinery, food laws and consultants.

In addition, there are the usual sections giving particulars of Government Departments, Trade and Research Associations, Royal Warrant Holders, etc.

## Notes and News

### First Batch of Food Technologists From the IFTTC out

At a colourful ceremony in the Crawford Hall, Mysore, on 11th July 1967, 23 candidates of the International Food Technology Training Centre at the Central Food Technological Research Institute, Mysore, were presented with provisional degree certificates by Shri K. R. Ramachandran, officiating Vice-Chancellor of the Mysore University. This was the first batch of students to complete successfully the M. Sc. Course in Food Technology of the Mysore University. Sixteen of these students were from India, representing various states, five from Thailand and two from Philippines. Mr. S. Neelakantan (India) and Mr. P. Panpaprai (Thailand) were awarded the Girdhar Lal Gold Medal for their best performances throughout the duration of the course.

The International Food Technology Training Centre (IFTTC) was set up in 1964 in accordance with an agreement between the Government of India and the Food and Agricultural Organizations of the United Nations. The object of this Centre is to train personnel

from South-East Asia in food science and technology, so that they can play an effective role in the rapid and rational development of modern food processing industries in the region.

Congratulating the successful candidates, Shri Ramachandran expressed satisfaction and pride that Mysore University had grown in a desirable new dimension, far beyond its frontiers. All this was possible due to the utmost co-operation between the Govt. of India, FAO, Canadian Freedom from Hunger Foundation and CFTRI with its excellent facilities and competent staff. While the University had registered a phenomenal growth, during these last five decades, there was simultaneously a shift in emphasis. Although the basic ideals of 'learning for its own sake' still remained the same, in an age dominated by technology, one could not ignore the call to train technologists.

In an appeal to the successful graduates, he said that their education did not end with this degree. The important thing was that they were equipped to face the toughest problems and devise ways and means of solving them. Food preservation was a field of service

which was, by far the most important today, especially in this region and naturally the responsibilities were immense. It was still a far way to go to banish hunger from the world, when it would no longer be necessary to establish Freedom from Hunger Foundations.

Mr. J. H. Hulse, Chief, Food Science and Technology Branch, Nutrition Division of the FAO, Mr. N. T. Currie, Canadian Hunger Foundation, Mr. R. Balasubramanian, Joint Secretary, Department of Food, Ministry of Food & Agriculture, Government of India, Dr. W. J. Gall, Director, IFTTC, Dr. H. A. B. Parpia, Director CFTRI and Co-Director IFTTC, and members of the staff of the University of Mysore and the CFTRI were present.

#### **Institution of works managers (London) Indian Branch**

Institution of works Managers (London) Indian branch is holding a 2-day National Conference of Works Managers on the 8th and 9th of December 1967 in Bombay. The conference will be the first of its kind to be held in India and is also the first to be arranged by the Institution of Works Managers (London) on a national scale outside England.

The subject of the conference is "The Indian Industry Today" and sessions will be held on the following: (1) Exports—How?, (2) Labour Legislation—Too much? and (3) Industrial Discipline and Productivity.

The conference is to be inaugurated by Shri V. V. Giri, Vice-President of India on the 8th December 1967 and a number of prominent industrialists, Govt. spokesmen and Trade Unionists from different parts of India have agreed to present papers and participate in the discussions.

An official delegation from the Institution's parent body in the U. K. headed by the General Secretary, Mr. G. J. West is also arriving to participate in the conference.

Further particulars about the conference can be had from the Hon. Secretary, Indian Branch, Mr. M. R. Lodh, C/o Devidayal Cable Industries Ltd., Pokhran Valley, Thana, Maharashtra.

#### **All India symposium on refrigeration, Air-conditioning and environmental control in the dairy industry**

A Symposium on the above topic has been organised by the Indian Institute of Technology, Kanpur with the cooperation of the Indian Dairy Science Association and Indian Association of Food Technologists on 24th and 25th of November 1967. Engineering aspects and problems of the dairy industry and related industries will be discussed there. The technical papers cover the range of applied engineering science in the fields of heat and mass transfer, refrigeration, storage and

transportation and the various unit processes involved in the production of powdered milk and other milk products. Indian Institute of Technology will play the host and have included in the programme, conducted tours of the Institute and tour to other dairy units nearby. Further information may be obtained from Dr. L. S. Srinath, Head, Department of Mechanical Engineering, Indian Institute of Technology, Kanpur (U. P.).

#### **B. C. Roy National Award 1969**

The Management Committee has decided that the following three awards may be given during the year October - November 1969.

1. Good and capable teacher in Medicine (civil or military).
2. Specialists in different branches of medicine.
3. Service in the socio-medical relief.

The award will be of the value of Rs. 200/- each, one award to be given in each of the five categories once in five years from 1969.

Nominations for the award, indicating the role of person or persons in the category may be sent to the Secretary, B. C. Roy National Award Fund, Office of the Medical Council of India, Temple Lane, Kotla Road, New Delhi-1, Nomination forms will be available from the above address from November 1967 and the nomination should be sent before 31st March 1969.

#### **Silver Jubilee Research award 1960**

To commemorate its Silver Jubilee in 1959, Medical Council of India had created a Silver Jubilee Research Award Fund. The fund has now been registered under the societies Registration Act XXI of 1960, and is being managed by a Committee of Management. The Management Committee has decided to make the next award during November, 1969. This award will be open to all citizens of India and foreign nationals who have spent considerable time for research in India, and who have distinguished themselves by outstanding original research in the field of medical and allied sciences. The value of the award will be Rs. 25,000/- along with a gold medal of the value of Rs. 1,000/-. The award, for the present, will be presented once in 5 years at a ceremonial function at which the successful candidates would be required to make an oration.

The award will be made on the basis of nomination of candidates to be submitted alongwith copies of monographs and reprints of nominees' special study and research. These would be scrutinized by an Expert Committee which will be constituted by the Committee of Management as and when necessary and they would make their recommendations to the

Committee of Management. The decision of the Committee of Management of the Silver Jubilee Research Award Fund of the Council shall be final.

In case of a joint research, the award shall be divided between the workers in such proportion as may be decided. The role of the person nominated for the award should be clearly indicated so as to make it easy to determine whether the major part of the work has been done by that person.

Nominators are requested to forward nomination forms complete in all respects as indicated in the instructions.

Blank nomination forms can be had from the Secretary, Silver Jubilee Research Award Fund, Office of the Medical Council of India, Temple Lane, Kotla Road, New Delhi-1, from *November, 1967*, and completed nomination forms should reach him not later than 31st March, 1969, through registered A.D.

**Indian Standards News**

The following standards have been published.

		<i>Price</i>
		Rs.
Thiometon Emulsifiable concentrates	IS:3905-1966	3.50
Ziram Water Dispersible Powder	IS:3901-1966	3.50
Hand Maize Sheller	IS:3939-1967	2.00
Mackerel Canned in Brine	IS:3849-1966	1.50
Ghee Refinery-Recommendation	IS:3922-1966	5.00
Rum	IS:3811-1966	1.00
Butter fat-sampling and test	IS:3508-1966	1.00
Broiler feeds	IS:4018-1967	4.00
Chlordane Emulsifiable concentrates (Revision)	IS:2682-1966	6.00

The following Standards Specifications have been issued for wide circulation:

**Pesticides**

Toxaphene Technical	DOC:AFCDC:6(301)
Thiram, Technical	DOC:AFCDC:6(570)
2, 4-D Technical	DOC:AFCDC:6(571)
Endosulfan Technical	DOC:AFCDC:6(572)
Endosulfan Dusting Powders	DOC:AFCDC:6(573)
Endosulfan Emulsifiable Concentrates	DOC:AFCDC:6(574)
Endosulfan Water Dispersible Powder Concentrates	DOC:AFCDC:6(575)
Binapacryl, Technical	DOC:AFCDC:6(576)
Binapacryl, Emulsifiable Concentrates	DOC:AFCDC:6(577)
Dry Salted Mackerel	DOC:AFDC:27(578)
Canned Tuna	DOC:AFDC:27(579)
Fishmeal as Livestock feed	DOC:27(580)

Code for sanitary conditions in Fish Industry-preprocessing stage	DOC:AFDC:27(584)
—do— —do— Part II	DOC:AFDC:27(585)
Ajwan	DOC:AFDC:21(593)
Dehydrated Onion	DOC:AFDC:21(595)
Cinnamon	DOC:AFDC:21(608)
Cloves whole	DOC:AFDC:21(616)
Pork, Luncheon, Meat canned	DOC:AFDC:18(560)
Code for construction of Abattoirs	DOC:AFDC:18(588)
Methods of sampling tea	DOC:AFDC:16(592)
Glossary of tea testing terms	DOC:AFDC:16(602)
Poultry feed (revised)	DOC:AFDC:15(607)
Balanced feed mixtures for cattle (revised)	DOC:AFDC:15(559)
Cereals	DOC:AFDC:31(539)
Malted skimmed milk food	DOC:AFDC:34(622)
Maida (Revised)	DOC:AFDC:32(609)
Soji (revised)	DOC:AFDC:32(610)
Physical Methods of Analysis of food grain	Part 1 DOC:AFDC:26(533)
	Part 2 DOC:AFDC:26(53)
	Part 3 DOC:AFDC:26(597)
One piece milk can	DOC:AFDC:35(618)

Copies can be obtained from the office of the Indian Standards Institution, New Delhi, Bombay, Calcutta, Kanpur and Madras.

**Association of Food Technologists**

**LIST OF NEW MEMBERS**

*Life Members*

1. Dr. S. Varadarajan, Research Unit, Hindustan Lever Ltd., Haji Bunder, Sewri, Bombay-16.
2. Dr. D. V. S. K. Rao, Research & Development Manager, Britannia Biscuit Company, Reay Road, Bombay - 10.
3. Mr. V. G. Rajadhayasha, Technical Director, Hindusthan Lever Limited, Hindusthan Lever House, Backbay Reclamation, Bombay - 1.
4. Mr. H. A. Souter, Production Manager, Food Specialities Limited, 3, Mathura Road, P. O. Box No. 611, Link House, New Delhi.
5. Mr. M. G. Sathe, Food Technologist, Sathe Biscuit & Chocolate Co. Ltd., P.O.B. 597, Poona-2.
6. Mr. B. B. Sardeshpande, Managing Director, Corn Products Co. of India Ltd., Shriniwas House, Waudby Road, Bombay-1.
7. Dr. B. P. Baliga, Technical Director, Tata Oil Mills Co. Ltd., Bombay House 24, Bruce Street, Bombay-1.

*Members (yearly)*

1. Mr. R. N. Ramani, 51, Thambu Chetty Street, Madras - 1.
2. Miss Shanty Agnes, c/o. Mr. M. D. Devadason, Dean, Regional College of Education, Mysore-6 (Associate member)
3. Mr. G. S. Purohit, 2/1034, Bhaidas Mehta's Street, Sagrampura, Surat-2.
4. Mr. A. S. Sareen, 17/26, Punjabi Bagh, Delhi-26.
5. Mr. H. P. Kardikar, Asst. Factory Manager, Corn Products Co. India Ltd., Shrinivas House, Wadudby Road, Fort, Bombay-1.
6. Mr. R. Vasudeva Murthy, Managing Director, Sri Gajanana Rice & Oil Mills Ltd., Ediga Ezension, Mysore.
7. Mr. J. C. Jaisani, Student, F.A.O., I.F.T.T.C., C.F.T.R.I., Mysore-2 (Associate member)
8. Mr. K. Ramaseshan, Asst. Development Manager, Hindustan Lever Ltd., G. T. Road, Ghaziabad (U. P.)
9. Mr. Greechar Pejaraprasithdi, Student, F.A.O., I.F.T.T.C., C.F.T.R.I., Mysore-2 (Associate member).
10. Mr. B.H. Lee, Student, F.A.O.I.F.T.T.C., C.F.T.R.I. Mysore-2 (Associate member).
11. Mr. M. S. Baniwal, Student, F.A.O. I.F.T.T.C., C.F.T.R.I., Mysore-2 (Associate member).
12. Mr. Sushil Kumar, Student, F.A.O., I.F.T.T.C., C.F.T.R.I., Mysore-2 (Associate member).
13. Mr. M. K. Patni, Student, F.A.O., I.F.T.T.C., C.F.T.R.I., Mysore-2 (Associate member).
14. Mr. Vilas Fedane, Poysha Industrial Co. Ltd., Messant Road, Sewri, Bombay-33.

*Change of address*

1. Shri R. C. Katiyar, Fruit Unit, Naubahar, Simla-2, Himachal Pradesh.
2. Mr. R. B. Rao, Britannia Biscuit Co. Ltd. M.T.H. Road, Padi, Madras-50.
3. Mr. R. L. Goje, Horticultural Development Officer, Konkan Region, Ratnagiri, Maharashtra State.
4. Mr. Hariraj Singh, 55/8, Labour Colony, Nawabganj, Kanpur-2 (U.P.)
5. Mr. C. S. Ramadoss, Dept. of Biochemistry & Biophysics, Banaras Hindu University, Varanasi-5 (U. P.)
6. Mr. M. Madalagatti Rao, Asst. Horticulturist, University of Agric. Sciences, Dharwar.
7. M. Mulla, Assistant Animal Scientist, Regional Research Station, University of Agricultural Sciences, Raichur, Mysore State.

**BOOKS RECEIVED**

1. Commission 4 of International Institute of Refrigeration 1965 Supplement to the Bulletin of the Institute of the International Refrigeration 177, Boulevard, Malesherbes, Paris 17°, France.
2. Chemistry and Physiology of Flavours—Symposium on Foods edited by H. W. Schultz, E. A. Day and L. M. Libbey, A. V. I. Publishing Co. Inc., P. O. Box No. 388, West Port, Conn., U. S. A.
3. Technology of wine making by M. A. Amerine, H. W. Berg and W. V. Cruess, A. V. I. Publishing Co. Inc., P. O. Box 388, West Port, Conn., U. S. A.

# Food Science and Technology Abstracts

## 1. General

1.23 *Oxalate contents of foods commonly used in Kashmir*, S. KAUL & S. L. VERMA, *Indian J. med. Res.*, 1967, 55(3), 274.

Oxalate content of different foods consumed by Kashmiris is determined to find out how far this influences the rural lithiasis, a most commonly observed disease among Kashmiris. K. A. R.

## 2. Cereal

2.53 *Distribution of lipids in air fractioned flours*, R. D. DAFTARY, A. B. WARD & Y. POMERANZ, *J. Fd Sci.*, 1966, 31(6), 897.

Lipids were extracted with petroleum ether, water saturated butanol following petroleum ether, or directly with water saturated butanol. Fractionation was done by silicic acid column and TLC. Lipid contents increased with increase in protein contents of flour fractions. The original flour contained a higher concentration of total and bound lipids than the residual coarse flour; the two flours contained comparable amounts of protein. A. A.

2.54 *Determination of a bacterial  $\alpha$ -amylase of damaged starch in wheat flour. Application in an industrial control laboratory*, Y. AUDIDIER, AND OTHERS, *Inds aliment. agric.*, 1966, 83 (12), 1597.

The new method is based on hydrolysis by a bacterial  $\alpha$ -amylase. Rapid and reproducible, this method is well adapted to laboratory control. It is shown that raw starch granules from one variety present equal sensitiveness to this enzymic action, whatever their anatomical origin, but differ in sensitiveness according to varieties. The rate of enzymic hydrolysis of damaged starches is much greater as their damage level is higher. A. A.

2.55 *Some practical aspects of the use of wheat flour in brewing*, P. W. RUSSELL EGGITT, *Milling*, 1966, 147 (26), 575.

The confirmation of earlier results of research in commercial practice has been detailed with special reference to: improved shelf life; taste tests; feeding and metering flour; and mashing problems. B. S. N.

2.56 *Utilization of calcium from lime-treated corn*, J. E. BRAHAM, & R. BRESSANI, *Nutr. Bromatol. Toxicol.*, 1966, 5 (1), 14.

In growing albino rats, the calcium in lime-treated corn was significantly better retained than in untreated corn, but not at the same level as that from skim milk. The addition of L-lysine HCl resulted in an increase in Ca absorption and retention, both from the treated and untreated corn, and the addition to lime-treated corn of an amino acid mixture that fulfilled the requirements of the rat, resulted in Ca retention and absorption levels similar to those observed with skim milk. A. A.

2.57 *Quality evaluation of irradiated Pakistani rice*, NORMAN W. TAPE & W. E. FERGUSON, *Fd Irrad.*, 1966, 7 (1-2), A22.

Irradiation of rice to control insect infestation does not change the quality of rice. The flavour, colour and texture of rice was not affected by 30,000 rads. At 60,000 rads, there was slight harmful effect on flavour. The niacin and thiamine content was not changed by irradiation. A. A.

2.58 *Fine grinding of wheat mill feeds and whole wheat for industrial use*, A. C. STRINGFELLOW, A. J. PEPLINSKI & V. F. PFEIFER, *Cereal Sci. Today*, 1967, 12 (2), 43.

Fine grinding is easily done with a pin mill and any over size

particle is removed by conventional sifter or an air classifier for further grinding. Mill feed products were prepared with particle sizes as low as 64 M (17xx, 230—mesh). Fine grinding and air classification separated upto 25% of the mill feeds into fractions containing 20-25% protein. A. A.

2.59 *Technical trends and developments in flour milling, 1955-1965* Parts, 1, 2, 3, P. G. AIZLEWOOD, *Milling*, 1967, 148 (1), 5; 148 (5), 92; 148 (11), 217.

Review.

2.60 *Long term storage of wheat*, S. W. PIXTON & S. T. Hill, *J. Sci. Fd Agric.*, 1967, 18 (3), 94.

The changes in the chemistry and in the baking and physical characteristics taking place in grain, stored for 8 years under four conditions (under varying conditions of oxygen concentration and temperature of the grain) have been discussed. K. A. R.

2.61 *Effect of heating on brown rice composition and quality*, TETSUYA IWASAKI & TATSUO TANI, *Cereal Chem.*, 1967, 44 (2), 204.

The effects of heating temperature on moisture content of rice to be heated, and of heating time on many properties of rice, were studied. Enzyme activity, reducing sugar content, and acidity of water extract changed during heating and were good indicators for judging changes in quality of rice. Enzyme activities went down; reducing sugars increased. Viability of rice (14.3% moisture) was well preserved even after heating at 60°C for 1 hr but was destroyed by heating at 70°C for 1 hr. Cooking quality tests of heated rices confirmed that heating has an effect similar to that of aging on rice texture, but no effect on fat acidity or on gelatinization temperature of rice flour. High moisture rices showed less resistance to heating than low-moisture rices. Heating temperature was a greater factor than heating time and only the increase in reducing sugars was influenced by heating time. A. A.

2.62 *Comparative composition of waxy and non-waxy rice*, AMANDA J. VIDAL & BIENVENIAO O. JULIANO, *Cereal Chem.*, 1967, 44 (1), 86.

Three pairs of isogenic lines of rice differing in the waxy gene were studied for content and composition of fat, protein, and starch in the brown rice. Each pair had the same gelatinization temperature. Apart from the absence of amylose in the waxy rice, its amylopectin had a lower intrinsic viscosity than the corresponding non-waxy amylopectin. Differences in the quantity and composition of lipid and protein were slight and not consistent for the three pairs of lines. A. A.

