



JOURNAL OF

FOOD SCIENCE

AND

TECHNOLOGY

ASSOCIATION OF FOOD TECHNOLOGISTS, INDIA

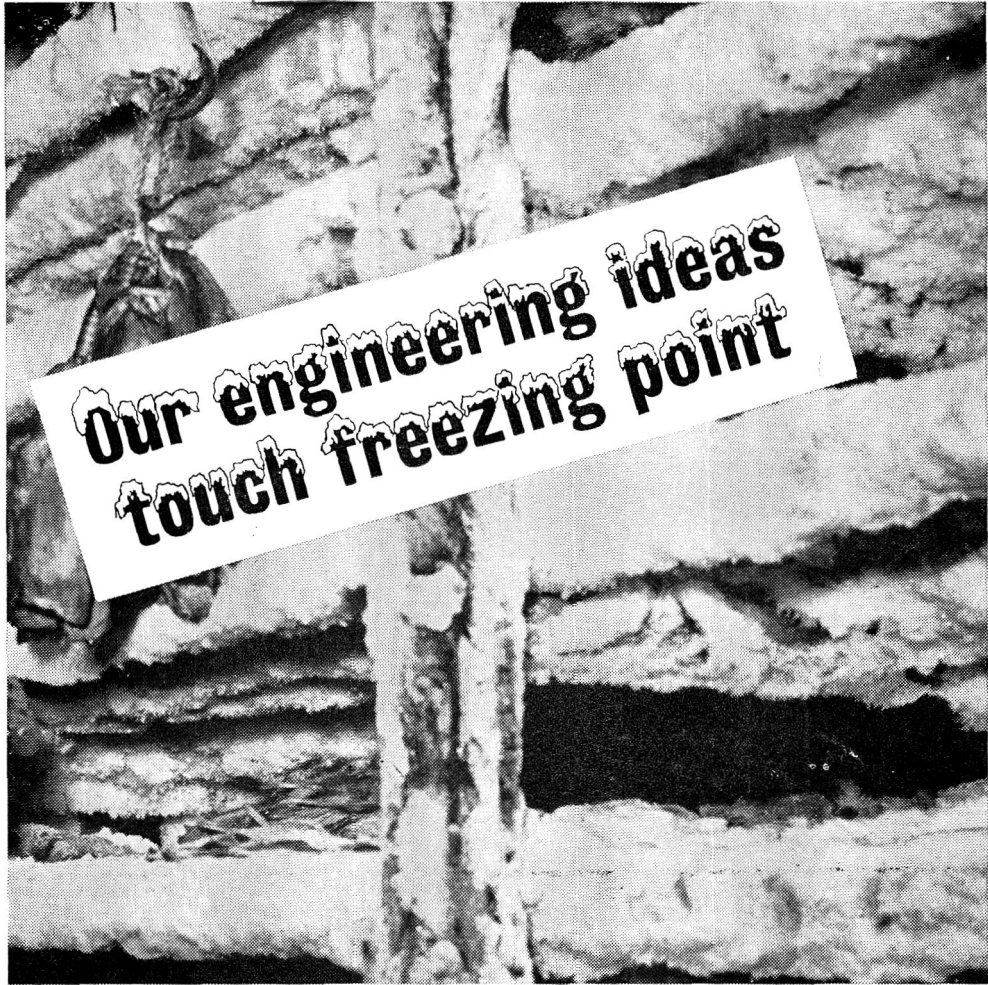
VOL. 5

NO. 2

JULY

1968

ଶ୍ରୀମତୀ ଶ୍ରୀମତୀ
ଶ୍ରୀମତୀ ଶ୍ରୀମତୀ
ଶ୍ରୀମତୀ ଶ୍ରୀମତୀ



It happened when we branched off into the cold storage business. We are now specialists in this field as well. With years of experience behind us, we can give you the exact design for cold storage plants, supply equipment and give you the benefit of efficient after sales service. We also install refrigeration plants for dairies, creameries, bacon factories, poultry processing plants, fisheries, beverage cooling and ice and water chilling plants. So, if you're looking for profits in freezing the freshness of food, consult us.



Dairy & Refrigeration Division

LARSEN & TOUBRO LIMITED

P.O. Box 278, Bombay 1 • P.O. Box 619, Calcutta 16
P.O. Box 323, New Delhi 1 • Post Bag 5247, Madras 2

EDITORIAL BOARD

K. T. Achaya, Hyderabad
B. L. Amla, Mysore
C. P. Ananthakrishnan, Bangalore
K. Bagchi, New Delhi
J. V. Bhat, Bangalore
A. N. Bose, Ernakulam
A. K. Mitter, Calcutta
C. Gopalan, Hyderabad
K. K. Iya, New Delhi
D. V. Karmarkar, New Delhi
A. Krishnamurthy, New Delhi
G. S. Littlejohn, Calcutta
H. A. B. Parpia, Mysore
S. V. Pingale, New Delhi
D. V. Rege, Bombay
Sam H. Dalal, Bombay
M. G. Sathe, Poona
B. N. Sastri, Mysore
C. M. Singh, Izatnagar
A. Sreenivasan, Bombay
V. Subrahmanyam, New Delhi
R. D. Taneja, New Delhi
S. Varadarajan, Bombay
K. S. Venkataramani, Annamalais
P. K. Vijayaraghavan, Mysore
M. A. Wadud Khan, Bombay

Editor: M. R. Chandrasekhara

Associate Editors: N. Subramanian, Krishna Kumari, H. S. R. Desikachar, P. B. Rama Rao, G. K. Rao and K. A. Ranganath

Executive Secretary: B. Panda

Joint Secretary: M. Narayana Rao

Treasurer: S. C. Bhattacharjya

Production Manager: K. V. Achyuta Rao

The Journal of Food Science and Technology is issued quarterly

The Association of Food Technologists assumes no responsibility for the statements and opinions advanced by contributors. The Editorial Board in its work of examining papers received for publication is assisted, in an honorary capacity, by a large number of distinguished scientists working in various parts of India.

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).

Payments in respect of subscriptions and advertisements may be sent by cheque, bank draft, money order or postal order marked payable to the Hon. Executive Secretary, Association of Food Technologists (India), C.F.T.R.I., Mysore-2, (India).

Journal of Food Science and Technology

VOLUME 5

NUMBER 2

JULY 1968

CONTENTS

	PAGE
Editor's Note	57
Research Papers	
Expansion and Swelling of Raw and Parboiled Rice during Cooking—M. Mahadevappa and H. S. R. Desikachar	59
Effect of Pre-Harvest Spray of Sodium Orthophenyl Phenate and Captan on the Control of Decay in <i>Anab-e-Shahi</i> Grapes (<i>Vitis vinifera</i> Linn.)—P. Narasimham, M. Madalagatti Rao, N. Nagaraja and B. Anandaswamy	63
A Study on the Maturity, Regional Variations and Retention of Green Colour of Cardamom—C. P. Natarajan, S. Kuppuswamy and M. N. Krishnamurthy	65
Short Communication	
Effect of Heat on the Yield and Physico-Chemical Characteristics of Oil and Protein from Groundnut	69
Changes in Ovomucin Concentration during Thinning of Thick White in Eggs	71
Some Observations on the Histology of Raw and Parboiled Rice	72
Symposia and Seminars	
Progress Evaluation of Modernisation of Rice Milling	74
The Second Annual Convention of the All India Association of Poultry Industry	74
Book Reviews	75
Notes and News	79
Association News	85
Food Science and Technology Abstracts	86

ASSOCIATION OF FOOD TECHNOLOGISTS

(INDIA)

CENTRL FOOD TECHNOLOGICAL RESEARCH INSTITUTE MYSORE

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

AFFILIATED TO THE INSTITUTE OF FOOD TECHNOLOGISTS, USA

Objects:

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

Major Activities:

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

Membership:

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

Admission Fee Re. 1. Annual Membership Fee Rs. 15 or \$ 3.50.
Annual subscription to Journal Inland Rs. 25.75 Foreign \$ 5.50 (or its equivalent)

For membership and other details, kindly address:

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

EDITOR'S NOTE

The Prime Minister, Smt. Indira Gandhi released a special postage stamp on the 17 July 1968 to commemorate the wheat revolution in India, evident from an estimated 17 million tonnes harvested in 1967-68 against 12 million tonnes in the best previous harvest of 1964-65. The current year has not only seen the bumper wheat harvest in the Punjab but also the bumper rice harvest in Thanjavur; the total grain production has been estimated to be 95 million tons, representing an increase of 73 per cent in the last eighteen years.

The significance of this could be judged in its proper perspective only when all the factors that have made this spectacular achievement possible, are taken into consideration.

The average yields of cereals in India are among the lowest in the world, being approximately 1000 kg/ha. for milled rice and 800 kg./ha for wheat. Japan, Taiwan, the Netherlands and U.K. have three times the average yield rate of India. That there is vast scope for increasing the grain production in India, is clearly brought out by comparing the high yield records of *Krishni Pandits* with the averages or by comparing the yield levels at experimental stations with the corresponding state averages. Given the inputs the yields can be increased.

The story behind these developments is one of long strenuous work coupled with occasional successes in many fields. There is no doubt that the weather has been helpful in many areas, but that is only a part of the entire picture.

A major share of the credit goes to the scientists who have been responsible for the introduction of high yielding varieties of crops. Introduction of rice varieties like *IR 8*, *Taichung Native 1* and *ADT 27* have almost doubled the yields. The dwarf wheat varieties introduced from Mexico, the *Lerma Rojo* and *Sonora 64*, have very desirable characteristics like lodge-resistance, high response to fertilizers and rust resistance. Nearly 10,000 crosses between the Mexican dwarf and Indian varieties have been made and are under study. The *Sharbati* mutant of *Sonora 64* has all the characters of the original with added

plus-points like bold lustrous amber grains. Similar work is in progress in Madras, Pantnagar, Ludhiana and other places. The Bangalore Agricultural University has recently released a high yielding white variety of *Eleusine coracana*. The yield is not the only aspect under study. The quantity and quality of the proteins of the grains are also being considered. In the wake of the brilliant work of Mertz, Bates, Veron and others in developing the high lysine maize, *Opaque 2* and *Floury 2*, plant breeders in India are also aiming at genetic mutants of grain crops which in the words of the Food Minister 'will upgrade the protein quality of wheat and rice to the level of milk protein'.

But this is not the whole story. The garnering of the food grains is an equally important and strenuous job. In Thanjavur and in the Punjab, the Food Corporation of India (FCI) in collaboration with the local authorities had to bear the brunt of this task. The transport of the grain from the producing centres to the consuming areas over several hundreds of miles, with monsoon threatening to break at any moment, posed problems, which if unsolved might have washed off a major chunk of the 'wheat revolution'. The FCI is now providing 'grain banks' to hold seven million tonnes of food grain at a cost of about seven hundred crores of rupees. One of the achievements of this operation was that the agriculturist was not doomed by the surplus production as the FCI was able to hold the price line and 'pump over Rs 100 crores into the pockets of farmers in the states of the Punjab and Haryana'.

The wheat revolution or the agricultural revolution has been possible only because of the general toning up of the other inputs. The demand for fertilizers has now outstripped the production. In 1966 the consumption of nitrogen was 6 lakh tonnes, in 1966-67 it was 9.6 lakh tonnes and the target for 1967-68 is 13.5 lakh tonnes. Other statistics are equally impressive. The irrigated area has increased from 56 million acres to 77 million acres and the area under improved seeds to 120 million acres.

But with all this, if the crop that is grown is lost to rodents and other pests, all the heroic efforts will be wasted. The losses on these counts have been estimated to be enormous. Steps have to be taken urgently to prevent these losses.

India not only grows large quantities of grains, but also leads the world in the production of pulses and oilseeds like groundnuts. The dietary of the Indian is low in calories, but is much poorer in quality proteins. The animal proteins may not be available in sufficient quantities to the Indian housewife for many more years to come. To quote Altschul, 'The Americans have 1650 lb. of grains per person. But they eat only 150 lb. of grain. The rest of 1500 lb. are fed to animals to produce the animal protein for

them. The Indians have 340 lb. of grains available per person per year. Of this they eat 295 lb. There is none left for the animal feeding'. While the agricultural revolution that is taking place in the country may well make the country self sufficient in food, a revolution in food technology is required to provide the nutritionally balanced food, by making use of available unused resources. The technologist has a special responsibility to create new foods with acceptable qualities which can stand in comparison with animal protein foods in nutrition and taste.

The means and the knowledge for this technology are available. The time is now ripe to meet this challenge.

Expansion and Swelling of Raw and Parboiled Rice during Cooking

M. MAHADEVAPPA AND H. S. R. DESIKACHAR
Central Food Technological Research Institute, Mysore

Manuscript Received: 17 June 1968

Expansion in length, breadth and lateral thickness as also the rate of increase in weight and volume at different stages of cooking were determined in milled raw and parboiled rice from *Coimbatore Sanna (Indica)* and *Taichung-65 (Japonica)* varieties of paddy. Parboiled rice showed lower values for these criteria than raw rice in both varieties. The time required for cooking to the same degree of softness was greater for parboiled than for raw rice samples. At this stage, the expansion in breadth was more for parboiled than for raw rice. The increase in weight and volume was more for raw than for parboiled rice. Between the two varieties, *Taichung* always expanded more along length and less along breadth and lateral thickness than *Coimbatore Sanna* paddy. Total increase in weight and volume were more for *Coimbatore Sanna* than for *Taichung*.

Expansion characters of brown rice were however atypical. Parboiled brown rice had higher expansion than raw along the breadth, but not along length. With progressive cooking, the kernels opened along the dorsal and ventral lines of fusion. The severity or depth of fissure was more in raw than in parboiled samples. The fissures started along the dorsal line continuing later along the ventral line.

The existence of characteristic differences in the swelling quality and the dimensional expansion of raw and parboiled rice during cooking of two *Indica* varieties of rice has been demonstrated in earlier studies from this laboratory¹. It was of interest to find out whether there was an inter-racial difference in this respect. The results of such a comparison between raw and parboiled rices in an *Indica* and a *Japonica* variety are presented here. Comparisons have also been made between the respective raw and parboiled rices in both varieties.

Materials and Methods

Two pure lines *Coimbatore Sanna* (CS), an *Indica* variety known to possess good cooking property, and *Taichung-65* (T), a high yielding *Japonica* variety were obtained from a paddy breeding station. Brown rice and rice polished to about 8 per cent (degree of milling) were prepared from the paddy samples by using a McGill sheller and a McGill Miller No. 3 respectively. Paddy was parboiled in both varieties by soaking in hot water at 60°C for 5 hours, steaming and then drying as described earlier¹. Only sound head rice samples without visual surface defects were selected for the study in all cases, the broken grains having been removed with a sizing device.

Expansion ratios along length and breadth (dorsiventral thickness) as also swelling ratio by weight and volume were determined at different periods of cooking by methods described earlier¹. Grain expansion ratios were determined on 50 to 70 individual grains. Apart from measurements along the length and breadth axis, increase in lateral diameter of grains was also measured by examining transverse sections of cooked and uncooked grains at different stages of cooking. Ten per cent acetic acid containing 25 per cent propylene glycol was used as a fixative for uncooked rice grains, while saturated solution of polyethylene glycol was used as the firming agent for cooked rice grains. For studying the pattern of kernel opening at different stages of cooking, the number of kernels which showed signs of opening along the dorsal and ventral axes from among 500 grains was determined. The severity of opening was assessed by a qualitative grading system taking into account the depth of the fissure. This was, however, subjective.

Results and Discussion

Expansion of grains: The expansion ratios along length and breadth at different stages of cooking of brown rice in the raw and parboiled state are presented in Table 1. There were no significant effects due to

TABLE 1. EXPANSION RATIOS OF BROWN RICE DURING COOKING

Treatment	Time of cooking in minutes						
	5	10	15	20	25	30	40
<i>Along length</i>							
CS (raw)	1.06	1.09	1.13	1.16	1.21	1.24	1.29
CS (parboiled)	...	1.07	1.16	1.22	1.27	1.31	1.31
<i>Taichung</i> (raw)	1.09	1.12	1.15	1.17	1.21	1.23	1.31
<i>Taichung</i> (parboiled)	...	1.09	1.14	1.22	1.28	1.33	1.40
<i>Significance:</i>							
D ₁₋₂†	...	...	...	...	...	*	...
D ₃₋₄	...	...	...	...	*	*	*
D ₁₋₃	*	*	...	...	...	...	...
D ₂₋₄	...	...	...	...	...	...	*
<i>Along breadth</i>							
CS (raw)	1.09	1.11	1.21	1.24	1.34	1.45	1.49
CS (parboiled)	...	1.08	1.16	1.38	1.47	1.59	1.73
<i>Taichung</i> (raw)	1.08	1.10	1.13	1.14	1.16	1.16	1.19
<i>Taichung</i> (parboiled)	...	1.10	1.18	1.25	1.25	1.29	1.36
<i>Significance:</i>							
D ₁₋₂†	...	...	...	*	*	*	*
D ₃₋₄	...	...	...	*	*	*	*
D ₁₋₃	...	...	*	*	*	*	*
D ₂₋₄	...	...	...	*	*	*	*

† D Represents mean differences between treatments indicated in the subscripts

* Significant at 5% level

variety or parboiling treatment on the expansion ratio along length. The expansion ratio along the breadth was, however, more for the parboiled samples than for the raw in both varieties of paddy. CS variety had a tendency to expand more along the breadth than *Taichung* in both raw and parboiled states.

Similar data for polished rice samples at 5 minute intervals during cooking as also corresponding values for the 2 varieties cooked for the optimal cooking period (minimum time required to cook the grains to a stage when the core presented no raw opaque material as pressed between two glass plates) have been presented in Table 2. In both the varieties, the expansion ratios along the length were more for raw rice than for parboiled rice. *Taichung* had a tendency to expand more along the length than CS in both raw and parboiled samples. This difference became specially noticeable in the later stages of cooking.

Along the breadth, however, CS exhibited greater expansion than *Taichung*. There was a difference in expansion along the breadth between raw and parboiled paddy for CS variety. This was negligible for *Taichung*. The expansion along the lateral diameter followed almost the same pattern as for the breadth.

TABLE 2. EXPANSION RATIOS OF POLISHED RICE DURING COOKING

Treatment	Time of cooking in minutes					At optimal cooking period @
	5	10	15	20	25	
<i>Along length</i>						
CS (raw)	1.29	1.45	1.59	1.62	1.63	1.65
CS (parboiled)	1.22	1.30	1.42	1.53	1.53	1.59
<i>Taichung</i> (raw)	1.24	1.42	1.61	1.72	1.78	1.90
<i>Taichung</i> (parboiled)	1.24	1.35	1.49	1.59	1.67	1.83
<i>Significance</i>						
D ₁₋₂ †	*	*	*	*	*	...
D ₂₋₄	...	*	*	*	*	*
D ₁₋₃	*	...	...	*	*	*
D ₂₋₄	...	...	*	*	*	*
<i>Along breadth</i>						
CS (raw)	1.30	1.52	1.64	1.65	1.71	1.63
CS (parboiled)	1.28	1.35	1.46	1.53	1.57	1.73
<i>Taichung</i> (raw)	1.26	1.41	1.51	1.49	1.52	1.52
<i>Taichung</i> (parboiled)	1.28	1.39	1.40	1.46	1.52	1.59
<i>Significance</i>						
D ₁₋₂ †	...	*	*	*	*	*
D ₃₋₄	...	...	*	...	...	...
D ₁₋₃	...	*	*	*	*	*
D ₂₋₄	...	...	...	*	...	*
<i>Lateral diameter of transverse section</i>						
CS (raw)	1.19	1.29	1.35	1.48	1.47	...
CS (parboiled)	1.15	1.28	1.34	1.41	1.42	...
<i>Taichung</i> (raw)	1.12	1.24	1.33	1.41	1.40	...
<i>Taichung</i> (parboiled)	1.12	1.17	1.24	1.28	1.29	...

† D Represents mean differences between treatments indicated in the subscripts

* Significant at 5% level

@ Optimal cooking period: CS (raw)—22 minutes. *Taichung* (raw)—28 minutes CS (parboiled)—34 minutes. *Taichung* (parboiled)—38 minutes

Although the values in the table pertained to average of 50-60 grains, lateral diameters before and after cooking could not be measured in the same grain. Hence the differences could not be tested for statistical significance.

Since parboiled samples had to be cooked for a longer period than raw rice for optimal degree of cooking the difference in expansion along length between raw and parboiled samples was small and of low significance. At this stage of cooking *Taichung* also exhibited greater expansion than CS along the length both in the raw and parboiled stages. Along the breadth, however, parboiled rice had a tendency to expand more than raw rice¹ and CS paddy had greater expansion than *Taichung* both in the raw and parboiled stages.

Swelling quality: Data on total swelling of the rice samples both by volume and by weight are presented in Table 3. Raw rice in both the varieties had a greater swelling rate than parboiled rice. CS, in general, exhibited a greater swelling power than *Taichung* both in raw and parboiled samples. At optimal degree of cooking, there was however, no significant difference between the two varieties in the raw state. In the

parboiled samples, CS variety retained its greater swelling capacity.

Development of fissures during cooking: During the cooking process, the kernels of parboiled rice opened relatively more slowly than raw rice samples (Table 4). This is to be expected since parboiled rice has firmer texture than raw rice. At each stage of cooking the severity of the fissure as judged by its depth was also greater for raw than for parboiled rice. Some differences in the severity of opening between CS and *Taichung* were found but these were not however, statistically significant.

It is pertinent to point out some observations about the development of the fissures during the cooking process. In brown rice, the cleft developed in an ill defined manner and at any point on the surface of the grain. In polished rice, however, the cleft or opening always developed along the dorsal or ventral axis and at the distal end away from the germ tip. At any stage of cooking the number of kernels open along the dorsal line was greater than those open along the ventral line. There were very few grains which were open only ventrally. The dorsal line of fusion appears therefore to be a weaker point than the ventral line. It has, however, been indicated previously² that absorption of water by polished rice grains, when immersed in water, starts preferentially at the germ tip and proceeds along the ventral line developing opacity. This entry of water at germ tip may be due to the spongy character of the epithelial tissue connecting the germ and the endosperm³.

Histological examination of transverse sections of rice reveals that the pattern of cell distribution is somewhat peculiar. In the lateral area, the cells are polygonal and isodiametric while along the dorsiventral axis the cells are elongated and linearly arranged on both sides

TABLE 3. SWELLING RATIOS BY WEIGHT AND VOLUME OF RAW AND PARBOILED RICE DURING COOKING

Treatment	Time of cooking in minutes						At optimal cooking period @
	5	10	15	20	25	30	
<i>By weight basis</i>							
CS (raw)	1.73	1.89	2.72	3.35	3.58	3.87	3.63
CS (parboiled)	1.66	2.25	2.46	2.56	2.96	3.33	3.58
<i>Taichung</i> (raw)	1.59	..§	2.41	2.84	3.20	3.64	3.62
<i>Taichung</i> (parboiled)	1.73	1.97	2.32	2.43	2.82	3.18	3.40
<i>Significance:</i>							
D ₁₋₂ †	*	*	*	*	*	*	*
D ₃₋₄	*	...	*	*	*	*	*
D ₁₋₃	*	...	*	*	*	*	...
D ₂₋₄	*	*	*	*	*	*	*
<i>By volume basis</i>							
CS (raw)	2.00	2.37	3.43	4.29	4.96	5.19	4.90
CS (parboiled)	1.80	2.86	3.07	3.25	3.90	4.40	4.61
<i>Taichung</i> (raw)	1.75	2.71	2.97	3.54	4.18	4.97	4.80
<i>Taichung</i> (parboiled)	1.97	2.41	2.83	3.05	3.62	4.14	4.47
<i>Significance:</i>							
D ₁₋₂ †	*	*	*	*	*	*	*
D ₃₋₄	*	*	*	*	*	*	*
D ₁₋₃	*	*	*	*	*	*	...
D ₂₋₄	*	*	*	*	*	*	*

† D Represents mean differences between treatment indicated in the subscripts * Significant at 5% level § Sample lost @ Optimal cooking period as in Table 2.

TABLE 4. THE NUMBER AND SEVERITY OF FISSURES DEVELOPED DURING PROGRESSIVE COOKING OF RICE (500 grains taken for each test)

Cooking period minutes	Kernels open dorsally		Kernels open ventrally||		Severity of opening					
	Raw %	Parboiled %	Raw %	Parboiled %	Raw* %	Parboiled* %	Raw† %	Parboiled† %	Raw§ %	Parboiled§ %
CS										
10	78	8	36	2	5	0	55	2	8	6
20	84	68	56	28	24	2	44	4	16	62
30	91	75	68	25	63	4	25	11	3	60
40	98	92	86	42	86	6	12	14	0	72
Optimal‡	84	88	44	44	40	6	40	8	4	74
<i>Taichung</i>										
10	64	60	36	40	7	0	45	2	12	58
20	84	78	58	44	30	4	46	6	8	68
30	91	82	66	42	70	2	18	28	3	52
40	96	96	90	64	82	4	14	30	0	62
Optimal‡	92	90	74	62	44	8	34	22	14	60

|| These grains were also open dorsally ‡ Optimal cooking period as in Table 2.

*, † and § represent cleavage of grains with decreasing order of severity

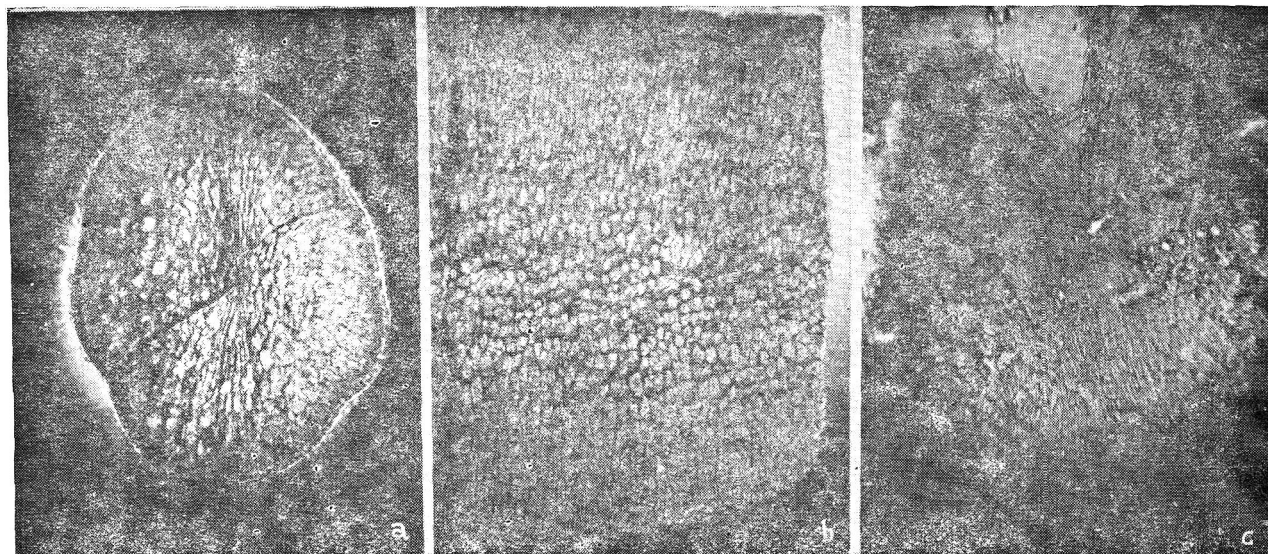


Fig. 1. Positioning of long cells in rice kernels in relation to development of fissures during cooking: *a* and *b*, transverse and longitudinal sections respectively of raw uncooked rice; *c*, transverse section of cooked rice. (Note the long cells in dorsal and ventral parts in *a* & *b* and fissuring along the dorsiventral axis in *c*).

away from the centre (Fig. 1). Along the dorsiventral axis, therefore, there is greater tendency for the cells to fall apart and develop transverse cracks as a result of the expansion. Cooked rice grains often present the appearance of segments loosely held together. The existence of dorsiventral rifts has also been reported by Little and Dawson⁴. The tendency to develop cleavage would be far less along the lateral diameter where the arrangement of cells is reticulate and protein is present in higher concentration⁴. This pattern of cell distribution could also explain why the cleft develops during cooking along the dorsal or ventral line. There is, however, no explanation as to why it should

open first along the dorsal line as observed in the present study. In brown rice, the endosperm cells are surrounded and covered throughout by the outer aleurone and bran layer. The cleavage in brown rice may, therefore, be atypical and develop at any point.

References

1. Kurien, P. P., Radhakrishna Murthy, R., Desikachar, H. S. R. and Subrahmanyam, V., *Cereal Chem.*, 1964, **41**, 16.
2. Desikachar, H. S. R. and Subrahmanyam, V., *Cereal Chem.*, 1961, **38**, 356.
3. Mahadevappa, M. and Desikachar, H. S. R. *J. Fd Sci. Technol.* 1968, **5**, 70.
4. Little, R. R. and Dawson, E. H., *Fd Res.*, 1960, **25**, 611.

For Attention of Members and Subscribers!

The following back issues of the Journal are urgently required for meeting some foreign orders. Those of the members who can spare these could cash them for Rs 4 each by contacting the Hon. Executive Secretary, CFTRI, Mysore.

Vol. 1 No. 1—1964

Vol. 4 No. 1—1967

B. Panda

Hon. Executive Secretary

Effect of Pre-Harvest Spray of Sodium Orthophenyl Phenate and Captan on the Control of Decay in *Anab-e-Shahi* Grapes (*Vitis vinifera* Linn.)

P. NARASIMHAM, M. MADALAGATTI RAO,* N. NAGARAJA AND B. ANANDASWAMY
Central Food Technological Research Institute, Mysore

Manuscript Received : 20 February 1968

Use of Captan and sodium orthophenyl phenate as pre-harvest sprays reduced decay of *Anab-e-Shahi* grapes considerably during transit and storage. Captan was, however, found to be superior to sodium orthophenyl phenate in this respect. Both the fungicides did not impair the quality and composition of the grapes.

Spoilage of grapes due to fungal diseases during transit and storage is a serious problem. The infection is generally carried from the field and the spores of *Botrytis cinerea*, *Cladosporium herbarum* and *Alternaria* sp. can grow even at cold temperatures. Attempts to control the decay in grapes by chemicals like potassium metabisulphite, iodine, formalin, butyl alcohol, etc., have been partly successful¹. Fumigation with sulphur dioxide has proved effective in controlling the decay in grapes during transit and storage and is being widely practised in United States. Improper use of this technique, however, leads to the damage of fruits. Fumigation does not ensure complete safety against subsequent fungal attack, thereby requiring its application at regular intervals. In order to control the fungal infections at the field itself, application of fungicides has been tried. Harvey^{2,3} reported successful control of decay in *Emperor* grapes during storage by 3 applications of Captan at monthly intervals before harvest. Tomkins⁴ reported the possibilities of using the wraps impregnated with o-phenyl-phenyl acetate, to prevent rotting of grapes. Scott *et al.*⁵ reported that wastage of purple *Cornichon* grapes was reduced with the use of tissue paper impregnated with sodium orthophenyl phenate.

The present study was undertaken to assess the relative efficacy of sodium orthophenyl phenate and Captan (Flit 406), when applied 4 days prior to harvest, on the control of decay of *Anab-e-Shahi* grapes during transit and storage.

