



JOURNAL OF

FOOD SCIENCE

AND

TECHNOLOGY

ASSOCIATION OF FOOD TECHNOLOGISTS, INDIA

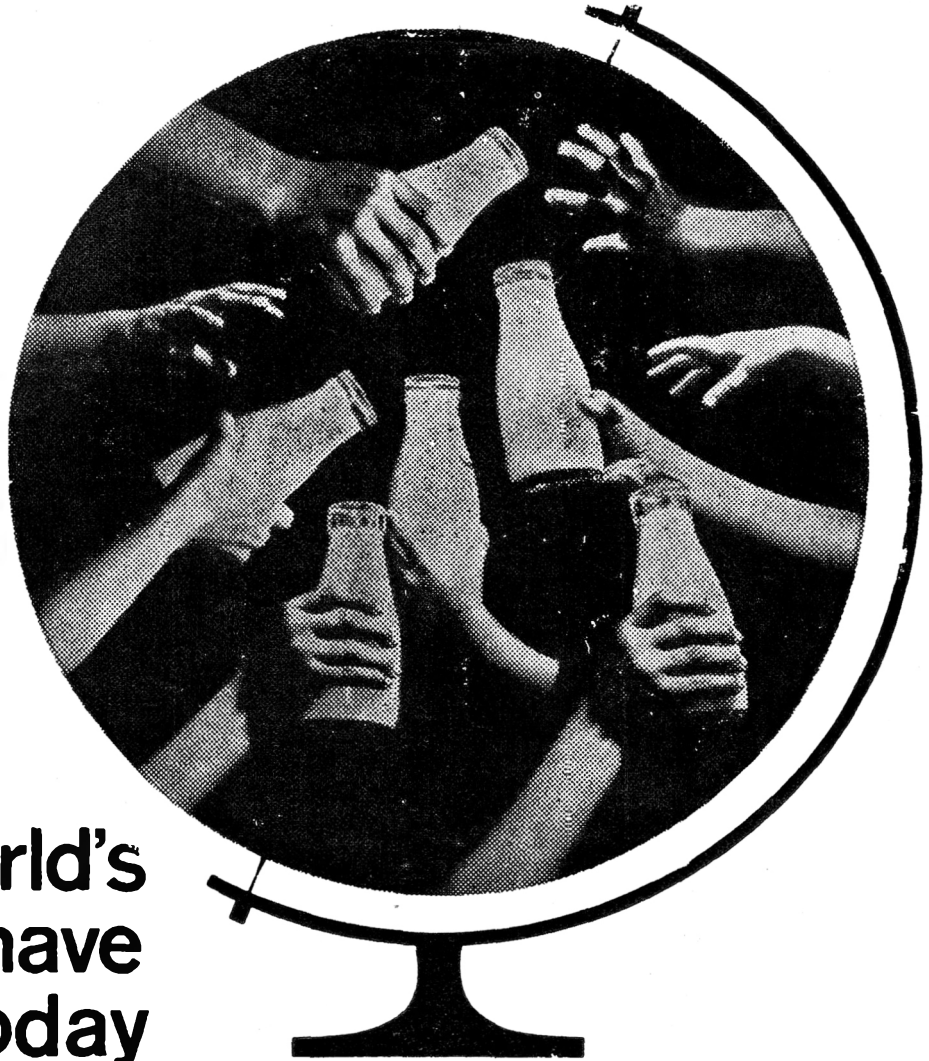
VOL. 5

NO. 1

APRIL

1968

॥ ॐ नमो भगवते वासुदेवाय ॥
 ॐ नमो
 ॥ श्री गणेशाय नमः ॥



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

DIY 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.



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The Journal of Food Science and Technology is issued quarterly

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Annual Subscription

A. Foreign U.S. \$5.50
B. Inland Rs 25.75

Communications regarding contributions for publication in the Journal and books for review should be addressed to the Editor, Journal of Food Science and Technology, Association of Food Technologists (India), C.F.T.R.I., Mysore-2 and communications regarding subscriptions and advertisements should be addressed to the Hon. Executive Secretary, Association of Food Technologists (India), C.F.T.R.I., Mysore-2, (India).

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Journal of Food Science and Technology

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ASSOCIATION OF FOOD TECHNOLOGISTS

(INDIA)

CENTRAL FOOD TECHNOLOGICAL RESEARCH INSTITUTE MYSORE

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EDITOR'S NOTE

India exported pickles and *chutneys* worth Rs 5.3 million during the year 1967; the biggest importer of this item being Britain (Rs 3.17 million). In addition, India exported *papads* worth Rs 2 million and canned and bottled fruits and vegetables worth Rs 9.6 million. Other items of exports like confectionery, wheat, bran, instant coffee, etc., amounted to Rs 2.5 million. The export of banana and mangoes has also been well established; the export during 1965-66 was worth Rs 2.05 millions. Spices have been another important foreign exchange earner worth about Rs 230 million.

In order to boost the export of food products further, it is necessary for the Indian industrialists to bestow some thought on the techniques of proper presentation in addition to the functional requirements of the package. Food products packed in attractive containers will provide an eye appeal, which is as important as the taste of the commodity. Overwrapping with flexible barrier materials like coated cellophane films for cartons of dried fruits, *papads*, etc., provides necessary protection for the products and gives added sale impact. One of the recommendations at the eleventh Indian Standards Convention held in Chandigarh in 1967 was that 'scientific market survey should be carried out abroad to gather consumer preference regarding the packaging of Indian goods'. The Central Food Technological Research Institute at Mysore has been carrying out extensive work on ready

mixes for traditional foods, such as *idli* (fermented product from cereal-pulse mixture), and sweetmeats like *Jamun* and *Jilebi* and on their functional packaging. Recently, the work has been extended to *papads* (paste food) also. The Defence Food Research Laboratory, Mysore has done pioneering work in the packing of *chappaties* and other ready-to-serve products for the defence requirements.

There is an ever increasing demand for sophisticated packaging material, particularly for export purposes. The Indian food manufacturers have also realised the need of elegant packaging for foods for home consumption. But still considerable leeway has to be covered before Indian manufactured goods can stand competition in packaging with the goods made in other countries. The indigenous packaging industry has to make rapid advances before it will be in a position to meet the country's needs.

The formation of the Indian Institute of Packaging fulfils a vital need of the hour. This Institute should organise training course in all the disciplines of packaging, carry out operational research in marketing and merchandising and develop suitable packs with market appeal for different commodities. Foreign markets once developed should not be lost due to substandards in the quality of the product, which necessitates adequate packaging; in addition Indian foods should stand comparison with elegantly packed goods from other countries.

Instant Sauces

T. K. CHAKRABARTY, B. S. BHATIA, K. R. DWARAKANATH AND P. K. VIJAYARAGHAVAN
Defence Food Research Laboratory, Mysore

Manuscript Received: 14 Nov. 1967

Ready-to-use dry sauces (mint, mango, apple, tomato, mixed fruit) which rehydrate instantly by addition of water have been prepared. Simple method of dehydration of fruits/vegetables in cabinet hot air dryer has been used in this process. The sauces have a storage life of more than a year at ambient temperature and about six months at 37°C when packed in paper-aluminium foil-polyethylene laminate packs. The retention of vitamin C of these sauces on storage is fairly good.

Instant dry sauces, which can be reconstituted and used with a variety of food materials, form a readily acceptable item in the rations of the defence forces. They can be packed in light weight pouches and can be transported easily.

Processes for the preparation of apple sauces by using vacuum shelf drier¹, explosive puffing² and atmospheric drum driers³, have been reported. The present communication deals with the preparation of instant dry sauce, which is in a ready-to-serve form.

Materials and Methods

All the spices, fruits and vegetables used for the preparation of the sauces were procured from the local market. Commercial sorbitol powder and clove extract were also used in the preparation. Proximate composition and vitamin C were determined by using AOAC methods⁴. The development of brown colour was estimated by determining the optical density at 430 m μ of the alcohol extract (4 g. sauce extracted in 30 ml. of 60 per cent ethanol).

Drying procedure: Attempts to dehydrate the ready mixed sauces was met with some difficulties. Hence the fruits and vegetables were first dehydrated and the dry components were mixed with the other ingredients.

The procedure for dehydration of the components is briefly described below.

Apple: Apples, *Golden Delicious*, purchased from the local market were washed in running water and were peeled, cored and cut into thin radial slices (5.0 to 7.0 mm. thick). The slices were steam blanched for 3 minutes and soaked in 0.08 per cent potassium metabisulphate solution for 5 minutes. They were spread over 80×40 cm. aluminium trays (tray load 3.5 kg./sq.m.) and dehydrated in cabinet dryer at 65±5°C to 5.5 per cent moisture level. Drying ratio

was 8.2 and sulphur dioxide in the dehydrated product was 784 p.p.m.

Tomato: Ripe red firm tomatoes, purchased from the local market were washed in running water, cut into thin slices (5.0 to 7.0 mm. thickness) and spread over the trays (tray load of 3.0 kg./sq.m.). Solution of potassium metabisulphite (0.75 per cent w/v) was sprayed over them uniformly (50 c.c. per kg. of tomato slices). They were dehydrated as before to 7.9 per cent moisture level. Drying ratio was 16.6 and sulphur dioxide in the dehydrated product was 206 p.p.m.

Mango: Ripe mango (*Badami*) was peeled and pulped in a pulping machine. The mango pulp was heated to 80-85°C and adjusted to pH 5.0; 5 per cent gelatinised starch was mixed with it and the heating of the mixture was continued for 3 min. The material was then dried as before at 60±5°C to a moisture level of 3.1 per cent (tray load 3.0 kg. per sq.m.).

Raw mango (*Omlet* variety) was washed, peeled and cut into thin strips (5×5×7 mm. approx.). The strips were steam blanched for 4 min. and then soaked in 0.1 per cent potassium metabisulphite solution for 5 min. They were dried in the cabinet dryer (tray load 3.5 kg. per sq. m.) at 65±5°C to 4.6 per cent moisture level. The drying ratio was 9.4 and sulphur dioxide in the final product was 144 p.p.m.

Amla: *Amla (Phyllanthus emblica)* was washed and steeped in 7.0 per cent brine for 96 hours. The excess brine was drained. It was then cut into thin slices and steam blanched for 5 minutes and soaked in 0.1 per cent potassium metabisulphite for 5 min. The slices were then dried at 60±5°C in the cabinet dryer to 2.5 per cent moisture level (tray load 3.2 kg. per sq.m.). The drying ratio was 8.1. The sulphur dioxide in the dehydrated product was 300 p.p.m.

TABLE 1. RECIPES OF INSTANT SAUCES

	Mint g	Mango g	Apple g	Tomato g	Mixed fruit	
					Apple+Amla g	Apple+Amla+ Tomato g
Dry base (Fruit or vegetable)	10.0	100.0	100.0	100.0	50+50	33+33+33
Raw mango (dry)	100.0	...	...	...	...	...
Sugar	150.0	75.0	120.0	100.0	100.0	100.0
Sorbitol	...	...	40.0	...	...	...
Salt	15.0	5.0	16.0	3.0	3.0	3.0
Onion (dry)	...	...	...	10.0	10.0	10.0
Garlic "	...	...	...	0.2	0.2	0.2
Ginger "	2.5	...	...	...	...	...
Green chilli (dry)	10.0	...	...	...	...	...
Red chilli	...	0.5	0.5	6.0	6.0	6.0
Cumin seed	2.5	2.5	2.5	0.25	0.25	0.25
Asafoetida	0.5	...	...	...	...	...
Mace	...	0.5	0.5	...	...	...
Nutmeg	...	...	...	0.5	0.5	0.5
Black pepper	...	1.5	3.5	0.5	0.5	0.5
Cinnamon	...	0.5	0.5	0.5	0.5	0.5
White cardamom	...	0.25	0.25	0.25	0.25	0.25
Clove oil	...	...	...	0.01	0.01	0.01
Citric acid	...	5.6	14.2	...	...	...
Glacial acetic acid	...	5.6	8.5	3.0	3.0	3.0

TABLE 2. PROXIMATE AND MINERAL COMPOSITION OF INSTANT SAUCES

	Moisture	Protein (N × 6.25)	Petrol ether extract	Ash	Sodium chloride	Total sugars	Reducing sugars	Total aci- dity as citric acid	Volatile aci- dity as acetic acid	Calcium	Iron	Phosphorus
	%	%	%	%	%	%	%	%	%	mg%	mg%	mg%
Mint	3.85	2.58	0.50	5.75	5.10	56.22	4.57	7.48	0.12	67.45	1.12	32.13
Mango	4.01	1.65	1.05	2.88	2.51	76.70	20.79	6.99	2.66	96.16	3.29	42.13
Apple	3.86	1.11	0.91	5.08	4.87	61.65	18.55	7.41	2.36	103.70	16.47	48.37
Tomato	6.31	5.53	2.58	3.92	1.79	67.45	22.30	4.36	1.27	138.60	19.79	176.10
Mixed Fruit (Apple + Amla)	3.77	1.31	1.22	1.45	1.35	63.20	16.13	3.73	1.15	88.26	21.03	82.31
Mixed Fruit (Apple + Amla + Tomato)	3.47	2.92	1.79	1.97	1.60	63.57	16.95	4.36	1.39	54.99	5.86	105.20

Mint: Mint (*Mentha spicata*) was washed and leaves were soaked in a solution of sodium bicarbonate (0.1 per cent), magnesium oxide (0.3 per cent) and sodium metabisulphite (0.1 per cent) for 30 min. at ambient temperature. The mint leaves were taken out of the solution and excess of solution drained off. The leaves were dried in cabinet dryer at $60 \pm 2^\circ\text{C}$ to 5.0 per cent moisture level (tray load 1.5 kg./sq.m.). The drying ratio was 8.2 and sulphur dioxide in the dehydrated product was 214 p.p.m.

Garlic: The garlic cloves (*Allium sativum*) were taken out after removing the outer membrane. The cloves were cut into thin slices and were dehydrated in cabinet dryer at $60 \pm 5^\circ\text{C}$ to 5.6 per cent moisture level (tray load 3.0 kg./sq.m.) and freed from the inner skin. The drying ratio was 2.4.

Onions and green chillies were dehydrated using the methods reported earlier^{5,6}.

Recipes: The recipes of the instant sauces are given in Table 1.

Procedure for the preparation of sauces: The method was as follows:

The dehydrated items were ground to fine powder (60 mesh). Sugar, salt, citric acid, red chillies and other spices were separately ground into powder (60 mesh). All the ingredients were mixed. Acetic acid was added during the final stage of mixing.

Results and Discussion

Organoleptic quality: The sauces are instantly reconstituted by the addition of water (one-and-half times by weight in mango, apple and tomato, twice in mint and thrice in mixed fruit) at ambient temperature. Comparatively more water was required when *amla* was one of the components of the sauce. The organoleptic quality of the sauces was found to be good

as determined by a taste panel of six members of the staff of this laboratory.

Proximate and mineral composition: Proximate and mineral composition of the sauces is given in Table 2.

The results show that tomato, apple and mixed fruit sauces contain a fair amount of minerals. A minimum of 3 per cent acidity and 55 per cent total sugar were necessary in the dry sauces to give them appetizing blend of flavour.

Shelf-life: All these sauces when packed in paper-aluminium foil-polythene laminate packs were found to have satisfactory shelf-life of not less than one year when stored under ambient conditions, except tomato sauce in which case the shelf-life was about eighteen weeks. This was because of the higher moisture content (6.3 per cent) of tomato sauce which could not be reduced when the cabinet dryer was used.

Reduction of moisture by inpack desiccant improved the shelf life. Data recorded in Table 3 and 4 show

TABLE 3. BROWNING OF INSTANT SAUCES (O.D. AT 430 m μ)

Sauce	Period of storage in weeks (ambient temp. 24–30°C) (4.0 g sauce in 30 ml of 60% alcohol)			
	Initial	8	16	26
Mint	... 0.3979	0.4202	0.4318	0.4487
Mango	... 0.1427	0.1805	0.1857	0.1912
Apple	... 0.3010	0.4559	0.4689	0.4876
Tomato	... 0.6021	0.6529	0.6990	0.7959
Mixed Fruit (Apple+Amla)	0.4202	0.4528	0.5576	0.5686
Mixed Fruit (Apple+Amla+ Tomato)	0.6022	0.6576	0.6778	0.6990

TABLE 4. REFLECTANCE METER STUDIES OF INSTANT SAUCES ON STORAGE

Sauce	Period (weeks)	Temperature	Reflectance meter reading (adjusted to magnesium oxide as 100)	Visual colour	Acceptability
Mint		Initial	73.5	Light green	Acceptable
	36	Ambient	60.0	Buff	"
	36	Accelerated*	56.0	"	"
	44	Ambient	58.0	"	"
	44	Accelerated	49.0	"	"
Apple	88	Ambient	47.0	Light grey	"
		Initial	74.0	Light cream	"
	28	Ambient	61.0	Deep cream	"
	28	Accelerated	50.5	Light brown	"
	36	Ambient	51.5	"	"
Mango	36	Accelerated	40.0	"	"
	48	Ambient	42.0	"	"
		Initial	73.0	Orange-yellow	"
	34	Ambient	60.5	Dull orange-yellow	"
	34	Accelerated	53.5	"	"
Tomato	44	Ambient	58.5	"	"
	44	Accelerated	44.0	"	"
	88	Ambient	45.0	"	"
		Initial	52.0	Brown	"
	64	Ambient	20.0	Brick-red	Not acceptable
Mixed fruit (Apple + Amla)	72	Ambient	14.5	"	"
	92	Ambient	11.0	Dark-brown	"
		Initial	69.0	Light brown	Acceptable
Mixed fruit (Apple + Amla + Tomato)	70	Ambient	34.5	Dull brown	"
	78	Ambient	32.5	"	"
		Initial	66.0	Light brown	"
Mixed fruit (Apple + Amla + Tomato)	72	Ambient	38.0	Dull brown	"
	80	Ambient	32.0	"	"
		Initial	66.0	Light brown	"

* Accelerated temperature: 37 \pm 1°C.

TABLE 5. PER CENT RETENTION OF VITAMIN C DURING STORAGE

Sauce	Ambient temperature (24-30°C)				At 37 ± 1°C			
	Period (weeks)	Value	With in-package desiccant		Period (weeks)	Value	With in-package desiccant	
			Period (weeks)	Value			Period (weeks)	Value
Mint	26	41.7	26	71.6	16	25.8	26	58.8
Mango	26	31.4	26	60.4	26	16.9	26	47.2
Apple	26	56.3	...	...	20	41.7	...	...
Tomato	24	77.9	32	72.3	...	...	32	65.7
Mixed Fruit (Apple + Amla)	24	77.2	...	...	24	41.9	...	...
Mixed Fruit (Apple + Amla + Tomato)	24	76.2	...	...	24	50.5	...	...

that in spite of the discolouration/browning in these sauces on storage, they were acceptable. No positive correlation was found between the acceptability and the degree of browning. Data in Table 5 show that there is a good amount of retention of vitamin C during storage. The use of inpack desiccant improved the retention of vitamin C in the sauce.

Acknowledgement

Grateful acknowledgement is made to Dr V. Ranganathan, Deputy Chief Scientist R and D for his interest in this investigation.

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Effect of Phosphine Fumigated Rice on the Growth of Albino Rats

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Manuscript Received: 14 Nov. 1967

The effect of feeding rice fumigated with phosphine gas (phostoxin tablets) on the gain in weight and the weights of livers and kidneys as well as the histological changes has been investigated. Even rice treated with a very high dose of the fumigant (50 tablets per tonne) when fed to animals after aeration, did not reveal any effects on overall growth, weight of some of the organs and histological changes.

Phosphine gas has been used as a bulk fumigant for the effective control of *Sitophilus granarius*, *Tyroglyphus farinae* (mite) and larva of *Trogoderma granarium*.¹ Hubert² used phostoxin for emergency fumigation against a number of insect pests and observed that traces of residues of aluminium phosphide decomposed when the grain was moved. Shikernove and Radover³ found that phostoxin was effective against a major rice pest but that it did not adversely affect the physical and rheological properties of the grain. Similar observations on wheat⁴ and corn⁵ have been made. Harger and Spolyer⁶ have reviewed phosphine toxicity. Neubert and Hoffmeister⁷ found that the cellular oxidation of α -ketoglutarate was affected in acute phosphine poisoning. They have also observed a reduction in the respiration of *Neurospora crassa*. Chronic exposure of rats to sublethal doses of phosphine produced a small but regular fall in the liver coenzyme-A. Chronic effects caused by phosphine on man are similar to those caused by phosphorus⁸. This paper deals with the feeding trials on albino rats of phosphine fumigated rice after thorough aeration.

Materials and Methods

Rice (var: *Bangara Sanna*) was fumigated with phosphine (phostoxin tablets*) at dosages of 1, 5 and 50 tablets per tonne. The phostoxin tablets were placed in about 25 kg. of rice in air-tight tins. The tins were opened after four days and the rice was thoroughly aerated for at least two weeks. A minute quantity of $Al(OH)_3$ resulting from phostoxin, was mixed with the grain during turning and aeration. A representative sample of non-fumigated grain was kept as control.

Sixteen (8 male and 8 female) albino rats weighing about 50 g. each were allotted to four groups according to randomized block design (ignoring litter mates). One group was fed with rice diet (Table 1) containing control rice and the other three groups were kept on rice diet containing fumigated rice. The rats were fed *ad lib* for a period of twelve weeks. Records of weekly gain in weight and food intake were maintained. At the end of the experimental period R.B.C. and haemoglobin contents of the blood drawn from the tail of the rats were estimated⁹. The weights of the liver and kidneys of the rats were recorded prior to histopathological examination.

The average gain in weights of rats at the end of 4, 8, and 12 weeks, and the average weights of the livers and kidneys and the blood picture of the animals at the end of the experiment are given in Tables 1 and 2.

Results and Discussion

There was no significant difference in the average weekly gain in weight of rats at the end of 8 and 12 weeks (Table 1). There was no significant difference in the weights of the kidneys of the rats of the four groups and the livers of the female rats, while minor differences were observed in the case of male rats. The results in Table 2 show that the overall blood picture did not show any major deteriorative changes and histopathological examination did not reveal any abnormality of the livers and kidneys of the animals thus demonstrating that even at high dosage of 50 tablets per tonne the treated rice after thorough aeration had no deleterious effects on the experimental animals.

* Phostoxin tablets supplied by Degesch, Frankfurt (Main) W. Germany. Each tablet generates 1g. phosphine.

TABLE 1: AVERAGE WEEKLY GAIN IN WEIGHT OF RATS AT THE END OF 4, 8 AND 12 WEEKS

Diet	Initial weight g		Average gain in wt. in g/week at the end of						Average diet intake g/rat/day*		
	Males	Females	4 weeks		8 weeks		12 weeks		4th week	8th week	12th week
			Males	Females	Males	Females	Males	Females			
A. Poor rice diet† (control)	50.1	49.0	7.2	8.6	7.1	7.2	5.8	5.4	6.9	7.1	7.1
B. Poor rice diet containing rice fumigated with phosphine at 1 tablet per tonne	49.7	49.4	10.5	8.8	8.0	6.9	6.3	5.4	7.2	6.9	7.1
C. Poor rice diet containing rice fumigated with phosphine at 5 tablets per tonne	49.9	49.4	7.9	8.6	7.2	6.6	6.1	5.4	6.6	6.6	6.8
D. Poor rice diet containing rice fumigated with phosphine at 50 tablets per tonne ...	49.7	49.2	9.1	9.6	7.6	7.0	6.4	5.4	7.0	7.1	7.3
Standard error of the mean based on 21 degrees of freedom	...	...	±0.75	±0.50	±0.50	±0.29	±0.34	±0.28	...	...	...

* The values are expressed on dry basis and are the averages of both the male and female rats.

† The composition of the rice diet was: rice, 78.5%, tur dhal, 5%, groundnut oil, 5%, non-leafy vegetables, 8.2%, leafy vegetables 2.1%, skim milk powder, 0.9% and common salt, 0.3%.

TABLE 2. AVERAGE WEIGHT OF LIVER, KIDNEY, HAEMOGLOBIN AND RBC CONTENT OF RATS FED WITH DIFFERENT DIETS

Diet	Liver g.		Kidney g.		Haemoglobin content g/100 ml.		R.B.C. 10 ⁶ /mm ³	
	Males	Females	Males	Females	Males	Females	Males	Females
A. Poor rice diet (control)	3.9	4.3	1.1	1.0	14.7	14.0	7.0	6.7
B. Poor rice diet containing rice fumigated with phosphine at 1 tablet per tonne	4.5	4.3	1.1	1.0	13.0	13.0	5.6	5.8
C. Poor rice diet containing rice fumigated with phosphine at 5 tablets per tonne	4.8	4.3	1.1	1.0	13.0	13.8	6.1	6.3
D. Poor rice diet containing rice fumigated with phosphine at 50 tablets per tonne	4.8	4.4	1.0	1.1	14.8	14.0	7.1	6.8
Standard error of the mean based on 21 degrees of freedom	±0.20	±0.15	±0.15	±0.04	±0.26	±0.24	±0.16	±0.14

Acknowledgements

The authors are thankful to Shri S. K. Majumder, Chairman, Infestation Control and Pesticides Discipline and to Dr H. A. B. Parpia, the Director of the Institute for their keen interest in the investigation. The authors are also thankful to Mrs Indira Murthy for the statistical analysis of the data, Shri M. Muthu for fumigation, and Shri C. P. Ramasundaram for technical assistance.

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Studies on the Preparation and Nutritional Value of Protein, Vitamin and Calcium Enriched Wheat Macaroni

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Manuscript Received: 6 Oct. 1967

Pilot scale preparation and nutritive value of protein-enriched macaroni rice are described. The product contained about 17 per cent protein (moisture-free basis). The growth of children fed macaroni in place of rice as part of their normal diet was superior to that of children on the rice diet. Mean increases in their weights and heights over a period of four-and-half months were: 1.41 kg and 3.1 cm., respectively as compared with 0.67 kg and 1.88 cm., of the control group. The children on macaroni diet also showed significantly higher mean daily retentions of nitrogen (2.58 g) and calcium (388.5 mg) as compared with 1.77 g. and 88.5 mg. respectively of children consuming rice diet.

In recent years, considerable world-wide interest has developed in protein-rich foods. Average, *per capita* consumption of protein¹ in India is estimated at 50.4 g. as against a usually recommended level of 60-70 g. per day. Rice is the staple food of a majority of Indian population and it continues to be in short supply. The protein content of rice is low, viz., 6-7 per cent which explains the low intake of protein by people subsisting largely on rice. Among the processed foods, macaroni is the nearest substitute for rice, as it can be cooked and consumed in a manner to which the rice consuming population are accustomed. The technology of macaroni products offers possibilities of fortification with nutrients deficient in rice, particularly protein and calcium².

Considerable work has been done at the Central Food Technological Research Institute on the development of rice substitutes, including protein rich macaroni products^{3,4}. In a recent communication, Bains *et al.*⁵ have shown the possibility of improving the status of protein of wheat macaroni, by fortification with lysine and milk protein. The quality of protein in the product was evaluated by PER experiments. The present paper describes the preparation and nutritional assessment of protein enriched macaroni based on a blend of semolina and casein (95:5) with added vitamins and calcium.

Materials and Methods

Preparation of macaroni: Protein enriched macaroni in the form of rice grain was prepared from a blend of wheat semolina and casein (95:5) with added calcium carbonate (1 part). Vitamin additions per 45.4 kg. of

the blend were: thiamine hydrochloride 125 mg., riboflavin 250 mg., calcium pantothenate 250 mg., vitamin A-acetate 0.75×10^6 I.U., and vitamin D₂ as calciferol 0.05×10^6 I.U. The product was prepared in 150 kg. batches in the macaroni pilot plant described elsewhere^{4,6}.

The ingredients were mixed and transferred to the overhead hopper of the Buhler A.T.A. continuous extrusion press. The flow of dry ingredients and water into the dough mixing compartment was adjusted to give a water absorption of 34-35 per cent. The dough was extruded through a rice shaped die. The product first passed through a pre-drier and then loaded into trays for steaming for one-and-half minutes. The steamed product was again passed through the pre-drier from where it was conveyed to the main T.T.H.A. drier which is divided into three sections. In the first section, the dry and wet bulb temperatures were controlled at 55° and 47°C, and in the third section at 55° and 50°C, respectively. In the middle section, an atmosphere of saturated humidity was provided to reduce the moisture gradient between the relatively dry surface and the moist interior of the product. Adopting this schedule, it was possible to dry the product, in 4-4½ hours to the required moisture content.

Nutritive value: The composition of macaroni rice as compared with that of raw milled rice is shown in Table 1. The nutritive value of the product was studied by human feeding experiments described below.

Feeding test subjects: Forty-eight children, aged 7-12 years, resident in a local institution were selected

TABLE 1. CHEMICAL COMPOSITION OF PROTEIN ENRICHED MACARONI AND RAW MILLED RICE

Components	Macaroni	Raw milled rice
Moisture (g.)%	10.7	12.5
Protein (N × 6.25) (g.)%	15.7*	6.9
Fat (g.)%	1.24	0.4
Calcium (mg)%	420	10.0
Phosphorus (mg)%	163	110.0
Iron (mg)%	3.4	1.0
Thiamine HCl (mg)%	0.35	0.084
Riboflavin (mg)%	0.59	0.08
Calcium pantothenate (mg)%	1.10	...
Nicotinic acid (mg)%	4.0	1.2
Vitamin A (I.U.), per 100 g.	1650	...
Vitamin D (I.U.), per 100 g.	110	...

* Moisture free basis 17.5%

TABLE 2. INGREDIENTS IN THE NORMAL DIET OF CHILDREN RESIDENT IN THE INSTITUTION*

Food	g/day/child
Rice, raw milled	220
Wheat flour (as bread)	114
Pulse (<i>Cajanus indicus</i>)	25
Vegetables	50
Condiment and spices	13
Coconut	4
Groundnut oil	4
Common salt	10
Sugar	30
Skim milk powder	10
Fruit, banana	30

* The experimental diet contained an equivalent amount of macaroni in place of raw milled rice. The rest of the ingredients were the same as in the normal diet.

and paired into two groups of 24 each on the basis of initial weights, heights and nutritional status determined in accordance with the score card of the Nutrition Advisory Committee of the Indian Council of Medical Research⁷. The children were examined clinically and treated for worms by administering santonin before starting the experiment.

Pattern of the institution diet: The diet which the children normally consumed in the Institution was investigated according to the methods used by Reddy, *et al.*⁸. The pattern of diet which emerged from this investigation is shown in Table 2.

The control group was fed the usual institution diet in which raw milled rice was the major component. The children in the experimental group were fed macaroni rice in lieu of raw milled rice.

Preparation of diets: Rice and macaroni were cooked separately in approximately three times their volumes of boiling water. Excess gruel was allowed to be absorbed by the cooked products. Pulse and vegetables were cooked as curry by incorporating spices

and condiments. Whole wheat flour was made into yeast raised bread and sliced according to the share of each child.

The food was served in three meals a day. Breakfast consisted of bread and coffee; one banana was given to each subject. At lunch, children in the control group were given rice equivalent of 120 g. raw milled rice, and half the amount of curry. The dinner pattern was the same as that for lunch. The children in the experimental group were fed 'macaroni rice' in place of rice. Feeding of test diets was continued for four-and-half months.

Representative samples of the diets were collected, dried, mixed and ground in a Wiley mill and preserved in air-tight bottles for analysis.

