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SRI LANKA ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

PROCEEDINGS

OF THE

THIRTY SECOND ANNUAL SESSION

7th to 11th December, 1976

PART I

SECTIONAL PROGRAMMES AND SUMMARIES

COLOMBO 1976

SRI LANKA ASSOCIATION
FOR THE
ADVANCEMENT OF SCIENCE

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PART I

SECTIONAL PROGRAMMES AND SUMMARIES

CONTENTS

The full papers of all the summaries included in these proceedings are available for reference by any SLAAS member at the SLAAS office.

COLOMBO 1976

SECTION A: MEDICAL, DENTAL AND VETERINARY SCIENCES

(Physics Theatre)

Wednesday 8th December

3.00 ... **The Promotion and Planning of Research using the Deutsche Forschungsgemeingschaft as the example.**
—**Prof. Dr. Gerd Roellecke** (Jointly with Sections B, D & F) — (Arts Theatre).

Thursday 9th December

8.40 ... Biochemical and Immunological Composition of Human Colostrum and Cord Blood Serum obtained from a Group of Sri Lankan Women of Low Socio-Economic Status (A preliminary survey)—L. P. Samaranayake, W. G. J. P. Fernando and R. D. Piyasena.

9.00 ... Plasma Oestrogen Levels in Sri Lankan Women—W. G. J. P. Fernando, C. Wellappili, L. P. Samaranayake and R. D. Piyasena.

9.20 ... Prevalence of Arbovirus infections in Sri Lanka : Results of a 1976 Survey compared with that of 1966—U. T. Vitarana, M. Kanapathipillai, M. Anandarajah and H. D. N. Gunasekera.

10.00 ... Morphometric Studies of Human Placentas of Sri Lankan Women of Low Socio-Economic Status—L. P. Samaranayake.

10.30 ... Business Meeting.

1.00-3.00 **Seminar on Student Projects** (Physics Theatre).

3.00 ... Popularisation of Science Committee Seminar (all Sections) —(Arts Theatre)

6.30 ... **Seminar on 'Encephalitis'** (Anatomy Theatre, Medical Faculty, Kynsey Road).

Friday 10th December

10.00 ... Annual Meeting (all Sections)

1.40 ... The Changing Pattern of Contraceptive Acceptance : A Longitudinal Study — Mahasara Gunaratne.

2.00 ... The dynamic system in the acceptance and continuation of Contraception — Mahasara Gunaratne.

2.20 ... A Study of 334 Male Sterilisations in Kandy — P. Abeykoon.

2.40 ... Patterns of Rheumatoid Arthritis in Sri Lanka — F. X. S. Emmanuel, S. N. Arseculeratne and L. V. Weliange.

Saturday 11th December

8.20 ... A Study of Necrotising Enteritis — C. B. Kumarakulasinghe and C. Ratnatunga.

8.40 ... Bacteriological Aspects of Ileal Perforation complicating Typhoid — J. S M. Peiris, S. N. Arseculeratne, C. B. Kumarakulasinghe, K. Marathappu and R. Edwards.

9.00 ... A Clinical Study of Down's Syndrome in 1975/1976 — Rohan Jayasekera and Priyani Soysa.

9.20 ... Motives for admission from the Out-Patient Department of a Base Hospital — B. Mahendra.

10.00 ... Obliterative Arterial Disease of Limbs in the Central Province — C. Ratnatunga.

10.20 ... Arteriographic Patterns of Lower Limb Ischaemia in the Central Province — P. Amerasinghe and C. Ratnatunga.

10.40 ... Undergraduate Attitudes to the Medical Curriculum — B. Mahendra.

11.15 ... **Presidential Address: "Viruses, Humans and some questions of Philosophy" — U. T. Vitarana**— (Chemistry Theatre).

BIOCHEMICAL AND IMMUNOLOGICAL COMPOSITION OF HUMAN COLOSTRUM AND CORD BLOOD SERUM OBTAINED FROM A GROUP OF SRI LANKAN WOMAN OF LOW SOCIO - ECONOMIC STATUS - (A PRELIMINARY SURVEY)

L. P. Samaranayake, W. G. J. P. Fernando
(Biochemistry Department, University of Sri Lanka, Peradeniya Campus).
and
R. D. Piyasena
(Nuclear Medicine Unit, Faculty of Medicine, Peradeniya Campus).

Quantitative biochemical and immunological data on the composition of human colostrum and cord blood serum are not available for Sri Lankan Women. In order to investigate the correlation between these data with maternal nutrition and morphometry of placenta, the following investigations were made on 62 samples of cord blood and 50 samples of colostrum from the same subjects.

Colostrum: Total protein (Biuret method), Immunoglobulin A. Immunoglobulin G and Secretory Ig A (single radial immunodiffusion) levels.

Cord Blood Serum: Total protein (Biuret method), Vitamin B_{12}, Triiodothyronine (T_3), Thyroxine (T_4) and Cortisol (radioimmunoassay techniques), Immunoglobulin A and Immunoglobulin G (single radial immunodiffusion) levels.

Vitamin B_{12}, T_3, T_4 and Cortisol levels in human cord blood serum are reported for the first time in Sri Lanka. Vitamin B_{12} levels showed a wide variation (100 to 1460 pg/ml) with a mean of 599.4 pg/ml. Cortisol and T_4 ranged from 2.3 to 11.3 μg/100 ml. and 1.3 to 18.3 μg/100 ml. with a mean of 6.81 μg/100 ml. and 11.39 μg/100 ml. respectively. The cord blood serum immunoglobulin levels showed a positive correlation with the placental mass.

"Transfer of maternal antibodies to the foetus is of considerable importance in the immune mechanism of the neonate. In man the route is solely trans-placental, but antibodies contained in colostrum appear to help combat infections of the intestinal tract. Only IgG is transferred in man, and elevated IgM / IgA levels may be due to:

(1) Active synthesis by the foetus,

(2) Maternal, bleeding into the foetal circulation.

Determination of IgM / IgA levels in cord serum is used in the diagnosis of perinatal infections. In this paper we are reporting the normal values for cord serum IgG, IgM and IgA."

PLASMA OESTROGEN LEVELS IN SRI LANKAN WOMEN

W. G. J. P. Fernando, C. Wellappili, L. P. Samaranayake, and R. D. Piyasena

(Nuclear Medicine Unit, University of Sri Lanka, Peradeniya Campus).

Plasma Oestrogen levels estimated by Radioimmunoassay are reported for the first time in Sri Lanka. The assay uses an antiserum to Oestradiol / Oestrone; and ^{3}H and ^{14}C Oestradiol as tracer. The technique will be described in brief. The sensitivity of the assay is 10 pg, enabling the assay to be done with 1 ml. of plasma in normal subjects.

Total plasma Oestrogens has been estimated in 50 normal subjects in the follicular and the luteal phases of the normal menstrual cycle. The average total Oestrogen levels were found to be 65 ± 10 pg/ml. in the follicular phase, and 80 ± 10 pg/ml. in the luteal phase.

The assay has been used for clinical diagnosis in cases of primary and secondary amenorrhea, hypopitutarism and in simple hirtutism in females. These results will be presented and the clinical value of the assay will be discussed.

PREVALANCE OF ARBOVIRUS INFECTIONS IN SRI LANKA: RESULTS OF A 1976 SURVEY COMPARED WITH THAT OF 1966.

U. T. Vitarana, M. Kanapathipillai, N. Anandarajah and H. D. N. Gunasekera

(Virology Department, Medical Research Institute)

Since the survey carried out in 1966 there has been no proper surveillance of the activity of arboviruses in Sri Lanka. In view of the alarming spread of Dengue haemorrhagic fever in South East Asia there is a need to determine the susceptibility of the population as well as the activity of these viruses and their vectors in different parts of the country in order to prepare a preventive programme. This is a preliminary report of a survey begun this year.

50 blood samples (a fixed number per age group) were collected from hospital patients, not suffering from a virus infection, in each of the following towns:—Anuradhapura, Jaffna, Batticaloa, Trincomalee, Nuwara Eliya, Kandy, Badulla, Ratnapura, Galle, Matara, Negombo, Chilaw, Panadura, Kurunegala, Tissamaharama and Colombo. These sera were tested for haemagglutination inhibiting antibodies to the arboviruses (Dengue, Chikungunya, Japanese encephalitis and Sindbis) prevalent in Sri Lanka using a modification of the method of Clarke and Casals.

In comparison with 1966, for the island as a whole, there appears to have been:-

(1) a reduction in Dengue activity,

(2) a marked drop in Chikungunya and

(3) a greater susceptibility to arbovirus infestions, specially in the younger age groups.

There appears to be no recent Dengue activity in Nuwara Eliya and Tissamaharama while Anuradhapura has little; but Kandy, Matara and Jaffna have shown a significant increase. However there ia a suggestion of a recent increase in the level of activity of both virus groups in several towns. Are we on the threshold of another epidemic?

MORPHOMETRIC STUDIES OF HUMAN PLACENTAS OF SRI LANKAN WOMEN OF LOW SOCIO - ECONOMIC STATUS

L. P. Samaranayake

(Department of Biochemistry, University of Sri Lanka, Peradeniya Campus).

Quantitative data on the structural composition of the human placenta are required for a better understanding of the effect of maternal nutrition on placental function. Similar studies have not been performed in Sri Lanka previously.

The following morphometric investigations were carried out on 54 term placentas collected from normal term deliveries at the Kandy General Hospital: (mean values of findings in brackets)

1. Trimmed placental weight (377.39 Gm).
2. Trimmed placental volume (369.76 ml).
3. Greatest diameter of placenta (19·4 cm).
4. Least diamter of placenta (16.56 cm).
5. Distance between the point of insertion of the cord and the placental margin (5.06 cms). and
6. Placental outline with the point of insertion of the cord.

Frequencies and vertical frequencies of gestational age, birth weight, and placental weight were determined. The gestational age, birth weight, height and head circumference were compared with the morphometric data of the placenta and a positive correlation was found between the birth weight and placental mass.

Since morphometric data are not available for Sri Lankan women our findings are compared with such data obtained from a group of middle class North American women. Most of the parameters studied were found to be significantly reduced in the local group. The significance of these findings in relation to maternal nutrition will be discussed.

THE CHANGING PATTERN OF CONTRACEPTIVE ACCEPTANCE—A LONGITUDINAL STUDY

Mahasara Gunaratne
(University of Sri Lanka, Peradeniya Campus).

Tne results of a longitudinal study of contraceptive acceptors over a five-year period are presented. The demographic characters show a shift from an older age group to a younger one, and from a higher to a lower parity. The shifts in parity groups were more significant than for age groups.

For each method used three distinct categories are identified on the basis of age and parity. For reversible methods of contraception, the characteristics of acceptors were similar in contrast to the permanent methods. Parity seems to have been the criterion of selecting patients for sterilisation without due regard to age whereby very young patients have been sterilised resulting in medical problems. For permanent methods there has been a significant drop among high parity acceptors.

For pregnancy spacing, younger subjects prefer the IUD to the pill. There is a tendency among IUD acceptors to continue with this method long after the desired family size is reached. Consequently those acceptors of sterilisation who have spaced their families for some time are in an older age group.

The significance of the shifts in demographic characters on the Maternity Services and in hospital practice is predicted.

THE DYNAMIC SYSTEM IN THE ACCEPTANCE AND CONTINUATION OF CONTRACEPTION

Mahasara Gunaratne
(University of Sri Lanka, Peradeniya Campus).

The success of population control programmes is basically linked with the effective delivery of contraceptive measures to the community. In Sri Lanka, beliefs, attitudes and behaviour of a community play a significant role in health education. A

comparison of effectiveness of contraceptive methods requires consideration of the difference between theoretical and use-effectiveness. The principal daterminants in acceptance and continuation of contraceptive methods derived from a clinic practice are identified and the dynamic nature of the system linking acceptance with continuation is revealed. The various constraints to which this dynamic system is subjected to are recognised and a working system formulated to achieve dynamic equilibrium.

The principal determinants appear to be the greater or lesser availability of personnel, of knowledge, and the means of fertility control. The role of the successful acceptor as a source of information to the community is emphasised.

Adverse publicity for a particular method which initially resulted in poor acceptability had subsequent good continuation rates and re-acceptance when the constraining factors were dealt with by the working system suggested.

A master-card depicting the constraints and working system mentioned to achieve dynamic equilibrium is submitted as a teaching-aid.

A STUDY OF 334 MALE STERILISATIONS IN KANDY

Palitha Abeykoon

This paper reports the findings of a study conducted on 334 men who obtained vasectomies in a Kandy Clinic.

The objectives of the study were to determine:

1. the socioeconomic characteristitics of the men seeking sterilisation.
2. the reasons for the decision for family limitation.
3. the sources of information and influence in the decision making process.

4. the response to the post-operative follow up advised and postoperative interview and examination.

The data was gathered by structured interview prior to the operation and a postoperative followup.

The variables considered include age distribution, levels of education and occupations, children by their ages and sex, sources and time of information, earlier contraception, reasons and persons influencing the decision making process and preferences in relation to either a male or female child prior to the vasectomy.

The complications of the operation and the results of the seminal fluid examination were also recorded.

The results indicate that;

1. a proportionately greater number of men were Sinhalese Buddhists drawing incomes higher than the national norms. Muslims are significantly less.

2. friends and earlier acceptors were the chief sources of information and influence rather than medical and paramedical personnel·

3. there is a definite preference to have a male child before deciding on a vasectomy.

4. complications were rare and minimal.

5. the response to postoperative followup was poor and that operational and delivery aspects influenced this significantly.

There emerge from the findings distinct possible, practical, inputs in communication, education and services that could be made into the sterilization programmes of the country.

PATTERNS OF RHEUMATOID ARTHRITIS IN SRI LANKA

F. X. S. Emmanuel, S. N. Arseculeratne and L. V. Weliange

(Department of Microbiology, Faculty of Medicine, Peradeniya Campus)

Rheumatoid arthritis is a subacute or chronic symmetrical poly-arthritis causing destruction of articular cartilage and Juxta-articular bone with a predelection for small joints and often accompanied by systemic disturbance and circulating antiglobulins (Rheumatoid factors).

37 patients classifiable either as "Classical" or "Definite" Rheumatoid arthritis are described. The mean age was 42.4, the male to female ratio was 1 : 5, 70% were seropositive, 18.9% had subcutaneous nodules and 67% had positive radiological findings. However, in spite of attempts to standardise the diagnostic criteria for purposes of comparison, valid comparison between different populations cannot still be made with confidence.

Caucasian patients seem to show similar features as in our series. viz. mean age of 42-43 years, male to female ratio 1 : 3, 20 - 30% of them have subcutaneous nodules, and 85 - 90% are seropositive. Data from West Africa, however, indicate that majority of their patients are in the 20-40 age group, that the male to female ratio is more or less equal (29 : 31), and that very few of them have subcutaneous nodules and only 9 - 13% are seropositive.

More specific conclusions cannot be drawn from our present study until a more extended study including extensive field surveys are carried out in this country.

A STUDY OF NECROTISING ENTERITIS

C. B. Kumarakulasinghe and C. Ratnatunga
(Department af Surgery University of Sri Lanka, Peradeniya Campus, and General Hospital, Kandy)

A further report is made of a study of necrotising enteritis being carried out by us, amongst patients admitted to the General Hospital Kandy, since 1967. The clinical and pathological data of 122 cases, where the diagnosis was confirmed at operation (101 cases) or necropsy alone (21 cases) are reviewed.

Some of the features that may point towards an aetiology are (a) a definite seasonal incidence (b) a striking family history and the presence of neurological, hepatic and haemorrhagic manifestations in some of the cases.

The clinical features and the problems in diagnosis are discussed.

Of the 101 patients who required surgical intervention, approximately half were treated without resection of the bowel. An analysis of the operated cases appears to indicate a greater need for resection.

BACTERIOLOGICAL ASPECTS OF ILEAL PERFORATION COMPLICATING TYPHOID

J. S. M. Peiris & S. N. Arseculeratne
(Department of Microbiology, Peradeniya Campus)

C. B. Kumarakulasinghe, K. Marathappu & R. Edwards,
(Department of Surgery, Peradeniya Campus,.)

Ileal perforation as a complication of typhoid fever is not uncommon in this country, and carries a high mortality.

Twenty patients with typhoid perforations were studied. For conformation of typhoid in patients with suspected "perforation", the clot culture, stool culture and S.A.T. appear unhelpful.

Culture of a mesenteric lymph node removed during laparotomy is a reliable method of retrospective diagnosis even in patients who have had prior antibiotic therapy.

S.A.T. titres of patients with typhoid perforatin appear to be lower than that of comparable patients with uncomplicated typhoid.

Bacteriological examination of the peritoneal pus suggests that peritonitis resulting from the perforation is a typical faecal peritonitis where the coliforms and anaerobes predominate. The typhoid bacillus probably plays a minor role (if any) in the peritonitis. Hence it is advisable that antibiotic treatment should cover not only *S. typhi,* but also the predominant pathogens in the peritoneal pus. The antibiotic sensitivities of these organisms suggest that Chloramphenicol should be used together with Kanamycin or Gentamycin, as the majority of of coliforms isolated were resistant to Chloramphenicol and Ampicillin.

A CLINICAL STUDY OF DOWN'S SYNDROME IN 1975/1976

Rohan Jayasekara.
(Dept. of Anatomy, University of Sri Lanka, Colombo Campus)

Priyani Soysa.
(Dept. of Pediatrics, University of Sri Lanka, Colombo Campus)

The clinical criteria for diagnosis of Down's Syndrome make it unnecessary in most situations for routine cytogenetic analysis.

Penrose described two groups:

The age-dependant group being solely due to nondisjunction associated with late maternal age and

The age-independant group which too can be due to non-disjunction and hence Trisomy 21, but also due to heritable and nonheritable translocation defects.

This study firstly shows the maternal age distribution of patients seen in the University Paediatric Unit in Colombo. The incidence in late maternal age is low and this is related to the number of pregnancies after 40 years. The incidence is highest between maternal ages of 20 and 30, 50% of cases being in this group. The maximum number of pregnancies in this country however coincide with this peak incidence and this is shown in the study. The need to highlight this age incidence is to disseminate this knowledge, to prevent the incidence of Down's Syndrome after 30 years.

The age of presentation for diagnosis, the family histories, and the association with congenital heart diseases are discussed.

Cytogenetic studies though attempted are not presently economically possible in all cases. Successful cultures are shown. The study brings out (1) the need for cytogenetic analysis because of the high incidence of Down's Syndrome in the young mother. (2) The possibility of prevention of 50% of D. S. by family planning.