Materials and Methods

The study was carried out in February 1966 at Hyderabad. Different rows demarcated with stone

pillars having practically uniform vines were selected at random for each of the treatments. Fifty bunches of uniform size and maturity were selected and tagged under each treatment. These were sprayed with different fungicide formulations. Two fungicides Captan (N-trichloromethyl thio-4-cyclohexane-dicarboximide) at 0.1 and 0.2 per cent concentrations, and sodium orthophenyl phenate (SOPP) at 0.2 per cent concentration were tried. Both 4 per cent Waxol-O and water containing 0.5 per cent Tween-80 as wetting agent were employed as carriers of the fungicide, keeping 4 per cent Waxol-O alone and unsprayed as controls. Waxol-O of 4 per cent strength was prepared by diluting the stock emulsion of 12 per cent solids with soft water⁶.

Four days after spraying, the treated and control bunches were harvested and packed according to trade practices, in dealwood nailed boxes of same dimensions (locally known as fruit packing cases) and keeping under each treatment 3 replicates of 5 kg. capacity, using the same quantity of cushioning. The packages were then transported to Mysore by passenger train over a distance of 800 Km, thereby subjecting the fruits to normal journey hazards like vibration, shunting, dropping, etc. Healthy, intact bunches and dropped sound berries were separated from decayed berries and weighed. The percentage losses during transit were calculated. From the intact bunches under each treatment, 4 kg. of grapes (two samples in each treatment) were placed in cold room maintained at 0-1°C and 85-90 per cent R.H. Periodical observations were made on the weights of intact bunches, and decayed berries. Cumulative percentage wastage due to decay was worked out. The data are presented in Table 1.

* Present Address: Agricultural College, Dharwar.

TABLE 1. PERCENTAGE DECAY DURING TRANSIT AND STORAGE AT 0°C OF *Anab-e-Shahi* GRAPES TREATED WITH FUNGICIDES BEFORE HARVEST

Treatment	Spoilage during transit* (%)	Cumulative spoilage (%) after storage for 2, 3, 4 and 5 weeks			
		2	3	4	5
0.1% Captan in 4% Waxol-O	1.8	3.3	5.9	8.4	10.0
0.2% Captan in 4% Waxol-O	2.0	2.7	6.4	10.0	12.9
0.2% SOPP in 4% Waxol-O	4.9	7.0	10.1	14.9	20.0
0.2% Captan in water with 0.5% Tween-80	4.4	1.9	8.2	16.5	21.5
0.2% SOPP in water with 0.5% Tween-80	6.3	5.5	13.6	25.3	38.0
4% Waxol-O	14.2	13.3	21.5	31.1	41.1
Control (no spray)	15.9	14.9	20.7	27.4	35.8

* The grapes, after harvest, were packed in conventional dealwood cases and transported by train from Hyderabad to Mysore (800 Km).

Results and Discussion

In general, during transit, the treated lots showed less decay as compared to controls. Captan with Waxol-O showed the least decay ranging from 1.8-2.9 per cent; when water was used as carrier the control of wastage due to decay, as compared to the controls, was lesser with SOPP than with Captan. Four per cent Waxol-O alone showed a wastage of 14.2 per cent which is almost equal to that of control (15.9 per cent wastage).

The data on decay during the 5 weeks storage at 0-1°C and 85-90 per cent R.H. also showed the same trend in the performance of fungicides as that found during transit. At the end of 5 weeks, the grapes treated with 0.1 and 0.2 per cent Captan in 4 per cent Waxol-O registered a decay of 10.0 and 12.9 per cent respectively as against 35.8 per cent in the control lots. Sodium orthophenyl phenate in 4 per cent Waxol-O also reduced the decay of grapes, but not to the same extent as Captan. Both Captan and SOPP when applied with water containing 0.5 per cent Tween-80 as carrier did not reduce wastage as effectively as with 4 per cent Waxol-O. Waxol-O alone at 4 per cent concentration has no control on the decay of grapes during storage, as observed during transit.

Acknowledgment

The authors are thankful to Dr H. A. B. Parpia, Director and Shri H. C. Bhatnagar, Chairman, Fruit and Vegetable Technology Discipline, for their keen interest in this investigation.

References

1. Pentzer, N. T., *Proc. Am. Soc. hort. Sci.*, 1941, **39**, 281.
2. Harvey, J. M., *Phytopath.*, 1955, **45**, 137.
3. Harvey, J. M., *Plant Dis. Rep.*, 1959, **43**, 889.
4. Tomkins, R. G., *Nature, Lond.*, 1963, **199**, 669.
5. Scott, K. J. and Roberts, E. A., *Aus. J. exp. Agric. Anim. Husb.*, 1965, **5**, 295.
6. Dalal, V. B., Subrahmanyam, H. and Srivastava, H. C., *Project Circ.*, Central Food Technological Research Institute, No. 40, 1961.

VIIITH INTERNATIONAL CONGRESS OF NUTRITION

The Congress will be held in Prague from August 28 to September 5th, 1969. The programme will be presented under (a) Modern aspects of nutrition of individuals and population (Section 1-5) and (b) Nutrition technology under the conditions of scientific and technical progress (Section 6-8).

The Eight different sections are :

- Section 1—Biochemical aspects of nutrition
- Section 2—Metabolic processes in energy homoeostasis and growth
- Section 3—Nutrition and diseases with mass incidence

Section 4—Secondary nutritional disorders—clinical aspects

Section 5—Nutritional studies in economically developed countries and in developing regions

Section 6—Hygienic aspects of nutrition

Section 7—Nutritive value of food, food technology

Section 8—Optimum conditions of food production

Further information can be obtained from the Secretariat of the VIIITH International Congress of Nutrition, Institute of Human Nutrition, Budejovicka 800, Prague 4, Czechoslovakia.

A Study on the Maturity, Regional Variations and Retention of Green Colour of Cardamom

C. P. NATARAJAN, S. KUPPUSWAMY AND M. N. KRISHNAMURTHY

Central Food Technological Research Institute, Mysore

Manuscript Received: 14 Nov. 1967

The moisture in the whole fruit varied from 60.5 to 92.5 per cent and in seeds 36 to 87 per cent. Density of fresh fruit varied from 0.884 to 1.280 g/c.c.; the weight of individual berry from 0.66 to 1.08 g. and the percentage of seeds from 28 to 45. Volatile oil ranged from 5.4 to 9.8 per cent (v/w) in seeds and the percentage seeds in dried berry ranged from 66.6 to 81.5. Soaking of green cardamom in 2 per cent sodium carbonate solution for 10 min. has been shown to fix the green colour during drying and subsequent storage.

The chemistry and technology of cardamom as well as the stability of the green colour in the berry during storage have been reported earlier¹⁻³. Different methods of preservation of the green colour in cardamom have also been reported⁴.

In view of the importance attached by the trade to the green colour of the berries, a study has now been made on the effect of alkali treatment on the preserva-

tion of the green colour and the changes that occur in this product during storage. Data on regional variations in maturity of harvested berries have also been reported.

Materials and Methods

Green cardamoms of varying maturity were obtained from the plantations and experiments were

TABLE 1. REGIONAL VARIATIONS AND MATURITY STUDIES WITH CARDAMOM

Region	Colour of berries	Fresh cardamom						Dried cardamom								
		Moisture% (by wt.)			*Density g./cc.	*Wt. of single berry g.	Seed in 100 g. berry	Moisture% (by wt.)			*Wt. of single berry	Seed in 100 g. berry	†Volatile oil content (%) in seed (v/w)			
		Whole berries	Seed	Husk				Whole berries	Seed	Husk						
Coorg (A)	Green	...	...	...	1.150	1.00	36.0	7.5	9.8	...	0.23	73.0	9.4
	Yellow	...	...	...	0.884	0.89	37.0	10.5	12.0	...	0.25	74.0	9.1
Coorg (B)	Green	...	...	...	0.955	0.66	34.0	8.0	10.0	...	0.12	69.6	8.6
	Yellow	...	...	...	0.954	0.52	35.0	8.0	9.0	...	0.12	73.5	8.2
Mudigere	Green	...	...	...	0.910	1.04	35.0	9.3	10.0	6.87	0.23	74.5	8.9
	Yellow	...	...	...	0.890	1.08	33.0	8.8	9.5	...	0.24	75.5	8.6
Saklespur	Green	...	44.0	...	0.970	0.76	34.5	...	12.0	...	0.25	75.0	8.0			
	Yellow	...	40.5	...	0.946	0.78	33.0	...	12.0	...	0.25	75.0	9.0			
Yercaud (Salem Dt.)	Green	82.5	...	...	0.940	1.02	42.0	7.5	7.0	8.95	0.23	73.0	9.6	
	Yellow	81.5	...	...	0.970	0.92	38.5	8.0	7.2	...	0.26	73.0	9.4	
Pambadampara (Kerala)	Green	74.0	56.0	88.0	1.026	0.66	44.0	7.2	7.5	5.50	0.20	73.5	8.2			
	Yellow	69.5	51.0	85.0	1.020	0.74	45.0	7.1	6.9	7.60	0.22	75.0	8.0			
"	(a) Large size	}	equally	matured	79.0	59.0	...	1.100	0.85	32.7	7.0	5.0	...	0.22	68.7	7.7
	(b) Medium				79.0	57.0	...	1.130	0.85	38.0	7.0	4.7	...	0.18	69.5	9.1
	(c) Small				78.0	60.0	...	1.045	0.52	34.0	6.5	4.7	...	0.10	72.0	8.1
Lower Palnis	(a) Green-White seeds	92.5	87.0	...	1.148	0.77	28.0	8.5	7.5	...	0.15	73.0	5.4			
	(b) Green-Brown "	76.8	56.0	...	1.236	0.89	33.4	10.4	9.2	10.5	0.19	76.0	6.5			
	(c) Green-Black "	72.8	42.0	...	1.280	0.70	35.0	9.0	9.0	...	0.18	78.5	7.0			
	(d) Yellow-Black "	67.0	36.0	...	1.090	0.85	37.0	9.0	8.9	...	0.22	81.5	7.1			
Neliampathys	(a) Green-Brown "	70.5	51.0	82.0	1.020	0.81	37.0	7.5	6.5	...	0.12	66.6	9.0			
	(b) Green-Black "	68.5	50.0	78.0	1.016	0.81	34.2	10.0	9.0	12.0	0.14	69.0	9.8			
	(c) Yellow-Black "	60.5	41.0	72.0	1.005	0.83	37.0	7.5	7.0	...	0.18	74.0	9.5			

* Average value of 5 determinations

† Moisture free basis

conducted at the Institute as well as at the plantations.

Maturity studies: From a bulk pick, the cardamom berries were separated into green, yellowish green and yellow ones, indicating the different stages of maturity. Physical data on density (g/c.c.), skin and seed weights, moisture and volatile oil content were determined in the different lots. These data are given in Table 1.

Density was determined by taking a known weight of berries in a suitable 100 ml. volumetric flask and volume was made up with distilled water from a burette. The volume occupied by the berries was determined and the density calculated as g/c.c. The average of five determinations has been reported.

The percentages of green and yellow berries in a bulk pick, and their dry weights are given in Table 2.

Moisture was estimated by the toluene distillation method, and volatile oil by Clevenger method.

Changes in the volatile oil content of cardamom seeds in berries of different maturity, from three estates are given in Table 3.

TABLE 2. PERCENTAGE OF GREEN AND YELLOW CARDAMOM BERRIES AND DRYING YIELD IN A BULK PICK OF FRESH CARDAMOM

Material	Wt. of lot kg.	Distribution %	Drying yield %	Moisture %
I. Mudigere—Bulk lot	18.3	...	...	...
(1) Green	14.4	74	22.5	10.0
(2) Yellow	3.9	26	22.2	10.0
II. Coorg—Bulk lot	10.0	...	...	...
(1) Batch—(a) Green	7.0	70	18.5	8.0
(b) Yellow	3.0	30	21.6	8.0
(2) Batch—Bulk lot	25.0	...	...	...
(a) Green	19.5	78	19.2	8.0
(b) Yellow	5.5	22	22.0	8.5

TABLE 3. EFFECT OF MOISTURE AND MATURITY OF BERRY ON THE VOLATILE OIL CONTENT IN THE SEEDS

Region	Description of berry	Moisture in seeds before drying %	Moisture in seeds after drying %	*Volatile oil content % in dried seeds (v/w)
Lower Palnis	Green-White seeds	87.0	7.5	4.4
	Green-Brown seeds	56.0	9.2	6.5
	Green-Black seeds	42.0	9.0	7.3
	Yellow-Black seeds	36.0	8.9	7.1
Neliam-pathys	Green-Brown seeds	51.0	6.5	9.0
	Greenish yellow-black seeds	50.0	6.5	9.8
	Yellow-Black seeds	41.0	7.0	9.5
Saklespur	Green-Black seeds	43.5	12.0	9.0

* Moisture free basis

TABLE 4. EFFECT OF CHEMICAL TREATMENT ON THE COLOUR OF DRIED BERRIES

Treatment	*Reflectance % (Y-value)
Control	20.2
2% Sodium carbonate	17.7
2% Sodium carbonate + 0.5% Copper sulphate	17.7
2% Sodium carbonate + 1% Groundnut oil	18.0
2% Sodium carbonate + 1% Olive oil	16.5
2% Sodium carbonate + Groundnut protein isolate	19.0
2% Sodium hydroxide	16.5
2% Sodium hydroxide + 0.5% Copper sulphate	16.0
1% Magnesium oxide + 2% Sodium bicarbonate	19.0
1% Sodium hydroxide + 0.5% Copper sulphate	18.0

* Average of five readings

TABLE 5. OPTIMAL CONDITIONS FOR SODIUM CARBONATE TREATMENT

Effect of concentration of sodium carbonate (Soaking time, 20 min.)		Effect of soaking time (2% Sodium carbonate solution)	
Strength of solution %	*Reflectance % (Y-value)	Time in min.	*Reflectance % (Y-value)
0.2	19.5	1	20.2
0.5	18.0	2	19.2
1.0	19.0	5	19.2
2.0	18.0	10	18.0
5.0	17.2	30	18.4
10.4	17.0	60	20.0

* Average of five readings

TABLE 6. SOME ANALYTICAL DATA FOR COMMERCIAL SAMPLES FROM VANDAMETTU AUCTION CENTRE AND THE PRICE STRUCTURE

Lot No.	Price Rs/kg	Moisture%	Average density g./c.c.	Average weight of berry g.	Average length of berry cm.	Average thickness of berry cm.	Reflectance % (Y-value)
17	32.75	7.4	0.670	0.131	1.327	0.585	17.8
24	33.55	6.5	0.722	0.159	1.328	0.586	18.5
26	33.55	5.6	0.677	0.117	1.328	0.586	18.5
29	33.50	7.3	0.603	0.114	1.281	0.585	17.7
30	38.00	6.0	0.651	0.199	1.502	0.625	15.7
42	33.60	7.9	0.694	0.129	1.323	0.584	18.7
44	34.75	6.5	0.690	0.150	1.298	0.591	19.0
49	34.55	7.6	0.703	0.156	1.293	0.592	19.5
52	38.00	6.7	0.741	0.157	1.389	0.584	16.5
55	34.70	7.9	0.770	0.176	1.298	0.592	18.5
59	32.30	5.7	0.676	0.138	1.326	0.585	18.5
107	33.85	6.8	0.764	0.157	1.324	0.586	19.5

Except moisture, all other values are the averages of five determinations.

TABLE 7. CHANGES IN MOISTURE CONTENT AND COLOUR DURING STORAGE OF GREEN CARDAMOM (PERIOD 8 MONTHS)

Region	Sample No.	Treatment*	Method of packing and storage	Before storage		After 8 months' storage	
				Moisture %	Reflectance % (Y-value)	Moisture %	Reflectance % (Y-value)
Coorg, Mysore State	1	Untreated	polyethylene bags, in dark	7.5	20.5	8.5	24.0
	2	Treated	"	6.0	17.7	8.5	19.0
	3	Untreated	can	7.5	20.5	7.5	25.0
	4	Treated	"	6.0	18.7	8.0	18.5
Yercaud, Salem Dist.	5	Untreated	polyethylene bags, in drak	8.0	19.7	9.5	26.5
	6	Treated	"	7.0	17.0	9.5	20.0
	7	Untreated	can	8.0	19.7	9.0	25.0
	8	Treated	"	7.0	17.0	9.0	19.0
Pambadampara, Kerala State	9	Untreated	polyethylene bags, in dark	7.2	18.0	9.0	20.0
	10	Treated	"	8.0	16.5	9.0	19.0
	11	Untreated	"	7.3	17.7	9.0	22.0
	12	Treated	"	7.4	17.5	9.0	19.5
	13	Untreated	"	7.5	18.2	9.0	21.0
	14	Treated	"	7.5	17.0	9.0	19.0
Neliampathys	15	Untreated	"	6.5	18.5	8.5	21.0
	16	Treated	"	7.0	18.0	8.5	18.0

* Soaking in 2% sodium carbonate for 10 min.

Effect of chemical treatment on the fixation of green colour: Freshly harvested green cardamom was soaked for varying periods in solutions of different alkalies. The berries were drained at the end of 20 min., spread over trays and dried at 60°C in a through-flow drier. The colour of the dried berries was determined using a photoelectric reflection meter with the green tristimulus filter. The y-values are given in Table 4. The optimal conditions for sodium carbonate treatment are shown in Table 5.

Colour of market samples: Data regarding the colour of samples of dried cardamom taken from an important auction centre are shown in Table 6.

Effect of storage on the colour of cardamom berries: Alkali-treated as well as untreated samples were stored at 25°C and 37°C in tin containers and polyethylene (300 gauge) bags and their colour and moisture content determined periodically. The y-values are given in Table 7.

Results and Discussion

Depending on maturity, moisture varied from 60.5 to 92.5 per cent in the whole fruit and from 36 to 87 per cent in the seeds. The density of fresh fruit varied from 0.884 to 1.280 g/c.c., the weight of individual berry from 0.66 to 1.08 g, and the percentage of seeds from 28 to 45. With practically the same depth of visual colour, the maturity of the berries varied from region to region. This might

perhaps be due to differences in climatic conditions. The volatile oil content ranged from 5.4 to 9.8 per cent (v/w) in seeds and percentage of seeds in dried berry from 66.6 to 81.5. These variations indicate that a preliminary grading of the green berries could be useful in standardising the conditions of drying for obtaining a product of uniform quality. At present cardamom is graded only after it is dried. Further work in this direction is necessary.

In typical bulk samples of 20-24 kg. 70-78 per cent of the berries were green and 22-30 per cent yellows. With advancing maturity, the colour of the seed changes from white to brown and finally to black. The immature white seeds contain less oil than the brown or black ones. The oil content in brown and black seeds is practically the same.

As judged by the reflectance values (average of 5 readings) given in Table 7, alkali-treated samples had a deeper green colour than untreated ones before and after storage. Soaking for 10 min. in 2 per cent strength sodium carbonate solution was the optimum for fixation as well as retention of green colour in the berries. The-treatment is best suited in view of the cheapness, ease of handling and ready availability of the chemical.

In the case of market samples, the reflectance values ranged from 15.7 to 19.5. Samples with values less than 17.5 per cent generally fetched better prices. In general, the greener cardamom received higher

bids in the auction as compared to the yellowish or yellowish green cardamom. There was correlation between tristimulus value and auction price.

Alkali treatment for better retention of green colour in the berries, is thus advantageous and beneficial. Such beneficial effect of alkali on retention of the green colour of chlorophyll in green peas has been reported earlier⁵.

Acknowledgment

The authors wish to thank Dr H. A. B. Parpia, Director, for his keen interest in this work.

References

1. Srivas, S. R., Patwardhan, S. G. and Siddappa, G. S., *Spices Bull. Annu. No.*, 1963, 79.
2. Viraktamath, C. S., Iyengar, N. V. R. and Sreenivasan, A., *Res. and Ind.*, 1964, 9 (2), 33.
3. Natarajan, C. P., Kuppaswamy, S., Krishnamurthy, M. N., Thomas D'Souza and Gopalan, K. K., *Indian Spices*, 1967, 1, 5.
4. Krishnamurthy, N., *Some Studies on the Curing Aspects and Utilization of Cardamom*, Thesis for Assoc. of the C.F.T.R.I., 1964.
5. Blair, J. S. and Ayres, T. B., *Ind. engng Chem.*, 1943, 35, 85.

POLSON LIMITED
need
FOOD TECHNOLOGIST

Here is a challenging position calling for astute commercial insight and the ability to co-ordinate the technical and commercial aspects of new products.

Job Requirement : To develop new and better food formulas, to co-ordinate with research organisations in India and abroad on studies made, and to provide Management with technical feasibility reports.

Qualifications : Ph.D. in Food Technology from a foreign university.

Experience : Minimum 5 years in Industry or a Research Institution, either in India or abroad.

Age Limit : Up to 35 years.

Salary : Commensurate with qualifications and experience, with benefits of Provident Fund, Gratuity, Bonus, Leave, etc.

Please apply within 15 days to :

POLSON LIMITED
P. O. Box 367, Bombay 1

Envelope to be superscribed :
"FOOD TECHNOLOGIST"

Effect of Heat on the Yield and Physico-Chemical Characteristics of Oil and Protein from Groundnut

Application of heat during the processing of groundnuts will alter the physico-chemical characteristics of oil and protein and thus affect the acceptability and nutritive value of these components. Some of these aspects were investigated under specified laboratory conditions.

Groundnut kernels (moisture content 5 per cent) were obtained from the local market and decuticled. Samples of whole kernels and kernels powdered in a Waring blender were spread in petri dishes and heated for 1, 3, 7 and 11 days in an air oven at 100°C. The influence of the physical state of association of lipid and protein when the quality of these components is altered by heat could thus be examined. In the whole kernel, most of the lipid exists in the 'free' form as fat globules whereas in the powdered samples the oil is mixed with other components.

Lipids were extracted from these samples (a) with petroleum ether (40-60°) for 16 hours in a Soxhlet apparatus and (b) with chloroform-methanol (2:1 v/v) mixture according to Folch *et al.*¹. The lipid extracts were analysed for yield of oil, peroxide value² iodine value², thiobarbituric acid value³ and colour. On the oil-free meal, nitrogen solubility (N-solubility), phosphorus and 'available lysine'⁴ were determined.

To determine N-solubility, one gram of the oil-free residue was suspended in about 30 ml. of distilled water and the pH adjusted to 9.5 by the addition of 1N NaOH. This suspension was made up to known volume with distilled water and shaken for 1 hr. The nitrogen in the supernatant was determined by the Kjeldahl method. Lipid phosphorus was determined according to the method of Bartlett⁵.

The results are presented in Table 1. Fresh groundnuts yielded about 3 per cent more lipids when extracted with chloroform-methanol than with petroleum ether. Separation of phospholipids in these samples by thin layer chromatography on silica gel G using a mixed solvent system of petroleum ether: diethyl ether: acetic acid (80:20:1 v/v) revealed that the chloroform-methanol extracted lipids had a higher content of phospholipids (0.84 per cent) than that in the petroleum ether extracts (0.27 per cent). The higher yield of lipids by chloroform-methanol might indicate the more efficient extraction of phospholipids and other 'bound' lipids. In the case of heated samples there was no difference in the quantity of oil extracted by the two methods. After 11 days of heating, the lipids extracted by either method from groundnut powder contained 16-18 per cent of material insoluble

TABLE 1. EFFECT OF HEAT ON THE YIELD AND PHYSICO-CHEMICAL CHARACTERISTICS OF OIL AND OIL-FREE RESIDUES FROM GROUNDNUT (Each value quoted below is the mean of duplicate values)

Sample	Oil								Oil-free residue	
	Petroleum ether Soxhlet method				Chloroform-methanol method				%N soluble in dilute NaOH at pH 9.5	Available lysine by Carpenter's method (g/16g N)
	% oil	PV*	IV	TBA† value	% oil	PV*	IV	TBA† value		
Control	50.45	1.9	92.2	...	53.7	2.3	93.2	...	90.5	2.83
Kernels-100°C 1 day	50.6	2.5	92.1	9.4	51.3	2.9	89.5	8.2	88.6	2.83
" 3 "	55.3	3.2	90.1	9.7	50.9	3.8	89.4	13.6	79.6	2.56
" 7 "	52.8	14.9	85.1	16.7	51.4	16.1	82.3	17.1	68.6	2.64
" 11 "	51.4	14.6	81.5	14.3	52.2	23.9	80.2	12.4	47.6	2.72
Powder-100°C 1 "	51.5	4.8	92.3	11.8	51.8	19.4	90.3	7.6	86.6	3.20
" 3 "	53.1	4.4	89.9	15.9	50.8	18.2	90.5	6.4	70.0	3.15
" 7 "	51.1	23.1	38.0	16.1	52.2	27.4	40.5	8.7	44.6	1.76
" 11 "	52.1	21.1	35.4	23.3	53.9	33.5	31.9	10.8	30.0	1.40
	(16.0)§				(18.0)§					

* PV: Peroxide value expressed as m.eq. peroxides/kg. of oil; † TBA: Thiobarbituric acid value expressed as mg. malonaldehyde/kg. of oil; §: Insoluble in cold petroleum ether; IV: Iodine value.

in cold petroleum ether. This probably represented the heat-polymerised oil fraction. Lipids from whole kernel samples were totally soluble in cold petroleum.

With increased application of heat there was a tendency for the peroxide value of the extracted lipid to increase and the iodine value to decrease. These changes were not strictly proportional to the duration of heating; the peroxide value showed a steep rise and the iodine value a steep fall when the heating period was increased from 3 to 7 days. In every instance, the peroxide value of the lipid extracted by chloroform-methanol was higher than that of the lipid extracted by petroleum ether. The lipids from the powdered groundnuts showed higher peroxide values than that from the whole kernels. Iodine values showed no difference.

The thiobarbituric acid values of the lipids extracted by either method showed a tendency to increase with increased heating period, but did not correlate with the peroxide values.

Visual examination revealed that the yellowish brown colour of lipid samples deepened with increased application of heat. Increase in the light brown colour was observed in the residue meals also.

The meals after petroleum ether extraction of the whole kernels and powders contained an average of 57.8 per cent and 54.6 per cent protein with little variation among samples in the same group. The slightly lower N-content of the oil-free residues from the powder samples may indicate loss of some protein N with the lipid fraction. Such losses of protein N by interaction with oxidizing lipids has been observed in model systems⁹.

N-solubility of oil-free residues in dilute alkali solution at pH 9.5 decreased as heating was prolonged. This decrease was larger with powder samples than with kernel samples. Throughout the heating period there was no loss of 'available lysine' in the kernel

samples, but this was very high in powder samples heated for 7 and 11 days.

The following conclusions could be drawn from this investigation:

(i) The quality of oil and protein in groundnuts subjected to processing is affected by (a) the physical state of association of protein, lipid and other components (b) the extent of contact with air and (c) the extent of application of heat.

(ii) The deterioration of oil, as judged by the parameters employed in this study, is not directly proportional to the extent of heat applied.

(iii) The loss of 'available lysine' occurs only in the case of groundnut powder heated for 7 and 11 days. This is not observed in the case of groundnut kernels.

(iv) Nitrogen solubility of the fat-free residue in dilute sodium hydroxide solution is a good index of the extent of heat applied, but does not indicate the loss in the 'available lysine' content.

We wish to thank Dr K. S. Srinivasan and his colleagues for carrying out the available lysine analysis.

Central Food Technological
Research Institute, Mysore.

T. N. R. Varma
A. Nirmal Kumar

14 Nov. 1967.

References

1. Folch, J., Lees, M. and Stanley, G. H. S., *J. biol. Chem.*, 1957, **226**, 497.
2. Association of Official Agricultural Chemists, *Official Methods of Analysis*, Washington, D.C., 1965, 10th Edn, 419.
3. de Koning, A. J. and Silk, M. H., *J. Am. Oil Chem. Soc.*, 1963, **40**, 165.
4. Carpenter, K. J., *Biochem. J.*, 1960, **77**, 604.
5. Bartlett, G. B., *J. biol. Chem.*, 1959, **234**, 466.
6. Roubal, W. T. and Tappel, A. L., *Arch. Biochem. Biophys.*, 1966, **113**, 5.

Changes in Ovomucin Concentration during Thinning of Thick White in Eggs

The problem of thinning of thick white of shell eggs during storage at room temperature has remained unsolved. The structure of thick white is due to its four-fold concentration of ovomucin as compared to thin white. Apart from this, no other difference in the characteristic proteins is present¹.

Evans *et al.*²⁻⁴ found lower values for certain amino acids in protein fractions from whites of stored shell eggs. Charkey *et al.*⁵ and Hill *et al.*⁶ found ovomucin isolated from fresh white was richer in tryptophan than the isolate from white of stored eggs. However, this difference in tryptophan between ovomucin from fresh egg white and that from egg white of stored shell eggs was due to the contamination of the isolated ovomucin with as much as 15 per cent lysozyme⁷. Lysozyme is very rich in tryptophan⁸, (approximately 10 per cent). Hawthorne⁹ advanced the theory that the mechanism of thinning of egg white involves the interaction of lysozyme with ovomucin. Further they have reported that there is no lysis or hydrolysis of ovomucin, when isolated ovomucin and lysozyme are interacted.

In view of the above, quantitative isolation of ovomucin from thick and thin white from shell eggs stored for different lengths of time at room temperature was undertaken. Ovomucin was precipitated by the conventional dilution method¹⁰ with some alterations. 200 ml. of the white was mixed with 800 ml. of distilled water using an electric stirrer at slow speed avoiding foaming, for the initial precipitation. The precipitate was collected by centrifugation after overnight storage in the refrigerator. For the subsequent washings, contact between precipitate and extractant was not 24 hours in the cold as advocated by Brooks and Hale¹⁰, but only for the duration necessary to thoroughly disperse the precipitate under the stirrer. Globulins were removed from the precipitate by washing with 5 per cent sodium chloride as suggested by Warner¹¹. After removing the adhering sodium chloride, the precipitate was dried with acetone washings at reduced pressure over concentrated sulphuric acid.

The ovomucin concentrations at different stages are given in Table 1.

There was no change in concentration of ovomucin in thin white upto the 7th day. There was a fall in concentration on further storage. In the case of concentration of ovomucin in thick white, there was no change up to the 7th day. But on further storage, there was an increase in concentration up to the 15th day. Further storage lead to a loss in concentration.

TABLE 1. CHANGES IN OVOMUCIN CONCENTRATION IN THICK AND THIN WHITE DURING STORAGE OF SHELL EGGS AT ROOM TEMPERATURE

Storage (days)	Thin white		Thick white	
	Water %	Ovomucin (mg.) %	Water %	Ovomucin (mg.) %
0	87.9	60.5	88.1	230.1
1	87.5	60.4 (60.1)	87.7	228.3 (227.3)
3	87.3	60.5 (60.6)	87.1	234.1 (231.4)
5	86.5	64.9 (63.9)	86.3	247.5 (242.4)
7	86.0	64.5 (63.1)	86.1	239.8 (234.4)
9	86.1	51.2 (50.2)	86.0	269.1 (262.7)
15	86.9	52.1 (51.5)	86.7	271.3 (267.0)
30	86.2	41.3 (40.5)	86.0	171.9 (167.8)

Figures in parenthesis are calculated to initial moisture content.

A similar loss in ovomucin during thinning of thick white has been reported by Moran¹² and Conrad and Scott¹³ whereas Balls and Hoover¹⁴ reported that the ovomucin lost from thick white was recoverable from thin white. Other details about the polysaccharide make up of ovomucin, changes in lysozyme, etc., will be reported in another publication elsewhere.

Central Food Technological
Research Institute, Mysore.
1 February, 1968.