Metabolism studies: When the test was half way through, 8 corresponding children in the two groups, were selected for studying the metabolism of nitrogen, calcium and phosphorus as influenced by the replacement of rice in their diet by 'macaroni rice'. The duration of the metabolism experiment was seven days, the first three days period being considered non-experimental during which the subjects were made accustomed to the routine for collection of faeces and urine. Carmine dye mixed with the diet was used as an indicator for starting collection of faeces and urine, during the next four days. Individual faecal samples were daily mixed with 100 ml. of 5 per cent oxalic acid and 100 ml. of alcohol containing 5 g. of each of phenol and thymol as preservatives. The treated faeces were dried in air oven at 70°C. The four-day collections were mixed together, weighed and ground fine for analysis. The urine samples were collected in separate bottles each containing 100 ml. of concentrated hydrochloric acid and 5 g. phenol as preservatives.

Physical measurements: The heights and weights of children were recorded in the beginning and at the end of the test.

Analytical methods: The diet samples were analysed for moisture, protein, calcium and phosphorus by the A.O.A.C. procedures⁹.

The blood of each child was examined for haemoglobin and red blood cell counts before and at the conclusion of the test. Haemoglobin was determined by the acid-haemetin method¹⁰ and the red blood cell count in a Neubauers haemocytometer.

Measured aliquots (200 ml.) of urine were neutralised to pH 7, followed by addition of 2 g. sodium acetate, evaporated to dryness on a water bath and incinerated at 550°C in a muffle furnace. The ash was extracted with hydrochloric acid, filtered and appropriate aliquots were taken for the determination

of calcium and phosphorus. Faecal samples were ashed and hydrochloric acid extracts of the ash were used for calcium and phosphorus determinations. Nitrogen in the urine and faeces was determined according to the Kjeldahl method.

Results and Discussion

The mean daily intakes of nutrients by children consuming rice and enriched macaroni diets respectively were: protein, 38.4 and 56.3 g.; fat, 7.0 and 9.0 g.; calcium 304 and 1239 mg.; phosphorus, 657 and 745 mg.; iron, 9.2 and 17.2 mg.; thiamine hydrochloride 0.64 and 1.08 mg.; riboflavin, 0.62 and 1.77 mg.; nicotinic acid, 7.6 and 14.7 mg.; and vitamin A, 225 and 3300 I.U. The nutrients in the rice diet were below the standards prescribed by the Nutrition Advisory Committee of the Indian Council of Medical Research¹¹. The calorific value of both diets was about 1417. Though accustomed to rice as a staple cereal, the children liked enriched macaroni in the shape of rice.

There were significant increases in the weights and heights of children fed macaroni diet; mean gains being 1.41 kg. and 3.1 cm. respectively, as compared with 0.67 kg. and 1.88 cm. of the rice group (Table 3). The blood condition of children consuming macaroni diet was also better than that of children on rice (Table 4).

A large percentage, viz., 66 per cent of children administered macaroni diet, showed improvement in their nutritional status, as compared with 25 per cent of children in the rice group. In fact, the majority of children, viz., 59 per cent in the rice group remained in a stationary nutritional status as compared with 33 per cent in the experimental group.

Nitrogen metabolism: The mean daily intake of nitrogen by the rice group was 6.12 g. as compared with 9.1 g. by the macaroni group (Table 4). The mean excretion of nitrogen in the faeces of macaroni group was slightly lower (0.89 g.) than that of the rice group (1.05 g.). However, urinary excretion of nitrogen was considerably more in the macaroni group (5.62 g.) as compared with the rice group (3.30 g.). The subjects were all in positive nitrogen balance, and the mean retention of nitrogen by children consuming macaroni diet (2.59 g.) was significantly higher than that of the rice group (1.77 g.).

Calcium metabolism: The mean daily intake of calcium by children in the macaroni group was substantially higher (1239 mg.) than that of rice group which averaged 304 mg. per day. Two of the subjects in the rice group showed negative calcium balance, whereas all the children in the macaroni group

TABLE 3. HEIGHTS AND WEIGHTS, AND HAEMOGLOBIN AND RBC COUNTS OF CHILDREN IN CONTROL AND EXPERIMENTAL GROUPS (MEAN VALUES)

(24 girls in each group, test feeding: 4½ months)

	Control (a)		Experimental (b)		Difference between means (b-a)	't'
	Initial	Increase	Initial	Increase		
Height, cm	121.44	1.88	121.18	3.10	1.22	6.3
Weight, kg.	20.01	0.67	21.01	1.41	0.74	5.0
Haemoglobin, g/100 ml.	12.72	0.37	12.99	0.69	0.32	3.6
Red blood cell count, 10 ⁶ /cu mm.	4.27	0.07	4.29	0.35	0.28	4.3

* Value of 't' at 1% level of significance, 2.8

TABLE 4. MEAN DAILY INTAKE, EXCRETION AND RETENTION OF NITROGEN, CALCIUM AND PHOSPHORUS BY CHILDREN IN CONTROL AND EXPERIMENTAL GROUPS CONSUMING NORMAL DIET AS COMPARED WITH MACARONI DIET*

Diet	Mean daily				
	Intake	Excretion		Total	Retention
		Faecal	Urinary		
	Nitrogen g				
Rice diet	6.12	1.05	3.30	4.35	1.77
Macaroni diet	9.09	0.89	5.62	6.51	2.58
Calculated value of Fishers, 't'	...	3.53	11.4	...	14.40
	Calcium mg				
Rice diet†	304	218.0	45.7	263.7	88.5
Macaroni diet	1239	777.6	72.9	850.5	388.5
't'†	...	8.22	2.32	...	...
	Phosphorus mg				
Rice diet	657	241.9	108.5	350.4	306.6
Macaroni diet	745	314.6	69.1	383.7	361.3
't'†	...	4.5	4.7	...	3.4

* 8 children in each group.

† Value of 't' at 1% level of significance, 3.49.

‡ Since two of the subjects were in negative calcium balance, the average retention figure is based on positive values of six subjects.

remained in positive balance. Mean retention of calcium by the macaroni group was significantly higher viz., 388.5 mg. than that of the rice group even if only positive values of calcium retention were used in the computation. However, only 25 per cent of the ingested calcium was retained, most of it was excreted in the faeces and relatively less in the urines.

Phosphorus metabolism: The mean daily intake of phosphorus by children consuming rice and macaroni diets were 657 and 745 mg., respectively. The children

in both the groups remained in positive phosphorus balance. Mean retention of phosphorus by the children on macaroni diet was slightly higher viz., 361.3 mg. as compared with 306.6 mg. in the case of rice group, the difference being statistically non-significant. Mean faecal excretion of phosphorus in macaroni group was significantly higher (314.6 mg.) than of the children of the rice group (241.9 mg.). Urinary excretion of phosphorus of the children in the rice group was relatively higher, viz., 108.5 mg. than that of the children consuming macaroni diet whose mean excretion of phosphorus amounted to 69 mg./day.

Conclusions: In view of significant improvement in the health of children fed fortified macaroni in place of rice as part of their normal diet, it will be advantageous to promote the production and consumption of such products among children subsisting on inadequate rice diets. Such products can be produced commercially with the conventional macaroni equipment.

Acknowledgement

The authors express their thanks to Dr H. A. B. Parpia and Dr M. Swaminathan for their keen interest in the work, to Mr A. N. Sankaran and Mrs Indira Murthy for technical help in the statistical layout of feeding tests, and to Mr C. P. Ram Sundaram for blood analysis and to Miss S. Philomena for the management of feeding tests.

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Light Weight Flexible Packaging for Accelerated Freeze Dried (AFD) Meat

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Manuscript Received: 16 Nov. 1967

Studies on the development of a light weight flexible packaging for accelerated freeze dried (AFD) meat, for use in the Armed Services, are reported. The packaging is based on indigenous materials [60 g. brown casing paper/aluminium foil (0.04 mm)/polyethylene (150 gauge) pouch with a 2-ply bleached corrugated liner; pouch enclosed in a 2-ply corrugated rectangular carton (waxed)] and ensures a minimum shelf-life of one year under field conditions.

The development of a light weight flexible packaging for accelerated freeze dried (AFD) meat is a military requirement, particularly for issue to troops operating in extreme conditions of high altitude and difficult mountainous terrain. It is also necessitated by the growing scarcity of tin plate. The pack should ensure a minimum shelf-life of one year under varied operational conditions and withstand extreme climatic and transport hazards.

A flexible light weight pack for AFD meat for use in the Armed Services should satisfy the following qualitative requirements.

- (a) The packaging should be based on indigenous materials.
- (b) The internal pouch should be of materials completely impermeable to water vapour and oxygen.
- (c) The packs should be so designed as to minimise fragmentation of meat chunks and to avoid damage to the barrier pouch.
- (d) The pack should lend itself to the production line.

The use of flexible packaging for freeze dried foods has been previously experimented with by various workers. Shockley¹ came to the conclusion that transparent wraps, whether single films or laminates, are inadequate and that foil laminates are essential for packaging freeze dried foods. Syn and Luh² and Daoud and Luh³ experimenting on flexible packaging of specific freeze dried food products came basically to the same conclusion. Ward⁴ also suggested that only foil laminates adequately protect high fat content AFD foods, such as meat. Angel⁵ and Bowman⁶

expressed the opinion that foil based flexible pouch, provided with suitable carton, gave the most economic and efficient packaging for freeze dried foods. A rather heavy gauge (0.078 mm) foil laminate has been tried by the British Army and is currently in use by the Australian Army for packaging freeze dried meat bars^{7,8}. The U.S. Army has recommended⁹ a thicker gauge (0.088 mm) foil laminate for packaging freeze dried foods for troops on long range patrol. Collins and his associates¹⁰ found that fin-sealed bags enclosed inside cartons are preferable to gusseted pouches, as the latter show poor resistance to the permeation of oxygen and water vapour.

Recently Rai and Sharma¹¹ described transparent packaging materials, like high density polyethylene and cellulose film/polyethylene laminates and reported that foil based laminates are suitable for the packaging and storage of AFD meat. However, they have not reported the details regarding packaging materials and the method of pouch formation. Besides, they neither mentioned any tests to detect leaks in the pack nor did they report the oxygen content inside the pouch initially and on storage.

The present communication relates to the design and development of a light weight pack based on indigenously available flexible materials, to hold 400 g. of freeze dried meat, which meets the functional requirements mentioned earlier.

Materials and Methods

Foil laminate—The following laminates of aluminium foil are available from the industry:

- (i) 60 g. brown casing (BC) paper/0.02 mm.foil/polythene 150 gauge, adhesive (sodium silicate) laminated,

TABLE 1. PACKAGE PERFORMANCE TESTS

Particulars of test	Package particulars	Oxygen conc. (% by vol.) in packs	Remarks
1. Accelerated oxygen permeability in different pouch packs	(a) Pouch made from 60 g. BC paper/0.02 mm foil/polythene 150 gauge	0.75—16.0	All pouches had same dimensions; they were packed in the same manner with equal quantities of meat; initial oxygen conc. in packs, 0.5—1.0%.
	(b) Pouch made from 60 g. BC paper/0.04 mm foil/polythene 150 gauge	0.5—1.5	
	(c) Pouch made from 50 g. white paper/polythene/0.009 mm foil/polythene 150 gauge	16.0—28.0	
2. Gas retentivity of pouches made by two different methods	(a) Pouch formed on mandrel, collapsed and reopened for filling	18.0—19.6	Pinholes seen in most pouches, especially at corners.
	(b) Pouch crease marked without use of mandrel; opened for filling with easy opening device.	1.0—1.5	No visible damage in pouches.
3. Vibration test on finished packs	(a) Packs complete with liner and carton, containing 400 g. AFD meat chunks	1.5—1.75	No visible damage to pouch; initial oxygen conc. 1.0%; per cent fragmentation 2-3.
	(b) A 2- $\frac{1}{2}$ cans each containing 200 g. AFD meat chunks	0.8—1.0	Subjected to only 5 hr shaking; per cent fragmentation, 25—50.
4. Reduced pressure test (stored at 16 in. Hg. for 24 hr)	Packs complete with liner and carton, containing 400 g. AFD meat chunks	1.2—1.5	No damage to pouch or rupture of seal; initial oxygen conc., 1.5%.

(ii) 60 g. brown casing paper/0.04 mm. foil/polythene 150 gauge, adhesive (sodium silicate) laminated; and

(iii) 50 g. white paper/polythene/0.009 mm. foil/polythene 150 gauge, extrusion laminated.

To ascertain their suitability for packaging AFD meat, the following tests were carried out:

(a) *Accelerated oxygen permeability test*: Pouches made by a new technique (mentioned later), from indigenous laminates were filled with 400 g. of AFD meat chunks, flushed with nitrogen gas and sealed to give the final pack dimension of 29 × 14.5 × 5 cm. The oxygen concentration in about 50 per cent of these packs drawn at random was found to vary between 0.5 and 1.0 per cent by volume. Since the test is destructive, the remaining 50 per cent of the packs were subjected to the permeability test. The packs were placed in a drum, filled with oxygen gas under ambient conditions and stored for 4 days. During this period the oxygen concentration inside the drum was found to be 80-90 per cent. At the end of the storage period, the oxygen content inside the packs was determined using the Beckman Oxygen Analyzer (model 777). The results are shown in Table 1.

(b) *Resistance to folding and creasings*: Kohler-Molin Folding Endurance Test was carried out on the three laminates. A sample from M/s Atlas, Denmark (50 g. white glazed paper/polythene 12.15 g. per sq.m./foil 0.012 mm/polythene 40 g. sq.m.), stated to be suitable for packaging AFD meat, was also tested for comparison. The test was carried out at a constant

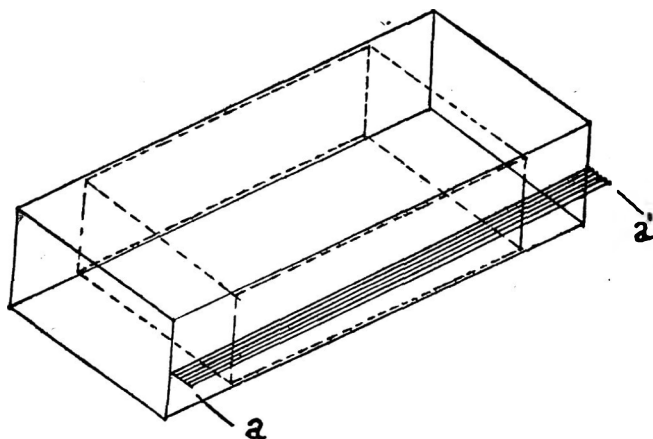
load of 800 g. on specimens 15 mm. wide × 90 mm. long at a speed of 200 double folds per minute. The number of foldings for rupture observed in these laminates are:

- (i) 0.04 mm. foil laminate, 35 (av. of 10 determinations)
- (ii) 0.02 mm. foil laminate, 41 (av. of 10 determinations)
- (iii) 0.009 mm. foil laminate, 43 (av. of 6 determinations)
- (iv) Sample from Denmark, 424 (av. of 6 determinations)

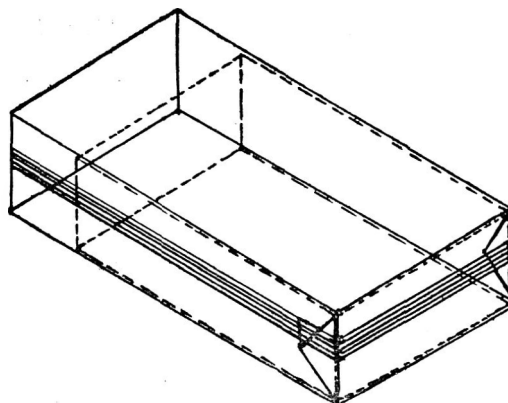
Three dimensional pouch: Three dimensional pouches with rectangular cross section and fin-seal seams were made by the following two methods:

(a) *Use of mandrel*: The pouch was made by wrapping it round a wooden mandrel of rectangular cross-section as illustrated in Fig. 1. In the first stage (1), a side seam was preferred to a centre seam. After giving a crease mark at each bend or fold and after forming the bottom and side seams by heat sealing, the mandrel was taken out and the pouch was flattened. The pouch could be reformed into three dimensional shape at the time of filling.

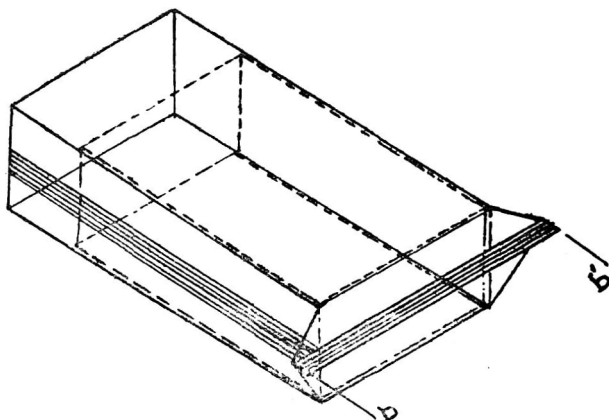
(b) *Without use of mandrel*: Pouches in flat form with bottom and side seams and crease marks exactly as above were made by a new technique (under patent) without the use of a wooden mandrel. The crease marks in this technique were made by a method similar to that used for creasing fibre boards for



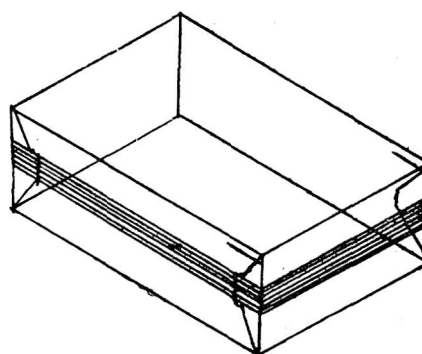
I. The inner pouch material is cut to size and wrapped over the mandrel as shown with the overlapping edges bent so as to bring their sealable surfaces in contact with each other. At this stage only the side seam (a a') is formed at the centre of one of the longer side surfaces.



III. The extended ears are folded over the longer side to give a flat bottom surface.



II. At this stage the bottom seam of the inner pouch is formed by bringing together the bottom edges of the pouch and heat sealing the overlapping surfaces in the centre of the bottom surfaces of the pouch, thus simultaneously giving two extended ears to the pouch (b b').



IV. The extended mouth edges of the top of the pouch are brought together as in Stage II. The overlap surfaces at the top provide the space for the third fin-seal seam with two extended ears. No heat sealing is done but the edges and the extended ears are bent to give crease marks only.

Fig. 1. Fin-seal pouch formation with wooden mandrel

making boxes and cartons. The pouches could be opened out mechanically into three dimensional forms with the help of a simple device.

After the pouch is filled with AFD meat the top could be flattened and heat-sealed to give a fin-seal top seam which is nicely folded on the pack (Fig. 2, 3 and 4) to give a neat geometrical shape. Pouches made from 60 g. BC paper/0.04 mm. foil/polythene (150 gauge) by both methods were packed with meat under nitrogen and stored under ambient conditions for one month. They were then tested for oxygen content and visible damage. The results are presented in Table 1.

Pouch lining and cartoning: To protect the pouch from abrasion and pin holing by the contents, a bleached grease proof 2-ply corrugated sheet paper was used as an inner liner with the plain surface facing the meat. A 2-ply corrugated sheet carton (suitably waterproofed) into which the packed and sealed pouch could be inserted was found both economical and satisfactory (Fig. 2, 3 and 4). Details regarding the liner and carton materials are given in Table 2.

Testing of finished pack: The following tests were carried out on packs (each containing 400 g. of AFD meat chunks) to determine the adequacy of packaging.

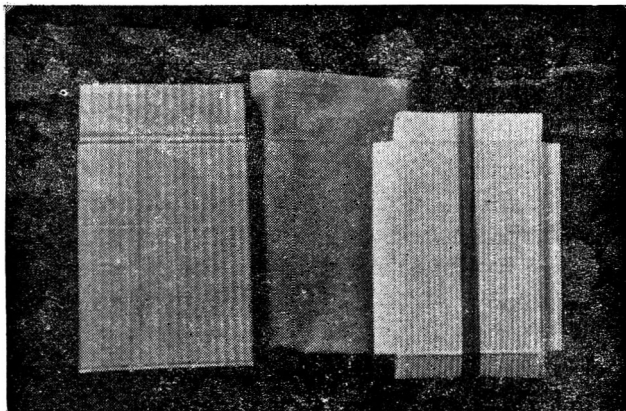


Fig. 2. Components of the pack (inner liner, inner pouch and outer carton)

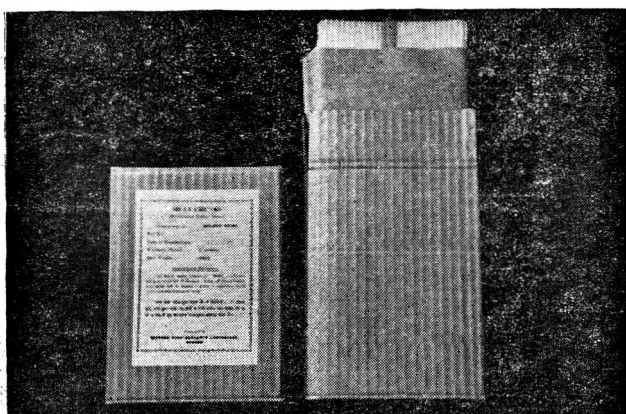


Fig. 3. The order of assembly and the finished pack

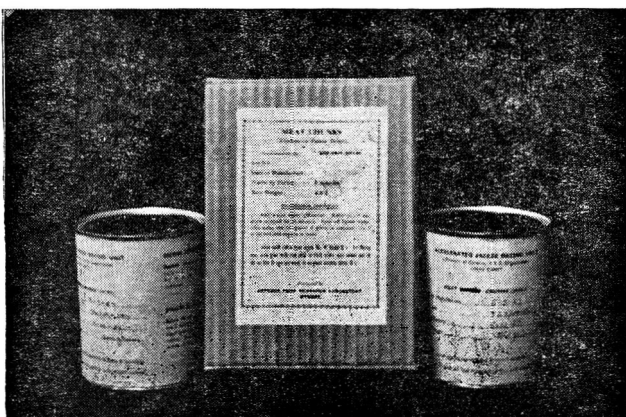


Fig. 4. Developed pack containing 400 g. AFD meat from two A 2½ cans displayed

(a) *Vibration test*: The packs were mounted in a horizontal shaker set to vibrate at the rate of 140 cycles/minute and subjected to vibration for 10 hours. At the end, the oxygen content of packs and the amount of fragmented pieces (i.e., pieces less than 0.5 cm. in length) and powder were estimated (Table 1).

TABLE 2: PROPERTIES OF THE TWO PLY CORRUGATED SHEETS USED AS LINER AND CARTON MATERIALS

Material	Type of flute	Basis weight (g/m ²)	Flat crush strength (kg/cm ²)	Breaking strength lb/inch	
				Plain sheet	Corrugating sheet
2 ply brown corrugated sheet (for carton)	'A'	195	1.170	MD-28 TD-18.8	MD-35 TD-31
2 ply bleached white, grease proof corrugated sheet (for inner liner)	'B'	108	0.200	MD-25 TD-9.1	MD-22.8 TD-14.6

MD — Machine Direction

TD — Transverse Direction

TABLE 3. ACCELERATED STORAGE TEST AT 37°C AND 95-100 PER CENT R.H. FOR 8 MONTHS

Package particulars	Oxygen conc. in pack (by vol.)	Moisture (%)	FFA (expressed as % oleic acid)	Peroxide value (in milli-equivalent of oxygen/kg. of fat)
Packs completed with liner and carton, containing 400g. AFD meat chunks	0.5-3.6	1.6-2.7	1.5-3.2	10.2-6.6

Organoleptic test—acceptable throughout

(b) *Storage under reduced pressure*: The packs were left under reduced pressure (16 in. of Hg.) for 24 hours in vacuum desiccators and then exposed to atmospheric conditions for a further period of 24 hours. The packs were then examined and the oxygen content inside the packs was determined (Table 1).

(c) *Accelerated storage test*: The packs were stored for 8 months in a humidity chamber maintained at 37°C and 95-100 per cent R.H. At intervals of 2 months, the packs were tested for oxygen content and the meat tested for acceptability by a panel of 4 judges; the moisture content, free fatty acids and peroxide value of fat were also estimated. The results are reported in Table 3.

Results and Discussion

Choice of a laminate: The primary criterion for the selection of a wrapping material to protect AFD meat for one year is its complete impermeability to oxygen and water vapour. Only aluminium foil laminates satisfy this criterion. The results in Table 1 show that among the available foil laminates,

only 0.04 mm. foil laminate is completely impermeable to oxygen. A separate test to determine impermeability to water vapour was not considered necessary.

The second desirable criterion for the suitability of a wrapping material is its flexibility. The 0.04 mm foil laminate is found to be rather stiff and lacking in appreciable resistance to folding and creasing. The Dutch sample, in contrast, gave a much better performance. For meeting the immediate requirements, however 60 g. BC paper/0.04 mm. foil/polythene (150 gauge) had to be selected on the basis of its impermeability to moisture and oxygen.

Three dimensional pouch: For thick and bulky products, flat pouches with heat sealed seams around edges are unsuitable and uneconomical. Gussetted pouches are in common use for this purpose. In the case of the selected foil laminate, however, a gusset pouch is unsuitable firstly because wrinkles will be formed while opening and filling the pouch, and secondly because the heat seal of seams having both four layers and two layers of the laminate is imperfect. Hence fin-seal flat pouches with rectangular cross-section were preferred. The method of making the pouch with the help of a mandrel is already in use, but the equipment which does this also fills and closes the pouch in successive¹² sequence. The results of the folding endurance test indicate that the pouch so made is not safe for use if it is collapsed and then reformed. Examination of pouches has revealed that pinholing, specially at corners results when pouches are collapsed and reopened. The method developed by the authors gives exactly the same type of collapsed pouch but avoids folding for imparting crease marks. No damage is done to the laminate when pouches are formed and opened by this method.

Suitability of finished pack—(a) Vibration Test: The vibration test simulates the effects of rail transport over a period of 2 weeks or so. Table 1 indicates that the inner lining and the carton give adequate protection to the foil laminate from internal damage. The pack also affords protection to meat chunks and very little fragmentation is noticed. The cost of pack compares favourably with that of cans, being about 75 per cent of the latter.

(b) *Storage under reduced pressure:* Storage under reduced pressure was carried out to test the stability of packs when subjected to air transport. Table 1 indicates that the packs withstand the effect of low pressure (16 in. Hg.) for 24 hr.

(c) *Accelerated storage:* Accelerated storage of AFD meat in the packs shows (Table 3) that meat remains acceptable to consumers throughout the storage period of eight months. The moisture content of meat did not exceed 2.7 per cent and the maximum oxygen content inside the pack was only 3.7 per cent. The meat did not develop any rancidity.

From our experience on storage studies of similar products, a shelf-life of eight months under the accelerated conditions of storage can be reasonably extrapolated to the shelf-life of a minimum of one year under operational conditions of storage.

Acknowledgement

The authors wish to express their grateful thanks to Shri N. L. Jain, Officer-in-Charge, AFD Unit, Delhi for the supply of AFD meat and to Dr V. Ranganathan, Deputy Chief Scientist, R and D Organisation, Ministry of Defence for his keen interest in the work.

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A Note on the Technique of Heat Processing of Foods in Flexible Pouches

Ready-to-eat foods like *chapaties*, *parottas*, *samosas* and cutlets if introduced in the Service rations especially for troops operating under extreme conditions will be popular. It has been reported that *chapaties*¹ and *parottas* incorporated with sorbic acid (0.48 per cent on the weight of wheat flour) kept well in pouches of aluminium foil based laminates for over six months. Flex-canning or inpack processing of many ready-to-eat foods in flexible packaging, based on polyamide, polyester or polypropylene either unsupported or as laminates with aluminium foil and polyethylene, is a recent technique^{2,3} and has been reported to be of potential civilian and military significance. This requires special types of autoclaves⁴ which use compressed air to equilibrate the pressure on either side of the pouches to prevent the bursting of the pouches. Since the special types of autoclaves and retortable packaging materials are not indigenously available, a new technique of heat sterilisation of ready-to-eat foods in flexible pouches of indigenous origin in conventional types of autoclaves is reported here.

Among the indigenous packaging materials, an aluminium foil based laminate* (60 g. BCP /foil 0.02 mm/polyethylene 150 gauge) was found to be quite suitable for in-pack processing by this technique. The technique consists of providing the flexible pouches containing the food with a small vent or opening about 2 cm diameter) in one corner and plugging the vent with cotton (Fig. 1). The pouches are then retorted in conventional autoclaves at a temperature of 121°C (15 lb./sq. in.) for 20 minutes and cooled. After cooling these are heat sealed just underneath the corner containing the cotton plugs which are then removed (Fig. 1).



Fig. 1. Flexible pouches (a) with opening, (b) opening sealed

* The laminate based on aluminium foil was supplied by M/s India Foils Ltd., Calcutta.

The advantages of this technique are:

- (i) Provision of cotton plug ensures equalisation of pressure inside and outside the flexible pouch thus preventing bursting of the pouches and thereby permits the use of conventional autoclaves and
- (ii) The cotton plug acts as an effective filter against bacterial contamination.

This technique of in-pack heat sterilisation has shown promise with several popular ready-to-eat foods of potential defence interest like stuffed *parottas*, *parottas*, *puries*, *samosas* and *masala dosai*. Stuffed *parottas* (based on potato curry) has been preserved (Table 1)

TABLE 1: ACCELERATED STORAGE OF IN-PACK PROCESSED STUFFED PAROTTAS

Period of storage	Acceptability (3 member taste panel)	Chemical data (range)			Remarks
		Moisture (%)	FFA (% oleic acid)	Peroxide value (Meq. O ₂ /kg)	
0-6 months	Very good and highly acceptable	50.51 to 52.24	0.23 to 0.24	4.32 to 5.13	After six months 60% packs sterile and maximum total plate count in other 100/g.

by this technique for a period of six months under accelerated storage (37°C; 95-100 per cent RH) and ambient conditions (21.1°-32.2°C; 32-72 per cent RH). The samples remained highly acceptable and no off-flavour or bitterness was reported.

Acknowledgement

We are grateful to Dr N. A. Nityananda Rao for helpful suggestions.

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Book Reviews

Laboratory Handbook for Oil and Fat Analysts: By L. V. COCKS AND C. VAN REDE, Academic Press, London, 1966, Price 90sh.

As the title of the book indicates, it is primarily designed as a laboratory handbook for oil and fat analysts to provide reliable and speedy analytical methods. At the same time specialists have contributed sections on recent techniques such as gas-liquid chromatography, thin layer chromatography, spectrophotometric and polarographic methods for determination of trace metals, mass spectrometry and nuclear magnetic resonance spectroscopy. Another section provides information on analytical characteristics and fatty acid composition, of the more common vegetable, animal and fish oils and fats. Topics covered in the other five sections include methods of analysis for oilseeds and nuts, cakes, meals and animal feeding stuffs; oils, fats, fatty acids and fatty alcohols; glycerol; analyses in connection with the extraction, refining, bleaching, hardening and other processing of oils and fats and fat products. Methods described are mainly those in practical usage in the Unilever Laboratories and may not coincide with other official methods like AOCS and AOAC. One has to bear this in mind while applying the methods.

The book should prove useful not only to oil and fat analysts but to others in the food field, since a wide range of topics are covered and the treatment is clear and precise. Each analytical method, for example, describes the principles of determination, reagents, apparatus, process, calculations and gives explanatory notes. The book is well printed and bound and adequately indexed.

M. KANTHARAJ URS

Fish Oils: Their Chemistry, Technology, Stability, Nutritional Properties and Uses: Edited by M. E. STANSBY, The AVI Publishing Co. Inc. Westport, Connecticut U.S.A., 1967, pages 440 + x, Price \$20.