2.63 *Determination of total sulphur in wheat with EDTA and EGTA after nitric-perchloric acid oxidation*, W. D. BASSON, *Cereal Chem.*, 1967, 44 (1), 92.

A rapid method for the determination of sulphur in plant material is proposed. EDTA and EGTA are used as chelating agents for the Ba<sup>++</sup> in BaSO<sub>4</sub>. Correlation with AOAC method was good. A. A.

2.64 *Moisture adsorption by wheat flours and their cake baking performance*, C. GUR-ARICH, A. I. NELSON, M. P. STEINBERG & L. S. WEI, *Fd Technol. Champaign*, 1967, 21 (3A), 412.

The moisture adsorption isotherm of wheat flour was independent of the particle size distribution of the flour. The sorptive capacity of flour decreased with increasing protein content. The

sorptive capacity of starch fractionated from flour was higher than that of gluten fraction. The adsorption isotherm of the original flour at the low range of water activities was higher than that of either starch or gluten alone. The water soluble fraction of the flour did not contribute to the water activity of flour. Cakes baked from flour of decreasing particle size distributions exhibited significantly increasing cake volumes and decreasing sorptive capacity.

A. A.

2.65 *Extensive analyses of flours and mill feeds made from nine different wheat mixes. II. Amino acids, minerals, vitamins and gross energy*, D. H. WAGGLE, M. A. LAMBERT, G. D. MILLEP, E. P. FARRELL & C.W. DEYOE, *Cereal Chem.*, 1967, 44 (1), 48.

Wheat, bran, shorts, reddog, germ, and flour from mixes of five hard red winter, two hard red spring, one white, and one soft red winter wheat were analysed for 17 amino acids, 9 vitamins and related compounds, 15 minerals, and gross energy content. The amino acids determined by ion-exchange chromatography were lysine, histidine, arginine, asparatic acid, threonine, serine, glutamic acid, proline, glycine, alanine, cystine, valine, methionine, isoleucine, leucine, tyrosine and phenylalanine. Vitamins and related materials determined were niacin, pantothenic acid, folic acid, thiamine, riboflavin, pyridoxine, alpha-tocopherol, biotine and choline. Levels of these minerals were determined: Ca, P, K, Na, Mg, Zn, Fe, Mn, Cu, Se, B, Sr, Al, Ba and Co. As is well known, mill feeds contained higher levels of vitamins, minerals and amino acids, than flour milled from the various wheats used.

A. A.

2.66 *Improvement of semolina quality through steam treatment of Durum wheat*, G. N. IRVINE, J. W. BRADREY & H. C. BLACK, *Cereal Chem.*, 1967, 44 (2), 230.

Steam conditioning of durum wheat in order to inactivate enzyme lipoxidase and diminish, if not eliminate loss of semolina pigment during pasta processing may be satisfactorily accomplished at a laboratory level in a wheat washer at 40-60 lb. for  $\approx 1$  min around 120°F.

B. S. N.

2.67 *Macaroni brownness*, R. R. MATSUI & G. N. IRVINE, *Cereal Chem.*, 1967, 44 (1), 78.

Brownness in macaroni has been attributed to a Maillard-type reaction. However, brownness arising from a varietal characteristic of durum wheat has been found to be due to a water-soluble protein. This component is readily extracted with water, producing a reddish brown solution, and exhibits an absorption maximum at 400 m $\mu$ . It is a basic protein as shown by the amino acid composition, by its behaviour during electrophoresis and by ion-exchange column chromatography. Analysis suggests that the component is associated with copper.

A. A.

2.68 *Some changes in No. 2 corn stored two years at moisture contents of 14.5 and 15.2% and temperatures of 12°, 20°, and 25°C.*, C. M. CHRISTENSEN, *Cereal Chem.*, 1967, 44 (1), 95.

Samples of No. 2 corn stored at 14.5% moisture content (m.c.) retained essentially their original condition, as judged by appearance, invasion by storage fungi, germination percentage, and final fat acidity value, when kept at 12°C for 2 yr; and changed only slightly in 1.5 years at 20°C. In the samples kept at 15.2% m.c., changes in the characteristics measured were slight in 6 months at 12°C, but appreciable after 2 years. Differences in condition of the samples kept at 14.5 and 15.2% m.c. and 20°C, were relatively large after 1-2 years. The samples stored at 25°C deteriorated rapidly at both moisture contents.

A. A.

2.69 *Study of phytase and fluoride effects in germinating corn seeds*, CHONG W. CHANG *Cereal Chem.*, 1967, 44 (2), 129.

Properties of phytase were studied with endosperm — scutellar tissue of corn seedlings 4 days old. The corn phytase lacked a strict substrate specificity. Optimum incubation temperature of the enzyme was 50°C., optimum pH was 5.6 and the Michaelis constant (Km) was  $0.9 \times 10^{-4}$  moles per liter. The highest total enzyme activity was located in the fraction at 1,700 $\times$ g. the supernatant at 20,000 $\times$ g was the location of the highest enzyme activity. The enzyme survived high temperature, was activated by calcium chloride and was inhibited by sodium fluoride. Fluoride prevented phytin breakdown and inhibited growth during corn germination.

A. A.

### 3. Pulses

3.12 *Vining procedures and their influences on yield and quality of peas*, D. J. CASIMIR, R. S. MITCHELL, L. J. LYNCH & J. C. MOYER, *Fd Technol. Champaign*, 1967, 21 (3A), 427.

Information was obtained on the performance of faure type viners (stationary and mobile) and two other types of mobile pea harvesters. Faure type viners (stationary and mobile) gave better pea yields and prevented damage more effectively. The texture changes were evaluated by the maturometer. Damage counts and the classification of damage were related to the mechanism of removal of the peas from pods.

J. V. S.

3.13 *Quick-cooking Lima and other beans*, LOUIS B. ROCKLAND & EUGENE A. METZLER, *Fd Technol. Champaign*, 1967, 21 (3A), 344.

The process consists of: (1) Intermittent vacuum treatment (Hydrovac process) for 30 and 60 min. in a solution of inorganic salts; (2) soaking for 6 hr in the same salt solution; (3) rinsing; and (4) drying. The hydration medium contains sodium chloride, sodium tripolyphosphate, sodium bicarbonate, and sodium carbonate. The process has been adapted for making quick cooking products from other types of beans, soybeans and peas. Cooking time for most processed beans varied between 25 and 35 min. At 8.5 to 9.5% moisture quick cooking Lima beans remained acceptable for at least 6 months at ambient conditions. Nutritive value of processed and untreated Lima beans was similar.

J. V. S.

### 4. Fruits, Vegetables and Tubers

4.63 *Irradiation of mangoes. 1. Radiation induced delay in ripening of Alphonso mangoes*, S. D. DHARKAR, K. A. SAVAGAON, A. N. SRIRANGARAJAN & A. SREENIVASAN, *J. Fd Sci.*, 1966, 31 (6), 863.

Extension of storage life of unripe and mature Alphonso mangoes could be achieved at an optimum dose of 25 Krads, when irradiated under air, N<sub>2</sub> or CO<sub>2</sub>. Irradiation under N<sub>2</sub> atmosphere minimised changes in organoleptic quality, ascorbic acid, and carotenoids, and allowed least spoilage. A 6-day delay in ripening could be expected in fruits irradiated with 25 Krads under N<sub>2</sub> or air. Radiation effect on fruit skin is more prominent in terms of inhibition in chlorophyll disappearance and carotenoid formation than in ripening changes in the meat of the fruit.

A. A.

4.64 *Irradiation of mangoes. 2. Radiation effects on skin-coated Alphonso mangoes*, S. D. DHARKAR, K. A. SAVAGAON, A. N. SRIRANGARAJAN & A. SREENIVASAN, *J. Fd Sci.*, 1966, 31(6), 870.

Mangoes coated with an emulsion made of an acylate mono-glyceride preparation showed physiological damage due to inhibition of respiration and this can be rectified by a spurt in activity when fruits were irradiated in air or N<sub>2</sub>. Irradiation in CO<sub>2</sub>

which also retards respiration, showed physiological damage which is reversible. Suppression of respiration beyond an optimum level seems to be responsible for irreversible damage to the fruit. Organoleptic evaluation, analysis for fruit constituents, skin colour and pressure tests showed that storage life of the fruit can be increased by combining skin coating with irradiation under air or N<sub>2</sub>.

A. A.

4.65 *Yam Storage. I. A review of yam storage practices and of information on storage losses*, D. G. COURSEY, *J. Stored Prod. Res.*, 1967, 2 (3), 229.

Review: 40 references. 5 tables.

4.66 *Proximate composition of ready-to-serve potato products*, ELIZABETH W. MURPHY, ANNE C. MARSH, KATRINE E. WHITE and SUSIE N. HAGAN, *J. Am. diet. Ass.*, 1966, 49 (2), 122.

Data regarding moisture, food energy, fat, protein and carbohydrate values of nine potato products; potatoes au gratin, potato chips, French fried potatoes, mashed potatoes, patties, puffs, scalloped potatoes and potato soup are presented.

B. S. N.

4.67 *Colour of cooked carrots related to carotene content*, N. C. BORCHGREVINK, & HELEN CHARLEY, *J. Am. diet. Ass.*, 1966, 49 (2), 116.

Chromatographic, spectrophotometric and subjective evaluation studies have revealed that carrots cooked in saucepan had the highest carotene content, all trans-beta carotene, and possessed typical red-orange bright colour. Carrots cooked in pressure saucepan for 2 min. had the highest neo-beta carotene B although it had the lowest concentration of all trans isomer carotene. Destruction of all trans-beta isomer carotene along with some isomerization of the cis form results in lowering of colour intensity in cooked carrots.

B. S. N.

4.68 *Storage of pickling cucumbers*, P. J. FELLERS & I. J. PFLING, *Fd Technol. Champaign*, 1967, 21 (1), 74.

Regular and controlled atmosphere storage life of pickling cucumbers (Var. SMR-15) was highly dependent on the size of the fruit, storage temperature, and washing prior to storage. The best combination of temperature and atmosphere was 34°F at 5% CO<sub>2</sub>—5% O<sub>2</sub>. The post storage life of cucumbers stored 3-4 weeks was only 12-18 hr.

A. A.

4.69 *Gas chromatography of the field-glass-greenhouse-grown, and artificially ripened tomatoes (Lycopersicon esculentum)* K. B. DALAL, L. E. OLSON, M. H. YU & D. K. SALUNKHE, *Phytochem*, 1967, 6 (1), 155.

Fifteen different peaks were resolved from red ripe tomato flavour extract by GC techniques. Except isobutanol, and n-hexanol, concentrations of the volatile compounds in the field tomatoes were higher than those in the greenhouse grown tomatoes. Artificially ripened tomatoes contained less volatile components.

A. A.

4.70 *Studies in fruit set and fruit drop in citrus. IV. Sweet orange*, B. B. SHARMA & G. S. RANDHAWA, *Indian J. Hort.*, 1966, 23 (1 & 2), 12.

The growth regulators tried were: gibberellic acid, (GA-10, 25, and 50 ppm), 2,4-D (2.5, 5.0 and 7.5 ppm.), 2,4,5-T (2.5 5.0 and 7.5 ppm.) and parachlorophenoxyacetic acid (CIPA) (10, 20 and 30 ppm). The test trees were of *Hamlin* and *Valencia late* varieties. GA proved best for fruit set (highest fruit set, at 50 ppm) during 1961, 1962, 1963. A significantly improved fruit set was also obtained at 7.5 ppm. level of 2, 4-D/2, 4, 5-T during 1961 - 1963. GA (10, 25 and 50 ppm) generally reduced fruit size.

Maximum fruit size, fruit diameter and fruit weight were obtained with 7.5 ppm. of 2, 4, 5-T. There were only slight changes in the physico-chemical qualities under various plant regulator treatments.

J. V. S.

4.71 *Varietal resistance in banana against Anthracnose fungus (Gloeosporium musarum)*, D. P. THAKUR & A. P. MISRA, *Indian J. Hort.*, 1966, 23 (1 & 2), 59.

All 6 table varieties tested—*Harichal*, *Malbhog*, *Champa*, *China*, *Martban* and *Aepan* were susceptible while *Kathia* and *Muthia*, both culinary varieties were fairly resistant.

J. V. S.

4.72 *Biochemical studies in the physiology of sapota. I. Physical changes* M. V. SASTRY, *Indian Fd Packer*, 1966, 20 (6), 11.

According to physical characteristics *Cricket ball* variety can be harvested between 125 to 130 days from start. Development pattern shows a sigmoid curve indicating auto catalytic growth. The total life of the fruit is divided into five phases; the first phase coinciding with 50 days from the date of flowering.

K.A.R.

4.73 *Biochemical studies in the physiology of sapota. II. Major chemical constituents*, M. V. SASTRY, *Indian Fd Packer*, 1966, 20 (6), 16.

During growth there is active cell division and cell formation. Cellulose is almost constant throughout; however pectin synthesis differs from cellulose and lignin synthesis. Increase in sugars follows an epsilon curve. Fructose registers a constantly increasing trend while reducing sugars and glucose are similar in their synthesis. Non-reducing sugars being the dominant of all sugars during the final stages resemble almost total sugars in their synthesis. Starch is almost constant throughout the growth.

A. A.

4.74 *Description and classification of grape varieties*, K. L. CHADHA & G. S. RANDHAWA, *Indian J. Hort.*, 1966, 23 (1 & 2), 38.

Review 196 references.

4.75 *Nitrogen metabolism during storage in relation to the breakdown of apples. I. Changes in protein nitrogen level in relation to incidence*, D. MARTIN, T. L. LEWIS & J. CERNY, *Aust. J. agric. Res.*, 1967, 18 (2), 271.

Increase in protein nitrogen content during cool storage (studied under 4 different rates of water loss) did not appear to be related to the development of break down. High nitrogen level in the fruit, high relative humidity in the storage atmosphere, and advanced maturity at harvest, all increased susceptibility to break down, but only the first of these factors influenced the protein nitrogen level. An inverse relationship between percentage water loss and break down incidence was demonstrated.

K.A.R.

4.76 *Texture of frozen vegetables: Effect of freezing on green beans*, MILFORD S. BROWN, *J. Sci. Fd Agric.*, 1967, 18 (2), 77.

Blanching and cooking did not cause damage, but freezing caused damage to the tissue. Very rapid freezing by immersion in liquid nitrogen prevented damage and reduced the texture degradation. At freezing rate lower than that required for preservation, immature cells of the parenchyma are at first damaged. Further reduction of the freezing rate caused breakage of other cell walls. When the freezing rate was changed during freezing, the part of the bean that froze rapidly was not damaged whereas that which froze slowly was damaged. Decreasing the freezing rate during freezing did not damage the portion of the bean already frozen. Sensory panels could distinguish texture differences in beans frozen at various rates.

K. A. R.



4.77 *Low temperature and the storage of carrots*, W. Hugh SMITH, *J. Fd Technol.*, 1967, 2 (1), 89.

The long term storage of carrots at 32°F resulted in more fungal rotting than at 34°F and this is due to low temperature injury. Above 34°F rotting developed rapidly and there was increased growth of shoots and rootlets. For storage upto 2 months temperatures in the range of 32-37°F are not critical. For longer storage 34°F is optimum. K. A. R.

4.78 *A forced air precooler for pickling cucumbers*, C. E. HOOD, *Fd Technol. Champaign*, 1967, 21 (2), 190.

More than 1000 bushels of 1962 season cucumbers were tested in a specially constructed and designed precooler (capacity 80 bushels). Time required for cooling cucumbers to desired storage temperature of 50-55°F was 35 to 55 min. depending on cucumber size, amount of ice in the hunker and initial temperature of cucumber stock. A. A.

4.79 *Studies on preparation and storage of ash gourd preserve by the hot continuous concentration process*, B. S. RAMACHANDRA, L. S. SUBBA RAO & S. RANGANNA, *Indian Fd Packer*, 1966, 20 (6), 5.

An equipment making use of flow of air through the hot syrup for evaporation and controlling the rate of concentration, has been developed for the manufacture of preserve. The concentration is raised continuously at the rate of 1°Brix per hour at 60°C till the final concentration is reached. The product is translucent and the syrup is clear. Storage changes and cost of manufacture are presented. A. A.

4.80 *Heating rates of fruit products in an agitated kettle*, G. D. SARAVACOS & J. C. MOYER, *Fd Technol. Champaign*, 1967, 21 (3A) 372.

In fruits and fruit pieces (apples, apricots, pears and plums), the heating rate in steam jacketed kettle, of the fruit surfaces increased with particle size, speed of agitation; and jacket steam pressure to heat transfer coefficients could be calculated because of diversity of particle sizes, and shapes. The heating rates of purees were influenced mainly by their rheological properties. All the purees, except apple sauce were pseudoplastic. J. V. S.

4.81 *Processing of the rarer tropical fruits*, F. E. SEALE, *Fd Technol. Aust.*, 1967, 19 (5), 233.

Fruits discussed are papaya, banana, passion fruit, mango, acerola, guava, lyche and Anona.

4.82 *The detection of adulteration of fruit juices by thin layer chromatography*, B. M. ALWAREZ, *Analyst*, 1967, 2 (2), 176.

The method applied to citrus/non-citrus juice is based on differences in the composition of fruit juices that are revealed by TLC. For non-citrus juices, 10% adulteration with apple juice, or 25% of another foreign juice can be detected as can 0.1/μg of glycine in 5 ml. of citrus juice extract be detected. J. V. S.

4.83 *Studies on the canning of Coorg Mandarin orange segments*, C. B. KARIAPPA, B. A. S. RAO & G. S. SIDDAPPA, *J. Fd Sci. Technol.*, 1967, 3 (3), 101.

Use of pectinase or low methoxy pectin (LMP) was not helpful in canning. Calcium chloride added segments were firm even after 4 months. Use of high Brix sugar syrup (50 to 60° Brix) prevented cloudiness. Turbidity is minimised by using syrup of 60° Brix containing 0.05 per cent calcium chloride. K. A. R.

4.84 *Conditions for producing foam mat dried grape fruit crystals*, ROBERT E. BERRY, OWEN W. BISSET, C. J. WAGNER, JR. & M. K. VELDHUIS, *Fd Technol. Champaign*, 1967, 21 (3), 293.

A commercial process has been developed. Drying temperature is maximum 170°F for 2 min. followed by 150-160°F for 10 min. The final product contains less than 0.5% methyl cellulose and its final moisture content is 1.0-1.25%; no in-package desiccant is needed. To increase its density, the product is ground and compressed to about 0.6g/cc between pressure rolls without impairing solubility. After regrinding, fines are removed by screening to aid reconstitution. The final product is packed in cans or flexible pouches. A. A.

4.85 *Physiological studies during the growth and development of different varieties of guavas (Psidium guajava L.)*, H. C. SRIVASTAVA & P. NARASIMHAN, *J. hort. Sci.*, 1967, 42 (1), 97.

Changes in size and specific gravity and in the content of water, titratable acid, reducing and non-reducing sugars, tannins, pectin and ascorbic acid were recorded from fruit-set to harvest in three seed bearing and one seedless variety of guava. Pattern of changes were similar in seeded and seedless varieties, although the sugars and ascorbic acid contents rose earlier and to higher levels in the seedless and the fruits matured earlier and fell from the trees earlier. Pectin content decreased with increase in ascorbic acid content in the seeded varieties, but in the seedless variety a rapid rise in the ascorbic acid content occurred during a period of pectin accumulation. The end of initial rapid decline in respiration rate generally coincided with the beginning of reducing sugar accumulation. A. A.