MOTIVES FOR ADMISSION FROM THE OUT-PATIENT DEPARTMENT OF A BASE HOSPITAL

B. Mahendra

(Out - patient Department, Base Hospital, Matale. Presently, Department of Psychiatry, University of Sri Lanka, Peradeniya Campus)

The admission patterns from the O. P. D. of a Base Hospital, where the monthly attendance was approximately 10,000 were studied. It was seen that a substantial number of patients did not require admission on clinical grounds but wished for in-patient treatment on socio-economic and other considerations. 200 such patients were studied and their motives for insisting on admission even when the nature of the illness did not warrant admission were examined. It was found that 65% of patients demanding admission complained they had come long distances because facilities were unavailable at their local hospital or said

they had come "ready for admission". A difference in the reasons given for the first four days of the week as against the last three i.e. the week-end, was noted. It is contended that Medical Officers in peripheral units must either be provided with trained auxiliary staff or these stations manned by assistant medical practitioners. It is deemed more important to stock these institutions with ample quantities of drugs to deal with trivial ailments. District hospitals must be equipped with medical officers with facilities for minor surgery and there must be constant communication between them and the Base Hospital so that, for instance, patients awaiting routine surgery could be referred on appropriate days. It is shown meaningless to to classify hospitals as "Base" unless it is fully justified, so that ludicrous situations of transfer from "Base" to "Base" need not arise. Furthermore, it is argued that having one-man specialities is wasteful.

OBLITERATIVE ARTERIAL DISEASE OF LIMBS IN THE CENTRAL PROVINCE

C. Ratnatunga
(General Hospital Kandy)

A high incidence of peripheral arterial disease was noticed in the central province. The significant morbidity, caused by several agonizing weeks in hospital, becoming addicted to analgesics and ultimately losing parts of the affected limb, attracted the author's attention. The study spans the period June '74 - August '76 and includes 175 patients.

70% of the patients were under 50 years of age. 7% had associated cardiac ischaemia and 2% had cerebral ischaemia. Claudication was the only presenting symptom in 8%, claudication with ulceration or ischaemia of the digits in 62%, and ulceration and ischaemia in 30%. This contrasts greatly with the pattern of arterial disease found in Europe and the USA.

A definite male preponderance (169 patientss) and a high incidence of smoking (168 patients) was noticed. The femoropopliteal segment was fund to be the site of obstruction in 35% of patients. Upper limbs were affected in 31% of patients. Histology was done in a proportion of cases.

ARTERIOGRAPHIC PATTERNS OF LOWER LIMB ISCHAEMIA IN THE CENTRAL PROVINCE

P. Amerasinghe and C. Ratnatunga.
(General Hospital, Kandy.)

Arteriographic data of 115 patients with lower limb ischaemia seen during the period July '68–Aug. '76 are reviewed. 92 bilateral and 23 unilateral femorol arteriograms were done. In 6 patients repeat arteriograms were done several months or years tater.

The commonest site of obstruction was found to be the superficial femoro-popliteal segment with the majority occurring in the vicinity of the adductor hiatus. Several patients had disease at multiple sites.

The problems involved in classification of these patients on the basis of radiological appearences are discussed. Subsequent clinieal and histological correlations were done in some. Clinico–arteriographic correlations to assess the reliability of pulse examination revealed that the popliteal pulse examination was an unreliable index of patency. Narrowing of the popliteal artery, its retrograde filling by collaterals and human error accounted for the discrepancy.

UNDERGRADUATE ATTITUDES TO THE MEDICAL CURRICULUM

B. Mahendra
(Dept. of Paychiatry,
University of Sri Lanka, Peradeniya Campus.)

The second, third, fourth and final year student population of the Colombo Medical School were surveyed by a self–administered questionnaire. 59 items in six parts were given to include details of a socio-economic nature, inquire into the

students' satisfaction with their choice of career and their aspirations, the areas of anticipated further specialization, attitudes to the medium of instruction, lectures, tutorials, continuous assessment, examinations and other forms of evaluation. The majority of students were satisfied as to their choice of career and hoped to enjoy their lives as doctors. The respondents were mainly of middle-class origin and roughly 20% were on bursaries or bank loans. Almost 100% wished their education to be in English and nearly all students found English to be very useful or indispensable to them. The need for optional lectures was equally strongly felt. Over 50% desired a change in the system of evaluation and some 70% would like examinations to be common to Colombo and Peradeniya. The great majority of respondents, even in their final years, had not committed, themselves to further specialisation but of those who had, the conventional specialities were favoured. The student responses have been analysed and the results have been critically discussed.

SECTIONAL PROGRAMME

SECTION B: AGRICULTURAL SCIENCES AND FORESTRY

(Arts Theatre)

Wednesday 8th December

1.00 ... Rainfall in Sri Lanka in 1975 in relation to evapotranspiration and the Moisture Status of the Soil—A. W. R. Joachim.

1.20 ... Evaluation of Eppawala Apatite by Chemical Analysis-V. H. Ambepitiya and S. L. Amarasiri.

1.40 ... A Fused Phosphate Fertilizer From Eppawala Rock Apatite- S. L. Amarasiri and V. H. Ambepitiya.

2.00 ... Biosuper—A Biological Superphosphate from Eppawela Rock Phosphate- D. T. Weerasekera and Sathiabama de Silva.

2.20 ... Horton Plains Peat as a Carrier of Legume Inoculum—D. T. Weerasekera.

2.40 ... Recycling of Wastes—An Evaluation of Distillery Residues as Poultry Feed Supplements—N. Sriskandarajah, V. Ravindran and V. Puvirajasingham.

3.00 ... **The Promotion and Planning of Research using the Deutsche Forschungsgemeinoschaft as the example—Prof. Dr. Gerd Roellecke** (Jointly with Sections A, D & F) (Arts Theatre).

Thursday 9th December

8.00 ... Effect of a Supplementary Source of Micronutrients on Germination and Growth of Coconut Seedlings—M. A. T. de Silva and P. P. Atputharajah.

8.20 ... Inorganic and Organic Sources of Nitrogen and Phosphorus as Fertilisers for Coconut—T. S. Balakrishnamurti.

8.40 ... Downward Movement and Transformation of Phosphorus After Long-Continued fertilizer application to Coconut—P. Loganathan and V. Nalliah.

9.00 ... Phosphorus Adsorption by some Tropical Coconut Soils of Sri Lanka: I. Effect of Soil Properties—P. Loganathan and T. W. Fernando.

9.20 ... Phosphorus Adsorption by some Tropical Coconut Soils of Sri Lanka: II. Effect of pH and Calcium—P. Loganathan and T. W. Fernando.

9.50 ... Planting Densities and Planting Systems for Coconut *(Cocos nucifera* L.)—A study of vegetative characters—M. A. P. P. Manthriratne.

10.30 ... Business Meeting.

1.00 ... Effect of Ammonium Sulphate, Urea, Ammonium Carbonate and Sodium Chloride on Germination of Rice Seeds and On Seedling Growth—Indrani Maldeniya and Mervyn W. Thenabadu.

1.20 ... Silica Content in Rice Husk and Its Availability—Asoka Wijeratne and Mervyn W. Thenabadu.

1.40 ... Reponse of Improved Rice Varieties of Different Age Groups (long, medium, short) to Fertilizers in the South West Sector Drainage and Reclamation Schemes 1974 - 1975—S. Jesudas, I. Balasuriya and D. L. Wickremasinghe.

2.00 ... The Response of Improved Rice Varieties Bg 11-11 (4-4½ months) and Bg 34-8 (3 months) to Phosphorus Fertilizer in the Bolgoda and Kiralakelle Drainage and Reclamation Schemes—Yala 1975—I. Balasuriya, D. L. Wickremasinghe and K. A. J. H Fernando.

2.20 ... The Performance of Improved Rice Varieties of Long, Medium and Short Aged Groups in Cultivators' Fields of Bolgoda, Bentota Left Bank and Kiralakelle Drainage and Reclamation Schemes—Yala 1974, Maha 74/75 and Yala 1975—D. L. Wickremasinghe and I. Balasuriya.

2.40 ... Investigation on Rice cultivation in the Beminiwatte APC area (Ultisols) (a) Monitoring of Management Practices—Yala 1975, (b) Preliminary Field Investigations—Maha 1975/75—S. Masilamany and I. Balasuriya.

3.00 ... **Popularisation of Science Committee Seminar** (All Sections) (Arts Theatre).

4.30 ... **Presidential Address: Towards Meeting the Food Requirements of Tomorrow—Mervyn Pulle** (Chemistry Theatre).

Friday 10th December

10.00 . Annual Meeting (All Sections)

1.00 ... Hevea (Rubber) Seeds for Human Food – L. C. Wheeler (Jointly with Sections D & E.) (Biology Lecture Theatre).

1.20 ... Study of the Incidence of 'Black Grain' in Rice and its Effects on Rice Quality—C. Breckenridge and V. Sangerapillai.

1.40 . Cooking Quality of Four Varieties of Soyabeans as Influenced by Storage—C. Breckenridge and S. F. M. Fallil.

2.00 ... Diurnal and Seasonal Fluctuations of Nutrients in Foliar Tissues of Coconut—M. Jeganathan, P. A. D. G. A. Appuhamy, B. J. A. F. Mendis and G. D. George.

2.20 ... Study on the Annual Exhaust of Soil Nutrients by the typica x pumila Hybrid palm—M. Jeganathan, P. A. D. G. A. Appuhamy, B. J. A. F. Mendis and G. D. George.

2.40 ... Effect of Iron and Manganese on Growth and Nutrition of Coconut Seedlings—M. A. T. de Silva and G. M. Anthonypillai.

Saturday 11th December

8.40 ... Microbial control of *Nephantis serinopa* Meyrick, the black headed caterpillar of coconut with different formulations of the bacterium *Bacillus thuringiensis*. Berliner—P. Kanagaratnam and U. Pethiyagoda.

9.00 ... New developments in the control of *Aspidiotus destructor*, the coconut scale—P. Kanagaratnam and S. V. Sinnathamby.

9.20 ... Some Minor Pests of Coconut: New Records for Sri Lanka—P. Kanagaratnam, J. L. J. G. Pinto and S. V. Sinnathamby.

10.00 ... Use of systemic insecticides for the control of some serious pests of of coconut—P. Kanagaratnam and U. Pethiyagoda.

10.20 ... Efficacy of *Trichoderma* spp. as a biocontrol for *Corticium rolfsii* and *Rhizoctonia* state of *Thanatephorus cucumeris*—B. Sivakadadcham.

10.40 ... Death of clove seedlings caused by *Cylindroclasdium floridanum*—B. Sivakadadcham.

1.00 ... Variations in the Composition of Oil in Citronella Strains—E. E. Iruthayathan, H. M. W. Herath and R. O. B. Wijesekera.

1.20 ... *Sesbania speciosa* - A new Crop of Agro-Industrial Promise in the Dry Zone—T. Sivalingam.

1.40 ... Effect of 2-chloro-4, 6-bis-(ethylamine)-S-triazine (Simazine) on soil microbial activity and nitrification in an alluvial soil—C. S. Weeraratne.

2.00 ... Studies on the Mineralization of Organic Matter in Two High Organic Matter Containing Rice Soils—Sarojinidevi Kandiah and Mervyn W. Thenabadu.

RAINFALL IN SRI LANKA IN 1975 IN RELATION EVAPOTRANSPIRATION AND THE MOISTURE STATUS OF THE SOIL

A. W. R. Joachim

A preliminary study was undertaken to estimate the moisture status of the soil in relation to rainfall and evapotranspiration in Sri Lanka in 1975, in respect of eight major climatic zones. These are typified by the following specific locations: Hambantota (low arid), Anuradhapura and Jaffna (low dry), Kurunegala (low intermediate), Colombo (low wet), Ratnapura (low ultra wet), Kandy (mid wet), Diyatalawa (high intermediate), and Nuwara Eliya (high wet). The average potential evapotranspiration data estimated by Koelmeyer by the Thornthwaite formula and procedure were used as the basis of the calculation of the following parameters for 1975: actual evapotranspiration, moisture deficit and moisture surplus. The periods of soil moisture recharge and utilisation were also incidentally ascertained.

Some of the features of interest resulting from the study are as follows:

(1) The pattern of the water balance in 1975 in the wet and ultra wet zones was normal, water being much in excess of plant needs in most months except January and February.

(2) The arid and dry zones showed a different pattern to normal in respect of the duration of soil moisture deficits. The drought in the dry zone, especially the Anuradhapura district, was more severe than that in the arid zone.

(3) The actual evapotranspiration in the arid and dry zones in 1975 was about equal to the annual rainfall, the exception being Jaffna because of abnormally high rain in the N. E. Monsoon.

(4) The intermediate Kurunegala zone had a well - distributed water regime and the mid wet zone of Kandy a high water surplus due to a heavy rainfall in November.

(5) The Thornthwaite method of assessment of the soil water balance offers promise of effective use in agriculture.

EVALUATION OF EPPAWALA APATITE BY CHEMICAL ANALYSIS

V. H. Ambepitiya and S. L. Amarasiri
(Central Agricultural Research Institute, Peradeniya).

Citric acid (2%) is used in many parts of the world for evaluating the suitability of rock phosphates for direct applicaion to crops. A wide range of values (0.1 – 5.2 % $P_2 0_5$) of citric acid soluble phosphorus for Eppawala apatite has been reported by different investigators in Sri Lanka. This has led to the general conclusion that the Eppawala deposit consists of rock material of highly variable citric acid soluble phosphorus content. While this may be correct such divergent values can also result from use of differing analytical procedures.

The effect of varying the ratio of apatite to cirtic acid used, the time of shaking and the rate of shaking on the amount of phosphorus solubilised have been investigated.

From the same source of Eppawala apatite we have obtained widely different citric acid soluble phosphorus by changing the ratio of apatite to citric acid. Some of the variation in the citric acid soluble phosphorus of Eppawala apatite referred to earlier could have resulted from non adherence to the same analytical proedure by the numerous laboratories. A standardised analytical procedure is essential for the proper evaluation of Eppawala aptite.

A FUSED PHOSPHATE FERTILIZER FROM EPPAWALA ROCK APATITE

S. L. Amarasiri and V. H. Ambepitiya
(Central Agricultural Research Institute, Peradeniya).

The citric acid solubility of Eppawela apatite used by the Department of Agriculture for its field experiments has been in the range 2–4% P_2O_5, whereas that of imported saphos phosphate has been about 10% P_2O_5. Field experiments conducted with

rice in many parts of Sri Lanka have shown that Eppawala apatite is not as good a source of phosphorus fertilizer as imported rock phosphate or concentrated superphosphate.

By fusing Eppawala apatite (analysing 27% Total P_2O_5 and 3.4% citric acid soluble P_2O_5) with sodium carbonate and powdered quartz at about 1100°C a product was obtained with a citric acid solubility of 20% P_2O_5.

In a greenhouse experiment with rice on an acidic soil fused Eppawala apatite was found to be superior to Eppawala apatite and to imported rock phosphate but was not quite as good as concentrated superphosphate and Rhenania phosphate (a fused phosphate made in West Germany).

BIOSUPER—A BIOLOGICAL SUPERPHOSPHATE FROM EPPAWELA PHOSPHATE

D. T. Weerasekera and Sathiabama de Silva
(C. A. R. I., Peradeniya)

Natural deposites of rockphosphate vary in their hardness and availability of phosphorous to plants. The best being the soft north African deposits. Treatment of rock phosphate with conc. sulphuric acid results in a 20% ordinary superphosphate. This process needs expensive factories and capital.

Soils mixed with 1% sulphur and incubated at 28°C would indicate the presence of sulphur bacteria by the acidity formed. In biosuper 5 parts of rockphosphate is mixed with 1 part of sulphur powder and 1% soil inoculum having Thiobacillus with water to form a pellet. Within the TH. thiooxidans dissolves the rockphosphate at a pH round 3.5 by forming sulphuric acid.

Biosuper is cheap and could be made with a cement mixer. As the optimum temperature for the thiobacilli is 28°C its sucess is only in the tropical regions. It is a slow acting fertilizer and is suitable for only perennial crops. In pastures and sugar cane

biosuper has performed better than the superphosphate in the second and third years. The thiobacilli is an aerobe and does best in miost wet regions but not in water logged rice soils.

In a glasshouse replicated pot trial Siratro, *Phaseolous atropurpureus* a perennial subtropical pasture legume was grown in a highland phosphate deficient soil with zero phosphate, 2, 4 and 8 cwts. of raw Eppawela phosphate, biosuper and ordinary superphosphate. At the 4th harvest after 218 days the dry weight and P content of the ordinary superphosphate treatments was best, secondly the biosuper and lastly the Eppawela phosphate. At the 3rd and 4th harvest the Eppawela phosphate is showing promise as a slow acting fertilizer in aerobic conditions but it has shown no response in earlier rice trials (in flooded conditions).

Details of the 10 treatments at the harvest with the dry weight and phosphate uptake would be given.

HORTON PLAINS PEAT AS A CARRIER OF LEGUME INOCULUM

D. T. Weerasekera
(C. A. R. I., Peradeniya)

Peat rich in organic matter has been used as a carrier of inoculum in Australia and U.S.A. Sterlization of the peat destroys all microorganisms and is essential for the slow growing Rhizobium japponicum group, the slower Rh. lupini group but not for the fast growing Rh. trifoli.

The number of rhizobia that has to be applied to the inoculated seed is the key to any standard. In sterile glasshouse work one rhizobium is sufficient for positive nodulation but under field conditions in an adverse environment with competition with other soil organisms 300 rhizobia/seed is the minium standard but under favourable conditions 200 / seed could give prompt nodulation.

Rhizobia were grown in an areated yeast extract sucrose medium to provide 500 x 10^3 viable rhizobia/ml. A viable plate count was done. 100ml of this broth was mixed with 200g of Horton Plains peat sterilized (<300 mesh) to give a water content of 40 – 45%. Counting methods were done by standard dilution procedures on the surface of a yeast extract-mannitol agar containing 1 in 40,000 of Congo Red. Plate dilution counts were made by inoculating duplicate seedlings. This permits a culture to be defined as below standard $<10 \times 10^6$ rhizobia/g; doubtful 10 to 100 x 10^6/g; satisfactory 100 to 1000 x 10^6/g. and very satisfactory 1000 x 10^6/g. The below standard and doubtful material is discarded. The very satisfactory is given an expiry period of 6 months and the satisfactory as in this case of Horton Plains peat 4 months if maintained at 2°C.

RECYCLING OF WASTES – AN EVALUATION OF DISTILLERY RESIDUES AS POULTRY FEED SUPPLEMENTS

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and
V. Puvirajasingham
(State Distilleries Corporation, Kandy).

By-products of the distilling and fermenting industries have been used in animal feeding to supplement protein, vitamins, minerals and some unidentified growth factors. Fodder yeast and yeast as single cell protein are being increasingly used at present. Considerable quantities of yeast becomes available as toddy sediment and spent wash in the local coconut arrack distilling industry. Experiments were conducted to evaluate dried distillery residue (DDR) as a poultry feed supplement.