B. R. Baliga
S. B. Kadkol and
N. L. Lahiry

References

1. Feeney, R. E., Ducay, E. D., Silva, R. B. and MacDonnell, L. R., *Poult. Sci.*, 1952, **31**, 639.
2. Evans, R. J., Davidson, J. A. and Butts, H. A., *Poult. Sci.*, 1949, **28**, 206.
3. Evans, R. J., Butts, H. A., Davidson, J. A. and Bandermer, S. L., *Poult. Sci.*, 1949, **28**, 691.
4. Evans, R. J., Davidson, J. A., Bandermer, S. L. and Butts, H. A., *Poult. Sci.*, 1949, **28**, 697.
5. Charkey, L. W., Dyer, E. and Wilgus, H. S., *Poult. Sci.*, 1947, **26**, 626.
6. Hill, E. G., Burton, G. R. and Charkey, L. W., *Poult. Sci.*, 1947, **28**, 862.
7. Gottschalk, A. and Lind, P. E., *Brit. J. exp. Path.*, 1949, **30**, 85.
8. Lewis, J. C., Snell, N. S., Hirschmann, D. J. and Farenkel-Contrat, H. L., *J. biol. Chem.*, 1950, **23**, 186.
9. Hawthorne, J. R., *Biochem. Biophys. Acta*, 1950, **28**, 6.
10. Brooks, J. and Hale, H. P., *Biochem. Biophys. Acta*, 1961, **46**, 289.
11. Warner, R. C. in *The Proteins*, Vol. II, Part A, Edited by H. Neurath and K. Bailey, Academic Press, Inc., New York, 1954.
12. Moran, T., *J. Soc. chem. Ind.*, 1937, **56**, 967.
13. Conrad, R. M. and Scott, H. M., *Proc. of 7th World's Poultry Congress*, 1939, 528.
14. Balls, A. K. and Hoover, S. R., *Ind. engng Chem.*, 1940, **32**, 594.

Some Observations on the Histology of Raw and Parboiled Rice

It has been observed earlier that brown rice prepared from parboiled paddy offers difficulties during polishing in that the bran sticks to the surface of the polished rice giving it a dirty appearance¹. It has also been indicated previously that steaming of raw rice bran improved the extractability of the oil from it². It was, therefore, of interest to find out whether the steaming/soaking treatments (involving some form of heat) to the paddy during the parboiling process affect in any way the oil bearing cells in the peripheral layers of rice. The present note reports some histological observations on raw and parboiled rice.

The husk was carefully separated by hand from raw and parboiled paddy and transverse sections of the dehusked grains were prepared using suitable sectioning methods described earlier³. Stains used were Sudan IV, Ferric-ferrocyanide reagent and Congo Red for fat, protein and cell walls respectively. Staining with Sudan IV for fat followed by counterstaining with Ferric-ferrocyanide reagent for protein provided a good differential staining.

As can be seen from Fig. 1, oil globules in transverse sections of raw rice were discrete round bodies dispersed mostly in the aleurone layers of the grain. In

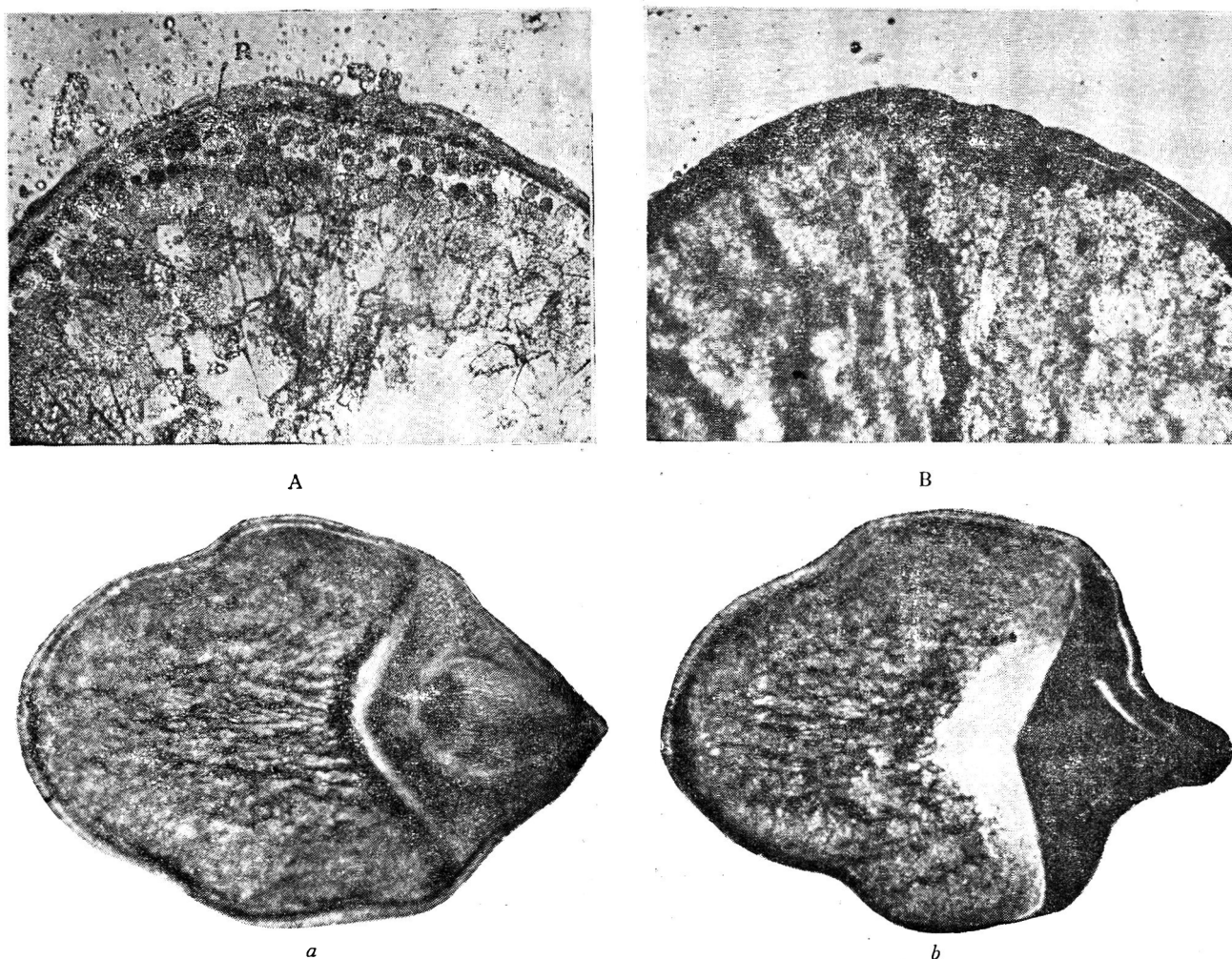


Fig. 1. Effect of parboiling on the appearance and disposition of oil cells in the aleurone and germ layers of the rice kernel

A, B: Endosperm of raw and parboiled rice (Note the distinct globule at R)

a, b: Transverse sections of germ of raw and parboiled rice.

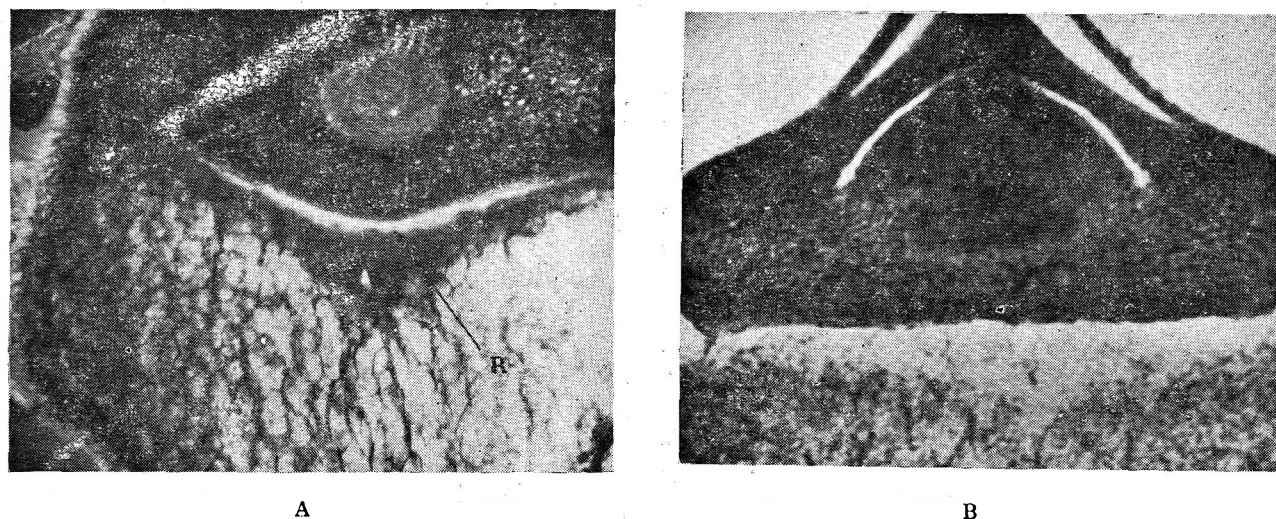


Fig. 2. Spongy layer demarcating scutellum from endosperm at R. A = Raw. B = Parboiled.

sections from parboiled rice the individuality or identity of the globular structure was destroyed. The oil bodies were ruptured and were seen only as a dark patch adjacent to the bran layers. A similar observation was made in sections of the germ where also the oil globules predominate. There was also an indication in many sections that the bran layers had separated from the aleurone layer along a cleft developed between them. When the paddy was soaked in water below 70°C during the parboiling process, the appearance of the oil globules was not affected. Steaming of soaked paddy involved in parboiling, or soaking of paddy in water above 80°C tended to bring about the rupture of the oil globules.

Another coincident observation made during the course of the sectioning relates to a change in the appearance of the thin walled loose spongy cells separating scutellum and the endosperm of the grain. While these cells were opaque and took no stain with Congo Red in raw rice sections, it was found that, after parboiling, these cells had been compressed (Fig. 2) by the expansion of the endosperm cells below them. Presumably these thin walled cells represent a demarcation of the germ with the rest of the grain. The germ is loosely attached to the endosperm in raw rice and can be easily removed by cutting or abrasion exposing the soft spongy and opaque layer. The chalky or opaque white tips in milled rice probably represent this layer. In parboiled rice, the germ is quite difficult to remove since it gets more firmly fused or merged with the

expanded endosperm cells. It was also found that the cell walls in raw rice sections were intact while they had got damaged in a considerable number of cells in parboiled rice.

Protein was predominant in the aleurone and sub-aleurone cells in both raw and parboiled kernels. Its concentration was higher in lateral and ventral parts than in dorsal, gradually decreasing towards the centre as was also found by Little and Dawson⁴. The sparse distribution of protein in dorsal peripheral cells when compared to lateral and ventral peripheral cells was found even after cooking. The migration of protein from the sub-aleurone cells and its ultimate deposition in the aleurone layer recorded by De and Rahman⁵ do not find support from the present histological observation. Most of the protein appears to remain *in situ* both during parboiling and cooking.

Central Food Technological
Research Institute, Mysore
17 January 1968

M. Mahadevappa
H. S. R. Desikachar

References

1. Raghavendra Rao, S. N., Narayana, M. N. and Desikachar, H. S. R., *J. Fd Sci. Technol.*, 1967, 4, 150.
2. Raghavendra Rao, S. N., Ananthachar, T. K. and Desikachar, H. S. R., *J. Fd Sci. Technol.*, 1965, 2, 115.
3. Mahadevappa, M. and Desikachar, H. S. R., *J. Fd Sci. Technol.*, 1968, 5, 57.
4. Little, R. R. and Dawson, E. H., *Fd Res.*, 1960, 25, 611.
5. De, H. N. and Rahman, M., *Sci. Res.*, 1965, 2, 160.

Progress Evaluation of Modernisation of Rice Milling

The East India Rice Mills Association, Calcutta, organized, in collaboration with the Central Food Technological Research Institute, Mysore, a seminar on *Progress Evaluation of Modernisation of Rice Mills* in Calcutta between 30 April and 2 May 1968. The seminar was represented by scientists, rice millers, rice milling machinery manufacturers and experts from State and Central Ministries of Food.

The deliberations of the seminar were distributed among 4 technical sessions, which dealt with milling, parboiling, drying, storage and by-product utilization aspects of rice. The results of scientific investigations by the Research Institutes relating to the above topics were presented by the concerned scientists. Problems faced by millers in the modernization of the existing mills, policies with regard to the introduction of new mills, etc., were also discussed. Mill machinery manufacturers assured the millers with regard to the supply of modern units of rice milling machinery.

At the end of its two day deliberations, the seminar passed a number of important resolutions which are summarised below:

1. Both Central and State Governments must accord due recognition to the rice milling industry and adopt suitable measures for its early modernization.

2. Huller type rice mills are highly wasteful. They should be replaced by sheller type milling units. Government may take measures to impose ban on the use of hullers.

3. Full utilization should be made of the large idle capacity of existing rice mills.

4. Necessary financial help should be given to the rice milling industry to undertake an effective programme of modernization.

5. The need for adoption of modern methods of parboiling in preference to traditional systems was stressed both by the scientists and the millers.

6. The importance of mechanical drying of paddy both in the field as well as in rice mills was stressed. The defects in the customary methods of sundrying must be avoided.

7. Scientific methods of storage and preservation including the latest pest and insect control methods should be adopted for reducing the incidence of heavy wastage in customary storage practices.

8. The difficulties in organizing the production of edible quality oil from rice bran must be overcome. Research in utilization of other important by-products viz., paddy husk should be undertaken.

9. Considering the potential requirements created in respect of indigenous manufacture of the modern type rice milling machinery, the import of such machinery from abroad should be banned.

10. The seminar recommended the creation of a rice board or rice development council to help research work on production, processing and marketing of paddy, rice and their by-products.

H. S. R. DESIKACHAR

The Second Annual Convention of the All India Association of Poultry Industry

The Annual Convention was held at Bombay from 8 to 11 March, 1968. Shri Anna Saheb Shinde, the Minister of State for Food and Agriculture, Government of India inaugurated the above Convention and participated in its deliberations. The convention was attended by delegates from different parts of India, representatives of different Educational and Research Institutes, officials from the Ministry of Food and Agriculture and Government of Maharashtra. Reports on the following topics were presented and discussed.

1. Feed ingredients.
2. Management and sanitation.
3. Diagnostic laboratory and poultry institute.
4. Taxes and finance.

5. Marketing of poultry and poultry products.

6. Publicity and promotion of production and consumption of eggs and chicken.

There was a technical session on 'Science in the Service of Poultry Industry' on 9th March, 1968, in which matters pertaining to nutrition, breeding, hatching, disease control and poultry products technology were discussed. Dr B. Panda, Scientist, Central Food Technological Research Institute, Mysore, and the Hon. Executive Secretary, Association of Food Technologists (India), presented a paper on 'Marketing of Egg and Poultry Products' in India. The convention was a great success and brought forth many matters of vital interest to the Indian poultry industry.

Book Reviews

The Chemistry and Physiology of Flavours—Symposium on Foods, Ed. by H. W. SCHULTZ, E. A. DAY AND L. M. LIBBEY, AVI Publishing Co., Inc., Westport, Connecticut, U.S.A., 1967, pp. 552, Price: \$ 3.50.

This is a publication of the proceedings of a Symposium of Foods in the Department of Food Science and Technology at Oregon State University. It is a comprehensive summary and source of reference material on the chemistry and physiology of flavours prepared by twenty-four outstanding scientists of the day. It includes suggestions for future research towards increasing our knowledge of flavour. The introduction by R. W. Moncrieff is a lucid exposition of the physiology of flavour perception. The complexity of the problem of flavour study and use of new tools in this field are well explained.

The book is divided into four sections. The section on physiological aspects of olfaction and gustation presents insight into the structure and functions of olfactory organs, problems in the physiology of olfaction and theories of olfaction—how the chemoreceptors in the nose differentiate odourvectors and odourvector mixtures. The 'stereochemical theory of olfaction'—that shapes and sizes of the molecules of odouriferous materials determine their odour sensations—is described and discussed.

The section on Advances in Analytical Methodology assesses the usefulness of modern techniques of GLC, IR, NMR and Mass Spectrometry in the study of flavours.

The section on Flavour of Foods is most useful for people actively engaged in flavour research. Most of the important foods such as bread, wine, meat, milk, cheese, fruits, etc., have been covered, giving details of recent developments in this field. The possible use of this knowledge in compounding aroma components for enhancing flavour of various foods is well brought out.

The last section on Origin of Flavour in Foods is very interesting and instructive, especially the chapter on nonenzymatic browning reactions.

The printing and get up of the book are excellent. It is a valuable addition to the few books that are available in this comparatively new field of flavour chemistry, and a must for all laboratories engaged in food research. The low price brings it within the reach of many.

Y. S. LEWIS

Leitaden Moderner Methoden der Lebensmittelanalytik (Optische Methoden) Manual of Modern Methods in Food Analysis (Optical Methods) HANS GERHARD MAIER, Dr Deitrich Steinkopff Verlag, Darmstadt, 1966, pp. vii+69, Price: DM 16.

This book is an addition to the existing books on analytical methods used in the food industry and restricts itself to the routine optical methods used in food analysis. As is rightly mentioned in the Foreword, this book is not meant to be a text-book on food analysis, but a manual which would bring to the food analysts, methods, apparatus and set-ups in the form of short practical exercises, which would help them getting familiar with the methods and working of the apparatus. All the optical methods are not described in this manual; for example, Raman spectroscopy and mass spectroscopy, nuclear magnetic resonance are not included, whereas visible, UV- and IR-spectrophotometry, fluorimetry, flame photometry, colorimetry and refraction are dealt with in detail.

The introductory section covers theories of light absorption, emission, refraction and rotation, along with the description and diagrammatic sketches of the equipment used in the measurement of the same. Each section is supplemented with practical exercises from the food analysis field, in order to acquaint the worker with the potentialities of the methods as well as the likely sources of error. One, however, misses the interpretation of results, which is so important to food analysts. Each section is followed by a list of standard books suggested for further reading. Being a book written by a food analyst, based on the experience gained by him in conducting classes in food chemistry at the University of Frankfurt, it has succeeded in achieving its aim of filling the need of reference manuals for food analysts and technicians.

The author, Dr Maier, needs to be complemented for this excellent manual.

S. P. MANJREKAR

The Technology of Wine Making: M. A. AMERINE, H. W. BERG AND W. V. CRUESS, AVI Publishing Co., Inc., West-Port, Connecticut, U.S.A., 1967, pp. 799, Price: \$ 28.

Wine making is an art. Amerine and Berg in 1960 published the book 'The Technology of Wine making' in an attempt to understand the scientific basis of this

art. Prof. Cruess has joined Amerine and Berg in presenting this Second Edition which has been completely revised. The text consists of twenty chapters, dealing on topics such as wines and wine regions of the world, composition of grapes, American wine types and their composition, the molds and yeasts of grapes and wine, chemistry of fermentation and composition of wines, winery design, equipment, operation and sanitation, red table wine production, production of white table wine, production of sherry, port and other dessert wines, sparkling wine production, wine making in Eastern United States, vermouth and flavoured wines, fruit wines, non-bacterial spoilage, bacterial spoilage, brandy production, winery by-products, evaluation of wines and brandies and legal restrictions on wine making.

Some of the chapters have been re-written, and revised. Mention must be made of the Chapter on 'winery design, equipment and operation' which has been enlarged and brought up-to-date.

Biochemical orientation of modern oenology has been ably reflected in this book. The book deserves a place in the library of those interested in wine technology, and serves as a valuable reference book. Get up of the book and the types used are quite pleasant.

Mistakes have crept in some pages. Reference for (p. 94) a curved knife is wrongly printed as Fig. 73. Similarly reference for showing relation between initial Balling (Brix) degrees of the grapes, Balling of the must etc. (p. 442) has been wrongly shown as Fig. 78. (Figure 78 shows a portable filter press). Reference of Marsh (p. 610) should be 1965 and not 1935.

Ignoring these minor defects, the book is very useful and the authors deserve compliments.

B. A. SATYANARAYANA RAO

Potato Processing: By W. F. TALBURT AND O. SMITH, AVI Publishing Co., Inc., Connecticut, U.S.A., 1967, pp. ix+588, 73 tables and 133 figures, Price: \$17.

The second revised and enlarged edition of 'Potato Processing' is a welcome addition to the series of books on food processing published by AVI. Besides revising the subject matter of the twenty chapters and providing references to the most significant articles published upto April 1966, an additional chapter dealing with 'waste disposal' has been included which summarizes information on potato processing effluents and their treatment.

Eminent experts in the field of potato technology have written various sections covering all phases of potato processing including detailed descriptions of processing procedures for all types of frozen, dehydrat-

ed canned and fried products, a complete discussion of raw material storage problems, methods for selection of potatoes for processing, a thorough treatment of storage diseases, an evaluation of most important potato varieties and detailed treatment of nutritive value of potatoes. Also included in the subject matter are details of pre-peeled potatoes and miscellaneous products like salad, soup, pancakes, chipbars, confections, nuts, puffs and some fermented products like alcohol and lactic acid.

Throughout the book, copious use is made of illustrative figures. The style is lucid and easy to understand. While original references given at the end of each chapter and subject index at the end of the volume are very useful, inclusion of author index would have enhanced the value of the book.

The volume is a most valuable reference book for those directly engaged in any type of potato processing. It is also useful as a text book for college courses covering the handling, storage and utilisation of potatoes.

B. S. BHATIA

Biology and the Manufacturing Industries: Ed. by M. BROOK, Institute of Biology Symposium Number 16, Academic Press, London and New York, 1967, pp. xii+165, Price: 45 sh. or \$ 8.

This book is a collection of the papers read and the discussions at a symposium held at the Royal Geographical Society, London on September 29-30, 1966. The objective of this symposium has been to underscore the diverse applications of biology in industrial processes and practices, with emphasis on productivity.

The papers have been presented in 4 sessions. The first one deals with four unrelated topics on biological food production. These relate, respectively, to microbial food production with special reference to utilisation of starch wastes for food yeast manufacture; the merits of continuous *vs.* batch fermentation processes in relation to growth-associated products such as yeast cells or alcohol; pest prevention and control on the factory floor, with raw materials, machinery and finished goods; and, varietal selection, breeding and management as factors influencing primary production of food crops and livestock.

The second session illustrates, in three reports, the contribution that the biologist can make to the manufacturing industries, *viz.*, control of marine fouling by micro-organisms in the operation of power stations with sea water as coolant; treatment and disposal of industrial waste waters; and elimination of troubles in a variety of industries by organisms that could use

a fantastically wide range of substrates for their growth. A paper in this section on sponsored research by industries in universities or other institutions and in industrial laboratories seems somewhat out of place.

In the third session dealing with biology and the consumer, the extent to which the biologist could contribute to consumer demands for sensory attributes and freedom from toxicity is discussed in three reports, including one on the general problem of mycotoxins.

Papers presented in the final session relate to the role that biologists can play in industrial research, in non-technical management and as industrial engineers. They reveal the importance of co-operation between universities and industries in training biologists and the scope for many different applications of biology in the manufacturing industries.

The various contributions, several of them very brief, have been objectively presented by experts, each in his field and the many discussions, by the 30 or so other participants, are proof of the interest that the symposium has evoked. The topics chosen for the meeting, though grouped for the four sessions, lack cohesion. Perhaps inevitable to some extent, this is certainly offset by the awareness that the symposium has generated to the importance of biological disciplines in primary and industrial productivity, alike.

A. SREENIVASAN

Symposium: Selenium in Biomedicine: Ed. by O. H. MUTH, The AVI Publishing Co., Inc. Connecticut, U.S.A., 1967, pp. 464, Price: \$ 4.

This compendium on selenium is based on the proceedings of the first International Symposium on the subject at Oregon State University, 1966. The role of trace elements in health and diseased states of plants and animals has been well recognised since long. However, the importance of such trace metals in human nutrition is still to be explored. Recent reports have thrown some light on the role of elements such as zinc and selenium in malnourished conditions in human population groups. It is in this background that this report on the interdisciplinary approach to the importance of selenium to plants, animals and human health, is a welcome feature.

The editing of the proceedings of the symposium has been admirably well done covering various facets of selenium biology. Most informative is the critical review of the methods available for selenium estimation at the microgram and submicrogram levels. Next is the exhaustive compilation on selenium dynamics—selenium in soils, plants and animals.

The interrelationship between selenium, vitamin E and sulfur amino acids is yet another area of interest

to the biochemist. One chapter which will stimulate the nutritionist is the summary of the exploratory studies on the possible role of selenium in human nutrition. Evidence is presented to indicate that infant malnutrition in underdeveloped countries may be complicated by dietary insufficiency of selenium. Limited evidence is given to show that selenium may have stimulatory effect on weight gain and reticulocytosis in malnourished states.

The symposium has also touched on the gaps in our knowledge of the biochemical function of selenium, i.e., its action at molecular level. The possibilities include that selenium may function as peroxide decomposers, stabilise or alter membrane properties or influence the activities of sulphhydryl enzymes. These only indicate the multifunctional role of selenium at the molecular level.

This compendium gives under one cover a wide spectrum of the many facets of selenium, its chemistry and biochemistry. It is a very useful reference for any worker on trace elements, whether related to plants, animals or human.

V. NAGARAJAN

Biochemistry of Some Food Borne Microbial Toxins: Ed. by RICHARD I. MATELES AND GERALD N. WOGAN MIT Press, Massachusetts Institute of Technology, Cambridge, Massachusetts and London, England, 1966, pp. ix+171, Price: \$ 7.50.

The book under review is a collection of papers presented at the symposium on Microbial Toxins held at the meeting of the American Chemical Society, New York on 12th September 1966. The papers, presented by leading scientists in the field are compiled in two parts. The first part includes bacterial and algal toxins. Under bacterial toxins, production, isolation, purification, estimation, chemistry, physical biochemical and toxicological properties of enterotoxins, botulinum toxin and Bongkrek toxin of *Pseudomonas* have been covered. Of particular interest is the paper on algal toxin which brings out an important point that many algae being potential animal and human foods could be a serious health problem if toxin producing algae are not recognised and avoided.

Part II contains papers on fungal toxins, which includes sporidesmins, furanocomarins, oestrogenic metabolites of *Fusarium graminearum*, fluorescent compounds other than aflatoxins produced by Japanese industrial molds and recent advances on ochratoxins. In each of these cases, a comprehensive historical review, followed by the chemistry, methods in isolation, purification and estimations, and biological effects of the corresponding toxic compounds is presented.

With the discovery of aflatoxins, microbial toxins are receiving the utmost attention all the World over and are posing a serious threat to human as well as animal health. To spot out the presence of such compounds in food stuffs and eliminate them, a thorough knowledge on the subject is necessary. From this point of view this book is a very valuable addition to the library and it serves as a useful guide to the research worker engaged in the studies on microbial toxins.

V. SREENIVASAMURTHY

Journal of Food Technology: Editor: E. C. BATE-SMITH. Published by Blackwell Scientific Publications, A quarterly; Annual subscription: £5 (\$ 17.50).

The long-felt need for a research journal in U.K. devoted to the publication of original research findings in the field of food science and technology is fulfilled by the publication of the *Journal of Food Technology*, by Blackwell Scientific Publications for the Institute of Food Science and Technology (U.K.). The journal was started in 1966 under the editorship of W. B. Adam. The Journal at its very outset has stated that the 'object is to provide free forum for papers describing the results of original research and review articles'. Most of the research papers appearing in the journal are from U.K. and it is heartening to note that these research papers are of good standard as expected of a country which has a long history in food research. The publication of review articles is another feature of the journal and this will bring home to the food technolo-

gists the latest developments made in specific field of food science. The proceedings of the Institute of Food Science and Technology (U.K.) is published regularly and this will be of value not only to research workers but also to industry and trade, as these three interests are represented in the symposium. The Journal has recently brought out a special number on Meat Science and Technology. The printing and get up of the journal is good.

K. A. RANGANATH

Books Received

Cookie and Craker Technology, S. A. Matz, AVI Publishing Co.

Modern Cereal Chemistry, D. W. Kent Jones and A. J. Amos, Food Trade Press.

Food Flavours, J. Merory, AVI Publishing Co.

Milk Pasteurisation, C. W. Hall and G. M. Trout, AVI Publishing Co.

Annual Report of Regional Research Laboratory, Hyderabad 1966-67.

Industrial Processing of Citrus Fruit, Z. Berk, U.N. Industrial Development Organisation.

Tree Nuts, Production, Processing and Product, Vol. 2, J. G. Woodroof, AVI Publishing Co.

Correction

The price of *Meat Hand Book* by A. Levie is \$ 11, and not \$ 10 as published in *J. Fd Sci. Technol.*, 1967, 4, 180.

Notes and News

Food Preservation through Solvent Drying

This method of preserving convenience foods developed by Byron B. Bohren gives products similar to freeze dried material but is cheaper and faster than freeze drying. Meat, vegetable and other food stuffs which suffer spoilage can be preserved with all its flavour, aroma and nutritional value unaffected by this method of azeotropic dehydration at room temperature. The material is slurried in ethyl acetate (which is permitted for application in foods by FDA) when the moisture in the material forms a mixture with the solvent. This mixture when subjected to moderate vacuum results in the taking off of the azeotrope at ambient temperature leaving dehydrated food.

The product which resembles freeze dried material looks more appealing than frozen foods. Also there is no water flashing or cellular destruction. Other advantages over freeze drying includes faster drying cycle and lower heat requirements. This is because the penetration of solvent accelerates water diffusion rate and ethyl acetate has one-fifth the volumetric latent heat of vaporization of water. Also no refrigeration is required for transporting the dehydrated material. Among the materials processed are meat, whole strawberries, slices of banana and potato. In a trial coarsely ground hamburger was soaked in ethyl acetate and azeotropic distillation was carried out at 75°F and 0.132 atmosphere. After separation of the azeotrope the hamburger was heated in a vacuum oven to 100°F at 0.000132 atm. to drive off solvent without thermal degradation of the product flavour, aroma and nutritional value (*Chem. Engng*, 1968, 75, No. 4, p. 60).

Food Research in the United Kingdom

Food is easily the largest single item of expenditure in the average British household. The latest statistics show that in 1964 the total food bill was £5,557,000,000, of which more than half was for food processed in some way and the rest for food distributed 'fresh', i.e., unprocessed. Consumer expenditure on food was expected in the first version of the National Plan to increase by £50,000,000 (at 1964 prices) by 1970. Although about a quarter of all domestic expenditure still goes on food, this proportion is steadily declining with increasing affluence. In 1964

£551,000,000 (over 10 per cent) was spent on meals away from home.

The food processing industry employed 621,000 people in 1964 out of which 1720 were scientists and technologists. The total value of the goods produced were of the order of £2,477 million. About 1/3 of the turnover of all food sales was accounted for by a score or so of the largest companies.

The import of food material from abroad was of the order of 27 per cent of the total imports but half of this was unprocessed. The export of manufactured foods was of the order of £100 million in 1964, half of which was sugar and confectionery. In 1964-65 the total amount spent by the industry on food research was of the order of 10 million of which 6.9 was running cost and the remainder capital expenditure. Though considerable extension in industrial research since 1945 has been reported the increase is more in expanding the existing laboratories rather than new industries adopting research. One of the outstanding examples of industrial research is provided by the Unilever organisation which had a research staff of 700 in 1963. Most of the food manufacturing firms had no research cell at all except quality control. They depend upon co-operative research associations and 'Sponsored Research Organisations'. At present there are 17 Food Research Associations and Institutes and 4 Universities with Food Science Departments. The 3 main interests, namely Government, industry and universities are closely interwoven.