4.86 *Depectinising guava juice with fungal pectinase*, L. M. WALDT & R. D. MAHONEY, *Fd Technol. Champaign*, 1967, 21 (3), 305.

Enzyme activity was measured at various temperatures by isopropanol precipitation of pectin remaining in the juice after a period of incubation. The time concentration relationship of enzyme activity is demonstrated. Measurement of the Q<sub>10</sub> of this pectinase system was attempted. Depectinisation and flocculation into colloidal environment of guava juice are discussed. A. A.

4.87 *True vitamin A value of some vegetables*, C. NAGESHWARA RAO, *J. Nutr. & Dietet.*, 1967, 4 (1), 10.

True vitamin A content of 14 foodstuffs was analysed by chromatographic technique standardised using suitable calcium hydroxide as adsorbent. The biologically inactive beta-carotene was found in yam, gazzargadda and carrot. The values reported were found to be 50-97% of the values obtained by assuming biological potency of beta-carotene for all the fractions. Retention of vitamin A values of leafy vegetables stored in darkness at room temperature and in the refrigerator were almost similar. Frying leafy vegetables in a small amount of oil accounted for higher loss of vitamin A, than by boiling in restricted quantity of water. B. S. N.

4.88 *On the stabilization of vitamin C in foods. IV. Concerning the stabilizing substances present in white cabbage*, P. SPANYAR, E. KEVEI & M. BLAZOVICH, *Z. Lebensmittelunters. U. Forsch.*, 1966, 132 (3), 129.

An attempt was made to obtain from freeze-dried white cabbage a substance having a stabilizing action of ascorbic acid and/or dehydroascorbic acid. The stabilizing effect is exercised by two different kinds of substances. One of them is a wax-like substance, or one of its components, which is found on the surface of the leaves and is difficult to dissolve in ether and alcohol. The other is red anthocyanin dyestuff which is insoluble in ether but easily soluble in alcohol, and makes its appearance only after chlorophyll is removed. K. M. D.

4.89 *Standardising sweetness of canned beets*, M. C. BROWNE & W. B. ROBINSON, *Fd Technol. Champaign*, 1967, 21 (3), 299.

Raw table beets differing in variety, harvest, year and irrigation were analysed for sugar content and canned as slices with an added amount of sucrose calculated to give a cut out sucrose content of 7.2%. A taste panel expressed a consistent preference for the canned beets containing added sugar over controls packed without sugar. A high correlation ( $r=0.97$ ) was found between sucrose content and °Brix which allows a refractometer reading to be used as a means of estimating the sugar content of raw beets.

A. A.

4.90 *Variability for capsaicin content in chillie*, D. K. THIRUMALA CHAR, *Curr. Sci.*, 1967, 36 (10), 269.

The capsaicin content of sun-dried fruits of a few NP varieties of chillies assessed by using u.v. absorption spectrometry after chromatographic partitioning of alkaloid, varied from 0.2773—1.1267 mg/100 mg of sundried chilli powder.

B. S. N.

4.91 *An enzyme activation process for producing sweet potato flakes*, MAURICE W. HOOVER, *Fd Technol. Champaign*, 1967, 21 (3A), 322.

The peeled, trimmed and raw sweet potatoes were heated by steam injection to 160–185°F and retained in conversion tanks for 2–60 min. to achieve specific degrees of conversion. The material was then heated quickly at 200°F to complete cooking and also inactivate the enzymes. The puree was then drum dried. The method avoids use of enzymes from commercial sources and can be applied on fresh/cured or stored sweet potatoes.

J. V. S.

4.92 *Instant sweet potato flakes—Processing modifications necessitated by varietal differences*, J. J. SPADARO, J. I. WADSWORTH, G. M. ZIEGLER, A. S. GALLO & S. P. KOLTUN, *Fd Technol. Champaign*, 1967, 21 (3A), 326.

The process developed for producing instant flakes from Goldrush variety has been modified for other varieties by the addition of sugar to puree before dehydration; or by the addition of sugar and enzymatic conversion of starch to sugar; or by adding color preservatives.

J. V. S.

## 5. Oilseeds and Nuts

5.19 *Drying and storing peanut*, O. MYKLESTAD, *Food Preserv. Q.*, 1966, 26 (2-4), 21.

5.20 *Enzymatic modification of the extractability of protein from soybeans, Glycine max*, K. M. ABDO & K. W. KING, *J. agric. Fd chem.*, 1967, 15 (1), 83.

Enzymes extracted from *Pestalotiopsis westerdijkii* improve extractability of protein in soybean from 74–95% and yield a soybean milk free from toxic components possessing protein quality equal or superior to product prepared without enzymatic treatment. Optimum conditions of enzymatic treatment for soybeans were nearly established at 32 mg. of enzyme protein/g. of soybean residue incubated at pH 4.6 for 6 hr. at 37°C. Enzymatic treatment solubilizes nearly one half of crude fiber present in soybean.

B. S. N.

5.21 *Fractionation and characterization of alcohol extractables associated with soybean proteins. Non-protein components*, A. M. NASH, A. C. ELDRIDGE & W. J. WOLF, *J. agric. Fd Chem.*, 1967, 15 (1), 102.

Isolated soybean proteins extracted with 86% (v/v) ethanol yielded 3.7% of a light brown semi-solid. The alcohol extractable

materials were fractionated by chromatography on diethyl amino ethyl cellulose columns with non-aqueous solvents and preparative TLC on silicic acid. Phosphatidyl choline, phosphatidyl ethanolamine, saponins, sitosterol glycoside, and genistein were identified. About one fourth of the alcohol extract was a yellow oil containing triglycerides and other neutral compounds.

A. A.

5.22 *Composition of commercial peanut butters*, SARA ROBERTSON, J. E. MARION & J. G. WOODROOF, *J. Am. diet. Ass.*, 1966, 49 (1), 208.

Thirty brands of commercial peanut butter were analysed for moisture, oil, protein, and fatty acid composition. Organoleptic evaluations were also made on the samples. Results showed wide differences in protein and oil content between samples. The major fatty acids were in order of decreasing magnitude: oleic, linoleic, palmitic and stearic. Other fatty acids noted were: behenic, arachidic, linolenic and lignoceric. Differences were noted in the fatty acid composition of different samples. The levels of palmitic and linoleic acids appeared to be inversely related to total sensory scores and had correlation coefficients of  $-0.52$  and  $-0.38$  respectively.

B. S. N.

5.23 *Accelerated drying of groundnuts*, S. ANSAR AHMED, D. RAMACHAR, S. ALLABAKSH & S. D. THIRUMALA RAO, *J. Sci. Fd Agric.*, 1967, 18 (3), 116.

Drying of groundnut soon after harvest is necessary to prevent deterioration during storage. Study on the sun-dried and accelerated—dried groundnut showed that sun-dried groundnuts were slightly lower in free fatty acids during the storage period. Accelerated dried groundnuts also kept well both in respect of free fatty acids and peroxide value of oils.

K. A. R.

5.24 *Cottonseed meal trace element survey by atomic absorption spectrophotometry*, W. W. TURNER Jr., *J. Am. Oil Chem. Soc.*, 1967, 44 (2), 129.

Cottonseed meal from 14 States and Mexico was analysed for Ca, P, Fe, Mg, K, Na, Cu, Mn, Zn, and Co. The data show the surprising uniformity of these elements regardless of the area in which the seed was grown and type of processing used.

A. A.

5.25 *'Bontrae' a new meat like ingredient for convenience foods*, W. W. THULIN & S. KURAMOTO, *Fd Technol. Champaign*, 1967, 21 (2), 168.

Textured protein food products can be prepared from isolated soybean protein; a typical process is indicated and the economics of the particular product (Bontrae) is contrasted with those of meat. Fabricated soybean products can be tailored to specifications with respect to composition, shape, texture, flavour and colour. Any lack in nutritional protein quality can be compensated.

J. V. S.

5.26 *Cottonseed protein concentrate*, J. T. LAWSON & H. S. RAO, *Cereal Sci. Today*, 1967, 12 (2), 40.

Mixtures of acetone, cyclohexane and water (A:C:W) have been utilised to produce protein concentrates by solvent extraction methods. The solvent mixtures developed remove gossypol and oil simultaneously from cottonseed flakes. The method is in an advanced stage of development. There is no need to maintain a lower level of water in A:C:W mixture. The beginning water level should, however, be high to induce water movement from mixture into flakes with 6.5% moisture. The water loss to flakes must balance against the water gain from stripping steam used in oil meal desolventisation.

J. V. S.

5.27 *Coconut processing in the tropics*, *Fd Technol. Champaign*, 1967, 21 (3), 37.

Dip treatment in 25% solution of Na<sub>2</sub>CO<sub>3</sub> or in a mixture of 7% acetic acid and 5% H<sub>2</sub>SO<sub>4</sub> was found to be effective in protecting coconut kernels against different forms of spoilage. J. V. S.

## 6. Oil, Fat & Wax

6.18 *Fats and food spoilage*, SCIENCE EDITOR, *Milling*, 1967, 148 (6), 105.

The role of fatty acids in bringing about oxidative rancidity and enzymic hydrolysis leading to deterioration of such foods in a short time, and the preventive measures.

6.19 *Incorporation of nitrogen by fatty materials during storage*, M. K. GOVIND RAO & K. T. ACHAYA, *Indian J. Technol.*, 1967, 5 (1), 23.

Oils (safflower and cottonseed), fatty acids (lauric, linoleic, linolenic, palmitic and oleic) and methyl esters of these fatty acids are subjected to accelerated storage treatments by: incubation at 63°C; bubbling air at 95°C and purified N<sub>2</sub> at 53°C; and bubbling ammonia. Increase in nitrogen content in oleic and linoleic acids under varying conditions remained almost the same, whereas it became almost twice in saturated acids. Nitrogen incorporation into fatty material, on exposure to atmosphere is chiefly through ammonia of air and to a partial extent through some other binding reaction at double bond involving probably ammonia. B. S. N.

6.20 *Selective hydrogenation of soybean oil in the presence of copper catalysts*, C. OKKERSE, A. DE JONGE, J. W. E. COENEN & A. ROZENDAAL, *J. Am. Oil Chem. Soc.*, 1967, 44 (2), 152.

Linolenic acid usually associated by many workers with poor keeping quality was found to be hydrogenated more selectively in the presence of Cu catalysts than in that of Ni and other hydrogenation catalysts. The linoleic acid which is essential for nutrition, was maintained better with Cu catalyst than with Ni catalyst. By means of this process, it is possible to manufacture an oil of good keeping quality having high linoleic acid content. J. V. S.

6.21 *The relationship between alkyl furans and the revision flavour of soybean oil*, S. S. CHANG, R. G. KRISHNAMURTHY & B. R. REDDY, *J. Am. Oil Chem. Soc.*, 1967, 44 (2), 159.

The flavour characteristics of 2-ethyl furan were evaluated in a bland freshly deodorised cottonseed oil. It was found that 2-ethyl furan had higher flavour threshold than 2-pentyl furan and did not contribute to any beany and grassy type of reversion odor and flavour to any oil. GC did not show any peak which had retention time corresponding to 2-ethyl furan. A. A.

6.22 *Chemical reaction involved in the deep fat frying of foods.*

III. *Identification of non-acidic volatile decomposition products of corn oil*, R. G. KRISHNAMURTHY & STEPHEN S. CHANG, *J. Am. Oil Chem. Soc.*, 1967, 44 (12), 136.

A total of 14 compounds were identified and an additional 20 compounds were tentatively identified in the non acidic volatile decomposition products produced by corn oil under conditions simulating commercial deep fat frying. The chemical structure of the identified compounds and the postulated mechanism of their formation revealed some of the chemical reactions involved in the deep fat frying of foods. Many of the compounds had interesting odor characteristics. It is concluded that their effects on human health, when inhaled or ingested should be studied. J. V. S.

6.23 *Chemical reactions involved in the deep fat frying of foods.*

II. *Identification of acidic volatile decomposition products (VDP) of corn oil*, TSUKASA KAWADA, R. G. KRISHNAMURTHY, B. D. MOOKHERJEE & S. S. CHANG, *J. Am. Oil Chem. Soc.*, 1967, 44 (2), 131.

The acidic VDP produced by corn oil maintained at 185°C for 30 hr with periodic frying of moist cotton balls and with addition of fresh oil to replenish the oil lost due to evaporation, decomposition and absorption, by cotton balls were fractionated by repeated GC. The fractions were identified by IR and mass spectrometry. A total of 30 acids were characterised. They consisted of 12n-aliphatic saturated acids, seven 2-enoic acids, one 3-enoic acid, three keto acids, two hydroxy acids, four dicarboxylic acids, and one aromatic acid. Suggestions have been made for the study of the effects of these acids on human nutrition. A. A.

6.24 *A limited survey of fats and oils commercially used in deep fat frying*, J. A. THOMPSON, M. M. PAULOSE, B. R. REDDY, R. G. KRISHNAMURTHY & S. S. CHANG, *Fd Technol. Champaign*, 1967, 21 (3A), 405.

A survey of commercial fats and oils, by physical and chemical analysis revealed that some processors maintained their frying oils in good quality. Fatty acid composition of used fat and oil, analysed by GC did not add up to 100%. In a severely damaged oil it amounted only to 84%. This is attributed to the possible presence of polar and polymeric fatty acids. J. V. S.

6.25 *Nutritional aspects of thermally oxidised fats and oils*, HANS KAUNITZ, *Fd Technol. Champaign*, 1967, 21 (3), 60. Review. Fifty one references.

6.26 *The effects of seed pretreatments and extraction conditions on the amount of minor components in seed oils*, L. A. APPELQUIST, *J. Am. Oil Chem. Soc.*, 1967, 44 (3), 206.

Procedures are described for extraction of rape and mustard seeds resulting in oils with no detectable peroxides if high quality viable seeds are used. The effects of pre-washing of equipment, and the exclusion of light and heat, on the peroxide value of the oil extracted are shown to differ, depending upon the kind and quality of seed. Oils from white mustard seed obtained lower peroxide values than oils from rapeseed when subjected to pro-oxidative conditions during extraction. A. A.

6.27 *Oil content of groundnut seeds*, E. A. K. ELSAED, *Curr. Sci.*, 1967, 36 (10), 270.

The oil content of 4 varieties of groundnut grown in Sudan varies from 48.20 to 52.54%.

6.28 *High oleic acid safflower oil*, R. H. PURDY & B. J. CAMPBELL, *Fd Technol. Champaign* 1967, 21 (3A), 349.

Commercially feasible varieties having about 80% oleic, 15% linoleic and 5% saturated fatty acids have been evolved by breeding. The oil from the new varieties had low four point bland flavour and light colour. Accelerated test methods suggested oxidative stability comparable to commercially available partially hydrogenated shortenings. Laboratory scale studies indicated the use of these oils as stable food fat. J. V. S.

## 7. Starch, Sugar & Confectionery

7.8 *Studies on mechanical factors affecting dough development*, P. W. HEAPS, T. WEBB, P. W. RUSSEL EGGITT & J. B. M. COPPOCK, *J. Fd Technol.*, 1966, 2 (1), 37.

Doughs of wheat flour, salt and water have been mixed at

various rates and to various levels of mechanical work input. Rheological tests have confirmed that there exists a definite level of work input which gives maximum dough development for any one flour; the results suggest, moreover, the existence of an optimum rate of work input for producing the most stable dough and the best bread.

7.9 *The development of gummy layers in cakes*, BYRAR S. MILLER HENRY B. TRIMBO & R. M. STANDSTEDT, *Fd Technol. Champaign*, 1967, 21 (3A), 377.

The gummy layer in certain cakes is due to the movement of moisture into this section from other portions of the batter, and the moisture migration is due to temperature gradients or liquid settling out of the batter. Guar and CMC were shown to prevent the moisture movement and gummy layers in starch-water dispersion and also in cake batters heated in sealed cans. Guar and CMC in a cake mix produced better cakes at higher liquid level than a formulation which do not contain these materials.

J. V. S.

## 8. Spices and Condiments

8.5 Lipase activity in black pepper, ERIK HALBERT and DOUGLAS G. WEDDEN, *Nature, Lond.*, 1966, 212 (5070), 1603.

The lipolytic enzyme in pepper is associated mainly with the outer pericarp and is insoluble in water. The preliminary assay revealed that the outer pericarp and residual seed converted 26 and 7% respectively of their substrates to FFA. Maximum acid production occurred at 46°C.

K. A. R.

8.6 *The packaging and storage of dried ginger*, K. C. RICHARDSON, *Food Technol. Aust.*, 1966, 19 (4), 65.

General article.

8.7 *Development of a bitter substance in onion juice*, S. SHWIMMER, *Fd Technol. Champaign*, 1967, 21 (3), 292.

Onion juice contains a bitter substance derived enzymatically from a non bitter precursor. This bitter substance is not directly derived from the system responsible for onion odor and pungency. It is non-volatile, non-ionic, but soluble in diethyl ether. It may be triterpenoid or flavonoid, but is not quercetin. Its formation in onion juice can be prevented without affecting odour intensity, by a temporary, acidification of the juice.

A. A.

## 9. Meat, Poultry and Fish

9.38 *Chemical modifications of smoke-cured meats during their preservation*, L. M., NICORA, and others, *Ind. aliment. agric.*, 1966, 83 (12), 1923.

Smoke-curing of meats seems to confer a certain stability to their main constituents. The analysis of the physico-chemical modifications that occurred during the first month of storage and a preservation period of 45-days concerns the dry extract, protein nitrogen and lipid content.

A. A.

9.39 *Inspection of meat in the past. II. Decrees on meat inspection in the XVIIIth and XIXth centuries*, E. LASZLO, *Husipar*, 1967, 16 (1), 42.

Review.

9.40 *Chemical cleaning and disinfecting of slaughter houses and meat processing plants*, J. TAKACS, *Husipar*, 1967, 16 (1), 18.

Elimination of wooden parts, repairing of damaged surfaces, use of stainless steel equipment, disinfecting machine, hot water of 82°C and special type of detergent solutions and employment

of suitably qualified technical personnel are essential pre-requisites for running and maintenance of a modern slaughter house.

B.S.N.

9.41 *A portable rotating knife tenderometer*, J. BJORKSTEN, P. ANDERSON, K. A. BOUSCHART and J. KAPSALIS, *Fd Technol. Champaign*, 1967, 21 (1), 84.

The new instrument yields significant tenderness data on cooked beef muscle. The results correlated with that from Warner-Bratzler shear unit at 1% significance with study of 24 carcasses.

J. V. S.

9.42 *Enzymatic reducing pathways in meat*, BETTY M. WATTS and others, *J. Fd Sci.*, 1966, 31 (6), 855.

Except for a small utilization of oxygen in meat slurries (ascribed to non-enzymatic oxidation) all reductive activity can be stopped by inhibitors of DPNH oxidation via the electron transport chain. Added DPN accelerates all reductive activity. Metmyoglobin reduction does not occur until oxygen has substantially disappeared from the meat. Added succinate greatly accelerates oxygen utilization, but affects metmyoglobin reduction indirectly by establishing anaerobic conditions.