The publication is a comprehensive treatise on fish-oils covering all important aspects namely chemistry, technology, stability, nutritional properties and uses. Excepting 'Marine Oils with Particular Reference to those of Canada' (Bulletin No. 89) edited by B. E. Bailly published in 1952 by Fisheries Research Board of Canada, there is no other comprehensive book worth mentioning on the subject. Furthermore the above

bulletin has been last revised in 1952 and since then, considerable research on new techniques has been published. There was a need for an up-to-date book covering all the latest information gathered during the last fifteen years and the present publication will go a long way to fill this gap.

The book is divided into six sections, each section consisting of a few chapters. Thirty-one different authors have contributed. Many of the authors (Banks, Dreosti, Lundberg, Malins, Olcott, Stansby to name a few) are renowned in their own field. The authors are from different parts of the globe (U.S.A., Norway, Denmark, U.K., Japan, Peru, South Africa), though the largest contingent of authors (eleven) has come from U.S. Bureau of Commercial Fisheries. Certainly it has been a difficult task for the editor to harness the knowledge of so many specialists of the world. On the whole barring a few omissions and commissions, the task has been achieved with credit. In a book of this nature certain amount of overlapping is unavoidable.

Section I—dealing with composition and analysis has five chapters; fatty acid composition, classes of lipids, general analytical methods, gas-liquid chromatography and chromatographic methods. In the chapter on general analytical methods the methods for analysing fish-oils for various oil-constants and other common characteristics are not described. The main emphasis is on the aspects like extraction, evaluation of flavours and odours and sensory evaluation methods.

Section II—(Separations and reactions of fatty acids) consists of three chapters: (i) fractionation methods, (ii) reactions of the carboxyl group and (iii) reactions of the ethylenic bonds. The area covered is quite vast but it lacks depth. Fractionation methods relate only to fatty acids or their methyl esters. Fractionation of tri-glycerides (solvent winterisation) has not been touched.

Section III—Stability and deterioration has four chapters: general deterioration reactions, deteriorative changes in fish oils, antioxidants and odours and flavours. The chapter on odours in this section could have accommodated the analytical techniques for odour and flavour described in Section I. The latest information on odours and flavours is presented here. But practical aspects of anti-oxidants and stabilisation have not received their proper share of discussion.

Section IV—(Production methods and utilisation) has seven chapters; three on production and processing and four dealing with uses. Special mention should be made of the chapters on the uses of fish-oil in protective coating and in margarine and shortening. But certain other uses of fish-oil (use of sardine oil in canning of fish in Norway or use of fish-oil in tanning of iron or steel) have not been mentioned. Importance of freshness in case of fish *vis-à-vis* fish oil should have been discussed. These are important omissions. In the five chapters dealing with nutrition (Section V), different authors have furnished most up-to-date information on fish oil as dietary fat, as source of essential fatty acids as a hypocholesterolemic agency and as animal feed. Nutritional value of polymerised oil (a very important problem with fish-oil) has been discussed. Polymerised oils have poor digestibility but are non-toxic.

The last section with five chapters, deals with fish-oil industry in different countries (North America, South America, Europe, Japan, South Africa and South West Africa). It is a pity that no mention has been made of fish oil industry in some geographical areas like USSR, India (sharkliver oil and sardine oil), China and other Asian countries.

Almost all the chapters have their own bibliography. Except for one printing error in the contents page (page IX), where 'Section IV—Production methods and utilisation' has been printed in place of 'Section II—Separations and reactions of fatty acids', the book is remarkably free of such mistakes.

In spite of the few omissions mentioned earlier it is a good publication and every fish-technologist should possess this book.

D. P. SEN

Biochemical and Biological Engineering Science, Vol. I:
 Edited by NORMAN BLAKEBROUGH, Academic Press, London, 1967. The University Press, Glasgow, 402 pages, Price 100 Sh.

This book is the latest addition to the general field of biochemical engineering and deals with the following subjects. Aspects of microbiology (K. R. Butlin), Industrial fermentation (N. Blakebrough), Aerosol filtration by fibrous filter (S. K. Friedlander), Agitation and aeration (R. K. Finn), Mass transfer in fermentation equipment (P. H. Calderbank), Fermentation process kinetics (R. Luedeking), Recovery of fermentation products (R. Hutt), Finishing operations (W. C. Peck), Effluent disposal (J. W. Abson and K. H. Todhunter) and Sedimentation and flocculation in effluents treatment (R. F. Wills). The book thus

covers all aspects of biochemical engineering. Important references are included at the end of each chapter.

In the opening chapter basic concepts of microbiology are dealt with and in chapter 2 the fundamental concepts of fermentation process in industrial fermentation are discussed. In chapters 3 and 4 operations like air filtration, agitation and aeration, typical of an aerobic fermentation process, are described. Mass transfer and kinetics in fermentation process have received the right attention in the chapters 5 and 6. The theoretical and practical aspects of operations like filtration, solvent extraction, adsorption, crystallization, applied in product recovery have been described taking as examples penicillin and streptomycin. The finishing operations like drying, size reduction, granulation and tableting are essential steps in any processing. Equipment for these operations have been mentioned in detail with photographs of many equipments in chapter 8. Biological disposal of sewage and industrial effluents is one of the important areas of biochemical engineering. Chapter 9 and 10 have discussed the principles, methods and cost of such treatment in detail. The legal aspects of effluent disposal are also touched upon.

Volume I has been devoted to the understanding of physical factors and relates them to biological processes. However, not much emphasis has been placed on scaling up of fermenters and media sterilization. Moreover, worked out problems have not been included by way of examples in any of the chapters. The book is precise and easily understandable. Although the book is primarily intended to be used for post-graduate students and research scholars, it may still be used as an excellent text book for under-graduate students in biochemical engineering.

SUNIT MUKHERJEE

Review on Recommended Conditions for Cold Storage of Perishable Produce: International Institute of Refrigeration, (2nd Edition, 1967), Price \$ 2.50.

This book serves as a ready reference to all those who are directly or indirectly associated with cold storage industry, specially to those in the fresh produce trade.

The introduction is too general in the sense that the book has listed recommendations on general principles. The book should have cited a few examples of how the optimal or expected storage life of fruit and vegetable is judged and the various criteria, such as wastage, loss in weight, loss in quality, etc., employed in judging the expected cold storage period of a commodity. The book should have defined the normal practices employed in deciding the expected or optimal

storage life of the commodities. The book has listed the optimum cold storage period of various fruits and vegetables which are stored within 24 hours after picking. In a country like India, where the fresh produce is transported at tropical temperature from the producing areas to various major markets situated far away, where they can be cold stored, it will be necessary to know the maximum time admissible between picking or harvesting and storage. It is necessary to impress upon the produce industry the benefits of prepackaging and proper packaging techniques before the produce is cold stored. This book has dealt with aspects like storage temperature, relative humidity, air circulation, ventilation, packaging and stacking, volatile substances, hygiene and condensation in very general terms. Duration of the storage of commodities is worked out depending upon their ability to ripen normally after removal from cold storage. The book has listed in the table optimum cold storage temperature in °C and °F; relative humidity, expected storage life with remarks for quite a large number of fruits and vegetables. In addition to above, the book has included variety-wise the optimum cold storage life of apples and pears with and without controlled atmosphere or gas storage. The information with regard to *Alphonso* mango, green tomatoes and onions from India need to be revised in view of the recent studies carried out by C.F.T.R.I.

The note on the storage of mixed varieties has thrown light on the disadvantages of storing together several kinds of fruits and vegetables for long periods, however, short time storage may be worthwhile. Specially, in ships, with one cold room and requirement of storage of fresh produce does not exceed 22-30 days, a compromising low temperature (low temp. above the optimum temp. of the commodity) such as 55-60°F suitable for storing together several kinds of fruits and vegetables may be found. The storage life of commodities at the compromising low temperature need to be worked out for the benefit of those who have one cold room to depend upon.

The tables on heat of respiration for various fruits and vegetables give important information which is directly related to the storage life of the commodity at that temperature. The fresh fruit and vegetable is a living entity and its storage life is directly proportional to the heat of respiration. Important information relating to chilling injury and freezing temperatures of several fresh fruits and vegetables is also available in this book. On the whole, the book deals with the required cold storage temperature and the expected storage life of fruits and vegetables and includes separate chapters on meat, poultry and eggs; fish and crustacea and dairy products. Among the mis-

cellaneous items included are cocoa beans, coffee green, olive oil, etc., and various cut flowers whose optimum cold storage temperature and expected storage life are listed.

There are still gaps to be filled after more information is collected on fruits and vegetables which are usually transported by rail/road over a long distance involving more than 24 hours before they are cold stored at the marketing centres. The expected storage life at their respective optimum cold storage temperature after transportation and exposure over 24 hours to tropical temperatures need to be worked out. The book is very informative and deals in general with storage life of cold stored commodities. The readers who are seeking practical solutions, for optimum cold storage temperature and the expected storage life of fruits and vegetables and other commodities like meat, fish, poultry, eggs, cut flowers, etc., will find it very interesting and useful.

V. B. DALAL

Tree Nuts—Production, Processing, Products. Vol. I: by J. G. WOODROFF, the AVI Publishing Company Inc., Westport, Connecticut, U.S.A., 1967, pages ix + 356, Price \$ 19.50.

Woodroff's book on 'Tree Nuts' has now made available, knowledge about the production, processing and products of the more popular tree nuts in a convenient book form. This is perhaps the only book in English on the subject which is so comprehensive and authoritative. Although it is primarily devoted to the American nut industry, it does give detailed information about the almond industry in Spain and Italy.

The book contains 12 chapters and 4 appendices. The appendices are on U.S. Standards for Grades of shelled almonds, almonds in the shell, Brazil nuts in the shell and Filberts in the shell.

Chapter I gives an interesting description of the tree nuts of the world which includes their uses, history, consumption, cultivation and the status of the individual nuts.

Eleven kinds of tree nuts have received major attention, viz., almonds, Brazil nuts, cashew nuts, chestnuts, filbert and Macademia nuts, pecans, pine-nuts, pistachio nuts, black walnuts and English walnuts. The following six nuts have been discussed but given less attention: apricot nuts, beechnuts, butternuts, chinquapins, heartnuts and hickory nuts.

Of particular importance to the tree nut industry of India is the chapter on cashew nut. Although this is one of the shortest chapters in the book, containing only thirteen pages, it gives valuable information about India's control over the cashew nut industry

of the World. A point to reckon with, is that although India is the largest exporter of cashew nuts, she is not the largest producer. East Africa is the largest producer.

India imports raw cashew nuts in the shell, then shells, packs and exports the nuts. About ninety per cent of African production of raw cashews is imported by India. The book does not mention what difficulties East Africa encounters in operating processing facilities which makes it necessary for her to export raw cashews.

Factors influencing the quality and quantity of tree nuts are discussed for each kind of nuts under varieties, soils, climate, culture, pest control, harvesting methods, storage facilities, methods of shelling and grading, containers and manufacturing procedures. Recipes for using nuts in the home and public eating places are included. The information is further substantiated by elaborate tables and pictures of the latest equipment used in the industry.

The book will be of great use to those who grow, harvest, store, import, export, process or manufacture products from nuts. It will also be useful to teachers, researchers, and co-operative extension workers. The information is applicable to horticulturists, food scientists, human nutritionists, and to those in related fields.

W. B. DATÉ

Vitamin C in the Technology of Cereals (La Vitamina C nella tecnologia dei cereali) (in Italian language), DR ENG. LJUBOMIR MILATOVIC, Tecnica Molitoria, Pinerolo, Italy, 1967, pages 170, 68 illustrations, Price \$6.

In this study, the author presents the uses of vitamin C, in the preparation of bread, paste goods and 'Panettoni' (fruit cakes) technologies. The book is divided into four parts.

In the First Part the bibliographic data on the application of L-ascorbic acid in bread making technologies is presented. The chemistry of L-ascorbic acid, its use in the bread making; the chemistry and

physics of flour; and the effects of L-ascorbic acid on dough are discussed.

In the Second Part, the author presents the results of his own investigations on bread quality, made both in Italy and in Yugoslavia.

According to the author in bread making, the addition of L-ascorbic acid to such flours, in amounts ranging from 3 to 6 mg per cent, improved the stability, physical properties of the dough, the bread volume, the crumb porosity, and the general aspect of the bread.

The author concludes that the application of vitamin C should be combined with rheological flour testing in bread making technology, regardless of the bread making process adopted.

The third part of the book is devoted to the effect of L-ascorbic acid on organoleptic culinary and biological values of paste goods. It is reported that vitamin C influences positively the retention of pigment matters in paste goods, and that it forms a colour of non-enzymic origin (Maillard reaction) and decreases the disintegration of paste goods during boiling.

The technological aspects of the use of vitamin C in paste goods industry and the methods of evaluation of the products are well documented. The book will be of much use to technical experts working in the flour producing and processing industries.

Books Received

1. *Biology and the Manufacturing Industries*, Edited by M. Brook, Academic Press.
2. *Selenium in Biomedicine Symposium*, Edited by O. H. Muth, AVI Publications.
3. *Fundamentals of Food Processing Operations*, J. L. Heid and M. A. Joslyn, AVI Publications.
4. *Carotenoid other than Vitamin A—International Symposium*, Butterworth & Co.
5. *Biochemistry of Some Food Borne Microbial Toxins*, Edited by Richard I. Mat and Gerald N. Wogan, MIT Press.

Proceedings of the Fifth Dairy Industry Conference Held at Hyderabad

The Fifth Dairy Industry Conference was organized at Hyderabad, Andhra Pradesh, during February 5-8, 1968 under the auspices of the Indian Dairy Science Association. Approximately 400 delegates, representing Government, scientific institutions, dairy manufacturing industry and milk producers attended the conference.

The Chief Minister of Andhra Pradesh, Shri K. Brahmanand Reddy, presided over the inaugural session of the conference. The Union Minister for Food and Agriculture, Shri Annasahib Shinde, delivered the inaugural address. The Minister reviewed the progress of dairy development during the last two decades and emphasized the need for a rapid increase in milk production to meet the demands of the growing population and in particular the vulnerable section of the society. He suggested that attempts should be made to rationalise milk production and its proper utilisation, with accent on remunerative price to the producer farmer. He pointed out that it is possible to increase the average milk production of our cattle to 5 litres a day per animal by judicious herd development programme through progeny testing, artificial insemination and cross breeding.

Dr Iya, President of the Indian Dairy Science Association, in his introductory talk remarked that out of 20-22 million tons of our annual milk production, less than 4 per cent passed through organized dairies in the country. In order to channelise more milk through organised dairies, there was a need to set up at least 1000 dairies in townships with a population of 20,000 and more. This problem of starting new dairies was closely linked with procurement of surplus milk from villages, which were now cut off from the cities due to inadequate transportation facilities and milk collection agencies. Dr Iya said that one of the most vexatious problems of the dairy industry was the large number of cattle, which was responsible for the low productivity, small profit margins for the farmer and low milk availability to consumer. He hoped that the newly constituted high power committee on cow protection will carefully weigh all the pros and cons of the situation and will give the right lead to establish dairying on sound economic foundations without which the industry will have a very bleak future.

The main theme of the conference was 'More milk to more people through organised dairies'. Shri Tribhuvandas Patel, Chairman of the Kaira District Co-operative Milk Producers' Union Limited, Anand, discussed the achievements and goals of the intensive cattle development project in Gujarat area. The talk was followed by critical appraisal of progress of I.C.D. projects in the country by Dr P. Bhattacharya the Animal Husbandry Commissioner. Though the impact of these programmes was evident, it was felt that more intensive inputs were needed to realise the full benefits from the programmes. The degree of implementation of the programme in different projects was not the same due to various factors, namely inadequate finance, unremunerative prices and insufficient outlets for the milk, lack of trained personnel, insufficient attention paid to the education of the farmer and lack of close contact between the dairy plant and the milk producer. There was unanimity of opinion that cross-breeding with exotic cattle should be implemented rapidly with a view to increasing milk production quickly. It was agreed that there was a distinct place for the buffalo and the efforts to improve the milk yield of the buffalo should continue. It was also agreed that unless surplus uneconomic cattle could be eliminated, the progress of the Intensive Cattle Development Programme would be seriously hindered.

Shri A. K. Roychaudhari, Milk Commissioner, West Bengal presented a paper on 'Problems of handling losses in the dairy plants' and Shri N. S. Dave of Delhi Milk Scheme discussed the various factors involved in plant operations, efficiency, personnel management and overall economics of dairy plants. The handling loss in an organised dairy plant was reported as 1.9 per cent by Shri Roychaudhari and was attributed to breakage of bottles, non-delivery and delay in erection of dairy equipment, indiscipline in plant work and increased cost of consumable article. These losses were 0.4 to 0.5 per cent under conditions existing in New Zealand and it was generally felt they were very high in Indian dairies. In view of the opinion expressed by the various participants, it was recommended that norms based on data collected under actual operation conditions and on objective basis should be established for losses of milk during different

stages of handling in plants of different sizes by a special study group constituted by the Indian Dairy Science Association. This will result in evolving a suitable standard for fixing the losses incurred in the handling of milk. It was felt that training of personnel operating the plant was necessary to enable increase in efficiency. Welfare amenities to staff should be provided and strict vigilance on plant operations must be ensured. The conference recommended that the purchase price of milk paid to producers should be based on a realistic appraisal of the cost of production to allow a margin of profit. Since the cost of packaging and distribution is the most important factor for fluid milk supply, it was suggested that all related aspects of this factor including the use of single-service containers and plastic containers should be studied.

Dr N. N. Dastur introduced the topic of 'Production of indigenous dairy products in organised dairy plants' and presented a paper on demand, consumption and role of indigenous dairy products in dairy industry. He surveyed the pattern of utilization of milk in the production of ghee, khoa, butter, ice cream and other products. Though the indigenous products play an important role in country's dairy industries, the present day dairy development programme took very little notice of the traditional industry. It was now desirable to have new thinking and encourage dairy plants handling surplus milk to meet the demand for indigenous products. Prof. Michael Halse of the Institute of Management, Ahmedabad discussed the managerial

approach in deciding the place of traditional milk products in a modern dairy. He elucidated the problem by presenting the data collected at Surat District Co-operative Milk Producers' Union. He pointed out that there was an important traditional product market in the area of operation of most modern dairies'. The plan of action for production of traditional products should be based on study and analysis of the market. The traditional products have good demand and it should be the function of the dairies to make them available to people with better quality, better service and at lower prices. Shri M. R. Srinivasan, discussed the various aspects of the technology of Western and indigenous milk products and feasibility of introducing them in modern dairy for the benefit of the consumers.

There were two scientific sessions in which more than 70 research papers were presented by research workers in the different disciplines of dairy science.

The highlights of the Dairy Industry Conference were a talk by Sir Richard Trehane, Chairman, Milk Marketing Board for England and Wales, and a paper presented by Mr S. J. Cowen on behalf of Mr J. W. Stichbury, Director of Herd Improvement, New Zealand Dairy Board on 'Improving the efficiency of milk production at the farm level'.

The Conference concluded its sessions on 8th February 1968 after a Plenary Session at which the general resolutions on various topics were approved for taking further action.

Notes and News

Flavour Potential of Milk Fat

Food flavour is a complex of at least three factors: aroma, taste and texture. These are often modified by other factors like colour, sound and previous experience. The flavours of dairy products are diverse and what is *sine qua non* of one product may be highly distasteful in another e.g. the methyl ketones of blue cheese are undesirable in fresh cream or the low molecular fatty acids so essential for cheddar flavour spoil the flavour of fresh beverage milk. Fresh milk is devoid of flavour and its slight olfactory character is attributed to such low molecular weight compounds as acetone, acetaldehyde, methylsulphide, traces of C₄-C₁₀ fatty acids, methyl ketones and lactones. The major flavour sensation in fresh milk is ascribed to its tactile effect and its pleasant feel in the mouth, mainly because of its emulsion and colloid structure. Milk fat has a very high flavour potential as it can undergo various oxidative and non-oxidative changes. Microbial metabolism can also produce an array of flavours. Oxidized flavours have been described by various descriptive terms like cardboard, painty, fishy, grassy, metallic, fruity, etc. Many of the compounds responsible for these flavours have been identified and have been shown to produce these even in minute levels (0.0005 to 1.2 p.p.m.). Some compounds are additive in nature. Most of these compounds are undesirable but one compound cis-4-heptenal produces a creamy flavour and is used as a flavouring agent.

The non-oxidative changes in milk fat arise from the hydrolysis of enol-ether linkages in the triglyceride fraction of milk which constitutes 98 per cent of the fat. These yield long chain aldehydes which impart a waxy flavour. The methyl ketones and lactones occurring in heated milk fat, often impart very desirable flavours in pastries and confectioneries prepared out of butter fat.

The flavour potential of milk is affected by many factors like diet, breed and stage of lactation of the cow and the season. These factors are under study.

Methyl ketones which are present in all heated or concentrated milk products are responsible for some of pleasant flavours; but excess of these are responsible for abnormal and undesirable flavours. Similarly homologous series of lactones which are also produced from precursors, on heating of milk. These are also responsible for the desirable flavours in beverage milk

or in confectioneries but not in other dairy products.

The mechanism of the biosynthesis of these compounds has attracted considerable attention and factors which influence the content of these and their precursors are under study.

J. E. Kinesella, S. Patton and P. S. Dimick, *J. Amer. Oil Chem. Soc.*, 1967, **44**, 449.

Fish Protein Concentrate for Humans

A large scale test, using fish protein concentrate as a food additive for human consumption, will be carried out in the near future, following the delivery of 100 kilograms of the concentrate to Ethiopia by the manufacturers—A. B. Astra, the Swedish drug company.

The concentrate (often known as fish flour) is said to be soluble in water and can be utilized in a similar way to powdered milk. The company says it contains 83 per cent full value protein and 13 per cent mineral substances.

Canadian Food Industries Journal, January 1968, Vol. 39, No. 1.

Shrinkable Bag by Union Carbide

A new PVC casing with shrink properties is now available from the Food Casing Division of Union Carbide Canada Limited. Marketed under the name Visking-Krehalon, it will be used in the meat packing industry for packaging smoked meats, loaf and sausage items.

Visking-Krehalon is produced in five thicknesses for specific applications, and is easily converted into bags. After the product has been inserted into the package, a vacuum is pulled and the package is immersed in hot water or run through a steam tunnel where film is shrunk tight onto the product.

The surface properties of the new film ensures excellent print reproduction in up to four colours. Converting and printing is done at the company's Lindsay, Ontario plant.

Canadian Journal of Food Industries, January 1968, Vol. 39, No. 1, p. 45.

Kidwai Memorial Prize

Six scientists have been awarded the Rafi Ahmed Kidwai memorial prize for agricultural research during

1965. The awards were announced by the Indian Council of Agricultural Research on 21 March 1968.

The six scientists are:

Dr S. S. Bains, Head of Division of Agronomy, Indian Agricultural Research Institute, New Delhi (for Agronomy), Mr A. M. Michael, Associate Professor of Agricultural Engineering, Punjab Agricultural University, Ludhiana (for Agricultural Engineering), Dr J. S. Kanwar, Deputy Director-General, Indian Council of Agricultural Research, New Delhi (for Agricultural Chemistry). Dr H. D. Srivastava, Head of the Division of Parasitology, and Dr S. C. Dutt, Helminthologist, both of Indian Veterinary Research Institute, Izatnagar (for Animal Diseases), and Dr Pushkaranath, Director, Central Potato Research Institute, Simla (for Agricultural Botany).

Dr H. D. Srivastava and Dr S. C. Dutt will share the prize money equally.

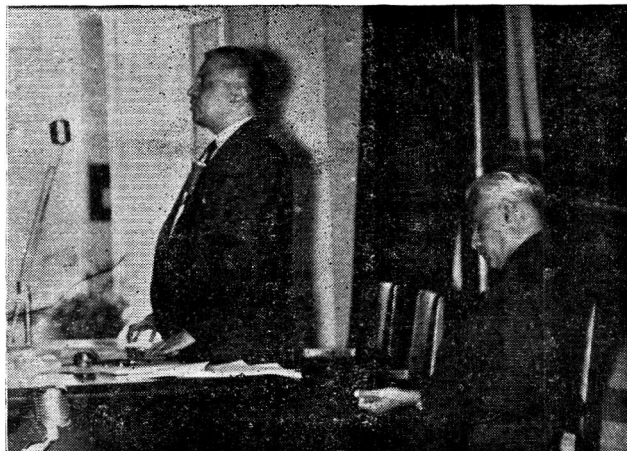
White Pepper

India is exporting about 20,000 tonnes of black pepper annually, and the market has reached a saturation point. Any further increase in exports of pepper can be achieved only by making white pepper. Americans use this in light coloured sauces and salad dressing, mayonnaise, cream soup, etc. In Europe, however,

white pepper is traditionally preferred to black pepper for household and restaurant use. White pepper fetches up to about 40 per cent higher price than black pepper and its estimated demand is about 15-20 thousand tonnes. The traditional home of white pepper is Indonesia and Malaya. Pepper is allowed to ripen on the vine and then retted in water for a day or two. The skin is rubbed off and what remains gives white pepper on drying. Harvesting methods in India are different, and our growers cannot be persuaded to wait till the ripening stage. Fruits easily drop off and birds eat away plenty. Researches conducted at C.F.T.R.I. have shown that even fully matured green pepper can be processed to give white pepper. The skin can be softened by either boiling in water for 10-15 minutes or retting in deep tanks for 6-8 days. The material is then passed through a fruit pulping machine to remove the skin and, after treatment with a little metabisulfite, dried. The yield of white pepper from fully mature green pepper is about 25 per cent, as against 33 per cent of black pepper. The loss in weight is compensated by the higher price white pepper commands. Also, some pepper oil can be recovered from the wastes. The white pepper produced by this process has been adjudged to be even better than many well known commercial samples.

Association of Food Technologists (India)

Report of the Annual General Body Meeting of the Association of Food Technologists held on 31-1-1968 at the Central Food Technological Research Institute, Mysore



Dr Iya addressing the meeting

The meeting was attended by over 125 members and was presided over by Dr K. K. Iya, the President of the Association. The President requested Dr H. A. B. Parpia, Director of C.F.T.R.I. and the past-President of the Association to address the members. Dr Parpia, dealt with the agricultural and post-harvest losses in major food crops produced in India and made an emphatic appeal to strengthen the activities of the Association and thus make the country self-sufficient in food.

In his Presidential address Dr K. K. Iya after welcoming the delegates to the General Body Meeting gave a detailed account of the various animal resources of food and the problem of effective control of uneconomical cattle population in the country. He presented valuable statistical data relating to cows, poultry, goat, sheep and fish and appealed to all the members to view the problem of animal production from a scientific point and help in solving the problems.

The Honorary Executive Secretary (Dr T. N. Ramachandra Rao) then briefly indicated the activities of the Association for the year under review. The Association played an active role in organising the International Symposium on Protein Foods and Concentrates, held at Central Food Technological Research Institute, Mysore during the months of

June-July 1967 and also participated in the Symposium on Dairy Refrigeration at Kanpur. As in previous years a large number of Technical Seminars by eminent scientists who visited Mysore were arranged.

He reported that the National Institute of Sciences of India had made a gracious gesture by granting a sum of Rs 500 this year, towards the publication expenses of the Journal of Food Science and Technology.

The Hony. Treasurer (Sri C. P. Natarajan) presented the balance sheet for 1967 and the budget estimate for 1968. He stated that the financial position of the Association was very much improved. During the year 79 new members had joined, in addition to several life members. The number of subscribers to Journal both in India and abroad had increased.

The General Body Meeting discussed at length, the two resolutions recommended by the Executive Council; the first relating to the change in Bye-Laws about the election of Hony. Joint-Secretary and the Hony. Executive Secretary and the other relating to the nomination of the Editor of the Journal for a period of not less than three years. At the end of the discussion the following resolutions were passed for adoption, by the General Body.



Sri C. P. Natarajan, Hon. Treasurer presenting his report



Dr Amla addressing the meeting

I. *The Joint Secretary will be elected every year. On completion of his term of one year, he will automatically become Hony Executive Secretary and will continue in that office for one year.*

There will be no election for the post of Executive Secretary.

In view of the above, it is proposed that the present Joint Secretary, Dr B. Panda be continued as Hony Executive Secretary for the year 1968 only.

II. *The Chairman of the Publication Committee and the Editor shall be nominated by the Executive Committee for a period not less than 3 years.*

The other points raised during the discussions related to the necessity for a written report by the Hony Executive Secretary being submitted with the agenda papers for discussion, maintenance of separate accounts for Journal expenses, procedures for intimation of resignation and acceptance of renewals. At the suggestion of the President the resolutions relating to Postal Ballot and Corporate members were taken up and it was decided that these should be sent for wide circulation for eliciting opinion of the members.

Introducing Dr B. L. Amla, the President for 1968, Dr K. K. Iya, the out-going President gave a brief

account of the academic attainments and Industrial Experience of the new President. Dr B. L. Amla then briefly traced the development of the Science of Food Technology. He appealed to all the members to strengthen the Association and its activities.

The Gardner's Award for the best research papers published in the Journal of Food Science and Technology during the years 1965 and 1966 were presented to the following authors:

1965: *Dr H. S. R. Desikachar, Sri S. N. Raghavendra Rao and Sri T. K. Ananthachar.*

1966: *Sri B. S. Ramachandra, Sri S. Ranganna, Sri L. S. Subba Rao and Dr S. S. Kalbag.*

With a vote of thanks to the Chair the meeting came to a close. Elections were held soon after and the list of newly elected office bearers for the year 1968 is given below.

President Elect (1969)	Dr P. K. Vijayaraghavan
Vice-President (HQ)	Sri C. P. Natarajan
Councillor (HQ)	Dr H. A. B. Parpia
Hony Executive Secretary	Dr B. Panda
Hony Treasurer	Sri S. C. Bhattacharjya
Hony Joint Secretary	Dr M. Narayana Rao

T. N. RAMACHANDRA RAO,
Hony Executive Secretary

The Executive Council of the Association of Food Technologists in its meeting held on 21st March 1968 passed the following resolution.

'The Executive Council appreciated the valuable contribution made by Shri M. R. Chandrasekhara for bringing up the A.F.T. Journal to the high standard that it enjoys today. Therefore, Shri M. R. Chandrasekhara, Scientist, C.F.T.R.I., was unanimously nominated for the Editorship of the A.F.T. Journal for a period of three years starting from 1968.

Address Delivered by Dr K. K. Iya, Retiring President at the General Body Meeting of the Association of Food Technologists

The population of India is approximately 520 million and has been steadily increasing. The agricultural production, on the other hand, is not keeping pace with the growth rate of the population. The land suitable for cultivation is deteriorating through floods, erosion and other natural calamities besides poor management practices. Further the pressure on our land resources is very great because of the problem of feeding cattle and other livestock population estimated at over 400 million, in addition to the human population. The Food Technologist is, therefore, faced with the problems of minimising competition between humans and animals for the produce of limited land, and conserving the food produced to the maximum extent and ensuring the full utilisation of it through modern technological processing and exploiting new sources of food to increase the quantitative and qualitative availability of food for man.

The production of cereals and pulses can be raised by intensive cultivation of high yielding varieties and multiple cropping programme. Even though vegetable foods can provide proteins of satisfactory nutritive value, it has been found necessary to include animal protein foods in a wholesome appetising and complete diet. According to the 1961 census, 62 per cent of Indian population was non-vegetarian and it was expected that this would further increase with industrialisation, spread of education and with improvement in standards of living. This in turn would lead to substantial increase in the demand for livestock products like meat, eggs, fish, etc.