The research associations derive their income primarily from U.K. Food Manufacturers' Voluntary Subscriptions on a scale graded according to size of concern to which Ministry of Technology adds normally about 50 per cent although they are now granting 150 per cent in the case of Biological Research Associations. Government Research Institutes are financed almost entirely by the tax-payer, except the new Meat Research Institute which is getting half its funds from a levy on the producers and users of meat and half from the treasury. Research Associations are autonomous, non-profit making companies, governed by elected councils of members with some Government nominees. They also have numerous technical committees to help evolve research programme that are in the interests of the industries supporting them. Members are kept informed of the results not only of

the current research of their Research Association but also of work published elsewhere through regular issue of abstracts. They are also kept abreast of changes in U.K. and foreign food legislation. Government Research Institutes which are more concerned with basic research in food science, endeavour by various means to ascertain the food industries longterm scientific needs and feed the results back to industry through committees and panels.

At present, government research institutes are properly being enabled to expand and universities have been encouraged to set up schools of food science but as the equipment and facilities required for research today are becoming increasingly sophisticated, the Research Associations depending for their existence on voluntary subscriptions are facing special difficulties.

The Food Industry is not science-based in the same sense as the electronics or chemical industries. Food processing and distribution could continue effectively without anything more in the way of research than glorified trouble-shooting. The evolution is speeding up as a result of two circumstances. Firstly, the shortage of skilled scientists puts a premium on the development of more efficient mechanized, controlled methods of manufacture. Secondly, an 'affluent society' demands labour saving meals. All this new product development raises new background problems in food chemistry and microbiology if safe, attractive foods to be consistently marketed.

The crucial issues are to provide the necessary finance, bearing in mind that not everything desired can be done, so that rigorous selection of priorities must be exercised; and, complementary with this, to maintain sufficiently close contact with practical operators in the industry so that the research scientists may be aware of their problems, perhaps even before they are themselves, and at the time ensuring that promising new discoveries and developments are given prompt trials with a view to full scale application if successful.

(C. L. Cutting, *Progress No. 1, 1967*)

* * * *

The above paper is of very great interest from the point of view of the development of Food Research in our country. It is high time that the food industries of the country also organise themselves and invest on co-operative research so that the results could be shared by all. Such endeavours could be encouraged by the Government by providing matching grants.

Fortification of Foods

The Symposium organised by the American Chemical Society of Chicago (Division of Agriculture and

Food Chemistry) is of particular interest in India where, in recent times, enrichment of foods is getting to be a standard practice in various forms.

Fortification of food can be grouped under various heads: (a) restoration of nutrients depleted during processing to their original levels (b) fortification with extra quantities of nutrients (like in infant foods and patent foods) (c) enrichment for reasons of public health (e.g., enrichment of bread) (d) enrichment of interchangeable foods like margarine (which is fortified with 15,000 IU of vitamins A to bring it upto the level of butter) (e) fortification to make the food self-sufficient (fortification of sugar) (f) and fortification for non-nutritional purposes (such as the enrichment of vitamin C as a reducing agent, and vitamin E as an antioxidant).

The introductory paper of Robert S. Harris (MIT, Cambridge, Mass) has primarily dealt with the philosophy behind enrichment and attention is particularly drawn to the fact that much of the nutrients originally present in the food materials are lost during processing and storage; but, with the advent of synthetic vitamins and amino acids the task of overcoming these defects has become comparatively easy.

The dietary patterns in America and the importance of enriching bread for improving the nutritional level has been discussed in a paper by Corinne le Bovit (USDA, Washington, DC). It has been shown that bread in U.S.A. is enriched with thiamine, riboflavin, iron, calcium and vitamin D and at a low cost (1 cent for 67 loaves).

Enrichment of flour with vitamins of B group has been discussed by Clinton L. Broke (National Centre, for Chronic Disease Control, U.S.A.). The fortifying mixture is generally distributed in the flour by a metering devise. The cost of enrichment has become greatly reduced in 1967, as compared to the cost in 1941. This can be illustrated by the fact that the respective costs of enrichment in 1967 were 2 cents/100 lb. for flour and 1 cent/57 lb. of bread, as compared to the costs in 1941, i.e., 17 cents/100 lb. of flour and 1 cent for 10 lb. of bread. Enrichment of corn flour and grits is also done in some States of U.S.A. Likewise, macaroni products are enriched with B₁, B₂, niacin and iron. According to the standards of identity prescribed, the bags containing enriched rice should bear labels stating that the rice should not be rinsed before cooking or drained after cooking.

About 24 per cent of proteins consumed by the American is derived from dairy products. Enrichment of milk with vitamin D (9400/IU quart of milk) has become an established practice, and the decline in the incidence of ricketts has largely been due to this mea-

sure. The skim milk used for beverages is also enriched with vitamins A and D. Enrichment of dairy products and margarine has been discussed by S. T. Cutler and E. L. Thomas (University of Minnesota).

Enrichment with vitamins and minerals has become a standard practice, but use of amino acids and protein concentrate is still a novelty. Protein concentrates from soya, and other oilseeds, skim milk and fish meal can be used with flours to improve their nutritive value. The significance of these applications to developing countries has been dealt by G. K. Parman (AID, Washington).

Fortification of sugar with thiamine and nicotinic acid to facilitate easy sugar metabolism in humans, has been stressed by Juan M. Navia (MIT, Cambridge, Mass). This measure has become particularly necessary since the *per capita* consumption of sugar has increased steeply in recent years.

Fruit juices and drinks are fortified with vitamin C. β -carotene (1,666,000 IU/g) and β -apo-8'-carotenal (1,200,000 IU/g) have also been used as sources of vitamin A for fortifying fruit products. They also provide colour to the products. R. H. Bunnell (Hoffmann La Roche, Nutley, N. J.) has discussed the fortification of fruit products and its limitations.

In 1966, 65 per cent of infants discharged from hospitals in U.S.A. were fed infant foods. It is therefore, necessary to fortify these foods with vitamins C, B₆ and D and minerals like calcium and iron. L. J. Filer, Jr. (University of Iowa) has described this aspect along with fortification of special foods for allergic and other clinical conditions.

[*J. agric. Fd Chem.*, 1968, 16 (F)]

Unusual Methods for Heat Economy in Distillation and Evaporation Practice

Generally in distillation practice the heat adsorbed by the cooling medium in the condenser is not utilised but allowed to go waste. If the technique of differential pressure distillation is employed considerable saving can be effected in the heat input to the system under consideration. Consider an evaporator—condenser system wherein the condenser is operated at higher pressure with evaporator working at lower pressure. Then the heat given up during condensation can be made available for heating the feed to the evaporator. This utilization of the normally wasted heat will save some heat-input to the evaporator. Another way of improving heat economy is to use a fluid with lower specific volume than steam for heating.

This is well illustrated by the following example. Consider a system where evaporation is carried out at atmospheric pressure and the condensation at 20 psig.

i.e., 35 psig (approx.) (B.P. of water 259.3°F). One pound of steam at atmospheric pressure occupies 26 cubic feet. In order to compress the same to 20 psig the work done would be

$$26 \times 20 \times 144 = 74,880 \text{ ft. lb.}$$

$$\text{i.e. } \frac{74,880}{778} = 96.25 \text{ B. Th. U.}$$

If the efficiency of the process is 25 per cent, the actual thermal energy input

$$= \frac{96.25}{0.25} = 385 \text{ B. Th. U.}$$

The heat given up by one pound of steam at atmospheric pressure by condensation

$$= 965.8 \text{ B. Th. U.}$$

Therefore the saving in heat:

$$= \frac{965.8 - 385}{965.8} \times 100 = 60 \text{ per cent}$$

(CPE 47 (12), 62, 1966, *The Chem. Engr*, 203, NN 66, 298).

Freeze Drying at Lower Cost

Drs Judson King and Peter Clark of University of California have developed a technique of freeze drying wherein heat transfer is mostly by convection. This convective mode of heat transfer has been found to be better than conduction or radiation for freeze drying of food or drugs. The medium employed is a light gas which is circulated between a water adsorbent material and the food material to be dried. The gas carries heat from the adsorbent material to the food and water from the food under process to the adsorbent material. Thus convective heat transfer effects the drying of material. This results in speedy heat transfer. In this technique, the absolute pressure in the drying chamber can be about hundred times higher than those employed in conventional freeze dryers. This reduces the expenses on evacuating the chamber. The unit can be operated either continuously or batchwise. Thus food or biological material in sizes of about one inch or less can be freeze dried at lower cost but with better quality. (*Chem. Engng*, 1968, 75 (8), 60).

IFTTC Valedictory Function

Twenty-three students from South and Southeast Asia have completed the M.Sc. (Food Technology) Course conducted during 1966-68 by the International Food Technology Training Centre (IFTTC) at the Central Food Technological Research Institute

(CFTRI), Mysore. They were presented with certificates of completion by Dr K. L. Shrimali, Vice-Chancellor, Mysore University at a valedictory function held on June 28, 1968, at CFTRI. Dr H. A. B. Parpia, Director, CFTRI and incharge of the International Training Centre welcomed Dr Shrimali and delivered the introductory lecture outlining the training provided at the Centre. The Chief Guest, Dr Shrimali, then delivered the valedictory address. Mr J. Van der Linden, FAO Associate Expert at the IFTTC, proposed a vote of thanks.

Among those who have completed the course, 12 are from India, 4 are from South Korea, 2 each from Ceylon, Nepal and Thailand and one from Philippines. They are:

<i>Ceylon:</i>	Ramanathan, Ponniah Weerasinghe, Leelananda.
<i>India:</i>	Desai, G. N. (Gujarat) Eipeson, W. E. (Kerala) Godavari Bai, S. (Mysore) Jadhav, P. B. (Maharashtra) Jaisani, J. C. (Rajasthan) Jerath, N. K. (Delhi) Mehrotra, V. K. (Uttar Pradesh) Patni, M. K. (Madhya Pradesh) Prabhakar Prabhu, Ch. (Mysore) Sushil Kumar (Punjabi Suba) Venkataraman, P. S. (Madras) Venkata Subbaiah, G. (Andhra Pradesh)
<i>Korea (South)</i>	Kang, Choo Whoi Kim, Kil Hwan Lee, Bock Hyun Lee, Hong Won
<i>Nepal:</i>	Pradhan, Ananda Prakash Singh Pradhan, Omkar Man Singh
<i>Philippines:</i>	Sillona, Mrs Feliciana Cruz
<i>Thailand:</i>	Greechar, Pejaraprasithdi Suchon, Nimmannitaya

CFTRI Releases Six Processes for Commercial Utilization

Six processes developed by the Central Food Technological Research Institute, Mysore have been released recently to small scale manufacturers for commercial production.

Process for making instant mixes of idli, dosai, vadai, gulab jamun and jilebi has been given to a firm in Tadepalligudem, Andhra Pradesh. The ready-mixes are being produced on a commercial

scale by three firms, one each in Poona, Bangalore and Mysore according to the formula developed by CFTRI; their annual turn-over is around Rs 1,800,000.

Two firms, one in Visakhapatnam and the other in Kozhikode have taken up the process for making fruit bars using various types of pulpy fruits such as mango, guava, papaya and banana. A Madras firm also was supplied with the process some time ago. The process for making mango cereal flakes which can be used as break-fast food has been given to a firm in Kozhikode and one in Madras. The process for making garlic powder for use in food preparations has been taken up by two firms, one in Virudhunagar and the other in Visakhapatnam. A firm in Secunderabad has been given the process for manufacture of egg washing powder and egg coating oil. The egg washing powder is useful for cleaning dirty eggs to prevent microbial spoilage and for better presentation in the market. The egg coating oil helps preservation of eggs for a longer time.

K. N. Oil Industries

The K. N. Oil Industries, Mahasamund, Dist. Raipur, M. P., inaugurated the solvent extraction plant on 11 April 1968. The plant manufactured by DeSmet has an installed capacity of 30 tons per day and is intended mainly for extraction of rice bran using foodgrade hexane. It could also be used for extraction of mahua, cottonseed, groundnut, etc.

Twelfth Indian Standards Convention

The Indian Standards Institution has accepted the invitation of the Orissa Small-Scale Industries Association to hold its Twelfth Indian Standards Convention at Bhubaneswar. The Convention will be held from 15 to 21 December 1968.

The Institution holds Indian Standards Conventions every year at important industrial centres in the country, with the object of providing a forum to scientists, technologists, industrialists and others for discussing problems of mutual interest and for sharing their knowledge and experience in selected fields of industrialization, in the context of industrial and economic development of the country.

Those wishing to participate in the forthcoming Standards Convention are invited to write for particulars to Shri Kavaljit Singh, Organizing Secretary, Twelfth Indian Standards Convention, Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1.

International Food Information Service

The Commonwealth Agricultural Bureaux, the Institute for Documentation (Federal German Republic) and the Institute of Food Technologists (U.S.A.) have agreed jointly to sponsor and finance an international food information service. This will take the form of a comprehensive journal of informative abstracts covering the world literature of food science and technology, organized for the storage and retrieval of information by computer techniques. The service will be operated by a Management Committee comprising representatives of the three sponsoring organizations.

The journal, *Food Science and Technology Abstracts*, will appear monthly in English and will publish about 12,000 abstracts annually, including abstracts of the world's food patent literature. It will be produced at the Commonwealth Bureau of Dairy Science and Technology, Shinfield, Reading, Berkshire, England, and printed and distributed by the Institute for Documentation in Germany which, in collaboration with the

Institute of Food Technologists and the Commonwealth Agricultural Bureaux, will also be responsible for preparing computer-generated indexes and storing the information in the journal on magnetic tape for machine retrieval.

The first issue of the journal is expected to appear in January 1969. Further information can be obtained from Mr E. J. Mann, Director of the Commonwealth Bureau of Dairy Science and Technology.

'Proteins: Foods, Technology and Nutrition'

The Society of Biological Chemists, India proposes to organize a symposium on 'Proteins: Foods, Nutrition and Technology' at Madras, from Sept. 5-7, 1968 to honour Dr R. Rajagopalan, one of our senior members of the Society for more than 20 years. Invited as well as free papers will be presented at the meeting. Presentation of *free papers* is restricted to the members of the Society. Abstracts of papers should be sent to the Secretary, Society of Biological Chemists, India, Bangalore 12.

INDIAN STANDARD INSTITUTION

The following standards have been published:

Mustard and rape seed for propagation purposes	IS:4194-1967	Rs 2.00
Code for Sanitary Conditions, Handling and Transport in Fish Industry	IS:4303 (Part II)-1967	Rs 2.50
<i>Kusum</i> oil	IS:4088-1966	Rs 2.00
Solvent-Extracted Soybean oil, Refined	IS:4276-1967	Rs 2.50
Sampling of Oilseeds	IS:4115-1967	Rs 4.00
Solvent-Extracted Sunflower Oil, Refined	IS:4277-1967	Rs 2.50
Tuna Canned in Oil	IS:4304-1967	Rs 3.50
Pork Luncheon Meat, Canned	IS:4352-1967	Rs 4.00
Analysis for Foodgrains Part I Refractions	IS:4333-1967	Rs 3.50
Specification for Gin	IS:4110-1967	Rs 2.00
Specification for Whiskies	IS:4449-1967	Rs 2.00
Glossary of Terms Relating to Starch	IS:4287-1967	Rs 4.00
Endosulfan Water Dispersible—Powder Concentrates	IS:4324 (Part I)-1967	Rs 5.50
Methyl Bromide—Revision	IS:1312-1967	Rs 5.50
Thiram, Technical	IS:4320-1967	Rs 5.50
2, 4-D, Technical	IS:4321-1967	Rs 5.00
Analysis for Foodgrains Part III Determination of Hectolitre Weight	IS:4333 (Part III)-1967	Rs 2.50
Tinned Mild Steel Milk Cans Revised	IS:1373-1967	Rs 5.00
Code for Sanitary Conditions, Handling and Transport in Fish Industry Part I Pre-Processing State	IS:4303 (Part I)-1967	Rs 2.50
Dry-Salted Mackerel	IS:4302-1967	Rs 2.50
Fish Meal as Livestock Feed	IS:4307-1967	Rs 5.00
Aluminium Farm Milk Cooling Tanks	IS:4192-1967	Rs 5.50

The following standards have been accepted for wide circulation:

Potassium Metabisulphite, Food Grade	DOC:AFDC 19 (690)
Sodium Metabisulphite, Food Grade	DOC:AFDC 19 (691)
Salt Petre, Food Grade	DOC:AFDC 19 (692)
Lecithin, Food Grade	DOC:AFDC 19 (693)
Sorbic Acid, Food Grade	DOC:AFDC 19 (694)
Sorbitol, Food Grade	DOC:AFDC 19 (689)
Pyrethrum Emulsifiable Concentrates	DOC:AFDC 6 (675)
Warfarin, Technical	DOC:AFDC 6 (678)
Thiram Water Dispersible Powder	DOC:AFDC 6 (679)
Commafuryl, Technical	DOC:AFDC 6 (683)
Thiram Seed Dressing Formulation	DOC:AFDC 6 (680)
Gamma BHC (Lindane) Smoke Generators	(First revision of IS: 1505-1959) DOC:AFDC 6 (701)
Method for Determination of Sedimentation Value	DOC:AFDC 26 (654)
Method for Determination of Weight of 1000 grains	DOC:AFDC 26 (653)
Specification for Sample Divider for Foodgrains	DOC:AFDC 26 (532)
Flavoured Milk	DOC:AFDC 34 (685)
Infant Milk Foods	DOC:AFDC 43 (565)

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

XVIII INTERNATIONAL DAIRY CONGRESS

The Congress will be held in Sydney from 12-16 October 1970. The Technical Sessions will be under 4 headings.

1. The General Symposium consisting of lectures of selected speakers.
2. Technical, Scientific and Economic Sessions classified in 3 broad categories:
 - A—Dairy Processing;
 - B—Dairy Husbandry and Milk Production;
 - C—Economics and Marketing.

Lecturers in each of the subjects listed will deal with highlights and points of advance since the previous Congress.

3. Syndicate language group discussions mainly on economics and marketing.

4. National Dairy Industries—presenting unique features and problems of the industry in dairy countries and in some developing dairy industries.

An Exhibition will also be organised as part of the Symposium.

Enquiries regarding arrangements may be addressed to The Secretary-General, XVIII International Dairy Congress, 47 Macquarie Street, Sydney, N.S.W. 2000, Australia.

The National Liaison Officer for India is Dr Noshir N. Dastur, Joint Commissioner (Dairy Development), Ministry of Food and Agriculture, Krishi Bhavan, New Delhi 1.

Association News

Shri Mirle S. Subba Rao, Scientist, Central Food Technological Research Institute, Mysore who spent 14 months in France on a French Government Fellowship (Astef) returned in February 1968. During his stay abroad he worked in five different laboratories and specialized in the techniques of wine and beer manufacture. The problems studied include isolation of yeast mutants, malo lactic fermentation and quality control of wine and beer.

Shri S. R. Shurpalekar, Scientist, Central Food Technological Research Institute, Mysore who was on deputation to West Germany on German Academic Exchange Service Scholarship returned in February 1968. During the 18 months stay abroad, he worked with Dr P. F. Pelshenke of the Federal Research Institute for Cereal Industry in Detmold on problems relating to the milling quality of wheat and jowar, air-classification of Bengal gram flour and incorporation of tuber and legume flours with wheat flour for making bread and biscuits.

B. Panda, Honorary Executive Secretary, Association of Food Technologists has been elected as the 'Man of Year' by the Poultry Association of India. An editorial in the Poultry Guide (1968, 5, 5.) states that among his achievements could be counted processing and solvent extraction of silk worm pupae, manufacture of albumen flakes and utilization of yolk in biscuit manufacturing, egg coating oil and egg washing powder. Some of the processes have already been handed over by the CFTRI to commercial firms for exploitation.

List of New Members

1. Mr Ratan G. Advani, c/o Chubby Chicks Pvt. Ltd., Vadgoan-Maval, Poona District.
2. Mr Ashar Jayant Chandrasen, 2F, Prem Nagar, Green Street, Santacruz (West), Bombay 54. AS
3. Mr Chitale Madhukar, 26/1, Mahavir Building, Bhandarkar Road, Matunga, Bombay 19.
4. Miss Herminia Z. Manoto, FAO, IFTTC, C.F.T.R.I., Mysore 2.
5. Mr Birendra Nath Srimani, Reader, Dept. of Food Technology and Biochemistry, Jadavpur University, Calcutta 32.
6. Mr Parimal Chattopadhyay, 51 M.N. Bose Lane, Masterpara, P.O. Konnagar, Dt. Hooghly, West Bengal.
7. Dr K. Vas, Central Food Research Institute Budapest, II Herman, Out 15, Hungary.
8. Miss K. C. Meera, C.F.T.R.I., Mysore.
9. Miss R. Leela, C.F.T.R.I., Mysore.

10. Mr K. Visweswariah, C.F.T.R.I., Mysore 2.
11. Mr Desai Girishchandra N., FAO, IFTTC, C.F.T.R.I., Mysore 2.
12. Mr William L. De Haas, FAO Regional Office, 1, Ring Road, Kilokri, New Delhi 14.
13. Mr Dharmapal Dilwari, c/o M/s T. R. Paul and Co., Batti Hattan, Amritsar, Punjab.
14. Mr Pradeep B. Jadav, FAO, IFTTC, C.F.T.R.I., Mysore 2.

Life Member

Mr A. Vijayan, M/s Chemical Engineering Corporation Private Limited, P.O. Box 15, Tirupathi, Madras State.

Change of Address

1. Mrs F. C. Sillona, Republic Flour Mills, Inc. Pioneer Street, Pasig, Rizal, Philippines.
2. Mr R. C. Bhutiani, Officer-in-charge, C.F.T.R.I. Experiment, Station, Ludiana 5.
3. Mr S. M. Jambagi, Fruitnik-Delican (Pvt.) Ltd., Industrial Estate, Krishnagiri (Madras State).
4. Dr P. R. Krishnaswamy, Protein Foods Association, Mahalakshmi Chambers, 22, Bulabhai Desai Road, Bombay 26.
5. Mr V. K. Mehrotra, 542, Patel Nagar, Meerapur, Allahabad.
6. Mr A. P. Pradhan, c/o Shri Tirupar B. Pradhan, 227, Khichapokhari, Kathmandu 6, Nepal.
7. Mr S. S. Netravalkar, 1st Floor Sarswati Sadan, 31, Parekh Street, Bombay 4.
8. Mr S. Mahadevaiah, c/o K. Savanandaiah, Kannalal Visawaneedam P.O., Bangalore 23.
9. Mr S. K. Navani, Dept. of Food Science, University of Strathclyde, 1, Horslethill Road, Glasgow W 2. (U.K.).
10. Mr K. N. Khanna, Managing Partner, M/s Khanna Energy Food Products, Subash Market, Bareilly, U.P.

Association of Food Technologists Eastern Branch

The following office bearers were elected for the year 1968 :

Sri R. K. Dutt	<i>President</i>
Dr A. K. Mitra	<i>Vice-President</i>
Sri Sunit Mukerjee	<i>Hon. Secretary</i>
Dr S. Majumdar	<i>Treasurer</i>
Dr R. Dutta (Eyre Smelting Pvt.)	
Mr G. S Littlejohn (Metal Box)	
Sri P. S. Narayana (Rickitt & Coleman)	
Sri Mathur (Kusum Products)	
Sri B. C. Pande (Hindustan Levers)	
Sri K. C. Dey	

Food Science and Technology Abstracts

1. General

- 1.5 *Use of computers in food research*, J. A. PREST, *Fd Technol. Champaign*, 1967, **21** (11), 1488.
Review.
- 1.6 *Research to prevent food losses and increase output*, *Br. Fd J.*, 1968, **70** (82), 7.
A brief report of research work being conducted in Britain.
- 1.7 *Romania's food industry*, *Br. Fd J.*, 1967, **69** (820), 195.
- 1.8 *Irradiated food facts*, *Br. Fd J.*, 1967, **69** (820), 178.
General.
- 1.9 *Radioactivity in food*, *Br. Fd J.*, 1968, **70** (822), 12.
General.

2. Cereals

- 2.27 *Studies on methods for amino acid analysis of wheat products*, G. O. KOHLER AND RHODA PALTER, *Cereal Chem.*, 1967, **44** (5), 572.
Hydrolysis conditions for amino acid analysis of wheat and bran.
- 2.28 *Factors influencing falling number values*, HAROLD PERTEN, *Cereal Sci. Today*, 1967, **12** (12), 516.
Falling number method has been widely accepted for determining the sprouting damage in rye and wheat used for baking. The method is fairly reproducible but, small samples of 50 g. or less are not sufficient for determining amylase activity. Good results can be obtained only if 200—300 g. of samples are used. Care in grinding and uniform stirring of samples can improve results.

J. v. s.

- 2.29 *Evaluation of the Brabender quadrumat junior experimental flour mill for routine wheat testing*, P. MEREDITH, *J. Sci. Fd Agric.*, 1967, **18** (9), 396.
The flour produced from the mill is sufficiently similar to that from an Atteschalmers experimental mill to be suitable for large scale wheat quality testing programme. The only difference was in mixing tolerance of doughs from the two kinds of flours. Yield of flour decreased as wear occurred during four years of testing.
- 2.30 *Interaction between wheat proteins and dextrans*, R. W. JONES AND STIG R. ERLANDER, *Cereal Chem.*, 1967, **44** (5), 447.

K. A. R.

- In solutions of 0.02 M acetic acid, some dextrans will interact with gluten, gliadin and glutenin. The interaction either produces turbidity or a precipitate and is concentration dependent. At constant carbohydrate concentration, turbidity increases to a maximum as the protein concentration is increased. As protein concentration is increased beyond the critical point, the turbidity falls to zero.
- 2.31 *The proteolytic enzymes of wheat and flour and their effect on bread quality in the U.K.*, J. HANFORD, *Cereal Chem.*, 1967, **44** (5), 499.

A. A.

- An assessment of value of tests in measuring gluten quality softening and an examination of the enzymes responsible. No correlation was found between the softening of gluten of different wheat flours and the increase in soluble N₂. Total soluble N₂

showed a correlation with the N₂ supplementation requirements of flour doughs. The softening enzyme was affected by wheat flour grade and when gluten was washed with dilute NaCl solution.

J. v. s.

- 2.32 *Effect of baking on retention of thiamine, riboflavin and niacin in Arabic bread*, MORTEZA MALEKI AND SHAWKY DAGHIR, *Cereal Chem.*, 1967, **44** (5), 483.

Experimental samples were baked to 400°, 450° and 500°C for different time intervals. Thiamine was destroyed more in brown bread than in white bread and increased with intensity in heating; the loss of riboflavin was similar in brown and white breads; niacin loss in all conditions was negligible. In vitamin enriched breads, the riboflavin retention was greater than in un-enriched breads; added niacin was retained completely.

J. v. s.

- 2.33 *Macaroni made with non-fat milk*, ELMER F. GLABE, PERRY W. ANDERSON AND PAULINE F. GOLDMAN, *Cereal Sci. Today*, 1967, **12** (12), 510.

Macaroni made from non-fat dry milk (NFDM) has superior texture and flavour than standard macaroni (NFDM content, 12-25 per cent). The PER of this product is more than twice that of standard macaroni. Carrageenan is responsible for texture improvement.

J. v. s.

- 2.34 *Kaffir corn malting and brewing studies. XVII. Purification and properties of sorghum malt α -amylase*, D. P. BOTES, F. J. JOUBERT AND L. NOVELLIE, *J. Sci. Fd Agric.*, 1967, **18** (9), 409.

α -amylase of sorghum malt has been purified by a combination of charcoal and heat treatment, DEAE-cellulose and calcium phosphate chromatography, and gel filtration, yielding a product with a specific activity of 10,304 units per mg. nitrogen. Both in the ultracentrifuge and on electrophoresis the purified α -amylase revealed a single peak. Results are presented for the molecular weight, sedimentation, diffusion and amino acid composition of the purified enzyme. The enzyme is micro-heterogeneous and it was separated into four sub-fractions.

K. A. R.

- 2.35 *Kaffir corn malting and brewing studies. XVIII. Purification and properties of sorghum malt β -amylase*, D. P. BOTES, F. J. JOUBERT AND L. NOVELLIE, *J. Sci. Fd Agric.*, 1967, **18** (9), 415.

Sorghum malt β -amylase has been purified by a combination of acid treatment, alcohol fractionation, DEAE-cellulose and calcium phosphate chromatography, and gel filtration. The purified enzyme was homogeneous and results are presented for the molecular weight, sedimentation, diffusion, amino acid composition, and kinetic properties of the purified enzyme.

K. A. R.

- 2.36 *Corn flour: from surplus commodity to premium product*, HUGH J. ROBERTS, *Cereal Sci. Today*, 1967, **12** (12), 505.

- 2.37 *Corn dry milling: pretempering low-moisture corn*, O. L. BREKKE, *Cereal Chem.*, 1967, **44** (5), 521.

A number of pretempering times (3 to 91 hr) and pretempering moisture levels (14-20 per cent) were tried in yellow dent corn, all at room temperature. Pretempering to a moisture content of 15—17 per cent was optimal, and a pretemper time of 20 hr

was preferred. Pretempered corn produced more of flaking grits, better germination and a higher yield of total grits than corn having only conventional temper. The pretemper made the conventional temper more effective.

J. V. S.

2.38 *Comparison of wet milling properties of Opaque-2, high lysine corn and normal corn*, S. A. WATSON AND K. R. YAHL, *Cereal Chem.*, 1967, **44** (5), 488.

Wet milling of *Opaque-2* corn produced high yields of steep water, germ oil and fiber and low yields of gluten-protein and starch. Lysine in steep water protein was similar for *Opaque-2* as well as normal corn, but gluten protein from *Opaque-2* was significantly higher in lysine and tryptophan than that from normal corn. Higher lysine contents were accompanied by lower zein contents in the glutens. Starch from *Opaque-2* corn had the same properties as that from normal starch.

A. A.

2.39 *Studies of the effect of extreme storage conditions on white rice*, P. F. PELSHANKE, *Milling*, 1967, **149** (11), 192.

Egyptian, *Originario* (both short kernel varieties) *Rinaldo Bresani* and *Surinam Selecta* (both long kernel varieties) on storage at various temperatures for an year under air, nitrogen, oxygen and carbon dioxide atmospheres showed that very little colour changes were observed at 2 and 20°C; at 35°C, however, yellow colour was markedly noticed in all samples. Cooking tests revealed that rice volume increased by 13 per cent at 2°, by 16 per cent at 20°C and 35°C in Italian variety. Losses in cooking were lower in Egyptian variety (0.2-2.0 per cent) and *Surinam Selecta* (0.0-0.9 per cent), but higher in Italian samples (0.2-1.7 per cent). Differences in cooking consistency were not significant from taste. Cooked rice became soft after storage in 96 per cent of tests. Few samples stored at 35°C developed straw smell, a storage flavour; on cooking them yellow colour appeared.

B. S. N.

2.40 *Nutritive quality of idli, a fermented food of India*, A. G. VAN VEEN, L. R. HACKLER, K. H. STEINKRAUS AND S. K. MURHERJEE, *J. Fd Sci.*, 1967, **32** (3), 339.

No appreciable increase in methionine was found after 24 hours of fermentation. The PER and digestibility in rats were the same as from the unfermented mixture. The riboflavin content was decreased.

K. A. R.

2.41 *Peroxidase enzymes in wheat germs*, G. A. LANZANI, A. MARCHESINI, L. A. MANZOCCHI AND P. LEQUI, *Enzymologia*, 1967, **33** (6), 361.