K. A. R.

9.43 *Protein alterations and associated changes in porcine muscle as influenced by maturity, genetic background, and post-mortem muscle temperature*, R. N. SAYRE, JOAN PARA and E. J. BRISKEY, *J. Fd Sci.*, 1966, 31 (6), 819.

Muscle from 5-10 kg. animals had more glycogen and less myoglobin as well as less total nitrogen than muscle from 250-300 kg. animals. Glycolytic activity was more in the post mortem muscles of mature animals and exhibited greater loss of colour and decreased protein solubility. Post slaughter holding did not affect the rate or extent of glycolysis, but chilling gave benefits to subjective score for colours and juice retaining capacity. It also made the protein solubility less severe.

9.44 *The determination of salt in bacon by using a sodium ion responsive glass electrode*, J. H. HALLIDAM and F. W. WOOD, *Analyst*, 1966, 91 (1089), 802.

Method enables the determination of percentage of salt on water content to be measured directly on the meat in a few minutes. Many determinations can be made cheaply and accurately enough for purposes of routine factory control.

A. A.

9.45 *Radiation sterilization of prototype military foods. II. cured ham*, ABE ANELLIS, D. BERKOWITZ, C. JARBOE and H. M. EL-BISH, *Appl. Microbiol.*, 1967, 15 (1), 166.

Ten lots of diced cured ham, packed in cans were inoculated with approximately  $10^6$  *Clostridium botulinum* spores per can. Each lot was seeded with a different strain (five type A and five type B strains). All cans were irradiated to various dose levels with  $Co^{60}$ . Evidence provided by swelling, toxicity and recoverable *Cl. botulinum* with 6,350 cans demonstrated (1) that 4.5 Mrad, was more than adequate as a sterilization dose; (2) the minimal experimental sterilizing dose (ESD) based on non-swollen non-toxic end points was  $2.0 < ESD < 2.5$  Mrad and based on non-sterile spoiled cans was  $3.0 < ESD < 3.5$  Mrad (the latter was supported by the computed theoretical 12 D dose); (3) D values calculated from botulinal survival data indicated that as a group, A type strains were more radio-resistant than type B strains; strains 12885 A and 41B with respective D values of 0.242 and 0.175, represented the most resistant of each type; (4) swollen cans did not contain toxin nor were toxic cans always swollen; (5) viable *Cl. botulinum* can exist for 6 months at 3°C without producing visible or toxic spoilage at doses of 3.0 Mrad and lower, including, in some instances 0.0 Mrad; and (6) a phenomenon similar to heat activation of spores occurred to sublethal radiation doses.

A. A.

- 9.46 *Cooling and freezing of lamb and mutton carcasses—I. Cooling and freezing rates in legs*, R. L. EARLE and A. K. FLEMING, *Fd Technol. Champaign*, 1967, 21 (1), 79.  
Temperatures were measured at the deepest part of the legs of lamb and mutton carcasses during cooling and freezing under various conditions. Cooling and freezing rates were calculated from standard heat transfer reactions using as a theoretical model of the deepest part of the leg, a cylinder of meat with a diameter appropriate to the weight and grade of carcass, and of infinite length. The experimental and theoretical results were in agreement. A. A.
- 9.47 *Effect of heat resistance on the physical and functional properties of liquid and spray-dried egg albumin*, S. L. BROWN and M. E. ZABIK, *Fd Technol. Champaign*, 1967, 21 (1), 87.  
Exposure of egg albumen to preheating, spray drying or high temperature storage brought about the following significant changes: decrease in apparent surface tension, increase in sp. gr. of both egg albumen foam and angel cake batter, decrease in foam stability and decrease in volume of angel cakes. Preheating had the most adverse effect and caused an additional significant decrease in the compressibility of angel cake, its significant differences (attributable to heat treatment of egg albumen) were recorded in the tenderness or tensile strength of cakes. A. A.
- 9.48 *Shortening as a factor in meat ageing*, C. L. DAVEY, HELEN KUTTEL & K. V. GILBERT, *J. Fd Technol.*, 1967, 2 (1), 53.  
Shortening during slow and rapid phases of rigor mortis onset determines the extent to which beef ages. For meat stored at 15°C for 3 days, shear force values are uniformly low at shortenings of 0% to 20% of the freshly excised muscle length. However, there is a 4 to 5 fold increase in toughness as shortenings proceed from 20% to 40%. This is followed by a decrease in toughness as shortenings increase further from 40% to 55%. With increasing shortenings beyond 20%, progressive decreases occur in the extent to which meat ages until at 40% shortening, ageing has declined to zero. A. A.
- 9.49 *Studies on composition of food. I. Some differences in the composition of broiler and free range chickens*, JEAN ROBERTSON, MARGARET S. VIPAND, D. TAPS FIELD & J. P. GREAVES, *Brit. J. Nutr.*, 1966, 2<sup>o</sup>, 675.  
Fat content appeared to be related to breed as well as type of bird. Broilers had less thiamine and more fat than free range chickens. Thiamine was destroyed in cooking by about one-third in most cases. B. S. N.
- 9.50 *Preventing denaturation of the proteins in frozen fish muscle and fillets. I. Effects of additives on the quality of frozen minced fish muscle*, M. AKIBA, T. MOTOHIRO & E. TANIKAWA, *J. Fd Technol.*, 1966, 2 (1), 69.  
In Japan, frozen fish muscle is used for preparing Japanese-style fish paste. Use of a mixture of sugars (5% by wt.) and alkaline polyphosphate (0.5% by wt.) or egg white alone (5% by wt.) was effective in preserving the quality of fish muscle. High molecular weight substances like starches, casein, gluten, carboxymethyl cellulose and sodium polyacrylate showed little effect. Olive oil, shortening oil or lecithin were partially useful as additives accompanying the use of sugars and polyphosphates. Inorganic substances, including potassium bromate, aluminium chloride and sodium chloride were not effective in improving the quality. A water leaching procedure prior to the grinding of raw fish muscle always gave a better product than that produced without leaching. K. A. R.
- 9.232 *Sanitation in meat and poultry processing plants*. R. GEISTER & A. C. MAACH, *J. Milk Fd Technol.*, 1967, 3 (3) 67.  
Review.
- 9.52 *A method for rapid determination of protein in meat by dye binding*, V. G. MOSS & E. W. KIELSMEIER, *Fd Technol. Champaign*, 1967, 21 (3A), 351.  
A dye binding method was developed using Amido Black 10 B. With the types of samples used in the tests, a 0.10% dye solution at a dye-to-protein ratio of  $0.525 \pm 7.5\%$  to 1, produced optimum results. Protein contents of samples were determined. A. A.
- 9.53 *Cured color development during Frankfurter processing*, JAY B. FOX, W. E. TOWNSEND, S. A. ACKERMAN & C. E. SURFT, *Fd Technol. Champaign*, 1967, (3A), 386.  
Different processing variables which affect the colour development in Frankfurter emulsion. No measurable stable meat pigment formed during chopping. The lag in colour production was reduced by chopping under N<sub>2</sub>, vacuum mixing or by adding ascorbate or erythorbate; temperature of cooking was critical for color production and retention. There was an interaction of effect between different types of wrapping film and cooking temperatures. J. V. S.
- 9.54 *Influence of continuous chilling on tenderness of Turkey*, W. W. MARIEN & H. M. GOODMAN, *Fd Technol. Champaign*, 1967, 21 (3), 307.  
Turkeys 15-27 weeks old, were processed commercially and chilled continuously in a mechanical system for 1 hr followed by 3 hr or 23 hr in unagitated ice slush. Tenderness was measured using the L. E. E. Kramer shear press. Meat from breast muscle, and on occasions from leg muscle, did not show significant treatment effects which became marked in 15-week old Turkeys, confirming that the Turkey fryer has a greater toughness problem. A. A.
- 9.55 *Temperature measurement and fish*, J. GRAHAM, *Fd Technol. Aust.*, 1967, 19 (5), 216.  
Deals with the temperature measurement of wet fish and frozen fish during processing and distribution, and also describes how to measure temperature in freezing plants, cold stores and smoking kilns. K. A. R.
- 9.56 *Radiation pasteurization of tropical fish—Bombay Duck (Harpodon nehereus)*, P. L. SAWANT, S. S. MAVINKURVE, S. SAROJA, K. A. SAVAGAON & U. S. KUMTA, *Fd Technol. Champaign*, 1967, 21 (3A), 444.  
The fresh storage life of eviscerated Bombay Duck (*Harpodon nehereus*) at 10-12°C was extended by radiation pasteurisation for 12, 21 and 46 days by 0.25, 0.5 and 1 Mrad in contrast with rapid deterioration of the unirradiated samples in 3 days. Details are presented of storage properties of irradiated/unirradiated fish and also of chemical index, organoleptic properties and bacterial load. TVBN count was a better index of incipient spoilage than was bacterial load or tyrosine equivalent in the irradiated fillets. J. V. S.
- 9.57 *Canning and storage of crab meat*, SHARAD GANGAL & N. G. MAGAR, *Fd Technol. Champaign*, 1967, 21 (31), 397.  
During canning of crab meat (*Scylla serala*) loss occurred in free amino acids, B-vitamins and minerals. B-vitamins and amino acids declined markedly during storage, and pH, NPN, trimethylamine nitrogen (TMAN) and total non volatile basic nitrogen (TVBN) increased steadily. Peroxide value increased

and iodine values decreased during storage for 9 months. Antioxidants (citric acid and NDGA) minimised changes in these two factors and maintained flavour. J. V. S.

9.58 *Proximate composition and nutritive value of leg meat of two edible species of frogs, Rana hexadactyla and R. tigrina*, N. P. DANI, B. R. BALIGA, S. B. KADKOL & N. L. LAHIRY, *J. Fd Sci. Technol.*, 1966, 3 (3), 4.

No significant difference in the chemical composition of the two species was observed. The proximate composition closely resembles the values obtained for fish. The nutritive value of frog leg meat was almost on par with that of other flesh foods.

K. A. R.

## 10. Milk and Dairy Products

10.27 *Calcium, protein, fat, and moisture of commercialy made cottage cheese*, BARBARA M. KENNEDY and MARIE SCHELSTRACTE, *J. Am. diet. Ass.*, 1966, 49 (6), 502.

Twenty samples of cottage cheese from five manufacturers were analysed for moisture, protein, fat and calcium contents. Average calcium content recorded was lower than those reported in literature. B. S. N.

10.28 *Concentrated and manufactured milk*, C. W. CULLIP, *J. Soc. Dairy Technol.*, 1966, 19 (4) 201.

Review.

10.29 *Butter*, J. E. KING, *J. Soc. Dairy Technol.*, 1966, 19 (4), 182.

Review. 22 references.

10.30 *Cheese*, G. M. ROBERTSON, *J. Soc. Dairy Technol.*, 1966, 19 (4), 195.

Review.

10.31 *The influence of vacuum pressing on the texture of cheddar cheese*, P. S. ROBERTSON, *J. Soc. Dairy Technol.*, 1966, 19 (4), 225.

Pressures greater than 26 lb/in<sup>2</sup> were required for maximum improvement in texture. A vacuum of 15 in. was less effective than a vacuum of 25 in. Vacuum pressing of 'dressed' cheese for 5 min. was almost as effective as vacuum pressing for 17 hr; vacuum pressing after dressing was more effective than before dressing. Vacuum pressing improved the texture of cheese made with mixed strain starters although this cheese was not as close as vacuum pressed cheese made with single strain starters. K. A. R.

10.32 *Sterile processing in the dairy industry*, ANN LANG, *Fd Technol., Aust.*, 1966, 19 (3), 120.

Production of ultra high temperature sterilized (U.H.T.) dairy products aseptically packaged in cartons, having a shelf life of many weeks has been described. K. A. R.

10.33 *Studies on co-precipitates of milk proteins. I. Manufacture with varying calcium contents*, L. L. MULLER, J. F. HAYES & N. SNOW, *Aust. J. Dairy Technol.*, 1967, 22(1), 12.

The level of calcium in the product is determined by the pH of precipitation, amount of calcium chloride added and the washing conditions. For medium calcium products (Ca about 1.5%), heating milk at 195°F for 10-12 min. after addition of 0.06% of calcium chloride and precipitation at pH 5.3-5.4 is optimum. For low Calcium product (Ca level 0.5-0.8%), 15-20 min. heating at 195°F in the presence of 0.03% calcium chloride and precipitation at pH 4.6 is essential. For a high calcium product,

a short holding time at 195°F in the presence of 0.20% calcium chloride is necessary. Heat treatment alone allowed two thirds of the proteins to be removed from whey. Adjustment of pH of the milk and provision of a holding tube in which coagulation takes place increases the recovery. The remaining soluble proteins in the whey—about 15% of the original level—were shown to include a high proportion of soluble casein. Operation of the plant on a commercial level is discussed. K. A. R.

10.34 *Studies on co-precipitates of milk proteins. 2. Simple method of estimation of calcium*, J. A. DUNKERLEY & J. F. HAYES, *Aust. J. Dairy Technol.*, 1967, 32 (1), 19.

A method for the estimation of calcium by the use of hydroxy naphthol blue indicator is described. The method is mainly for Calcium determination under factory scale. The advantage is that the indicator is available in bottles having a self dispensing top which delivers approximately 100 mg. K. A. R.

10.35 *Carotene and vitamin A in camel milk*, KHALID UMAR KHAN & T. C. APPANNA, *J. Nutr. Dietet.*, 1967, 4 (1), 17.

Activated 1, 3-dichloro-2-propanol when employed as a colorimetric reagent, eliminates need for precautions of anhydrous conditions, permits simultaneous reading of both vitamin A absorption and carotene at 585 m $\mu$  and 800 m $\mu$  and reduces the sample to 0.25 to 1.0 ml. by saponifying milk samples and extracting the same in a single test tube. B. S. N.

10.36 *Minimum standards for milk for manufacturing and its production and processing recommended for adoption by state regulatory agencies*, F. E. FENTON, *J. Milk Fd Technol.*, 1967, 30 (3), 84.

General.

10.37 *Comparison of methods for grading milk intended for manufacturing purposes*, ROGER DABBAH, SITA RAMAYYA TATINI & J. C. OLSON JR., *J. Milk Fd Technol.*, 1967, 3° (3), 71.

Results of 4 bacterial estimation tests—SPC, DMCC, MBRT and RRT (5P 7/4) used for classifying 3873 samples of raw milk were compared. It is suggested that use of a single test as RRT (5P 7/4) with separate classification levels for can supplies and for bulk tank supplies may be conducive for more uniform classification of milk supplies regardless of their geographical source. J. V. S.

10.38 *The low temperature microflora of young cheddar cheese*, W. S. CHARK JR., & G. W. REINBOLD, *J. Milk Fd Technol.*, 1967, 30 (2), 54.

Samples of seven day old, commercial cheese obtained from Iowa plants, were plated in special Trypticase-soy agar, covered with 50 ml. of 1.5% (w/v) agar and incubated at 7.2°C for 3 months. Microorganisms isolated were: enterococci (475), 49.5%; micrococci (148), 15%; lactic streptococci (126), 13%; miscellaneous gram+Ve rods (108), 11%; associate bacteria, (48), 5%; miscellaneous gram—Ve rods (33), 3-5%; lactobacilli (24), 2.5%; and miscellaneous organisms (5), 0.5%.

10.39 *The occurrence of citrate fermenting bacteria in cheddar cheese*, W. W. OVERCAST & K. M. RAO, *J. Milk Fd Technol.*, 1967, 30 (1), 18.

Among the 40 samples of cheddar cheese purchased from retail outlets and examined for flavour, aged cheese with sharp flavour had on an average, fewer citrate fermenting organisms. Converse was true in light flavoured cheese which showed higher counts of citrate fermenting organisms. J. V. S.

- 10.40 *Factors affecting characteristics, composition, and quality of skim milk cheese*, R. E. HARGROVE, F. E. McDONOUGH & R. P. TITSLER, *J. Dairy Sci.*, 1967, 50 (2), 160.

Flavour and texture of cheese were affected by the amount of milk fat, moisture content, the activation of intrinsic milk lipase and the rate and extent of acid development. The manufacturing processes related to control of moisture, acidity and flavour were homogenization of milk fat, fortification of cheese milk with skim milk solids, type and amount of starter, curd size, rate and extent of curd cooling and the temperature and type of cheese pressing.

K. A. R.

- 10.41 *The effect of freeze-dehydration on the survival of certain psychrotrophic bacteria in skim milk, ice cream mix substitute and cottage cheese*, C. VANDERZANT & F. R. SUAREZ, *J. Milk Fd Technol.*, 1967, 30 (2), 48.

A species of *Achromobacter* was relatively more resistant than 5 cultures of *Pseudomonas*. The effect of freezing on viable population varied among cultures and even among different samples of the same culture. Increased viable counts were observed in some cases after freezing. In many aspects the freeze-drying effects on cultures were similar in ice cream substitute and skim milk. When freeze-dehydrated samples were rehydrated and stored at 5.5°C, viable counts of F 11 and 54 increased; in samples stored in dehydrated form, further reduction in viable counts was observed. In cottage cheese, freeze-dehydration highly reduced the viable bacteria. When dehydrated samples were rehydrated and stored at 5.5°C, no big change in viable counts occurred. In samples stored dry, there were further reductions in viable counts.

J. V. S.

## 11. Coffee, Tea and Cocoa

- 11.3 *A contribution to the study of phenomena occurring during the storage of raw coffee*, R. WILBAUX & D. HAHN, *Cafe Cacao, Th'e*, 1966, 10(4), 342.

Graphs of moisture adsorption-desorption taken from various publications were examined and an average practical curve has been worked out for the use of stockists. Results of an adsorption-desorption trial are described.

Limits of moisture content at which the more common moulds and insects make their appearance are reported; information is also provided on the possible activity of certain enzymes and perhaps of chemical reactions.

Whitening of insufficiently dried coffee during storage occurs at a moisture content of 12% in the case of *robusta* which is less susceptible than *arabica*. Water content of 11% (ERH=0.65) is considered the safe limit for the storage of *robusta* coffee although deterioration due to xerophytic moulds, *Araecerus fasciculatus*, and enzyme action, cannot be entirely ruled out.

Ideal conditions for storage of coffee are described. K. M. D.

- 11.4 *Some aspects of the chemistry of tea. A contribution to the knowledge of the volatile constituents*, H. A. BONDAROVICH, A. S. GIAMMARING, J. A. RENNER, F. W. SHEPPARD, A. J. SHINGLER and M. A. GIANTURCO, *J. agric. Fd Chem.*, 1967, 15 (1), 36.

Eighty-three volatile constituents of black tea have been identified by subjecting an aqueous solution of steam distilled tea oil to gas chromatography. Isolation of volatile constituents in pure form has been attempted with a view to establish their structure and properties.

B. S. N.

## 12. Food Additives

- 12.15 *Examination of some additives usable in the making of cured meat products*, L. KORMENDY, *Husipar*, 1966, 15 (6), 223.

Among the various additives tried, phosphate products showed significant reduction in cooking loss in cured meat production.

- 12.16 *Prevention of non-enzymic browning*, D. L. INGLES, *Food Preserv. Q.*, 1966, 26 (2-4), 39.

Review. 17 references.

- 12.17 *Salt as a preservative for foods*, M. INGRAM & A. G. KITCHELL, *J. Fd Technol.*, 1967, 2 (1), 1.

Review. 93 references.