The DDR used in these experiments analysed 9.75% moisture, 20.87% crude protein, 1.20% ether extract, 2.20% crude fibre, 10.10% ash and 55.88% N–free extractives.

Initially DDR was added to a commercial ration at 5 and 10% levels and fed to broiler finishers and compared with two commonly used protein supplements namely local fish meal and milk powder added at the same levels. The performance of the birds supplemented with DDR was better than the other two groups. DDR fed group had significantly better ($P>0.05$) weight gains and feed efficiency compared to local fish meal.

In the second experiment rations were formulated incorporating 5, 10 and 15% DDR to be isocaloric and isonitrogenous as the control. The differences in the performance of broiler starters fed with these rations were not significant ($P>0.05$), indicating that DDR could be used in broiler rations up to 15%. A fifth ration containing 5% DDR in addition to the control showed slightly better results suggestive of the presence of an unidentified growth factor.

EFFECT OF A SUPPLEMENTARY SOURCE OF MICRONUTRIENTS ON GERMINATION AND GROWTH OF COCONUT SEEDLINGS.

M. A. T. de Silva and P. P. Atputharajah
(Coconut Research Institute, Lunuwila)

Solutions of Fe, Mn, Cu, Zn, B and Mo were injected into the husks of seasoned coconut seednuts of uniform size and maturity. The quantity of each nutrient injected was equivalent to about 10 times the total quantity normally present in the kernel and coconut water. A "plus-all" treatment and a "minus all" treatment served as controls.

Zinc and copper treatments not only appeared to shorten the period of sprouting, but also increased the percentage of successful germinations. Boron on the other hand progressively reduced the rate of sprouting.

These treatments also had a significant effect on growth of seedlings. With respect to height of seedlings six months after planting, the treatment effects were in the order of Cu> Mo> Mn> Fe> Zn> B> "plus all" ⇌ "minus all". The adverse effects of boron on both germination and subsequent growth of seedlings may possibly be due to toxic effects.

This study basically shows that a supplementary source of copper, zinc and possibly molybdenum to seednuts may not only help to hasten the process of sprouting but also promote better growth of seedlings.

INORGANIC AND ORGANIC SOURCES OF NITROGEN AND PHOSPHORUS AS FERTILIZERS FOR COCONUT

T. S. Balakrishnamurti

(Coconut Research Institute, Lunuwila).

Results of a long term field experiment to investigate the performance of inorganic and sources of nitrogen and phosphorus as fertilizers for coconut on a sandy loam soil in the intermediate zone (rainfall) are presented and discussed. The inorganic sources were sulphate of ammonia and saphos phosphate and the organic sources fish guano, bone meal and cattle manure.

Except for the first two years of the experiment, all the fertilizer treatments were consistently and significantly superior to the control. However, there was no significant difference between the effects of the inorganic and organic fertilizer mixtuers on yield (pounds copra per acre).

DOWNWARD MOVEMENT AND TRANSFORMATION OF PHOSPHORUS AFTER LONG-CONTINUED FERTILIZER APPLICATION TO COCONUT.

P. Loganathan and V. Nalliah.
(Coconut Research Institute, Lunuwila).

Available phosphorus ($NaHCO_3$ extraction) measurements in the profile of a sandy loam soil down to 105 cm depth, after 7 and 8 years of fertilizer application to coconut in the Semi-Dry Lowland of Sri Lanka showed that the surface soils (0-15 cm) of concentrated superphosphate tratement had higher P values (60 and 89 ppm) than the rock phosphate treatment (3 and 16.5 ppm). At 40 cm depth conentrated superphosphate treatment had 6 and 30 ppm P whereas the rock phosphate treatment had almost zero P at and below 40 cm depth.

Phosphorus in the soil profile after 8 years of fertilizer application was fractionated by the method of Chang and Jackson. The results showed that the concentrated superphosphate treatment increased the Al-P fraction and to a lesser degree Fe-P and Ca-P. Rock phosphate treatment increased the Ca-P fraction and to a lesser extent Fe-P and Al-P. Sodium bicarbonate extractable P was shown to be very highly correlated with Al-P fraction.

$\frac{\text{Al-P}}{\text{Fe-P}}$ decreased with increase in soil depth suggesting that, with time, Al-P gets transformed into Fe-P by refixation or is removed by the tree.

Based on the P movement and transformation results it is proposed to use concentrated superphosphate as the P fertilizer for coconut soils of the Dry Zone in Sri Lanka in place of the presently used rock phosphate.

PHOSPHORUS ADSORPTION BY SOME TROPICAL COCONUT SOILS OF SRI LANKA : I. EFFECT OF SOIL PROPERTIES

P. Loganathan and T. W. Fernando
(Coconut Research Institute, Lunuwila).

Phosphorus adsorption, in the presence of 10^{-2}M $CaCl_2$, by 10 acid coconut soils belonging to the Order, Ultisols, Alfisols and Entisols, is described by a two site Langmuir adsorption isotherm. The first site adsorption (equilibrium P< 1μg/ml) had very high bonding energy coefficient and low adsorption maxima compared to the second site (equilibrium P >1μg/ml). The first site adsorption maxima of Ultisols (349 to 825 μg/ml), were higher than those of the other soils (136 to 345 μg/ml). These adsorption maxima were significantly correlated with surface area, % clay, % silt, free iron oxides and active Al (1M NH_4OAc, pH 4.8) but not with organic carbon, cation exchange capacity, exchangeable Ca, and extractable Fe (1M NH_4OAc, pH 4.8). Among these factors, free iron oxides was the most important factor ($r = 0.906^*$) controlling the adsorption.

The kinetics of P adsorption by these soils showed an initial rapid phase followed by a slow process. In the region of the first site, about 75% of the adsorption was complete within a few minutes while the rest of the adsorption took 3 to 6 days.

Langmuir adsorption maxima was satisfactorily used to predict the P availabllities in these soils treated with concentrated superphosphate.

PHOSPHORUS ADSORPTION BY SOME TROPICAL COCONUT SOILS OF SRI LANKA: II. EFFECT OF pH AND CALCIUM

P. Loganathan and T. W. Fernando.
(Coconut Research Institute, Lunuwila).

Phosphorus adsorption by an Ultisol and an Alfisol was studied in the presence of 4 x 10^{-2}M NaCl and 1 x 10^{-2}M $CaCl_2$ at pH values of 4.5 and 6.0, and equilibrium P concentrations of 0.1 to 10μg/ml. The results showed that for Na, P adsorption was higher at pH 4.5 than at 6.0 for all equilibrium P concentrations, whereas for Ca, this holds only at low equilibrium P concentrations while at high concentrations of P, the adsorption is higher at pH 6.0 than at 4.5.

Net surface charge determinations on P-treated and untreated soils at pH values of 3 to 7 and at different concentrations of NaCl and $CaCl_2$ showed that P is specifically adsorbed at all pH values tested. At high pH values the specific adsorption was higher for Ca than Na whereas at low pH values there was hardly any difference between Na and Ca. It is suggested that at high pH values, Ca helps the adsorption of P, probably by forming a bridge between the oxide and hydroxide groups of the soil surface and P.

PLANTING DENSITIES AND PLANTING SYSTEMS FOR COCONUT *(COCOS NUCIFERA* L.)— A STUDY OF VEGETATIVE CHARACTERS

M. A. P. P. Manthriratna
(Coconut Research Institute, Lunuwila).

It has been customary to plant coconut on the corners of a geometrical figure - a square, a rectangle or a triangle - giving approximately 65 palms per acre.

There is general agreement that the triangular system of planting while giving more palms per acre, makes more demands on the environment and light reaching the ground is progressively reduced after the first few years growth. Furthermore the trangular system of planting hinders cultural operations as well as the growing of intercrops particularly during the 5th to the 25th year of growth of the coconut palms. As mixed cropping with permanent intercrops may be the pattern of the future, planting densities and planting systems for coconut are under investigation.

The results are presented of a staitstically designed field trial at Pothukulama Research Station where 16 different spacings of Coconut ranging from a low density of 45 palms per acre (111 palms per hectare) to a high density of 116 palms per acre (297 palms per hectare) are compared.

In this interim report, the influence of spacing on the growth and period for initial flowering indicates that (a) spacing has no significant influence on total leaf production, (b) spacing has a significant effect on the length of leaves and the girth of the trunk and, (c) it has no significant effect on the period taken for initial flower production.

It is likely that a better assessment between the different densities will be brought out when yield data – number of nuts and the weight of copra – are considered in the next few years.

EFFECT OF AMMONIUM SULPHATE, UREA, AMMONIUM CARBONATE AND SODIUM CHLORIDE ON GERMINATION OF RICE SEEDS AND ON SEEDLING GROWTH

Indrani Maldeniya and Mervyn W. Thenabadu

(Faculty of Agriculture, University of Sri Lanka, Peradeniya Campus).

Effects of ammonium sulphate and urea, on the germination of several varieties of rice seed were tested in solutions ranging from 0.01M to 0.08M. Distilled water was used as the control.

Percentage germination generally was less in urea than in ammonium sulphate of the same concentration. Germination decreased with increasing concentration of urea. Pokkali had the highest percent germination while A 15-100 had the lowest.

With increasing concentration of urea percentage germination of varieties A 15-100 and A 16-14 decreased rapidly and there was no germination in solutions stronger than 0.04M. Further, seedling vigour degenerated with increasing concentration up to 0.04M. The varieties Bg 34-6 and Bg 3-5 did not germinate in 0.05M and 0.06M solutions respectively. All other varieties tested ceased to germinate at concentrations above 0.07M; and seedling vigour gradually declined up to this concentration.

In ammonium sulphate solutions too percentage germination of varieties A 15-100 and A 16-14 was less compared to the other varieties. However, unlike the urea there was no complete lack of germination in any ammonium sulphate solutions tested. Pokkali showed one hundred percent germination even in the highest concentration (0.08M) and A 15-100 showed the lowest.

Toxicity symptoms and death was high in seedling in ammonium carbonate solutions and low in ammonium sulphate. Sodium chloride solutions showed little adverse effects in seedling growth, except a slight wilting exhibited by Mashuri in solutions of 0.04M and higher.

These results are discussed in the light of practical problems in fertilizer applications.

SILICA CONTENT IN RICE HUSK AND ITS AVAILABILITY

Asoka Wijeratne and Mervyn W. Thenabadu
(Faculty of Agriculture, University of Sri Lanka, Peradeniya Campus)

The contents of silica in the husk of several varieties of rice grown at three locations, in the Co-ordinated Rice Varietal Trials of the Research Division of the Department of Agriculture during the *Yala* season 1975, were determined.

There were differences in the silica content in husk of plants grown at Gannoruwa, Bathalagoda and Ambalantota. The values varied between 8 and 12 percent in plants from Gannoruwa and between 17 and 20 percent in plants from Ambalantota. Plants from Bathalagoda, in the Intermediate Zone, had values ranging from 11 to 14 percent.

There were no significant differences in silica content of paddy husk between varieties grown in the same location. Although the percentage of silica varied between the Wet zone and the Dry zone locations the percentage husk in the grain was not found to vary.

The solubilization of silica from rice husk treated differently was also studied in the laboratory after incubation for six weeks in a slightly acid, sandy loam paddy soil from Peradeniya. It was found that available silica from husk ash was greater than from unburnt or burnt husk. Addition of glucose to soil tended to increase availability of silica, burnt husk releasing more of the compound than the ash.

These results are discussed in relation to earlier studies.

RESPONSE OF IMPROVED RICE VARIETIES OF DIFFERENT AGE GROUPS (LONG, MEDIUM, SHORT) TO FERTILIZERS IN SOUTH WEST SECTOR DRAINAGE AND RECLAMATION SCHEMES—1974 - 1975

S. Jesudas, I. Balasuriya and D. L. Wickramasinghe
(Field Trials Division, Department of Agriculture)

The response of improved rice varieties to the Department of Agriculture recommendation, which includes NPK 5 : 15 : 15 pelletised Fertilizer was evaluated in the low lying poorly drained flood prone areas of the Bolgoda, Bentota Left Bank, Bentota Right Bank and Kiralakelle Schemes.

Considering the possibility that pelletised Fertilizer may be unavailable, the effect of using NPK Straight Fertilizers (ie. urea, concentrated super phosphate and muriate of potash) was also tested, at the same nutrient levels, for the respective age groups.

In all schemes, the varieties tested gave a highly significant yield response to the application of fertilizer at half the recommendation, full recommendation and even at a higher level, when compared with the "No Fertilizer Control." The response to half Departmental Recommendation, was comparatively large in all instances. The investigations revealed beneficial effects of applying fertilizers, along with good management, where traditionally farmers use low levels of fertilizer.

The performance of straight fertilizer was as good or even better than that of the NPK 5 : 15 : 15 pellets. However, in these areas (Histosols) pelletised Fertilizer has definite practical advantages. Restricting the use of pelletised fertilizer to the histosols of Colombo, Kalutara, Galle, Matara and Ratnapura districts, could result in considerable savings in the cost of fertilizer.

THE RESPONSE OF IMPROVED RICE VARIETIES BG 11-11 (4-4½ Months) AND Bg 34-8 (3 Months) TO PHOSPHORUS FERTILIZER IN THE BOLGODA AND KIRALAKELLE DRAINAGE AND RECLAMATION SCHEMES — YALA 1975

I. Balasuriya, D. L. Wickremasinghe and K. A. J. H. Fernando

(Field Trials Division, Department of Agriculture)

The schemes referred to are located in the Histosol region of the Low-country Wet Zone. (South West Sector.) Rice lands within the schemes are lowlying (ie. below Mean Sea level to +5 feet above Mean Sea Level), frequently flooded, poorly drainaged and subject to coastal salinity.

Despite reduced flood risk, improved drainage and salinity control, frequently in the varieties used the tillering was poor, root growth retarded, leaves were pale-yellowish and yields were relatively low.

Fertilizer investigations on Bog, Half Bog and Gleyic Alluvial soils, low in available phosphorus, revealed a significant response to phosphorus up to 68 lb and 51 lb P_2O_5/ac (as concentrated super phosphate) at Bolgoda and Kiralakelle Schemes respectively, with both Bg 11-11 and Bg 34-8. ie. a response to 100% and 50% more P_2O_5/ac than recommended. Withholding the recommended quantity of Phosphorus (34 lb P_2O_5/ac) resulted in a greater depression in yield than withholding nitrogen. This further emphasises the need for phosphours fertilization. The available phosphours (Olsen's) of soils did not reflect the magnitute of the responses obtained.

A significant response was shown to the recommended quantities of nitrogen too. (ie. 63 lb N/ac and 37 lb N/ac).

THE PERFORMANCE OF IMPROVED RICE VARIETIES OF LONG, MEDIUM, AND SHORT AGED GROUPS IN CULTIVATORS' FIELDS OF BOLGODA, BENTOTA LEFT BANK, AND KIRALAKELLE DRAINAGE AND RECLAMATION SCHEMES—YALA 1974, MAHA 74/75 AND YALA 1975.

D. L. Wickremasinghe and I. Balasuriya
(Field Trials Division, Department of Agriculture)

The Bolgoda, Bentota Left Bank and Kiralakelle Drainage and Reclamation Schemes situated in the Histosols of the Low country Wet Zone districts of Kalutara, Galle and Matara respectively, are part of the South West Sector Drainage and Reclamation Project. These schemes are designed to increase rice production by effecting improvements to the rice growing environment.

Improved varieties, of 5-6½ months (photoperiod sensitive), 4-4½ months, and 3 & 3½ months duration, were evaluated for yield and adaptability, along with indigenous varieties, using recommended fertilizer and management practices.

In the long Aged Group Bg 3-5, an improved photoperiod sensitive variety, was well adapted to the *Maha* season. In the Medium Aged Group the best yielder was Bg 11-11 followed by H_4 and Bg 90-2, BW 78 too was a promising variety. In the Short Aged Group Bg 34-8 (3 months), Bg 94-2 and Bg 94-1 (3½ months) were the outstanding varieties. It is noteworthy that Bg 94-2 gave more stable and higher yields than the preferred Bg 94-1. The improved varieties, of all age groups, were superior to the indigenous varieties.

The data revealed a considerable variation in acre yields of varieties between schemes. This indicates differences in production potential, owing to difference in climate, hydrology and flood patterns, and suggests the need for recommending varieties and inputs to suit the specific needs of individul schemes.

INVESTIGATION ON RICE CULTIVATION IN THE BEMINIWATTE APC AREA (ULTISOLS) (A) MONITORING OF MANAGEMENT PRACTICES - YALA 1975, (B) PRELIMINARY FIELD INVESTIGATIONS—MAHA 1975 / 76.

S. Masilamany and I. Balasuriya

(Field Trials Division, Department of Agriculture)

The Socio-Economic Survey (1975) conducted by the Agrarian Research and Training Institute reported relatively low yields of 28–35 bu/ac in Maha 1973/74 and Yala 1974 for this area when compared with the district yields (Kegalle). This was despite the use of high yielding varieties, fertilizer and supplementary irrigation in some rice tracts. Therefore, the investigations reported in this paper were carried out with the primary objective of identifying technical constraints for acheiving high acre yields.

The results of the monitoring of management practices in Yala 1975 indicate that low acre yields in this area, even with the use of improved varieties, is mainly due to a combination of inadqeuate and unbalanced use of fertilizer and insufficient knowledge of appropriate management practices. Unless these constraints are eliminated the mere changing over from traditional village varieties or old improved varieties eg. H_4, H_8 etc. to new improved varieties eg. Bg 11-11, Bg 34-8 etc. is unlikely to acheive substantial increases in acre yields. The data did not reveal any serious technical constraints attributable for the low yields reported.

Field experiments in cultivators' fields in Maha 1975/76 revealed that yields in the range of 80-100 bu/ac could be obtained with the variety Bg 11-11, and the current fertilizer and management recommendations of the Department of Agriculture. There were however, strong indications that substitution of concentrated super phosphate in place of the recommended Rock Phosphate could further increase yields.

STUDY OF THE INCIDENCE OF 'BLACK GRAIN' IN RICE AND ITS EFFECTS ON RICE QUALITY

C. Breckenridge and V. Sangerapillay
(Central Agricultural Research Institute, Peradeniya).

The control of 'Black Grain' or pecky kernels in rice is of considerable importance to the rice industry as it reduces the quality of milled rice, milling yields and could have an adverse effect on storage. The preliminary work described includes a study of the causal organism, stage of infection, some effects on storage and its incidence with regard to variety and location.

The organism cultured and isolated from 'pecky kernel' was similar in microscopic appearance to the species Curvularia which has been previously reported as the causal organism. The black pigment produced on the surface of infected grain diffused through out the endosperm on parboiling, intensifying the colour. In raw rice beneath the black spots were opaque areas of crumbly texture which caused the grains to break on milling. Microscope sections showed these areas to be due to ramification of fungal hyphae.