Two classes of peroxidases from wheat germs were separated by ion exchange chromatography; one class had ionic properties different from the other. The heterogeneity of each class was demonstrated by electrophoresis.

A. A.

2.42 *Interaction of phospholipid-metal complexes with water-soluble wheat protein*, J. G. FULLINGTON, *J. Lipid Res.*, 1967, **8** (6), 609.

Insoluble complexes are formed by the combination of certain water soluble wheat flour proteins with triphospho-inositides or phosphatidyl serine. An analysis of reactive and non-reactive protein species have shown no differences to clearly explain their behaviour. Methylation of protein increases its binding to lipid; acetylation decreases the interaction.

J. V. S.

2.43 *Lipids in flour from gamma-irradiated wheat*, C. CHUNG, K. F. FINNEY AND Y. POMERANZ, *J. Fd Sci.*, 1967, **32** (3), 315.

Lipids were extracted with petroleum ether and with water saturated butanol from wheat aliquots gamma-irradiated by 0, 1, 2, 3, 5 and 10×10⁶ rep doses. The water saturated butanol

extract was fractionated by silicic acid column chromatography into polar and non-polar lipids. The fractions were studied for phosphorus content. Profound change was observed in rheological properties and bread making characteristics of the flours accompanied by a small decrease in the ratio of non-polar to polar lipids and by an increase in the phosphorus content of the polar fraction.

A. A.

2.44 *An evaluation of methods used in detecting changes in artificially dried stored corn*, WILHELMUS HEUSDENS AND MAJEL M. MACMASTER, *Am. Miller Processor*, 1967, **95** (11), 7.

Methods for glutamic acid decarboxylase activity, viability, germination, mold count and fat acidity were studied with dried and stored samples to determine changes in corn stored with little or no contamination with storage molds. Glutamic acid decarboxylase activity was the most satisfactory method to detect overheated corn, while mold count and fat acidity were good indices of deterioration upon storage.

A. A.

2.45 *New approaches in the extraction of malt*, P. J. MEDDINGS, *Fd Technol. Aust.*, 1967, **19** (14), 670.

Review. 58 references.

2.46 *Storage of barley in an underground pit sealed with a polyethylene liner*, E. DONAHAYE, S. NAVARRO AND M. CALDERON, *J. Stored Prod. Res.*, 1967, **3** (3), 359.

Fifty tons of locally grown barley were stored in an underground pit hermetically sealed inside a polyethylene liner at Kibbutz Lahav. Gas measurements and observations showed that a satisfactory hermetic seal was obtained within the liner after seven weeks of storage (1.0-3.2 per cent O₂). However, the efficiency of the seal was reduced by the growing activity of rodents which damaged the liner, and this appears to be a limiting factor for this type of storage. Changes in moisture content and in germination power were minimal during the storage period. Marked seasonal temperature changes were only recorded at the periphery of the grain bulk, while at the centre the temperature remained stable. The barley which was removed after 15 months of storage, during nine of which the liner was sealed, was clear, of natural brightness and colour, of low moisture content, and uninfested.

A. A.

3. Pulses

3.2 *Varietal differences in ascorbic acid content and yield contributing characters in pea (Pisum sativum L)*, S. LAL, N. C. PANDE AND A. N. KHANNA, *Madras agric. J.*, 1967, **54** (12), 640.

In the seventeen varieties tested, the ascorbic acid content varied from 32.25 mg./100 g. to 60.49 mg./100 g. of fresh seeds. The highest was recorded in T 61 and it was closely followed by *Sylvia* (58.25 mg./100 g. of pods). Minimum was recorded in *Mid-freezer-rogers*.

K. A. R.

3.3 *Effects of methionine and tryptophan supplementation to two improved strains of red gram on protein utilization by albino rats*, R. P. DEVADAS, R. GIRIJA BAI AND N. SNEHALATA, *J. Nutr. Dietet.*, 1967, **4** (4), 300.

Improved strains of red gram 1141 and *SA 1* supplemented with methionine and tryptophan when fed to rats at 15 per cent protein level, revealed that protein quality was not equal to that of SMP, probably due to the limited availability of lysine or to any other limiting amino acid in the diet.

B. S. N.

3.4 *Effect of different levels of pulse proteins on liver and blood lipids*, C. H. CHAKRABARTI AND UMA BANERJEE, *J. Nutr. Dietet.*, 1967, **4** (4), 295.

An increase in liver lipids and cholesterol with a concomitant decrease in phospholipid occurred in rats fed Bengal gram and lentil proteins at 12 per cent level for eight weeks. At 18 per cent level pulse proteins, the cholesterol levels in liver and normal liver lipids were almost normal. With the intake of pulse protein at higher levels, the rise of serum cholesterol level in rabbits could not be controlled.

B. S. N.

3.5 *The distribution of protein, lysine and methionine and anti-tryptic activity in the cotyledons of some leguminous seeds*, G. ZIMMERMAN, S. WEISSMANN AND S. YANNAI, *J. Fd Sci.*, 1967, **32** (1), 129.

Two representative varieties of oil and starchy legumes were examined. Anti-tryptic activity in the separated cotyledons does not invariably follow the protein distribution pattern. Fractionation of the cotyledons, if technically feasible, may yield protein richer fractions of high nutritive value. Some protein-poorer fractions may need less heat to inactivate nutritionally undesirable anti-tryptic activity where this is lower than in other fractions.

A. A.

4. Fruits, Vegetables and Tubers

4.23 *Carotenoids in Lycopersicum esculentum (Tomatoes)*, A. KRISHNA MALLIA, C. SUBBARAYAN AND H. R. CAMA, *J. Nutr. Dietet.*, 1967, **4** (4), 277.

The total carotenoids present in *Bangalore* variety of tomato (*Lycopersicum esculentum*) were 11.83 mg./100 g. fresh pulp and 127 mg./100 g. dry pulp. Of the seventeen different carotenoids identified lycopene accounted for 75 per cent of total carotenoids; oxycarotenoids were present in small proportions with the ratio of carotene hydrocarbons to oxycarotenoids being 9:1.

B. S. N.

4.24 *Storage changes in the free amino acids of foam mat dried tomato powders*, M. GEE, R. P. GRAHAM AND A. J. MORGAN JR., *J. Fd Sci.*, 1967, **32** (1), 78.

Increases in certain amino acids were independent of storage temperature; possibly they were caused by proteolysis. Decreases in certain other amino acids were accelerated at higher storage temperatures. These amino acids may be lost in non-enzymatic browning reactions.

A. A.

4.25 *The effect of storage on chemical constituents of tomato fruits*, K. N. CHINNASWAMI, *Madras agric. J.*, 1967, **54** (10), 541.

Tomato fruits were stored in bamboo baskets lined with paddy straw for 15 days under room temperature. At the end of storage period a significant increase in titratable acid, and a decrease in reducing sugars and vitamin C (13.9 per cent decrease) was observed. The sugar acid ratio reduced from 6.11 to 3.06 due to increase in acidity by the reduction of sugars resulting in sourness.

K. A. R.

4.26 *Relation of pit orientation to force required to remove the pit from individual Montmorency cherries*, J. H. VON ELBE, R. T. SCHULER, J. L. HALDERSON, H. D. BRUHN AND J. D. MOORE, *Fd Technol. Champaign*, 1967, **21** (11), 1524.

Data show that pit orientation in relation to pitter needle has an important influence on the ultimate force required to remove the pit. Horizontal orientation of the suture of the cherry will probably be the best for determining skin toughness and flesh firmness.

A. A.

4.27 *The structure of the cuticular wax of prune plums and its influence as a water barrier*, JOAN M. BAIN AND D. MCG. McBEAN, *Aust. J. Biol. Sci.*, 1967, **20** (5), 895.

The wax on prune plums was found to comprise of 2 layers which are described. Studies were made on fruits 2 months before and 2 months after maturity. Deposits of wax remained

uniform at about 300 $\mu\text{g}/\text{cm}^2$ during the time the samples were taken and thickness was estimated to be 3-5 μ . The influence of waxy layer in retarding water loss from prunes during drying procedures has been discussed.

J. V. S.

4.28 *Anthocyanins in Royalty grapes*, L. E. CHEN AND B. S. LUH, *J. Fd Sci.*, 1967, **32** (1), 66.

4.29 *Citrus carotenoids. I. Comparison of carotenoids of mature green and yellow lemons*, H. YOKOYAMA AND C. E. VANDERCOOK, *J. Fd Sci.*, 1967, **32** (1), 42.

Lemons, both mature-green, and yellow, yield a complex mixture of carotenoids. The lighter colour of the pulp and flavedo of yellow lemons is due to much lower concentration of carotenoids than are present in oranges. As the lemon ripens and coincident with the disappearance of chlorophyll, alpha-carotene disappears and zeta-carotene and an eta-carotene-like compound appear in both pulp and peel. Small, but significant amounts of beta-carotene, 5,6-monoepoxide, and its isomeric 5,8-epoxide, and mutatochrome are present in pulp of yellow lemon.

A. A.

4.30 *The ascorbic acid content of Nigerian vegetables*, O. L. OKE, *J. Fd Sci.*, 1967, **32** (1), 85.

The ascorbic acid in common vegetables of Nigeria was 18-98 mg./100 g. of vegetable material. On boiling 46-68 per cent of the ascorbic acid was lost; 47-87 per cent was lost on exposure to sun for 3 hr.

A. A.

4.31 *Carbohydrate changes in sweet potato flakes made by the enzyme activation technique*, MAURICE W. HOOVER AND SUE JANE HARMON, *Fd Technol. Champaign*, 1967, **21** (11), 1529.

The prepared raw material was pretreated by steam injection, held for specific periods, cooked at elevated temperature and drum dried. Maltose increased in material preheated at temperature between 174° and 178° F, but there were no significant differences in sucrose and hexose sugars.

J. V. S.

4.32 *Fruit and vegetable production and processing trends in the U.S. and Canada*, *Br. Fd J.*, 1967, **69** (820), 140. General.

4.33 *Development of Mandarin orange processing industry*, H. C. BHATNAGAR, *Indian Fd Packer*, 1962, **21** (5), 11. Review.

4.34 *Effect of canning and storage on the chemical composition and organoleptic quality of juices of different varieties of oranges grown in Lebanon*, M. MALEKI AND S. SARKISSIAN, *J. Sci. Fd Agric.*, 1967, **13** (11), 501.

Chemical analysis of 5 varieties of oranges was done at weekly intervals for seven weeks. The fresh juice from the *Blood* and *Washington Navel* varieties compared favourably in chemical composition with a concentrated frozen product from U.S.A.; the juice from *Blood* withstood canning and storage better than other varieties tested. In all samples there was a significant decrease in the levels of ascorbic acid and of essential oils during storage. Organoleptic evaluation showed that blends of 2 or 3 different varieties were preferred to the juice of a single variety.

K. A. R.

4.35 *Apo-10'-violaxanthal, a new carotenoid from Valencia orange peels*, A. LAURENCE CURL, *J. Fd Sci.*, 1967, **32** (2), 141. A new 5,6-epoxide carotenoid aldehyde, apo-10'-violaxanthal, was isolated from *Valencia* orange peels.

A. A.

4.36 *Phenolase activity in tomato fruit in relation to growth and to various ripening disorders*, G. E. HOBSON, *J. Sci. Fd Agric.*, 1967, **18** (11), 523.

A method for the extraction of phenolase is described. In tomato the phenolase activity increases towards maturity and then decreases somewhat during normal ripening. The red area of fruit which showed a physiological ripening disorder known as 'blotch' contained an abnormally high activity while the green areas contained even higher activity. Tomatoes exhibiting 'blossom-end' rot also showed enhanced activity, especially in the affected region. Levels of phenolase in tomato species other than *Lycopersicon esculentum* have also been examined.

A. A.

4.37 *Sultana grape dehydration*, G. KERRIDGE AND J. V. POSSINGHAM, *Fd Technol. Aust.*, 1967, **19** (13), 627.

With an entering air temperature of 145° F using the parallel flow system it was possible to dry one ton dry weight of dipped grapes to 13.5 per cent moisture in 37.2 hours.

K. A. R.

4.38 *Penetration and distribution of calcium ions in thermal processed apple slices*, JIMMIE L. COLLINS AND ROBERT C. WILEY, *J. Fd Sci.*, 1967, **32** (2), 185.

Apple slices were treated in a solution containing CaCl₂ and radioactive (Ca⁴⁵ Cl₂) to determine the movement of Ca ion into the tissue. Use of a vacuum-pressure technique while the slices were submerged in Ca solution showed uniform distribution of Ca ions in the tissue. Radio active Ca ions may be used to determine the efficiency of canning where plant tissues are treated with Ca salts.

J. v. S.

4.39 *Pectic enzymes and development of the pear (Pyrus communis)* C. W. NAGER AND M. E. PATTERSON, *J. Fd Sci.*, 1967, **32** (3), 294.

Changes in firmness, protein, pectinesterase (PE) and polygalacturonase (PG) were followed during enlargement, maturation, and abnormal ripening of the *Bartlett* pear on the tree. Although the PE activity for pear increased during maturation, with a good correlation with total weight ($r=0.93$ and 0.87 for 1962 and 1963), the amount of activity per gram and per milligram protein decreased. There was a high correlation between PE activity and protein ($r=0.84$ and 0.91 for 1962 and 1963). The specific activity of the enzyme decreased during maturation. As the fruit matured and ripened on the tree the per cent recovery of PE decreased. The use of polyvinyl pyrrolidone in the extraction procedure to absorb the phenolic compounds counteracted this trend.

A. A.

4.40 *Problems in measuring leucoanthocyanin content of pears*, RENATA URY SMATHERS AND HELEN CHARLEY, *J. Fd Sci.*, 1967, **32** (3), 300.

Four solvents, 95 per cent ethanol, methanol, and both ethanolic and aqueous acetone, were used to extract leucoanthocyanin from *Bartlett* pears. Ethanol extracted approximately one-fourth, methanol one-third, and acetone somewhat less than two-thirds based on the amount in the corresponding slurry. Conversion of leucoanthocyanin to anthocyanidin was influenced by the dispersing medium, the normality of the butanol in which the conversion was effected, and the source of the leucoanthocyanin (pear marc, slurry, or synthetic leucocyanidin). When ethanolic acetone was the dispersing medium yields of the anthocyanidin was the greatest.

A. A.

4.41 *Effect of gamma irradiation on straw berries as a means of extending its shelf life and lethal dose of Botrytis cinerea*, SADAMI SHIBBE, HITOSI ITO AND HIROSHI IIZUKA, *Agric. Biol. Chem., Japan*, 1967, **31** (8), 930.

Strawberries on irradiation with zero-kilo roentgen (kR), 100 kR and 200 kR and kept at 23°C developed 10 per cent

saprophytic fungi infection due to presence of *Botrytis cinerea*, *Rhizopus* and *Penicillium* after 3, 4 and 5-6 days storage. The chief agent responsible for 'Donner' strawberry infection was found to be *Botrytis cinerea* Persoon. The lethal dose for the isolated strain was found to be 970 kR.

B. S. N.

4.42 *Polyphenolic compounds in canned cling peaches*, B. S. LUH, E. T. HSU AND K. STACHOWICZ, *J. Fd Sci.*, 1967, **32** (3), 251.

Cling peaches (*Prunus persica* var *Halford*) were canned with 36° Brix syrup in No. 2½ cans as peeled halves. The polyphenolic compounds were extracted from the drained peaches with 95 per cent ethanol containing 0.1 per cent HCl. The extract is concentrated in a flash evaporator under vacuum to remove the ethanol, and with petroleum ether to remove carotenoids. Polyphenolics shown to be present in the extract were: 4 chlorogenic acid isomers, 5 leucoanthocyanidin isomers, catechin, epicatechin, isoflavone, 2-*p*-coumarylquinic acids, and caffeic acid. Chlorogenic acids, leucoanthocyanidins, and catechin were present in larger amount than the others.

A. A.

4.43 *Marmelosin in bael fruit and its products*, H. L. KAUL, K. L. KAPUR AND W. B. DATE, *Indian Fd Packer*, 1967, **21** (5), 5.

The marmelosin content in the ripe fruit is 0.27 per cent and it decreases to 0.14—0.17 per cent in the ripe fruit. While preparing the preserve, 50-60 per cent of it is lost. In squash the loss is 80 per cent. The preserve and squash contain respectively 0.12 per cent and 0.27 per cent of marmelosin.

K. A. R.

4.44 *Brine fermentation of cucumbers treated with sodium o-phenylphenate*, THOMAS A. BELL, JOHN L. ETCHELLS AND ROBERT M. SWINDELL, *J. agric. Fd Chem.*, 1967, **15** (6), 1108.

Sodium o-phenylphenate added at beginning of fermentation of brined cucumbers did not interfere with natural acid fermentation. O-phenyl phenol was adsorbed at high concentration, on skin of cucumbers, whereas in brine, concentration of the chemical was reduced to negligible level.

B. S. N.

4.45 *Changes in crystallinity of cellulose during dehydration*, F. SHIMAZU AND C. STERLING, *J. Fd Sci.*, 1967, **32** (3), 273.

Samples of onions and bell peppers were taken during various stages of high and low temperature dehydration and lyophilization to ascertain the step-wise changes that occur in the crystallinity of cellulose. Cellulose crystallises mainly during the later stages of drying in all the three processes, and freezing produces only a minor amount of crystallisation. Most of the water loss and loss of rehydration capacity occurs at the start of dehydration. The latter is ascribed to cell death and loss of differential permeability in protoplasmic membranes.

A. A.

4.46 *Effect of storage conditions on standard plate counts of raw onions*, J. A. SIREGAR, M. P. STEINBERG, L. S. WEI AND A. I. NELSON, *J. Fd Sci.*, 1967, **32** (3), 349.

Onions stored in moving air at 34°F kept well, including the bruised ones. At room temperature bruised onions showed a greatly increased microbial quotient (an expression used for the standard plate count and per cent spoiled).

K. A. R.

4.47 *Overcoming the bacteriostatic activity of onion in making standard plate counts*, L. S. WEI, J. A. SIREGAR, M. P. STEINBERG AND A. I. NELSON, *J. Fd Sci.*, 1967, **32** (3), 346.

Addition of potassium sulfite counter-acts the bacteriostatic activity of onion homogenates in making standard plate counts. Five tenths per cent sulfite is sufficient and the concentration may

be 1.6 per cent. Coliforms were not inhibited by sulphite. It is recommended that all standard plate counts of onion be made with 0.5 per cent K_2SO_3 in the blending solution.

K. A. R.

4.48 *Effect of wax and lanolin emulsions on the efficiency of potato-blight fungicides in laboratory tests*, T. H. MCINTOSH AND D. EVELING, *Ann. appl. Biol.*, 1967, **60** (2), 223.

Copper oxychloride, tetrachloroisophthalonitrile, zineb and fentin acetate were formulated as wax or lanolin emulsions and compared with commercial wettable powders of the same fungicides. Most of the wax or lanolin formulations gave better protection against infection than wettable powders.

J. V. S.

4.49 *Effect of gamma irradiation on volatile compounds from cooked potato*, MAKATO TAJIMA, KINICHI KIDA AND MASAO FUJIMAKI, *Agric. biol. Chem. Japan*, 1967, **31** (8), 935.

Cooked potato irradiated with 10,000 rad doses either immediately or after 50 days storage did not show significant differences in the volatiles between non-irradiated and irradiated samples whereas with 100,000 rads an increase in their amount, especially of carbonyl compounds was observed. Ascorbic acid content recorded decline by 10 and 30 per cent respectively with 10,000 and 100,000 rad doses for cooked potato.

B. S. N.

4.50 *An amylase inhibitor in Colocasia esculenta*, M. NARAYANA, RAO, K. S. SHURPALEKAR AND O. E. SUNDARAVALLI, *Indian J. Biochem.*, 1967, **4** (3), 185.

C. esculenta contains a water soluble specific, salivary amylase inhibitor. The inhibitor is not dialysable, is stable to boiling temperatures and is precipitable by the usual protein precipitants.

A. A.

5. Oilseeds and Nuts

5.11 *Nutritive value of some oilseed proteins*, R. J. EVANS AND SELMA L. BANDEMAR, *Cereal Chem.*, 1967, **44** (5), 417.

Samples of hexane-extracted peanuts, sun-flower seed, sesame seed, soyabean seed and safflower seed have been analysed for essential amino acids and their nutritive value tested by rat feeding experiments as well as by assay with the microorganism *Tetrahymena pyriformis* W.

J. V. S.

5.12 *Studies on lipolytic enzymes of oilseeds. I. Sesamum indicum (Gingelly)*, K. SREE KUMAR AND S. KRISHNA MURTHY, *Enzymologia*, 1967, **33** (5), 243.

A slow acting lipase of gingelly seeds with a pH optimum of 5.6 is described in the fatty layer obtained after centrifuging a 30 per cent homogenate. The enzyme shows maximum activity at an incubation period of 22 hr. The enzyme has been separated from the fat and a method of reconstitution of fat-free enzyme and extracted fat is described. The method results in recovery of 60 per cent activity. The enzyme is active towards triglycerides and long chain fatty acid esters. It is also highly active towards Tween 80, a water soluble substrate.

A. A.

5.13 *Groundnut oil meal—A substitute for skim milk powder at low cost stock diet for laboratory animals*, S. D. AMBEGAOKAR, V. P. SHINDE AND J. K. KAMATH, *J. Nutr. Dietet.*, 1967, **4** (4), 281.

Replacement of 20 per cent skim milk powder by an equal quantity of groundnut oil meal in the stock diet of albino rats did not result in appreciable change in the amino acid make up of the diet. Significant differences in the growth rate, haemoglobin and red blood cell counts, lactation and reproduction ability between these two groups of rats were not also observed.

B. S. N.

5.14 *Research studies on drying farmers' stock peanuts*, REED S. HUTCHINSON, *Oleagineux*, 1967, **22** (12), 737.

The conditions in which the drying of peanuts takes place after harvesting, and the method commonly used are described. Several ways of drying are compared differing in the temperature of drying air, the direction of its flow and the time taken for it to pass through the mass and the thickness of the layer of peanuts. The effects are discussed.

A. A.

5.15 *Studies on peanut seed storage*, EDUARDO ZINK, FAUSTO J. CORAL AND ROMEU DE TELLA, *Oleagineux*, 1967, **22** (11), 679.

Peanut can be stored without loss of viability by treating with a fungicide. Best fumigation was obtained in seeds shelled by machine and treated immediately with fungicide. Machine-shelled seeds showed lower germination percentages. Fungicide treatment also had insect repellent action. Mere hand shelling is not practicable. Mechanical shelling is recommended followed by seed selection and fungicide treatment.

J. V. S.

5.16 *Protein-calcium-phytic acid relationships in soybean*, KYOKO SAIO, EMIKO KOYAMA AND TOKUJI WATANABE, *Agric. biol. Chem. Japan*, 1967, **31** (10), 1195.

The study reveals that solubility characteristics of soyabean meal proteins are remarkably influenced by calcium and phosphorus, that complex containing protein, calcium and phosphorus is formed above isoelectric point of protein, and the combinations are labile above pH 8, particularly by heating.

B. S. N.

5.17 *Identification of the hexosamine in a 7S protein of soyabean globulins*, IKUNORI KOSHIYAMA, *Agric. biol. Chem. Japan*, 1967, **31** (7), 874.

The hexosamine present in purified 7S protein was identified by hydrolysing it *in vacuo* for 6 hr and 110 C with 3.5N HCl. The hydrolysate on concentration under reduced pressure was introduced into Dowex 50 \times 8 column 0.8 \times 43 cm, H⁺ form, (200-400 mesh) and eluted with 0.33 N HCl for column chromatographic studies, which yielded glucosamine and galactosamine.

B. S. N.

5.18 *Changes in amino acid composition during germination of soyabean*, YOSHINORI ISHIKAWA, SHIZUKO HASEGAWA, TAKANORI KASAI AND YATARO OBATA, *Agric. biol. Chem. Japan*, 1967, **31** (4), 490.

L- and Y- glutamylaspartic acids were detected in acidic fraction of soyabean seedling. RF values of both peptides were consistent with those of authentic samples with several solvent systems.

A. A.

5.19 *Fractionation of main components and their sub-units of soyabean proteins*, KAZUYOSHI OKUBO AND KAZUO SHIBASAKI, *Agric. biol. Chem. Japan*, 1967, **31** (11), 1276.

The water extracted proteins and C and D fractions prepared from defatted soyabean meals were fractionated by a method of gel filtration with Sephadex G-200, resulting in higher purification of the C and D components. The dissociated sub-units of the C and D components were seen as bands B and B₁ on the starch-gel electrophoretical pattern of system with urea, the sub-units of C component were mainly corresponding to the bands 7, 8, 9 and those of the D.

6. Oils, Fats and Waxes

6.13 *A new process for simultaneous refining and deodorization of fats and oils*, G. B. MARTINENGI, *Chemy Ind.*, 1967, **43**, 1815.

Deacidifying—deodorizing distillation is carried out by steam stripping under a vacuum of the order of 1.5-2 mm. Hg. absolute

pressure. The lower value of absolute pressure helps in drastically reducing the steam required for distilling unit quantity of the fatty acid. This is illustrated for stearic acid where a steam requirement of 2408 kg. at 760 mm. and 100°C is reduced to 3.16 kg. at 1 mm. Hg. and 150°C. The steam requirement is only 0.06 kg. at 0.55 mm. Hg. However, the volume occupied by 1 kg. of steam at these low pressures is extremely high being 800,000 litres at 0.8 mm. Hg. and 1,400,000 litres at 0.4 mm. Hg.

M. C. B.

6.14 *Commercial processes for hydrogenating fatty oils*, L. F. ALBRIGHT, *Chem. Engng*, 1967, **74** (21), 249.

The U.S. practice of carrying out the hydrogenation via any one of the three processes of which two are batch and one of continuous flow is described with a good coverage of the various steps involved in each of the processes. Economics of the three processes are considered in the light of cost of hydrogen (wide fluctuation) and also wages and labour.

M. C. B.

6.15 *The world fats situation, prospects and problems*, C. A. C. DE BOINVILLE, *Oleagineux*, 1967, **22** (8-9), 503. Review.

6.16 *Fatty acid composition of comestible vegetable oils*, D. GRIECO AND G. PIEPOLI, *Oleagineux*, 1967, **22** (10), 611.

Fifty one oils extracted from 15 species of oilseeds have been analysed. The oil content of each sample, FFA in each of extracted oils and their fatty acid composition determined by GC are given.

J. V. S.

6.17 *Thin layer chromatographic detection of soyabean oil in sun flower oil*, G. BIERNOTH, *Fette Seifen Anstrmittel*, 1967, **69** (9), 635.

A TLC method in which the negligible tocopherol of sun flower oil (approx 5 p.p.m.) does not interfere. The addition of 3.5 per cent of soybean oil to sun flower oil can be detected.

A. A.

6.18 *Prevention of colour fixation of cottonseed oil with ortho amino benzoic acid*, C. NARAYANA AND S. D. THIRUMALA RAO, *Oleagineux*, 1967, **22** (11), 691.

A description of different treatments proposed for the prevention of colour fixation in cottonseed oil before refining. Experiments are described on the elimination of gossypol from crude oil by ortho-amino benzoic acid and its sodium salt and on the efficiency of this process, which enables satisfactory bleaching after prolonged storage.

A. A.

6.19 *A brief report on Italian mandarin oil*, F. MISITANO, *Perf. essent. Oil Rec.*, 1967, **28** (11), 854.

Techno-economic data on the mandarin and mandarin oil production for 1956 to 1965.

J. V. S.

6.20 *Chemistry of Indian essential oils. III, IV.*, K. K. BASLAS, *Perf. essent. Oil Rec.*, 1968, **58** (11), 782, **59** (1), 12.

Information of importance to food technologists is on: *Eugenia jambolana*, *Feronia elephantum*, *Foeniculum panmorium*, *Mangifera indica*, *Mentha spp.*, *Murraya koenigi* and *Myristica fragrans*.

J. V. S.

7. Starch, Sugars and Confectionery

7.5 *New Starches. III. The properties of the starch from Phalaris canariensis*, K. J. GOERING AND MERLYN SCHUH, *Cereal Chem.*, 1967, **44** (5), 532.

The starch from the seeds of *Ph. canariensis* was prepared by an alkali process and studied for its characteristics.

7.6 *Sugar brews and bread improvement*, DOROTHY M. COLLYER, *J. Sci. Fd Agric.*, 1967, **18** (9), 428.

The use of partly fermented sugar brew instead of the dough water and compressed yeast improved the specific volume, texture and softness of bread made by a mechanical development process without oxidising improver and intermediate proof. The improving effect of the brew was due entirely to its residual sugar, ethyl alcohol content and the active state of the yeast. Because these factors vary simultaneously in a fermenting brew, there was an optimum duration of brew fermentation. The use of such brew reduced the work input requirement during dough mixing and final proof time.

A. A.

7.7 *Studies on the cereal starches. VII. Correlations among the amylograph characteristics of rice starch and flour*, HISAYA HORIUCHI, *Agric. biol. Chem. Japan*, 1967, **31** (9), 1003.

Significant correlations among amylograph characteristics or other relating properties of rice starch and flour were recognized by orderly arrangement of previously obtained data. Linear regression of peak viscosity on breakdown, was available for detecting a deteriorative damage of rice starch and grain. Alpha amylase in white rice did not have close relation with peak viscosity of the flour. The ratio of breakdown to consistency and the corrected peak viscosity calculating the coincidence of the slurry concentration were significantly correlated with the starch iodine blue value and rigidity of the cold paste body respectively.

A. A.

7.8 *Thermal capacity and specific heat of cocoa butter, chocolates and icings at different temperatures*, K. BECKER AND BAUERMEISTER, *Fette Seifen Anstrmittel*, 1967, **69** (8), 593.

Thermal capacity (TC) of chocolate doughs in relation to the temperature is of great importance in designing chocolate making machinery. Measurements made with a thermal calorimeter (designed for this purpose) have shown that the thermal capacities can differ at the same temperature depending upon the composition of the doughs. A method and required data are given for rapid calculation of TC of a number of doughs.

J. V. S.

7.9 *Microwaves extend shelf life of cakes*, K. A. EVANS AND H. B. TAYLOR, *Fd Mf*, 1967, **42** (10), 50. General.

8. Spices and Condiments

8.1 *The technological development of green ginger industry in Australia*, G. S. SHRAPNEL, *Fd Technol. Aust.*, 1967, **19** (13), 604.

9. Meat, Poultry and Fish

9.36 *The concentration of inosine 5'-mono-phosphate in meat*, R. D. DANNERT AND A. M. PEARSON, *J. Fd Sci.*, 1967, **32** (1), 49.

Concentrations of inosine 5'-monophosphate (IMP) were not significantly different in the longissimus dorsi, biceps femoris, and semimembranosus muscles of 6 pork carcasses sampled 48 hr post-mortem. On aging beef for 28 days at 0.5-1.5°C (33-35°F) the peak concentration of IMP (5.4 µM/g.) occurred at 12 hr. post-mortem. Following the 4th day a gradual but steady decline in IMP content was observed until a value of only 0.75 µM/g. or less than 15 per cent of the peak IMP concentration remained after 28 days' storage. A wide range of IMP concentration was observed between muscles obtained from different species with beef sampled at 0 hr containing the highest amount and pork heart muscles sampled at 0 hr containing the least.