The population of some important livestock as revealed by the 1961 census is given below:

Species	No. (in millions)
Cattle	175.56
Buffalo	51.21
Sheep	40.22
Goat	60.86
Pigs	5.16
Poultry	114.25

According to the Nutritional Advisory Committee, a balanced diet should contain among other food items a minimum of 10 oz. milk, 3 oz. meat and fish and 1 egg

per day. However the present position about the availability of these protective foods is very poor. Available data reveals that an average Indian is underfed both with regard to quantity and quality. Among the different animal products, the consumption of meat is about 3-4 g. per person. The fish consumption in India is 1/5 and milk is 1/4 of that of well fed western countries. This dietary deficiency of animal protein particularly in the case of lower income group is reflected in retarded growth of children, poor physique and health of the adult, low resistance to disease and low working efficiency.

Cattle and Buffalo Breeding

The cattle population in India is approximately 20 per cent of the world cattle population and should actually play an important role in the agricultural economy. It should be able to supply milk, meat, hides, skins and organic manure and should serve a source of draught power for cultivation and rural transport. The vast majority of Indian cattle and buffaloes are, however at present of a non-descript type with low milk production and poor breeding efficiency.

The available supply of milk in 1965-66 was approximately estimated at 24.5 million tons and could supply only 5.75 oz. milk *per capita* per day. This has resulted in operating the existing milk and milk products plants at below 50 per cent of their handling capacity. It is therefore apparent that the milk production has to be rapidly increased. In order to achieve this objective, more emphasis should be placed on the development of specialised high producing dairy cattle and buffaloes in all milk shed areas by cross-breeding with exotic breeds on a large scale, and by suitable developmental programme for improving livestock through proper feeding, management and disease control. If we constituted a milk herd on a nationwide basis and registered animals yielding 5 litres of milk/day or more we would need only 48 million cattle (32 million in milk and 16 million replacements) as against 75 million we are carrying today. This smaller number can be fed and looked after much better. This will eventually help in producing the optimum requirement of 10 oz. of milk and milk

products per head per day. Simultaneously there is also an urgent need for increasing the number of organised dairies say at least 3 milk supply dairies per District or in the aggregate 1500 dairies, as against today's 150 plants, each handling 1000-2000 litres of milk.

Due to the imposition of ban on slaughter of cattle, the number of wild and stray cattle is increasing at a very rapid rate. These cattle cause considerable damage to standing crops in rural areas and are a general nuisance. Even though the stray and unproductive cattle are sent to *gosadans*, they are still parasites on productive land, which could otherwise be utilised for human food. Due to the food habits and religious dogmas, it is rather unfortunate that the meat cannot be utilised and there is a considerable loss of this important food item.

Sheep and Goat

One of the basic sources of meat is the sheep population of India. Sheep supply annually 145,000 tons of meat and 35,000 tons of wool. Further 15.3 million sheep skins are utilised by leather industry annually. Unfortunately, the potentialities of raising mutton breeds of sheep on commercial basis have not been fully exploited. The average meat production of Indian sheep is 10 kg. as compared to about 20 kg. per sheep in foreign countries. Limited studies have been conducted in Maharashtra, Andhra Pradesh, Madras and Himachal Pradesh on improvement of sheep by cross breeding with exotic breeds such as Merino and Rambouillet. The major portion of Indian wool is of coarse quality and is not suitable for high grade apparel. Due to the shortage of foreign exchange, it has now been felt necessary to improve the quality and quantity of wool in the country and also to increase the export of raw wool, carpet and rugs to earn foreign exchange.

The goat population in India is about 60.86 million and is a major meat producing animal in the country and is also a valuable source of milk particularly for the economically weaker sections of the population. In spite of the important contribution goat makes towards meat and milk production, very few attempts have been made to exploit this animal and there is a need for intensification of research work in developing breeds for meat and milk production.

The development of piggeries has not made much progress in India compared even to goat and sheep. Pigs are maintained by poorer classes of people and are raised on waste, garbage refuge, etc. Efforts have been made by certain organised factories to provide incentive for raising pigs and Government have also set up intensive breeding programmes and bacon factories.

More piggeries should be established on organised basis to utilise this important food item and research activities should be intensified to develop cheaper substitutes for pig feed in order to conserve human food.

The present production of meat is only one per cent of the total requirement and that too is not properly utilised for want of adequate refrigeration, storage and processing facilities. At present only about 2.500 tonnes of processed meat is produced in organised meat packaging plants in the form of ham, bacon, sausages, canned meat, etc. The total meat production is about 513,000 tonnes and is much below the target of 10 million tons required by the population. This target can be achieved only by developing suitable breeds of sheep, goat and pigs and increasing their number. This will help augmenting food production and will reduce the present demand on cereals.

Animal by-products

Apart from meat, the animal by-products have a tremendous bearing on increasing the national income of the country. It is estimated that 18 millions of fallen carcasses of large animals are available annually, but most of them are not properly utilised. Usually hides and bones are collected, while other by-products like meat, fat, horns and hoofs particularly of cattle are allowed to go waste. The hides obtained are often found defective due to faulty methods of flaying and curing adopted by the trade. It is estimated that the net annual loss due to bad flaying, curing and non-utilisation of by-products is about Rs 27 crores. This can easily be avoided by modernising the slaughter houses and providing facilities for utilising slaughter house by-products. The Central Leather Research Institute has developed techniques for the manufacture of animal casings, guts, sutures, etc., for which there is a good market in Japan, Spain and West Germany. We can no longer afford to neglect meat production and utilisation of slaughter house wastes and 'fallen' animals.

Poultry

The poultry population of the country is about 114 million and substantial progress has been made during the last decade in developing this industry by improved management, feeding, breeding and disease control. The egg production had increased upto 5,600 million by the end of the Third Five Year Plan. This has still to be increased almost 30 times to provide one egg *per capita* per day. Our national average of egg production per breed is still 1/3rd to 1/4th that of the potential; and breeding programmes aimed at developing high egg laying strains need to be intensified. Intensive

research has also to be carried out on improved methods of processing and preservation of poultry and poultry products. Suitable storage, transportation and marketing methods are likely to minimise the loss and wastage of this valuable food material. Pioneering efforts in this direction have been made at the Central Food Technological Research Institute. A co-ordinated breeding programme has also been taken up at the Regional Poultry Farms at Bangalore, Bombay and Bhubaneswar to provide the farmers with efficient stock of birds and certain States are also associated with the work of breeding programmes and training facilities.

During the last decade the farmers in southern and eastern States are interested in duck industry and the Government of India has proposed to set up 10 duck breeding farms and 5 duck extension centres in the Fourth Five Year Plan at an estimated cost of Rs 73.25 lakhs.

Fish and Fish Products

Fish is an important source of protein, but forms only a fraction of food resources and has not been properly exploited in India. The Indian Ocean contributes only 2 million tonnes out of 52 million tonnes of world fish production. There is a need to exploit this potential source with a view to meet the fish deficit. The rate of expansion of marine fisheries in India has been slow due to traditional methods of fishing. As a result of assessment of the fishery survey carried out by the Central Marine Fisheries Research Institute it is estimated that the output could be doubled by using large sized mechanised crafts and by extending the fisheries operations to about 50 fathom line.

The inland fish production accounts for 36.5 per cent of India's average fish production. This catch can be considerably increased by adopting scientific methods of fish culture in the fresh and brackish waters of the country, by developing the reservoir fisheries and capture of fish from rivers and estuaries. Special emphasis should be given for cultivation of indigenous and exotic species of fish, selective breeds and hybridisation.

Since fish and fishery products are a highly perish-

able commodity, it is necessary to provide facilities like refrigerated fishing vessels, modern transport, processing and efficient storage. It is also necessary to increase the production of frozen fish and canned fish for home consumption as well as for export purposes. Fish meal industry is also in its infancy. Promising results on radiation pasteurisation using Cobalt-60 gamma irradiation of tropical fish have been reported from Atomic Energy Establishment, Bombay. This new technique will not only be useful for fish, but also for other meat products to increase their shelf life. A considerable amount of research work is also being carried out on the utilisation of fish for the preparation of fish hydrolysate, sausages and fish protein concentrates. The fish and fish products will find an important place in the Indian dietary in the near future.

It is evident from this review that our country is facing an acute shortage of animal protein in spite of its enormous animal and fish population. It is essential that the animal production should be developed as an industry in the country by advancement of animal science research and technology. There needs to be close co-ordination not only between research programme and developmental investments in the field of animal production but also between the programmes of several national institutes and other research institutes functioning under different organisations like ICAR, CSIR, Atomic Energy Establishment, ICMR, etc. Future research plans should be based on the consumer demand, social changes in the food habits and availability of surpluses. The demand for processed foods and finer goods of livestock origin like wool, leather, etc., is increasing and our research should be projected towards production of better quality edible products from animal and fishery sources. I am confident that the development and contribution of animal industry by producing more meat, milk, eggs and fish and other animal products will be the eventual long term solution of the acute food problem in India. In this task, Associations such as this have an active role to play and we must gear our organisation to meet this challenging task.

Presidential Address of Dr B. L. Amla at the General Body Meeting of the Association of Food Technologists

Mr President, Fellow Members of the Association and Friends,

At the outset, I wish to express my gratefulness to all of you for placing your confidence in me and giving me the occasion to serve the Association in the capacity of the President for the year 1968. I am fully aware of the uphill task the developing organization offers to its office bearers but I am fully confident that with your unqualified support and efforts, no task will be difficult. Moreover I am very fortunate to have taken over Dr Iya who during his tenure as President has done considerable amount of spade work and laid strong foundations to bear the future programmes. Our Association has an ever increasing role to play in the coming years, especially in the light of the problems the nation is facing, such as food shortage, population explosion, management or mismanagement of the scientific theatre and lack of social recognition of science and technology in the country.

Individuals at times, may not be able to air or express their opinions on matters affecting the field of science because of the fear of going against the code of conduct rules or even against sections of society which often little appreciates frank views. At such times professional Association like 'AFT' can play an effective role and present the collective views of the constituent members.

We all very well know that the country is trying hard to uplift its economic status in the community of nations and it is a common knowledge that success in this direction is dependant on the application of science and technology for the benefit of society. In such matters professional organizations can play an important role in shaping a policy. But for any organization to become vocal or assertive, it has to earn and establish a name for itself and to achieve this the organization has to depend on the constituent members. The achievements or contributions of individual members lend a place of recognition to the association.

The productivity of an individual is dependent on creative thinking, resources available, exchange of views with fellow scientists and exposure to the reality of the problems. Professional associations

can help providing the individuals some of the necessary attributes. Therefore, individuals and association are strictly complimentary.

As of late, you all know very well, the problem of management of science and technology is much talked about in the country. This situation has arisen because the scientific community has not delivered what was expected of it and hence the criticism. If productivity in science and technology is not commensurate with the existing problems, doubts arise about the pattern of management. As has been said-in order to evolve an effective and workable science policy, the nation has to keep two complimentary aspects in mind—Policy for Science and Science in policy.

Unless at a high level the policy for science or science policy is made realistic to the needs of the country, the situation may assume dimensions beyond control with the passage of time. Here again professional organizations can play a dominant role in shaping the policy.

Let me say a few words about our own field of food science and technology and review the situation in context of national needs and objectives.

The field of food technology took birth in U.S.A. in 1804 when Nicholas Appert successfully completed trials in bottling the food. Since then the field has developed enormously in all directions and has given rise to the mighty food processing industry.

What has been developed in U.S.A., U.K. or Europe as products cannot easily be transplanted as such into India barring a few exceptions. The consumer-likes or preferences are tied up with many factors and vary from one socio-economic group to another. This, therefore, necessitates the development of the products keeping in view the consumer requirements in the country.

In fact the role of a food technologist is to aid in the marketing transactions of food commodities. The marketing is a part and parcel of the modern productive process, the part at the end that gives point and purpose to all that has gone before. The goods that farmers grow and sell must be stored, transported, processed and delivered in the form and at the times and to the places the consumer desire.

Since all food materials are perishable, the job in a nutshell of a food technologist becomes to help—

1. Preserve,
2. Conserve,
3. Nutritionally balance,
4. Introduce convenience,
5. Reduce cost,

of raw materials or processed products. Affluent urban population has brightened the scope and prospects for food industries in the country.

For the last 20 years, most of the industrial and commercial development has been concentrated in and around urban areas. This has led to the

concentration of wealth in these areas. The job opportunities have become much greater resulting in better purchasing capacity of the consumer. With the overall shortage of food adulteration has become rampant. The consumer is more inclined to go in for semi-processed or processed foods so as to be sure that the product would relatively be free from adulteration. In addition with urbanisation, these foods which require no cooking or minimum cooking are bound to be in greater demand. The food industry must be prepared to meet this demand.

I therefore hope that the future efforts of the food technologists and the food industry would be directed to augment the food supply and also meet the consumer requirement in the country.

THE INTERNATIONAL SYMPOSIUM ON 'NEW SOURCES OF PROTEINS IN HUMAN NUTRITION'

The Symposium will be held in Amsterdam, from the *24th to the 29th of November 1968*. It will be dedicated to the study of the scientific, technical and economical problems related to new sources of animal proteins, (fish concentrates, caseinates, etc.), of vegetable ones (cereals, soybeans, peanuts, algae, leaves, etc), food yeasts, synthetic amino-acids, and petroleum yeasts. The Symposium is organized by the International Commission for Agricultural and Food Industries (CIIA-ICAI) and the Permanent International Bureau of Analytical Chemistry (BIPCAPIBAC), assisted by the Dutch Organization of Nutrition and Food Technology (Voorlichtingsbureau Voor de Voeding). It enjoys the participation of the Food and Agricultural Organization of the United Nations (OAA-FAO), the World Health Organization (OMS-WHO) and the United Nations

Children's Fund (FISEUNICEF). The proceedings of the Symposium will be held in French, English and German, with simultaneous interpretation.

An inscription fee of 100 florins is to be paid to the Dutch Organization Committee.

For any information related to the Symposium apply either to:

International Commission for Agricultural
and Food Industries (C.I.I.A.)
18, Avenue de Villars
75-PARIS 7.

or to: The Dutch Organization Committee
Voorlichtingsbureau Voor de Voeding Laan
Copes Van Cattenburch 44
THE HAGUE-3

Our Presidents



Present President—Dr B. L. Amla

Dr Bansi Lal Amla, Chairman, Discipline of Industrial Research, Consultancy and Extension Services, Central Food Technological Research Institute, Mysore, was inducted as President of the Association Food Technologists (India) on 15 February, 1968.

Dr Amla was born on 1st January 1931 at Muzaffarabad in the Pakistan-occupied Kashmir. After graduating in the field of Agriculture with First Class and 2nd position from Banaras Hindu University in 1954, he went to U.S.A. and took his M.S. Degree from Cornell University in Horticulture in 1955 and Ph.D. Degree in Food Technology from the University of Massachusetts in 1959. While at the University of Massachusetts, he was initially appointed instructor in the Department of Food Science and Technology and later Assistant Professor in School of Home Economics and Nutrition.

On his return to India in 1960, Dr Amla joined C.S.I.R. as a Pool Officer and was posted in the Food Ministry in the Department of Subsidiary Foods. In 1962, he left the Scientists' Pool to take up the Managing Director-ship of AMCO Cold Storages and Fruit Products in Jammu and Kashmir State where he continued till the end of 1963. Dr Amla joined C.F.T.R.I., Mysore, in January 1964.

Dr Amla is a specialist in Horticulture and Food

Technology with deep understanding of the food industries in India and abroad.

Dr Amla is connected with many academic, professional societies and committees. He is the Chairman of Joint Research Coordination Committee of C.F.T.R.I.; Defence Food Research Laboratory, Mysore; Indian representative on the Executive Committee of the International Institute of Refrigeration, Paris; Member of Advisory Board of the National Sugar Research Institute, Kanpur, member of the Development Council for sugar industry, and Standing Research Advisory Committee of the Development Council for Sugar Industry; Technical Panel of the Banana and Fruit Development Committee of the Ministry of Food and Agriculture; Research Committee of Khadi and Village Industries Commission and Member on the Managing Committee of the Chamber of Commerce and Industry, Mysore. He is also the past Vice-president of the Association of Scientific Workers of India; the Government Director on the Board of Directors of the Mysore Fruit Products Limited, Bangalore and Vice-president of the Association of Food Technologists (India).

He is a member of the Hony Societies of Sigma Xi (National Research Honour, U.S.A.) instituted for the advancement of sciences and Phitau Sigma (National Research Honour U.S.A.), Instituted for Advancement of Food Science and Technology.



President Elect—Dr P. K. Vijayaraghavan

Born on 2nd February 1922, Dr P. K. Vijayaraghavan, a distinguished alumnus of the University of Madras, first graduated from Loyola College Madras in 1941 and obtained his Master's degree in Biochemistry from the Biochemical Laboratories, University of Madras, in 1945. After obtaining the Master's degree in 1945, Dr Vijayaraghavan was worked as a Research Assistant on an I.C.M.R. scheme at the University Biochemical Laboratories, Madras, for two years, after which he was appointed as an Asst. Research Officer in the Nutrition Research Laboratories, Coonoor, where he received special training under Dr W. R. Aykroyd in the fields of Food and Nutrition. In the year 1949 Dr Vijayaraghavan was invited by the university of California Los Angeles to serve on their staff as Asst. Professor of Biochemistry. During his tenure at the University of California he also obtained a Master's degree in Microbiology. After his return to India in 1951, Dr Vijayaraghavan continued as a Research Officer in the Nutrition Research Laboratories till 1954 when he joined the Defence Science Service, and was posted as Senior Scientific Officer Grade I to Defence Research Laboratory (Materials) Kanpur where he was engaged on research for five years as a Biochemist and Microbiologist. In 1961 Dr Vijayaraghavan was given the task of raising the Defence Food Research Laboratory at Mysore as Officer-in-Charge which post he is still holding as the Director.

Dr Vijayaraghavan has over 25 years of research experience in the fields of Nutrition, Biochemistry,

Microbiology and Food Technology, during which period he has published no less than 54 papers in the above fields. Significant contributions of Dr Vijayaraghavan particularly early in his career relate to his work in the fields of protein and vitamin B₁₂ nutrition with special reference to haemopoiesis. He has also worked on the role of methionine and choline in liver damage, which has found practical application. Notable contributions of Dr Vijayaraghavan in the field of Defence Science relate to the determination of nutritional requirements for the Armed Forces under the various conditions of operations and development of a diverse variety of processed foods and pack rations for the use of the Services including development of methods for preserving and packaging of various processed food items for inclusion in pack rations, the accent always being on logistic convenience. Mention may also be made in this connection of the great appreciation expressed by the Everest Team (1965) who were supplied with about 2 tons of processed foodstuffs from the Defence Food Research Laboratory.

Dr Vijayaraghavan's contribution to science in the fields of Nutrition, Biochemistry, Microbiology and Food Technology have received ample recognition both by the Government of India as well as various non-governmental bodies. He is an elected member of the American Chemical Society and also a member of the Society of Sigma Xi of the U.S.A., a member of the Executive Council of the Nutrition Society of India, member of the Nutritional Advisory Committee of the ICMR, member of the Divisional Council of the ISI and various other committees of other learned bodies too numerous to list.

Dr Vijayaraghavan was deputed to visit the various research and manufacturing establishments in the field of Food Technology in the United States and in the United Kingdom in the year 1963. Subsequently he was deputed to represent the Government of India as a member of the delegation at the Commonwealth Defence Science Organisation (Food Study Group) held in Sept. 66 at Ottawa (Canada).

Dr Vijayaraghavan was elected as the Vice President of the Association of Food Technologists (India) for the year 1966-67 and he has also been on the Editorial Board of the Journal of Food Science and Technology and has always evinced keen interest in the publication. He is also a member of the editorial board of Journal of Nutrition and Dietetics.

Dr Vijayaraghavan is a keen sportsman specialising in cricket and has represented his University in his younger days. Time permitting, he is always ready to take part in the various sports activities of the Defence Food Research Laboratory.

List of New Members Accepted

1. Shri K. C. Eapen, Defence Food Research Laboratory, Jyothinagar, P.O. No. 45, Mysore 1.
2. Shri P. Damodar, D.F.R.L., Post Box No. 45, Jyothinagar, Mysore 1.
3. Shri Triloki Nath Rawal, D.F.R.L., Post Box No. 45, Jyothinagar, Mysore 1.
4. Shri Sadasinga Arya, D.F.R.L., Post Box No. 45, Jyothinagar, Mysore 1.
5. Shri S. B. Kannur, D.F.R.L., Post Box No. 45, Jyothinagar, Mysore 1.
6. Shri T. K. Chakrabarthy, D.F.R.L., Post Box No. 45, Jyothinagar, Mysore 1.
7. Shri M. V. R. Koteswara Rao, D.F.R.L., Post Box No. 45, Jyothinagar, Mysore 1.
8. Shri N. Karunakaran, D.F.R.L., Post Box No. 45, Jyothinagar, Mysore 1.
9. Shri M. N. Ramanuja, D.F.R.L., Post Box No. 45, Jyothinagar, Mysore 1.
10. Shri P. D. Vaidya, D.F.R.L., Post Box No. 45, Jyothinagar, Mysore 1.
11. Shri M. P. Srivatsava, D.F.R.L., Post Box No. 45, Jyothinagar, Mysore 1.
12. Shri A. N. Srivastava, D.F.R.L. Post Box No. 45, Jyothinagar, Mysore 1.
13. Smt. N. Nirmala, D.F.R.L., Post Box No. 45, Jyothinagar, Mysore 1.
14. Miss B. A. Susheela, D.F.R.L., Post Box No. 45, Jyothinagar, Mysore 1.
15. Miss A. Vallidevi, D.F.R.L., Post Box No. 45, Jyothinagar, Mysore 1.
16. Shri C. H. Siddaiah, D.F.R.L., Post Box No. 45, Jyothinagar, Mysore 1.
17. Shri K. Prahlad, D.F.R.L., Post Box No. 45, Jyothinagar, Mysore 1.
18. Dr Rugmini Shankaran, D.F.R.L., Post Box No. 45, Jyothinagar, Mysore 1.
19. Shri Mohankumar M. Rathi, Raniwar Peth, Nasik City, Central Railway, Maharashtra.
20. Major M. S. Uban, 83, Road, 2-B, Rajendra Nagar, Patna 16, (Bihar).
21. Shri Hiralal Kaul (Punjabi), R/O Lower Sather, Baghvanpore, Srinagar, (Kashmir).
22. Smt. A. Vijayalakshmi, Department of Home Science, University College, Tirupathi (A.P.)
23. Dr Dattathreya Shriniwas Wagle, Research, Biochemist, Biochemistry Department, Punjab Agricultural University, Ludiana 4. (Punjab).
24. Shri T. K. Sambashiva Rao, Horticulturist, Darlco Cannings Limited, Post Box No. 96, Moospet Road, Trichur 5 (Kerala).
25. Shri A. K. Vasuki, Bakery Division, Britannia Biscuit Company, M.T.H. Road, Padi, Madras 50.
26. Dr C. M. Singh, Director, Indian Veterinary Research Institute, Izatnagar, U.P.
27. Dr (Mrs) Sumathi R. Mudambi, Professor of Foods and Nutrition, College of Home Science, S.N.D. T. Women's University, Queen's Road, Bombay 1.
28. Dr Mudambi V. Rajagopal, Backery Flat, Britannia Biscuit Co., Limited, Reay Road, Bombay 10.
29. Shri V. N. Mallikarjuna Rao, Jagajit Industries, P.O. Jagajit Nagar, Kapurtala District, Hamira, Punjab.
30. Shri A. S. Murti, Discipline of Microbiology, C.F.T.R.I., Mysore 2.
31. Dr S. V. Suryanarayana Rao, Discipline of Meat, Fish and Poultry Technology, C.F.T.R.I., Mysore 2.
32. Shri Syed Younus Ahmed, I.R.C.E., C.F.T.R.I., Mysore 2.
33. Shri M. M. Krishnaiah, C.F.T.R.I., Mysore 2.
34. Shri R. Balakrishna Nair, Discipline of M.F. and P.T., C.F.T.R.I., Mysore 2.
35. Mr W. E. Fisher, P.O. Box No. 913, Sudan.
36. Dr Samir Maladi, AID, Mission 2, 219, Avenue de Paris, Tunisia.

Life Members

37. Shri J. Arjundas, M/S A. C. Gangaram and Co., Post Box No. 67, Mysore 1.
38. Dr H. A. B. Parpia, Director, Central Food Technological Research Institute, Mysore 2.
39. Shri R. Vasudevamurthy, Gajanana Rice and Oil Mills, Edga Extension, Mysore City.

Change of Addresses

1. Mr Swaran Singh Othian, Canning Section, Institutes of Hotel Management, Catering and Nutrition, Pusa, Delhi 12.
2. Shri A. S. Sareen, 4/26, Punjabi Bagh, Delhi 26.
3. Miss T. E. Phillip, Principal, Institute of Catering Technology and Applied Nutrition, Veer Sawarkar Road, Dadar, Bombay 28.
4. Shri Ashok Kumar Bhatia, C.F.T.R.I. Experiment Station, Gill Road, Ludhiana 3 (Punjab).
5. Prof. Dr Deo Borgstrom, 4550, Comanche Drive, Okemos, Mich. 48864, U.S.A.

Indian Standards Institution

The Indian Standards Institution has published the following Indian Standard Specifications:

1. Sweet Potato (*Ipomoea batatas* Lam.) IS:4234-1967, Rs 2.50
2. Sterilized Milk IS:4238-1967, Rs 5.00
3. Alcoholic Drinks IS:3753-1967, Rs 2.50
4. Chillies, Fresh IS:4235-1967, Rs 2.50
5. Mandarins (*Citrus reticulata* Blanco) IS:4243-1967, Rs 4.00
6. Maize Seed for Propagation Purposes (*Zea mays* Linn.) IS:4196-1967, Rs 2.50
7. Methods of Test for Alcoholic Drinks IS:3752-1967, Rs 7.00
8. Rice Seed for Propagation Purposes IS:4197-1967, Rs 2.00

9. Copper Oxochloride Dusting Powder IS:1506-1967, Rs 5.00

The Indian Standards Institution has prepared the following draft Indian Standards Specifications for wide circulation:

1. Citric Acid, Food Grade DOC:AFDC 19 (589)
2. Tartaric Acid, Food Grade DOC:AFDC 19 (590)
3. Sodium Benzoate, Food Grade DOC:AFDC 19 (591)
4. Benzoic Acid, Food Grade DOC:AFDC 19 (623)
5. Mineral Mixtures for Supplementing Cattle Feeds (Revised) DOC:AFDC 15 (632)
6. Livestock Feed (Revised) DOC:AFDC 15 (633).

Food Science and Technology Abstracts

1. General

- 1.1 *The role of technical assistance in food industry development*, Z. I. KERTESZ, *Fd Technol. Champaign*, 1967, 21 (9), 1212. General.
- 1.2 *Yarn sizing market for cereal research*, CLARENCE A. MOORE, *Cereal Sci. Today*, 1967, 12 (8), 318.
A techno-economic report.
- 1.3 *Convenience foods*, P. K. BATES, *Cereal Sci. Today*, 1967, 12 (11), 466.
Review.
- 1.4 *Expanded convenience products*, ARTHUR I. MORGAN JR. AND ROBERT P. GRAHAM, *Cereal Sci. Today*, 1967, 12 (11), 473.

2. Cereals

- 2.1 *Investigation of fat-protein complexes in cereals*. I. M. ROHRlich AND T. NIEDERAUER, *Fette Seifen Anstr Mittel*, 1967, 69 (2), 63.
Experiments on the isolation of a lipoprotein from cereal flours by extraction with methanol/chloroform followed by treatment with water. The ultimate analysis gives reproducible N- and P-values. Chromatographically and electrophoretically, the fat-protein complex behaves like a uniform substance.
K. M. D.
- 2.2 *Recent trends in rice research in respect of its processing and nutritive value*. A review, A. KANNAN AND R. P. DEVADAS, *J. Nutr. Dietet.*, 1967, 4 (3), 219.
Review. 122 references.
- 2.3 *Studies on the proteinaceous subcellular particles in rice endosperm: electron-microscopy and isolation*, HISATERU MITSUDA, KYODEN YASUMOTO AND KAZUO MURAKAMI, *Agric. biol. Chem., Japan*, 1967, 31 (3), 293.
Electron-microscopic examination of rice endosperm revealed the existence of proteinaceous subcellular particles 1 to 4 μ in diameter and spherical or oval in shape. Isolation of the particles was effected by differential centrifugation in density gradient medium after mechanical or enzymic disintegration of endosperm cells. The isolated particles were predominantly composed of protein and residual constituents were mainly lipid and carbohydrate. Their shape and behaviour were similar to those found in the endosperm. These facts show that the subcellular particles concerned are protein bodies. There seemed to be several kinds of protein bodies different with respect to their protein and lipid contents.
A. A.
- 2.4 *Wheat-based products for world use*, BETTY SULLIVAN, *Cereal Sci. Today*, 1967, 12 (10), 446.
Review.
- 2.5 *Early generation screening for gluten strength in durum wheat breeding*, V. M. BENDELOW, *Cereal Sci. Today*, 1967, 12 (8), 336.
A new technique of screening durum hybrid populations for gluten strength by combining Ottawa micro flour mill and electronic recording dough mixer. Hybrid lines showing mixed characteristics different from those of acceptable standard varie-

ties can be discarded and the breeding can be restricted to promising areas.

J. V. S.

- 2.6 *Relation of starch damage and related characteristics to kernel hardness in Australian wheat varieties*, PHILIP C. WILLIAMS, *Cereal Chem.*, 1967, 44 (4), 383.

A consistent measure of kernel hardness in wheat may be estimated by a simple test, the 'particle size index' test by breaking down wheat under a standard grading procedure. A large number of Australian varieties of wheat tested by this method appear to show close relationship with damaged starch content of flours and to be associated with characteristics of water absorption, gassing power and diastatic activity.

B. S. N.

- 2.7 *Evaluation of the modulus of elasticity of wheat grain*, LEORA SHELEF AND NURI N. MOHSENKY, *Cereal Chem.*, 1967, 44 (4), 392.

Modulus of elasticity of Seneca wheat grain equilibrated at 50 per cent R.H. and 72°F was determined by four different methods by an Instron table model testing machine with 50 lb load cell. Four values for the apparent modulus of elasticity of grains of 9.1 per cent moisture content, range from 1.6 $\times 10^5$ to 8.3 $\times 10^5$ p.s.i.

B. S. N.

- 2.8 *Influence of protein content in wheat evaluation*, G. W. SCHILLER, A. B. WARD, L. H. HUANG AND J. A. SCHELLENBERGER, *Cereal Sci. Today*, 1967, 12 (9), 372.

- 2.9 *A comparison of several methods in determining the metabolizable energy content of durum wheat and wheat cereal by chicks*, W. C. LOCKHART, REECE L. BRYANT AND D. W. BOLIN, *Poult. Sci.*, 1967, 46 (4), 805.

The metabolizable energy content of one sample of durum wheat was found to be 3153 and 3502 metabolizable calorie (MC) per kilogram on a 90 and 100 per cent dry matter basis respectively. Whole wheat cereal containing 11.1 per cent moisture and 12.7 per cent protein was found to have 3400 MC/kg.

K. A. R.

- 2.10 *Production of wheat variety breads on a continuous mix laboratory unit*, R. V. SCHANEFELT, E. R. HAYES AND JOHN A. JOHNSON, *Cereal Sci. Today*, 1967, 12 (9), 382.