- 12.18 *New synthetic antioxidants based on caffeic acid*, B. H. THEWLIS, *J. Fd Technol.*, 1967, 2 (1), 83.

Experimental details are given for the preparation of the synthetic antioxidants 1-caffeyl glycerol 1-palmityl 2, 2-dicaffeyl glycerol and 1, 2, 3-tricaffeyl glycerol.

A. A.

## 13. Food Analysis

- 13.14 *The fluoride content of some foods and beverages — a brief survey using a modified Zr-SPADNS method*, J. R. MARIER and DYSON ROSE, *J. Fd Sci.*, 1965, 31 (6), 941.

An analytical method that estimates upto 2.0 ppm of fluoride in a 10 g. sample of food. A survey indicated that the use of fluoridated water in food or beverage processing will increase the fluoride content by 0.34-0.75 ppm. It is estimated that the total ingestion of fluoride by a worker will range from 2 to 5 mg/ per day.

K. A. R.

- 13.15 *On the detection of glucose- $\delta$ -lactone in meat products with the help of infra red spectroscopy*, H. GUNTHER, *Lebensmitt. Rdsch*, 1967, 63 (1), 8.

Two methods of detection which have been recently published are now supplemented with a method of identification of the IR-spectrum of gluconic acid labelled by colour reactions.

K. M. D.

- 13.16 *Micro-detection of calcium oxalate in pineapple raphids by infra-red spectroscopy*, L. PETERS and I. SUCKER, *Z. Lebensmittelunters. U. Forsch.*, 1967, 131 (6), 351.

The crystals occurring as raphids in the flesh of the pineapple fruit, just below the skin, could be enriched by a simple method and their existence demonstrated by microscopy under polarized light. The micro-technique for IR spectroscopy provided clear proof that the needle-shaped crystals consist of calcium oxalate. By appropriate calibration ("dilution series" of analytically pure substance), this method can be used for semi-quantitative estimations. Something less than 10  $\mu$ g. of calcium oxalate can be detected by this micro-method, as compared to 50  $\mu$ g. by the normal technique of IR spectroscopy.

K. M. D.

- 13.17 *Estimation of anthocyanins in currant juice*, J. KOCH, E. & HAASE-SAJAK, *Z. Lebensmittelunters. U. Forsch.*, 1967, 131 (6), 347

The anthocyanins in black currant juice are isolated by filtration on gel and then measured spectrophotometrically in HCl solution. As none of the anthocyanins occurring in black current juice was obtainable in the pure state, they were calculated as malvin.

K. M. D.

- 13.18 *Separation of antioxidants by thin layer chromatography*, J. DAVIDEK, G. JANICEK and E. DAVIDKOVA, *Z. Lebensmittel unters. U. Forsch.*, 1967, **131** (6), 345.
- The antioxidants BHA, BHT, and NDGA were separated on a silica gel layer, using a chloroform/acetic acid mixture as solvent. The optimal acetic acid concentration ranges from 10 to 35%. Gallates can be identified by this process, on account of their reaction with phosphomolybdic acid. The method gives good results and is suitable for rapid detection of these antioxidants in fats and oils. K. M. D.
- 13.19 *A thin-layer chromatographic colorimetric method for determining naringin in grape fruit*, James F. FISHER, HAROLD E. NORDBY and THEO J. KEW, *J. Fd Sci.*, 1966, **31** (6), 947.
- The procedure involves preparing the sample by filtration, evaporation, and coagulation followed by centrifugation. The naringin is then separated from its tasteless isomer by TLC and is recovered from the chromato-plate. A modified Davis test is employed for colorimetric analysis.
- 13.20 *Qualitative estimation of food dyes separated on thin layers of cellulose*, G. LEHMANN, and H. G. HAHN, *Lebensmitt Rdsch*, 1967, **63** (1), 6.
- The food dyes are first enriched on an alumina column, then separated by thin-layer chromatography, eluted from the cellulose layer, and measured by absorption of light.
- The method is demonstrated on a model lemonade containing citric acid, and one red and one yellow dye.
- 13.21 *Paper chromatographic estimation of ferulic, caffeic and chlorogenic acids in vegetable foodstuffs*, E. W. JURICS, *Z. Lebensmittelunters. U. Forsch.*, 1966, **132** (4), 193.
- The methanol extracts of various fruits and vegetables were chromatographed with a mixture of n-butanol/glacial acetate/water (7:1:2) on paper repeatedly developed by ascent. Ferulic acid was made visible with a 0.1% aqueous solution of FeCl<sub>3</sub>; caffeic and chlorogenic acids were made visible with a 0.1% methanolic solution of FeCl<sub>3</sub> and a 20% aqueous solution of Na<sub>2</sub>CO<sub>3</sub> a new method elaborated by the authors. The developed spots were quantitatively evaluated by densitometry with direct transmission of light. The smallest quantity of substance that could be detected was 10/μg. of ferulic acid, 1/μg. of caffeic acid, and 2.5/μg. of chlorogenic acid. The estimations could be performed with an accuracy of ± 4% or ± 10% respectively. A. A.
- 13.22 *Thin layer chromatography in the study of natural waxes and their constituents*, P. J. HOLLOWAY & S. B. CHALLEN, *J. Chromatog.*, 1966, **25** (2), 336.
- The adsorption TLC of waxes and 15 classes of reported wax constituents has been studied in detail. The choice of suitable adsorbants, solvent systems and general and specific methods of detection are discussed. A procedure for the isolation of milligram fractions from intact waxes by preparative layer chromatography is described. A. A.
- 13.23 *The use of polyamide in analysis of water soluble food dyes. IV. Thin layer chromatography of water soluble food dyes*, J. DAVIDEK & E. DAVIDKOVA, *J. Chromatog.*, 1967, **26** (2), 529.
- The use of polyamide powder has been shown to be ideal for TLC separation of synthetic food dyes. The dyes tested were: Amaranth, Hzorubin, Echrot, Cochenillerot, Erythosin, Sunset yellow, Tartazin, Naftalgelb, Indigotin and Brillantschwarz. J. V. S.
- 13.24 *Simple method for estimation of protein digestibility in vitro, using filtration under pressure. I. Description of the method*, L. PRAHL & K. TAUFEL, *Z. Lebensmittel unters. U. Forsch.*, 1967, **133** (2), 73.
- The test material is digested at 38 C for 4 hr with pepsin in an acid reaction and then for 20 hr with pancreatin in a neutral or slightly alkaline reaction. Thereafter, the digested and undigested (residue) protein components are separated in a pressure filtration apparatus having a membrane impermeable to protein; the nitrogen distribution is determined by Kjeldahl's semi-micro method. The method yields well graded values for different protein qualities, e.g., after damage by technological as well as domestic processing. The error in the case of milk powder is 2.6%. K. M. D.
- 13.25 *The differential determination of lysine in heated milk. I. In vitro methods*. E. BUJARD, V. HANDWERCH & MAVRON, *J. Sci. Fd Agric.*, 1967, **18** (2), 52.
- Lysine content was measured after acid hydrolysis of the sample (TLV, or x-value) lysine availability by an enzymic digestion procedure (ALV-e or y z value) and by two modifications of the fluorodinitrobenzene method: the direct method (ALV-f I or z-value) and Carpenter's corrected straight acid procedure (ALV-F II or v-value). The four procedures gave strongly correlated, but numerically quite different results. The enzymic procedure and Carpenter's chemical method produced very similar results for lysine availability. In all heated samples, lysine content was much higher than lysine availability. The direct fluorodinitrobenzene method yielded values intermediate between those for lysine content and 'true' lysine availability. A nomograph is presented which accounts for the different conditions of lysine in heated milk and allowst he interconversion of the x,y, z and v-values. A. A.
- 13.26 *The differential determination of lysine in treated milk. II. Comparison of the in vitro methods with the biological evaluation*, F. MOTTU & J. MAURON, *J. Sci. Fd Agric.*, 1966, **18** (2), 57.
- The biological determination of lysine availability performed in young rats using a gluten zein basal diet supplemented with appropriate amino acids correlated best with those of enzymic determination (ALV-e) and the corrected FDNB method (ALV-f II). All the data presented are in conformity with the working hypothesis that in heated milk the reaction at the epsilon amino group of lysine controls biological lysine availability by transforming this amino acid into an enzyme-resistant inactivated form. K. A. R.
- 13.27 *Microbiological assay of protein quality with Tetrahymena pyriformis W. 4. Measurements of available lysine, methionine, arginine and histidine*, J. A. STOTT & H. SMITH, *Brit. J. Nutr.*, 1966, **20**, 663.
- Available amino acid content of a wide range of animal and vegetable sources has been estimated by a microbiological assay technique, employing the protozoan *Tetrahymena pyriformis* W. Values reported for samples with higher available lysine content (8g/16gN) are in close agreement with those obtained by the flurodinitrobenzene method whereas they were lower in case of lower available lysine samples. Modern commercial practices do not appear to have any effect on availability of lysine in groundnut and soy meals. Significant variations occurred in available lysine content of different samples of the same cereal. Probably due to binding of lysine by gossypol in cotton seed, considerable variations in available lysine content between samples was observed. B. S. N.
- 13.28 *Amino acid analysis of glutenins and gliadins*, J. A. D. EWART, *J. Sci. Fd Agric.*, 1967, **18** (3), 111.



Amino acid compositions of glutenins and gliadins from two strong and two weak wheat have been compared. Glutenin has higher lysine, glycine, and tryptophan, arginine, tyrosine, threonine (ascorbic acid+asparagine), serine and alanine content. Gliadin is richer in proline (glutamic acid+glutamine), cystine, phenylalanine, amide nitrogen and isoleucine. No definite differences were observed in contents of methionine, valine, leucine or histidine. The calculated factor for converting weight of nitrogen to glutenin or gliadin is 5.6. The mean percentage of (glutamic+aspartic) acids in the amide form is 82 for glutenin and 92 for gliadin.

A. A.

13.29 *Application of an automated procedure to the milk phosphatase test*, R. G. REYNOLDS & W. J. P. TELFORD, *J. Milk Fd Technol.*, 1967, 3 (1), 21.

The sensitivity of this procedure for detecting under pasteurisation and raw milk addition has been considered and compared with the official Gilcreas-Davis method.

13.30 *Determining head space gas composition in canned foods*, ANTHONY LAPEZ & BARBARA S. KREBS, *Fd Technol. Champaign*, 1967, 21 (3A), 365.

The apparatus basically consisted of a modified Zalum air tester to pierce the cans and extract a sample of gas. An air tight syringe was used to remove the sample from the Zalum apparatus and to transfer it to a gas chromatograph or to another gas analysis instrument. The gas chromatograph column temperature ranged from 25 to 28. Helium was the carrier gas. Data are given for O<sub>2</sub>, H<sub>2</sub>, N<sub>2</sub>, CO<sub>2</sub>, and CO in fruit, marine, meat and dairy products.

J. V. S.

13.31 *Potentiometric determination of salt in foodstuffs*, S. J. COLE, *Fd Technol. Champaign*, 1967, 21 (3), 302.

The method is based on potentiometric titration of chloride with silver nitrate. It is applicable in a laboratory or a plant. Results with this method are more reproducible and give slightly higher recoveries than the official methods in use. Extraction of chloride is complete in 5 min; fluoride and phosphate ions do not interfere. Sulfur containing amino acids, bromide, and iodide interfere quantitatively, but no difficulties should be experienced at levels encountered in most foods. The end point is pH dependent for the pH 0.5 - 5.0.

A. A.

#### 14. Food Microbiology and Fermentation

14.28 *Production of fungal protein from waste molasses*, J. P. SHUKLA & S. M. DUTTA, *Indian J. Technol.*, 1967, 5 (1), 27.

Optimum conditions for the growth, synthesis of protein and methionine have been determined for production of methionine-rich protein from *Rhizopus* sp. strain in cane molasses. Use of ammonium chloride and calcium diphosphate in diluted molasses with 6% total reducing sugars results in maximum yields of fungal protein with 0.65% methionine.

B. S. N.

14.29 *The proportion of 2-methyl butanol and 3-methyl butanol in some brandies and whiskies as determined by direct gas chromatography*, D. D. SINGER, *Analyst*, 1966, 91 (1089), 790.

With n-pentanol as the standard, 65 samples of Cognac brandies, Scotch and other whiskies have been examined with diethyl tartrate or polyethylene glycol 200 as the stationary phases. The sum of the 2 pentanol isomers determined separately agrees well with their determination as a single peak on polyethylene glycol 200. The ratio of the concentrations of the isomers seems to be characteristic of the spirit.

A. A.

14.30 *Abnormal substances produced in fungus contaminated food stuffs*, IKUZO URITANI, *J. Ass. off. anal. Chem.*, 1967, 50 (1), 105. Review 39 references.

14.31 *Note on blue black spots in bread*, L. D. GALLOWAY & T. E. RYMER, *J. Fd Technol.*, 1966, 2 (1), 95.

The blue-black spots observed on the surface of sliced bread is due to a variant of *Bacillus subtilis* which might have been in the dough.

K. A. R.

14.32 *The bacterial content of minced evaporated, granulated and solar salt*, R. N. MICHAUD & P. J. VANDEMARK, *Fd Technol. Champaign*, 1967, 21 (2), 193.

Low total bacterial count and low numbers of salt-tolerant species were found in 37 samples of rock and evaporated salt. Tests for bacteria potentially important in food processing were negative. Analysis of 13 samples of solar salt showed significant, but variable total and halophilic bacterial counts. The results suggest that minced or evaporated salt is not a likely source of bacteria involved in spoilage of foods, and that discretion is indicated for the use of solar salt in certain food processing operations.

A. A.

14.33 *Factors influencing microbial stability of butter cream-type fillings*, JOHN H. SILKER & STANLEY A. MCHUGH, *Cereal Sci. Today*, 1967, 12 (2), 63.

Factors influencing *Staphylococcus* growth in these cells are investigated. It is concluded that any *Staphylococcus* problem in this product is more apparent than real.

J. V. S.

14.34 *Mushroom mycelium as another potential source of protein*, H. FALANGHE, *Fd Technol. Champaign*, 1967, 21 (2), 157.

Mushroom cultivation for meeting protein shortage with emphasis on trials at Brazil.

14.35 *Submerged culture of morel mushroom mycelium: Recent developments*, J. H. LITCHFIELD, *Fd Technol. Champaign*, 1967 21 (2), 159.

Review of conditions for cultivating *Morchella* spp. Future potential for morel mycelium is seen in food flavouring applications.

14.36 *Fungal protein for food and feeds. IV. Whole sugar beets or beet pulp as a substrate*, WILLIAM D. GRAY & MOHAMED O. ABOU-EL-SEUD, *Econ. Bot.*, 1967, 20 (4), 372.

Sugar beets appear to be a good substrate for the growth of fungus; the highest yield of protein obtained was 3.48 g/100 g. roots. Thus, it is possible to produce 15.79 g. of protein per pound of fresh roots which initially contained only 3.40 g. of crude protein.

K. A. R.

14.37 *Influence of yeast strain and pH on pyruvic acid content of wines*, B. C. RANKINE, *J. Sci. Fd Agric.*, 1967, 18 (2), 41.

Results obtained on laboratory and pilot plant scale with 12 yeast strains indicate that the amount of pyruvic acid produced range from 2-4 to 3-fold depending upon the yeast strain. High pH always correlated with high pyruvic acid content. These results obtained with grape juice were confirmed with artificial medium. The biochemical and oenological significance is discussed.

K. A. R.

14.38 *Investigations on the occurrence and generations of mucic acid in grape musts and wines. IV. Column and paper chromatographic investigations of the acids contained in grape must*, J. SCHORMULLER & W. CLAUS, *Z. Lebensmittelunters. U. Forsch.*, 1967, 133(2), 65.

Mucic acid is contained only in musts from rotten grapes and not in the must from healthy grapes. Succinic acid, the presence of which was not certainly known till now, could be detected in small quantities in the musts from both rotten and healthy grapes.

K. M. D.

14.39 *Removal of bacteria from raw food materials by electrophoresis*, EIICHI TANI KAWA, TERUSHIGE MOTOHIRO & MINORU AKIBA, *Fd Technol. Champaign*, 1967, 21 (3A), 439.

Removal of *E. coli* from the intestines of oysters having low contamination and of SG-2 bacteria (responsible for swelling and blackening of canned clams) from the intestine of baby clam was possible by the electrophoresis. Addition of 10 ppm. of an anionic surface active agent (sodium tetradecyl sulphate) increased the rate of removal of bacteria from highly contaminated baby clams.

J. V. S.

## 15. Toxicology

15.21 *Production of aflatoxin on wheat and oats: measurement with a recording densitometer*, R. D. STUBBELEFIELD, O. L. SHOTWELL, C. W. HESSELTINE, M. L. SMITH & H. H. HALL, *Appl. Microbiol.*, 1967, 15 (1), 186.

A method has been developed for the production of aflatoxin by growing *Aspergillus flavus* NRRL 3145 on solid substrate wheat. Optimal yields of 900 g. of aflatoxin G<sub>1</sub> and 900 g. of aflatoxin B<sub>1</sub> per gram of substrate were obtained in 4 to 5 days at 28 C. A study on hulls and groats of oats and on whole oats by *A. flavus* strains (NRRL 2999, NRRL 3000, and NRRL 3145) revealed that aflatoxin was produced on all three substrates; production however, was very slight on hulls. Strain NRRL 3145 grown on solid substrate groats produced the largest amounts of aflatoxin (580 µg. of B<sub>1</sub> and 450 µg. of G<sub>1</sub> per g. of substrate). A densitometric method for reading TLC plates is described; this is more objective and more accurate than the earlier visual methods.

A. A.

15.22 *Aflatoxin—producing potential of isolates of the Aspergillus flavus—oryzae group from peanuts (Arachis hypogea)*, RUTH A. TABER & HARRY W. SCHROEDER, *Appl. Microbiol.*, 1967, 15 (1), 140.

Out of 78 samples of farmer stock peanuts from 9 different areas, only 2 contained more than 50 ppb of aflatoxin. Infestation by members of the *Aspergillus flavus-oryzae* group varied from 35—100% of kernels/area and from 1-100% of kernels/sample. Aflatoxin production by individual isolates ranged from 0 to 349,143 ppb under the test condition employed. In general, the isolates produced 8-10 more B<sub>1</sub> than B<sub>2</sub>; no isolate producing aflatoxins G<sub>1</sub>, or G<sub>2</sub> was found.

A. A.

15.23 *Relationship between Aspergillus flavus growth, fat acidity and aflatoxin content in peanuts*, H. E. PATTEE and SANDRA L. SESSOMS, *J. Am. Oil Chem. Soc.*, 1967, 44 (1), 61.

The influence of fungal growth, under standardised conditions, on fat acidity, in large seeded Virginia type peanuts inoculated with *A. flavus* and relationships between fat acidity and aflatoxin was studied. Fat acidity increased quadratically and was highly correlated with visible fungal growth. A lag in aflatoxin production in relation to fat acidity increase was noted; fat acidity reached 60 mg. KOH/100 g. kernels before aflatoxin become detectable. This relationship suggests a rapid method for detecting aflatoxin.

A. A.

15.24 *Influence of biologically modified atmospheres on aflatoxin production by Aspergillus flavus growing on peanut kernels*, H. E. PATTE & OTHERS, *Oleagineux* 1966, 21 (12), 747.