Artificial innoculation in green house experiments showed the tender stages of the kernel to be more susceptible to the organism. There was no varietal susceptibility but agro – climatic differences had significant effect on its incidence, the wet zone station Bombuwela showing the highest incidence and lowest at the dry zone station Ambalantota.

Storage at room temperature and at two levels of grain moisture, showed that there was no spread of infection at low moisture but remained a viable and potentially dangerous organism which after 6 weeks of high moisture could result in rapid spread of infection.

COOKING QUALITY OF FOUR VARIETIES OF SOYBEANS AS INFLUENCED BY STORAGE

C. Breckenridge and S. F. M. Fallil

(Central Agricultural Research Institute, Peradeniya).

Although whole Soybeans could be an important source of good quality proteins for countries that have a short supply of animal protiens, the long cooking times necessary have discouraged its wide use. It has been observed that excessive cooking times are needed specially by Soybean that have been stored for long periods.

In the investigations carried out it was recognised that cooking consisted of two steps, soaking and balanching. The rate of water absorption during soaking, and blanching times, were studied for four Soybean varietes stored for 13–20 weeks, at room temperature and atmospheric humidity. The effect of the seed coat on water absorption and blanching was also studied.

It was found that the water absorption pattern varied for the different varieties but did not vary significantly with storage for any one variety. The blanching time of the presoaked beans on the other hand showed varietal differences and also increased significantly with increased storage time, almost two fold for SJ 2 and Bossier.

The seed coat while being an important barrier to water absorption during soaking did not show any change during storage that affected the rate of water absorption or blanching times. The increased cooking time was attributed to structural changes in the cotyledon part of the seed. Deterioration in flavour was observed with storage.

DIURNAL AND SEASONAL FLUCTUATIONS OF NUTRIENTS IN FOLIAR TISSUES OF COCONUT

M. Jeganathan, P. A. D. G. A. Appuhamy, B. J. A. F. Mendis and G. D. George
(Coconut Research Institute, Lunuwila).

Foliar analysis could be used for a dual purpose, either for ***direct diagnostic use*** to decide which nutrient or nutrients are causing poor growth or for ***predictive use*** to decide how much response could be expected from the application of fertilizers.

However, before using foliar analysis for interpretive purposes, rigid standardization of sampling procedure is necessary; the physiological age of the leaflet analysed, the position along the length of the frond, the season and even the time of day at which sampling is carried out, have all been found to cause fluctuations of nutrients in the leaf. It is therefore necessary to minimise these interfering effects.

A study was conducted on 30 healthy adult typica palms that have reached the production phase. Samples were taken from leaflets confined to the midregion of the 14th leaf. For the study of diurnal fluctuations in nutrients, sampling commenced at 0600 hours and was repeated at 3 hourly intervals upto 1800 hours. The seasonal fluctuations were studied by sampling at monthly intervals, covering both the rainy and dry months, for a full one year period.

Statistical analyses of the data for the major nutrients N, P, K, Ca and Mg showed that there was no significant fluctuations in nutrient concentration diurnally but all elements showed significant seasonal fluctuations, execpt P which showed an interaction between diurnal and seasonal fluctuations.

The study revealed that leaf sampling could be done at any time of the day and the ideal time of sampling during the year covered the period August to September when nutrient fluctuations were minimal.

STUDY ON THE ANNUAL EXHAUST OF SOIL NUTRIENTS BY THE TYPICA X PUMILA HYBRID PALM

M. Jeganathan, P. A. D. G. A. Appuhamy, B. J. A. F. Mendis and G. D. George
(Coconut Research Institute, Lunuwila).

High yielding hybrid varieties, the crosses between the tall x dwarf (typica x pumila) are being supplied to the industry as suitable for planting in the Wet Zone. It is also envisaged that in all replanting schemes the existing stands will be replaced by these hybrids. The position being so and in view of the lack of systematic field fertilizer trials on hybrids, the interim recommendations of fertilizers have been based solely on those being presently recommended for the typica. A study was therefore carried out in order to see the adequacy of the fertilizer added.

Estimates of the annual removal of the major nutrients (N, P, K, Ca & Mg) by the selected hybrid palms, were done covering the period June 1973 to April 1974, by sampling fallen fronds, fallen nuts and the nuts of the 1st and 2nd clusters. From the results of analyses the total amount of nutrients removed by both fronds and nuts of hybrids were 51, 7, 93, 27 and 14 Kg/ha for N, P, K, Ca and Mg respectively. The amount of N, P and K made available annually by the addition of fertilizer were 74, 17 and 107 Kg/ha respectively. It appears from the data that the amount of fertilizer added as K is just sufficient to offset the annual removal of this element by foliage and nuts and the amounts for N and P appear sufficient to meet the losses.

The data show that there is adequate evidence to review the fertilizer requirements of hybrids and to initiate further field fertilizer trials.

EFFECT OF IRON AND MANGANESE ON GROWTH AND NUTRITION OF COCONUT SEEDLINGS.

M. A. T. de Silva and G. M. Anthonypillai
(Coconut Research Institute, Lunuwila).

In a sand culture experiment the effect of three levels each of iron and manganese at pH4 and 7, on growth and nutrition of coconut seedlings was examined.

The height of seedlings increased significantly at pH4 and decreased significantly at pH 7, when the supply of iron was increased. The effect of manganese on the total number of leaves was significant but showed a quadratic relationship. The Fe – pH interaction for total number of leaves and the Fe – Mn interaction in respect of dry weight of roots were also significant.

The concentration of manganese in roots and leaf components was largely related to the level of supply. Iron uptake on the other hand was affected by pH, but showed no uniformtty in the relationship with the level of supply.

Determinations of Fe^{++} and Fe^{+++} in root tips by an EDTA - extraction procedure showed that immobilisation of iron occurs through conversion to the ferric form when the supply of iron was increased. The formation of the ferric form was not related to nutrient pH, but tended to decrease when the manganese supply increased.

Although evidently the uptake of iron is severely reduced through immobilisation in the roots of coconut seedlings when the supply is high, manganese does not appear to take any part in this process.

MICROBIAL CONTROL OF *NEPHANTIS SERINOPA* MEYRICK, THE BLACK HEADED CATERPILLAR OF COCONUT WITH DIFFERENT FORMULATIONS OF THE BACTERIUM *BACILLUS THURINGIENSIS* BERLINER.

B. Kanagaratnam and U. Pethiyagoda
(Coconut Research Institute, Lunuwila).

The effectiveness of four commercial preparations Dipel, Thuricide, Biotrol and Bactospeine of the sporeforming bacterium *Bacillus thuringiensis* Berliner was studied in the laboratory for the control of *Nephantis serinopa* Meyrick, the black headed caterpillar of coconut. Fresh coconut leaflets thoroughly sprayed on both surfaces with known concentrations of the four formulations were fed to larvae of the pest over a period of four to five days. The test suspensions of the four formulations were so prepared as to give as far as possible equivalent spore concentrations. Subsequent feeding was on fresh unsprayed leaflets until the experiment was concluded at the end of two weeks from the date of spraying. All four commercial preparations caused high mortality of the larvae. In view of the promising preliminary results with these formulations, further studies on the use of this bacterial pathogen appear to be well justified.

NEW DEVELOPMENTS IN THE CONTROL OF *ASPIDIOTUS DESTRUCTOR*, THE COCONUT SCALE

B. Kanagaratnam and S. V. Sinnathamby
(Coconut Research Institute, Lunuwila).

In 1974 a programme for the biological control of *A. destructor* was started on a large scale and the spraying operations with kerosene oil-soap emulsion were temporaily suspended. Three exotic Coccinellid predators were imported, mass bred and released in the scale infested coconut plantation but they failed to establish in the release points. Two indigenous Coccinellid predators and an Aphelinid parasite were observed

to be widely distributed and effective natural enemies in bringing the pest under satisfactory control. Other indigenous predators were uncommon and present only in small numbers. The immature forms of the two common indigenous predators were often found parasitised in the field. Details of the mass breeding of Coccinellid predators in the laboratory, the methods of release and their performance in the field are discussed. The risks of predator mortality by the use of sprays of a kerosene oil-soap emulsion were also assessed.

SOME MINOR PESTS OF COCONUT; NEW RECORDS FOR SRI LANKA

P. Kanagaratnam, J. L. J. G. Pinto and S. V. Sinnathamby

(Coconut Research Institute, Lunuwila).

Three mites, three mealybugs and a spike moth were observed for the first time as minor pests of coconut in Sri Lanka.

Raoiella indica Hirst, a small mite has been recognized as a pest in India, United Arab Republic and Mauritius. It was found to occur in great numbers and to cause damage to the ventral surface of leaves of about one year old seedlings at Dehiwela and Demanhandiya. In the glasshouse at the Coconut Research Institute, Lunuwila in addition to the above species, two other mites namely *Tetranychus fijiensis* Hirst and *Oligonychus (Reckiella)* sp. were also found. The damaged leaves turned yellow and dried up prematurely. *Stethorus keralicus* Kapur, a Coccinellid predator was found associated with these mites.

Mealybugs of *Palmicultor* sp. were found in large aggragations deep within the crown of three to four year old plams in the field at Nelumdeniya. Due to the sucking of sap, tips of leaflets were often dried at emergence.

Pseudococcus citriculus Green, a mealybug was observed on leaves of seedlings and adult palms in many coconut growing areas and causing localised yellowing.

Inflorescencess of more than one hundred palms were found heavily infested with mealybugs of *Dysmicoccus* sp. at Kakkapalliya. No visible damage could be noted though sucking of sap could have caused serious damage to young tissues.

Larvae of *Batrachedra* sp., a spike moth was observed to damage buttons in the spike and to cause their shedding. This results in yield reduction.

USE OF SYSTEMIC INSECTICIDES FOR THE CONTROL OF SOME SERIOUS PESTS OF COCONUT.

P. Kanagaratnam and U. Pethiyagoda
(Coconut Research Institue, Lunuwila).

Pests of coconut are often difficult to reach by insecticidal sprays and systemic chemicals which could be applied at a convenient height above ground have to be considered. The institute has already recommended Metasystox as a means of control of *Rhynchophorus ferrugineus,* the red weevil pest.

Two potential alternatives to metasystox which was temporarily in short supply, were tested out. These are monocrotophos and Dicrotophos. Both gave satisfactory control when injected into the trunks of red weevil infested palms by the standard technique. Neither chemical produced symptoms of phytotoxicity at the concentration employed.

The leaf eating caterpillar, *Nephantis serinopa* was also brought under effective control by trunk injection of monocrotophos. The effect persisted for at least four months and would therefore be capable of controlling a succession of larvae hatching out of layings over a period of time. *N. serinopa* is not

effectively controlled by releases of parasites, and insecticides have to be considered as a means of control. The injection technique with systemic insecticides obviates the risks of spray contamination but raises problems of possible residue accumulation in edible tissues. This aspect needs further study.

EFFICACY OF *TRICHODERMA* SPP. AS A BIOCONTROL FOR *CORTICIUM ROLFSII* AND *RHIZOCTONIA* STATE OF *THANATEPHORUS CUCUMERIS*

P. Sivakadadcham
(Central Agricultural Research Institute, Peradeniya).

Four species of *Trichoderma* which are commonly met with in the soils of Sri Lanka were tested against *Corticium rolfsii* and *Rhizoctonia* state of *Thanatephorus cucumeris* for their efficacy as a biocontrol for these pathogens. One *Trichoderma* sp. not resembling any of the described species was found to suppress the growth of *Corticium rolfsii* in agar culture more effectively than two other recorded species namely *Trichoderma hamatum* and *Trichoderma harzianum*. *Trichoderma pseudokoningii* was found to be as effective as the unidentified species. This unidentified species of *Trichoderma* was also found to be pathogenic to *Rhizoctonia* state of *Thanatephorus cucumeris* in agariculture.

This paper contains a description of the isolate of the unidentified *Trichoderma* species and its activity against select pathogenic fungi grown in agariculture and the efficacy of the organism as a biocontrol for these pathogens on selected crops in the greenhouse.

DEATH OF CLOVE SEEDLINGS CAUSED BY *CYLINDROCLADIUM FLORIDANUM*

B. Sivakadadcham

(Central Agricultural Research Institute, Peradeniya).

Cylindrocladium floridanum was isolated from dying seedlings of clove collected from a nursery in Peradeniya. Inoculation experiments with mycelium and conidia confirmed the pathogenicity of this fungus. The disease developed rapidly under conditions of high humidity whereas in a dry atmosphere the activity of the pathogen was almost completely checked. Vigorous seedlings were more or less resistant to attack by the fungus. It was observed that infected seedlings could be saved by transferring them to a drier environment and by improving the nutrient status of the soil medium by the addition of Hyponex. In this case the seedlings regained their vigour and produced new shoots even though the apical region of the primary shoot had been killed by the initial infection.

VARIATIONS IN THE COMPOSITION OF OIL IN CITRONELLA STRAINS

E. E. Iruthayathan, H. M. W. Herath and R. O. B. Wijesekera

Commercial Ceylon oil of Citronella is distilled mainly from lenabatu type (Cymbopogon nardus) but there are areas where Mahapengiri (Cymbopogon winterianus) and lenabatu are grown in mixtures and the oil from these plantations enters the oil of commerce. Eleven different straints of Mahapengiri and lenabatu were found in citronella plantations of Sri Lanka.

Compositions of oil extracted from these different strains showed differences with regard to thirty one constituents. The constituents of leaf oil and flower oil varied widely in their percentages and the difference were highly prominent in the content of monoterpene alcohols, phenolics and in some of the terpene hydrocarbons. In the flower oil mangnitude of differences in the percentage of constituents between the strains was less compared to that of leaf oil, The percentages monoterpene hydrocarbon compunds of flower oil were lower than those of leaf oil while the monoterpene alcohols except citronellal had higher percentages. Methyl iso eugenol was higher in the flower oil than in the leaf oil in seven strains while it was low in one strain.

The correlation studies showed the relationship between the contents of total terpene hydrocarbons monoterpene alcohols, camphene-bornane compounds phenolics and total acetylisables. Correlation values explained the influence of production of one particular group of compounds over the others.

The variability in the contents of different constituents of oil among the strains was in accord with their genetic differences.

SESBANIA SPECIOSA – A NEW CROP OF ARGO-INDUSTRIAL PROMISE IN DRY ZONE

T. Sivalingam
(Veterinary Research Institute, Peradeniya).

Sesbania speciosa Taub. is considered to be a suitable agro-industrial crop in the Dry Zone of Sri Lanka. Agronomical studies carried out with this crop at Polonnaruwa and Trincomalee Research Stations and the estimation carried out at the Paper Mills at Valachenai, have shown the ablity of the crop to sustain a quality raw material for the Paper Industry.

Sesbania, a legume of wide adaptability and profuse nodulation, has the ability to fix nitrogen and to grow without added nitrogen. Innoculated plants of Sesbania, at eight weeks growth, were estimated to contain 2.1 percent Nitrogen in contrast to 0.8 percent with the uninnoculated control. The rapid growth habit with an abundant production of green material is of interst in terms of Agriculture and Industry. Sesbania is widely used in India for the improvement of the soil in organic nitrogen as in the reclamation of alkaline and sodic siols. The seed being abundant in production, nutritive and highly proteinous, has potential for the livestock feeding, especially in poultry.

On the Industrial side, the yield of dry raw material for the paper manufacture was 16,568 Kg/hc. with a pulp yield of 46 percent. The quality of the pulp and the properties of the fibre were of a standard grade, suitable for the manufacture of quality paper.

Discussion will be based on the results obtained in the field as well as in the laboratory on the agro-industrial aspect of the crop.

EFFECT OF 2 CHILORO 4, 6-BIS - (ETHYLAMINO)— S - TRIAZINE (SIMAZINE) ON SOIL MICROBIAL ACTIVITY AND NITRIFICATION IN AN ALLUVIAL SOIL

C. S. Weeraratna

(Dept. of Agicultural Chemistry, University of Sri Lanka Preadeniya Campus)

2 - chloro-4, 6-bis-(ethylamino) - s - traiazine (simazine) is a biologlcally active compound in that it is known to inhibit photosynthesis. Simazine is commonly used as a selective herbicide in crops such as citrus, coffee, maize etc.

Investigations reported in this paper were carried out to examine the influence of Simazine (10 ppm) on soil microbial activity and nitrification of added ammonium ions in an alluvial soil of pH 6.5 over a period of 12 weeks.

Results indicate that simazine increased soil microbial activity (shown by increased CO_2 production) from the initiation of the experiment. This effect was observed over a period of 8 weeks. Nitrification was found to be inhibited by Simazine over a period of 6 weeks.

STUDIES ON THE MINERALIZATION OF ORGANIC MATTER IN TWO HIGH ORGANIC MATTER CONTAINING RICE SOILS

Sarojinidevi Kandiah and Mervyn W. Thenabadu

(Faculty of Agriculture, University of Sri Lanka, Peradeniya Campus)

The potential for mineralization of two high organic matter containing rice soils, one each from the Bolgoda and Irranavillu Drainage and Reclamation Schemes, was studied. The amount of carbon dioxide evolved was taken as an index of the rate of mineralization.

The Bolgoda soil which had the higher quantity of organic matter liberated more carbon dioxide than the Irranavillu soil, upon incubation, as measured using a Collin's calcimeter.

Submerged conditions retarded rate of evolution of carbon dioxide. Addition of lime had little effect on mineralization within the first three weeks whereas glucose and peptone increased it appreciably. Readily available nitrogen and phosphorus fertilizer had no effect on mineralization.

Release of nitrogen from mineralization was increased by additions of urea and peptone, whereas addition of glucose had opposite effect. Submerged conditions retarded nitrogen release. Lime application was found to increase nitrogen release in the more acidic Irranavillu soil.

These results are discussed in relation to fertility of these soils.

SECTIONAL PROGRAMME

SECTION C: ENGINEERING, ARCHITECTURE AND SURVEYING

(King George's Hall)

Wednesday 8th December

1.00 ... Development of Natural Rubber Latex-Portland Cement Mixes for Engineering Applications—M. Nadarajah and Upali G. Fernando (Jointly with Section E) (K. G. Hall).

1.30 ... Ground Water Observations in the Kala Oya Basin—S. Arumugam.

2.00 ... City Road Transport in the Light of the Energy Crisis—D. Wijesekera.

4.00 ... **Presidential Address: Engineering Education (?) In Sri Lanka Today H. Sriyananda** (Chemistry Theatre).

Thursday 9th December

8.00 ... **Seminar on "Engineering Research & Development in Sri Lanka".**

10.30 ... Business Meeting.

1.30 ... The use of Activity Sampling in the study of loom stoppages at the Veyangoda Mills (N.T.C.)—J. S. Gunasekera and T. A. Wickremasinghe (Jointly with Section F). (K. G. Hall)

2.00 ... The Need for Scientific & Technological Co-operation among the Non-Aligned & Developing Countries—D. L. O. Mendis (Jointly with Section F).