Investigations included use of a whole wheat premix in producing commercial wheat bread, production of wheat bread using whole wheat milled by different methods and study of effects of bran with different granulations on bread quality. Grinding method used in preparing wheat flour affected bread quality. Conventional roller milling was superior to pin milling. Acceptable bread was produced with up to 25 per cent whole wheat in formula. Granulation of bran fraction affected the bread quality, but the effects depended on the amount of bran in the formula.

J. V. S.

- 2.11 *Research with a pilot scale continuous bread making unit. IV. Further studies on use of fungal enzymes with flour brews*, HARALD GROSS, R. L. BELL, FRANK FISCHER AND SULTAN REDFERN, *Cereal Sci. Today*, 1967, 12 (9), 394.

The development energy (DE) of dough made with a 40 per cent flour brew is less than that made with a 30 per cent brew.

With 2 different enzyme preparations, the DE of doughs made from brews containing 30 or 45 per cent flour was reduced by about the same amount independently of the amount of flour in the brew or the protein content of the flour. Increasing flour protein content increases the DE required for producing optimum quality. With most flours, bread having similar quality as that made without enzymes can be achieved at lower (14-28 per cent) speeds by adding fungal enzymes.

A. A.

2.12 *An electronic recording dough mixer. V. Measurement of energy used in a mixograph-type mixer*, PETER W. VOISEY, H. MILLER AND M. KLOCK, *Cereal Chem.*, 1967, **44** (4), 359.

A new method of recording the torque to mix doughs in a mixograph is demonstrated. An electronic integrator is used to record the energy used to mix the dough in digital form. The method is a useful technique which may allow rapid evaluation of dough development during mixing.

A. A.

2.13 *Use of hydrogen peroxide treated non fat dry milk in the continuous dough mixing process*, R. B. PATEL, R. MICKELSON AND J. A. JOHNSON, *Cereal Sci. Today*, 1967, **12** (9), 377.

Use of oxidised non-fat dry milk (NFDm) at 6 per cent level in continuous mix bread produced good quality bread. In addition to properly oxidised NFDm, other conditions involving absorption, dough oxidants, and mixing must be optimum to produce bread of superior quality.

A. A.

2.14 *Oxidising and reducing effects in the continuous dough process*, R. E. MAUSETH, J. L. NEES, L. M. CHAMBERLIAN AND W. R. JOHNSON, *Cereal Sci. Today*, 1967, **12** (9), 390.

Mixing speed requirements and consumption were reduced by ascorbic acid and increased by potassium bromate. Internal characters of bread were affected by potassium iodate and potassium bromate, but they were not affected by ascorbic acid. It has been found that ascorbic acid can act as a reducing agent in the CM system and provides a convenient way of controlling the mixing speed requirement of a flour.

A. A.

2.15 *Antifirming of white bread by application of heat stable bacterial amylase*, LEONARD, M. WALDT AND ROBERT D. MAHONEY, *Cereal Sci. Today*, 1967, **12** (9), 358.

Summary of results obtained as a consequence of adding BAA in a series of large scale commercial bakes in a medium sized bakery utilising conventional manufacturing procedures.

A. A.

2.16 *Bread enrichment with Protal-Peruvian cottonseed flour*, A. BACIGALUPO, T. S. AGUILAR, P. LUNA DE LA FUENTE AND J. VALLE RIELTRA, *Cereal Sci. Today*, 1967, **12** (10), 431.

Enrichment with protal (a cottonseed protein concentrate) improves the nutritive value of white bread. It was possible to attain an improvement of 37.5 per cent in the nutritive value with an enrichment of 15 per cent protal in the mixture. All protal breads had good flavour and the brown colour was proportional to the protal content in bread. The physical texture of bread improved with 5-10 per cent level of protal and the shelf-life of bread enriched with protal was also improved.

J. V. S.

2.17 *Milk proteins responsible for deleterious effects in continuous mix bread*, A. M. SWANSON AND W. B. SANDERSON, *Cereal Sci. Today*, 1967, **12** (9), 363.

Addition of 6 per cent non-fat dry milk to the dough produced bread with low loaf volume and total score as compared to low milk control. Addition of whole acid casein also caused low loaf

volume, poor grains and texture. This effect was overcome to some degree by pre-heating acid casein before baking. The baking property of skim milk was improved by heating it in alkaline pH. Raw acid and rennet whey appeared to contain a loaf depressant factor which was absent in salt whey. The major components of whey were not harmful to loaf volume and bread score. Some correlation was found between the physical properties of dough and the final bread quality.

J. V. S.

2.18 *Improvements in protein quality in corn based foods*, SIDNEY M. CANTOR AND HUGH J. ROBERTS, *Cereal Sci. Today*, 1967, **12** (10), 443.

Review.

2.19 *New milled corn products, including C.S.M.*, B. TOLLEFSON JR., *Cereal Sci. Today*, 1967, **12** (10), 438.

2.20 *Processing quick cooking dehydrated sweet corn*, K. H. STEINKRAUS AND G. E. MACDONALD, *Fd Technol. Champaign*, 1967, **21** (8), 1136.

A pilot plant process is described; *FM-Cross, Tasty-V* and *Seneca Arrow* varieties were most suitable for dehydration. A pre cook of 15 min. at (121°C) was substituted for the usual 5 min. blanch at 100°C to ensure soft pericarps after 30 min. rehydration in boiling water. The corn was dipped in 1500 p.p.m. SO₂ solution before precooking and again before dehydration to preserve original fresh corn colour and to stabilise it during storage. This resulted in a residual SO₂ content of 700 p.p.m.

A. A.

2.21 *On the amino acid composition of rye-flour protein*, M. ROHRLICH, *Dt. Lebensmittel Rdsch*, 1967, **63** (4), 106.

Amino acid composition of rye flour fractions separated by the method of Hess and by air sieving were determined. Coiled protein and adhesive protein showed a distinct difference in their contents of glutamic acid and proline. The content of basic amino acids (lysine and arginine) is higher in the adhesive protein/starch fraction than in coiled protein. The content of basic amino acids in the residue of the adhesive protein/starch fraction rises when a portion of the adhesive protein is dissolved by an acetic acid (but not when dissolved by ethylenechlorohydrin).

K. M. D.

2.22 *Chemical and biological evaluation of the effects of fermentation on the nutritive value of foods prepared from rice and grams*, R. RAJALAKSHMI AND K. VANAJA, *Brit. J. Nutr.*, 1967, **21** (2), 467.

Studies were made on *idli* and *khaman* (product from dehusked and milled Bengal gram). Fermentation improved thiamine and riboflavin contents and decreased phytate in both products. Weanling rats fed on these products had superior weight gain, N retention, thiamine and riboflavin contents in liver and activities of xanthine oxidase and succinic dehydrogenase and haemoglobin than those fed unfermented product.

J. V. S.

2.23 *Grain storage effects on the sedimentation index of quality*, P. J. MATTERN, *Am. Miller & Proc.*, 1967, **95** (5), 12.

The sedimentation test, useful for measuring the bread baking strength, consists of mixing water, lactic acid and alcohol with a weighed portion of the flour and measuring the sedimentation value after 5 min. During one year of storage, the sedimentation value for wheat decreased an average of 6.2 sedimentation units with a range of 0.5 to 18.0 units. The sedimentation value is related to the change in the physical and chemical differences existing in the grain after one year.

K. A. R.

2.24 *Studies of the quality of Indian milled flours*, P. HARIDAS RAO, K. A. TARA AND G. S. BAINS, *J. Fd Sci. Technol.*, 1967, 4 (1), 2.

2.25 *Refrigerated dough products*, GEORGE L. LANNUIER, *Cereal Sci. Today*, 1967, 12 (11), 478.
Review.

2.26 *Collaborative study of determination of uric acid in flours*, N. P. SEN, *J. Ass. off. anal. Chem.*, 1967, 50 (4), 776.

A collaborative study of an enzymatic—U.V. method. The mean recovery of added uric acid (91 mg./100 g. of flour) was 103 per cent.

J. V. S.

3. Pulses

3.1 *Use of papain in the preparation of quick cooking dehydrated pulses and beans*, B. S. BHATIA, L. A. RAMANATHAN, M. S. PRASAD AND P. K. VIJAYARAGHAVAN, *Fd Technol. Champaign*, 1967, 21 (10), 1395.

Quick cooking precooked dehydrated pulses and beans which reconstitute to smooth slurry in a short time can be prepared by subjecting the cooked grains to the action of papain. Treatment with NaCl was useful only in a limited way because of rancidity and reduced shelf-life of product.

J. V. S.

4. Fruits, Vegetables and Tubers

4.1 *Studies on the content of reducing sugar and pectin in ripe banana (Musa sapientum of Basrai group) on storage*, B. P. GHOSH AND N. SARKAR, *J. Nutr. Dietet.*, 1967, 4 (3), 207.

Reducing sugar content in ripening banana at 37°C under incubation between 4-48 hr increases with prolongation of this period and rises to 65.4 per cent on dry weight basis. Pectin content is, however, found to decrease with incubation for different periods of time.

B. S. N.

4.2 *Essential oils of some orange peels*, KAZAUYKI MACKAWA, MASANOBU KODAMA, MITSUO KUSHII AND MITSUTOSHI MITAMURU, *Agric. Biol. Chem. Japan*, 1967, 31 (3), 373.

The essential oils contained in the peels of Kabasu, Sudachi, Iyokan, Daidai and Natsudaidai orange were studied by gas-chromatography. The major components of each essential oil were d-limonene β -pinene, camphene, 1, 8-cineol, and caprylaldehyde. As minor components there were found 23 compounds in Kabusu, 14 in Sudachi, 9 in Iyokan, 14 in Natsudaidai and 11 in Daidai oil.

A. A.

4.3 *Carotenoids in the flavedo of marsh seedless grape fruit*, HENRY YOKOYAMA AND MICHAEL J. WHITE, *J. agric. Fd Chem.*, 1967, 15 (4), 693.

The flavedo of the Marsh seedless grape fruit contains a highly complex carotenoid mixture. At midseason the major coloured carotenoids are the epoxides, violaxanthins, and luteoxanthins. The main carotenoid is the colourless polyene phytoene. Phytoene is present in only trace amounts in the early season mature fruit. However, on ripening, phytoene accumulates as the major carotenoid constituent. During this period of maturation the total coloured carotenoid content in the flavedo is decreasing. The unique methylketone carotenoid reticulataxanthin is present also.

A. A.

4.4 *Methods for determination of oxygenated terpene, aldehyde and ester concentrations in aqueous citrus essences*, JOHN A. ATTAWAY, RICHARD W. WOLFORD, MARSHAL H. DOUGHERTY AND GEORGE J. EDWARDS, *J. agric. Fd Chem.*, 1967, 15 (4), 688.

Three new methods were developed for functional group analysis of water-soluble components of citrus juice essences. These included techniques for estimating oxygenated terpenes as $C_{10}H_{18}O$,

saturated aliphatic aldehydes as octanal, and α - β -unsaturated aldehydes as citral. In addition, a standard procedure was adapted for the determination of esters as ethyl butyrate. Analyses of 15 citrus juices are given.

A. A.

4.5 *The effect of conditions of storage on the respiration of apples.*

1. *The effect of temperatures and concentrations of carbon dioxide and oxygen on the production of carbon dioxide and uptake of oxygen*, J. C. FIDLER AND C. J. NORTH, *J. hort. Sci.*, 1967, 42 (2), 189.

In sound apples the mean percentage increase in respiration for a rise in temperature from 38 to 45°F is 40 per cent for CO_2 output and 60 per cent for oxygen uptake. In apples susceptible for temperature injury the rates of CO_2 output and oxygen uptake at below 38°F increase with time and with onset of injury. The rates fall when injury becomes severe. There is no varietal difference in the respiratory activity of apples under controlled atmosphere storage. Increasing the CO_2 concentration or decreasing oxygen concentration in the storage atmosphere reduces the respiration rate, the effects of given concentrations of CO_2 and oxygen are additive as regards rate of respiration, but not prolongation of storage life. The respiration quotient is constant at any one temperature, for all concentrations of oxygen from 2 to 21 per cent. It is lower in the presence of CO_2 than in its absence, rises with falling temperature and reaches values in excess of 1.3 at 32, 35 and 38°F in air.

A. A.

4.6 *Chemical changes in spinach stored in air and controlled atmosphere (CA)*, FRANK BURKHEIMER, J. N. MCGILL, A. I. NELSON AND M. P. STEINBERG, *Fd Technol. Champaign*, 1967, 21 (9), 1273.

The rate of ascorbic acid loss from spinach stored at 34°F was slightly higher in CA than in air. However, at 45°F the loss in CA was 50 per cent that in air. Loss of vitamin C in CA at 45°F was less than at 34°F. Samples stored in nitrogen atmosphere showed a loss of over 50 per cent in the total antiscorbutic value. There was a marked increase in pH in spinach stored in CA. The titratable acidity increased during air storage and decreased in CA. Protein was degraded at the same rate in air and in CA.

A. A.

4.7 *Studies on L-threonine dehydratase from spinach (Spinacia oleracea)*, RAJENDRA K. SHARMA, SARLA R. MODI AND RAJARSHI MAJUMDER, *Indian J. Biochem.*, 1967, 4 (2), 61.

4.8 *Nutritive value of dehydrated sweet potato trimmings fed to beef steers*, JAMES BARD AND P. A. PUTNAM, *J. agric. Fd Chem.*, 1967, 15 (4), 726.

The experimental rations contained either 51 per cent dehydrated sweet potato trimmings or 51 per cent cracked corn. The results suggest that this waste product may have a place in cattle feeding, particularly under conditions when grain availability is limited.

A. A.

4.9 *Frost injury systemic in sweet potatoes*, BOYCE D. EZELL AND MARGUERITE S. WILCOX, *J. agric. Fd Chem.*, 1967, 15 (4), 729.

Storage quality of sweet potatoes appears to be very much influenced by frost before and during harvest. Injuring tops by frost or otherwise causes systemic injury to plants as seen by decreased synthesis of carotenoids during storage.

B. S. N.

4.10 *Levels of free and combined sulfur dioxide in fruits during sulfuring and drying*, D. MEG. MCBEAN, *Fd Technol. Champaign*, 1967, 21 (10), 1402.

A method of determining SO₂ in cider has been adopted for use with sulfured apricots and peaches.

4.11 *Dehydrated bananas*, JOHN E. BREKKE AND LYLE ALLEN, *Fd Technol. Champaign*, 1967, 21 (10), 1391.

Bananas were dehydrated by air blast drying, drum drying and freeze drying. Improved products were obtained by treating the material with SO₂ prior to drying. The products were evaluated subjectively and also analysed for moisture and colour.

J. V. S.

4.12 *Some compounds formed during non-enzymic browning of orange powder*, JAMES H. TATUM, PHILIP E. SHAW AND ROBERT E. BERRY, *J. agric. Fd Chem.*, 1967, 15 (5), 773.

Eight furan type compounds, 3 pyrroles, 3 acids, one lactone and methyl cyclopentenolone were separated by GLC and identified by spectroscopic methods in dehydrated orange powder.

J. V. S.

4.13 *Degradation of hesperetin and naringenin to phloroglucinol*, WILLIAM F. NEWHALL AND S. V. TING, *J. agric. Fd Chem.*, 1967, 15 (5), 776.

A preparative alkaline fusion procedure has been developed for the production of phloroglucinol from hesperetin, the aglycone of hesperidin from orange, or naringenin, the aglycone of naringin from grape fruit. Separation of phloroglucinol from the accompanying aromatic acid derivative was accomplished best in each case by column chromatography using Dowex—1 resin.

4.14 *The influence of low oxygen levels and relative humidity on storage of green tomatoes*, C. L. LOCKHART AND C. A. EAVES, *J. hort. Sci.*, 1967, 42 (3), 289.

Green and red tomatoes were stored for 3 weeks at 10°C in 100 per cent nitrogen or low oxygen levels at different R.H. Rots were controlled by 69-76 per cent R.H. but at 86-92 per cent R.H., considerable fungal rotting was evident after 20 days of storage. Superficial discolouration of the skin occurred on green tomatoes stored in 1.4 per cent or less O₂ but none occurred on those stored in 4-5 per cent O₂. Rots caused by *Rhizopus* spp. were more successfully controlled by lowering the R.H. than were those caused by *Fusarium* or *Alternaria* spp. Rots following chilling were reduced by lowering the relative humidity.

A. A.

4.15 *Physico-chemical changes in Indian guavas (Psidium guajava L.) during fruit development*, S. K. MUKHERJEE AND N. DUTTA, *Curr. Sci.*, 1967, 36 (24), 674.

The period of ripening of *Safeda*, *R.F. Pyriform* and *Lucknow 49* to reach maturity were 137, 110 and 106-138, days respectively. Ethylene in appreciable quantities was found at the maturity stage, which also coincided with the initiation of colour change in fruits. The maturity standards fixed for *Safeda* are given.

B. S. N.

4.16 *A preliminary study of the new sesquiterpene isolated from the leaves of guava, Psidium guajava Linn.* ASHRAM BHATI, *Perf. essent. Oil Rec.*, 1967, 58 (10), 707.

4.17 *Measurement of whole potato firmness with a universal testing machine*, M. C. BOURNE AND NELL MUNDY, *Fd Technol. Champaign*, 1967, 21 (10), 1887.

The nature of the universal testing machine (UTM) is such that the actual deformation can be magnified by a known factor, thus allowing deformation to be measured with precision. The deformation test measured by UTM appears reliable for testing potato firmness.

J. V. S.

4.18 *The effect of conditions of storage on the respiration of apples.*

11. *The effect on the relationship between loss of respirable substrate and the formation of end products*, J. C. FIDLER AND C. J. NORTH, *J. hort. Sci.*, 1967, 42 (3), 207.

Acid concentration decreases logarithmically with time in apples which remain uninjured. When low temperature breakdown supervenes, the rate of acid loss is accelerated. The rate of acid loss is decreased by reducing the oxygen concentration or by increasing CO₂ concentration. The loss of carbohydrate is reduced by controlled atmosphere storage conditions. The rate of loss of substrates usually exceeds the loss of carbon as CO₂ and the theoretical oxygen-uptake for oxidation of the substrate lost exceeds the observed oxygen-uptake. The lower the temperature the greater the excess. Carbohydrate substrate is interconvertible into some non-reducing substance or substances.

K. A. R.

4.19 *Effect of pre-harvest spray of growth regulators on the size composition and storage behaviour of sapota (Achras sapota Linn.)*. I. S. LAKSHMINARAYANA, H. SUBRAMANYAM AND V. SURENDRANATH, *J. Fd Sci. Technol.*, 1967, 4 (2), 66.

4.20 *Effect of pre-harvest spray of maleic hydrazide and isopropyl n-phenyl carbamate on sapota (Achras sapota Linn.)*. II. S. LAKSHMINARAYANA AND H. SUBRAMANYAM, *J. Fd Sci. Technol.*, 1967, 4 (2), 70.

4.21 *The refrigerated storage of Victoria plums in low oxygen atmospheres*, W. HUGH SMITH, *J. hort. Sci.*, 1967, 42 (3), 223.

Storage of Victoria plums in 1 per cent oxygen at 34°F markedly extended their storage life by reducing low temperature injury. A further extension was obtained by storage at 31°F in 1 per cent oxygen, interrupted by two days storage at 65°F after the 16th day.

4.22 *β-glucosidase activity in canned plums*, D. R. HAISMAN AND D. J. KNIGHT, *J. Fd Technol.*, 1967, 2 (3), 241.

In canned plums, β-glucosidase breaks down the diglucoside amygdalin to glucose, benzaldehyde and hydrocyanic acid. At 60°C, in aqueous solution, the enzyme was 90 per cent inactivated in 32 min at pH 5.0, and in 0.6 min at pH 3.0. In the presence of its substrate amygdalin, and in the solid phase, the enzyme was much more heat stable. Because the enzyme system in the kernels is at its optimum pH, in contact with its substrate, and in the solid phase, it is not wholly inactivated by the normal heat process given to canned plums. The breakdown of amygdalin to benzaldehyde and cyanide is measured at different temperatures.

K. A. R.

5. Oilseeds and Nuts

5.1 *Some oilseeds from tropical herbaceous crops*, J. A. CORNELIUS AND W. D. RAYMOND, *Trop. Sci.*, 1967, 9 (2), 75.

5.2 *Refining and bleaching of peanut miscella*, M. M. CHAKRABARTY, D. BHATTACHARYA AND A. BASU, *Fette Seifen Anstr. Mitt.*, 1967, 69 (6), 403.

Very effective removal of free fatty acids (FFA) and decolorisation of the peanut miscellas were achieved by treating at 45-60 per cent oil content with 16°-20°Bé caustic soda solution at room temperature (ca. 32°±1°C). Good bleaching of refined miscella samples was also possible at room temperature with commercial acid treated earth and active charcoal. Refined oils had 0.02—0.06 per cent FFA with 94-99 per cent colour removed.

A. A.

5.3 *Isolated soybean protein as a banana spray drying aid*, SYLVIA MIZRAHI, ZEKI BERK AND URI COGAN, *Cereal Sci. Today*, 1966, 12 (8), 322.

The present work has shown that isolated soybean protein, at levels ranging from 4 to 20 per cent (on dry basis) may be used as an aid in spray drying, as an anti-caking agent, or as a nutritional supplement in the manufacture of banana powder.

A. A.

5.4 *Polysaccharides of soybean seeds. III. 1, 4-linked galacto- and trisaccharides from partial acid hydrolysate of the hot water extract fraction of soybean seed polysaccharides*, MAKIO MORITA, MASAKUNI OKUHARA, TADAKI KIKUCHI AND YOSITO SAKURAI, *Agric. Biol. Chem. Japan*, 1967, **31** (3), 314.

A homologous series of galacto-oligo saccharides were the major components obtained as partial acid hydrolysate of hot water extract of soybean seed polysaccharides. Two of them isolated by column chromatography on methylation followed by acid hydrolysis gave 2, 3, 4, 6-tetra, and 2, 3, 6-tri-0-methyl D-galactose and were linked galacto-di- and trisaccharides respectively. Alditols from these oligosaccharides had infra red absorptions at 885 and 895 cm^{-1} indicating thereby the presence of β -linkages in their molecules.

B. S. N.

5.5 *Optical rotatory dispersion (for ultra violet region) infra red absorption, and deuteration studies of soybean proteins (7S and 11S)*, DANJI FUKUSHIMA, *Agric. Biol. Chem. Japan*, 1967, **31** (1), 130.

Soybean 7S and 11S proteins have the intra molecular β -structure as determined from the optical rotatory dispersion (ORD) behaviour of the native and urea denatured proteins in the 300-600 $\text{m}\mu$ region. Both the protein molecules (7S and 11S) appear to be very rigid and compact even in their randomly folded parts in soybean as can be further substantiated by the levorotation near 230 $\text{m}\mu$ which increases on its denaturation.

B. S. N.

5.6 *Amino acids of processed meal proteins*, C. R. MITRA AND P. S. MISRA, *J. agric. Fd Chem.*, 1967, **15** (4), 697.

In a search for new sources of protein, amino acids from the processed seed meals of 29 species belonging to different natural orders have been analysed by two-dimensional paper chromatography. Comparative data show that most of these seed meals are equally rich in essential amino acids as are edible oil seed meals and can be used as cattle and/or poultry feed. Protein content of the Meliaceae and Cruciferae seed meals compare with the leguminous seed meals. *Jatropha curcas* (Euphorbiaceae) seed meal showed the presence of 58.1 per cent protein.

A. A.

5.7 *The use of coconut preparations as a protein supplement in child feeding*, *J. Fd Sci. Technol.*, 1967, **4** (2), 59.

Review. 26 references.

5.8 *Silica content in coconut (Cocos nucifera) kernel and water*, T. N. V. PILLAI, *Curr. Sci.*, 1967, **36** (24), 667.

Silica content of coconut kernel and water reported are: 158.3-455.2 and 2.0-128.0 μg . respectively.

B. S. N.

5.9 *Microdetermination of the major individual isothiocyanates and oxazolidinethione in rape seed*, C. G. YOUNGS AND L. R. WETTER, *J. Am. Oil Chem. Soc.*, 1967, **44** (10), 551.

The thioglycosides in the rape seed meal were hydrolysed with myrosinase and the aglycones released, were extracted with methylene chloride. The 3-butenyl and 4-pentenyl isothiocyanates were determined by GLC. The 5-vinyl-2-oxazolidinethione was determined in an aliquot of the extract by UV absorption (limit for detection: for isothiocyanates, 0.1 mg/g. of meal; for oxazolidinethione, 0.3 mg/g. of meal).

J. V. S.

5.10 *Preparation and composition of a tofu like product from ground nut*, M. A. KRISHNASWAMY AND T. SHANTHA, *J. Fd Sci. Technol.*, 1967, **4** (1), 6.

6. Oils, Fats and Waxes

6.1 *Studies on cashew oils. I. Preparation and analysis*, H. P. KAUFMANN AND J. BARVE, *Fette Seifen Anstr Mittel*, 1967, **69** (6), 437.

The fatty acid composition of the cashew kernel oil, determined by GC was found to be: palmitic acid, 8.2 per cent; palmitoleic acid, 0.4 per cent; stearic acid, 4.2 per cent; oleic acid, 67.4 per cent and linoleic acid, 19.8 per cent. The cashew nut shell liquid contains mainly mono- and dihydroxyalkylbenzenes and alkylphenolic acid. Owing to their large polarity differences, these components of the cashew nut shell liquid can be separated by partition between 80-90 per cent methanol and low boiling petrol ether. The silica gel column chromatography can be employed for the preparative separation of these components.

A. A.

6.2 *Pro- and antioxidants in the field of fats. XXI. Phenolic compounds of the vegetable origin*, KAUFMANN, H. P. AND WAHAB EL BAYA, A. E., *Fette Seifen Anstr Mittel*, 1967, **69** (4), 236.

Quercetin, dihydroquercetin, robinetin, rhamnetin, morin, fisetin and rutin were investigated for their antioxidative effect in relation to their concentration in the methyl esters of linoleic acid and linseed oil, fatty acids as well as on soybean oil and antioxidants. The effect is dependent on the concentration. The inversion effect due to increase in concentration could not be observed under the experimental conditions. The relation between the antioxidative effect and the chemical constitution of flavonols is discussed.

A. A.

6.3 *Effect of ionising radiation on fats. VIII. Formation of water in oils and fats induced by irradiation*, R. KOHN, *Fette Seifen Anstr Mittel*, 1967, **69** (5), 323.

Irradiation of groundnut oil and lard with γ -rays from a Co-60 source led, depending on the irradiated dose (10^4 to 10^6 rad), to formation of free water, which was measured by Karl-fischer-method. The formation of water in fats can be explained on the basis of currently accepted conceptions of radiolytic decomposition of esters, fatty acids, hydroperoxides and alcohols.

A. A.

6.4 *Gas chromatographic investigation of the fats of animal origin*, H. J. LANGNER, *Fette Seifen Anstr Mittel*, 1967, **69** (6), 453.

The C_{14} , C_{16} and C_{18} -fatty acid contents of a number of fats of animal origin were determined by GC. The GC separation was carried out in such a manner that even the polyunsaturated fatty acids could be completely separated.

K. M. D.

6.5 *Changes in lard during prolonged cold storage*, S. KLEIN AND J. POKORNY, *Prumysl Potravin*, 1967, **18** (7), 332.

Even when the unsuitable parts of the stored lard are removed oxidative rancidity of products begins to rise after 4-5 months of cold storage. As soon as the fat stability according to the Schaal test, falls below 9 days and the peroxide number exceeds 2 mval/kg, there is danger that the fat, when taken out of storage will become rancid before it is consumed. Fat with a high acid number becomes rancid more easily.

K. M. D.

6.6 *Investigations on the classification and evaluation of margarines keeping in view the requirements of the food law (conclusion)*, R. RISTOW, *Dt Lebensmittel Rdsch*, 1967, **63** (4), 115.

Commercial margarines were classified into three groups according to price. In two summers (1962 and 1965) and one winter (1964/65) a number of samples were analysed for polyunsaturated fatty acids, oil of marine animals, long chain fatty acids, hardening and tocopherol content.

The efforts of the margarine industry to improve quality are clearly recognizable in the analytical picture. However im moderate claims made in advertisements may create unnecessary difficulties in effecting a further improvement in quality based on latest scientific knowledge and economic necessities.

K. M. D.

- 6.7 *The component acids of Carica papaya (Caricaceae) seed oil*, R. C. BADAMI AND C. D. DAULATABAD, *J. Sci. Fd Agric.*, 1967, **18** (8), 360.

By the application of reversed-phase partition column chromatography, the oil from the seeds of *Carica papaya* was found to contain the following acids: lauric, 0.4, myristic, 0.4, palmitic, 16.2, stearic, 5.0, arachidic, 0.9, behenic, 1.6, hexadecenoic, 0.8, oleic, 74.3 and linoleic, 0.4 per cent.

A. A.

- 6.8 *Lactones in autoxidised vegetable oils*, J. A. FIORTI, V. KRAMPT AND R. J. SIMS, *J. Am. Oil Chem. Soc.*, 1967, **44** (9), 534.

Aliphatic saturated lactones have been found to be responsible for specific types of flavour in food materials. Both gamma and delta lactones were present in highly peroxidised cottonseed and soybean oils though they were absent in fresh oils. GLC, TLC, IR spectrophotometry and nuclear magnetic resonance spectrophotometry were employed during the experiments.

J. v. s.

- 6.9 *Mixing effects in dead-end hydrogenation*, JAIME WISNIAK AND SAVA STEFANOVIC, *J. Am. Oil Chem. Soc.*, 1967, **44** (9), 545.

Halphen test in many seed oils including that of *Gossypium hirsutum* is associated with the presence of biologically active cyclopropene acids, malvalic and sterculic. The methods in vogue for estimating them generally consist in dissolving the sample in 3 parts of glacial acetic acid and one part benzene, and then titrating at 55°C with 0.1 N hydrobromic acid in glacial acetic acid with crystal violet as indicator. A new titrating procedure which employs a solution of hydrobromic acid in toluene is now being developed.

J. v. s.

- 6.10 *Fatty acid composition of fats extracted from meat and cheese pizza*, LOIS T. KILGORE, *J. Am. Oil Chem. Soc.*, 1967, **44** (10), 592.

Fat and individual fatty acid composition of several types of pizza.

- 6.11 *Present production of some of the important essential oils in India. II*. O. P. VIRMANI, B. C. GULATI AND S. C. DUTTA, *Perf. essent. Oil Rec.*, 1967, **58** (10), 700.

Data on area, production and composition of oil of *Eucalyptus citriodora*, oil of geranium, oil of lavender and oil of rosemary. 13 references.

J. v. s.

- 6.12 *Effect of trans esterification of lard on stability, antioxidant-synergist efficiency, and rancidity development*, S. ZALEWSKI AND A. M. GADDES, *J. Am. Oil Chem. Soc.*, 1967, **44** (10), 576.

Effect of glyceride rearrangement of lard did not affect its resistance to oxidation or alter the efficiency of synergists and antioxidants. Changes in stability were due to the decomposition of tocopherol and the formation of reducing substances. The position of unsaturated fatty acids in the glyceride may influence the free volatile carbonyl compounds present in autoxidised lard and in rancidity development. Interesterification under vacuum produced an odourless and colourless randomised lard with natural stability in the range of the parent lard.

A. A.

7. Starch, Sugar and Confectionery

- 7.1 *Development of edible amylaceous coatings for foods*, LOUIS JOKAY, GLEN E. NELSON AND EUGENE L. POWELL, *Fd Technol. Champaign*, 1967, **21** (8), 1064.

The high amylose (70 per cent) starch commercially available can be used as coating materials to foods. The various benefits of using it have been discussed.