Growth in biologically modified atmospheres significantly decreased the production of aflatoxin in peanuts by *A. flavus*. Aflatoxin became detectable in 36 hr under normal atmospheres and continued to increase. Under modified atmospheres, produced by growth in sealed polyethylene bags, aflatoxin reached a detectable level in 48 hr but did not increase significantly thereafter.

K. M. D.

15.25 *Current research on toxic food contaminants*, G. N. WOGAN, *J. Am. diet. Ass.*, 1966, 49 (1), 95.

Review. 19 references.

15.26 *The Gangrene organism—A food poisoning agent*, JOHN E. DESPAUL, *J. Am. diet. Ass.*, 1966, 49 (3), 185.

The origin, characteristics, prevalence and methods of averting or counteracting gastro-intestinal illness caused by *Clostridium perfringens*.

B. S. N.

15.27 *Clostridium botulinum type E in fish from the Great Lakes*, THOMAS L. BOTT, JANET S. DEFFNER, ELIZABETH MECOY & E. M. FOSTER, *J. Bact.*, 1966, 91 (3), 919.

The intestinal contents of more than 3000 fish from Lakes (Erie, Superior, Huron and Michigan) were examined. Demonstration of the organism was accomplished by identifying its toxin in liquid culture inoculated with material from the alimentary tract. Incidence figures, expressed as per cent of the fish tested, were: Lake Erie, 1%; Lake Superior, 1%; Lake Huron, 4%; the main body of Lake Michigan, 9%; and Green Bay (on Lake Michigan) 57%. Thus *Cl. botulinum* type E appears to be widely but unevenly distributed in the Great Lakes and fish from all areas are potential carriers of it.

A. A.

15.28 *Effect of sodium nitrate and temperature on toxinogenesis by Clostridium botulinum in perishable cooked meats vacuum-packed in air-impermeable plastic pouches*, H. PIVNICK, L. J. RUBIN, H. W. BARNETT, H. R. NORDIN, P. A. FERGUSON & C. H. PERRIN, *Fd Technol. Champaign*, 1967, 21 (2), 204.

Sliced processed meats prepared using a range of concentrations of NaNO<sub>2</sub> were inoculated with spores of *Cl. botulinum* types A and B. After vacuum packaging in air-permeable plastic pouches the meats were stored at 20, 25, or 30 C. At interval, samples were tested for toxin and spoilage. At any given temperature, delay in toxinogenesis and spoilage were directly related to concentration of nitrite. Nitrite content did not influence acceptability on the first day toxin was found in the stored product. Heat injury of spores appears not to be a prerequisite to toxinogenesis inhibition by NaNO<sub>2</sub>.

J. V. S.

15.29 *Production of toxin by Clostridium botulinum type E in defined media*, B. Q. WARD & B. J. CARROLL, *Canad. J. Microbiol.*, 1967, 13 (1), 108.

The least effective concentration of citric or lactic acid for toxin production and of the toxicities of trypsinized and untrypsinized supernatant fluids of centrifuged cultures in a CDM (chemically defined medium) is reported.

K. A. R.

15.30 *Aflatoxins: Some factors affecting production and location of toxins in Aspergillus flavus-oryzae*, HARRY W. SCHROEDER, LEE J. ASHWORTH, *J. Stored Prod. Res.*, 1966, 1 (3), 267.

The quantity and quality of aflatoxins produced by two *Aspergillus flavus-oryzae* isolates from rough rice and Spanish peanut were compared with a known, highly toxigenic *A. flavus* strain. Total aflatoxin yields on sterile peanut, rough rice and shredded wheat after 18 days at 30 C ranged from 4 to 892 ppm. In shake cultures growing on 4% suspensions of these substances, yields

ranged from 17 to 426 ppm. Total aflatoxin yields and the proportion of the four primary aflatoxins reflected interactions between strains, sub-strains and methods of culture. In shake cultures, from 52 to 80% of the aflatoxins were located in the mycelium. Conidia collected from a shredded wheat substrate after 18 days were found to contain aflatoxins at the concentrations ranging from 0.7 to 56.1 ppm. A. A.

15.31 *A method for the detection and estimation of aflatoxin in fungal fermentation products*, LEO J. DENAULT & L. A. UNDERKOFER, *Cereal Chem.*, 1967, **44** (1), 1.

The method is based on the application of TLC on silica gel of chloroform extracts. A fluorescent spot having an R<sub>f</sub> higher than aflatoxin B<sub>1</sub> in seven commercial fungal enzymes was observed, whereas the UV and IR spectra of this component differed from that of aflatoxin B<sub>1</sub>. Data confirms the absence of aflatoxin in these fungal preparations examined, as a fluorescent derivative is not formed by this extract with formic acid in presence of thionyl chloride. B. S. N.

## 16. Infestation, Pesticides and Fungicides

16.35 *Silica based dusts for the control of insects infesting dry fish*, JOYCE KANE, *J. Stored Prod. Res.*, 1967, **2** (3), 251.

Inert, nontoxic silica based dusts are currently used in USA, against a number of insects including cockroaches. Silica dusts of low bulk density have shown definite promise in controlling insect infestation in dry *Dermestes frischii* Kug, *D. aterdeg* and *Necrobia ruspipes* (Deg) provided the fish is adequately dried and free from oil. B. S. N.

16.36 *Laboratory evaluation of malathion, bromophos and fenitrothion for use against beetles infesting stored products*, R. W. LEMON, *J. Stored Prod. Res.*, 1967, **2** (3), 197.

The relative toxicities of malathion, bromophos and fenitrothion to 10 species of stored-product.

16.37 *Extraction and gas chromatographic analysis of chlorinated insecticides from animal tissues*, PETER W. SASCHENBRECKER & DONALD J. ECOBICHON, *J. agric. Fd Chem.*, 1967, **15** (1), 168.

An extraction procedure for chlorinated hydro-carbon insecticides gives high quantitative yields from several distinctly different tissues (plasma, liver, breast muscle and brain). B. S. N.

16.38 *Comparative studies with Tribolium (Coleoptera, Tenebrionidae). II. Productivity of Tr. castaneum (Herbst) and Tr. confusum Dur. on natural, semisynthetic and synthetic diets*, ALEXANDER SOKOLOFF, IAN R. FRANKLIN & RAJ K. LAKHANPAI, *J. Stored Prod. Res.*, 1966, **1** (4), 313.

Different media tried are: Naylor's synthetic medium; corn supplemented with the amino acids-cystine, glutathione, proline and tryptophan; corn and whole wheat flour without any supplements, and corn and whole wheat flour supplemented with brewer's yeast and vitamins. The Naylor medium is unfavourable for both species. *Tr. castaneum* performs poorest in non-supplemented media, better in vitamin supplemented and best in yeast supplemented media. Addition of four amino acids to corn had beneficial effect to *Tr. castaneum*. It is concluded that *Tr. confusum* is better adapted to utilise a wider variety of foods than *Tr. castaneum* and in order to satisfy its greater quantitative requirements for certain nutrients, this species engages in cannibalism more often than *Tr. confusum*. When the two species are introduced into the same container, they compete for food and space, *Tr. confusum* is more often eliminated than *Tr. castaneum*. K.A.R.

16.39 *Pest control in the prevention of unnecessary losses in food manufacturing*, *Brit. Fd J.*, 1967, **69** (817), 51. Review. 10 references.

16.40 *Effect of phosphine on mites, insects and microorganisms*, R. N. SINHA, B. BERCK & H. A. H. WALLACE, *J. econ. Ent.*, 1967, **60** (1), 125.

Two bins of wheat (450 bushel capacity) were fumigated with PH<sub>3</sub> from phostoxin. GC analysis of interstitial air after fumigation revealed that PH<sub>3</sub> was found at higher concentrations at 4 ft. level than at 1- and 2-ft. levels from the top surface. No mites or insect was found 6 days after fumigation. Some of the mites reappeared in 1-3 months and continued to thrive as in previous years, possibly due to the destruction of some natural predators. PH<sub>3</sub> was effective against all stages of *Cheletus cruditus* (natural predator), *Haemolaelaps casalis* (Berlese), *Tarsonemus* sp., *Tydeus interruptus* Thor. and insects *Lepinotus reticulatus* Enderlein and *O. surinamensis*. Adults of *Cryptolestes ferrugineus* Stephens, *R. dominica*, *S. granarius*, *Tr. castaneum*, *Plodia interpunctella* and *Tr. parvibila* were killed by PH<sub>3</sub> on 6 days of exposure to concentration encountered 2½ ft. below bin surface. Germination and microbial flora were not affected by PH<sub>3</sub>. J.V.S.

16.41 *Studies on hydrogen phosphide against rice weevil*, G. ROUT & R. N. MOHANTY, *J. econ. Ent.*, 1967, **20** (1), 276.

At dosages of 4.95, 2.49, 1.24 and 2.0 mg/litre hydrogen phosphide (released from phostoxin) killed all the insects placed in the surface and at 40, 80, and 120 cm. depths in a paddy filled bin (length, 143.5 cm., diam., 25 cm., capacity, 35 kg.). When exposed for 8, 16, 24, and 72 hr. except at the lowest level (0.62 mg/litre) at the shortest exposure period (8 hr) at the greatest distance from the gases (120 cm), germination was not affected by phostoxin. J. V. S.

16.42 *A review of the properties and usage of methyl bromide as a fumigant*, R. H. THOMPSON, *J. Stored Prod. Res.*, 1966, **1** (4), 353. Review. 97 references.

16.43 *The literature of pesticide chemistry*, WALTER R. BENSON & HOWARD A. JONES, *J. Ass. off. anal. Chem.*, 1967, **50** (1), 22.

16.44 *Pesticide residue analysis: Present problems and achievements*, HAROLD EGAN, *J. Ass. Off. anal. Chem.*, 1967, **50** (1), 74. Review. 51 references.

16.45 *Tolerance status of some rats to an anticoagulant rat poison*, P. J. DOERAS, *Curr. Sci.*, 1967, **36** (8), 207.

*Rattus rattus* of Bombay when treated with heavier doses (0.025%) of warfarin along with their normal food shows better resistance than the bigger field rat, *R. bengalensis* which with a smaller dose (0.005%) records a total mortality of 70% upto sixth day. B.S.N.

16.46 *Studies on the large scale storage of food grains in India*, J. N. SARID, LALLAN RAI & S.V. PINGALE, *Bull. Grain Technol.*, 1967, **5** (1), 3.

Insect densities in the central bottom regions throughout experimental period were observed in stacks of western white wheat (grade II) stored in B-twill jute bags for 9-10 months. *Rhizopertha dominica* was found in small packets inside, whereas *Sitophilus oryza* was distributed on the periphery. The presence of higher insect population was invariably accompanied by higher temperatures in the central region of the stack. *Tribolium castaneum*, *Oryzaephilus surinamensis*, *Laemophloeus minutus* present initially continued at the same level till the end, while *R. dominica* and *S. oryza* appearing later increased in large numbers. B. S. N.

- 16.47 *Role of density on the multiplication of stored grain insect pests*, S. V. PINGALE & G. K. GIRISH, *Bull. Grain Technol.*, 1967, 5 (1), 12.  
Review. 35 references.
- 16.48 *Factors affecting the development of Tribolium castaneum (Herbst) on wheat*, SHALOM W. APPELBAUM & ABRAHAM M. KONIUN, *J. Stored Prod. Res.*, 1967, 2 (4), 323.  
The suboptimal development of *Tribolium castaneum* (Herbst) larvae on unsupplemented whole wheat flour of four varieties is attributed to vitamin deficiency, with the vitamin identified in one case as riboflavin. In two varieties, notably of *Triticum durum*, vitamin supplementation alone does not sufficiently improve the nutritional value, and the levels of L-amylase inhibitor, *Tribolium* protease inhibitor and wheat B-amylase (free and bound) have been analysed. No clear correlation could be drawn between the levels of individual factors and the ability of *T. castaneum* larvae to develop on the wheat varieties. Neither could the variable development be attributed to the starch quality of the various wheat varieties. A. A.
- 16.49 *The effect of light on the life cycle of Latheticus oryzae Waterhouse (Eoloptera, Tenebrionidae)*, M.A. HAFEEZ, *J. Stored Prod. Res.*, 1966, 1 (3), 243.  
Newly hatched larvae of *Latheticus oryzae* Waterhouse, on whole meal wheat flour supplemented with 10% yeast, were maintained at 30 C and either 75 or 85% R.H. under constant illumination of 9.7 ft. candles. At 75% R.H. only 9 out of 37 larvae completed their development, and these had a mean developmental period of 37.7 days. At 85% R.H., all the larvae died before pupation. Larvae maintained under similar conditions but in the absence of light suffered a mortality of less than 3% and had a mean developmental period of 30.3 days at both 75 and 85% R.H. A. A.
- 16.50 *Mortality of Trogoderma glabrum larvae in simulated wheat storages purged with CO<sub>2</sub> or N<sub>2</sub>*, ARTHUR F. PRESS, JR., FREDERICK O. MARZKE & GORDON C. PEARMAN, JR., *J. econ. Ent.*, 1967, 60 (2), 415.  
Wheat containing cages of *Tr. glabrum* (Herbst) larvae and stored in simulated silo-type structures (61.7 litres) was purged for 7 consecutive days with CO<sub>2</sub> or N<sub>2</sub> at a flow rate of 100 cc/minute. Both gases reduced the O<sub>2</sub> concentration to 1 or 2% within 1 day. CO<sub>2</sub> was more effective than N<sub>2</sub> in producing atmospheres lethal to *T. glabrum* larvae. A. A.
- 16.51 *Influence of organic insecticides on enzymes. V. Effect on the xanthine dehydrase of milk*, F. KIERMEIER, G. WILDBRETT, & L. LETTENMAYER, *Z. Lebensmittelunters. U. Forsch.*, 1966, 133 (1), 22.  
After feeding with  $\gamma$ -HCH, the compound was secreted with the milk—approx. 30 mg/l.—but it did not affect the enzyme activity. Supplementary *invitro*-experiments with  $\gamma$ -HCH and DDT as well as a few organophosphoric compounds which in contrast to parathion, do not contain nitrophenyl residues, also did not reveal any inhibitory influences on the xanthine dehydrase in milk, or in pure solution. K.M.D.
- 16.52 *A simple phosphine detector*, PREMSINGH, T. RAMASIVAN & K. KRISHNAMURTHY, *Bull. Grain Technol.*, 1967, 5 (1), 24.  
A simple phosphine detector which could be used to locate quickly leakages and concentrations of gases in air during fumigation has been developed using a set of glass tubes, filter paper strips, and reagent in an amber coloured bottle, along with a rubber bulb. At 5 ppm. and above of phosphine concentration, the smell could be easily identified. B.S.N.
- 16.53 *Determination of fenitrothion on stored barley*, D. F. HORTER, *J. Stored Prod. Res.*, 1966, 1 (3), 287.  
A modified colorimetric method based on the reduction of nitro group followed by diazotisation and coupling with N-1 naphthyl-ethylene diamine to give a coloured product to be assessed spectrophotometrically has been developed for determination of fenitrothion (0, 0-dimethyl, 0-(3-nitro-4-methyl-phenyl) phosphorothionate on stored barley. The advantages of employing this technique as against GLC are: slightly better accurate results and recovery; absence of repeated calibration and; quickness and efficiency of estimation. In both techniques, however, the oxygen analogue of fenitrothion is not eluted from Beckman grade II alumina by benzene and so does not act as an interfering substance. B. S. N.
- 16.54 *A field comparison of malathion, dichlorvos and fenitrothion for the control of Oryzaephilus surinamensis (L) (Coleoptera, Silvanidae) infesting stored barley*, A. A. GREEN & P. S. TYLER, *J. Stored Prod. Res.*, 1966, 1 (3), 273.  
A method is described for the protection and disinfestation of farm-stored grain by the admixture of water-based emulsions of insecticides. Heavy infestations of *Oryzaephilus surinamensis* (L) in feed barley were quickly controlled by the application of malathion at 10 ppm., fenitrothion at 2 ppm. and dichlorvos at 4 ppm. Fenitrothion at 1 ppm. took longer time to effect control. Malathion and fenitrothion disappeared slowly from the barley and conferred good protection for 8 months. Dichlorvos disappeared more quickly and conferred relatively little residual protection. A. A.
- 16.55 *A thin layer chromatographic screening test for organophosphorus pesticide residues*, D. C. ABBOT, A. S. BURRIDGE, J. THOMSON & K. S. WEBB, *Analyst*, 1967, 92 (2), 170.  
The compounds are extracted with dichloromethane and the extracts are cleared up on silica gel chromatoplates developed with hexane-acetone solution, 5+1. Eluted compounds are then oxidised with ammonium persulphate or a nitric acid-perchloric acid mixture for phosphorus determinations by molybdenum blue procedures useful for vegetable tissue. A. A.

## 17. Nutrition and Biochemistry

- 17.24 *Leaf protein concentrate prepared by spray drying*, G. H. HARTMAN, JR., WALTER R. AKESON & MARK A. STAHMANN, *J. agric. Fd Chem.*, 1967, 15 (1), 74.

Leaf protein concentrates were prepared by spray drying the juice expressed from fresh alfalfa and peavines. The concentrate was a green powder of low fiber content which could be fed to non ruminant animals. A product which might be further processed for human consumption was prepared by extraction of spray-dried preparation with ethanol. Proximate analyses, amino acid analyses, estimation of the biological value of protein, and analyses for some vitamins or growth factors were made and compared with other high protein foodstuffs. There appeared to be little or no loss of nutrients or nutritive value in the spray-drying process. On the basis of amino acid analyses and the pepsin-pancreatin digest indices, the protein could be potentially equal or superior to high protein feedstuffs now available. The vitamin content of the spray-dried preparation was higher than that found in the commercial dehydrated alfalfa products. A. A.

- 17.25 *Nutrition Research for the future*, WILLIAM J. DARBY, *Am. J. clin. Nutr.*, 1966, 19 (6), 440.  
Review. 12 References.

17.26 *The eradication of endemic goiter in Guatemala. Final report*, J. ROMEO DE LEON & OTTO G. RETANA, *Nutr. Bromatol. Toxicol.*, 1966, 5 (2), 43.

Endemic goiter showed an incidence of 38.5% of the total population in Guatemala in the year 1962. By the use of iodated salt (iodate) and an adequate control of the iodine level in the salt consumed by the population, this high incidence was reduced to 15% in 1962 and further to 5% in 1965. This last figure is indicative (according to the WHO criteria) that endemic goiter has ceased to be a health problem in this country. Guatemala is the first country in America and the second in the world to eradicate this disease as a health problem.

A. A.

17.27 *Effect of fish flour (UNICEF-CHILE-QUINTERO) on the experimental caries in the albino rat*, CHAYET, C. & OTHERS, *Nutr. Bromatol. Toxicol.*, 1966, 5 (1), 20.

The substitution of casein for an equal amount of fish flour in the cariogenic diet of Shaw produces a significant decrease in the number, extension and depth of dental caries in the albino rat. No signs of fluorosis were detected in the animals fed the fish flour containing diet. The weight gain of the rats that received the fish flour diet was very much the same as that exhibited by the animals on the casein diet.

A. A.

17.28 *Quantitative detection of dissolved milk protein in highly heated meat products, with the help of indirect haemagglutination*, L. KÖTTER, C. HERRMANN, & G. CORSICO, *Z. Lebensmittel unters. U. Forsch.*, 1966, 133 (1), 15.