3.00 ... **Popularisation of Seience Committee Seminar** (All Sections) (Arts Theatre.) (K. G. Hall)

Friday 10th December

10.00 Annual Meeting (All Sections)

1.30 ... Sinhala Tpyewriting Systems: Towards Greater Economy and Higher Efficiency—C L. V. Jayatilleke and S. Sivasegeram.

2.00 . An Experimental Investigation of a Class of Direction Independent Wind Mills—S. Sivasegeram.

2.35 ... A Simple Approach to the Determination of the Bearing Capacity of a Layered Soil—B. L. Tennekoon.

3.05 ... Classification Tests on Samanalawewa Soils—T. Sivapatham.

Saturday 11th December

8.00-11.00 } Symposium on Section C Student Projects
1.00- 3.00 } (for the Manamperi Memorial Award).

DEVELOPMENT OF NATURAL RUBBER LATEX-PORTLAND CEMFNT MIXES FOR ENGINEERING APPLICATIONS

M. Nadarajah
(Rubber Research Institute, Ratmalana)
and Upali G. Fernando
(Buildings Research Institute, State Engineering Corporation, Colombo).

Synthetic polymers such as polystyrene, polybutadiene and polyvinyl acetate are used in latex form, at amounts (dry) of about 15 to 17% on Portland cement to obtain improved properties such as tensile strength. There is however no such recommendation for using natural Rubber latex The cause for this deficiency has been found by us to be due to non rubber substances and especially sugars found in latex serum. These non rubber substances could be reduced by centrifugation and further by dilution with water and recentrifugation.

Our work has shown that rubber / cement ratio in (1 : 1½) cement mortar could be used up to 0.035% for field latex, up to 0.10% for once centrifuged latex and up to 0.20% for double centrifuged latex without drastically impairing physical properties and on the other hand some improved properties are obtained. Values for tensile strength, compressive strength and bending strength for the varying latices and at different rubber contents are given in the paper. The best properties were obtained with field latex, contrifuged latex and double contrifuged latex at a water/cement ratio of around 0.035%, 0.10% and 0.17% respectively. The latices could be prevulcanised with vulcanising chemicals, without serious reduction in strength of the Portand cement-natural rubber mixes. This development opens the way to use natural rubber latex in engineering applications

We have investigated the incorporation of natural rubber latex in "Wirecon", beat building material developed by the State Engineering Corporation. Laboratory results obtained for "Wirecon" / natural rubber latex mixes are given in the paper. The results show that appreciable improvements in impact strength, multiple fracture behaviour and extensibility can be obtaind by mixing rubber latex in "Wirecon".

GROUND WATER OBSERVATIONS IN THE KALA OYA BASIN

S. Arumugam

The Kala Oya Basin is one of the first areas to be developed under the Mahaweli Diversion Project. The waters resources of the basin would be augmented with the Mahaweli waters, diverted from Polgolla and at Bowatenna. In consequence, there is expected to be fundamental changes in the ground water regime of the Kala Oya basin.

Efforts have been made to collect data of the ground water found in the basin, before the entry of the Mahaweli waters.

The paper contains results of observations made of the ground water heights and the quality of water found in 21 selected wells in the area of the basin. These observations were taken monthly for eighteen months before the diversion was effected and would form a useful basin for comparison with condition that would very soon commence to prevail in the area, now that diversion has been effected and Mahaweli waters have commenced to flow into the Kala Oya Basin.

CITY ROAD TRANSPORT IN THE LIGHT OF THE ENERGY CRISIS

Dayantha Wijeyesekera
(Department of Civil Engineering, Katubedda Campus)

The increase in price of crude oil which occurred in 1973-74 has had a great impact on road transport. This paper deals with a study of its impact on road transport in the City of Colombo.

An attempt is made to compare the costs of a passenger mile of traditional forms of transport such as bus and private car, to other forms of transport which should be explored by harnessing alternate forms of energy.

Indication is also made on some factors which should be considered in highway and transportation planning, in order to reduce the excessive consumption of fuel.

THE USE OF ACTIVITY SAMPLING IN THE STUDY OF LOOM STOPPAGES AT THE VEYANGODA MILLS (N. T. C.)

J. S. Gunasekera and T. A. Wickremasinghe
(Department of Production Engineering, Peradeniya Campus).

This paper is the first part of a complete study of the weaving shed of the National Textile Corporation, Veyangoda Mills undertaken at the request of the Mills Manager and financed by the National Science Council. The Weaving Shed of the Veyangoda Mills has 504 semi-automatic powerlooms. 64 machines are grouped together and are assigned to four weavers with one overlooker and one operator. The looms operate continuously 24 hours a day for a few weeks at a time. The looms stop due to a number of reasons at random intervals. When these reasons such as warp or weft break, electrical or mechanical faults etc. occur the weaver comes to that loom and attends to the fault.

The first part of the study was to establish the correct percentages of stoppages due to various faults. This is used in the second part of the study to obtain the machine interference, cost of down time and the optimum number of machines per weaver for the minimum cost of production in the weaving shed. Activity sampling is a technique in which a large number of instantaneous observations are made over a period of time of a group of machines, processes or workers. Each observation recorded for a particular activity or delay is a measure of the percentage of time during which the activity or delay occurs.

Observations were made during all three shifts of work and altogether about 36,000 observations were made over a period of about one month by 6 observers. The percentage stoppages were calculated to an accuracy of $\pm$ 2% with 95% confidence. The results of the study, apart from being input data for the second part, provided important and valuable guidelines to the management for necessary corrective action.

THE NEED FOR SCIENTIFIC & TECHNOLOGICAL COOPERATION AMONG THE NON-ALIGNED AND OTHER DEVELOPING COUNTRIES

D. L. O. Mendis
(Ministry of Planning & Economic Affairs).

Third World Countries of Asia, Africa and Latin America have a common history of colonial occupation and exploitation by the metropolitan powers of Western Europe.

Liberation movements in many of these countries have had to defend their hard-won political freedom against neo-colonialist economic exploitation. The Non-Aligned group of countries have come together in an attempt to consolidate this defence; but it has been found that modern Science & Technology, instead of being developed indigenously as a weapon for this defence, is used more often as a weapon of neo-colonialist exploitation which sometimes even reveals itself in naked violence. Today any third world country that attempts to make its own development revolution, runs the risk of armed intervention and not merely economic blockade, if its development strategy does not win the approval of the Big Powers.

How can Science and Technology be used by third world countries in their struggle for ultimate liberation? What are the lessons of the heroic struggle of Vietnam to defend its revolution against the world's mightiest nation? What are the lessons of the revolutionary struggles led by men like the immortal Guevard in Latin-America and the unforgettable Cabraal in Africa? How will these lessons influence the destiny of the world's most populous nations that are amongst the Non-Aligned countries of Asia?

Thia paper, whilst discussing these and other issues, argues that Scientific and Technological cooperation among the Non-Aligned and other developing countries is a pre-requisite to their defence against neo-colonialist intervention and exploitation.

SINHALA TYPEWRITING SYSTEMS: TOWARDS GREATER ECONOMY AND HIGH EFFICIENCY

C. L. V. Jayatilleke and S. Sivasegeram

(Mechanical Engineering Department, Peradeniya Campus)

The paper reports as investigation of the two current typewriter keyboard systems on the basis of time and motion study. A new keyboard is designed on the basis of the principles of work study. Its performance is shown to be superior to that of existing ones on the basis of the following criteria (i) lead distribution amongst fingers, (ii) typewriting speed (iii) minimization of fatigue and (iv) ease of mastering the key board.

AN EXPERIMENTAL INVESTIGATION OF A CLASS OF DIRECTION INDEPENDENT WIND MILLS

S. Sivasegaram

(Department of Mechanical Engineering, Peradeniya Campus)

The paper presents an extensive investigation of a class of Resistance Type Wind Turbines. The existence of certain optimum design parameters is established and the suitabilit of the class for local use is dicussed in the paper.

A SIMPLE APPROACH TO THE DETERMINATION OF THE BEARING CAPACITY OF A LAYERED SOIL

B. L. Tennekoon

The method of stress characteristics is usually used for the determination of the bearing capacity of a homogenous soil. This method which has been derived for a weightless soil is extended to cover a real soil with weight. In contrast to this lower bound approach, it is possible to estimate the bearing

capacity by an upper bound approach using assumed failure surfaces. It is shown both theoretically and experimentally that, contrary to current assumptions, failure surfaces lie along velocity characteristics and not along stress characteristics.

In the case of a layered soil when a weak soil underlies a hard stratum current methods of analysis are adequate However difficulties arise when a weak soil of limited thickness overlies a stronger soil. It is shown that in this case the upper bound approach gives a more realistic estimate for the bearing capacity than the lower bound approach. This method is illustrated with an example of an embankment which was designed to stand on a foundation soil consisting of peat underlain by a stronger soil.

CLASSFICATION TESTS ON SAMANALAWEWA SOILS

T. Sivapatham

(Engineering Materials Laboratory, Irrigation Department)

The tests for Gradation Curves and Atterberg Limits performed according to Standard test proceedures on more than 60 disturbed soil samples from the proposed borrow areas and dam axis for the Samanalawawa Project indicate in general that the Plasticity Index is high whereas the clay content is low. It is also found that the classfication of these materials using the mal methods is not realistic. The probable causes for this viour are discussed in relation to the type of soils present in t ea.

The soils occuring in this area are residual soils and are called laterites which are formed by in situ tropical weathering of igneous and/or metamorphic rock. A characterictic of these soils is the aggregation of particles due to the presence of free iron oxide. It is concluded that the observation of high Plasticity Index and low clay content is due to the mechanical breakdown of the cementation bonds to varying degrees during the standard treatment in testing of samples. It is suggested that further stu ly on these soils with regard to the types of clay minerals, the interaction between the clay particles, the pore water cation-exchange capacity etc. is required to understand this behaviour fully. Such a study will enable the use of these materials for civil engineering works with a clearer understanding.

SECTIONAL PROGRAMME

SECTION D: NATURAL SCIENCES

(Biology Theatre)

Wednesday 8th December

1.30 ... Infestation of *Sitotroga Cerealella* (Oliver) Under Field Conditions and Storages in the Northern Part of Sri Lanka. V. K. Ganesalingam and S. R. Krishnarajah.

1.50 Variation shown in the liberation of CO_2 with growth of *Tetrahymena pyriformis* by using 14C pyruvic acid — M. V. E. Mendis, P. L. D. Waidyasekera and K. G. Dharmawardane.

2.30 ... Some Geological Aspects of the Elahara Gem Field — K. K. M. W Silva.

3.00 **The promotion and planning of research using the deutsche forschungsgemeinschaft as the example — Prof. Dr. Gerd Roellecke** (Jointly with Sections A, B & F) (Arts Theatre).

Thursday 9th December

8.00 ... Biology of *Silana farinosa* (Boheman, 1856) (Coleoptera; Chrysomelidae), a pest of *Murraya koenigii* (Sinh. Karapincha) — D. Y. S. Talagala and D. Manawadu.

8.20 ... Some aspects of fermentation of Coconut *(Cocos nucifera L.)* sap. — K. Theivendirarajah, K. Jeyaseelan and V. Puvirajasingam.

8.40 ... Controlled Fermentation of Coconut Sap – I : Nature and Behaviour of Microorganisms — U. Samarajeewa, U. Pethiyagoda and J. D. Atputharajah.

9.00 ... Effective utilisation of the raw materials and by-products in a coconut arrack industry — K. Theivendirarajah, K. Jeyaseelan and V. Puvirajasingam.

9.20 ... Controlled Fermentation of Coconut Sap — 2: Production of a Liquor of Consistent Quality — U. Samarajeewa, J. D. Atputharajah and M. C. P. Wijeratna.

9.50 ... **Cyclohazards and Coastal Plain Management in Bangladesh — Dr. M. A. Islam** (Jointly with section F) (Biology Theatre)

10.10 ... Studies of intercropping under coconut growth and yield of Cowpea *Vigna catiang Buru, Walp, Var, MI-35)* grown at three spacings under different densities of coconut — S. M. Karunaratne, H. M. P. Gunasena and M. A. P. Manthriratne.

10.30 ... Business Meeting.

2.00 .. Histochemical Observations on the Alimentary Tract of the Kalutara Snail *Achatina fulica* — C. R. D. Pereira and W. R. Breckenridge,

2.20 ... Some Observations on the Morphology and Biology of the Brown Planthopper, *Nilaparvata lugens* Stal (Homeptera: Delphacidae), in Sri Lanka — G. F. Rajendram and D. J. E. Daniel.

2.40 ... Protozea of Rice fields in Sri Lanka — A Preliminary Microbiological and Ecological Study — Sriya Kularatne and P. L. D. Waidyasekera.

3.00 ... **Popularisation of Science Committee Seminar** (All Sections) (Arts Theatre).

Friday 10th December

9.00 ... **Presidential address - Climatic Changes in Sri Lanka — G. G. R. Thambiahpillai** (Chemistry Theatre).

10.00 ... Annual Meeting (All Sections)

1.00 ... Hevea (Rubber) Seeds for Human Food - **L. C. Wheeler** (Jointly with Sections B & E) (Biology Theatre).

1.30 ... Physico - chemical and Microbiological changes in Desiccated Coconut during storage — R. A. Kulatunga and Kamini Meedeniya.

1.50 ... Growth of Explants of Coconut (*Cocos nucifera L.*) in Vitro — S. M. Karunaratne.

2.40 ... **Chemical Communication in Mammals - Acad. V. Sokolov**, (Jointly with Section E) (Chemistry Theatre).

Saturday 11th December

9.00 ... Guinea Grass for Paper Making — P. Manokeran.

9.20 ... A new mutation in *Culex pipiens fatigans*, Wiedemann, affecting the adult eye — K. R. Sriyani Gunawardane and Winston E. Ratnayake.

9.40 ... Molecular and Ultrafine Structure of Cotton Fibres — L. D. Fernando.

10.10 ... **"Seeds and bean weevils" — Dr. Rodger Mitchell.**

INFESTATION OF *SITOTROGA CEREALELLA* (OLIVER) UNDER FIELD CONDITIONS AND STORAGES IN THE NORTHERN PART OF SRI LANKA

V. K. Ganesalingam and S. R. Krishnarajah
(Department of Zoology, Jaffna Campus,)

Samples of paddy were collected from different field conditions and storages, kept in clean bottles in the laboratory and the number of moths that emerge from the samples was determined.

It was found that the ripe panicles that were on the rice plants in the paddy fields were in most cases infested with the moth. There was no significant difference between the degree of infestation of the panicles of the field close to the dwelling house and that of the panicles of the fields far away from the dwelling houses.

In most cases the samples of paddy collected from threshing floors were found to be infested with the moth. Those collected from the fields close to dwelling houses were equally infested as those collected from the fields away from the dwelling houses.

A survey for the presence of *S. cerealella* was made in the paddy fields after harvesting and it was found that the moth was not found at all in the paddy fields during that time.

A survey of the storage pattern in dwelling houses showed that out of many traditional methods of storage, particularly two methods, namely, storage in gunny bags and storage in large wooden boxes are the usual methods. Samples taken monthly from these storages showed that the paddy in both cases are equally infested with the moth. However, it was found that the storage of paddy in gunny bags covered by a heap of straw or covering the panicles with large heap of straw prevented infestation by this moth to a great extent.

It appears that *S. cerealella* comes to the paddy fields during the ripe panicle stage or harvesting and threshing stage and lays its eggs on the paddy causing infestation, and the method of storage, to a certain extent, prevents infestation.

VARIATION SHOWN IN THE LIBERATION OF CO_2 WITH GROWTH OF *TETRAHYMENA PYRIFORMIS* BY USING ^{14}C PYRUVIC ACID

M. V. E. Mendis, P. L. D. Waidyasekera
(Department of Biological Science, University of Sri Lanka, Vidyodaya Campus),
and
K. G. Dharmawardane
(Radio Isotope Centre, University of Sri Lanka, Colombo Campus)

The rate of liberation of $14CO_2$ from 14C pyruvic acid has been measured in a culture of the ciliate *Tetrahymena pyriformis* growing actively at 24°C in proteose-peptone, yeast extract (PPY) medium in a specially set up flask. Cell counts using a haemocytometer and estimates of $14CO_2$ using a Geiger-Muller counter were made daily within the 10 day generation time of the organism. The variation of CO_2 liberated with stage of growth is discussed.

SOME GEOLOGICAL ASPECTS OF THE ELAHARA GEM FIELD

K. K. M. W. Silva
(Department of Geology, University of Sri Lanka, Peradeniya Campus)

Gem deposits at Elahara (Kaluganga-Ambanganga valley) gem field show their occurrence as alluvial and as residual formations. Only four varieties of gems minerals are found in this gem field, (more than ten gem varieties are found in the Ratnapura gem field) namely; corundum (blue, green, yellow and white sapphirs and star sapphirs and rarely rubies), tourmalene (brown, green, pink and black tourmalene and cat's eye), spinel (blue, pink, red, green and black) and garnet (pyrope, grossularite and andradite). Studies on the residual type gem deposits show their derivation from the tourmalene—sillimanite - garnet gneisses and from the contacts of the marbles and graphic granite intrusions.

BIOLOGY OF *SILANA FARINOSA* (BOHEMAN, 1856) (COLEOPTERA; CHRYSOMELIDAE), A PEST OF *MURRAYA KOENIGII* (SINH. KARAPINCHA)

D. Y. S. Talagala and D. Manawadu

(Department of Biological Siences, University of Sri Lanka, Vidyodaya Campus.

Silana farinosa (Boheman, 1856) feeds on the leaves of *Murraya koenigii*, the Karapincha, often causing considerable loss. These studies have shown that in Sri Lanka, it has several generations a year, each consisting of 7 stages. Morphological characters of each stage were studied and detailed descriptions and figures are presented. Factors contributing to mortality of the pest were also studied and a Chalcid parasite, which might be of use in control, discovered.

SOME ASPECTS OF FERMENTATION OF COCONUT (*COCOS NUCIFERA L.*) SAP.

K. Theivendirarajah, K. Jeyaseelan

(Department of Botany, University of Sri Lanka, Peradeniya Capmus)

and

V. Puvirajasingam

(State Distilleries Corporation, Kandy)

The sap that is obtained from the inflorescence of Coconut palm (*Cocos nucifera L.*) contains about 16-22 percent sugar by weight. This normally undergoes fermentation by different types of yeast and bacteria resulting in coconut toddy. The fully fermented coconut toddy on an average contains about 6.5 percent alcohol by volume. On the basis of sugar present in the sap the amount of alcohol obtained under natural fermentation is rather low. The conversion of sugar into alcohol is in the region of about 60 percent.