J. v. s.

- 7.2 *Distribution of starch damaged by roller milling and by air classification*, Y. AUDIDIER J. F. DE LA GUERIVIERE, Y. SEINCE AND K. BENOUALID, *Inds aliment agric.*, 1967, **84** (3), 351.

Flours produced by roller milling from wheats harvested two years in succession were investigated here. The level of starch damage varied with type of processing and increased as the processing steps increased in number and severity. Starch damage levels from different mill streams increased in conjunction with minerals, protein, alpha-amylase and protease contents. Within a same stream flour, a small particle size was accompanied by higher levels of damaged and total starch by lower contents in minerals and protein, as well as by a gradual individualization of proteins. Air classification of roll milling streams group shifted the protein particles unbound by the grinding action, and gathered the lightest starch and protein particles in the line fractions. Hence resulted a change in total starch distribution. The level of damaged starch increased from coarse fractions to medium fractions, to fine fractions.

K. M. D.

- 7.3 *Thermogravimetric behaviour of starches*, BENJAMIN CARROLL AND JOHN W. LISKOWITZ, *J. agric. Fd Chem.*, 1967, **15** (4), 701.

Thermogravimetric analyses have been performed with a precision of about ± 0.2 per cent on granular starches, starch fractions, modified starches and mechanical starch mixtures.

B. S. N.

- 7.4 *Caramels and caramelization. I. The nature of caramelan*, SHOZABURO KITAOKA AND KIROKU SUZUKI, *Agric. biol. Chem. Japan*, 1967, **31** (6), 753.

Caramelan is not a single chemical compound, but is a mixture of about 20 compounds as evidenced by paper, thin layer and column chromatographic studies. The more important among the identified compounds are: glucose, fructose, 1, 6-anhydro- β -glucose (levoglucosan), sucrose, three gluco-disaccharides, isomaltose, kojibiose and nigerose.

B. S. N.

9. Meat, Poultry and Fish

- 9.1 *Tenderisation of meat*, B. S. BHATIA AND K. R. GOPALA RAO, *Indian Fd Packer*, 1967, **21** (4), 13.

Review. 58 references.

- 9.2 *Effects of animal age on juiciness and tenderness of beef*, GENEVIEVE P. HO AND S. J. RITCHEY, *Fd Technol. Champaign*, 1967, **21** (9), 1278.

Panel scores for juiciness and 6 components of tenderness were measured in 2 muscles *longissimus dorci* and *biceps femoris* from 3 carcass groups—veal, baby beef, and mature beef of 8 animals each. The panel scores, were related to the age of the animal, at 2 internal temperatures, 61°C and 80°C and were related to each other by statistical analysis. The age of these animals had no definitive effect on the panel scores at 61°C and little total effect on eating quality.

A. A.

- 9.3 *Stability of thiamine and riboflavin during freeze drying of meat*, O. SVABENSKY, J. PÍCKOVA AND M. MARTINOVSKA, *Prumysl Potravin*, 1967, **18** (7), 378.

There is no loss of vitamins B₁ and B₂ during freeze drying. If a low residual moisture content in freeze-dried meat is assumed, then practically 100 per cent retention of the vitamins can be guaranteed. Even high temperature does not affect the vitamin content, when the moisture content of the meat is low. Increase of humidity causes greater loss of thiamine in raw meat, but the effect on riboflavin is not so marked. Presence of oxygen has no effect on the retention of both the vitamins. To obtain maximum

nutritive value in freeze-dried meat the moisture content of the meat must be brought below 2 per cent and the relative humidity during storage should be less than 15 per cent.

K. M. D.

9.4 *Relative value of various pig breeds for meat industry*, J. LAT AND CERNOSEK A., *Prumysl Potravin*, 1967, 18 (7), 329.

The authors compare several breeds of pigs taking as a criterion their value to meat industry. The comparison covers the following breeds: *Landrace*, *Large white*, *Cornwall*, and their cross breeds. The *Landrace* pig has the highest proportion of high-grade sorts of meat.

A. A.

9.5 *Bacteriology of prepacked pork with reference to gas composition within pack*, G. A. GARDNER, A. W. CARSON AND J. PATTON, *J. appl. Bact.*, 1967, 30 (2), 321.

Bacteriological changes in pork stored at 16 and 2° under gas permeable and gas impermeable films and aerobic conditions were studied. The concentrations of CO₂, N₂ and O₂ in the atmosphere inside the packs were also studied. The bacteria isolated from prepacked pork were: *Pseudomonas*—*Achromobacter* spp., *Kurthia* spp., *Microbacterium thermosphactum*, *Enterobacter*—*Hafnia* spp. and lactobacilli.

A. A.

9.6 *Bacteriology of rapid cured ham*, C. D. BARBE AND R. L. HENRICKSON, *Fd Technol. Champaign*, 1967, 21 (9), 1267.

The bacterial populations studied reveal no significant bacteriological problems in the new concept of complete processing prior to chilling. The qualitative aspects of the rapid cured ready-to-eat ham appear to be quite comparable to the conventionally processed product. However, in view of the reduced incidence of various enterococci from the finished product, it would appear that the pre-chill processed ham would be more stable. The rapid cured ready-to-eat ham appears to present advantages over the conventional method of ham curing.

A. A.

9.7 *The influence of pre-chill processing techniques on bacon*, R. W. MANDIGO AND R. L. HENRICKSON, *Fd Technol. Champaign*, 1967, 21 (9), 1262.

9.8 *A study of emulsifying capacity of salt soluble proteins of poultry meat. I. Light and dark tissues of Turkeys, hens and broilers and dark meat tissues of ducks*, J. P. HUDSPETH AND K. N. MAX, *Fd Technol. Champaign*, 1967, 21 (8), 1141.

Values obtained for moisture (70.6-78.2 per cent) ether extractables (1.85-9.85 per cent) and total protein (17.5-24.2 per cent) were within previously reported ranges. Total protein and salt soluble protein were found in significantly greater amounts in light than in dark tissues of the same type poultry. This indicates that light meat would have a greater amount of emulsifying potential, than dark meat. However, in most cases, the emulsifying capacity of soluble protein, expressed as millilitre of oil emulsified by 100 mg. of soluble protein was significantly higher for dark than for light tissues.

A. A.

9.9 *Sources of variability in Turkey tenderness*, S. SCHOLTYSSEK, AND A. A. KLOSE, *Poult. Sci.*, 1967, 46 (4), 936.

9.10 *The stability of souffles subjected to frozen storage*, S. L. CIMINO, L. F. ELLIOT AND H. H. PALMER, *Fd Technol. Champaign*, 1967, 21 (8), 1149.

By increasing the flour level and judicious selection of frozen storage temperature (−18 to −23°C) baked sweetened whole egg souffles could be stored for 6 months' with less than 10 per cent loss in height. Height retention was also improved slightly by adding methylcellulose but was practically unaffected by varying either the yolk or the salt concentrations. Stability (height

retention) of baked unsweetened plain or cheese whole egg souffles was also favourably affected by increasing the flour concentration and by adding methyl cellulose, but the loss in height was generally greater than in the sweetened whole egg souffles.

A. A.

9.11 *Current problems in fish research. I. Bacterial spoilage and its control*, H. L. A. TARR, *Fishing News Internat.*, 1967, 6 (8), 52.

Review.

9.12 *Preservation of fish with tetracycline antibiotics*, M. N. MOORJANI, *Indian Fd Packer*, 1967, 21 (4), 5.

Review. 23 references.

9.13 *Applicability of luminescence analysis for establishing rigor mortis in fish*, H. WITTFOGEL, *Dt. Lebensmitt Rdsch.*, 1967, 134 (1), 1.

Filtered ultra-violet light from a quartz lamp produces a characteristic bluish white luminescence in whole fish and in fish fillets, attributed mainly to presence of lactic acid which was found when the fish is in *rigor mortis* and for a short time thereafter. Non-uniform fluorescence is an indication of incorrect freezing procedure on board the fishing vessel, or double freezing (after repacking on land), or freezing on land of a catch taken close in shore. The site and distribution of the fat depot in fatty fish are indicated by a known-yellow fluorescence which becomes more intense as time passes, and may indicate rancidity when very strong.

K. M. D.

9.14 *Evaluation of methods for determining the bacterial population of fresh fillets*, REMEDIOS SILVERRIO AND R. E. LEVIN, *J. Milk Fd Technol.*, 1967, 30 (8), 242.

Influence of various media, diluents and incubation temperatures on the total bacterial counts from fish. The results demonstrate the extreme variability and relative toughness of young Turkeys chilled for short periods, the interchangeability of Warner—Bratzler and Allo-Kramer shear methods, and the essential requirement for large numbers of birds per treatment group in order to increase the precision of objective tenderness measurement.

K. A. R.

9.15 *Effect of charcoal broiling on the sensory characteristics of hamburger and chicken breasts*, P. K. LEWIS, JR., T. L. GOODWIN AND K. L. MOSS, *Fd Technol. Champaign*, 1967, 21 (8), 1133.

Hamburger or chicken breast cooked with charcoal from hard wood showed superior organoleptic qualities over either lignite charcoal grilling, gas grilling or oven roasting.

J. V. S.

9.16 *Gas chromatographic and mass spectral analyses of cooked chicken meat volatiles*, M. NONAKA, D. R. BLACK AND E. L. PIPPEN, *J. agric. Fd Chem.*, 1967, 15 (4), 713.

Sulfer compounds, aldehydes, ketones, aromatic compounds, furans, esters, hydrocarbons, alcohols and terpenes were among the 62 identified compounds from about 227 obtained from fractionation and mass spectrometry of odorous fraction isolated from boiling chicken meat.

B. S. N.

9.17 *On the natural content of β-carotene in fresh, dried and frozen duck egg yolk*, E. BENK, R. DIETL AND L. BRIXIUS, *Dt. Lebensmitt Rdsch.*, 1967, 63, (4), 110.

The β-carotene content in 24 samples of fresh duck egg yolk, expressed as percentage of total carotenoids, varied between 1.3 and 20.6. Drying and freezing caused hardly any change in these values. In contrast, the content of β-carotene in hen egg yolk varies between 0.8 and 4.6 per cent of total carotenoids. The

other principal carotenoids in duck egg yolk are xanthophyll and zeaxanthine which occur also in hen egg yolk.

K. M. D.

9.18 *Ultra fast freezing of cooked egg white*, NILS BENGTSSON, *Fd Technol. Champaign*, 1967, 21 (9), 1259.

Marked advantage was observed for ultra fast freezing with liquid nitrogen or cold nitrogen gas and the quality was comparable to unfrozen material. Acceptable quality was achieved by circulating gas around -80°C . While freezing in a blast freezer at -35°C gave an unacceptable product. Dip freezing in liquid freon 12, with a boiling temperature of -30°C gave comparable quality and freezing rate to nitrogen gas freezing at -150°C .

J. V. S.

9.19 *The nature of heat damage in anchovy meals*, C. SILVA AND E. CONTRERAS, *Fishing News Internat.*, 1967, 6 (8), 44.

Six hours of drying defatted anchovy meals resulted in lowering of *in vitro* digestibility by 10.3–17.7 per cent. A group of pepsin hydrolysates present in the meals precipitated at pH 4.5, which was less in heated samples. Two groups of proteins with molecular weight of 100,000 and 1,600–3,600 were present on fractionation of the hydrolysate by sephadex G-100. Heat decreased the amounts of both these fractions, although the proportion of high molecular weight substances relative to the lower molecular weight fractions decreased.

B. S. N.

9.20 *The fish protein concentrate story. 4. World efforts towards FPC*, G. M. KNOBL, *Fd Technol. Champaign*, 1967, 21 (8), 1108.

Review. 28 references.

9.21 *The fish protein concentrates story. 5. The Bureau of Commercial Fisheries Programme*, DONALD G. SNYDER, *Fd Technol. Champaign*, 1967, 21 (9), 1234.

Review. 9 references.

9.22 *Effect of optical systems and sample preparation on the visible reflection spectra of pork muscles*, R. J. ELLIOTT, *J. Sci. Fd Agric.*, 1967, 18 (8), 332.

Of the three optical systems used to measure light reflectance from muscle, the best resolution of the spectra was achieved with integration spheres. The influence on the reflection spectra of the following factors was investigated: muscle surface, transparent film, depth of sample, longitudinal and transverse sections of muscle fibres, and the effect of fat. The spectra of samples within the *longissimus dorsi* muscle was affected by pH, but not by vertebral location. A thin sample covered with a glass cover slip and with a white rear reflector produced the maximum resolution of muscle pigments.

A. A.

9.23 *Distribution of p, p'-DDT residues in adipose and muscle tissues in beef cattle*, THERAN S. RUMSEY, PAUL A. PUTNAM, RUSSELL E. DAVIS AND CALVIN CORLEY, *J. agric. Fd Chem.*, 1967, 15 (5), 898.

Total dose of 300 mg. of p, p'-DDT/kg. of body weight over a 3- or 30-day period was given to two groups of animals consisting of 2 sheep and 1 cow in each group. Total DDT residues (DDD, DDT and DDE) appeared on the average, to be evenly distributed throughout the extractable fat of beef cattle, based on samples of 13 different tissues. Differences were found in the total DDT residue content of extractable fat due to dose rate and time after treatment, and the relative amounts of DDD, DDT and DDE were different between depot, fat, muscle, blood and milk fat.

A. A.

9.24 *Changes in protein solubility and associated properties during the ripening of Hungarian dry sausages*, VILMA MIHALYI AND L. KORMENDY, *Fd Technol. Champaign*, 1967, 21 (10), 1398.

Myofibrillar and sarcoplasmic proteins decreased in solubility during the first phase of ripening, while NPN and KI-insoluble proteins increased. Total N decreased. The extent of decline in protein solubility was more in the outer surface than in the inner. The increase in fat acidity suggested the presence of microorganisms with lypolytic activity.

J. V. S.

9.25 *Incidence of breast blisters and bruising in dressed poultry*, P. C. PANDA, M. A. HALEEM AND B. PANDA, *J. Fd Sci. Technol.*, 1967, 4 (2), 76.

9.26 *Changes in sulphhydryl and disulfide content of chicken muscle and the effect of N-ethylmaleimide*, THOMAS H. GAWRONSKI, JOHN V. SPENCER AND MERTON H. PUBOLS, *J. agric. Fd Chem.*, 1967, 15 (5), 781.

In the pectoralis major muscle of chicken, ratio of sulphhydryl to disulfide rapidly decreased post-mortem and reached a minimum in 2 hours. Shear values of excised muscles treated with N-ethylmaleimide which reacts with sulphhydryls were determined. This reagent prevents complete tenderisation.

9.27 *Fish flour as a protein source in calf milk*, J. T. HUBER AND L. M. SLADE, *J. Dairy Sci.*, 1967, 50 (8), 1296.

Average daily gains and feed efficiencies were not significantly depressed when fish flour was furnished upto 40 per cent of the dietary protein. However at 60 to 67 per cent, marked decreases were observed; and at 100 per cent death occurred. A linear increase in gains was noted as fat content of replacers increased from 10 to 20 per cent (on a dry basis). Digestibility of crude protein in fish flour averaged about 80 per cent compared to 90 per cent for skim milk protein. Digestibility of dry matter, crude protein, ether extract, and ash decreased as amount of fish flour in milk replaces increased.

K. A. R.

9.28 *Current problems in fish research. 2. Freezing*, H. L. A. TARR, *Fishing News Internat.*, 1967, 6 (9), 32.

General.

9.29 *Effects of processing, storage and incorporation of antioxidants on canned mackerel and ravaas*, S. S. PAWAR AND N. G. MAGAR, *J. Fd Sci. Technol.*, 1967, 4 (1), 8.

9.30 *Denaturation of proteins during frozen storage of pomphrets, mackerel and sardines*, S. S. PAWAR AND N. G. MAGAR, *J. Fd Sci. Technol.*, 1967, 4 (2), 75.

Results were interpreted to implicate sulphhydryl groups in the pre- and post-rigor reactions which are important in the tenderisation of muscle.

J. V. S.

9.31 *The relation between the toughness of cod stored at -7°C and -14°C , its muscle protein solubility and muscle pH*, W. P. COWIE, AND W. T. LITTLE, *J. Fd Technol.*, 1967, 2 (3), 217.

The decrease in protein extractability and the increase in toughness of fillets stored at -7°C proceeded at a faster rate than in fillets stored at -14°C for 34 weeks. At these temperatures measuring both protein extractability and muscle pH, the texture of the cod fillets can be assessed.

K. A. R.

9.32 *The effect of initial freezing temperature on the behaviour of cod muscle proteins during subsequent storage: a histological study of homogenates*, L. MALCOLM LOVE, *Bull. J. Soc. sci. Fish.*, 1967, 33 (8), 746.

Homogenates of frozen and thawed cod muscle obtained by cell fragility method varied in their microscopic appearance according to freezing temperature. Cod muscle frozen in liquid air, thawed and homogenised showed many myofibrils to be laterally united; on cooking the material was tougher than that

frozen at -3°C . Freezing at -3°C and storing at -1.6°C made the homogenates misty in appearance, and protein had been depleted considerably.

J. V. S.

9.33 *Effects of drying, salting and high temperatures on the nutritive value of dried cod*, A. AITKEN, A. C. JASON, J. OLLEY AND P. R. PAYNE, *Fishing News Internat.*, 1967, 6 (9), 42.

Cod (*Gadus callarias*) dried by the accelerated mechanical drying of Torry/Yarrow method was found to have its nutritive value unaffected by the high temperature involved or the application of salt curing and freeze drying techniques.

B. S. N.

9.34 *The nature of heat damage in anchovy meals by fat oxidation*, HEINZ-WERNER GEISLER AND C. CONTRERAS, *Fishing News Internat.*, 1967, 6 (9), 38.

The digestibility of anchovy meal decreases significantly during first 15 days, when peroxide value remains at the maximum. Digestibility of the meal decreases in proportion to added fat. Percentage of total lysine after five months ageing, did not reveal any change, although the percentage of lysine diminished during the period depending on the amount of added fat. The non-digestible fraction with pepsin contained a large proportion of total lysine, 50 per cent of which was in the 'available' form.

B. S. N.

9.35 *Changes of the muscle pigment in tuna on cooking*, CHIAKI KOIZUMI AND FUMIO MATSUURA, *Bull. J. Soc. sci. Fish.*, 1967, 33 (7), 651.

On reduction with sodium hydrosulfite, the cooked tuna meat became intensely pink giving the absorption spectrum fairly characteristic of ferrohemochrome. After adding some nicotinamide the spectrum typical of ferrohemochrome was obtained indicating the additional formation of this pigment. The results showed that the pink colour in cooked tuna meat may be due to a mixture of metmyochromogen and hemochrome, coordinating denatured myoglobin and nitrogenous base naturally present in the meat.

J. V. S.

10. Milk and Dairy Products

10.1 *Current technological problems of milk powder manufacture*, P. LEMAITRE, *Inds aliment. agric.*, 1967, 84 (4), 513.

Since 1958, the use of milk powders has diversified and drying technique has changed fast. Product cost has been reduced because of the bigger size of plants and the improvement of equipment. Various qualities are required from powders and plants often specialised along their market work at request. Finally, the author examines falling-film evaporators, then studies evolution of spinning and nozzle atomizers of drying chambers, coolers and instantizers.

K. M. D.

10.2 *Fermented milks*, A. CAMUS, *Inds aliment. agric.*, 1967, 84 (4), 505.

Processing of yoghurt in semi-continuous processes is frequently used.

10.3 *Effect of trypsin on milk in relation to its proteose-peptone fraction*, V. K. JOSHI, N. C. GANGULI AND V. R. BHALERAO, *Indian J. Dairy Sci.*, 1967, 20 (1), 41.

A 4-5 fold increase in proteose-peptone content of milk was observed when milk with trypsin was selectively digested. Acid as well as micellar caseins treated with trypsin give proteose-peptone and later on to non-protein components. Proteose-peptone species isolated from trypsin treated milk had additional components with different electrophoretic mobilities and lower

sialic acid concentration as compared to native proteose-peptone which exists in milk.

B. S. N.

10.4 *Effect of heat-treatment of buffalo and cow milk in the manufacture of yoghurt*, M. K. K. IYENGAR, V. K. N. NAMBU-DRIPAD AND A. T. DUDANI, *Indian J. Dairy Sci.*, 1967, 20 (1), 8.

Buffalo and cow milk heated to 80° or 85°C for 30 minutes was found to yield yoghurt with uniformly firm texture when treated with a mixed culture of *St. thermophilus* and *L. Bulgaricus*. Cow milk, however on fermentation possessed a better flavour than buffalo milk.

B. S. N.

10.5 *Incidence and significance of thermophilic bacteria in farm milk supplies*, S. B. THOMAS, R. G. DRUCE, G. J. PETERS AND D. G. GRIFFITHS, *J. appl. Bact.*, 1967, 30 (2), 265.

Review. 182 references.

10.6 *Polarographic determination of diacetyl in butter-milk*, WILLIAM P. FERREN, NORMAN SHANE AND ROBERT SCHWEIGERATH, *Fd Technol. Champaign*, 1967, 21 (9), 101.

Mixtures of butter milk and 0.2 N ammonium chloride (1:1) yielded a polarographic half wave at 0.76 volts vs saturated calomel electrode. Changes in diffusion current were related to diacetyl content of butter milk samples in the parts per million range.

A. A.

10.7 *Butter*, A. CAMUS, *Inds aliment. agric.*, 1967, 84 (4), 525.

10.8 *New butter-making technology for the KM 1000 continuous line*, M. VEDLICH AND I. BENESOVA, *Prumysl Potravin*, 1967, 18 (7), 334.

The authors recommend a new technology for the KM 1000 butter making lines incorporating continuous churns. The described technology contributes to better quality of the product and improves its keeping properties. Experiments with maintaining the same temperature during physical and biological ripening gave excellent results and the method owing to its simplicity has been already introduced as a part of standard technology. To improve the consistency of butter in winter period and reduce the fat content in butter milk the authors have elaborated a modified technology based on physical ripening at low temperature viz. 4°C . This being the only difference between the two modifications.

A. A.

10.9 *A thin-layer chromatographic method for detection of adulteration of ghee with vegetable fats*, M. K. RAMAMURTHY, K. M. NARAYANAN, V. R. BHALERAO AND NOSHIR N. DASTUR, *Indian J. Dairy Sci.*, 1967, 20 (1), 11.

The method based on separation of cholesterol and phytosterols of vegetable fats in milk fat by TLC consists of applying unsaponifiable matter of fats on glass slides previously coated with calcium carbonate and starch and dipped in 10 per cent solution of liquid paraffin in petroleum ether and effecting their separation by using a solvent mixture containing methanol-acetic acid-water (20:5:1). On drying and developing by spraying 10 per cent phosphomolybdic acid in methanol, the chromatogram showed cholesterol to have a higher migration rate than phytosterols. Ghee with 10-13 per cent vegetable fat showed both spots, and adulteration could be easily detected when coconut oil was present at 25 per cent level in milk fat.

B. S. N.

10.10 *Starter cultures for cheddar cheese*, E. R. VEDAMUTHU AND G. W. REINBOLD, *J. Milk Fd Technol.*, 1967, 30 (8), 247. Review. 38 references.

- 10.11 *Distribution of lipids in various fractions of cow's milk*, J. CERBULIS, *J. agric. Fd Chem.*, 1967, 15 (5), 784.

Free and 'bound' lipids were studied in different fractions of milk. Neutral lipids were found in free (petroleum ether fraction) and bound (chloroform-methanol, 2 to 1, v/v) fractions. Phospholipids were found only in 'bound' fraction. The composition of glycerides was determined by TLC. The di- and mono-glyceride content of bound neutral lipid fraction was higher than that of free neutral lipid fraction.

J. v. s.

- 10.12 *Pasteurisation treatment and consumer acceptability of milk*, D. D. DEANE, J. A. CHELESVIS AND W. R. THOMAS, *J. Dairy Sci.*, 1967, 50 (8), 1216.

The consumers preferred the flavour of the milk pasteurised at 78.9°C for 17 sec. as compared to milk pasteurised at 72.2, 75.6, 82.2 or 85.6°C for 17 sec. The intensity of the cooked flavour in milk stored at 1.7-4.4°C decreased within a few days after processing.

- 10.13 *Avoiding common defects in cheddar cheese*, GEORGE W. REINBOLD AND E. R. VEDAMUTHU, *J. Milk Fd Technol.*, 1967, 30 (10), 321.

Descriptive paper.

- 10.14 *Stability of a long chain polyphosphate in aqueous cheese extracts*, L. G. SCHARPF JR. AND T. P. KICHLINE, *J. agric. Fd Chem.*, 1967, 15 (5), 787.

The concentration and distribution of phosphate species as P_2O_5 remained unchanged in extracts stored at 3-7°C for 4 weeks. During four weeks of storage at 20°C, long chain species decreased from 89 to 64 per cent while orthophosphate species increased from 4 to 27 per cent. Two predominant genera of microorganisms were isolated from cheese extract, and natural alkaline phosphatase activity of extracts was high.

A. A.

11. Coffee, Tea and Cocoa

- 11.1 *Determination of loss on drying roasted ground coffees*, ELEANOR E. MCCARRON, *J. Ass. off. anal. Chem.*, 1967, 50 (4), 835.

Concordant results were achieved with air oven (105°C) and vacuum oven (at 100°C) methods for fine grinds of coffee after 6 hours of drying. For coarser grinds air oven method showed less loss than vacuum oven procedure.

J. v. s.

- 11.2 *Studies with coffee oil meal in diets for growing chicks*, L. B. CAREW, JR., H. ALVAREZ AND O. M. MARIN R. *Poult. Sci.*, 1967, 46 (4), 930.

Feeding of diets containing solvent extracted coffee oil meal to chicks resulted in marked depression in growth rate, feed intake and increase in mortality. Toxicity was observed when diet contained 10 per cent or more meal, and at 2.5 per cent significantly reduced growth was observed. Autoclaving of raw coffee oil meal resulted in small but significant improvements in growth and approximately 50 per cent reductions in mortality. The toxicity and growth reductions are manifestations of different substances in the meal.

K. A. R.

- 11.3 *Polysaccharides from instant coffee powder*, M. L. WOLFROM AND L. E. ANDERSON, *J. agric. Fd Chem.*, 1967, 15 (4), 685.

Two polysaccharide residues have been isolated from a commercial soluble coffee powder. An arabinogalactan was precipitated from aqueous solution after removal of the mannan, by barium hydroxide precipitation. The mannan was isolated in a separate experiment by precipitation with fehling solution. The con-

stituent sugars and physical properties of the material were determined. The L arabinose content of the arabinogalactan was much lower than that previously found for the arabinogalactan of the green coffee bean.

A. A.

12. Food Additives

- 12.1 *Succinylated monoglycerides: Effects in conventional and CM bread*, D. F. MEISNER, KLAUS LERENZ AND J. JONAS, *Cereal Sci. Today*, 1967, 12 (9), 400.

Succinylated monoglycerides (SMG), a new dough conditioner and bread softener, effectively strengthens dough structure; doughs containing SMG are more tolerant to processing variable and the bread has improved volume, grain texture, and over all quality. SMG retards the rate of crumb firming and thus produces bread with extended shelf-life. SMG achieves these functions without imparting to the dough or baked goods any undesirable flavours. This valuable quality of SMG is achieved by a carefully developed preparation method which avoids the formation of chemical by-products and that assures pleasing organoleptic properties.

A. A.

- 12.2 *Combined extraction and paper chromatography of food preservatives*, J. RAJAMA AND P. MAKELA, *J. Chromatog.*, 1967, 29 (2), 369.

Food preservatives—sorbic, benzoic, p-hydroxybenzoic acid and p-hydroxy benzoates—have been extracted from foods directly on to the chromatographic paper with ethyl ether. Paper chromatographic separation of the extracted compounds was effected on the same paper. Methyl, ethyl, and propyl p-hydroxybenzoates have been separated from each other during ether extraction and from the critical pair, the butyl and benzyl p-hydroxy benzoates on a paper impregnated with NaOH.

A. A.

- 12.3 *Modern emulsifiers: The basis of improved form retention by ice-cream*, K. G. LUDWIG AND W. C. GAKENHEIMER, *Fette Seifen Anstr Mittel*, 1967, 68 (4), 285.

The form stability or 'dryness' is responsible for the solid ice-cream which retains its form and does not drip or liquify before its final consumption. The form retention is primarily due to the agglomeration of the dispersed fat particles. The correct selection of the modern emulsifiers or additives leads to a controlled agglomeration.

K. M. D.

- 12.4 *Effect of alpha-tocopherol on oxidative stability of edible fats and oils*, ZOFIA MARKUZE, *J. Nutr. Dietet.*, 1967, 4 (3), 175.

Propyl gallate acted as a powerful antioxidant in lard and margarine, whereas alpha-tocopherol exhibited very weak properties in this respect.

B. S. N.

- 12.5 *Stabilization of wine with 3-(5-nitro-2-furyl)-acrylic acid*, J. FARKAS AND J. KOVAC, *Prumysl Potravin*, 1967, 18 (5) 267.

The authors have developed a new method of stabilizing wine with higher sugar content by adding 5-nitro-furylacrylic acid. The acid acts as a substance inhibiting fermentation processes. Its biological oxidation is very rapid and its presence in the wine prevents further oxidation. It replaces to a certain degree, sulphur dioxide, has an outstanding bacteriostatic effect, is only slightly toxic and is easily expelled from the organism. Its efficient dose does not exceed 1/20—1/40 of doses typical for conventional chemicals used at present. The results of research work confirm that 5-nitro-furylacrylic acid can be recommended as a stabilizing agent.