The required antisera against heated milk protein were obtained by immunization with metallic compounds. Dialysis and lyophilization of the highly heated material are necessary to obtain protein components that are still serologically reactive. By following the method described in the paper, milk protein could be detected in material heated up to 115 C, at a concentration as low as 0.1%.

K. M. D.

17.29 *Copper content of some low copper foods*, LIESBETH HOOK & IDA K. BRANDT, *J. Am. diet. Ass.*, 1966, 49 (3), 202.

17.30 *Effect of sulphite and ascorbic acid on mushroom phenol oxidase*, P. MARKAKIS & R. J. EMBS, *J. Fd. Sci.*, 1966, 31 (6), 807.

In model systems containing mushroom phenol oxidase and O-diphenolic or monophenolic substrates in phosphate buffer pH 6.5, sulphite initially did not protect the ascorbic acid from oxidation by quinones formed enzymatically. The sulphite, however, gradually decreased both the diphenolase and monophenolase activity of the enzyme and thereby diminished the overall destruction of ascorbic acid. Under certain conditions, ascorbic acid counteracted the sulphite inhibition activity of the monophenolase of the enzyme.

A. A.

17.31 *Diet surveys by weight method—a comparison of random day, three-day and seven day period*, A. D. TASKAR, M. C. SWAMINATHAN & SHANTHA MAHADEVAN, *Indian J. med. Res.*, 1967, 55 (1), 90.

Comparison of the average intake of protein and calories estimated from the random day method with that of the seven-day indicated no significant difference. Good correlation was observed between the random day intake values and those of the conventional method. Three day weight method is as efficient as the seven day weight method of diet survey among population in which day to day variations in dietary pattern are not much.

K. A. R.

17.32 *Protein fractions in human milk. I. Effect of duration of lactation and dietary supplementation on the protein fractions*, P. UDAYASEKHARA RAO & BHAVANI BELAVADY, *Indian J. med. Res.*, 1967, 55 (2), 174.

Paper electrophoretic analysis of the protein fractions of human milk indicated that casein content of the milk was influenced by the duration of lactation. Milk obtained during later stages of lactation contained basic protein. Dietary supplementation of protein or calories did not influence the protein fractions in milk.

K. A. R.

17.33 *Bread-its nutritional importance in our diet*, *Milling*, 1967, 148 (9), 172.

Presents data relating to daily intake of various foods and the role of bread in such a programme and the relative prices of different items of food as compared to bread.

B. S. N.

17.34 *Enzymes in food manufacture*, *Brit. Fd. J.*, 1967, 69 (817), 39.

The sources of enzyme and their increasing role in various food processing operations.

B. S. N.

17.35 *Ion uptake by mitochondria from cotyledons of Phaseolus vulgaris*, T. D. VENUGOPAL, & M. V. PATWARDHAN, *Phytochem.*, 1966, 6 (3), 351.

An actively respiring mitochondrial fraction has been prepared from the cotyledons of *P. vulgaris*. Mitochondria show ion uptake in the presence of succinate as substrate, but do not respond to ATP addition. Presence of magnesium is not necessary in the incubation medium for calcium uptake.

A. A.

17.36 *The use of isolated soybean proteins in bread*, SYLVIA MIZRAHI, GIDEON ZIMONERMAN, ZEK BERK & URICOGAN, *Cereal Chem.*, 1967, 44 (2), 193.

Addition of soyabean proteins to bread increases water absorption capacity of the flour and decreases loaf volume proportionately with level of protein. Addition of 1% lecithin to mixes with less than 6% soy protein counteracted the decrease of loaf volume. Isolated soybean protein admixed with wheat flour upto 6% level does not impair overall acceptability of bread.

B. S. N.

17.37 *Development of infant foods based on soyabean*, M. R. CHANDRASEKHARA, S. R. SHURPALEKAR, B. H. SUBBA RAU, SOMA KURIEN & KANTHA S. SHURPALEKAR, *J. Fd. Sci. Technol.*, 1966, 3 (3), 94.

A process for the preparation of spray-dried infant food based on soya dhal, skim milk powder and barley malt has been outlined. The PER of the product is 2.7 as compared to 3.0 of skim milk. Addition of DL-methionine to the product at 1.1g/16gN level, raises the PER to 3.0.

A. A.

17.38 *Amino acid composition of heat processed soy milk and its correlation with nutritive value*, L. R. HACKLER & B. R. STILLINGS, *Cereal Chem.*, 1967, 44 (1), 70.

Investigations were made to evaluate the effect of heat processing time and temperature on the changes of amino acids of soy milk protein and, also to evaluate the possible correlation of essential amino acid index and requirement index and nutritional value as measured *in vivo*. Two processing temperatures (93 and 121 C) were studied. Also investigated was the effect of spray drying inlet temperature on the amino acids of soy milk. The results indicate that soymilk heat processed for as long as 4 hr at 93 C caused no significant changes in amino acid composition. On the other hand, decreases in some of the amino acids (especially cystine) were observed when the processing temperature of 121 C was used. Further more, it is found that spray drying inlet temperature is critical, and that the amino acids destroyed during spray drying are different from those observed when soy milk was heated at 121 C. It is quite apparent from the results that heat processing conditions must be carefully controlled to produce soy milk of highest nutritional quality.

B. S. N.

- 17.39 *Effect of supplementing poor Indian diets based on wheat, rice and ragi with vitamins, minerals and groundnut flour on the nutritive value of the diets as judged by the growth of albino rats*, K. HARIHARAN, B.L.M. DESAI, S. VENKAT RAO, D. RAJALAKSHMI M. SWAMINATHAN & H. A. B. PARIPIA, *J. Nutr. Diet.*, 1967, 4 (1), 56.  
A significant increase in the growth rate and PER of rats was observed when rice or ragi diets were supplemented with calcium salts and vitamins; fortified groundnut flour alone or skim milk powder (SMP) along with it to provide about 5% extra protein in the diet were found to be equally effective in this respect. Both unfortified and fortified groundnut flours were almost as effective as SMP in improving growth rate when these provide 2.5 or 5% extra protein in the diet. B. S. N.
- 17.40 *Feed-back of nutrition research*, A. SREENIVASAN, *J. Nutr. Dietet.*, 1967, 4 (1), 1.  
Review.
- 17.41 *Studies on microatomised protein foods based on blends of low fat groundnut, soyabean and sesame flours and skim milk powder and fortified with vitamins, calcium salts and limiting amino acids*, P. K. TASKER, H. SRINIVAS, A. PAUL JAYARAJ, M. NARAYANA RAO, D. RAJALAKSHMI, R. RAJAGOPALAN, AND M. SWAMINATHAN, *J. Nutr. Dietet.*, 1967, 4 (1), 65.  
Incorporation of microatomised protein food based on blends of groundnut flour, soyabean flour, sesame and skim milk powder, so as to provide 2.5% extra protein resulted in increased growth rate in rats to about 10-12g, 12-13g, and 10-11g/week. Livers of animals receiving supplements were found to be normal showing there by that these were as effective as skim milk powder in correcting protein deficiency in the diets. B. S. N.
- 17.42 *Effects of school lunch with Indian Multipurpose Food, skim milk powder or their combination on the nutritional status of children*, RAJAMMAL P. DEVADAS, KAMALA ANANDAM, & LAKSHMI BHANUMATHI, *J. Nutr. Dietet.*, 1967, 4 (1), 51.  
Children fed diet supplemented with MPF and SMP showed the greatest increase in body weight, height, haemoglobin content and RBC count, whereas no significant differences in these factors were observed in case of children supplied lunch not supplemented with MPF and SMP.
- 17.43 *Nutrition in the syllabi and text books of elementary schools*, S. CHAMPAKAM & S. C. BALASUBRAMANIAN, *J. Nutr. Dietet.*, 1967, 4 (1), 36.  
Survey report, 6 references
- 17.44 *An assessment of the teaching of nutrition in elementary schools in Hyderabad*, S. CHAMPAKAM, SHANTHA MADHAVAN & S. C. BALASUBRAMANIAN, *J. Nutr. Dietet.*, 1967, 4 (1), 41.  
Survey report. 1 reference and 6 tables.
- 17.45 *Symposium on proteins*, L. K. RAMACHANDRAN, *J. sci. industr Res.*, 1967, 26 (3), 96.  
Brief resume of the proceedings of a symposium held at Osmania University, Hyderabad, during 22-24 September 1966. B.S.N.
- 18. Food Processing, Packaging and Engineering**
- 18.22 *Gas refrigerated railway car*, R. G. O'BRIEN, *Refrig. Air Condit. Heat.*, 1966, 21 (1), 30.  
The system involves the use of CO<sub>2</sub> or N<sub>2</sub> stored at low temperature in a liquid form in insulated cylinders: which are housed in a small compartment at one end of the car. The gas is released to the loaded compartment where it immediately expands to a fine spray at a very low temperature, absorbing heat from the van interior. K.A.R.
- 18.23 *A modern ships cargo refrigeration system*, P. STEEFENS, *Refrig. Air Condit. Heat.*, 1966, 21 (1), 25.  
Description of an automatic equipment aboard a multitemperature vessel providing—4 to +54° F, and comprising of 8 totally independent refrigerated sections. A.A.
- 18.24 *Refrigerated containers for rail ferry service*, *Refrig. Air Condit. Heat.*, 1966, 21 (1), 23.  
Transport of frozen vegetables by a new method of Carton.
1825. *The application of air cooled condensing equipment*, S. H. SOMERS, *Refrig. Air Condit. Heat.*, 1966, 20 (12), 23.
- 18.26 *The present state of food freezing and transportation with liquid nitrogen*, RAVASZ, E., *Husipar*, 1967, 16 (1), 30.  
Review
- 18.27 *Freeze concentration of food liquids: theory, practice and economics*, J. G. MULLER, *Fd. Technol. Champaign*, 1967, 21 (1), 49.  
Review. 33 references.
- 18.28 *Spray drying fruits and vegetables using skim milk as a carrier*, S. T. COULTER & W. M. BREENE, *J. Dairy Sci.*, 1966, 94 (7), 762.  
A wide variety of fruits and vegetables have been spray dried using condensed skim milk as a carrier in conventional milk drying equipment following comminution through a screen having 0.7 mm. perforation. The proportion of skim milk solids required ranged from 0% with peas and corn to 60% with tomatoes and the more hygroscopic fruits. The flavour and colour of the natural plant material were retained. A. A.
- 18.29 *Concentration by reverse osmosis of maple sap*, C. O. WILLITS, I. C. UNDERWOOD & U. MERTEN, *Fd Technol. Champaign*, 1967, 21 (1), 24.  
A new approach.
- 18.30 *Chemistry and Technology of deep fat frying*, STEPHEN S. CHANG, *Fd Technol. Champaign*, 1967, 21 (1), 33.  
An introduction to Symposium.
- 18.31 *The practice of deep fat frying*, CLIFFORD J. ROBINSON, *Fd. Technol. Champaign*, 1967, 21 (1), 35.  
Symposium paper.
- 18.32 *Application of atomic absorption spectrophotometry, in the food industries*, J. P. WOLFF, *Ind. aliment. agric.*, 1966, 83 (12), 1579.  
Atomic absorption spectrophotometry is the converse of the usual emission spectrophotometry and is about 100 times more sensitive. It is also much simpler and quicker in operation, and avoids prolonged pre-treatment of the samples.  
The following estimations are described: (a) iron and copper in wires; (b) copper in gelatins; (c) copper in fats; (d) copper in butter; (e) sodium, potassium and calcium in fats. K. M. D.
- 18.33 *Some technical aspects of grinding with roller mills*, FRED SCHUMACHER, *Milling*, 1967, 148 (6), 106.

The influence of differential, peripheral velocity and controlled roll pressure in the grinding process in a flour mill are the main factors which determine its efficient and economic operation.

B. S. N.

18.34 *Advances in glass packaging*, D. BRICKLEY, *Fd Technol. Aust.*, 1966, 19 (3), 124.

18.35 *Effects of plastics on milk quality and milk processing*, G. WILDBRETT, *Dt Lebensmitt. Rdsch.*, 1967, 63 (1), 1.

While the chemical properties of plastics have a direct influence on foods, it is the indirect consequences following from the physical properties of plastics which are of primary technological interest.

For example, the heat conductivity of polyethylene affects cooling of milk so much that it is necessary to change the method of production and operational technique. The ripening of cheese in foils is discussed in detail as a standard example.

K.M.D.

18.36 *The effect of processing operations on the energy available from foods*, E. E. RICE, *Fd Technol. Champaign*, 1967, 21 (3), 41. General. 5 references.

18.37 *Studies on the freeze drying of foods*, P. N. SRINIVASA RAO, P. RAJAGOPAL & P. K. RAMANATHAN, *J. Fd. Sci. Technol.*, 1967, 3 (3), 98.

Studies on freeze drying of potatoes, cooked mutton and cooked fish fillets have been carried out using (i) conventional freeze drier of Stoke's laboratory model, (ii) accelerated freeze drier of contact plate type and (iii) accelerated freeze drier of radiant type. The time temperature cycles in all the three types of units as well as in air-drying have been compared.

A. A.

18.38 *An improved equipment for the manufacture of preserves*, B. S. RAMACHANDRA, S. RANGANNA, L. S. SUBBA RAO & S. S. KALBAG, *J. Fd. Sci. Technol.*, 1966, 3 (3), 103.

In the hot continuous syrup concentration process, the syrup concentration is gradually raised at the rate of 1° Brix/hr in the preserve equipment itself thereby making the equipment compact. The fall in the syrup level is made up by continuous addition of concentrated syrup.

A. A.

18.39 *The redesign of malt extract evaporation unit*, G. C. PARTRIDGE, *Brit. chem. Engng.*, 1967, 12, (3), 374.

In the concentration of malt extract the final concentrate will have a solid content of 73-83% and a specific gravity of 1.36-1.42. This level of solid matter has to be attained without employing high temperatures because at temperatures beyond 70°C the enzymes are destroyed, and discolouration and caramelization occur at temperatures higher than 90°C. The design specification evolved in this work has made possible to have an evaporator which can give a product with 80% solids from feed and the solid content ranges from 2 to 25%. The evaporation rate attained is of the order of 30,000 lb water/hr.

M. C. B.

18.40 *Packaging of foods in laminate and aluminium film combination pouches. IV. Freeze-dried bell peppers*, H. N. DAOD & B. S. LUH, *Fd Technol. Champaign*, 1967, 21 (3A), 339.

Freeze dried bell-pepper (*Capsicum annuum* Var. California Wonder) was packed in Mylar-Saran-polyethylene plastic laminate and aluminium fibre combination (AFC) pouches under nitrogen and stored up to 12 months in dark at 32, 68 and 86° F. The product could be stored with excellent quality retention for 12 months or in AFC pouches at 32 and 68 F; the Mylar-Saran-polyethylene was less desirable for long time storage of this product.

J. V. S.

## 19. Food Texture and Flavour

19.14 *Volatile components of roasted peanuts. The major mono-carbonyls and some non carbonyl components*, M. E. MASON, BOBBY JOHNSON & MYNARD C. HAMMING, *J. agric. Fd Chem.*, 1967, 15 (1), 66.

Condensates obtained from roasted Spanish peanuts using high vacuum distillation and cryogenic trapping procedures possessed typical roasted peanut aroma. Analyses using gas chromatographic and qualitative chemical techniques revealed the presence of several aldehydes. Analysis of the total condensates and carbonyl compounds regenerated from their 2, 4-dinitro phenyl hydrazones using a combination gas-chromatograph-mass spectrometer (GC-MS) and thin-layer chromatographic analysis of the 2, 4, DNPH derivatives resulted in the positive identification of acetaldehyde isobutyraldehyde, benzaldehyde and phenylacetaldehyde and tentative identification of 2-and 3 methyl butanal and 3-methyl-2-butanone. Ethyl acetate, toluene and N, N-dimethyl formamide were tentatively identified but their presence in the carbonyl regenerates remains unexplained.

A.A.

19.15 *New developments in coffee aroma research*, F. GANTSCHI, M. WINTER, Y. FLAMENT, B. WILLHALM & M. STOLL, *J. agric. Fd Chem.*, 1967, 15 (1), 15.

A large number of substances were isolated and identified from a concentrated aroma of coffee obtained by molecular distillation of expelled coffee oil. Enrichment of small constituents by mild fractional distillation, liquid-liquid partition, and column chromatography prior to analysis by GC has led to the identification of constituents present in concentrations down to 0.5 ppm with respect to the starting concentrate. Investigation by spectrometers combined with synthetic work was used as the main tool for identification, assisted in some cases by IR and UV spectrometry. The identification of 22 constituents is described. Twenty of these compounds have not yet been found in coffee; possible ways of their formation during the roasting process are briefly mentioned.

A. A.

19.16 *Preparation and evaluation of butter culture flavour concentrates*, R. C. LINDSAY, E. A. DAY, & L. A., SATHER, *J. Dairy Sci.*, 1966, 50 (1), 25.

Synthetic butter culture concentrates, based on the analysis of natural high quality products, were prepared for butter, cottage cheese, sour cream and butter milk-flavour compounds. Included in the formulations were diacetyl, acetaldehyde, dimethyl sulphide, acetic acid and lactic acid. Products flavoured with the culture concentrates were found to possess a culture flavour very similar to that produced by natural butter cultures. A student preference panel showed equal preference for high quality cultured products and artificially flavoured products.

A. A.

19.17 *Improving the taste and smell of food*, *Brit. Fd J.*, 1967, 69 (817), 44.

The role of flavour enhancers in natural and processed fruit; meat, coffee, milk, butter and cheese flavours is described.

B.S.N.

19.18 *What flavour manufacturers are offering*, *Brit. Fd J.*, 1967, 69 (817), 47.

Reviews the latest advances in the development of savoury flavours by manufacturers of essences and flavours and the incessant efforts made for capturing the odoriferous factors of fresh fruits and vegetables.

B.S.N.

19.19 *Acceptability of novel proteins*, RAJAMMAL P. DEVADAS, *J. Nutr. ? Dietet.*, 1967, 4 (1), 26.

Review. 29 references.

19.20 *A quantitative approach to the comparative assessment of taste quality in the confectionery industry*, D. R. READ, *Fd Technol. Aust.*, 1967, **19** (7), 304.

19.21 *A shear apparatus for meat tenderness evaluation*, PETER W. VOISEY & H. HANSEN, *Fd Technol. Champaign*, 1967, **21** (3A), 355.

This commercial and convenient new device is based on Warner-Bratzler meat shear apparatus, and its precision is increased by recording the shear force on strip chart. It can reproduce fixed test conditions. Card can be used for making texture measurements of meat. J. V. S.