Fermentation studies carried out on unfermented coconut sap (sweet toddy) with yeast strains of high fermenting ability previously isolated from kitul (*Caryota urens L.*), coconut (*Cocos nucifera L.*) and palmyrah (*Borassus flabellifer L.*) toddy have shown that nearly 95 percent conversion can be achieved. Our investigations have shown that the fermentation rate depends on the pH of the sap, the initial yeast cell number and the concentration of sugar in the sap. Although most of the yeast strains tested can tolerate a wide range of pH from 3.5 to 7, the optimum pH was about 4.0 to 5.5. The rate of alcohol production increased with the increase in the number of yeast cells. Initial innoculum of 10^8 cells per ml. was found to give best results. Sweet toddy samples containing higher percentage of sugar (above 18 percent) took nearly 72 hours for complete fermentation, even with an initial innoculum of 10^8 yeast cells per ml. Maximum conversion of sugar in a relatively shorter peried (36–48 hours) was achieved by diluting the sap.

CONTROLLED FERMENTATION OF COCONUT SAP-1 : NATURE AND BEHAVIOUR OF MICROORGANISMS

U. Samarajeewa, U. Pethiyagoda and J. D. Atputharajah
(Coconut Research Institute, Lunuwila)

Coconut sap is the major base for the liquor industry in Sri Lanka. The sap is allowed to ferment freely in collecting pots under natural conditions and the product is either consumed fresh, bottled and pasteurised or distilled. The fermentation is brought about by wild yeasts and bacteria leading to products of variable characteristics.

The microorganisms at different stages of fermenting toddy were isolated from two geographical regions of the country. Some relevant morphological and physiological characteristics of the isolates were studied.

The patterns of utilization of sugars in the sap and production of alcohol and acids during fermentation by pure cultures and during natural fermentation are presented. Selection of a high alcohol yielding yeast strain on the basis of the above observations and its utilization for controlled fermentation will be discussed.

STUDIES ON INTERCROPPING UNDER COCONUT GROWTH AND YIELD OF COWPEA (*VIGNA CATIANG BURM, WALP, VAR. MI-35*) GROWN AT THREE SPACINGS UNDER DIFFERENT DENSITIES OF COCONUT

S. M. Karunaratne, H. P. M. Gunasena

(Department of Crop Science, University of Sri Lanka, Peradeniya Campus.)

and

M. A. P. Manthriratne

(Coconut Research Institute, Lunuwila)

An experiment was conducted at the Pothukulama Research Station of the Coconut Research Institute of Sri Lanka during November 1974 - February 1975 to investigate into the effect on growth and yield of cowpea Var, MI-35 grown at three spacings under seven densities of coconut.

Coconut densities varying from 112-286 palms per ha had no significant effect on seed number per pod or pod length of cowpea. When grown under lower densities of coconut, pod number per plant, 1000-seed weight, pod dry weight and final seed yield of cowpea increased significantly. Differences in the spacing of cowpea had no effect on any of the yield components of cowpea except total pod weight and husk weight and the closer spacing of cowpea (60x15 cm) increased seed yield when compared with the wider spacings (60 x 30cm), (60x45cm). A close correlation between seed yield (Y) and pod number (Pn), 1000-seed weight (Sw) and pod dry weight (Pd) were recorded which indicate that they were the main determinants of the final seed yield of cowpea. The above relationships could be shown by the following equations.

$Y = -8.141 + 52.612\ Pn\ (P = 0.01,\ R^2,\ 88.35\%)$
$Y = -42.942 + 0.923\ Pd\ (P = 0.01,\ R^2,\ 83.72\%)$
$Y = -372.359 + 6.622\ Sw\ (P = 0.05,\ R^2,\ 68.18\%)$

Total dry matter yield (Td) and seed yield (Y) were also closely correlated with leaf area duration (D) accounting for 96% and 76% of the variation in seed yield respectively. These relationships could be represented by the equations,

$Td = -58.884 + 58.399\ D\ (P = 0.001)$
$Y = -85.487 + 52.291\ D\ (P = 0.05)$

The results of this investigation suggest that coconut lands could be intercropped successfully with annuals such as cowpea provided that the coconut plants are widely spaced to allow sufficient light penetration to the intercrop.

EFFECTIVE UTILIZATION OF THE RAW MATERIALS AND BY–PRODUCTS IN A COCONUT ARRACK INDUSTRY.

K. Theivendirarajah, K. Jeyaseelan
(Department of Botany, University of Sri Lanka, Peradeniya Campus).
and
V. Puvirajasingam
(State Distilleries Corporation, Kandy)

The fermented sap obtained from the floral spadix of coconnt palm (*Cocos nucifera L.*), commonly known as 'Coconut toddy' forms the base for the production of a popular liquor 'Coconut arrack' in Sri Lanka.

Nearly 11 million gallons of coconut toddy with an average of about 6 6 percent alcohol by volume are distilled annualy to obtain 1.27 million proof gallons of alcohol. The percentage of alcohol yeild at present is about 11.6 . Our studies have

shown that the percentage alcohol yeild could be increased upto 17.5 by increasing the the amount of alcohol in coconut toddy when fermentation is being brought about under controlled conditions. This will uplift the annual production of arrack by about 1.1 million gallons and an income of Rupees 118 million.

Studies on the utilization of by-products which are presently being wasted, reveal that yeast could be cultivated in large quantities to prepare active dry yeast and marmite, and for use as animal feed This paper deals with the preperation of active dry yeast and marmite in Sri Lanka, which are at present being imported. Feasibility studies on the use of yeast obtained in this manner for baking purposes have shown satisfactory results.

CONTROLLED FERMENTATION OF COCONUT SAP-2 : PRODUCTION OF A LIQUOR OF CONSISTENT QUALITY

U. Samarajeewa J. D. Atputharaja and M. C. P. Wijeratna
(Coconut Research Institute, Lunuwila)

The problems associated with controlled fermentation of coconut sap differ from those where other starting materials are employed High ambient temperatures and method of collection of sap pose special problems in preventing spontaneous fermentation. Thus the methods adopted in brewing other quality liquors cannot be directly applied to coconut sap.

Traditional methods were employed to suppress fermentation of sap in collecting pots. Attempts to introduce pure cultures of yeasts to pots were not successful. The sap collected in the pots was heat treated at 90°C for 20 minutes in 5 gallon earthenware pots. Introduction of a high alcohol yielding pure yeast culture to the pots was successful. The fermented product was bottled and pasteurised.

The quality characteristics of the product will be discussed. Methods for clarification of the fermented product using bentonite and egg white were worked out. The possibility of applying controlled fermentation with selected yeast strains in small scale units will be discussed.

HISTOCHEMICAL OBSERVATIONS ON THE ALIMENTARY TRACT OF THE KALUTARA SNAIL *ACHATINA FULICA*

C. R. D. Pereira and W. R. Breckenridge
(Department of Zoology, University of Sri Lanka, Peradeniya Campus)

Achatina fulica, a voracious herbivore, is a common garden pest in Sri Lanka, and a knowledge of the functional organisation of its alimentary tract is of importance.

The alimentary tract consists of the following regions: buccal mass, oesophagus, crop, stomach, typhlosolar and post-typhlosolar intestine and rectum. Associated with the tract are the paired salivary glands and a single digestive gland.

In this study attention has been focussed primarily on the detection and distribution of

(1) mucosubstances, using the periodic acid-schiff (PAS) procedure and staining with Alcian blue, and

(2) Alkaline and Acid Phosphatases, using the Gomori Calcium and the Gomori Lead methods respectively.

Periodate reactive and alcianophilic mucous glands are found throughout the alimentary tract. Histochemically identifiable mucous cells are also present in the salivary glands.

Acid phosphatase activity was demonstrated in the digestive gland, salivary glands and throughout the tract, and the distributon of this enzyme in the digestive tract appears

to be confined to the above mucous glands Alkaline phosphatase activity, on the contrary, is shown only by the typhlosolar and post-typhlosolar intestine and by the digestive gland.

Mucus produced in the tract and salivary glands would help in the movement of food, in the consolidation of the faecal string and the passage of this string through the gut to the exterior. The acid phosphatases could function in digestion, and in the secretory process of mucous glands. The alkaline phosphatases, with their limited distribution, are probably involved in the absorption of nutrients and secretion processes as well.

SOME OBSERVATIONS ON THE MORPOLOGY AND BIOLOGY OF THE BROWN PLANTHOPPER, *NILAPARVATA LUGENS* STÅL (HOMOPTERA : DELPHACIDAE), IN SRI LANKA.

G. F. Rajendram and D. J. E. Daniel
(Department of Zoology, University, of Sri Lanka, Peradeniya Campus).

The brown planthopper, *Nilaparvata lugens* Stål, a major pest of rice in Sri Lanka, has been specially prevalent in Amparai and Batticaloa districts. It is present in other rice growing districts like Kurunegala, Matara and Wanni, and periodically assumes pest proportion in these areas. Varieties of rice observed to be resistant to the brown planthopper under experimental conditions in the International Rice Research Institute in the philippines have been found to be susceptible to attack by this pest in Sri Lanka. The present studies have been undertaken to determine whether the breakdown in resistance in the rice variety is caused by brown planthopper of a different biotype. The paper presents the results of studies made of wing structure, legs, head and thorax, abdomen and genitalia of the adult brown planthopper. Details are also given of the morphology and duration of egg and nymphal stages, and adult longevity, under laboratory conditions within a temperature range of 25° to 29.5°C (77° to 85° F).

PROTOZOA OF RICE FIELDS IN SRI LANKA – A PRELIMINARY MICROBIOLOGICAL AND ECOLOGICAL STUDY

Sriya Kularatne and P. L. D. Waidyasekara

(Department of Biological Sciences, University of Sri Lanka, Vidyodaya Campus.

Soils and Supernatant water from rice-fields from the dry (Ambalantota) and the wet (a) Gangodawila (b) (Bombuwala, Kalutara) low country and from the wet hill country (Pilimatalawa) of Sri Lanka have been examined. The Protozoa and Bacteria in them were collected and isolated by a special technique and later maintained in laboratory culture for identification and studies of population growth. The technique used and the results of this comparative study are described.

Seasonal variation in the Protozoa have also been studied; and an attempt made to correlate these with variations in environmental factors like temerature, pH, moisture content, organic matter content and bacteria content.

(This investigation was supported by a National Science Council grant).

HEVEA (RUBBER) SEEDS FOR HUMAN FOOD

Louis Cutter Wheeler

(Department of Biological Sciences, University of Southern California, Los Angeles, California and Flora of Ceylon Project, Royal Botanic Gardens, Peradeniya, Sri Lanka.)

Use of seeds of Hevea for human food is traditional among some of the aborigines of Amazonia, and by some Indonesians. Although the seeds are customarily given long cooking, during World War II some European prisoners of war in Java ate seeds of Hevea after simply roasting them in the fire.

It is well-known that the seeds of Hevea are poisonous when raw. They are cyanogenic and may contain phytotoxins (poisonous lectins). Feeding tests on poultry and swine in Sri Lanka have shown that there are also unidentified growth-depressant and antifertility factors. In order to identify and evaluate the factors hindering use of the seeds of Hevea for human food a project has been initiated at the University of Southern California using seeds supplied by the Rubber Research Institute of Sri Lanka, Rubber Research Institute of Malaysia, and Instituto Nacional de Pesquisas da Amazonia, Brazil. Dependable means will be sought for counteracting the deleterious factors in order to make the seeds available for human food.

The methods already used successfully in Amazonia and Indonesia for preparing Hevea seeds for human food will be summarized so that gastronomically adventurous pioneers in Sri Lanka can try eating the seeds in order to determine the feasibility of using this potential source of human food. These trials should be made cautiously starting with small amounts and never exceeding moderate amounts.

PHYSICO-CHEMICAL & MICROBIOLOGICAL CHANGES IN DESICCATED COCONUT DURING STORAGE

R. A. Kulatunga & Kamini Meedeniya
(Coconut Processing Board)

Desiccated coconut is manufactured by drying the comminuted white coconut kernel to moisture content below 3%. This is graded and packed and exported. Under normal conditions the well dried and well packed desiccated coconut remains in good condition for 6 months or more but with the passage of time, deterioration sets in leading to increased moisture and rancidity. In some manufactures this deterioration takes place sooner than 6 months. A study was carried out on the physico-chemical and microbiological changes occuring in desiccated coconut during storage. The following were estimated in samples from 8 mills over a period of 12 months.

Moisture content, pH of the product, F.F.A. of extracted oil, oil content, presence of aerobes, anaerobes, coliforms and E. coli type 1, yeasts and moulds.

Results indicated that physico-chemical and bacteriological changes occur during storage.

Moisture content increases, pH showed slight increase, oil content slight decrease, F. F. A. content increases, bacterial and yeast counts decrease with storage but moulds show increase.

The condition leading to accelerated deterioration and development of rancidity in desiccated coconut are discussed.

GROWTH OF EXPLANTS OF COCONUT (*COCOS NUCIFERA L.*) IN VITRO

S. M. Karunaratne
(Coconut Research Institute, Lunuwila)

The clonal propagation of the Coconut from tissue cultures is about the only conceivable means of vegetative propagation, since the palm otherwise possesses only a single vegetative bud at its apex (pol-bada).

In our attempts to obtain cultures of Coconut tissue we have been able to induce the formation of pustules of proliferating tissue in explants of the apical bud on media containing certain assortments of auxins and cytokinins. In no case, however, were we able to subculture the primary explant and establish an indefinite callus culture.

The use of a "nurse" tissue produced a four-fold stimulation of cotyledon explants. This points to the existence of hitherto unidentified and untried growth factors that could stimulate proliferation under proper culture conditions to give a true tissue culture eventually capable of embryogenesis "in vitro".

We have also clear evidence that polarity also plays a role in the induction of growth in primary explants.

GUINEA GRASS FOR PAPER MAKING

P. Manokeran

(National Paper Corporation, Valaichchenai).

Guinea grass *(Pannicum maximum)* popularly called wild Guinea thrives in all climatic conditions below an elevation of four thousand feet in Sri Lanka. In its tender age of four to six weeks the leaves are succulent and edible for the grazing cattle, but later it becomes fibrous, and cannot serve as a cattle fodder.

Therefore experiments were conducted in the laboratory of the National Paper Corporation at Valaichchenai to investigate the possibilities of using this matured grass for papermaking. The raw material was chipped manually and pulped with 12% caustic soda. The yield of pulp was 42%. The pulp was bleached in two stages using calcium hypochlorite. Evaluation of this pulp gave enough promising evidence of quality to try this raw material in the manufacturing process.

A mill trial was then carried out. About 7 tons of matured dry grass was chipped and pulped with 14% caustic soda. The pulp was bleached in two stages with calcium hypochlorite; and 60% of this pulp in the furnish was used to make type-writing grade of papers, The quality of the paper was comparable to that produced in the regular maufacturing process with straw pulp in the furnish.

The chemical and physical constituents of the fibers compared with those of Esparto grass *(Lygeum spartum)* Salai grass *(Eulaliopsis binata)* and Rice straw *(Oryza sativa)* indicate that wild guinea grass merits consideration as a fiber source to make quality papers.

A NEW MUTATION IN *CULEX PIPENS FATIGANS*, WIEDEMANN, AFFECTING THE ADULT EYE

K. R. Sriyani Gunawardane and Winston E. Ratnayake

(Department of Biological Sciences, University of Sri Lanka, Vidyodaya Campus)

A spontaneously arising mutation affecting the eyes of adult *Culex pipiens fatigans*, Wiedemann, the mosquito vector of urban filariasis in Sri Lanka has been isolated from a mosquito colony which has been inbred in the laboratory for twenty one generations.

The eyes of the mutant form are opaque and rough in appearence and black in colour, in contrast to the wild type eye which is transparent, smooth and green tinged dark brown in colour.

From a pure breeding stock of this mutant the following crosses were carried out in order to establish its mode of inheritance.

(1). Reciprocal crosses of mutant to wild type and their F_1 intercrosses were made, and their F_2 progeny was scored.

(2). The above F_1 mosquitos were back crossed reciprocally to the pure breeding mutant stock and their progeny was scored.

The above experimental crosses indicate that this mutation is probably autosomal and recessive and of variable penetrance. It has also been observed that the presence of the mutant gene tends to increase mortality.

This mutation, to the knowledge of the authors, has not been previously described and recorded.

MOLECULAR AND ULTRAFINE STRUCTURE OF COTTON FIBRES.

L. D. Fernando

(Department of Textile Technology, Katubedde Campus)

Differences among native cottons which have been recognized in the textile industry for many years and have formed the basis for cotton classification in commerce and ultimate utilization, include factors such as fibre length, fineness and spinnability. Recent detailed investigations have established that, in addition, cotton types vary in their fundamental mechanical properties. An attempt has been made to determine the level (s) of structural organization where such differences exist. Furthermore, with the advent of man-made fibres, modifications of the properties of natural fibres has become a compelling requirement for their survival in the competitive world market; and for this reason a detailed study of the structure of the cotton fibre has particular relevance.

The ultrafine and molecular structure of several varieties of cottons have been examined by means of transmission electron microscopy and X-ray and electron diffraction techniques.

It has been possible to establish that there are no significant differences in:

(i) the size of the particles (obtained after hydrolysis) whose dimension may be taken to represent the combined crystalline and paracrystalline regions, and

(ii) the crystal structure (Cellulose I),

between different cotton types. However, X-ray studies have shown that differences in the orientation of the 'Crystallites' have an effect on the mechanical properties of the fibre. Thus the evidence leads to the conclusion that variation in fibre properties are due to differences at higher (fibrillar) levels of the structural organization.

Electron diffraction results have also conclusively shown the inadequacies of the widely accepted model for the fnnd-amental structural unit of crystalline native cellulose.

SECTIONAL PROGRAMME

SECTION E: PHYSICAL SCIENCE

(Chemistry Theatre)

Wednesday 8th December

1.00 ... Development of Natural Rubber Latex - Portland Cement Mixes for Engineering Applications — M. Nadarajah & Upali G. Fernando (Jointly with Section C) (K. G. Hall).

1.30 ... Cashew Nut Shell Liquid as an Antioxidant in Natural Rubber Compounding — R. A. Rajapakse.

1.50 ... T. L. C. Examination of 34 Dipterocarp species of Sri Lanka — Y. A. G. P. Gunewardene, M. U. S. Sultanbawa and S. Balasubramaniam.

2.10 ... Chemical Investigation of two New endemic *Calophyllum* species — M. Dahanayake, S. Karunanayake, S. Sothesewaran and M. U. S. Sultanbawa.

2.30 ... Extractives of *Erythrospermum zeylanicum* (Gaertn) Alston, *Casearia thwaitesii* Briq., *Scolopia schriberi*. J.F. Gmel and *Chlorocarpa pentachista* Alston, (Flacourtiaceae) — S. P. Gunasekera, M. U. S. Sultanbawa and S. Balasubramaniam.

2.50 ... Three new terpenoid acids from *Uncaria thwaitesii* (Hook f.) Alston (Rubiaceae) — W.H.M.W. Herath, M.U.S. Sultanbawa and G. P. Wannigama.