A. A.

- 9.37 *Free and esterified cholesterol content of animal tissues and meat products*, C. TU, W. D. POWRIE AND O. FENNEMA, *J. Fd Sci.*, 1967, **32** (1), 30.
- A method was developed for total and free cholesterol estimation in beef, pork muscle and meat products. Total cholesterol content was (average): in beef, 58 mg/100 g; pork muscle, 65 mg/100 g. Both these muscles had an average cholesterol ester concentration of about 6 per cent of total cholesterol. During the broiling of ground chuck samples, upto 15 per cent of total cholesterol in raw meat was lost in cook-drip.
- J. V. S.
- 9.38 *Temperature dependence of pH changes in ox muscle post-mortem*, R. G. CASSENS AND R. P. NEWBOLD, *J. Fd Sci.*, 1967, **32** (1), 13.
- Sternomandibularis muscle was incubated shortly after slaughter at temperatures ranging from 1° to 37°C. Generally, pH dropped faster at 1°C than at 5°C during the first several hours post-mortem. The ultimate pH attained at 1° or 5°C was significantly higher than that attained at 15°, 24°, or 37°C.
- A. A.
- 9.39 *Freezer burn of animal tissue. 6. Experiments with ox muscle-frozen before and after rigor*, G. KAESS AND J. F. WEIDEMANN, *J. Fd Sci.*, 1967, **32** (1), 14.
- Freezer burn in semitendinosus muscle from food grade oxen was minimised by storage for 24 hr. post-mortem at 0°C, followed by slow freezing to -10°C and 78 per cent R.H. with permitted weight loss. Good quality beef was more resistant to freezer burn than poor quality beef. Total weight lost up to the time specified intensities of freezer burn were reached, was almost twice as much for samples frozen before, or shortly after rigor as for examples frozen several days later.
- A. A.
- 9.40 *Biochemical factors affecting beef tenderness*, N. B. WEBB, O. J. KAHLBERG, U. D. NAUMANN AND H. B. HEDRICK, *J. Fd Sci.*, 1967, **32** (1), 1.
- Tenderness decreased with increasing maturity for the cattle evaluated; it was improved by aging. Only during early stages of aging, were samples from control animals more tender than from ante-mortem stressed cattle; the difference disappeared by the end of aging period. Water holding capacity and juiciness scores were raised by ante-mortem stress. Movement of moisture and mineral ions during aging may be associated with development and resolution of *rigor mortis* and with improved tenderisation of meat.
- A. A.
- 9.41 *Color stability of prepackaged fresh beef as influenced by pre-display environments*, N. G. MARRIOTT, H. D. NAUMANN, W. C. STRINGER AND H. B. HEDRICK, *Fd Technol. Champaign*, 1967, **21** (11), 1508.
- Beef steaks prepackaged in films were stored for different periods in a 30°F dark environment prior to lighted display at 30°F. Color and desirability scores remained relatively stable during dark storage but subsequent display in light caused color degradation. There was less bacterial growth during dark period than during subsequent lighted display or during continuous lighted display. Packaging film influenced weight loss but did not appreciably influence bacterial count. Packaging films had a significant influence on color scores.
- A. A.
- 9.42 *Total pigments and myoglobin concentration in four bovine muscles*, D. A. RICKANSRUD AND R. L. HENRICKSON, *J. Fd Sci.*, 1967, **32** (1), 57.
- 9.43 *Changes in fatty acid composition of porcine muscle lipid associated with sex and weight*, E. ALLEN, R. W. BRAY AND R. G. CASSENS, *J. Fd Sci.*, 1967, **32** (1), 26.
- The fatty acid composition of porcine longissimus dorsi muscle lipid was determined for 30 animals slaughtered at two live weights and consisting of an equal number of boars, barrows and gilts. The lipid was separated into neutral lipid and phospholipid fractions prior to analysis. Odd-numbered fatty acids (C₁₁, C₁₃, C₁₅, and C₁₇) were significantly higher in the phospholipid fraction; the C₁₇ fatty acid was never detected in the neutral lipid fraction. Both weight and sex effects were restricted to the neutral lipid fraction. Weight had a significant effect on amount of C₁₀, C₁₁, C₁₂, C₁₄, C₁₆ and C₁₈ fatty acids in one or more of the sexes.
- A. A.
- 9.44 *Treatment of meats with ionising radiations. XIV. Radiation preservation of pack cuts of green bacon*, D. N. RHODES AND H. J. SHEPHERD, *J. Sci. Fd Agric.*, 1967, **18** (10), 456.
- Irradiation of vacuum packed back cuts of green bacon with a dose of 0.44 Mrad delayed spoilage at -1° from 9 to more than 40 weeks, and at 5° from 4 to more than 20 weeks. Organoleptic quality remained good throughout storage except for a very slight irradiation odour, detectable in the raw product only.
- A. A.
- 9.45 *Histochemical observations of porcine muscle as related to lipid accumulation*, E. ALLEN, R. W. BRAY AND R. G. CASSENS, *J. Fd Sci.*, 1967, **32** (1), 20.
- Four porcine muscle fibre types were observed by histochemical tests. The number of esterase positive fibres in all four muscles from boars tended to be higher in heavy weight than in the light weight group. The trend between weight groups was opposite for all muscles from barrows and gilts. The quantity of intramuscular lipid in *longissimus dorsi* increased with slaughter weight and tended to be lowest in boars.
- A. A.
- 9.46 *Changes in lipid composition of chicken muscle during frozen storage*, E. DAVIDKOVA AND A. W. KHAN, *J. Fd Sci.*, 1967, **32** (1), 35.
- Fresh chicken muscle contained about 1.1 per cent lipids of which more than half was phospholipid and about 30 per cent triglyceride; small amounts of cholesterol, cholesterol esters, and free fatty acids were present. During storage at -10°C, the phospholipid content of the muscle decreased owing to loss of lecithins and cephalins, the free fatty acid and triglyceride contents increased, the sphingomyelin content remained unchanged, and the lysolecithin content increased. The results suggest that lipolysis occurred during frozen storage, and that lipid hydrolysis and protein denaturation may be interdependent phenomena.
- A. A.
- 9.47 *Low dose ionising irradiation of tray-packed cut-up fryer chickens*, A. J. MERCURI, A. W. KOTULA AND D. H. SANDERS, *Fd Technol. Champaign*, 1967, **21** (11), 1509.
- Surface bacterial growth of the tray-packed cut-up fryer chicken was reduced during refrigerated storage, as a result of low dose gamma radiation from Co-60 source. Chickens irradiated in the frozen state showed more bacterial load and quicker onset of spoilage smell than those irradiated in fresh state. Raw meat from chickens irradiated at 0.5 Mrad level did not show any different odour than controls during extended period of storage. Cooking of 0.5 Mrad chickens tended to minimise irradiation smell.
- J. V. S.
- 9.48 *Some physical and chemical changes in the vitelline membrane of the hens egg during storage*, D. FROMM, *J. Fd Sci.*, 1967, **32** (1), 52.

Loss of strength and substance by the vitelline membrane of hen's egg were observed during changes in ambient pH. The vitelline membrane of freshly laid egg contains on its surface, a network of fibres which tends to dissipate as the pH of the albumen rises. Concomitantly, significant changes take place in the weight and the protein and hexosamine content of this membrane.

A. A.

9.49 *Radiation induced off-flavour development in whole egg magma*, T. P. LABUZA, S. A. GOLDBLITH AND E. L. CHANDLER, *J. Fd Sci.*, 1967, **32** (1), 61.

The dilution technique was used to show the degree of off-flavour production as determined in triangular tests by expert taste panels for the dose range of 50,000—400,000 rads at 32° F. Prior to irradiation, nitrogen was bled for 5, 10 and 20 sec. into egg magma being blended. The off-flavour threshold doses with nitrogen added were 47,080, 71,930 and 60,050 rads for 5, 10 and 20 seconds, respectively. For blending without nitrogen the threshold doses were 38,570, 31,170 and 42,100 rads.

A. A.

9.50 *Studies on the changes in the protein of the tissues of the Baltic herring (Clupea harengus membras L) under different conditions of storage. 1. The qualitative changes in free amino acids*, E. KOLAKOWSKI AND T. DABROWSKI, *Nahrung*, 1967, **11** (6), 493.

In herrings stored under iced and not iced (0°C to +2°C) conditions the qualitative changes in free amino acids were similar. There was decrease in free serine, arginine and not yet identified compounds X₁ and X₄ and by the occurrence of new free amino acids among which β-alanine, α-amino butyric acid and γ-amino butyric acid could be identified. In the filets which had been aseptically taken and stored, only insignificant changes were observed during storage.

K. A. R.

9.51 *Studies on influence of rays upon film packing. IV. Discolouration of film packed 'Sakura-Dembu' wrapped with cellophane of different colors*, WATARU WATANABE, AKIRA KOBAYASHI, TOSHIAKI HISASUE AND HIROSHI KAWAKITA, *Bull. J. Soc. sci. Fish.*, 1967, **33** (10), 956.

Samples packed in polyethylene laminated cellophane were covered by coloured cellophane (red, orange, yellow, green and colourless) and stored for 1 month at room temperature. The order and tendency of discolouration of samples wrapped in cellophanes of different colours were the same as in those in colourless cellophanes, thus showing no 'protective effect'.

J. V. S.

9.52 *Studies on green tuna. IV. Effect of cysteine on greening of myoglobin in the presence of trimethylamine oxide (TMAO)*, CHIAKI KOIZUMI AND FUMIO MATSUURA, *Bull. J. Soc. sci. Fish.*, 1967, **33** (9), 839.

Several substances (egg albumin, cysteine, glutathione, thio-glycolic acid and H₂S) were tested to find out the factor participating in the greening of myoglobin (MB) in the presence of TMAO. The mixed solution was treated in anaerobic conditions and colour of the precipitate and filtrate was observed on green tinge. Cysteine proved most intense greening. The natural green tuna can be represented by a model system consisting of MB, TMAO and cysteine.

J. V. S.

9.53 *A symposium on fish pigments in fundamental and applied aspects*, *Bull. J. Soc. sci. Fish.*, 1967, **33** (9), 853.

Synopses of following papers are given:

1. Hemoproteins of fish (K. Hashimoto).
2. Bile pigments of fish (T. Nomura).
3. Carotenoids in fish (S. Hirao).

4. Biological aspects of colouration in fish (T. Hibiya).
5. Discolouration of tuna meat during cold storage (M. Bito).
6. Blue or green meat of tuna fishes (C. Koizumi).
7. Discolouration of carotenoids in marine products (M. Hata).
8. Browning of fish muscle (M. Toyomizu).
9. Problems of color evaluation in marine product inspection (D. Nimura).

9.54 *Time-temperature effects of the bacteriological quality of pacific oysters and olympia oysters*, J. C. HOFF, W. J. BECK, T. H. ERICKSON, G. J. VASCOCELOS AND M. W. PRESNELL, *J. Fd Sci.*, 1967, **32** (1), 125.

The effect of storage in crushed ice and at 3 and 10°C was determined. The indices used were 35°C plate count, coliform MPN, fecal coliform MPN, and pH. The 35°C plate count, showed the best correlation with time and temperature of storage; fecal coliform MPN was most stable; coliform MPN increased at all temperatures, but not uniformly. The pH changes showed poor correlation with bacteriological changes.

A. A.

9.55 *The sterols of sea food*, D. KRITCHEVSKY, S. A. TEPPER, N. W. DITULLIO AND W. L. HOLMES, *J. Fd Sci.*, 1967, **32** (1), 64.

GC showed that the sterol fraction of all sea food examined, is predominantly cholesterol (over 90 per cent in haddock, pollock salmon, shrimp and lobster; 41 per cent in oysters; 57 per cent in crab; 26 per cent in scallop; and 37 per cent in clam). Oyster sterols also included 24-methylenecholesterol (26 per cent), and a crab sterol component, brassicasterol (37 per cent).

A. A.

9.56 *The £1400 million meat industry*, F. J. STRATTON, *Br. Fd J.*, 1967, **69** (819), 100.

Achievements and problems of meat industry in Britain.

9.57 *Quality in meat and quality control of meat products*, FERGUS HILL, *Fd Mf.*, 1967, **42** (11), 38.

Review. 11 references.

9.58 *An analysis of reflectance spectrophotometry as applied to meat and model systems*, H. E. SNYDER AND DAVID ARMSTRONG, *J. Fd Sci.*, 1967, **32** (2), 241.

A comparison of different ways of treating reflectance data showed that K/S (K—the adsorbancy co-efficient per unit of sample thickness; S—scattering co-efficient per unit of sample thickness) ratios were best suited for quantitative analysis of myoglobin derivatives in intact meat samples. Evidence was found for a change in the average path length of light reflected from a water suspension of a myoglobin dried milk mixture. The average path length decreased in the region of an adsorbancy peak. The ratios of K/S values derived from reflectance data on myoglobin derivatives can be quite different from the ratios of adsorbancy co-officients of the same derivatives at the same wave-lengths, but obtained by transmission spectrophotometry.

A. A.

9.59 *A new method for evaluating surface contamination of raw meat*, M. L. B. WILLIAMS, *J. appl. Bact.*, 1967, **30** (3), 498.

A method by which all surface organisms are washed off into a sampling diluent.

9.60 *Assessing beef acceptability—a proposed specification based on chemical methods*, D. PEARSON, *Fd Mf.* 1967, **42** (11), 42.

The specification outlined for assessing age and acceptability of beef are linked up with chemical characteristics like nature of fat and its content, volatile nitrogen, FFA of extracted fat and the fat extract release volume.

B. S. N.

- 9.61 *Variation of selected factors from the anterior to posterior of pork loin*, D. L. HARRISON, L. L. ANDERSON, J. BAIRD, C. PENGILLY, R. A. MERKEL, D. KROFT AND D. L. MACKINTOSH, *J. Fd Sci.*, 1967, **32** (3), 336.

Experimental data suggest that designs for studies using pork loin should consider variations within the loin from the 4th rib to the anterior end of the hip bone.

K. A. R.

- 9.62 *Vitamin A supplements and hypoxanthine—uric acid and nucleotide content of selected beef muscles*, D. D. MEYER, G. E. VAIL, V. D. BRAMBLETT, T. G. MARTIN AND R. B. HARRINGTON, *J. Fd Sci.*, 1967, **32** (3), 289.

An analysis of longissimus dorsi (two positions), biceps femoris, glutens medius, and rectus femoris muscles from 16 charolais—Hereford cross bred and 16 Hereford straight-bred heifers on supplements of vitamin.

K. A. R.

- 9.63 *Lipids of raw and cooked ground beef and pork*, ADA MARIE CAMPBELL AND PIRKKO R. TURKKI, *J. Fd Sci.*, 1967, **32** (2), 143.

The extracted lipids were fractionated into phospholipids and neutral lipids. Phospholipid concentration was higher in cooked meat than in raw meat. Fatty acid patterns of lipids were similar in raw and cooked meat except that the linoleate in phospholipid fatty acids was higher in cooked pork than in raw pork.

J. V. S.

- 9.64 *Effect of additives and refrigeration on reducing activity, metmyoglobin and malonaldehyde of raw ground beef*, BOBBIE K. HUTCHINS, THERESA H. P. LIU AND BETTY M. WATTS, *J. Fd Sci.*, 1967, **32** (2), 214.

The effect of chlortetracycline (CTC), oxytetracycline (OTC), and refrigerator storage temperatures on metmyoglobin (Met Mb), reducing activity (MRA) and oxygen utilising capacity (OUC) of ground raw beef was investigated.

A. A.

- 9.65 *Post-mortem changes in protein extractibility in beef, pork and chicken muscle*, ELAINE NELSON MCINTOSH, *J. Fd Sci.*, **32** (2), 208.

There was a general increase in viscosity and N₂ content of the extracts with ageing. Extractibility of N₂ and actomyosin was maximum at 2 weeks in both beef and pork. In chicken, maximum N₂ and actomyosin extractibility occurred at 4 and 6 days respectively. Thus in pork as well as in beef, 2 week's ageing apparently is required to complete post-mortem changes in muscle proteins.

A. A.

- 9.66 *Effect of post-mortem ageing and enzyme tenderisers on mucoprotein of bovine skeletal muscles*, ELAINE NELSON MCINTOSH, *J. Fd Sci.*, 1967, **32** (2), 210.

The effects of post-mortem ageing as well as papain were similar; the mucoprotein products isolated from treated muscles showed lowered viscosity, various degrees of ultra filterability, changes in characters of precipitants formed and decrease in glucosamine-galactosamine ratio. Following post mortem ageing a portion of protein became extractible by KCl.

J. V. S.

- 9.67 *Effect of cookery and holding on hams and Turkey rolls contaminated with Clostridium perfringens*, DOROTHY H. STRONG AND NANCY M. RIPP, *Appl. Microbiol.*, 1967, **15** (5), 1172.

Canned hams, Turkey rolls, and ground beef Cassaroles were inoculated with a mixture of vegetative cells and spores of selected strains of *Clostridium perfringens* in approximately known numbers. Small but measurable percentage of the organisms were found to survive cooking. The number of cells viable after cookery of the ham or Turkey was influenced by the position of the slice of meat

on the roast as well as by the final temperature to which the product was heated.

B. S. N.

- 9.68 *Effect of refined menhaden oils on the flour and fatty acid composition of broiler flesh*, DAVID MILLER, EDWARD H. GRUGER, JR., KAM C. LEONG AND GEORGE M. KNOBL, JR., *J. Fd Sci.*, 1967, **32** (3), 342.

Three menhaden oil preparations—(1) destearinated, (2) molecular distilled triglycerides, and (3) ethylesters of menhaden fatty acids—were fed to broilers at 4 per cent level to determine their effect on the flavour and fatty acid composition of the flesh. Corn oil and tallow were fed as controls. The flavour contributing components in the menhaden oil preparations apparently resided in the fatty acids regardless of whether the preparations were fed as the triglyceride or as the ethyl ester.

A. A.

- 9.69 *Heat induced changes of moisture in Turkey muscle*, P. G. ROBERS, G. E. GOERTZ AND D. L. HARRISON, *J. Fd Sci.*, 1967, **32** (3), 298.

Effects of end point temperature in unheated (10°C) muscle and muscle heated (dry heat, 176°C) to 25, 36, 45, 55, 65°C on moisture measured by selected methods, Warner-Bratzer shear values, and pH values of breasts and thigh legs from Turkeys were investigated. Rate of heat penetration temperature differentials and post-oven temperature increases of breasts and thighs were also noted.

K. A. R.

- 9.70 *Fatty acid composition of Turkey meat as affected by dietary fat, cholesterol and diethylstilbestrol*, R. A. CHUNG, Y. C. LIEN AND R. A. MUNDA, *J. Fd Sci.*, 1967, **32** (2), 169.

Diethylstilbestrol (BES) increased the total lipid content of Turkey breast, thigh and skin whether a corn oil (CO) or hydrogenated coconut oil (HCO) diet was consumed. The effect of DES, cholesterol (C) or DES+C was greater with the HCO diet than with the CO diet. The total poly-unsaturated acid content of the breast of Turkeys on the HCO control diet and on the CO control diet was the same but was greater in the thigh and skin lipids of turkeys on the CO control diet, primarily due to the greater linoleate concentration.

A. A.

- 9.71 *Characterisation of phosvitin from hen egg yolk*, N. RAMACHANERAN AND K. S. V. SAMPATH KUMAR, *Indian J. Biochem.*, 1967, **4** (4), 210.

Phosvitin was isolated in a pure form from the lipovitelline complex of hen egg yolk. The protein yields a single symmetrical peak on DEAE—cellulose column chromatography. Its purity has further been confirmed by disc electrophoresis on polyacrylamide gel and sedimentation velocity runs in the analytical centrifuge. Phosvitin forms aggregates during storage in cold.

A. A.

- 9.72 *Biochemical and quality changes occurring during freezing of poultry meat*, A. W. KHAN AND L. VAN DEN BERG, *J. Fd Sci.*, 1967, **32** (2), 148.

Freezing of chicken showed small but detectable changes in eating quality, and changes in muscle proteins during freezing depended on freezing rate. Freezing caused significant changes in the odour of uncooked breast and leg meat and a decrease in tenderness of leg met. Quick freezing seems to preserve the integrity of muscle proteins better than slow freezing.

J. V. S.

- 9.73 *Estimation of inosinic acid in chicken muscle and its formation and degradation during post-mortem ageing*, J. DAVIDEK AND A. W. KHAN, *J. Fd Sci.*, 1967, **32** (2), 155.

A new method was developed for extraction, separation and UV spectrophotometric assay of ribonucleotides and their derivatives in chicken muscle (mean error in duplicate assays, ± 2 per cent; recoveries were within ± 6 per cent of amounts added). The results suggested that inosinic acid was formed due to the breakdown of ATP between slaughter and onset of *rigor mortis*. During prolonged ageing (over 24 hr) or ageing in slush ice, the inosinic acid content of muscle decreased.

J. V. S.

9.74 *The effects of cooking on the chlorinated hydrocarbon pesticide residues in chicken tissues*, S. J. RITCHEY, R. W. YOUNG AND E. O. ESSARY, *J. Fd Sci.*, 1967, **32** (2), 238.

DDT and lindane were fed separately and in combination at levels of 0.2 and 2.0 p.p.m., to chickens during a growing period of 9 weeks. Pesticides in the tissues were reduced considerably on cooking, baking or frying. DDT, DDE, and Kelthane were present in the control and cooked carcasses, but DDD was found only in the cooked birds.

A. A.

9.75 *Studies on fish lipids. I. Fatty acid composition of lipids of marine fish as determined by GLC*, K. GOPAKUMAR AND M. RAJENDRANATHAN NAIR, *Indian J. Biochem.*, 1967, **4** (4), 229.

GLC has been used for identification and estimation of fatty acids in the body fat of pomphret, mackerel, kilimin and Jew fish. The last two types of fishes contain large amounts of C_{18} acids. Eicosapentaenoic ($C_{20:5}$) and docosahexaenoic ($C_{22:6}$) are the dominant polyunsaturated acids. In mackerel and pomphret the polyunsaturated acids are higher in phospholipids than in non-phosphorylated lipids.

J. V. S.

9.76 *Studies on salting and drying fish. I. Equilibrium considerations in salting. II. Dynamic aspects of salting of fish*, F. R. DEL VALLE AND J. T. R. NICKERSON, *J. Fd Sci.*, 1967, **32** (2), 173, 218.

I. The following variables were determined at equilibrium between fish muscle and brine, all as functions of the salt concentration in the brine; salt concentration in the muscle based on the volume of the muscle; salt concentration in the tissue water of the muscle and distribution co-efficient of salt between muscle tissue water and brine. Secondary variables which further described the salting equilibria were also found as functions of salt concentrations in the brine as follows, all based on unit weight of non-salt solids in the salted muscle: weight of salt (S/NSS), weight of water (W/NSS) and volume (V/NSS).

II. The diffusion co-efficient for penetration of salt into sword fish muscle was not constant but dependent upon the salt concentration in the muscle and upon temperature; the co-efficient salt concentration curve for 25°C had a minimum value at a salt concentration of approx. 1.5 moles/liter and was always lower in fish muscle than in aqueous salt solutions of the same salt concentration as the muscle. As in aqueous solution, the diffusion co-efficient and the equivalent conductance of salt in fish muscle were found to increase with increasing temperature.

A. A.

9.77 *Time temperature effects on the bacteriological quality of stored shell fish. I. Bacteriological changes in live shell fish: Pacific oysters (*Crassostrea gigas*), Olympia oysters (*Ostrea lurida*), Native littleneck clams (*Protothaea staminea*) and Manila clams (*Venerupis japonica*)*, J. C. HOFF, W. J. BECK, T. H. ERICKSEN, G. J. VASCONCELOS AND M. W. PRESNELL, *J. Fd Sci.*, 1967, **32** (1), 121.

The effects of storage at 10, 20 and 27.5°C on the bacteriological quality and pH of living oyster and clam shellstock was studied. Bacteriological indices used were coliform MPN, fecal coliform

MPN, and 35°C plate counts. No distinct seasonal patterns in bacteriological changes were found. The 35°C plate count showed the most consistent response; coliform MPN changes were less consistent and patterns of change were different in different species; and fecal coliform MPN showed the greatest stability, with increases occurring only at 27.5°C.

A. A.

10. Milk and Dairy Products

10.15 *Casein components soluble in chloroform-methanol 2:1 and fifty per cent aqueous ethanol*, J. CERBULIS AND J. H. CUSTER, *J. Dairy Sci.*, 1967, **50** (9), 356.

Chloroform-methanol (2:1) extracted approximately 2 per cent of protein from acid precipitated casein. This soluble fraction was identical with that obtained by 50 per cent aqueous ethanol extraction. γ -casein and temperature sensitive casein are the major components in the soluble casein fraction. Six more minor components, including three in casein group, are also present.

A. A.

10.16 *Effect of temperature on stability of hydrogen peroxide in milk*, V. M. AMIN AND N. F. OLSON, *J. Dairy Sci.*, 1967, **50** (8), 1336.

The percentage of H_2O_2 which decomposed varied with the type of media and temperature of storage. Hydrogen peroxide was most stable in redistilled water showing only slight decomposition at the highest temperature; catalase and lacto-peroxidase in the raw milk were responsible for a portion of the destruction and their effects were maximum in raw milk at 37.8 and 48.9°C during the first 6 min. of storage. Levels of decomposition in raw milk stored at 54.4 and 57.2°C were similar to those in sterilised milk held at the same temperature. The data suggest that 37.8°C is not a satisfactory temperature for treating raw milk for cheese making since significant destruction of H_2O_2 occurs.

K. A. R.

10.17 *Determining cleanliness of milk contact surfaces by analysing for calcium residues: Preliminary studies*, J. V. HEINZ AND R. T. MARSHAL, *J. Milk Fd Technol.*, 1967, **30** (11), 337.

The mean residual concentration of calcium on milk contact surfaces after control cleaning was 0.07 mg./100 cm². If the residual calcium limit exceeded 0.08 mg./100 cm² the indications were towards insufficient cleaning.

J. V. S.

10.18 *The fate of Salmonellae in the manufacture of cottage cheese*, F. E. MCDONOUGH, R. A. HARGROVE AND R. P. TITTLER, *J. Milk Fd Technol.*, 1967, **30** (11), 354.

Effects of cooking temperatures (110 to 130°F) during the manufacture of cottage cheese. *Salmonellae* survived 110 and 115°F in all trials and at 120°F in 1 of 5 trials. None survived at 125°F. Creamed cottage cheese inoculated with *Salmonella* and stored at 40°F did not show any marked decrease in numbers during storage.

J. V. S.

10.19 *Sialic acid and hexose contents of proteose peptone of milk in relation to other milk proteins*, N. C. GANGULI, S. K. GUPTA, V. K. JOSHI AND V. R. BHALERAO, *Indian J. Dairy Sci.*, 1967, **20** (2), 96.

Sialic acid content of proteose and proteose-peptone of cow's milk and buffalo milk were 33.6, 24.1, 11.5 and 9.6 mg/g. respectively. Nearly 80 per cent sialic acid was present in casein, the rest being distributed in whey protein and proteose-peptone. Proteose and proteose-peptone contained 2.78 per cent and 2.30 per cent hexose in cow's milk with 1.09 and 0.80 per cent as corresponding values for buffalo milk.

B. S. N.

- 10.20 *Studies on the changes of the milk casein by various treatments. V. Identification of volatile carbonyl compounds from heated casein solution*, TAKEO NAKANISHI AND TAKATOSHI ITOH, *Agric. Biol. Chem., Japan*, 1967, **31** (9), 1066.

The volatile carbonyl compounds generated in casein solution heated at 140°C for 60 minutes were isolated as 2, 4,—dinitrophenyl hydrazone derivatives. The mixture of derivatives was fractionated into 8 derivatives by column chromatography and preparative thin layer chromatography. Compounds identified were ethanol, propanol, 2 methylpropanol, 3-methylbutanol.

A. A.

- 10.21 *Studies on serological detection of cow-milk added to buffalo milk*, SUDARSHAN SINGH MALIK AND P. G. NAIR, *Indian J. vet. Sci.*, 1967, **37** (4), 207.

- 10.22 *Studies in stability of protein dispersions in milk. III. Effect of electrolytes*, BALWANT RAI PURI AND K. K. TOTEJA, *Indian J. Dairy Sci.*, 1967, **20** (2), 63.

Anions at lower concentrations are preferentially absorbed, raising the stability of casein dispersions, the effect increasing with increase in the value of the anion and decreasing with increase in the valency of the cation of the electrolyte under examination. The exchange of calcium by sodium or potassium in the colloidal complex protects the sol only slightly. Addition of organic liquids miscible in water, cause sensitization of milk almost in proportion to their capacity to lower surface tension.

A. A.

- 10.23 *Bacterial inhibitors in milk and other biological fluids*, B. REITER AND J. D. ORAM, *Nature, Lond.*, 1967, **216**, (5113), 328.

Review. 34 references.

11. Coffee, Tea and Cocoa

- 11.4 *Volatile constituents of coffee. Pyrazines and other compounds*, H. A. BONDAROVICH, PAUL FRIEDEL, VICTOR KRAMPL, J. A. RENNER, F. W. SHEPHARD AND M. A. GIANTURIO, *J. agric. Fd Chem.*, 1967, **15** (6), 1092.

Spectral and/or GLC data of a number of constituents of the aroma complex of roasted coffee are reported. The probable importance of pyrazines (and dihydropyrazines) for the flavour of roasted, or otherwise cooked foods is indicated.

B. S. N.

- 11.5 *Volatile flavour of black tea. I. Formation of volatile compounds during black tea manufacture*, RYOYASU SAIJO AND YOSHIO KUWABARA, *Agric. Biol. Chem., Japan*, 1967, **31** (4), 389.

Gas chromatographic analysis reveals that fresh leaf is rich in alcohols, while aldehydes and acids predominate in black tea. Fermentation resulted in increase of n-capronaldehyde (4.1 times after 3 hours fermentation), trans-2-hexen-1-al (13.2 times) and cis-3-hexenoic acids (1.2 times) and decrease of n-hexylalcohol (0.7 times), cis-3-hexen-1-ol (0.7 times) and methyl salicylate (0.8 time).

B. S. N.

- 11.6 *Volatile flavour of black tea. II. Examination of first fraction effluents in gas chromatography*, RYOYASU SAIJO, *Agric. Biol. Chem., Japan*, 1967, **31** (11), 1265.

The first effluent of essential oil of black tea in the GC analysis is important for characterizing black tea flavour. The isolation and identification of main unknown components were done by GC, IR and UV spectra. Ethyl acetate, ethyl alcohol and β -myrcene were identified as the increasing compounds during fermentation. Cis- β -ocimene and trans- β -ocimene were also identified only in completely manufactured black tea. These three terpenoid hydrocarbons are newly found constituents of essential

oil of black tea and are supposed to contribute considerably to the black tea flavour.

A. A.

- 11.7 *Improvements in the extraction of cocoa butter*, CAYETANO EZQUERRA LARREINA, *Oleagineux*, 1967, **22** (10), 617.

Article gives a resume of experiments on the improvements in industrial processing of cocoa. Composition of cocoa seed (water, nitrogenous substances, theobromine and fat), losses during roasting and shelling; and different procedures for use of cocoa are also given.

J. V. S.

12. Food Additives

- 12.12 *Effect of salt additives on detinning of canned spinach*, VICTOR N. LAMBETH, M. L. FIELDS AND J. R. BROWN, *Fd Technol. Champaign*, 1967, **21** (11), 1516.

Addition of nitrate-N to 2.5 per cent brine solution at 100 to 200 p.p.m., levels, as well as KCl and K₂SO₄ at 2000 p.p.m. levels increased the detinning of tin plate in canned spinach stored at 91°F for 9 months. However, detinning was not increased by the addition of these salts at storage temperatures of 74-78°F.