A. A.

- 12.6 *Salt as preservative for food*, T. MCLACHLAN, *J. Fd Technol.*, 1967, 2 (3), 249.
Review. 10 References.
- 12.7 *Preservatives: a review of methods of analysis*, PIETER L. SCHULLER AND EDWARD VEEN, *J. Ass. off. anal. Chem.*, 1967, 50 (5), 1127.
Review.
- 12.8 *Gas chromatographic determination of BHA and BHT in breakfast cereals*, DAVID M. TAKAHASHI, *J. Ass. off. anal. Chem.*, 1967, 50 (4), 880.
The GC method for BHA and BHT in rice and corn ready to eat cereals was revised to include CS₂ elution of the antioxidants and GLC using a flame ionisation detector for determination.
A. A.
- 12.9 *Rapid determination of sorbic acid in orange juice*, KERMIT M. FLOYD, *J. Ass. off. anal. Chem.*, 1967, 50 (5), 1123.
Orange juice is screened for the presence of sorbic acid by measuring the UV absorbance of an alcoholic solution of the juice. The sorbic acid is isolated by solvent extraction, measured quantitatively by UV spectrophotometry and finally identified by paper chromatography.
A. A.
- 12.10 *The effectiveness of EDTA as a fish preservative*, ROBERT E. LEVIN, *J. Milk & Fd Technol.*, 1967, 30 (9), 277.
A concentration of 0.005 per cent Na₄ EDTA markedly inhibited the growth of *Ps. putrefaciens*, *Ps. fragi* and *Ps. fluorescens* in half strength nutrient broth at pH 7.0. *Achromobacter lipolyticum* was insensitive to EDTA. Dipping of haddock fillets in 1.0 per cent Na₄ EDTA for 1 min., and subsequent storage at 3°C, did not show any decrease in bacteria in comparison to control. The trimethylamine and volatile basic N₃ formation was suppressed in EDTA dipped fillets.
J. v. s.
- 12.11 *l-ascorbic and d-iso ascorbic acids: quantitative separation and assay*, CORA E. WEEKS AND MIKE J. DENTSCH, *J. Ass. off. anal. Chem.*, 1967, 50 (4), 793.
The chromatography on silicic acid-impregnated glass fibre paper can separate l-ascorbic acid (vitamin) and d-isoascorbic acid (permitted food additive) in 25 min. They are extracted from chromatogram and assayed by a microfluorometric method. Concentrations of 1.8 µg/20 µl can be separated and assayed.
J. v. s.
- ### 13. Food Analysis
- 13.1 *Determination of ammonia in animal products and raw materials*, B. HAVELKA, *Prumysl Potravin*, 1967, 18 (5) 271.
The author describes the principles of the microdistillation method which has been developed for the determination of ammonia in animal food products and raw materials and recommends to include this method into the system of tests employed for checking the quality and freshness of food products and raw materials.
A. A.
- 13.2 *Apparatus for experimental microwave processing*, W. C. ROCKWELE, E. LOWE, C. C. HUXSOLL AND A. J. MORGAN JR., *Fd Technol. Champaign*, 1967, 21 (9), 1257.
An experimental apparatus was designed for use in conjunction with a conventional 25-KW, 915—megacycle microwave oven. The unit consists essentially of a product re-rotating inside a vacuum chamber. Food pieces are tumbled, with simultaneous exposure to microwave energy and sudden pressure reduction.
A. A.
- 13.3 *Developments in adulteration of food and its detection*, WILLIAM HORWITZ AND HELEN L. REYNOLDS, *J. Ass. off. anal. Chem.*, 1967, 50 (5), 1024.
Review.
- 13.4 *The determination of the nitrogen contents of various edible hydrogenated fats*, A. C. ROBERTS AND D. J. MCWEENY, *J. Fd Technol.*, 1967, 2 (3), 233.
By the wet oxidation of the fat with acid-hydrogen peroxide and subsequent kjeldahl micro-distillation, nitrogen levels of 100 µg/g in edible, refined and hydrogenated fats, can be detected. The Nessler method in conjunction with acid-hydrogen peroxide digestion is unsuitable.
K. A. R.
- 13.5 *Analysis of oil content of maize by wide-line NMR*, D. E. ALEXANDER, L. SILVELA, F. I. COLLINS AND R. C. RODGERS, *J. Am. Oil Chem. Soc.*, 1967, 44 (10), 555.
Experiments to define feasibility, accuracy and precision of wide line NMR spectroscopy as a non-destructive analytical tool for the oil content of living seeds are described. Tests were made on corn samples containing 1 seed to 25 g. A new dimension, is thus, added to the breeding and genetics of oil crops by the application of this technique.
J. v. s.
- 13.6 *Programmed temperature gas chromatographic technique for detecting trace amounts of fatty acids*, JOHN L. IVERSON, *J. Ass. off. anal. Chem.*, 1967, 50 (5), 1118.
Illustrations are given of the application of this method to cocoa butter oil, palm kernel oil, butter oil, and cod liver oil. Column overloading and changing the programming rates during an analysis have been found necessary to detect fatty acids present in p.p.m.
J. v. s.
- 13.7 *Estimation of crude fibre in dehulled soybeans*, R. E. ANDERSON AND K. E. HOLT, *J. Am. Oil Chem. Soc.*, 1967, 44 (10), 582.
The sample mounted on a microscopic slide, is treated with trichloroacetic acid, and placed in polarising projection microscope; the image is compared with a series of standard photomicrographs. The amount of husk present is measured quantitatively, and the estimation is made on crude fibre. The method takes 15 minutes for estimation on dehulled soybeans.
J. v. s.
- 13.8 *Thin layer chromatographic determination of antioxidants by the stable free radical, α, α-diphenyl-β-picrylhydrazyl (DPPH)*, J. GLAVIND AND G. HOLMER, *J. Am. Oil Chem. Soc.*, 1967, 44 (9), 539.
The reaction between the stable free radical, DPPH and antioxidants can be used for the visualisation of antioxidants in TLC. Amounts of tocopherol down to 0.5 µg can be detected.
J. v. s.
- 13.9 *Further collaborative study on methods for vanillin and ethyl vanillin in flavouring material*, J. FITELSON, *J. Ass. off. anal. Chem.*, 1967, 50 (4), 859.
Two UV absorption methods and a chromatographic method were studied collaboratively. All 3 methods gave reproducible results.
J. v. s.
- 13.10 *Determination of starch and soluble carbohydrates. I. Development of method for grains, stock feeds, cereal foods, fruits and vegetables. II. Collaborative study of starch determination in cereal grains and cereal products*, THEODORE E. FRIENDMANN, NORMAN F. WITT AND BONNIE W. NEIGHBORS, *J. Ass. off. anal. Chem.*, 1967, 50 (4), 944, 958.

- 13.11 *A new method for the determination of hot-water extract of malt*, A. M. BROWN, *J. Inst. Brew.*, 1967, **73** (5), 438.

Malt grist is continuously extracted in a soxhlet under specific reduced pressure at 65.5°C. This method, compared to the standard gave lower extract values but has the advantage of using smaller quantity of sample, quickness, lesser manipulation, etc.

J. v. s.

- 13.12 *Flame photometric determination of calcium in food, using a reversed oxyacetylene flame, a radiation buffer and an acid mixture*, JOANNA LEHMANN AND ELISABETH GATES ZOOK, *J. Ass. off. anal. Chem.*, 1967, **50** (4), 814.

The interferences, from K, P Mg Fe, S and Al over the concentration ranges usually found in relation to calcium in foods were controlled in the method. Recovery of calcium added to foods prior to ashing was 100 ± 1.38 per cent.

J. v. s.

- 13.13 *Collaborative study of a method for the determination of caffeine in non-alcoholic beverages*, ARTHUR R. JOHNSON, *J. Ass. off. anal. Chem.*, 1967, **50** (4), 857.

A spectrophotographic procedure. Recoveries were generally more than 90 per cent.

J. v. s.

- 13.14 *Determination of nicotine residues in food*, ROBERT J. MARTIN, *J. Ass. off. anal. Chem.*, 1967, **50** (4), 939.

Nicotine in an aliquot of filtered strip solution was extracted with 0.05 N HCl, made alkaline and extracted with chloroform. The chloroform extract was then washed with petroleum ether, concentrated and analysed by GC.

J. v. s.

14. Food Microbiology and Fermentation

- 14.1 *Fungal protein for food and feeds. V. Rice as a source of carbohydrate for the production of fungal protein*, WILLIAM D. GRAVY AND MOHAN D. KARVE, *Econ. Bot.*, 1967, **21** (2), 110.

By using brown rice as substrate and using *Dactylium dendroides* (1-108) it was possible to increase the total quantity of protein in rice by a factor of 2.29 and, using *Trichoderma* sp. (1-1937), by a factor of 2.85. By this it is possible to double the protein supply from rice.

K. A. R.

- 14.2 *SO₂ formation in fermenting grape musts*, G. WURDIG AND H. A. SCHLOTTER, *Z. Lebensmittel Unters. u. Forsch.*, 1967, **134** (1), 7.

Only traces of SO₂ (analytical blank values) could be determined in freshly pressed, non-sulphated grape musts, even when the grapes had been treated with S-containing fungicides. Earlier findings reporting presence of SO₂ in musts have not been confirmed. SO₂ was always present in the wines obtained from these musts, because a part of the sulphate was reduced to sulphite during fermentation. In 1965, there was 16-117 mg. of bound SO₂ per litre, while in 1964 the value was as high as 125 mg/l. The content of SO₂ is not closely correlated with the quantity of sugar fermented or alcohol produced.

K. M. D.

- 14.3 *Enzymatic estimation of glucose and fructose in wine*, M. K. MOHLER AND S. LOOSER, *Z. Lebensmittel Unters. u. Forsch.*, 1967, **134** (1), 18.

Estimation of glucose and fructose in wine, using the enzyme system hexokinase/glucose-6-phosphatodehydrogenase/isomerase, is not interfered with even when the contents of ascorbic acid, glycerine, or saccharose each exceed 300 g/l. Authors have

shown that neither SO₂ (100 parts for 1 part of glucose + fructose) nor Fe and Cu ions (25 mg/l) nor sorbic acid (1400/1) affect the estimation.

White wine has to be diluted to less than 300 mg. of glucose and fructose per litre before the estimation. The dyestuff in red wines does interfere in the estimation. Red wine (10 ml.) decoloured by passing through a mixture of 4 g. of acidified aluminium oxide and 0.1 g. active charcoal, and diluted to 25 ml. can be used directly for the test, even when it originally contained 750 mg. glucose + fructose per litre.

Ratio of glucose to fructose was estimated in 80 different red white wines and was found to vary widely from 1:1 to 1:10.

K. M. D.

- 14.4 *On the estimation of non-volatile acids in wine*, K. MOHLER, O. MAYRHOFER, R. PIRES AND S. LOOSER, *Z. Lebensmittel Unters. u. Forsch.*, 1967, **134** (1), 19.

A chromatographic separation on a silica-gel was undertaken to obtain values for l-lactate, l-malate, citrate and pyruvate in wine, and to compare them with the values obtained by enzymatic estimation. Good agreement between the two methods was obtained only in the case of malate.

Chemical analysis of lactic acid, methyl malic acid, and citrate were made difficult by various side reactions.

K. M. D.

- 14.5 *A new method for estimation of the mycelial weight in Koji*, KEI ARIMA AND TAKESHI UOZUMI, *Agric. biol. Chem. Japan*, 1967, **31** (1), 119.

The content of glucosamine in the mycelia of *Aspergillus oryzae* Koji and rice was determined by colorimetry after hydrolysis of these materials with sulfuric acid and purification of glucosamine fraction with a Dowex 50 W column.

B. S. N.

- 14.6 *The study of strains of Candida utilis in the course of continuous cultivation on ethanol with special respect to biotin requirement*, J. VERNEROVA, and V. SYHOROVA, *Folia microbiol. Praha*, 1967, **12** (2), 146.

It was found in a synthetic ethanol medium that a strain of *Candida utilis* can permanently form a sufficient amount of growth factors. This fact is confirmed both by high yields of biomass and steady level of biotin in the yeast mass. Composition of proteins is the same as in yeasts grown on other carbon sources.

- 14.7 *Keto acids formed by baker's yeast*, HEIKKI SUOMALAINEN AND A. J. A. KERMEN, *J. Inst. Brew.*, 1967, **73** (5), 477.

The keto acids formed in bakers' yeast in anaerobic fermentation and aerobic growth were, pyruvic acid, α -ketoglutaric acid, p-hydroxyphenyl pyruvic acid and were found in abundance. Also found were: α -keto- β -methyl valeric acid, α -keto-isovaleric acid, α -keto-isocaproic acid and β -phenyl pyruvic acid and small amounts of α -ketobutyric acid, oxalacetic acid and -keto- γ -methyl butyric acid.

J. v. s.

- 14.8 *Hop substances and yeast behaviour*, J. J. DIXON, *J. Inst. Brew.*, 1967, **73** (5), 489.

- 14.9 *The effect of suspended solids on the fermentation of distiller's malt wort*, N. R. MERITT, *J. Inst. Brew.*, 1967, **73** (5), 484.

Yeast growth was increased and the initial rate of fermentation was speeded up by the insoluble grain solids present in distiller's malt wort. The increased yeast concentration was accompanied by higher glycerol content and the formation of higher alcohols, specially isobutanol and 2-methyl butanol also

increased. Insoluble solids did not have any effect when yeast growth was limited by carbohydrate rather than amino nitrogen.

J. V. S.

14.10 *The variation of malt wort solution factors with extract concentration*, A. M. BROWN, *J. Inst. Brew.*, 1967, **73** (5), 436.

A simple method for measuring the variation of solution factors of malt wort with extract concentration is described. Direct measurements are made using worts prepared in a pilot mash tun. The rate of change of solution factor with excess gravity is found to be -0.488.

A. A.

14.11 *Some effects of malt kilning on wort properties*, J. BARRETT, C. M. GRIFFITHS AND B. H. KIRSOP, *J. Inst. Brew.*, 1967, **73** (5), 445.

During the curing of malt, the formation of colored materials is stimulated by temperature to a greater degree than in moisture removal. As colour develops, the total free amino acid content of the malt decreases and the activity of amylolytic and proteolytic enzymes is reduced. The influence of malt curing on the nitrogenous composition of wort is interpreted in terms of effects on the chemical composition of the malt and the enzymic events which occur during mashing.

A. A.

14.12 *Phenolic constituents of beer and brewing materials. II. The role of polyphenols in the formation of non-biological haze*, J. W. GRAMSHAW, *J. Inst. Brew.*, 1967, **73** (5), 455.

15. Toxicology

15.1 *Toxic fungi with special reference to aflatoxin*, J. M. BARNES, *Trop. Sci.*, 1967, **9** (2), 64.

The discovery of toxic action of aflatoxins on birds and mammals is briefly discussed with other fungal toxins poisonous to man and animals.

15.2 *Occurrence and determination of toxin forming mould fungi of the group *Aspergillus flavus**, F. SENSER, *Dt. Lebensmitt Rdsch.*, 1967, **63** (5), 140.

Varieties of the *A. flavus* group occur ubiquitously in the soil and two species *A. flavus* Link and *A. parasiticus* Speare are also found as facultative endoparasites in insects. The above mentioned two varieties were found in various types of bread, in rice, maize grits, fats, fruits and fruit products, sugar, marzipan, spices and various types of nuts.

A key for the rapid identification of *A. flavus* Link, *A. flavus* var. *columnaris* and *A. parasiticus* Speare is provided which will enable even non mycologists to make the identification without error.

K. M. D.

15.3 *Teratogenic response by hamsters, rats and mice to aflatoxin B₁*, J. A. DIPAOLO, J. ELIS AND H. ERWIN, *Nature, Lond.*, 1967, **215** (5101), 638.

Aflatoxin was injected on day 8 and on day 13 of pregnancy at 2 mg/kg/day and 4 mg/kg/day to hamsters. Malformed live foetuses were found in all litters of the mothers killed on day 9 or on day 12. However, the malformation of the foetus was not observed when they were given 2 mg/kg and killed 1 or 3 days later, or when they were given 4 mg/kg of toxin after the completion of most of the organogenesis. In mice, treatment with 8 or 12 mg/kg. on day 8 of gestation resulted in death and resorption of 90 per cent of the foetuses. No malformations were observed either in foetuses or in the placentae of treated mothers.

K. A. R.

15.4 *Crystalline aflatoxin M₁ from urine and milk*, M. S. MASRI, R. E. LUNDIN, J. R. PAGE AND V. C. GARCIA, *Nature, Lond.*, 1967, **215** (5102), 753.

Aflatoxin B₁ was ingested to cow and ewe and a method for getting crystalline aflatoxin M₁ from the cow's milk and ewe's urine is presented. The milk factor is found to be identical with urinary aflatoxin M₁. The appearance of aflatoxin M₁ in urine and milk is related to its presence preformed in the concentrates of aflatoxin B₁ rather than its *de novo* synthesis from B₁.

K. A. R.

15.5 *Possible reactions for aflatoxin detoxification*, WILLIAM TRAGER AND LEONARD STOLOFF, *J. agric. Fd Chem.*, 1967, **15** (4), 679.

The reactions of the four aflatoxins with a series of selected reagents were observed for possible usefulness in detoxification procedures. Loss of fluorescence and/or change of R_f on TLC were the principal reaction indicators. Chick embryo and tissue culture bioassays were used to provide evidence of detoxification. The reactions appear to be primarily addition and oxidation involving the olefinic double bond of the terminal furan ring and oxidation involving the phenol formed on opening of the lactone ring; benzoyl peroxide; osmium tetroxide, and I-¹/₂ react with all four aflatoxins. Detoxification, after contact with gaseous chlorine, chlorine oxide and nitrogen dioxide, and after treatment with 5 per cent NaCl solution, was confirmed by bioassay.

A. A.

15.6 *Note on water based aflatoxin standard*, ROBERT PETERSON AND A. CIEGLER, *J. Ass. off. anal. Chem.*, 1961, **50** (5), 1201.

15.7 *Preparation of aflatoxins and determination of their ultraviolet and fluorescent characteristics*, J. A. ROBERTSON, W. A. PONS JR., AND L. A. GOLDBLATT, *J. agric. Fd Chem.*, 1967, **15** (5), 798.

A. flavus was extracted with chloroform, and the crude mixtures of aflatoxins were precipitated with petroleum ether and partially purified by use of a silica gel clean up column. Highly pure aflatoxins B₁ and G₁ were isolated by liquid partition column chromatography followed by recrystallisation of appropriate fractions from chloroform-petroleum ether and chloroform methanol. Aflatoxins B₂ and G₂ were obtained by hydrogenation of aflatoxins B₁ and G₁ respectively. UV spectra were determined for crystalline aflatoxins in methanol and in acetonitrile. The relative fluorescent intensity was determined for the four aflatoxins in methanol, 95 per cent ethanol, and chloroform. The order of relative fluorescent intensity was the same only for the two alcohols and even in these solvents the ratio differed.

A. A.

15.8 *Note on removal of pigments from chloroform extracts of aflatoxin cultures with copper carbonates*, H. G. WISEMAN, W. C. JACOBSON AND W. C. HARMAYER, *J. Ass. off. anal. Chem.*, 1967, **50** (4), 982.

Basic green copper carbonate may serve as a useful reagent to remove yellow pigments which closely follow the aflatoxins in solvent partition schemes. It may also be useful in removing aflatoxin from the yellow pigments in toxicity studies of the pigments.

A. A.

15.9 *Methods for the qualitative and quantitative determination of aflatoxins*, E. H. MARTH, *J. Milk Fd Technol.*, 1967, **33** (10), 317.

Review. 21 references.

15.10 *Biliary excretion of aflatoxin in the rat after a single dose*, O. BASSIR AND F. OSIVEMI, *Nature, Lond.*, 1967, **215** (5103), 882.

The existence of various pathways of aflatoxin B₁ metabolism in the rat including that of demethylation is suggested. Excretion of a glucuronide in the urine and of a taurocholate conjugate in the bile is also of great importance in this process.

K. A. R.

- 15.11 *Detention and identification of Salmonella from dried whole egg, dried egg yolk and dried egg white: Report of a collaborative study*, PAUL L. POELMA, *J. Ass. off. anal. Chem.*, 1967, 50 (4), 753.

Method is described. It can detect and identify Salmonella from samples with a level of about 35 salmonella cells per 25 g. of sample. Recommended for official, first action.

J. V. S.

- 15.12 *The effect of copper on distilled water quality for use in milk and water laboratories*, GENE W. RONALD AND R. L. MORRIS, *J. Milk Fd Technol.*, 1967, 33 (10), 305.

Levels of Cu toxicity have been established in distilled water using the distilled water suitability test. It is shown that levels of Cu, toxic by the distilled water suitability test, are not toxic to the test organism, *Aerobacter aerogenes* in sterile milk or to a normal bacterial flora of a raw milk sample.

A. A.

16. Infestation, Pesticides and Fungicides

- 16.1 *Standardisation of Bacillus thuringiensis products: Homology of the standard*, H. D. BURGESS, *Nature, Lond.*, 1967, 215 (5101), 664.

- 16.2 *Review of the metabolism and decomposition of Diquat and Paraquat*, H. H. FUNDERBURK JR., AND G. A. BOZARTH, *J. agric. Fd Chem.*, 1967, 15 (4), 563.

Review. 46 references.

- 16.3 *New extraction system for residue analyses*, R. R. SCHHORBUS AND W. F. PHILLIPS, *J. agric. Fd Chem.*, 1967, 15 (4), 661.

A highly selective and sensitive pesticide detection technique based on the use of propylene carbonate as an efficient extractant for a wide group of pesticides has been described. Data on extraction of chlorine containing organics, organothiophosphates, urea derivatives and carbamates from soils, fruits, vegetables and animal products are presented. The propylene carbonate extracts following clean up were analysed by electron capture, thermionic, micro-coulometric gas chromatography and TLC.

B. S. N.

- 16.4 *Fumigation of bucket elevators with phosphine gas to control rice weevil and red flour beetles*, ROBERT R. COGBURN, *J. econ. Ent.*, 1967, 60 (5), 1485.

Aluminium phosphide tablets (each weighing 3 g., and releasing 1 g. of PH_3) were used for fumigation in elevators. Twelve elevators received 7 tablets and 12 others, 10 tablets. The test insects were kept in cages at top, middle and bottom of elevators. A fair degree of control was achieved by PH_3 fumigation and 10 tablets gave better control than 7 tablets. Mortality was not complete throughout any individual elevator. Use of PH_3 in elevator systems is indicated by heavy mortality of insects present in stored material.

J. V. S.

- 16.5 *Carbonate and phosphate resistance in adult granary weevil*, V. KUMAR AND F. O. MORRISON, *J. econ. Ent.*, 1967, 60 (5), 1430.

Sitophilus granarius (L.) developed resistance when selected under Baygon (O-isopropoxy phenyl methylcarbamate) and Fenthion pressure. Resistance to Baygon built up more rapidly than resistance to Fenthion. After 14 generations, it had reached 7.5 times to Baygon and only 1.6 times to Fenthion. The Baygon selected strain was tolerant of 2 other carbamates (UC 10854 (m-isopropyl phenyl methyl carbamate) and Tectran (4-dimethylamino-3-5-xyllyl methyl carbamate) and showed an increase of 2½ times in its resistance to DDT. Piperonyl butoxide synergised the action of Baygon against resistant forms.

A. A.

- 16.6 *Rearing stored product insects for laboratory studies: lesser grain borer, granary weevil, rice weevil, Sitophilus zeamais and Anguimoid grain moth*, R. G. STRONG, D. E. SBUR AND G. J. PARTIDA, *J. econ. Ent.*, 1967, 60 (4), 1078.

Production, comments on managements and description of methods adopted by the authors for rearing the test insects under study. All 5 species develop inside grain and are reared systematically on the same kind of media.

J. V. S.

- 16.7 *Atmospheric gas alteration and insect control in peanuts stored in various temperatures in hermetically sealed containers*, ARTHUR F. PRESS JR., AND PHILLIP K. HAREIN, *J. econ. Ent.*, 1967, 60 (5), 1043.

Inshell and shelled peanuts were stored for 14 weeks at 4, 16, 27 and 38°C in hermetically sealed containers, sealed 3.8 litre jars. Adult red beetles *Tr. castaneum* (Herbst.) were stored in some of the jars. The oxygen concentration in the storage atmosphere decreased at a faster rate and to a lower level with increases in temperature and in the peanuts infested with beetles. Except in peanuts at 16°C, the hermetic storage provided complete mortality of the beetles and stopped all reproduction in 4 weeks. Even 14 weeks of hermetic storage at 16°C was relatively ineffective against the insects.

A. A.

- 16.8 *Effectiveness of gamma irradiation for control of five species of stored-product insects*, F. L. WATTERS AND K. F. MAC QUEEN, *J. Stored Prod. Res.*, 1967, 3 (3), 223.

Adults of five species of stored product insects were irradiated in a mobile cobalt-60 irradiator at doses of 6250 to 1,50,000 rad. There were large differences among species in radiation sensitivity and time of death after treatment, especially at the lower doses. Except for *Rhizopertha dominica*, all species died in less than 3 weeks after irradiation at 50,000 rad. Irradiated *Tribolium castaneum* lived longer than non-irradiated beetles and this was the most resistant species at 6250 rad; though some individuals were temporarily sterilised for the first few weeks they later regained fertility. Adults of other species that survived 6250 rad were permanently sterilised. Survivors of all species continued to feed on wheat kernels.

A. A.

- 16.9 *Development rate and competitive ability in Tribolium. III. Competition in unfavourable environments*, PETER S. DAWSON, *J. Stored Prod. Res.*, 1967, 3 (2), 193.

Tribolium castaneum for its development from egg to pupa, has the favourable condition at R.H. 70 per cent. Use of corn flour media or wheat flour media as diet in fast selection competition experiments did not reveal any significant differences supporting thereby the hypothesis, that increased success of CS-fast strain in competition resides in a greater rate of cannibalism.

B. S. N.

- 16.10 *A temperature effect on mortality of confused flour beetles treated with CO₂ or N₂ before fumigation*, STANLEY D. CARLSON, *J. econ. Ent.*, 1967, 10 (5), 1248.

Adult *Tr. castaneum* were fumigated at different temperatures with CCl_4 : CS_2 (80:20 by volume) during metabolic depression caused by ½-hour exposure to flowing CO_2 or N_2 . At 30°C, preconditioning increased the mortality of the insects to a greater degree than it did at 20° or 40°C.

B. S. N.

- 16.11 *Quinoid secretions in grain and flour beetles*, ROLF K. LADISCH, STEPHEN K. LADISCH AND PHILIP M. HOWE, *Nature, Lond.*, 1967, 215 (5104), 939.

The results show that quinones and hydroquinones are ubiquitous in tenebrionid stored food insects. The quantities of these chemicals total only a few µg to about 0.5 mg/insect. The

number of insects contaminating the food is enormous and they produce a substantial quantity quinone.

K. A. R.

16.12 *A Laboratory study of Stegobium paniceum (L) (Coleoptera; Anobiidae)*, L. P. LEFKOVITCH, *J. Stored Prod. Res.*, 1967, 3 (3), 235.

The duration of development and length of adult life of *Stegobium paniceum* (L) has been recorded at a large number of sets of conditions; the ranges for development are 15-35°C and 30-100 per cent R.H. The most rapid development was at 30°C and 80-95 per cent R.H., the highest survival to the adult stage was seen at 20-30°C and 95 per cent R.H., and at 27.5-30°C and 50-55 per cent R.H. The heaviest adults were formed at about 20°C 70 per cent R.H. and lived longest at low temperatures. The optima for various aspects of performance, which occur at different sets of conditions (based on these data and those of other workers), are considered to form a homeostatic mechanism for the persistence of populations of the species. A brief comparison is made with *Lasioderma serricorne* (F).

A. A.

16.13 *Determination of 2, 4-D and its butoxyethanol ester in oysters by gas chromatography*, J. R. DUFFY AND PATRICIA SHELFON, *J. Ass. off. anal. Chem.*, 1967, 50 (5), 1098.

The method involves extraction of ester and any free acid with acetonitrile, hydrolysis of the ester to 2, 4-D with alcoholic KOH, acidification and ethyl ether: petroleum ether extraction of the alcoholic mixture. The organic layer is extracted with sodium carbonate solution; the resulting solution is acidified with HCl and reextracted with ether: petroleum ether. After the organic solvents are evaporated, the acid layer is methylated with diazomethane and chromatographed on a florasil column. The methyl ester of 2, 4-D is quantitatively determined by electron capture gas chromatography and further confirmed by TLC. This method will detect 0.5 p.p.m. of the herbicide in oysters.

A. A.

16.14 *Improved method for the determination of ethylene bisdithio carbamate residues in plants, fruits and vegetables*, CHARLES F. GORDON, RICHARD J. SCHUCKERT AND WILLIAM E. BORNAK, *J. Ass. off. anal. Chem.*, 1967, 50 (5), 1102.

Sample of frozen crop is blended in ice cold deaerated water and the homogenate is transferred to the apparatus containing hot 50 per cent H₂SO₄. The dithiocarbamates are decomposed and give out CS₂ which is removed by continuous air-sweep (average recovery, 70 to 103 per cent: sensitivity by different modifications of method, 1-10, 10-200 and 200-1000 µg of MANEB).

J. V. S.

16.15 *Laboratory evaluation of malathion as a protectant for almonds during storage*, G. H. SPITTER AND P. L. HARTSELL, *J. econ. Ent.*, 1967, 60 (5), 1436.

Malathion dust or spray afforded protection to almonds from *Plodia interpunctella*: and *Oryzaephilus mercator* for extended periods even at low levels.

J. V. S.

16.16 *A dichlorovos-malathion mixture for insect control in empty rail cars*, JOHN H. SCHESSER, *Am. Miller & Proc.*, 1967, 95 (9), 7.

Empty rail cars were sprayed with 50-50 dichlorovos—malathion mixture using a commercial oil spray gun and with 100 lb. per square inch of air pressure. Application of the material with 2½ per cent of insecticide into cracks, behind the liners and on to the interior surfaces of the car effectively killed insects within 15 minutes. In laboratory tests, the spray penetrated well enough into 3 in. of the compacted grain debris to kill 85 per cent of the test insects. After the treatment, 10 minutes of aeration brought

the concentration in the air down to a level at which it was safe for workmen to enter.

A. A.

16.17 *Persistence of Sevin residues on some vegetable crops after various harvest times*, MAKARIM AHMED ELESSAWI AND ABDEL RAHMAN EL-REFAI, *J. Ass. off. anal. Chem.*, 1967, 50 (5), 1109.

Sevin was applied to okra, cowpea, tomato and egg plant grown in special plots at a level of 0.34 per cent technical Sevin (60g. of 85 per cent wettable powder/15 litre water). Maximum residues on these plants, 3 hours after last application were, 3.2, 5.03, 1.88 and 1.88 p.p.m. respectively; the residue level was reduced to 0.5 p.p.m. in all vegetables within 8 days.

J. V. S.

16.18 *Laboratory tests of 5 new insecticides as protectants for stored rough rice*, ROBERT R. GOGBURN, *J. econ. Ent.*, 1967, 60 (5), 1286.

Bromodan, Bay 39007, Amer. Cyan. CL 47300, Ciodrin and Shell 5D 7438 s, s—benzylidene bis were tested as protectants for rough rice with *S. oryzae*, *Tr. castaneum* and *R. dominica* as test organisms. The most generally effective compound was CL 47300 (0, 0—dimethyl 0-4-nitro-m-tolyl phosphorothioate). Bromodan (5-(bromomethyl)-1, 2, 3, 4, 7, 7—hexachloro-2-norbornene) could control only *R. dominica*.

J. V. S.

17. Nutrition and Biochemistry

17.1 *Solving non-technique problems of protein enrichment in developing countries*, A. S. YOHALEM, *Cereal Sci. Today*, 1967, 12 (10), 421.

Review.

17.2 *Protein fortified grain products for world uses*, F. R. SENTI, M. J. COPLEY AND J. W. PENCE, *Cereal Sci. Today*, 1967, 12 (10), 426.

Review.

17.3 *Production and marketing of high-protein foods in Latin America*, H. W. BRUINS AND J. W. MONEY, *Cereal Sci. Today*, 1967, 12 (10), 418.

Article covers: availability of local ingredients, processing techniques, product usage, product nutrition, price, merchandizing, etc.

17.4 *New protein foods and the fight against malnutrition in Brazil*, J. E. DUTRA AND DE OLIVEIRA, *Cereal Sci. Today*, 1967, 12 (10), 449.

Review.

17.5 *Effect of protein level and duration of test on carcass composition, net protein utilization (NPU) and don protein efficiency ratio (PER)*, J. E. BRAHAM L. G. ELIAS, S. DE ZAGHI AND R. BRESSANI *Nutritio Dieta.*, 1967, 9 (2), 99.

The results indicated that NPU and PER were inversely proportional to both time and protein level. Two weeks and 10 per cent of protein in the diet gave maximum values for both variables studied. In all cases, the water content of the carcass decreased with time, but increased with protein level. Fat and ash content were inversely proportional to nitrogen content of the diet, while carcass nitrogen paralleled nitrogen intake.

A. A.

17.6 *Investigation into the calorie and nutritive values of canteen meals*, W. KUNKEL, *Nutritio Dieta.*, 1967, 9 (2), 87.

Ten lunches selected at certain intervals from those produced routinely in a communal kitchen were analysed for vitamins B₁ and C, potassium, calcium, phosphorus, protein, fat and carbohydrate. The average values found were compared with the levels recommended by the German Society of Nutrition.