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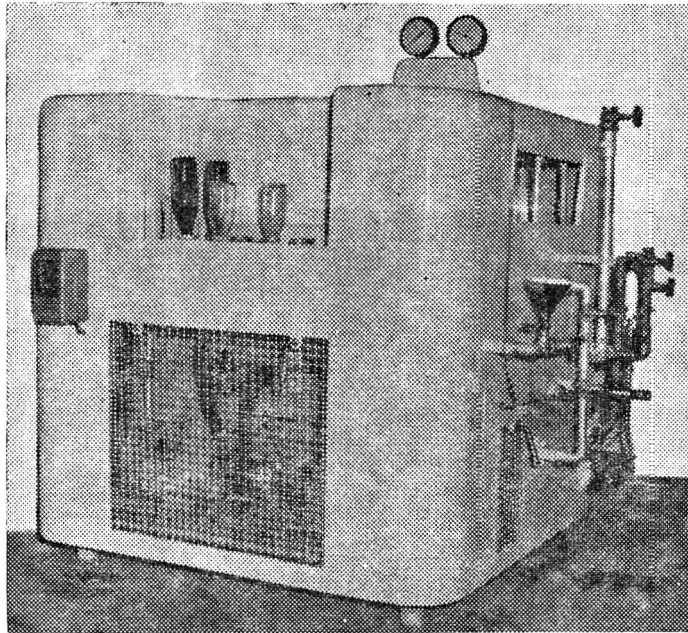
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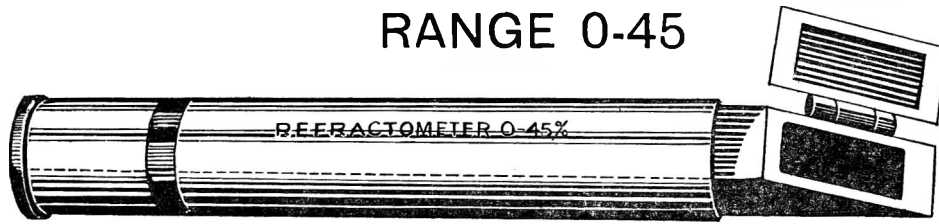
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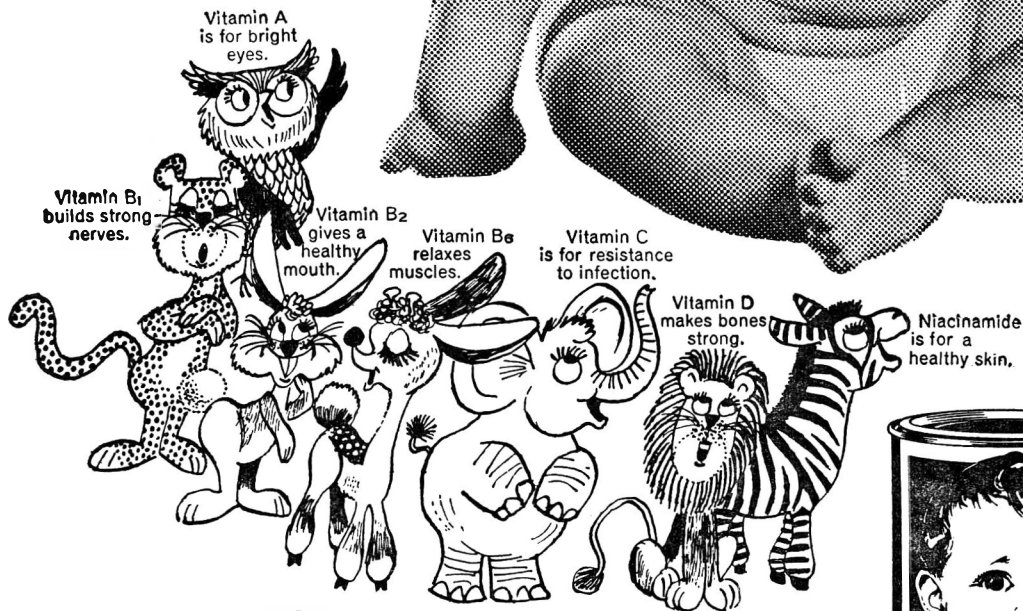
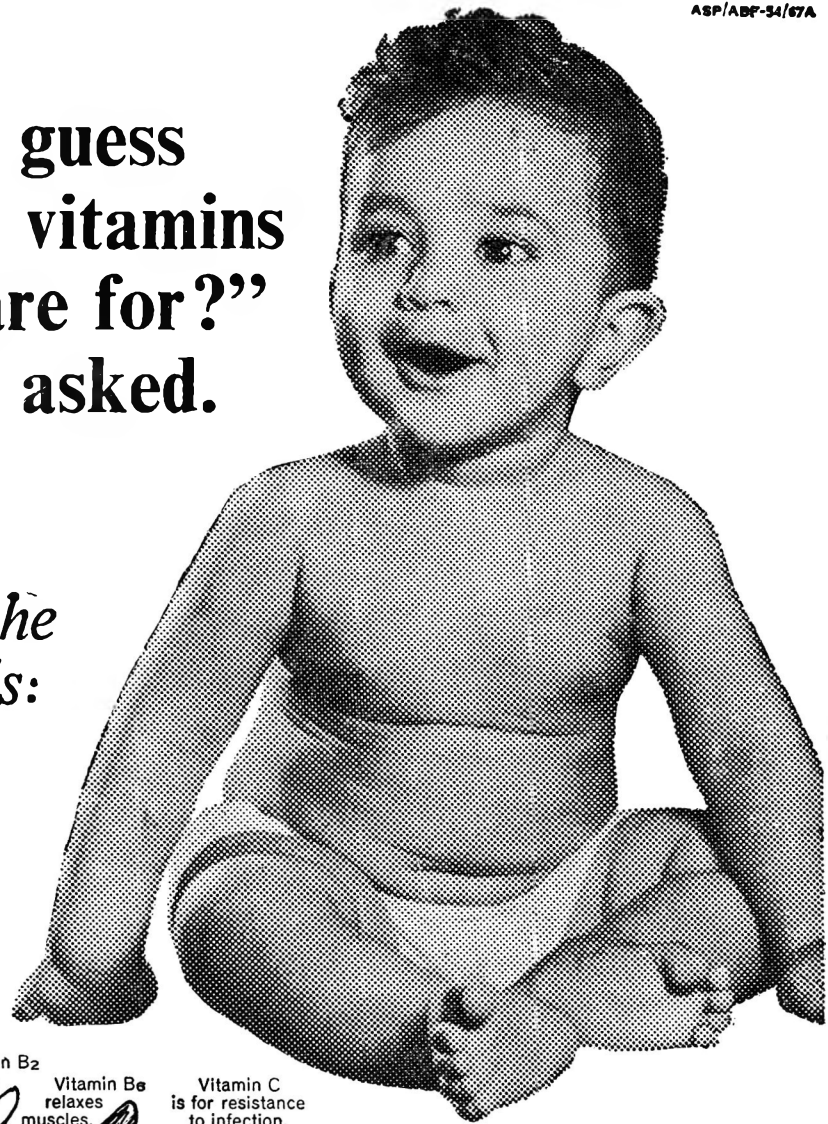


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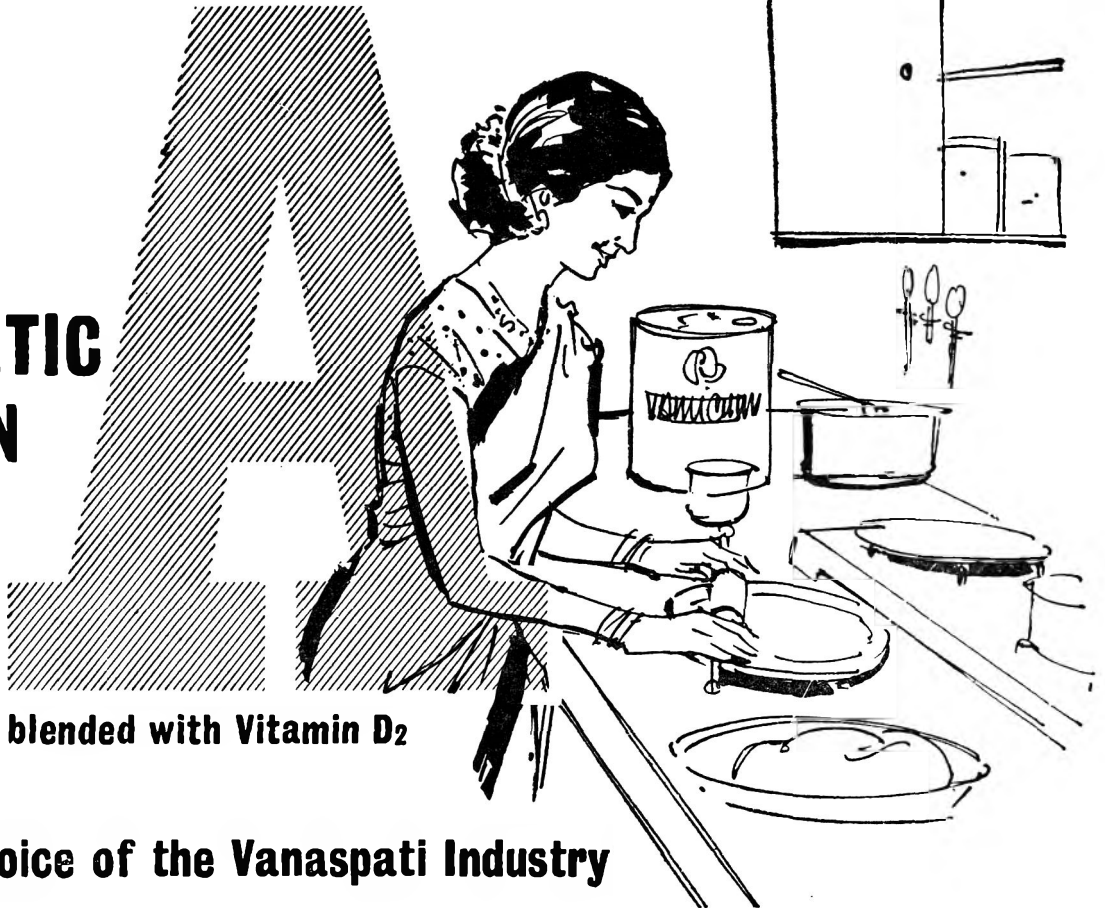


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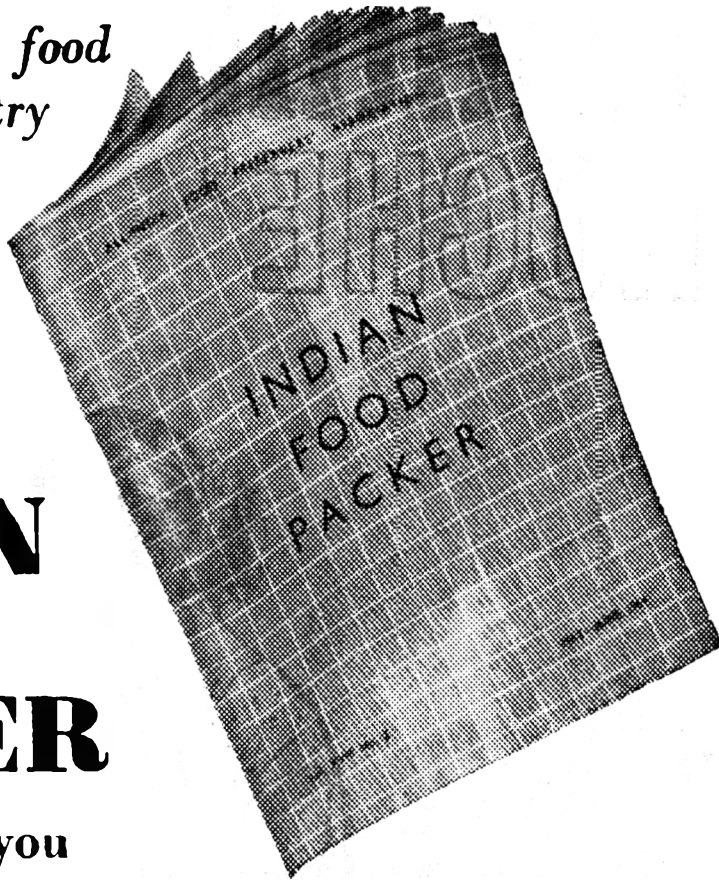


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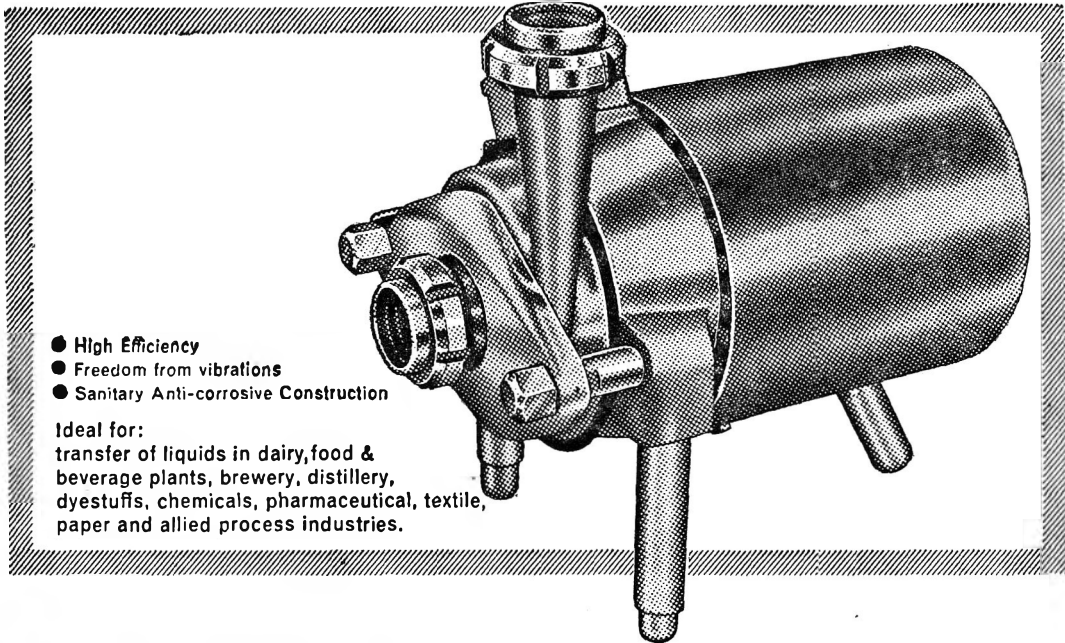
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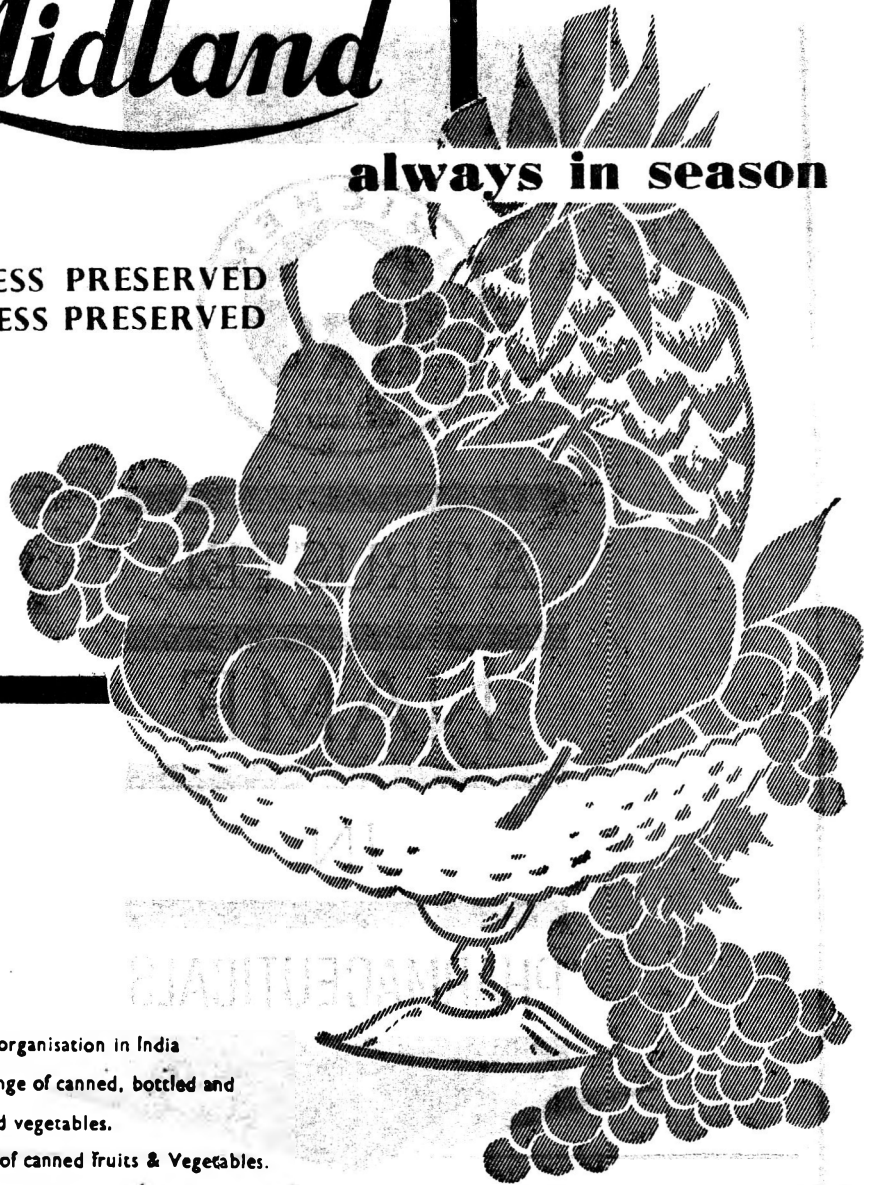
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1. Manuscripts of papers should be typewritten in double space on one side of the paper only. They should be submitted in triplicate. The manuscripts should be complete and in final form, since no alterations or additions are allowed at the proof stage. The paper submitted should not have been published or communicated elsewhere.

2. Short communications in the nature of letters to the editor should clearly indicate the scope of the investigation and the salient features of the results.

3. Names of chemical compounds and not their formulae should be used in the text. Superscripts and subscripts should be legibly and carefully placed. Foot notes should be avoided as far as possible.

4. *Abstract:* The abstract should indicate the scope of the work and the principal findings of the paper. It should not normally exceed 200 words. It should be in such a form that abstracting periodicals can readily use it.

5. *Tables:* Graphs as well as tables, both representing the same set of data should be avoided. Tables and figures should be numbered consecutively in Arabic numerals and should have brief titles. Nil results should be indicated and distinguished clearly from absence of data.

6. *Illustrations:* Line drawings should be made with Indian ink on white drawing paper preferably art paper. The lettering should be in pencil. For satisfactory reproduction, graphs and line drawings should be at least twice the printed size. Photographs must be on glossy paper and contrasty; two copies should be sent.

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Citation of references in the list should be in the following manner.

- (a) *Research Paper:* Menon, G. and Das, R. P., *J. sci. industr. Res.*, 1958, **18**, 561.
- (b) *Book:* Venkataraman, K., *The Chemistry of Synthetic Dyes*, Academic Press, Inc., New York, 1951, Vol. II, 966.
- (c) *Reference to article in a book:* Joshi, S. V. in *The Chemistry of Synthetic Dyes*, by Venkataraman, K., Academic Press, Inc., New York, 1952, Vol. II, 966.
- (d) *Proceedings, Conferences and Symposia:* As in (c).
- (e) *Thesis:* Sathyanarayan, Y., *Phytosociological studies on the Calcicolous plants of Bombay*, 1953. Ph.D. thesis, Bombay University.
- (f) *Unpublished work:* Rao, G., unpublished, Central Food Technological Research Institute, Mysore, India.



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