Thursday 9th December

8.00 ... Antibacterial Action of *Plectranthus zeylanicus* and *Coleus aromaticus* — L. B. de Silva, S. Senthe-shanmuganathan, R. S. B. Wickremesinghe, K. Tuley de Silva and K. Sangara Iyer.

8.20 ... Chemical Constituents of *Symplocus racemosa* — L. B. de Silva, U. L. L. de Silva & M. Mahendran.

8.40 ... Conversion of Cinnamon Leaf Oil to iso-Eugenol — V. Puvanesarajah, V. Kumar and S. Mageswaran.

9.00 ... Perfumery concrete from *Mesua ferrea* (family Guttiferae, Sinh: Na) flowers — V. Puvanesarajah, V. Kumar and S. Balasubramaniam.

9.20 ... Binding Energy of an electron transferred from a Univalent anion to a solvent — K. Tennakone and and R. H. Wijenayake.

9.40 ... An Eight-Dimnesional field theory of Quark Confinement — K. Tennakone.

10.30 ... Business Meeting

1.00 ... Ionogenic Groups of the cell surface of *Saccharomyces cerevisiae* — P. M. Jayatissa and A. H. Rose.

1.20 ... Role of wall phosphamannan in Flooculation of *Saccharomyces cerevisiae* — P. M. Jayatissa and A. H. Rose.

2.00 ... The Role of phenolics in discolouration of Natural Rubber — P. A. J. Yapa.

2.20 .. Epoxidation of Rubber Seed Oil—A. Coomaraswamy.

3.00 ... **Popularisation of Science Committee Seminar** (All Sections) (Arts Theatre)

Friday 10th December

10.00 ... Annual Meeting (All Sections)

1.00 ... Hevea (Rubber) Seeds for Human Food — L. C. Wheeler (Jointly with Sections B & D) (Biology Theatre).

1.20 ... A method to improve the quality of iron oxide pigments manufactured using hydrated lime — R. T. Guruge.

1.40 ... Preliminary Studies on the electrical properties of local mica — R. N. Ediriweera and P. A. J. Ratnasiri.

2.00 ... Spectroscopic and Thermodyanamic study of Aquo-organic solvent systems — R. H. Wijenayake and N. C. A. Weerasinghe.

2.20 .. Some Characteristics of Ground Water in Vanata-villu as determined by Nuclear Techniques — K. G. Dharmawardena and M. W. P. Wijesinghe.

2.40 ... **Chemical Communication in Mammals - Acad. V. Sokolov** (Jointly with Section D) (Chemistry Theatre).

4.00 ... **Presidential Address : Looking into Metals — P. P. G. L. Siriwardene** (Chemistry Theatre).

Saturday 11th December

8.30 ... A useful recent method for studying molecular structure and properties — W. Mallawaarachchi.

8.50 ... Fields of applicability of floating spherical Gaussian orbitals (FSGO) and the Chemist's involvement with the computer — W. Mallawaarachchi.

CASHEW NUT SHELL LIQUID AS AN ANTIOXIDANT IN NATURAL RUBBER COMPOUNDING

R. A. Rajapakse

(Rubber Technology Section, Ceylon Institute of Scientific and Industrial Research, Colombo).

All rubbers are susceptible to attack by oxygen, ozone, heat, light, weather and radiation. The attack by these agents causes a gradual breakdown of the polymer thus resulting in deterioration of rubber products, the process being referred to as the aging process. Materials, known as antioxidants are added to rubber during compounding to prevent or retard the aging process. The commonly used commercial antioxidants belong either to the phenolic type or to the amine type. Hindered phenols form an important group in the phenolic type of antioxidants. Cashew Nut shell Liquid (CNSL) consists mainly of Anacardic acid and Cardol both belonging to the class of hindered phenols. This paper reports the investigations carried out at the CISIR on the possibility of using CNSL as an antioxidant in natural rubber compounding. The laboratory scale investigations show that the antioxidant activity of CNSL is comparable with that of the antioxidants used most commonly by the rubber industry in Sri Lanka.

Also the Stress Relaxation properties and the Creep behaviour of the rubber vulcanisates have been found to improve when CNSL is used as the antioxidant.

T. L. C. EXAMINATION OF 34 DIPTEROCARP SPECIES OF SRI LALKA.

Y. A. G. P. Gunawardena and M. U. S. Sultanbawa
(Department of Chemistry, University of Sri Lanka, Peradeniya Campus).
and
S. Balasubramaniam
(Department of Botany, University of Sri Lanka, Peradeniya Campus).

Out of 44 endemic Dipterocarp species, 34 species have been investigated in a T. L. C. screening programme. Triterpenoids, Chrysophanol, Scopoletin, methoxylated ellagic acids, β-sitesterol and high molecular T. L. C. spots have been recognised. The distribution of these compounds and their value as chemotaxonmic markers to distinguish plant species at generic level in this family will be discussed.

CHEMICAL INVESTIGATION OF TWO NEW ENDEMIC *CALOPHYLLUM* SPECIES

M. Dahanayake, S. Karunanayake, S. Sotheeswaran and M. U. S. Sultanbawa
(Department of Chemistry, University of Sri Lanka, Peradeniya Campus).

Calophyllum trapezifolium Thw., and *Calophyllum tomentosum* Wight which were once considered to be non endemic to Sri Lanka have now been found to be different from the corresponding Indian species. The chemical investigation of the bark and timber of *C. tomentosum* and *C. trapezifolium* are being reported.

From the endemic *C. trapezifolium*, 6-deoxy jacareubin, 1, 6-dihydroxy-5-methoxy/xanthone, 2-hy/droxy/xanthone, guanandin, 1-hydroxy-5, 6-dimethoxy/xanthone, betulinic acid, epifriedelinol and friedelin have been isolated for the first time.

From *C. tomentosum* bark extractives betulinic acid, calabaxanthone, epifriedelinol, friedelin, β-sitosterol, taraxerol- and taraxerone have been isolated. The timber extract of *C. tomentosum* was shown to contain epifriedelin, friedelin, β-sitosterol, taraxerol, 6-deoxyjacareubin, I, 6-dihydroxy-5-methoxy/xanthone, I, 5-dihydroxyxanthone, I, 7-dihydroxyxanthone, jacareubin, and 2-(3-methyl but-2-enyl)-1, 3, 5-trihydroxyxanthone. Heartwood extractives of *C. tomentosum* were devoid of triterpenes/steroids whilst the sapwood/branch timber extractives had no xanthones.

EXTRACTIVES OF *ERYTHROSPERMUM ZEYLANICUM* (GAERTN) ALSTON, *CASEARIA THWAITESII* BRIQ., *SCOLOPIA SCHREBERI* J. F. GMEL AND *CHLOROCARPA PENTACHISTA* ALSTON (FLACOURTIACEAE)

S. P. Gunasekera and M. U. S. Sultanbawa
(Department of Chemistry, University of Sri Lanka Peradeniya Campus)

S. Balasubramaniam
(Department of Botany, University of Sri Lanka Peradeniya Campus)

Extractives were obtained from the bark and timber of four species of the family Flacourtiaceae with hot light petroleum and hot methanol. The following compounds have been isolated from the light petroleum extracts.

Friedelin, betulinic acid and ursolic acid from *Erythrospermum zeylanicuu*, β-amyrin from *Casearia thwaitesii*, Friedelin, β-amyrin and epifriedelinol from *Scolopia schreberi*, cycloartenone and cycloartenol from *Chlorocarpa pentachista*, β-sitesterol has been isolated from all four plants.

The methods used for isolation and characterization of these compounds and their chemotaxonomic importance will be discussed.

THREE NEW TERPENOID ACIDS FROM *UNCARIA THWAITESII* (HOOK F.) ALSTON (RUBIACEAE)

W. H. M. W. Herath, M. U. S. Sultanbawa and G. P. Wannigama
(Department of Chemistry, University of Sri Lanka Peradeniya Campus)

The timber of *Uncaria thwaitesii* (Hook f.) Alston was extracted with hot light petroleum (40–60°) and the residue extracted with hot acetone. A cold ether extract of the latter gave uncaric acid, diketo uncaric acid and diacetate of uncaric acid.

The chemical and physical data of these compounds will be discussed.

ANTIBACTERIAL ACTION OF *PLECTRANTHUS ZEYLANICUS* AND *COLEUS AROMATICUS*

L. B. de Silva, S. Sentheshanmuganathan, R. S. B. Wickremasinghe
(Medical Research Institute)
K. Tuley de Silva
(University of Sri Lanka, Vidyodaya Campus)
K. Sangara Iyer
(College of Ayueveda)

Plectranthus zeylanicus (Sin: Irriweriya, Sanskrit: Valakan) and *Coleus aromaticus* (Sin: Kapprawalliya, Tamil: Kappoorawallie) belonging to the natural order Labiatae find extensive application in indigenous medicine. The present paper describes the anti-bacterial actions of the essential oils of the two species and dehydroroyleanone and a new compund plectranthin $C_{22}H_{30}O_6$ isolated from *Plectranthus zeylanicus*. The anti-bacterial actions on *Sh. dysentriae*, *E. coli*, *Staph. aureus* and *M. tuberculosis* are discussed.

CHEMICAL CONSTITUENTS OF *SYMPLOCUS RACEMOSA*

L. B. de Silva and U. L. L. de Silva
(Medical Research Institute).
and
M. Mahendran
(Department of Chemistry, University of Sri Lanka, Colombo Campus).

Symplocus racemosa (Sinh. Lotsumulu), belonging to the natural order Styraceae is used in indigenous medicine in "phlegmatic diseases and Leprosy". From the petroleum ether extract of the bark of *Symplocus racemosa*, oleanolic acid and acetyl oleanolic acids were isolated; the ether extract was mainly betulinic acid.

CONVERSION OF CINNAMON LEAF OIL TO ISO - EUGENOL

V. Puvanesarajah and V. Kumar
(Department of Chemistry, University of Sri Lanka, Peradeniya Campus)
and
S. Mageswaran
(Department of Chemistry, University of Sri Lanka, Jaffna Campus).

The oils from cinnamon leaf, Clove and *Ocimum gratissimum* contain predominantly Eugenol. While eugenol is itself important as an ingredient in perfumery, it finds greater use in the preperation of the the more widely utilised iso-eugenyl which also serves as a starting material for the synthesis of iso-eugenl esters and esters and of vanillin.

Several methods have been patented for the conversion of eugenol to iso-eugenol. Howeyer we find that the conditions as patented rarely give good yields of iso-eugenol. Four methods using matereials readily availale in Sri Lanka were attempted of these we find treatment with excess caustic soda at 200° to give the best conversion.

Cinnamon Leaf Oil under such treatment gave a product which was distilled to give three fractions (a) pure iso-eugenol (b) fraction with physical constants acceptable for technical iso-eugenol and (c) higher boiling fraction. The latter was found to consist of demethylated compound The method should find commercial application in Sri Lanka in the manufacture of perfumery ingredients.

PERFUMERY CONCRETE FROM *MESUA FERREA* (FAMILY GUTTIFERAE SINH: NA) FLOWERS

V. Puvanesarajah and V. Kumar
(Department of Chemistry, University of Sri Lanka, Peradeniya Campus).
and
S. Balasubramaniam
(Department of Botany, University of Sri Lanka, Peradeniya Campus).

Mesua ferrea which blooms annually in June-July produces more than 50 kg of flowers per mature tree during a good season. Concretes from the flowers, which are sweet smelling could find use in the perfumery industry. Concretes were prepared from these flowers by extraction with light petroleum for 24 hour periods followed by concentration. The concretes 1 and 2 from the first and second extraction were found to be pleasant smelling while the third extracrion gave a concrete of lower quality which was rejected. The concretes 1 and 2 were reddish brown semi-solids and were obtained in good yield. The physico-chemical constants of the concretes (acid number, ester number, etc.) were determined and a chemicnl study initiated on concrete 1. It was found that major component of the extract was the triterpene alcohol lupeol.

BINDING ENERGY OF AN ELECTRON TRANSFERRED FROM A UNIVALENT ANION TO A SOLVENT

K. Tennakone
(Department of Physics, Vidyodaya Campus)

R. H. Wijayanayaka
(Department of Chemistry, Vidyodaya Campus)

The energy eigenstates of an electron transfered from a univalent anion into a solvent are calculated by taking into account the monopole and dipole terms of the electrostatic potential to which it is subjected. It is shown that the ground state binding energy is not impossibly high as indicated in the previous theories.

AN EIGHT-DIMENSIONAL FIELD THEORY OF QUARK CONFINEMENT

K. Tennakone
(Department of Physics, University of Sri Lanka, Vidyodaya Campus)

The success of the quark model in explaining almost all aspects of hadron physics is well known. However, all attempts to isolate free quarks have failed. Currently fashionable theories explain the above paradox by confining quarks to bounded regions of space. In this work an eight-dimensional field theory of quark confinement is proposed It is shown that absence of free quark fields imply that meson masses are quantized and lie on approximately linear Regge trajectories. The implications of the model on the bound state problem in quantum field theory are discussed.

IONOGENIC GROUPS OF THE CELL SURFACE OF *SACCHAROMYCES CEREVISIALE*

P. M. Jayatissa
(CISIR, Colombo 7)
and
A H. Rose
(School of Biological Sciences, University of Bath, Bath, England)

Most strains of *Saccharomyces cerevisiae* are negatively charged above pH 3.0. Two types of ionogenic groups have been postulated to contribute to this negative charge viz (1) phosphodiester groups in the side chains of the cell-wall phosphomannan (2) carboxyl groups of the acidic wall protein. This paper deals with evidence which support this view. To obtain this evidence electrophoretic mobility of a strain of *Saccharomyces cerevisiae* (NCYC 366) was studied before and after treatment to remove protein or phosphate. Protein was removed from the cell-wall surface by treatment with trypsin. To remove phosphate, which is in the diesterified state, a technique was used which specifically excizes phosphodiester groups and mannose residues distal to these groups. It involved treating cells with hydrofluoric acid (60%, v/v) at O°C.

Treatment with trypsin decreased the mobility due to protein by about 90%; while treatment with hydrofluoric acid decreased the mobility due to phosphate by about 85%. These observed effects on the electrophoretic mobility, which gives a measure of the surface charge indicated the relative contributions from these two types of ionogenic groups to the surface charge.

ROLE OF WALL PHOSPHOMANNAN IN FLOCCULATION OF *SACCHAROMYCES CEREVISIAE*

P. M. Jayatissa
(CISIR, Colombo 7).
and
A. H. Rose
(School of Biological Sciences, University of Bath, Bath, England).

Although flocculation of strains of *Saccharomyces cerevisiae* at the end of brewery fermentations is believed to involve formation of Ca^{2+}-mediated bridges between anionic groups in adjacent cells, there is a difference of opinion among workers as to the nature of the groups involved. Some believe that they are the phosphodiester linkages in side chains of the wall phosphomannan, while others contend that they are carboxyl groups in acidic wall proteins. This communication reports findings which allow an assessment to be made of the relative contributions of these two types of anionic group in yeast flocculation. A technique was used which specifically excizes from the yeast wall phosphodiester linkages and mannose residues distal to the linkage. It involves treating cells or walls with 60% hydrofluoric acid (HF).

Treatment with HF removed most of the phosphorus and small amounts of mannan, glucan and protein from isolated walls of two non-flocculent (NCYC 366 and 1004) and two flocculent strains (NCYC 1005 and 1063) of Sacch. cerevisiae. Cells of all four strains showed increase flocculating ability after HF treatment. Treatment with 1, 2-epoxy-propane caused a decrease in the flocculating ability of untreated and HF-treated cells. Excision of phosphodiester linkages from the yeast walls by HF, largely without any effect on protein carboxyl groups, was confirmed by pH-electro-phoretic mobility curves of cells. The results are interpreted as indicating that phosphodiester linkages in the wall phosphomannan are not involved in floc formation, and that this is mainly through carbhxyl groups in wall proteins.

THE ROLE OF PHENOLICS IN DISCOLOURATION OF NATURAL RUBBER

by

P. A. J. Yapa

(Rubber Research Institute of Sri Lanka, Agalawatta).

Darkening of natural rubber during both processing stage and storage has been a problem of considerable concern. It is regarded to be of two types, enzymatic and non-enzymatic. Oxidation of phenolic compounds in latex by polyphenol oxidase, is of the first type which is generally considered responsible for discolouration of most of the latices. However, the nature of these phenolic compounds and their role in discolouration of rubber is not known.

Qualitative and quantitative study was made of phenolic compounds of two clones namely PB 86 and RRIC 7. Five phenolics were detected in RRIC 7 and three in PB 86 by paper chromatography. In both clones two compounds were found to be predominant. One of them was a phenolic, identified as tyrosine and the other is probably an indole compound.

A slight increase in the phenolic content was observed after Ethrel stimulation. Clonal variation of thiol content in latex was studied as thiols have been reported to react with phenolics to form colourless compounds. Addition of thiols to latex improved the colour and the oxidative resistence of rubber. Effect of addition of tyrosine, tryptophan and EDTA on final colour of the rubber is also reported.

EPOXIDATAION OF RUBBER SEED OIL

by

A. Coomarasamy

(Rubber Research Institute of Sri Lanka, Ratmalana)

Epoxidised vegetable oils and epoxidised esters of unsaturated fatty acids are widely used in the polymer industry as stabilizers / plasticizers for polyvinyl chloride and other chlorinated polymers and in surface coating materials such as alkyd resins.

Rubber seed oil has the required amount of unsaturation to prepare epoxidised oil with desired properties and this paper discusses the work carried out at the Rubber Research Institute on epoxidation of rubber seed oil.

Epoxidation experiments were carried out using hydrogen peroxide/glacial acetic acid as the reagent under different sets of conditions. It has been found that epoxidised product with satisfactory exirane content could be prepared using this reagent. Resin catalysed epoxidation was found to be more efficient compared to the mineral acid catalysed process and addition of solvents such as ethyl acetate, benzene results in improvement in the extent of epoxidation.

Extent of epoxidation was measured by determining the exirane content, iodine value and by using IR spectroscopy.

Epoxidised oil will have a good market locally as well as abroad and it is possible to earn valuable foreign exchange by the commercial preparation of this product using locally available rubber seed oil.

A METHOD TO IMPROVE THE QUALITY OF IRON OXIDE PIGMENTS MANUFACTURED USING HYDRATED LIME.

R. T. Guruge,

(Ceylon Steel Corporation, Athurugiriya)

A study has been done in the laboratory and pilot plant scales to overcome the problems associated with the use of local hydrated lime to precipitate hydrated oxides of iron from waste pickle liquor (solution of Fe^{+2}) in manufacturing red, yellow and black iron oxide pigments.

The lowering of quality due to the use of hydrated lime containing unburnt lime and other impurities and with low solubility has been avoided by the use of ammonia gas liberated by passing steam through a mixture of hydrated lime and an ammonium salt solution. The ammonium salt recovered as filtrate is recycled to liberate more ammonia.