K. M. D.

17.7 *Effect of nutritional supplementation during infancy on growth of rats*, P. S. VENKATACHALAM, T. P. SUSHEELA AND PARVATHI RAO, *J. trop. Pediatr.*, 1967, **13** (2), 70.

Administration of a daily supplement to infants from the age of 4 weeks to 6 months in addition to breast milk did not show better gains in body weight, length, head and chest circumference. The supplement plus the breast milk daily supplied 2-2.5 g. of protein/kg. of expected body weight and all other nutrients in nearly enough quantities.

J. v. s.

17.8 *Studies on low cost balanced foods suitable for feeding weaned infants in developing countries. The protein efficiency ratio of low cost balanced foods based on ragi or maize, groundnut, Bengalgram, soya and sesame flours, and fortified with limiting amino acids*, V. A. DANIEL, T. S. SUBRAMANYARAJ URS, B. L. M. DESAI, S. VENKAT RAO, D. RAJALAKSHMI, M. SWAMINATHAN AND H. A. B. PARPIA, *J. Nutr. Dietet.*, 1967, **4** (3), 138.

Low cost balanced foods based on: (1) 70:20:10 blend of ragi, groundnut flour and SMP and (2) 70:20:10 blend of maize, groundnut flour and SMP at 10 per cent protein level had the PER 2.63 and 2.57 which rose to 3.28 and 2.91 respectively on fortification with lysine and methionine on replacement of SMP by soya flour or Bengalgram flour, the PER values were 2.63, 2.20 and 2.31 and 2.10 respectively. On fortification with lysine and methionine these increased to 2.91, 2.61 and 2.85 and 2.48 respectively. The growth rate in albino rats fed (1) and (2) protein foods at 10 per cent protein level were 18 g and 13-18 g/week in albino rats as against 22 g/week with milk diet.

B. S. N.

17.9 *The relative efficacy of protein foods based on blends of groundnut, Bengalgram, soyabean and sesame flours and fortified with limiting amino acids, vitamins and minerals in meeting the protein needs of protein depleted albino rats*, MYNA PANEMANGALORE, MANEKARNIKA N. GUTTIKAR, M. NARAYANA RAO, D. RAJALAKSHMI AND M. SWAMINATHAN, *J. Nutr. Dietet.*, 1967, **4** (3), 178.

Two protein foods based on (1) 40:40:20 blends of groundnut, Bengalgram and sesame flours and (2) 40:30:30 blend of groundnut, soyabean and sesame flours (with and without methionine) at 15 per cent protein level on being fed to rats for 10 days resulted in increase of 37.5-41.9 g. in body weight. The PER of I and II in depleted animals were 2.81 and 2.98, whereas these on fortification with lysine rose to 3.11 and 3.24 in comparison with 3.86 for milk. Protein retention percentage with I and II were 44.16 and 50.17 whereas with protein foods with lysine fortification these were 47.68 and 52.35 as against 63.65 for SMP diet.

B. S. N.

17.10 *The relative efficacy of some dietary proteins in the synthesis of plasma proteins in protein deficient animals and children*, M. SWAMINATHAN, V. A. DANIEL AND S. VENKAT RAO, *J. Nutr. Dietet.*, 1967, **4** (3), 231.

Review. 62 references.

17.11 *Rice polishings concentrate in nutrition*, C. H. CHAKRABARTI, *J. Nutr. Dietet.*, 1967, **4** (3), 252.

Review. 58 references.

17.12 *Treatment of dietary deficiency of vitamin B₁₂ with vegetable protein foods*, F. R. ELLIS AND F. WOKES, *Nutritio Dieta*, 1967, **9** (2), 81.

Twenty-six cases of dietary deficiency of vitamin B₁₂ in vegetarians have been successfully treated by administration of vegetable protein foods fortified with this vitamin. In 24 vegetarians so far investigated, six had serum B₁₂ levels below the normal range (140-900 µg/ml.).

K. M. D.

17.13 *Approaches to village level infant feeding. II. Detection of early protein calorie malnutrition (PCM); III. Breast feeding*, D. B. JELIFFE, *J. trop. Pediatr.*, 1967, **13** (2), 67, 13.

17.14 *Evaluating the quality of ready-to-eat preserved meals*, J. POKORNY HASHMIYA ZWAIN AND RUDOLF KOHN, *Prumysl Potravin*, 1967, **18** (5), 253.

Organoleptic properties of ready-to-eat preserved meat meals depend largely upon the rancidity stage of their fat components. The tendency to develop quick rancidity is more marked with meals containing a higher proportion of unsaturated fat acids. Some sorts of species slow down oxidation processes; starch, on the contrary, accelerates it.

A. A.

17.15 *Studies on experimental protein malnutrition. II. Effect of threonine deficiency on some aspects of glycogen metabolism in rats*, G. WILFRED AND T. N. SEKHARA VARMA, *Indian J. Biochem.*, 1967, **4** (2), 111.

Rats force-fed for 3 days a diet devoid of threonine maintain normal fasting blood sugar levels, high liver glycogen contents and normal response to administered epinephrine indicating no impairment in hepatic glycogenolysis. Phosphorylase (EC 2.4.1.1) is significantly decreased in experimental animals. The reduction in the enzyme activity, however, is not of such an order as to affect the hepatic glycogen mobilisation. Further, the data on the rate of incorporation of uniformly labelled glucose ¹⁴C into hepatic glycogen suggest that the accumulation of glycogen in the livers of deficient animals may be due to its increased synthesis rather than due to decreased mobilisation.

A. A.

17.16 *Interdependence of dietary protein and vitamins in metabolism. V. Relative influence of vitamin A and ascorbic acid on protein depletion and repletion in rats*, G. C. ESH AND SHYAMA P. BHATTACHARYA, *Indian J. Biochem.*, 1967, **4** (2), 114.

17.17 *Protein lipid interactions affecting the quality of protein foods*, T. N. R. VARMA, *J. Fd Sci. Technol.*, 1967, **4** (1), 12.

Review. 14 references.

17.18 *The digestion of heat damaged protein*, M. C. NEISHM AND K. J. CARPENTER, *Brit. J. Nutr.*, 1967, **21** (2), 399.

Report of experiments with chicks.

17.19 *Amino acids and nutrition. I.*, SISIR K. ROY AND R. N. BHATTACHARYA, *Sci. & Cult.*, 1967, **33** (9), 389.

General.

17.20 *Availability of amino acids in processed plant protein food-stuffs*, S. SZMELCMAN AND K. GUGGENHEIM, *J. Sci. Fd Agric.*, 1967, **18** (5), 347.

Microbiological availability of amino acids has been estimated with different organisms after digesting the foodstuff with different proteolytic enzymes.

K. A. R.

17.21 *Growth of Hong Kong children on diets containing rice or rice and wheat with and without nutrient supplements*, P. C. FRY, R. M. LEVERTON AND S. GOKSU, *Am. J. clin. Nutr.*, 1967, **20** (9), 954.

17.22 *Nitrogen retention in adult man: a possible factor in protein requirements*, H. FISHER, M. K. BRUSH, P. GRIMINGER AND E. A. SOSTMAN, *Am. J. clin. Nutr.*, 1967, **20** (9), 927.

The study corroborates the observations that healthy adult subjects can retain relatively large amounts of nitrogen, from good quality, high protein diets without concomitant changes in body weight.

A. A.

- 17.23 *Nitrogen balance studies in German subjects on various diets*, U. D. REGISTER, H. INAMO, C. E. THURSTON, J. B. VYHMEISTER, P. W. DYSINGER, J. W. BLANKENSHIP AND M. C. HORNING, *Am. J. clin. Nutr.*, 1967, 20 (7), 753.

Study evaluates, by nitrogen balance method in human subjects, the protein quality of diets containing vegetable protein mixtures and compares the results with similar diets containing milk and meat.

A. A.

- 17.24 *Nitrogen balances of adult human subjects who consumed opaque-2 maize as the principal source of protein*, H. E. CLARK, P. E. ALLEN, S. M. MEYERS, S. E. TUCKETT AND Y. YAMAMURA, *Am. J. clin. Nutr.*, 1967, 20 (8), 825.

The first experiment was designed to study the effectiveness of different levels of opaque-2 corn in maintaining N₂ equilibrium and thereby to estimate the minimum requirements of individuals: the second to determine whether the single addition of certain essential amino acids would improve nitrogen retention. The data indicate that this corn is a valuable source of protein for men and women if energy needs are satisfied.

A. A.

- 17.25 *The effect of protein value of diet on the neurological manifestation in rats by B, B-iminodipropionitril*, SARBY RIAD MORCAS, *Brit. J. Nutr.*, 1967, 21 (2), 269.

The landing and swimming tests have been used to detect the onset of neurological manifestations of toxicity of B, B-iminodipropionitrile (IDPN) in rats. Rats on diets of net percentage of dietary protein calories (NDP cal. per cent) of 10.1, 6.2 or 4.6 developed the syndrome later than those on diets of lower protein value. L-thyroxine did not prevent development of the ESC-syndrome but only delayed the onset of the action of IDPN.

A. A.

- 17.26 *Blood selenium levels, and the in vitro blood cell uptake of ⁷⁵Se in kwashiorkor*, R. F. BURK, JR., W. N. PEARSON, R. P. WOOD AND E. VITERI, *Am. J. clin. Nutr.*, 1967, 20 (7), 723.

The results of this study suggest that children with kwashiorkor have reduced stores of selenium. Whether this contributes significantly to the clinical syndrome of this complex disease is not known.

A. A.

- 17.27 *Hematologic response to vitamin E in the anemia associated with protein calorie malnutrition*, J. A. WHITAKER, E. G. FORT, S. VIMOKESANT AND J. S. DINNING, *Am. J. clin. Nutr.*, 1967, 20 (7), 783.

The authors discuss the natural cause of anemia associated with protein calorie malnutrients in 41 children receiving a hospital diet adequate in protein.

A. A.

18. Food Processing, Packaging and Engineering

- 18.1 *Developments in citric acid processes*, M. SCHOFIELD, *Perf. essent. Oil Rec.*, 1967, 58 (8), 557.

Review.

- 18.2 *Pilot plant for fluidised bed freezing and drying*, K. R. SCOTT, N. W. TAPE AND M. M. AREF, *Fd Technol. Champaign*, 1967, 21 (8), 1090.

A batch fluidised bed drier was modified to add a freezing capability. Apples were dried to 10 per cent moisture in 1.75 hr; and potatoes in 4.5 hr. Both products could be frozen well but not dehydrofrozen due to insufficient cooling capacity.

J. v. s.

- 18.3 *Amylograph Vs. falling number values (FNV) compared*, B. E. PATTERSON AND L. G. CRANDALL, *Cereal Sci. Today*, 1967, 12 (8), 332.

Alpha amylase activity in flour was measured by amylograph and FNV; both were found to permit satisfactory duplication of

results. FNV is quicker and less expensive and can be used as a valid guide for amylograph specifications.

J. v. s.

- 18.4 *Mass average sterilising value for thermal process. I. Comparison of existing procedures*, GORDON E. TIMBERS AND KAN-ICHI HAYAKAWA; *II. Development of a new method*, KAN-ICHI HAYAKAWA, *Fd Technol. Champaign*, 1967, 21 (8), 1069, 1073.

- 18.5 *Flavor retention and heat transfer during concentration of liquids in a centrifugal film evaporator*, Y. MALKKI AND J. VELDSTRA, *Fd Technol. Champaign*, 1967, 21 (9), 1179.

During the evaporation of aqueous solutions of diacetyl or cinnamic acid in a centrifugal thin film evaporator, the composition of a distillate is a function of evaporation temperature, temperature difference between heating steam and vapor from solution and feed rate. Sucrose in the solution increases the evaporation rate of most volatile components in model solutions studied. The flow of the liquid film has been found to be laminar with waves on the surface; there is evidence that the heat transfer is mainly due to conduction. Heat transfer data under the experimental conditions are presented.

A. A.

- 18.6 *Automatic sewage water purification plant for dairies*, O. TRENDLA, *Prumysl Potravin*, 1967, 18 (7), 339.

The purification system is based on a single-stage fermentation. To secure an efficient purification the plant must start working at the beginning of the morning shift and run 2, 5 hours longer than the other departments of the dairy. The management had to introduce the second shift to attend the plant. To solve labour an automatic system has been developed consisting of time switch, remote gauges level time relays and servo-motors controlling gate values of feeding pipe line and aeration channel. The system saves labour and maintains consistently optimum conditions for efficient purification.

K. M. D.

- 18.7 *Development of flexible containers for irradiated foods. I. Screening of commercially available plastic laminates*, J. J. ILLORAN, J. D. BRYER AND E. WIERBICKI, *Fd Technol. Champaign*, 1967, 21 (8), 1125.

Five commercially available plastic laminates were screened for in-package, radiation sterilisation processing of bacon, ham and pork. One plastic laminate was transparent. The food containing materials were: medium density polyethylene, high density polyethylene, and polyvinyl chloride. Changes in physical properties of pouches did not affect their functional performance. Preference scores, obtained from an organoleptic evaluation indicated that the products were acceptable.

A. A.

- 18.8 *Studies on the protection from light of transparent plastic bottles for edible oil*, H. HADORN AND K. ZURCHER, *Dt. Lebensmitt Rdsch.*, 1967, 63 (4), 99.

Refined groundnut oil in plastic (PVC) bottles and glass bottles protected from UV and shortwave light radiation with plastic filters were exposed to intense sunlight in the open. It was confirmed once again that only UV and short wave light is harmful to edible oils. If all the light having a wave length less than 420 nm is completely absorbed, then no harm is done even by intense solar radiation for 200 hours (4 weeks) in the open.

Even minimal degrees of damage by short wave light can be detected by UV-difference-absorption-spectroscopy. A decrease of absorption was observed in the range of conjugated trienes (270 nm). Triene decomposition is always accompanied by a characteristic change in the taste of oil.

K. M. D.

- 18.9 *Countercurrent extraction of raw cottonseed flakes with the acetone-hexane-water azeotrope*, VERNON L. FRAMPTON, ARMAND B. PEPPERMAN JR., JOSEPH SIMMONS AND W. H. KING, *J. agric. Fd Chem.*, 1967, 15 (5), 790.

Stepwise countercurrent extraction of oil from raw cottonseed and soybean flakes at room temperature with the ternary azeotrope (6.49°C) composed of acetone, hexane and water shown to follow the dilution law, and residual crude oil in the finished meals was reduced to less than 0.5 per cent in 3 minutes or less. Marcs and miscellas were separated by screening through a vibrating screen or by centrifugation. Analysis of finished cottonseed meals indicated low levels of gossypol.

A. A.

- 18.10 *Alcoholic extraction of oilseed with the aid of ultrasonics*, W. FRED SCHURIG AND PEDRO SAB, *J. Am. Oil Chem. Soc.*, 1967, 44 (10), 585.

The work concerns the evaluation of the magnitude of the effects of ultrasonic waves on the rate of extraction and checking of the models which have been proposed to explain the mechanism of vegetable oil extraction.

J. V. S.

- 18.11 *Application of dehydrated products in dry form in convenience foods*, R. L. ROBERTS AND B. G. GROSSI, *J. Milk Fd Technol.*, 1967, 12 (11), 481.

Review.

- 18.12 *Instantising process for powdered materials*, A. P. STEWART JR., *Cereal Sci. Today*, 1967, 12 (11).

A description of Nodaway process (U.S. Patent No. 3,248, 226).

- 18.13 *Evaporation concepts and evaporation design for minimum fouling*, A. I. MORGAN JR., *Fd Technol. Champaign*, 1967, 21 (10), 1353.

Deposition of a burnt layer on hot surfaces is a serious problem in the concentration of food liquids by evaporation. A means was devised for measurement of heat transfer at the inner surface of evaporator. Since fouling decreases heat transfer, its progress can be followed by change in heat transfer co-efficient during evaporation. For tomato juice and puree, temperature of the wetted surface is the factor that most influences fouling. Fruit puree fouling substance is relatively rich in denatured protein; sugar, fibre, pectin and ash are present in amount similar to that in puree. Omission of fibre greatly decreases fouling. Desirable features of evaporator operation are deduced from the findings.

A. A.

- 18.14 *Deodorisation: principles and practices*, C. T. ZEHNDER AND C. E. MCMICHAEL, *J. Am. Oil Chem. Soc.*, 1967, 44 (10), 478A.

Review. 22 references.

- 18.15 *Progress in the chilling and freezing of foods*, E. C. BATE-SMITH, *J. Fd Technol.*, 1967, 2 (3), 191.

Review.

- 18.16 *A management planning and control system*, JAMES C. SNYDER AND LARRY L. NELSON, *Fd Technol. Champaign*, 1967, 21 (10), 1341.

- 18.17 *Raw materials yield: key to final product cost*, GLYDE L. RASMUSSEN, *Fd Technol. Champaign*, 1967, 21 (10), 1305.

- 18.18 *Digital computer program for calculating selectivities of hydrogenation catalysts*, R. O. BUTTERFIELD AND H. J. DUTTON, *J. Am. Oil Chem. Soc.*, 1967, 44 (10), 549.

Linolenate and linoleate selectivities of hydrogenation catalysts are determined by a digital computer programme which solves the kinetic equations of consecutive first order reactions. The described programme is applicable to any initial oil or degree of hydrogenation.

A. A.

- 18.19 *Nomograms without Equations*, T. W. RICHARDS, *Brit. chem. Engng*, 1967, 12 (10), 1587.

The method indicated here for the construction of Nomograms is very useful particularly to those who do not have much training in mathematics under the following circumstances:

1. An equation is available but in a form not suitable for direct monogram construction.
2. Only graphed data for three variables are available without any equation.
3. Tabulated data are available, showing the interrelation of all three variables.

A few illustrations are also given.

M. C. B.

- 18.20 *What to know about homogenizers*, L. H. REES, *Food Engng*, 1967, 39 (8), 69.

Distinction between colloid mill and homogenizer is indicated. The principles involved types, operating characteristics affecting the performance are enumerated for both the equipments. Specific application of each of them in a variety of food industries has been described.

M. C. B.

- 18.21 *Equilibrium vapour pressure and latent heat of sublimation for frozen meats*, J. E. HILL AND J. E. SUNDERLAND, *Food Technol. Champaign*, 1967, 21 (9), 1276.

Experimental data on vapour pressure of chopped sirloin, lamb veal pork, chicken and beef fat for the temperature range -26°C to -4°C have been reported. Based on these and using clausius-calapoycon equation, heats of sublimation for various frozen meats have been tabulated for use in freeze drying.

M. C. B.

19. Food Texture and Flavour

- 19.1 *Characteristics of chicken flavour—Containing fraction extracted from raw muscle*, HELEN H. KOEHLER AND MARION JACOBSON, *J. agric. Fd Chem.*, 1967, 15 (4), 707.

Water extracts of dialyzed raw white and dark chicken muscle had significantly stronger chicken flavour than non-dialyzed samples. Fractionation with Sephadex G-25 and ultra violet absorbance gave four fractions, the second of them on heating produced chicken aroma and taste. Glucose, fructose, ribose, an unidentified sugar, lactic acid, amino acids (white 16; dark 11) IMP, GMP, inosine, carbonyls and sulphhydryls were present in flavour forming fractions.

B. S. N.

- 19.2 *Octadecadienoic acids in butterfat. I. The precursors of 4-cis-heptenal*, K. DE JONG, *Fette Seifen Anstrmittel*, 1967, 69 (4), 277.

It was found that the creamy smell of butter is due to an aldehyde, because of this finding, it was investigated as to which unsaturated fatty acids in butter cause the creamy smell after autoxidation. A micro-method for the determination of the position of double bonds in the substances which give rise to 4-cis-heptenal, is described.

K. M. D.

- 19.3 *Octadecadienoic acids in butterfat. II. Identification of a few non-conjugable fatty acids*, VAN DER WEL AND K. DE JONG, *Fette Seifen Anstrmittel*, 1967, 69 (4), 279.

With the help of gas and thinlayer chromatography as well as by determining the position of double bonds with OsO₄ the following-iso-linoleic acids in the butter fat were identified; cis, trans (or trans, cis): 11, 16 and/or 11, 15; 10, 16 and/or 10, 15; 9, 15 and/or 9, 16; 8, 16 and/or 8, 15 and/or 8, 12, trans, trans: 12, 16; 11, 15 and/or 11, 15; 10, 16 and/or 10, 15; 9, 16 and/or 9, 15 and/or 9, 13.

K. M. D.

- 19.4 *Questionable valuation of the hedonic scale in sensory tests*, H. STREULI, *Z. Lebensmittel Unters. u. Forsch.*, 1967, **134** (1), 5.

When different food samples are being compared by a taste panel using the hedonic scale, or any other scale of marks or points, a comparison of the average number of points of marks is permissible only when the samples have been evaluated independently. This precondition is seldom fulfilled; the different samples are tested by the same person in most cases. In such a case, one must calculate the difference in marks given by each taster and test whether the average difference deviates sufficiently from zero. Further difficulties arise when the taste panel is homogeneous or when the scale of measurement is defective.

K. M. D.

- 19.5 *Acceptability of food items designed for space flight feeding*, ROBERT A. NAUZ AND PAUL A. LACHANCE, *Fd Technol. Cham-paign*, 1967, **21** (10), 1361.

Preference ratings are reported for 15 dehydrated foods. Evaluations to determine acceptance were made under conditions of confinement, stimulation or testing of life support systems. Nearly all items tested were judged acceptable and, if adequately packaged, were considered to have a shelf-life at 100°F of over 6 months.

A. A.

- 19.6 *A critical look at two objective tests for cold storage deterioration*, J. OLLEY, E. STEPHEN, J. FARMER AND I. ROBERTSON, *J. Fd Technol.*, 1967, **2** (3), 207.

Protein solubility in salt solutions and cell fragility are two possible measures of textural changes in cold stored fish. These measurements are discussed for a wide range of species. The discrepancies between the methods, the artefacts in measurement caused by proteolysis at higher temperatures and possibly by free fatty acid are considered. The effect of pH, horizontal and vertical strength of the myofibrils, and initial protein solubility on taste panel assessment are discussed.

A. A.

- 19.7 *Thermal decomposition of ferulic acid*, WALTER FIDDLER, W. E. PARKER, A. E. WASSERMAN AND R. C. DOERR, *J. agric. Fd Chem.*, 1967, **15** (5), 757.

Unsubstituted, 4-methyl-4-ethyl- and 4-vinylguaiacols were identified as products from the decomposition of ferulic acid in air and nitrogen atmospheres. Vanillin, aceto vanillone (4-hydroxy-3-methoxyacetophenone) and vanillic acid were formed only in the air atmosphere. This work has relevance to the flavour in smoke cured foods.

A. A.

- 19.8 *Iso-linoleic acids responsible for the formation of the hardening flavor*, J. G. KEPPLER, M. M. HORIKK, P. W. MEIJBOOM AND W. H. FEENSTRA, *J. Am. Oil Chem. Soc.*, 1967, **44** (9), 543.

The hardening flavor that develops in hydrogenated linseed oil and soybean oils during storage was identified as 6-nonenol.

By means of oxidation experiments on 9, 15-, and 7, 15-iso-linoleic acids, it was established that only the first two iso-acids are the precursors of this typical flavour.

A. A.

- 19.9 *Flavour of peanuts grown in phorate-treated plots*, JENNIE L. BROGDEN AND ELSIG H. DAWSON, *J. econ. Ent.*, 1967, **60** (4), 1162.

Roasted peanuts and peanut butter from peanuts grown phorate treated plots were evaluated for flavour. Roasted peanut from phorate treated plots from one area showed the same flavour as peanuts grown in control plots. In another area, roasted peanuts from treated plots showed less off-flavour than those grown in control plots. Peanut butter from phorate treated plots from both areas had the same flavour as those grown in control plot.

J. v. s.

- 19.10 *Precursors of typical and atypical roasted peanut flavour*, JON A. NEWELL, MICHAEL E. MASON AND R. S. MATLOCK, *J. agric. Fd Chem.*, 1967, **15** (5), 767.

The data presented in the paper together with the prior knowledge of compounds formed during roasting peanut, have permitted the postulation of a mechanism for the production of flavour components from amino acids and carbohydrates. A diagram is provided to show the postulation.

J. v. s.

- 19.11 *A systematic characterisation of the reversion flavour of soybean oil*, THOMAS H. SMOUSE AND STEPHEN S. CHANG, *J. Am. Oil Chem. Soc.*, 1967, **44** (8), 50.

Among the 71 compounds identified, I-decyne and 2-pentyl furan are of unusual interest. The latter imparts to an oil at concentrations of 5-10 p.p.m., a beany and grassy flavour reminiscent of that of a reverted soybean oil.

J. v. s.

- 19.12 *Recovery of volatile compounds from butter oil*, D. A. FORSS AND GWENDA L. HOLLOWAY, *J. Am. Oil Chem. Soc.*, 1969, **44** (10), 572.

Three methods have tested for isolating volatile compounds from oils and fats by using approximately 1 p.p.m. of added C₃₋₁₂ n-alkan-2-ones and C₂₋₁₀ n-alkan-1-ols in butter oil: the combination of high vacuum degassing and cold finger molecular distillation proved to be the best method.

J. v. s.

- 19.13 *Determination of volatile amines in fish muscle by GLC*, 1., JUNSAKU NONAKA, HITOMI MITANI AND CHIATI KOIZUMI, *Bull. J. Soc. sci. Fish.*, 1967, **33** (8), 753.

The average recovery of TMA determined by GLC, was found to be 98 per cent. Estimations of TMA in horse mackerel and mackerel muscles stored at 1 to 4°C for 0, 2, 5, 8 and 11 days showed that the GLC method gave better values than the Dyer method, especially when the fish became unsound.

J. v. s.

A. A.—Author's Abstract.

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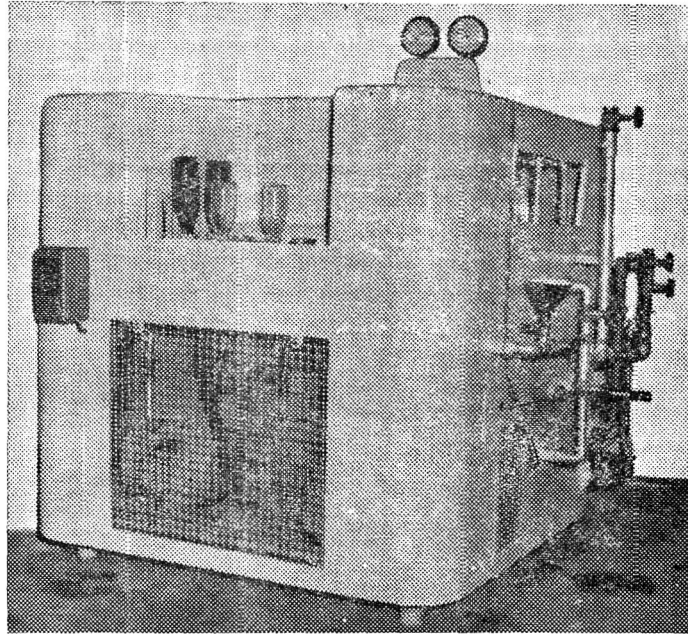
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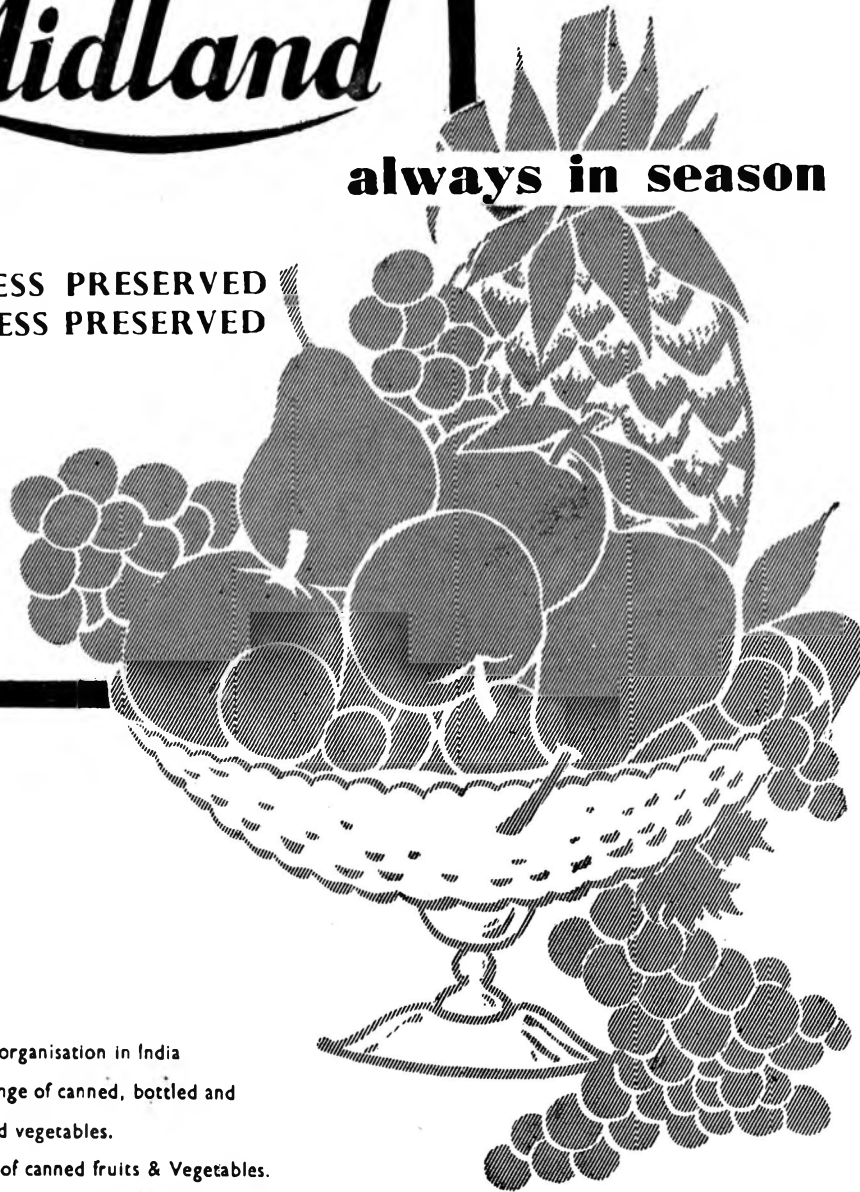
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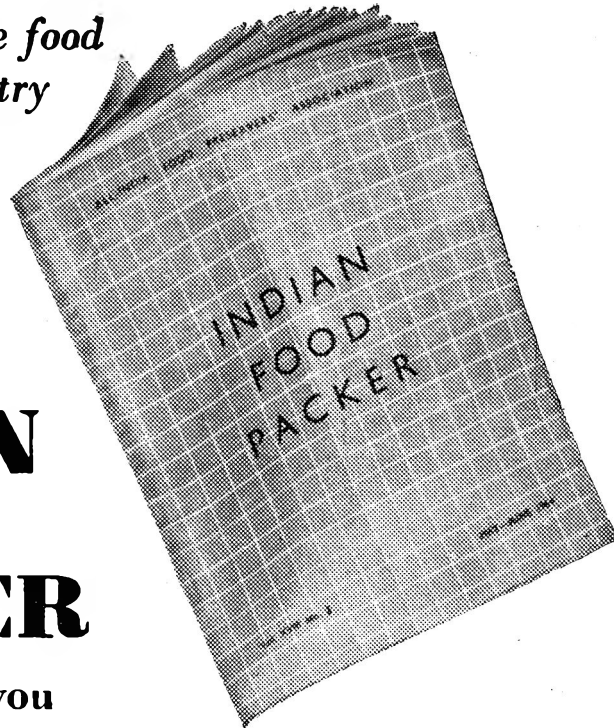
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