J. V. S.

- 12.13 *Acetylated monoglycerides as coatings for foods*, GERALD T. LUCE, *Fd Technol. Champaign*, 1967, **21** (11), 1462.

Preparation, properties, methods of application to food stuffs and the resultant coatings are discussed.

J. V. S.

- 12.14 *Effect of DPPD and ethoxyquin on muscular dystrophy of carp induced by oxidised saury oil*, TAKESHI WATANABE, TAKAO TSUCHIYA AND YOSHIRO HASHIMOTO, *Bull. J. Soc. sci. Fish.*, 1967, **33** (9), 843.

The antioxidants, DPPD (N, N'-diphenyl-p-phenylenediamine) and ethoxyquin did not counteract the action of oxidised saury oil; the former killed carp in 30-40 days, at a level of 250 mg per cent. When kept on a diet containing 120 mg. per cent of methylene blue, carp showed a typical sign of the disorder in 7 days and the rate of diseased fish exceeded 90 per cent in 20 days. A high blood sugar level was observed in the lots, in which fish showed a high percentage of muscular dystrophy.

A. A.

- 12.15 *Safety evaluation of flour treated with acetone peroxides*, B. L. OSER AND K. MORCARCIDGE, *Fd Cosmet. Toxicol.*, 1967, **5** (3), 309.

Bread made from flours treated with graded amounts of acetone peroxide (0.003-0.045 per cent as H₂O₂ equivalents) as bleaching and maturing agents was fed as major dietary components to rats for 2 years and dogs for 1 year. The parameters used in this study failed to show any adverse effects attributable to flour treatment used.

J. V. S.

- 12.16 *Cyclamates: comparable sweetening effects*, *Br. Fd J.*, **69**, (820), 177.

General.

- 12.17 *A study of the true taste of saccharin*, C. P. RADER, S. G. TIHANYI AND F. B. ZIENTY, *J. Fd Sci.*, 1967, **32** (3), 357.

High purification of saccharin did not diminish the bitterness and after taste. Numerous purification methods and the presence of sequestering agents failed to diminish the bitterness; after taste may be the true property of saccharin.

K. A. R.

- 12.18 *The use of nisin for shortening heat treatment in the preservation of green peas*, K. VAS, I. KISS AND N. KISS, *Br. Fd J.*, 1967, **69** (820), 136.

Nisin (5 mg/kg. crystalline nisin) in combination with heat treatment at 113°C and holding time of 10-15 minutes improves the quality of preserved green peas to have fresh colour by avoiding separation of starch and turbidity development in brine.

B. S. N.

12.19 *Derivatives of sorbic acid as food preservatives*, JOHN A. TROLLER AND ROBERT A. OLSEN, *J. Fd Sci.*, 1967, **32** (2), 228.

Two derivatives, sorbohydroxamic acid and sorbic acid aldehyde were more effective than the parent acid in limiting growth of moulds. Sorbic acid aldehyde was not suitable because of undesirable odour and flavour. Sorbohydroxamic acid was suitable as a preservative in many respects and its effects *in vitro* was confirmed in many food systems.

J. v. s.

12.20 *Physiological and histological changes in rats fed benzoic acid*, H. KREIS, K. FRESE AND G. WILMES, *Fd Cosmet. Toxicol.*, 1967, **5** (4), 511.

At a 3 per cent dietary level for 5 days, benzoic acid retarded growth and caused neurological disorders. Brain damage was histologically demonstrable. The changes occurred consistently after 5 days and occasionally after 3 days. Feeding of 1.1 per cent benzoic acid for 35 days retarded growth and impaired food utilisation, but did not induce any neurotoxic or pathological changes in brain.

J. v. s.

12.21 *Excretion of BHT and BHA by man*, J. W. DANIEL, J. C. GAGE, D. I. JONES AND M. A. STEVENS, *Fd Cosmet. Toxicol.*, 1967, **5** (4), 475.

After a single oral dose of [¹⁴C] BHT to man, about 70 per cent of the administered radio activity was excreted in the urine; with [¹⁴C] BHA the proportion excreted was 80-90 per cent. Kinetics of excretion of BHT and BHA are different.

J. v. s.

12.22 *Vanilla*, J. DE VRIES, *Fd Technol. Aust.*, 1967, **91** (12), 562.

Cultivation, curing, extraction and uses of vanilla.

12.23 *Alginates—The versatile modifying agents for foods*, J. G. KRIGSMAN, *Fd Technol. Aust.*, 1967, **19** (12), 556.

13. Food Analysis

13.15 *A method to determine very low α -amylase activities*, VON S. WINKLER AND G. LUCKOW, *Starke*, 1967, **19** (6), 159.

A colorimetric method has been developed for the quantitative determination of the α -amylatic or amylolytic effect by visual comparison of the different degradation stages of starch in this amyloscope, using corresponding standard colours. This can also be used to determine amylolytic effects of yeasts. The average deviation of the method at very low concentration of enzyme is 3-4 per cent of the enzymatic activities.

K. A. R.

13.16 *Studies concerning starch-complexed protein. 1. Spectrophotometric determination of free amino groups and total nitrogen*, S. ROGOLS AND J. E. GREEN, *Starke*, 1967, **19** (6), 169.

The starch-complexed-protein, being rich in free amino acids lends itself readily to a spectrophotometric technique whereby ninhydrin may be complexed to yield colour formation. By using predetermined standard curves and following this technique it is possible to determine the small differences in protein content in a large number of starch samples.

K. A. R.

13.17 *Development of a shearing strength measuring head for the maturity tester of Professor Schneider*, H. SCHULZ, *Nahrung*, 1967, **11** (5), 435.

Describes an additional measuring head for the maturity tester of Professor Schneider which permits to determine the shear

resistance of tissues from fruits, vegetables and root crops in the range from 0.200 to 17.000 Kp./cm² of shearing surface. The maximum variation of values obtained is less than 2 per cent and depends only on the biological differences of the tissue under investigation.

A. A.

13.18 *Amino acid analysis of cereal flour proteins*, J. A. D. EWART, *J. Sci. Fd Agric.*, 1967, **18** (11), 548.

Amino acid analyses have been made on flours of wheat, rye, barley, oats and maize. Wheat protein differs from the other flours in its higher capacity for polar and H-bonds and lower content of salt links. Other factors such as SS interchange potential may be more important than the pattern of inter molecular forces since the latter do not change much from rye to barley in spite of their rheological differences. The factors for conversion of nitrogen to protein are, in the order, 5.7, 5.8, 5.8, 5.7, 5.9.

A. A.

13.19 *Polarographic determination of hydroperoxides in oils*, A. NIEDERSTEBRUCH AND I. HINSCH, *Fette Seifen Anstrmittel*, 1967, **69** (9), 637.

The polarographic method has advantages like specificity for hydroperoxide, quickness, and sensitivity to detect even small amounts. Accuracy of the method as compared to chemical method is ± 3 per cent and when the hydroperoxide content is small ($<10^{-5}$ -mol/l) it is ± 10 per cent.

J. v. s.

13.20 *Determination of difolatan residues in fruits by electron-capture gas chromatography*, WENDELL W. KILGORE AND EARL R. WHITE, *J. agric. Fd Chem.*, 1967, **15** (6), 1118.

A procedure for the extraction and determination of difolatan residues on fruits is presented. The residues are extracted with benzene and analysed by electron-capture gas chromatography. Clean up of the extracts is necessary only when a high degree sensitivity is required. The technique is applicable to a variety of stone fruits, and as low as 0.01 p.p.m. of residue can be detected. Recovery values obtained from fortified control samples averaged 93 per cent.

B. S. N.

13.21 *Systematic analysis of natural waxes with the help of ion-exchange, column and thin layer chromatography*, G. H. SCHULZ, *Fette Seifen Anstrmittel*, 1967, **69** (8), 565.

The hydrocarbons were separated by adsorption chromatography on silica gel/CS₂ column and the separation of the acids from alcohol was achieved on a 2-phase ion-exchange column after saponification. The isolation of the individual homologues (C16-C32) from the alcohol and acid mixtures was carried out with the help of reversed phase column chromatography by step wise increase in temperature and acetic acid fermentation.

A. A.

14. Food Microbiology and Fermentation

14.13 *International microbiological standards for foods*, M. T. BARTRAM, *J. Milk & Fd Technol.*, 1967, **30** (11), 349.

14.14 *Bacteriological survey of the frozen prepared foods industry*, BERNARD F. SURKIEWICZ, RALPH J. GROOMES AND ADRIANO P. PADRON, *Appl. Microbiol.*, 1967, **15** (6), 1324.

2544 finished products from 29 potato processing firms were bacteriologically examined to assess the sanitary and clean atmosphere and conditions under which they were processed. French fries, fried potato cylinders and frozen stuffed baked potato products appear to be processed under none too happy sanitary conditions.

B. S. N.

- 14.15 *Continuous propagation of Trichosporon cutaneum in cheese whey*, CAVIT ATKIN, L. D. WITTER AND Z. JOHNORDAL, *Appl. Microbiol.*, 1967, **15**, (6), 1338.
- Trichosporon cutaneum*, a non-fermenting yeast, was used to convert cheese lactose into microbial cell material. The doubling time for this organism in a laboratory scale continuous propagator was 2 hr in a whey medium fortified with ammonium sulfate and corn steep liquor. Cellular growth and efficiency of conversion of lactose to cell material was higher than with *Saccharomyces fragilis* when grown in whey, the nitrogen content of *T. cutaneum* was 3.5 per cent and the distribution of amino acids per gram of cell protein was similar to that of commercial food yeasts.
- A. A.
- 14.16 *Effects of supplemental calcium or calcium binding agents on staphylococcal bacteriophage proliferation of skim milk*, N. K. DAS AND R. T. MARSHALL, *Appl. Microbiol.*, 1967, **15** (6), 1479.
- Additions of 0.0005 N calcium borogluconate to trypticase soy broth (TSB) produced an increase in phage titer about 1 million fold, whereas its addition to skim milk resulted in about a 100 fold decrease in the maximal titer. Supplemental calcium had a stimulatory influence on bacterial growth in TSB but not in skim milk. Studies were made of the effect of binding of calcium of skim milk on the proliferation of staphylococcal bacteriophage. Sequestering the calcium with 2 per cent phosphate mixture inactivated the phages without affecting the bacterial growth. However, chelation of calcium by 0.012 per cent ethylene diaminetetracetic acid produced an inhibitory effect on both the phages and the bacteria.
- B. S. N.
- 14.17 *Color development in Israeli miso type products and its possible use for quality control*, J. ILANY-FEIGENBAUM AND S. LAXER, *Fd Technol. Champaign*, 1967, **21** (11), 1527.
- The dark brown colour of Japanese miso and Israeli miso type products develops with length of fermentation. The brown color can be developed in a much shorter time by stimulating the fermentation with *koji* or the enzymes. The browning is suggested to be due to the interaction of the products of proteolytic enzymes with the amylases of *koji* and of its extracted enzymes of taka-diaxase.
- J. V. S.
- 14.18 *Hygiene in the factory*, G. A. THOMAS, *Fd Mf.*, 1967, **42** (10), 39.
- Review. 26 references.
- 14.19 *Food Microbiology: a world view of botulism*, *Br. Fd J.*, 1968, **70** (822), 23.
- A report of symposium held in Moscow.
- 14.20 *Hands and food hygiene: Recent research*, C. R. A. MARTIN, *Br. Fd J.*, 1967, **69** (819), 113.
- General.
- 14.21 *Yeast flora of cider factories*, J. F. BOWEN AND F. W. BEECH, *J. appl. Bact.*, 1967, **30** (3), 475.
- Data are presented to demonstrate the sequence of changes in yeast flora, before and after harvesting and storage, after pressing the fruit for cider.
- A. A.
- 14.22 *Examination of market foods for coliform organisms*, HERBERT E. HALL, DAVID F. BROWN AND KETH H. LEWIS, *Appl. Microbiol.*, 1967, **15** (5), 1062.
- About 490 different types of food samples collected from market were examined microbiologically. *Escherichia coli* (enterogenic) was detected in 0.6 per cent of the specimens. Except in materials having high load of natural flora, a limit of 100,000/g. of material was suggested.
- B. S. N.
- 14.23 *Enzymatic detection of the growth of Staphylococcus aureus in foods*, W. R. CHESBRO AND K. ANBORN, *Appl. Microbiol.*, 1967, **15** (5), 1150.
- A specific method for extraction and estimation of Staphylococcal nuclease in foods. Nuclease analysis does not require any unusual equipment and may be completed in 3 hours.
- B. S. N.
- 14.24 *Immunofluorescence technique for detection of Salmonellae in various foods*, N. F. INSALATA, S. J. SCHULTE AND J. H. BERMAN, *Appl. Microbiol.*, 1967, **15** (5), 1145.
- Salmonella* species have been detected in 9 food varieties by use of fluorescent antibodies without false-positive or false-negative results. Use of this technique permits a decrease of 24 hr in time normally required for *Salmonella* detection when compared with cultural *Salmonella* recovery methods.
- B. S. N.
- 14.25 *Combined effect of water activity, pH and temperature on the growth of Clostridium botulinum from spores and vegetative cell inocula*, A. C. BAIRD-PARKER AND BARBARA FREAME, *J. appl. Bact.*, 1967, **30** (3), 420.
- The combined effects of pH and salt concentration on the initiation of growth by *Cl. botulinum* spores may prove useful in reducing botulism hazards in foods. As seen in this study, at pH levels that could be achieved with a variety of foods, quite low concentrations of salt will prevent the development of spores into vegetable cells and hence toxin production.
- A. A.
- 14.26 *Occurrence of Bacillus subtilis with high heat resistance*, HENRIETTE M. C. PUT AND W. IJ. ALBERSBERG, *J. appl. Bact.*, 1967, **30** (3), 411.
- The heat resistance of spores of *B. subtilis* strain Bac 1-11, isolated from processed fried rice, and strain Bac 1-12, isolated from processed evaporated milk has been determined. The calculated $D_{112.5}$ of spores of Bac 1-11, in M/40 phosphate buffer (pH 6.8) and in fried rice (pH 6.4) was 4.2 min and 4.5 min ($Z=18$ and 20 resp.), respectively. The calculated $D_{112.5}$ of spores of Bac 1-12, in M/40 phosphate buffer (pH 6.8) and in evaporated milk (pH 6.4) was 5.0 min. and 6.7 min. ($Z=18$ and 23 resp.), respectively. The extrapolated D 12 values were 0.57, 0.76, 0.71 and 1.45 min. respectively.
- A. A.
- 14.27 *Phytase from Bacillus subtilis*, V. K. POWAR AND V. JAGANNATHAN, *Indian J. Biochem.*, 1967, **3** (4), 185.
- The enzyme which liberates inorganic phosphate from phytate has been obtained from culture filtrates of *B. subtilis* and is purified 50-fold. It specially requires Ca^{2+} for its activity.
- J. V. S.
- 14.28 *Antimicrobial action of citrus oils*, M. S. SUBBA RAO, T. C. SOUMITHRI AND R. SURYANARAYANA RAO, *J. Fd Sci.*, 1967, **32** (2), 225.
- The inhibitory effect of essential oils of orange and lemon oil and the antibiotics tylosin and nisin was tested on bacteria and fungi in nutritive media. Though the degree of inhibition varied with cultures, orange oil was a more powerful anti-microbial agent than lemon oil. All other conditions being equal, 2000 p.p.m. of orange oil had an effect similar to 10 p.p.m. of tylosin on all gram +ve cultures including spores of *B. subtilis*. The possibility of using orange oil as a preservative in foods is indicated.
- A. A.
- 14.29 *Effect of pH on fungal metabolites used as indicators of quality of foods*, M. L. FIELDS AND B. RICHMOND, *J. Fd Sci.*, 1967, **32** (2), 235.

- 14.30 *Causes of can swelling and blackening of canned baby clams. II. Bacterial action involved in can swelling and blackening of baby clams*, EICHI TANIKAWA, TERUSHIGE MOTOHIRO AND MINORU AKIBA, *J. Fd Sci.*, 1967, **32** (2), 231.

Six strains of bacteria (3 involved in blackening, 2 in swelling and one in both blackening and swelling) were isolated from blackened meat of baby clams in swelled cans. Spoiled clams seldom contained only one species of causative bacteria. Both meal blackening and can swelling may possibly occur in the same pack of canned baby clams.

J. V. S.

15. Toxicology

- 15.13 *Production of carcinogenic polynuclear hydrocarbons in the cooking of food*, W. LIJINSKI AND A. E. ROSS, *Fd Cosmet. Toxicol.*, 1967, **5** (3), 343.

The effect of variation in methods of cooking meat on the content of benzo (a) pyrene content as high as 50/ μ g./kg was found in one instance. The hydrocarbons seemed to arise from pyrolysis of fat, the amount produced increasing with increased fat content, longer exposure of the food to the flames and closeness to the heat source. None of the higher hydrocarbons including benzo (a) pyrene was produced when heat source was above the food or when the dripping of melted fat on to the heat source was prevented.

A. A.

- 15.14 *The purity of aflatoxin G₁ and use of antioxidants and chelating agent on the purification of the toxin by thin layer chromatography*, TAI-WAN KWAN AND JOHN C. HYRES, *J. Chromatog.*, 1967, **31** (2), 420.

During the purification of aflatoxin G₁ by TLC, about 10 additional modified toxins are separated as fluorescent bands. Use of BHT in developing and eluting solvents and EDTA in preparation of TLC plates and conducting the entire work in a dark room prevented such undesirable changes of toxin. Crude G₁ is yellowish in visible light and emits a green fluorescence by u.v. irradiation. Upon further purification it becomes colorless in visible light and a light blue fluorescent compound under u.v. light. During purification, the ratio of absorbance at 360 m μ or 366 m μ to that at 264 m μ changes from about 2 to 0.5. The high absorbance in the region of 360 m μ for the crude toxin is apparently due to an unknown yellow impurity.

A. A.

- 15.15 *Acute toxicity of aflatoxins M₁ and M₂ in one day old ducklings*, I. F. H. PURCHASE, *Fd Cosmet. Toxicol.*, 1967, **5** (3), 339.

The acute toxicity of aflatoxins B₁, M₁ and M₂ in one day old Pekin ducklings was estimated to be 12, 16 and 61.4 μ g./duckling. Single doses of each of these three aflatoxins produced similar free liver lesions. Whereas a high dose produced extensive haemorrhagic necrosis with little or no bile-duct proliferation, an intermediate dose produced slight bile duct proliferation and varying degrees of hepato cellular necrosis and a low dose caused considerable bile-duct proliferation and extensive degenerative changes in liver cells. Renal congestion at low doses of M₁ and M₂ was accompanied by degenerative changes (vacuolation) of the convoluted tubules but frank necrosis was seen only with M₁. Aflatoxin B₁, even in a high dose, induced only slight degenerative changes of the tubules. None of the aflatoxins produced glomerular damage.

A. A.

- 15.16 *Effect of heat on aflatoxins in oilseed meals*, G. E. MANN, L. P. CODIFER, JR. AND F. G. DOLLEAR, *J. agric. Fd Chem.*, 1967, **15** (6), 1090.

A cotton seed meal containing aflatoxins was heated at atmospheric pressure to reduce the levels of these mycotoxins as

measured by thin layer chromatography. Temperature, period of heating, and moisture content of the meal were varied in these experiments. Heating at 60°C and 80°C did not lead to marked reductions in aflatoxin levels. More definite reductions were obtained at 100°C, greater decreases taking place with increasing periods of heating and increasing moisture contents. The lowest level of aflatoxins B₁ plus B₂ achieved practically was about 44 p.p.b. obtained by heating for 120 minutes at 100°C with a moisture content of 20 per cent. This represented about 80 per cent reduction in the 214 p.p.b. aflatoxins present in the unheated cottonseed meal. About 34 per cent reduction in aflatoxins (111 to 73 p.p.b.) was obtained when a contaminated peanut meal was heated in a similar manner.

A. A.

- 15.17 *Inhibition of aflatoxin synthesis by p-amino benzoic acid, potassium sulfite and potassium fluoride*, NORMAN D. DAVIS AND URBAN L. DIENER, *Appl. Microbiol.*, 1967, **15** (6), 1517.

Aspergillus parasiticus Speare var. *globosum* Muria kami (*A. flavus* ATCC 155) was used in these studies. Aflatoxin elaboration was reduced upto 50 per cent in peanuts soaked in p-amino-benzoic solution. This inhibition may be due to competitive or feed back inhibition in one of the enzymes involved. Complete inhibition of aflatoxin occurred by potassium sulfite at 1 per cent level, whereas potassium fluoride did so at very high concentrations.

B. S. N.

- 15.18 *Aflatoxin in milk*, RUTH ALLCROFT, B. A. ROBERTS AND W. H. BUTLER, *Fd Cosmet. Toxicol.*, 1967, **5** (4), 597.

Review of work in progress.

- 15.19 *Invasion of peanut pods by Aspergillus flavus and other fungi in the presence of root-knot nematodes*, N. A. MINTON AND C. R. JACKSON, *Oleagineux*, 1967, **22** (8-9), 543.

The presence of the root-knot nematode, *Meloidogyne arenaria* increased the incidence of certain fungi in peanut shells and kernels. The abundance of *A. flavus* in peanut shells was significantly increased by the presence of *M. arenaria* in one test but not in a second one, despite a similar degree of infestation by the nematode in both tests. No reason for the difference in results is known. *M. arenaria* did not increase the incidence of *A. flavus* in the kernels in either test. *A. niger* was significantly more abundant in shells and kernels in the treatment receiving both *A. niger* and *M. arenaria* than in the treatment receiving only the fungus. *Sclerotium bataticola* was found only in the shells of *S. bataticola*+*M. arenaria* treatment. This fungus was not found in the kernels of any treatment.

The presence of *M. arenaria* resulted in an increase in numbers of total fungi (test fungi+contaminating fungi) in shells. The random occurrence of trace amounts of aflatoxins among treatments showed little relation to distribution of nematodes in shells and *A. flavus* in shells or kernels.

A. A.

- 15.20 *Comparative biological and biochemical studies in hybrid chicks. 2. Susceptibility to aflatoxin and effects on serum protein constituents*, R. B. A. CARNAGHAN, C. NANCY HERBERT, D. S. P. PATTERSON AND D. SWEASEYS, *Br. Poult. Sci.*, 1967, **8** (4), 279.

Hybrid 'A' chicks on being administered a single dose of aflatoxin, were found to be susceptible to its toxic effects leading to aflatoxicosis than 'B' type hybrid chicks. A reduction of 12.5 per cent in total protein content of susceptible group was found, although no consistent differences between the two groups could be observed between electrophoretic protein patterns or serum glycoprotein.

B. S. N.

- 15.21 *Aflatoxin production by Aspergillus flavus as related to various temperatures*, A. F. SCHINDLER, JOHN G. PALMER AND W. V. EISENBERG, *Appl. Microbiol.*, 1967, **15** (5), 1006.

Maximum production of toxin occurred at 24°C in *A. flavus* isolates cultured on wort media for 5 days, whereas maximal growth took place with temperatures of 29° and 35°C. Production of toxin was not linked either with temperature or growth rate of isolates. At 13°C, both isolates produced toxin in 3 weeks, while one of them did increase with increasing time.

B. S. N.

- 15.22 *Degradation of pure aflatoxin by Tetrahymena pyriformis*, DOROTHEA J. TENNISON AND JAMES A. ROBERTSON, *Appl. Microbiol.*, 1967, **15** (5), 1099.

Tetrahymena pyriformis W with nutrients, about 22×10^6 cells effected a reduction in concentration of aflatoxin B₁, 58 per cent in 24 hr and 67 per cent in 48 hr.

A. A.

- 15.23 *Acute and subacute oral toxicity of Alromine RU 100 in rats*, C. G. HUNTER AND D. E. STEVENSON, *Fd Cosmet. Toxicol.*, 1967, **5** (4), 491.

Alromine RU 100, used in food packaging materials is a mixture containing about 80 per cent (w/w) of the condensation products of diethanolamine and fatty acids and 20 per cent polyethylene glycol. Its acute oral LD₅₀ exceeded 3.2 g./kg. This study establishes a no-effect level for Alromine RU 100 of 0.1 per cent in the diet for 90 days equivalent to a rat intake of 60-70 mg/kg./day.

J. V. S.

- 15.24 *Short term feeding study of lauric diethanolamide in rats*, J. F. GAUNT, MADGE FARMER, P. GRASSO AND S. D. GANGOLLI, *Fd Cosmet. Toxicol.*, 1967, **5** (4), 497.

Lauric diethanolamide (LDE) [N, N'-bis (hydroxyethyl) lauramide] finds application in food packaging materials. After feeding studies, a no-effect level was established of 0.1 per cent LDE in the diet of rats for 90 days, a level equivalent to 50 mg./kg./day.

J. V. S.

16. Infestation, Pesticides and Fungicides

- 16.19 *Capric acid blended into food stuffs for control of an insect pest Tribolium confusum (Coleoptera: Tenebrionidae)* H. L. HOUSE AND A. R. GRAHAM, *Canad. Ent.*, 1967, **99** (9), 994.

Capric acid added to food stuffs—whole wheat flour and dried yeast to constitute 2.5 per cent or more of the food killed all *Tr. confusum* in 8 weeks. This material may be useful as a non-toxic insecticide.

J. V. S.

- 16.20 *Descriptions of larval and pupal stages of four lepidopterous rice borers in Malaysian Borneo*, G. H. L. ROTHSCHILD, *Bull. ent. Res.*, 1967, **57** (3), 343.

- 16.21 *The humidity responses of Trogoderma granarium Everts (Col., Dermestidae)*, U. YINON AND A. SHULOV, *Bull. ent. Res.*, 1967, **57** (3), 451.

Humidity responses of larvae and adults at different humidity gradients.

- 16.22 *The gas chromatographic determination of organophosphorus pesticides. II. A comparative study of hydrolysis rates*, J. H. RUZICKA J. THOMSON AND B. B. WHEALS, *J. Chromatog.*, 1967, **31** (1), 37.

The hydrolysis rates of organophosphorus pesticides are dependent upon their chemical structure and in pH 6.0 buffered solutions at 70° range from half lives of 0.5 hr to 4.0 days and longer still for phosphoramidates. At 20° the rates are several

hundred times slower. Oxidation of pesticides, where possible, usually results in decreased stability. Compared to highly stable, organochlorine pesticides, the toxic, phosphorus esters are undoubtedly less persistent, however, the rates of decomposition under uncatalysed conditions are still relatively slow. Contamination of surface waters by accident or misuse could result in long lived and potentially hazardous residues.

A. A.

- 16.23 *Gas chromatographic determination of captan residues*, WENDELL W. KILGORE, WRAY WINTERLIN AND ROBERT WHITE, *J. agric. Fd Chem.*, 1967, **15** (6), 1035.

A rapid procedure for the determination of captan [N-(tri-chloromethylthio)-4-cyclohexene-1, 2-dicarboximide] residues on apricots, peaches, tomatoes and cotton seed is presented. The residues are extracted with benzene or acetonitrile and analysed by electron capture gas chromatography. Residues as low as 0.01 p.p.m., can be detected. The overall average of captan residues obtained from fortified control samples was 92 per cent.

A. A.

- 16.24 *Methods for the determination of Mobam (4 benzothienyl N-methyl carbamate)*, ANDREW G. CHASAR AND CLAUDE A. LUCCHESI, *J. agric. Fd Chem.*, 1967, **15** (6), 1030.

Review. 14 references.

- 16.25 *Determination of chlorocholine chloride residues in wheat grain, straw and green wheat foliage*, ROBERT P. MOONEY AND N. ROBERT PASARELA, *J. agric. Fd Chem.*, 1967, **15** (6), 989.

The method outlined for estimation of residue levels of chlorocholine chloride (CCC) in wheat grain and plants at various stages of growth by removing CCC from tissue background by adsorption chromatography on aluminium oxide and then measuring CCC colorimetrically as a dipicrylamine-chlorocholine chloride complex at 415 m μ . Average recoveries of CCC from wheat grain, green wheat foliage and wheat straw were, 76, 86.4 and 90 per cent respectively with average control values of 0.10, 0.16 and 0.27 p.p.m.

B. S. N.

- 16.26 *Aeration of grains*, S. V. PINGALE AND G. K. GIRISH, *Bull. Grain Technol.*, 1967, **5** (3), 161.

Review.

- 16.27 *The Influence of temperature and humidity on the contact toxicity of some insecticide deposits to Tribolium castaneum Herbst.*, T. P. S. TEOTIA AND K. K. PANDEY, *Bull. Grain Technol.*, 1967, **5** (3), 154.

The effects of continuous treatment, temperature and humidity on the contact toxicity of DDVP, malathion, dieldrin and sevin to adults of *Tribolium castaneum* Herbst; the first three insecticides were more effective to beetles at $85 \pm 1^\circ\text{C}$, while sevin acted at $27 \pm 1^\circ\text{C}$ as shown by their mortality after 24 hr exposure to insecticidal films produced under Pottor's tower. Statistical 't' test, however, was significant for malathion alone. DDVP, dieldrin and sevin showed increased toxicity at higher humidities (about 90 per cent), whereas the reverse was the case with malathion (70-75 per cent humidity).

B. S. N.

- 16.28 *Adult longevity and oviposition of Trogoderma parabole Beal (Coleoptera, Dermestidae) at different temperatures*, S. R. LOSCHIAVO, *J. Stored Prod. Res.*, 1967, **3** (4), 273.

Male and female longevity decreased with increasing temperature in the range 12.8°C—32.5°C. Eggs of normal appearance were found to be laid at temperatures between 17.5—37.5°C and a few deformed and non-viable eggs at 15.6°C with no laying of eggs at higher temperatures.

B. S. N.

- 16.29 *The role of oxygen in the toxicity of fumigants to insects*, E. J. BOND AND H. A. U. MONRO, *J. Stored Prod. Res.*, 1967, **3** (4), 295.

Review. 49 references.

- 16.30 *The influence of oxygen on the toxicity of fumigants to *Sitophilus granarius* (L.)*, E. J. BOND, H. A. U. MONRO AND C. T. BUCKLAND, *J. Stored Prod. Res.*, 1967, **3** (4), 289.

Toxicity of methyl bromide, ethylene dibromide, ethylene oxide, hydrogen cyanide, hydrogen phosphide and carbon tetrachloride to *S. granarius* increased with reducing oxygen concentration till it reached 1 per cent. In nitrogen atmosphere, toxicity got reduced at various degrees depending upon the fumigant. Hydrogen phosphide, in the absence of oxygen could not prove fatal in spite of the use of higher concentrations of the fumigant. Carbon tetrachloride acted most toxic at 20.9 per cent oxygen. *Tribolium confusum* Du. V differed from *S. granarius* with regard to toxicity in the absence of oxygen of methyl bromide.

B. S. N.

- 16.31 *The inheritance of DDT resistance in *Sitophilus oryzae* (L.) (Coleoptera, Curculionidae) in Queensland*, B. R. CHAMP, *J. Stored Prod. Res.*, 1967, **3** (4), 321.

DDT resistance in *S. oryzae* (L.) in Queensland was confirmed using a test method for continuous exposure to DDT-impregnated filter paper; when exposed to 1 per cent DDT papers, a laboratory susceptible strain had a median response time of 3 hr; a laboratory resistant strain, 44 hr; and a field resistant strain more than 72 hr. The laboratory resistant strain had a resistance factor of X 12.8 for males and X 11.3 for females based on 24 hr. responses using a concentration variable. The resistance factor of the field resistant strain could not be measured with the method used. DDT resistance was controlled by one or more sex-linked, semi-dominant factors, and undetermined modifying and segregation distorting factors were present. Segregation aberrations were reduced.

A. A.

- 16.32 *Bioassay of captan by zebra fish larvae*, Z. H. ABEDI AND W. P. MEKINLEY, *Nature, Lond.*, 1967, **216** (5122), 1321.

Details on the rearing of zebra fish in laboratory are given. The test shows promise in its convenience, rapid reaction, sensitivity and reproducibility. About 90 per cent of larvae are killed in 90 min at a concentration of 1 p.p.m., of captan, and a standard dosage mortality curve can be prepared in this period of time for a rapid assay of microgram quantities of captan. Both the rapid kill and the head injury seem to be specific to captan.

K. A. R.

- 16.33 *Determination of malathion residues in wheat by gas-liquid chromatography*, K. D. ELMS, *J. Stored Prod. Res.*, 1967, **3** (4), 393.

Malathion residue present in wheat has been estimated employing GLC using a caesium bromide thermionic detector. Malathion recovered from ground wheat by hexane from 250 and 500 μ g applications were 93, 96, 100 and 93, 97, 100 per cent respectively.

B. S. N.

- 16.34 *Loss of warning odour from phosphine*, E. J. BOND AND T. DUMAS, *J. Stored Prod. Res.*, 1967, **3** (4), 389.

Phosphine (hydrogen phosphide) generated from aluminium phosphide has a odour of carbide or garlic. Incidentally, the high concentrations of this fumigant are detected by odour. Absence of odour as a result of sorption of phosphine by stored foods does not completely indicate its absence. In view of the fact that the odour components are present in very small quantities and get absorbed without appreciable sorption or reduction of

phosphine, it is necessary that tolerance limits for phosphine in air have to be determined.

B. S. N.

- 16.35 *Studies on rodents and their control. I. Studies on rat population and losses of food grains*, K. KRISHNAMURTHY, V. UNIYAL, JAGVIR SINGH AND S. V. PINGALE, *Bull. Grain Technol.*, 1967, **5** (3), 147.

Studies carried out on the total population of rodents in each of the five villages and at Hapur town indicated that rat population when expressed as rat per person or house was higher in villages than in towns. Total rat population, that is of *Rattus rattus* ranged from 624-1638 per village with the loss of food grains being 1.36-3.59 per cent per village.

B. S. N.

- 16.36 *Studies on rodents and their control. II. Control of field rats with aluminium phosphide*, K. KRISHNAMURTHY AND PREM SINGH, *Bull. Grain Technol.*, 1967, **5** (3) 173.

Two tablets, each of 0.5 g. of aluminium phosphide introduced into the rat burrow resulted in 80-90 per cent kill in the first instance, the cent per cent mortality being reached with a second treatment. The tablets are low in cost, indigenously manufactured, and the chemical is not absorbed by moisture in the soil. Further, the lethal concentration to rats is built up in a short-time and retained for a long time.

B. S. N.

17. Nutrition and Biochemistry

- 17.28 *Energy expenditure on human nutrition*, YOLA E. SWINDELLS, *J. Nutr. Dietet.*, 1967, **4** (4), 342.

Review. 45 references.

- 17.29 *Traditional foods their present production and use*, S. S. DE, *J. Nutr. Dietet.*, 1967, **4** (4), 330.

Review. 14 references.

- 17.30 *Nutritive value of hostel diet*, AMBALINI BAILUR AND B. PURI, *J. Nutr. Dietet.*, 1967, **4** (4), 311.

- 17.31 *Proximate and mineral composition of some processed military rations*, M. N. RAMANUJAM, B. A. SUSHEELA, A. VALLI DEVI M. L. SARMA, M. V. R. KOTESWARA RAO, N. A. N. RAO AND P. K. VIJAYARAGHAVAN, *J. Nutr. Dietet.*, 1967, **4** (4), 311.

Calorific values, proximate and mineral composition of a variety of processed quick cooking and precooked military rations like dehydrated cereals, pulses, vegetable and meat, ready-to-eat composite bars and ready-to-serve foods based on Indian recipes are reported.

B. S. N.

- 17.32 *The effects of various doses of a whey yeast protein preparation on the growth of rats*, A. SURAZYNSKI, J. POZNANSKI AND M. MIECZKOWSKI, *J. Nutr. Dietet.*, 1967, **4** (4), 306.

A yeast-protein preparation with a high nutritive value when supplemented to the diet of rats at a level not above 8.5 per cent does not result in structural changes in internal organs of chicken and rats.

B. S. N.

- 17.33 *Plant seeds as protein sources for food or feed. Evaluation based on amino acid composition of 379 species*, C. H. VAN ETTEN, W. F. KWOLEK, J. E. PETERS AND A. S. BARCLAY, *J. agric. Fd Chem.*, 1967, **15** (6), 1077.

Amino acid analyses of seeds of 379 species of plants indicated that seed proteins were generally adequate in leucine, phenylalanine, threonine and valine. Isoleucine and methionine percentages were found to be present below FAO requirements. Cereal grains and other Graminae seeds were generally low in lysine.

B. S. N.

- 17.34 *Efficacy of neera in curing riboflavin deficiency diseases*, G. VENKATASWAMY, *J. Nutr. Dietet.*, 1967, 4 (4), 276.

Preliminary studies on twentyfive cases of ariboflavinosis subsisting on a predominantly non-vegetarian diet on being treated with neera for a period of 10-40 days have shown significant recovery from riboflavin deficiency symptoms.

B. S. N.

- 17.35 *Kinetic behaviour and mechanism of inhibition in the maillard reaction. 3. Kinetic behaviour of the inhibition in the reaction between D-glucose and glycine, 4. Mechanism of inhibition*, P. S. SONG AND C. O. CHICHESTER, *J. Fd Sci.*, 1967, 32 (1), 98, 107.

- 17.36 *Properties of higher plant mitochondria. II. Effects of DNP, m-Cl-CCP, and oligomycin on respiration of mung bean mitochondria*, HIROSHI IKUMA AND WALTER D. BONNER JR., *Pl. Physiol. Wash.*, 1967, 42 (10), 1400.

The paper further characterises the respiratory properties of mung bean mitochondria and their responses to inhibitors and uncouplers of oxidative phosphorylation. The results from mung bean mitochondria are compared with those from animal mitochondria.

A. A.

- 17.37 *Amino acid composition and nutritive value of the alga Spirulina maxima*, G. CLEMENT, C. GIDDEY AND R. MENZI, *J. Sci. Fd Agric.*, 1967, 18 (11), 497.

Spirulina maxima is used as food in the Chad Republic. The dried alga, more than 60 per cent of which was proteinaceous material, contained all the essential amino acids in fairly good concentration except that the amount of sulphur amino acids was low. Nutritional experiments on rats showed that the biological value of the alga was acceptable and was correlated with the chemical score (protein index). Dried *Spirulina maxima* also contained several vitamins, particularly β -carotene.

K. A. R.

- 17.38 *Nutritional implications in processed foods*, ALAN H. WARD, *Milling*, 1967, 149 (10), 177.

Review.

- 17.39 *Effect of starches on protein utilisation and liver lipid composition in rats*, Y. O. CHANG, C. C. SOONG AND G. I. MILLER, *J. Fd Sci.*, 1967, 32 (1), 135.

Rice, wheat, corn and arrowroot starches were tested. Protein utilization was poorest with arrowroot starch, somewhat better with rice starch and best with either corn starch or wheat starch. Fatty acid in liver lipid showed a somewhat different distribution in rats fed arrowroot starch compared to the other three starches.

A. A.

- 17.40 *The maillard reaction in food products and carbon dioxide production*, S. J. COLE, *J. Fd Sci.*, 1967, 32 (3), 245.

Carbon dioxide production in model systems has been studied and its relationship to brown pigment and conjugated unsaturated carbonyl compounds investigated. Over a wide range of pH it was found that the type of sugar was the limiting factor in rate of carbon dioxide production rather than the amino acid. Carbon dioxide was formed mainly via the Strecker degradation, but it has been demonstrated that another unidentified pathway is available for the formation of carbon dioxide from sugars in the presence of amino compounds.

K. A. R.

- 17.41 *Development of a food mixture for infants and young children in Brazil*, J. E. DUTRA DE OLIVEIRA, N. DE SOUZA AND T. A. DE REZENDE, *J. Fd Sci.*, 1967, 32 (1), 131.

Studies on soy flour feeding indicated a PER of 1.99. The formula contained 19.50 per cent soy flour, 4.50 per cent non-fat

milk powder, 32.28 per cent corn starch, 39.00 per cent sucrose, and 4.72 per cent vitamins and minerals; the PER value of the protein in the formula was 2.31.

K. A. R.

- 17.42 *Indian Multipurpose Food and supplemented groundnut protein isolate compared as supplements for pre-school children*, MARY E. DUMM, B. R. H. RAO, G. JESUDIAN AND V. BENJAMIN, *J. Nutr. Dietet.*, 1967, 4 (4), 285.

High protein food (HPF), a blend of groundnut protein isolate (85 parts) and roasted Bengal gram flour (15 parts) fortified with vitamins and minerals, on being fed to pre-school children (2-5 yr) for a period of 6 months resulted in better increase in height in comparison with those fed on MPF diets, although no significant differences were found between two groups with regard to haemoglobin, packed cell volume, total serum proteins, serum albumin and serum vitamin A.

B. S. N.

- 17.43 *The effect of processing on the nutritional value of sugar meal for broiler chicks*, J. R. COUCH, Y. K. BAKSHI, T. M. FERGUSON, E. B. SMITH AND C. R. GREGER, *Br. Poult. Sci.*, 1967, 8 (4), 242.

Of the two factors detrimental to growth of chicks present in guar meal, trypsin inhibitor may be destroyed by cooking raw meal for 1 hr at 110°C with injection of superheated steam for 15 minutes when a temperature of 110°C is attained by the cooker. The second factor, guar gum, proves detrimental only when in diet above 1.8 per cent. Addition of pectinase to a diet having 15 per cent processed sugar meal is fed alone. With 20-30 per cent feeding of processed meal and in case of all raw meal fed at this level and below, hypertrophy of the pancreas in chicks developed.

B. S. N.

18. Food Processing, Packaging and Engineering

- 18.22 *Volatiles retention during the drying of aqueous carbohydrates*, L. D. MENTING AND B. HOOGSTAD, *J. Fd Sci.*, 1967, 32 (1), 81.

- 18.23 *Scientific evidence and common sense as a basis for food packaging regulations*, J. P. FRAWLEY, *Fd Cosmet. Toxicol.*, 1967, 5 (3), 293.

Review. 80 references.

- 18.24 *Use of statistics and computers in the selection of optimum food processing techniques*, A. M. SWASON, J. J. GEISSLER, P. J. MAGNINO JR. AND J. A. SWANSON, *Fd Technol., Champaign*, 1967, 21 (11), 1513.

A brief description of how a statistical model building and computer simulation were used in developing a sterilised baby food formula.

J. V. S.

- 18.25 *Gel filtration—road to new products; protein enriched milk: One application*, ERNST-GUNNAR SAMUELSSON, PETTER TIBLING AND SUNE HOLM, *Fd Technol., Champaign*, 1967, 21 (11), 1535.

- 18.26 *Flavor retention and heat transfer during concentration*, Y. MALKKI AND J. VELDSTRA, *Fd Technol., Champaign*, 1967 21 (9), 117.

The advantage of centrifugal thin film evaporator over agitated thin film evaporator so far as the heat transfer is concerned is made obvious by indicating the values of 'V' to both. For an aqueous solution of low viscosity under laminar flow the former has an 'V' of more than 6000 K cal/m² hr °C whereas the latter has a value ranging between 1500 to 3500 K cal/m² hr °C. The effect of such parameters as evaporation temperature difference between steam and the vapour from solution, feed rate and the presence of sucrose on the composition of the distillate is determined to arrive at conditions suitable for proper flavour retention.

M. C. B.

- 18.27 *Effect of drying method on the water sorption of dehydrated apple and potato*, G. D. SARAVACOS, *J. Fd Sci.*, 1967, **32** (1), 81.
Drying method affects primarily the rate of water sorption and to a lesser degree the equilibrium isotherms. Freeze-dried products absorbed more water vapour than puff-dried or air-dried products. The apparent diffusivity of water vapour was higher in freeze-dried samples, intermediate in puff-dried, and lowest in air-dried samples.
- 18.28 *New materials and methods in can manufacture*, F. FIDER, *Fd Mf.*, 1967, **42** (9), 44.
General.
- 18.29 *Modern methods of fluid flow measurement in food manufacturing*, *Fd Mf.*, 1967, **42** (11), 44.
General.
- 18.30 *Heat processing of foods. 2. Canning practice: establishing a procedure*, J. D. FELMINGTON, *Fd Mf.*, 1967, **42** (7), 29.
Discusses double seam terminology and determination of seam efficiency, types of retort and outlines various stages in the heat processing procedure.
- 18.31 *Heat processing of foods. 3. Canning practice: process evaluation and conditions*, J. D. FELMINGTON, *Fd Mf.*, 1967, **42** (8), 23.
Deals with process evaluation, heat penetration and its measurement, the impact of heat penetration on processing conditions and cooling conditions of cans.
- 18.32 *Food processing with microwaves*, *Br. Fd J.*, 1967, **69** (820), 164.
General.
- 18.33 *Solvents in food manufacture*, *Br. Fd J.*, 1968, **70** (822), 4.
General.
- 18.34 *Cryogenic freezing*, S. D. HOLDSWORTH, *Fd Mf.*, 1967, **42** (7), 42.
Review. 14 references.
- 18.35 *Recent developments in freeze drying in Australia and Overseas*, J. D. MELLOR, *Fd Technol. Aust.*, 1967, **19** (14), 652.
- 18.36 *Irradiation as a commodity treatment against fruit fly in Australian fruit*, J. J. MACFARLANE, *Fd Technol. Aust.*, 1967, **19** (14), 660.
- 18.37 *Irradiation induced gases in packaged foods. I. Identification and measurements*, B. G. PRATE, L. E. KNEELAND, F. HEILGMAN AND J. J. KILLORAN, *J. Fd Sci.*, 1967, **32** (2), 200.
Leaving sufficient head space in packaged foods may show swelling after irradiation due to H₂, CH₄, CO and CO₂ evolution. Tin plate and glass had no effect on the quantity of gas produced. Packaging in a polyolefin plastic material showed increase in H₂. A mathematical model for estimating the production of induced gases from proximate analysis successfully predicted gas productions in the 5 food products tested.
- 18.38 *Quality of prepacked processed foods. I*, J. R. BLANCHFIELD, *Fd Mf.*, 1967, **42** (10), 35.
Review. 2 references.
- 18.39 *Advances in bread packaging*, K. S. WILLIAMS, *Fd Mf.*, 1967, **42** (9), 42.
Review.
- 18.40 *Technological trends in convenience packaging*, STANLEY SACHAROW, *Fd Mf.*, 1967, **42** (9), 37.
Review.
- 18.41 *Tetrahedron pack*, T. A. S. JOHNSON, *Fd Mf.*, 1967, **42** (9), 53.
Tetrahedron pack has been adopted for milk recently in U.S.A. Its advantages include savings in packaging material, physical protection, convenience in use, simple gas packaging and a new and attractive look for the product.
- 18.42 *An appraisal of cartoning systems*, A. M. C. INGLIS, F. A. PAINE AND D. J. A. SHAW, *Fd Mf.*, 1967, **42** (9), 46.
Describes the advantages, equipment requirement and suitability of its use for installing in a food processing factory for safe and attractive packaging of processed foods.
- 18.43 *Prospects in U.K. for soluble film packaging*, JOHN A. CHAMBERS, *Fd Mf.*, 1967, **42** (9), 59.
Development of water soluble edible film for simple incorporation of ingredients into a good mix is gaining importance in U.K.
- 18.44 *Migration of flexible packaging components into food products*, ROBERT, L. FERM, *Am. Miller Processor*, 1967, **95** (10), 7.
Solvent extractions were carried out on 4, foil-laminated materials with films of Lexan-polycarbonate, Rilsan-Nylon 11, Kodar-polyester, and Teflan-fluorocarbon. All films have excellent thermal stability upto 275°F. Except in Lexanpolycarbonate, the film residues extracted were laminating adhesives which migrate through or permeate into the films. No significant volatile extractives were evident. Extraction yields of the four films were all less than the maximum specified in Federal Regulations. At 275°F, film residues are extracted in greater amounts by fats than by heptane at 150°F.
- 18.45 *Developments in aluminium foil packaging*, A. BREBNER, *Fd Mf.*, 1967, **42** (9), 67.
- 18.46 *Mechanisation in the bake house*, *Br. Fd J.*, 1967, **69** (820), 171.
- 18.47 *Pumps and valves in food processing*, *Fd Mf.*, 1967, **42** (11), 61.
General.
- 18.48 *Swiss butter pasteurising plant*, *Br. Fd J.*, 1967, **42** (7), 40.
- ## 19. Food Texture and Flavour
- 19.14 *The chemistry of flavour*, IRULIN HORN STEIN AND R. TERANISHI, *Chem. Engng News*, 1967, April 3, 92.
A feature article on flavour giving information regarding this complex sensation which is a combination of taste, odour, etc. Four basic tastes and eleven sub-groups are mentioned. Similarly nine odour classification is enumerated. Some of the factors like hydrogen ion concentration, nature of cation, anion and also structural configuration are indicated to play a role in determining the odour and taste of a substance.
- 19.15 *Volatile from grapes—Identification of volatiles from concord essence*, D. J. STERN, A. LEE, W. H. MCFADDEN AND K. L. STEVENS, *J. agric. Fd Chem.*, 1967, **15** (6), 1100.
The volatiles of concord grape (*Vitis labrusca*) were examined by capillary gas chromatography-mass spectral combination. Six components were identified; of particular interest were a series of crotonate esters and a possible ethylalkyl thio ester.
- 19.16 *Influence of microorganisms on the flavour of selected pre-cooked frozen foods*, N. F. DALTON AND D. H. STRONG, *J. Fd Sci.*, 1967, **32** (1), 116.
Certain microorganisms were inoculated into macaroni, blue berry pie, cheese and beef gravy, and stored in freezers.

panel studies showed that in some cases, there were changes in aroma and flavour due to some microorganisms; in many others, the changes were due to causes other than microflora.

J. V. S.

19.17 *Texture of ice cream. IV. The influence of fat content and coagulated fat on the structure of melted ice cream*, J. WHITEHEAD AND P. SHERMAN, *Fd Technol. Champaign*, 1967, **21** (11), 1521.

Only clear indication from the present data was that ice cream with the lowest coagulated fat content showed the highest values for all rheological parameters. Preliminary examination of good and poor texture ice creams suggests that all rheological parameters are significantly higher in the former supplies.

A. A.

19.18 *Flavours—their uses and abuses—blending and compatibility*, J. M. KINSEY, *Fd Technol. Aust.*, 1967, **19** (12), 568.

19.19 *Organoleptic methods of food analysis*, *Br. Fd J.*, 1968, **70** (822), 11.

Reports the pioneering research work done in Poland in this new field of food analysis.

B. S. N.

19.20 *New techniques in colour sorting*, TOM CHAPMAN, *Fd Mf.*, 1967, **42** (9), 60.

General.

19.21 *A glossary of odour stimuli and their qualities*, R. HARPER, E. C. BATE-SMITH, D. G. LAND AND NERYS M. GRIFFITHS, *Perf. essent. Oil Rec.*, 1967, **29** (1), 22.

Qualities of 53 odour stimuli have been determined in 2 experiments, with 45 stimuli common to both. Information obtained from all sources is listed in the glossary.

J. V. S.

A. A.

A. A. = Author's Abstract

19.22 *Studies on flavor components in soybeans. IV. Volatile neutral compounds*, SOICHI ARAI, OSAMU KOYANAGI AND MASAO FUJIMAKI, *Agric. biol Chem., Japan*, 1967, **31** (7), 868.

Ground raw soybean packed in glass column and warmed at about 50°C by a water jacket column and swept with nitrogen gas, yielded volatile flavour components. On GC analysis of these volatile components trapped in bottles dipped in ice water, solid carbon dioxide-acetone and liquid nitrogen, peaks corresponding to methanol, ethanol, 2-pentanol, isopentanol, n-pentanol, n-hexanol and n-heptanol were found as alcohols, while as an ester n-pentanol acetate was detected. The green bean type odour of soybean may probably be due to a large extent to the presence of isopentanol, n-hexanol and n-heptanol.

B. S. N.

19.23 *Volatiles from Delicious apple essence—extraction methods*, T. H. SCHULTZ, R. A. FLATH, D. R. BLACK, D. G. GUADAGNI, W. G. SCHULTZ AND R. TERANISHI, *J. Fd Sci.*, 1967, **32** (3), 279.

Identification and quantitative estimation of the major constituents of the organic volatiles in *Delicious* apple essence were made by gas—liquid chromatography and mass spectrometry. Isopentane and the fluorocarbon were similar in action. Compared with ether they gave lower recoveries especially for low molecular weight alcohols, but they gave extracts with higher concentrations of esters and aldehydes and thus are useful for further composition studies. Liquid carbon dioxide gave an extract similar to that given by ether.

With the best Compliments of

MANIPAL POWER PRESS

Quality Printers and Process Engravers

Manipal, P. B. No. 4

S. KANARA, Mysore State

Telephone 44, Manipal



COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

Journal of Scientific and Industrial Research—A monthly *general science periodical*, replacing Journal of Scientific and Industrial Research: Section A—General.

Indian Journal of Chemistry—A monthly *research periodical* devoted to the publication of *original communications* in Chemistry, replacing the Chemistry part of Journal of Scientific and Industrial Research: Section B—Physical Sciences.

Indian Journal of Pure and Applied Physics—A monthly *research periodical* devoted to the publication of *original communications* in Physics, replacing the Physics part of Journal of Scientific and Industrial Research: Section B—Physical Sciences.

Indian Journal of Technology—A monthly *research periodical* devoted to the publication of *original communications* in applied sciences and technology replacing Journal of Scientific and Industrial Research: Section D—Technology.

Indian Journal of Experimental Biology—A quarterly *research periodical* devoted to the publication of *original communications* of an experimental and analytical nature in the field of biology in place of Journal of Scientific and Industrial Research: Section C—Biological Sciences.

Indian Journal of Biochemistry—A quarterly *research periodical* devoted to the publication of *original communications* in the field of biochemistry, replacing the Annals of Biochemistry and Experimental Medicine, previously issued from the Institute for Biochemistry and Experimental Medicine, Calcutta.

SUBSCRIPTION RATES

INLAND

Annual subscription for individual periodicals	Rs. 15.00
Annual subscription for all six periodicals	Rs. 75.00
Subscription for two years for all six periodicals	Rs. 120.00

FOREIGN (with effect from 1 January 1964)

Rate A: For Libraries, Government Departments and Industry	£ 3.10.0 or \$ 10.00
Rate B: For individuals who purchase the journal for their own use	£ 2.5.0 or \$ 6.50

Publications and Information Directorate, C.S.I.R.
Hillside Road, New Delhi 12

Sole Distributors Outside India: PERGAMON PRESS
Oxford London Paris Frankfurt New York

Journal of Nutrition & Dietetics

A QUARTERLY JOURNAL DEVOTED TO THE PUBLICATION OF ORIGINAL RESEARCH AND REVIEW ARTICLES IN THE FIELD OF NUTRITION AND DIETETICS

Started for the first time in India, the Journal is serving a long felt need for those engaged in research in this field

Subscribers are assured of an attractive get-up. Contains information on many scientific aspects of fundamental and practical importance

SUBSCRIPTION IS OPEN TO ALL THOSE INTERESTED IN NUTRITION AND DIETETICS

The Journal has the support on the Editorial Board of all the prominent and leading scientists in this field

Ably managed and issued by:

**THE
AVINASHILINGAM COLLEGE OF HOME SCIENCE
COIMBATORE**

Become A Subscriber Today

Subscription Rate:

Indian Rs. 24 per year. Foreign countries 60sh. or \$ 9.00 per year.
Single copies of current number: Inland Rs. 6. Foreign 15 sh. or \$ 2.25.
Remittances should be made by draft or cheque, or by money order, payable to the Managing Editor, Journal of Nutrition & Dietetics, Sri Avinashilingam Home Science College, Coimbatore-11, India.

With best compliments from:

Bramhappa Tavanappanavar Private Limited

Post Box No. 7, Davangere City
MYSORE STATE

Manufacturers of:

DE-OILED GROUNDNUT EDIBLE FLOUR MEAL

'BT' Vanaspati, Refined Oil, Bar Soap and Chips

'BT' Balanced Cattlefeed Pellets and Poultry Feeds.

Grams: Nanahouse

Phone No. : 45

J. S. PUPAE FOOD PRODUCTS

Producer of:

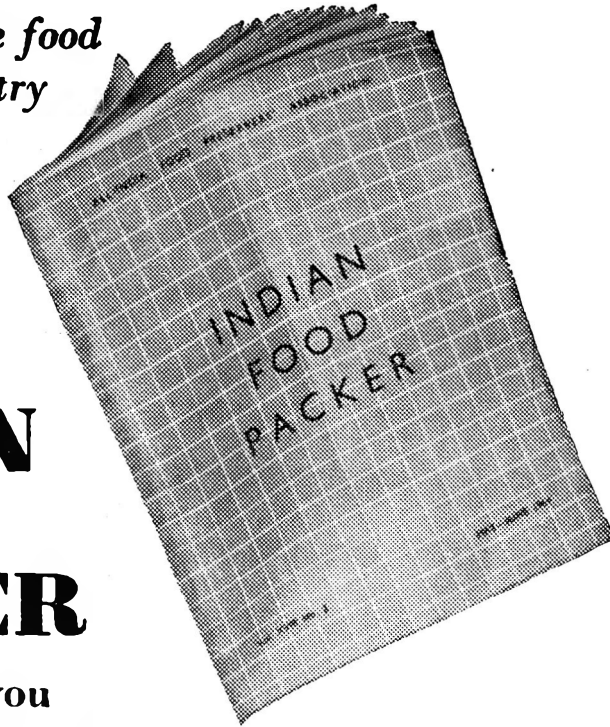
**PUPAE PROTEINS FOR FISH
ANIMAL AND POULTRY FEEDS**

PROPRIETOR:

JABBAR SHARIFF

Nana Buildings, Ramanagara P.O., (Mysore State)

If you are in the food packaging industry



INDIAN FOOD PACKER

is a 'must' for you

Published every two months, the Indian Food Packer is the official organ of the All-India Food Preservers' Association. It offers you:

Research and review papers on food science and technology

News and views on export potentials and foreign markets

Incisive editorials on the day-to-day problems faced by the food processing industries

Reviews of the latest books on food science and technology

Indian Food Packer commands a wide circulation among the food processing and ancillary industries, and the research and development departments of the Central and State Governments.

Subscription Rates: Rs. 10/- per year } postage
Rs. 2/- per copy } free
Foreign: 17 sh. per year }

INDIAN FOOD PACKER
Post Bag No. 2, Bangalore 16, India

Subscription Order Form

Starting immediately, please send me INDIAN FOOD PACKER for one year at Rs.....

NAME: _____

COMPANY/INSTITUTION NAME: _____

TYPE OF BUSINESS: _____

BILL ME

CHECK HERE IF YOU WANT 'INDIAN FOOD PACKER'
TO BE SENT TO YOUR HOME

BILL MY COMPANY

STREET..... CITY..... ZONE..... STATE.....

JWT/KP/3085

*“When you buy best quality Condiments
better buy ‘PEKO’”*

A name of prestige in condiments. Best in quality and pleasing taste

Products:

PINEAPPLE SLICES, MANGO SLICES, GUAVA JELLY,
JAMS AND MARMALADE, CHILLY SAUCE,
ALL TYPES OF TINNED FRUITS AND VEGETABLES

Please Contact:

PEKO FRUIT PRODUCTS

246 A/B Manicktala Main Road, CALCUTTA-54

Gram: ‘Canedfruit’.

Phone: ‘Cal-35-4222’



QUALITY PRODUCTS

FULL OF FLAVOUR
AND FRESHNESS

JUICES
JAMS
JELLIES
FRUITS
VEGETABLES
PICKLES
HONEY

PROCESSED AT THEIR MOST MODERN
CANNING PLANT AT KANPUR
SPENCER & CO. LTD.
BRANCHES THROUGHOUT INDIA



INSIST ON *Spencer's*

PS/f 29

AVAILABLE AT ALL LEADING STORES

price dth



MAKES YOUR PRODUCTS DECISIVELY SUPERIOR!

Roche supply the pharmaceutical industry in India with all forms and potencies of synthetic vitamin A. Made by the most modern methods of manufacture, Roche Synthetic Vitamin A offers quality, economy, uniformity and palatability—it is absolutely free from any unpleasant odour or taste.

Roche Synthetic Vitamin A can be supplied in bulk quantities...with the same high standard of quality.



—pioneers and leaders in the synthesis of vitamins

ROCHE PRODUCTS LIMITED, Bombay 34 (WB)

Sole Distributors:



VOLTAS LIMITED

Bombay • Calcutta • Madras • New Delhi
Bangalore • Cochin • Kanpur • Secunderabad



ASP/AS-3

Mummy swears Amulspray baby food is better for growth. Wonder how she can be so sure!

Amulspray has a better formula, you know. It's printed on every tin.

Amulspray, the new baby food from Amul, contains everything a baby needs for growth. More and better-quality protein for better brain and body development. Carbohydrates and fat for energy. Minerals for healthy blood and strong bones. Seven vitamins for steady growth, resistance to disease, keen eyesight, good appetite and physical fitness. Remember, your baby has to double his birth-weight in six months and triple it within a year. Amulspray contains all the growth-promoting nutrients in a well-balanced formula to help achieve this.

Amulspray is also easier to digest even by very delicate babies. It is made by the modern spray-drying process. (All baby foods in the U.S.A. are now made by this superior process.) Amulspray is an ideal substitute for mother's milk or for supplementary feeds. Start your baby on Amulspray right from the very first week.



Mrs. M. Benegal of Malabar Hill, Bombay says: "My baby has been on Amulspray from the very first week. It has agreed with him and his progress has been exceptionally good."

Amulspray
an excellent substitute
for mother's milk

Instructions to Contributors

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

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

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

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

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

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

7. Abbreviations of the titles of all scientific periodicals should strictly conform to those cited in the World List of Scientific Periodicals, Butter Worths Scientific Publication, London, 1952.

8. *References*: Names of all the authors should be cited completely in each reference. Abbreviations such as *et al.*, should be avoided.

In the text, the references should be indicated by numbers placed above the line (superior). They should be numbered and included at the end of the article in serial order.

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

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

IS THE PACKAGE AS GOOD AS YOUR PRODUCT ?

In processing food you control every stage meticulously. The ingredients are in perfect condition, perfectly mixed. The cooking is exactly right. Conditions of hygiene are impeccable.

But the moment you put your product into a package, it is out of your hands. The package takes over. And that's why your product must have a package you can trust.

At Metal Box we offer a Canning Advisory Service which covers counsel and assistance on every aspect of canning technology. The only one of its kind in India, this service ranges all the way from advice on cannery layout through compatibility and storage tests to the designing and development of improved food packages.

We also offer all the facilities of our Research Department and Technical Development Division to canners everywhere, large and small.

And after a package has been specially developed for your product, we will be happy to supply you with the can-closing, can-reforming and bottle-sealing machinery you may require.

If you are looking for export markets, remember Metal Box packages made to international standards have helped open overseas markets for a variety of products. Remember, too, that the accumulated technical resources of our associates all over the world are at your disposal.

You can trust the package we supply.