The two counterposing problems of loss of ammonia under alkaline conditions and incomplete precipitations under acidic conditions have been solved by a suitable adjustment of pH and a combination of precipitation, filtration and oxidation steps.

Good quality gypsum has been manufactured as a by product with pickle liquor containing $FeSO_4$ solution.

The pigments were of very high purity and good staining power.

PRELIMINARY STUDIES ON THE ELECTRICAL PROPERTIES OF LOCAL MICA

R. N. Ediriweera and P. A. J. Ratnasiri

(Section of Applied Physics & Electronics
Ceylon Institute of Scientific & Industrial Research Colombo).

The dielectric constant and dissipation factor of some local mica samples were determined over the frequency range 30 Hz to 1 MHz. The measurements from 30 Hz to 30 kHz were carried out using the bridge method, where as the susceptance variation method was used from 40 kHz to 1 MHz. The measurements were made at reduced pressures to eliminate the effect of moisture, which is present between the mica films, on the above electrical properties.

It was found that the dissipation factor decreased from values of the order of 10^{-2} at power frequencies to about 10^{-3} at frequencies above 100 kHz. The dielectric constant, at room temperature, varied between 5 and 6.5 depending on the sample.

Measurements carried out with some Indian samples showed that the frequency variation of these properties differ significantly between the local samples and the Indian samples.

SPECTROSCOPIC AND THERMODYNMIC STUDY OF AQUO-ORGANIC SOLVENT SYSTEMS

R. H. Wijayanayake

and

N. C. A. Weerasinghe

(Department of Chemistry, University of Sri Lanka, Vidyodaya Campus).

Each of the solvents methanol, ethanol and isopropanol was mixed with water in varying proportions. The behaviour of these mixtures were probed using the U. V. absorption spectrum of the iodide ion.

The variation of the peak maximum (E_{max}) of the iodide ion in the solvent mixtures with mole faction (x) can be described using the equation :

$$E^2_{max} = ax^2 + bx + c$$

where a, b and c are constants.

The deviation from the theoretical behaviour is attributed to structural effects of the solvents. Thermodynamic parameters are used to explain these structural effects.

SOME CHARACTERISTICS OF GROUND WATER IN VANATHAVILLU AS DETERMINED BY NUCLEAR TECHNIQUES

K. G. Dharmawardena
(Radioisotope Centre, University of Sri Lanka Colombo Campus).

M. W. P. Wijesinghe
(Department of Irrigation).

Naturally occuring isotopes, both stable and unstable can be used for solving many problems in hydrology. The main isotopes used are Deuterium, Tritium, Carbon-13, Carbon-14, and Oxygen-18. As a part of the hydrology programme of the Atomic Energy Authority, a study using these isotopes to find characteristics of ground waters at Vanathavillu has been carried out as a collaborative project between the Department of Irrigation and the Radioisotope Centre.

In this project samples of ground waters were obtained from the wells that have been sunk by the Department of Irrigation. Samples of surface water were also collected from the same area. Contents of Tritium, Carbon-13, Carbon-14 and Oxygen-18 in these samples were measured.

These values have lead to the conclusions that;

(1) Ground water in this area are about twenty five years old.
(2) In some areas, seepage of sea water takes place.
(3) Recharge is presently occuring in the southern part of the basin.
(4) The flow velocity is about 1–2 meters/year.

A USEFUL, RECENT METHOD FOR STUDYING MOLECULAR STRUCTURE AND PROPERTIES*

W. Mallawaarachchi

(Department of Chemistry, University of Sri Lanka, Peradeniya Campus).

This paper presents an introduction to the Floating Spherical Gaussian Orbital (FSGO) method as a means of evaluating structures and some properties of molecular systems. This FSGO concept is a sound ab-initio procedure, originuted by A. A. Frost (U. S. A.) in 1967. The method uses normalised Floating Gaussian functions of the form;

$$\phi_i = \left\{ \frac{2\alpha i}{\pi} \right\}^{\frac{3}{4}} \exp \left\{ -\alpha_i (r - R_i)^2 \right\}$$

where the orbital exponent αi and the components of the orbital centre vector R_i are the variations parameters.

The biggest advantage of the method lies in its simplicity in

(a) evaluation of component integrals

(b) visualisation of the electron distribution and interpretation of the results.

(a):- increases speed and improves economy when compared to other methods. These facts enable us to extend the FSGO method to larger systems, than those that could be coped within Hartree - Fock - Self - Consistent Field (HF - SCF) calculations.

FSGO calculations have been made for a series of Molecular systems. These calculations show that the method predicts results which are remarkably consistent with experiment.

Some theoretical aspects of the FSGO method and the results for few simple molecules and their conclusions are discussed in this paper.

*(*This work was done at the chemical laboratories, University of Cambridge).*

FIELDS OF APPLICABILITY OF FLOATING SPHERICAL GAUSSIAN ORBITALS, (FSGO), AND THE CHEMIST'S INVOLVEMENT WITH THE COMPUTER

W. Mallawaarachchi

(Department of Chemistry, University of Sri Lanka, Peradeniya Campus.)

Some improtant aspects of the FSGO method, which have a wide range of applicability in Chemistry, are discussed in this paper. The following fields of study are dealt with in detail.

(i) geometrical properties of molecules

(ii) study of potential energy surfaces and reaction mechanisms.

(iii) bond dissociation phenomena

(iv) demonstration of the concepts of resonance, hybridisation, and delocalisation.

(v) crystal structures and macromolecules

The work carried out in all the above areas where the FSGO method has been successfully utilized, is described.

Latter part of the paper explains the involvement of the computer, in the above work. Usefulness of the computer for chemists in general, is pointed out. It is suggested that chemists, students as well as professionals, must make the best use of the available computer facilities. Some examples of programming is also discussed.

SECTIONAL PROGRAMME

SECTION F: SOCIAL SCIENCE

(New Lecture Hall)

Wednesday 8th December:

11.00 ... A Planned Marketing System for Appropriate Products for Developing the Quality of Life of the Community as a whole – D. C. Edirisinghe.

1.30 ... Improving Quality of Life in Developing Countries – C. Sivanesan.

3.00 ... **The promotion and Planning of Research using the deutsche forschungsgemeinshaft as the example - Prof. Dr. Gerd Roellecke** (Jointly with Sections A, B & D) (Arts Theatre).

Thursday 9th December:

8.00 ... Changing Technology in Agriculture and Productivity in the Peasant Colonisation Schemes of the Dry Zone- H. N. C. Fonseka.

8.30 ... How Successful is our Import Substitution Policy – R. Mahalingasivam.

9.50 ... **Cyclohazards and Coastal Plain Management in Bangladesh – Dr. M. A· Islam** (Biology Theatre) (Jointly with Section D).

10.30 ... Business Meeting

11.15 ... **Presidential address: The Organisation of our Education System - an Analysis from Inside– E. L. Wijemanna.**

1.00 ... An experimental model for the plant location problem- J. S. Gunasekera (Jointly with section C) (K. G. Hall)

1.30 .. The use of Activity Sampling in the Study of loom stoppages at the Veyangoda Mills (N. T. C.) – J. S. Gunasekera, C. T. A. Wickremasinghe (Jointly with Section C) (K. G. Hall)

2.00 ... The need for Scientific & Technological Co-operation among the Non-Aligned & Developing Countries – D. L. O. Mendis (Joinlty with Section C) (K. G. Hall).

3.00 .. **Popularization of Science Committee Seminar** (All Sections) (Arts Theatre).

Friday 10th December:

10.00 ... Annual Meeting (All Sections)

1.30 ... Non-Traditional Marriage Proposals: A Survey – B. Mahendra and D. S. Samarasinghe.

2.30 ... Tourism in Sri Lanka, the mapping of International inequalities and their internal structural effects – Susantha Goonatilleke.

Saturday 11th December:

8.00 ... Education and Employment in Sri Lanka – A case for re-assessment of current views – Dingi Karunatilake.

8.30 ... Job Expectations of Rural Youth - Some Comments – S. W. Ranasinghe.

9.00 ... Towards a Theory of Exchange Control in Relation to Sri Lanka's Context - Wimal Wickremasinghe.

9.30 ... An Export Credit Insurance Corporation for Sri Lanka - Wimal Wickremasinghe.

A PLANNED MARKETING SYSTEM FOR APPROPRIATE PRODUCTS FOR DEVELOPING THE QUALITY OF LIFE OF THE COMMUNITY AS A WHOLE

D. C. Edirisinghe
(Department of Small Industries, Colombo).

"Quality of life" is taken as the amount of cash spent by an individual on the purchase of appropriate products for living. To measure quality of life a reference value was derived and it was taken as the amount of cash a person is required to spend at a given cost of products to obtain the required material benefits for living. The mean value of the cash spent per person was taken as the mean quality of life of the community at the particular cash flow considered. Probability ratio, in marketing was taken as the quantity of appropriate products required to be sold during a given time containing in the quantity sold during that time. Production systems, marketing, probability ratio, in marketing and the quality of life are analysed using methematics. This analysis shows that for an urban rural balance it is necessary to fix prices for products so that the total value of the appropriate industrial products required for the rural population are supplied to them for exchange of rural produce. It also shows that an increase in the quality of life is brought about only through the increase in the development of new appropriate products, increasing production to meet requirements, and maintaing the probability ratio in marketing at unity for appropriate products in such a marketing system.

IMPROVING QUALITY OF LIFE IN DEVELOPING COUNTRIES

C. Sivanesan

(Sri Lanka Customs, Jaffna)

The widening gap in the material standards of living between the developed and developing counties may unduly discourage us about improving the quality of life for all. But an analysis of the composition of the goods produced in developed countries shows that a good portion is not so essential and sometimes hinders the improvement in the quality of life. The ethos of competition and rivalry, motivated chiefly by greed and envy and dominant-dependent relationships promoting power rivalries have caused economic growth of partially doubtful value. This ethos have been questioned and challenged. A society motivated mainly by love, compassion, cooperation and service aiming at greater equality, freedom and justice for more and more people can pioneer a new quality of life for all where the essential necessities and a high and improving quality of life with widening scope for creative activities is provided to all and contribute to the achievement of a more stable, peaceful and prosperous world.

CHANGING TECHNOLOGY IN AGRICULTURE AND PRODUCTIVITY IN THE PEASANT COLONISATION SCHEMES OF THE DRY ZONE

H. N. C. Fonseka

(Department of Geography, University of Sri Lanka, Colombo Campus).

This paper will attempt to survey the changes in technology of paddy cultivation and their effects on productivity in certain selected colonisation schemes. The study has been based on field work and the data is in respect of three periods of time: 1958/59, 1967/68 and 1972/73 agricultural years.

It is seen that the improved and the new high yielding varieties of seed paddy have largely replaced the older pure-line seed and the traditional village varieties. Tillage operations have improved over the years with an increasing use of tractors. There has not been a significant increase in the practise of transplanting. There has been an increase in the use of fertilizer though still very much below optimum levels. Weeding has been adopted more extensively by the allottees but still the weed control measures practised are unsatisfactory. Paddy yields averaged 33 bushels per acre in 1958/59, 34 bushels per acre 1967/68 and 45 bushels per acre in 1972/73.

The expected results from the use of the improved and the new high-yielding varieties of seed have not been realised by the farmers. The basic problem appears to be that the package approach has not been followed : improved and new high yielding varieties of seed, transplanting, fertiliser recommendations and effective weed control do not appear to have gone together.

Shortages and maldistribution of irrigation water have aggravated this. The problems confronting the farmers in this regard ara analysed.

HOW SUCCESSFUL IS OUR IMPORT SUBSTITUTION POLICY

R. Mahalingasivam

Focus on Import Substitution Policy became evident during late 1950's as shortage of foreign exchange became a drag on our development efforts. The examination and identification of our imports indicated that several of the commodities imported could be produced with ease domestically. Our local entrepreneurs were also willing to undertake productions of a few of the commodities which were imported in the past because of various incentives offered by the State and because they were quite clear in their minds as to the future demands for these commodities. Some claim that the

protection offered by the State for the production of these commodities had led to wasteful uses of scarce resources.

It is, therefore, considered interestiug to investigate what changes have taken place as regards policies adopted for import substitution over a period of years, what forces were responsible for effecting the changes in policies and to what extent we are successful in onr aspirations.

This study is, therefore, an attempt to evaluate our achievements in relation to our targets in the area of import substitution. The study reveals that we were successful as regards a few commodities but failed in others. This paper will discuss the probable reasons for its successes and failures in our endeavours.

AN EXPERIMENTAL MODEL FOR THE PLANT LOCATION PROBLEM

J. S. Gunasekera,

(Department of Production Engineering, University of Sri Lanka, Peradeniya Campus.)

Plant or factory location is one of the most important long term decisions, the top management of any organisation has to make. The design of a production system is dependent on its location, because resulting physical factors influence layout and because the location will partially determine operating and capital costs. The final decision will depend on many factors such as the cost of land, cost of plant construction, availability and cost of power, transport facilities, proximity to markets etc.

It is usual to analyse this type of problem mathematically using techniques of OR such as linear programming. However the use of computer becomes a necessity when the number of variables of the problem become large.

An experimental model has been constructed using a vertical board, pulleys and strings for the case of a single plant (source) distributing to a large number of markets or warehouses (sinks). The demand of the warehouses, the supply of the factory, transport costs, handling costs etc. are taken into account in this model. The optimum location of the plant can be found simply by allowing the system to come to the equilibrium position. It can be proved that this equilibrium position obtained using the laws of mechanics is identical to the optimum plant location.

The model is not only valuable as a demonstration model for the students in Production Engineering and Management, but will also provide quick and approximate solution to actual situations in practice without the use of complicated mathematical programming. A similar model has been suggested earlier but the present model incorporates several interesting modifications.

NON-TRADITIONAL MARRIAGE PROPOSALS: A SURVEY

B. Mahendra and D. S. Samarasinghe

(Departments of Psychiatry, Peradeniya and Colombo Medical Schools).

500 marriage proposals appearing in the Sunday English newspapers were subject to study. The characteristics of those advertising and those sought for in their partners were coded into 15 sections and subjected to statistical analysis. The features of study included race, religion, caste, age, profession, dowry, horoscope, family wealth, position and social connections and attributes, physical and abstract, in the prospective partners. A high proportion of Roman Catholic and Christian advertisers and relatively few Tamils and Hindus were seen.

Religion and caste were specified more often than race and only a small minority stated they would accept partners from other religions and castes. The mean ages for male and female advertisers were 32.6 and 29 years respectively. A high proportion of female teachers sought partners and, similarly, teachers were in demand as brides. The majority of Tamils insisted on dowries and a high proportion of Tamils desired doctor brides. The chief male attributes desired seemed to be that they be teetotallers and "sober" while prospective brides were expected to be attractive, educated and good charactered. The type of person advertising and the increasing trend of newspaper advertisments for marriage partners are discussed and possible explanations offered.

TOURISM IN SRI LANKA, THE MAPPING OF INTERNATIONAL INEQUALITIES AND THEIR INTERNAL STRUCTURAL EFFECTS

Susantha Goonatilake

The paper based on a case study of the growth of tourism in Sri Lanka examines tourism within a framework of dependenoy vis-a-vis the developed industrial countries. It distinguishes between two types of tourism namely that between the developed countries themselves and tourism which brings in personnel from developed countries to developing countries The two categories of tourism it is pointed out have fundamentally different effects (economically, socially, culturally) on the receiving countries. Evidence indicates that the latter form of dependent tourism which has been consciously introduced into Sri Lanka within the last ten years has serious distortions in the economic, social and cultural spheres. These distortion effects have considerable similarities to the distortion of the economy by the introduction of the plantation sector in the 19th century and the paper suggests that the long term consequences of overemphasis on the tourist sector could be as grave as that of the introduction of the plantation ecenomy.

EDUCATION AND EMPLOYMENT IN SRI LANKA: A CASE FOR REASSESSMENT OF CURRENT VIEWS

Dingi Karunatilake

(Department of Sociology, University of Sri Lanka, Colombo Campus).

The paper critically analyses the currently accepted view that education in Sri Lanka has created a structural imbalance resulting in an imbalance between job expectations of the educated unemployed and the available job opportunities. The view is shown to be based on limited data and a simple view of the social situation in Sri Lanka. Educated youth are shown to accept any employment in some social situations. The data usually simply interpreted may in fact be explained by a time lag in the supply of employment and the opening of new avenues of employment to the generation under thirty during the previous decade. A simple cause and result view of education and job-waiting is shown to be capable of being misused for educational policy that may hinder the long-term development of the country, and a case is presented for a complex view allowing for dynamic man-power and educational planning with growth orientation for Sri Lanka.

JOB EXPECTATIONS OF RURAL YOUTH - SOME COMMENTS

S. W. Ranasinghe

(Marga Institute, Colombo 5).

This paper is based on some findings of a survey conducted by the Marga Institute during 1973-74. The survey covered a sample equivalent to one percent of the total rural population (i.e. 87,000 according to Census of 1971) and was conducted in 120 villages selected at random from the 22 administrative districts. The 'village' being a sampling unit takes an important place as the findings of the study reflects the socio-economic characteristics of these villages.

The paper will examine briefly the special features of employment and unemployment in a village context, viz the difficulty of making a correct analysis of the magnitudes of employment and unemployment using the definitions based on Western concepts. It will then go on to the subject of the study namely, the unemployed youth and examine their salient features. This will cover the following findings, that the increasing unemployment among the female youth is a recent phenomenon, the educational achievemnets of the unemployed youth and the period of waiting are not significantly corelated, the burden of unemployment is shared more by the households in lower income groups. The discussion on job expectations of youth will be confined to the unemployed youth as they form a crucial group in the present society. This discussion will cover among other things the following findings, job aspirations differ significatnly between males and females; the type of jobs sought by yonths are related significantly to their levels of education (i.e. those who have higher educational qualifications aspire for white-collar wage employment and those who have had primary or middle schooling expect non - white - collar wage employent, the majority of the unemployed aspire for jobs in the areas like crafts, manufacturing and production process work, services, sports and recreation work, agriculture, transport and communication, trade and commerce, and wishes to remain in their own villages. The income expectations of youth vary according to their levels of education and the job expectations of the majority of youth are not unrealistic compared to the occupations of their household heads and employed counterparts.

The paper will also examine briefly the attitudes of youth to self - employment in agriculture, small industry and allied fields. This will cover mode of self - employment preferred by youth, facilites required for self - employment and related aspects.

TOWARDS A THEORY OF EXCHANGE CONTROL IN RELATION TO SRI LANKA'S CONTEXT

Wimal Wickramasinghe

(Department of Economic Research, Central Bank of Ceylon).

Exchange Control is not only an allocative mechanism of foreign exchange mainly directed towards eliminating the *ex-ante* deficit in the balance of payments but also an instrument of development planning. This administrative weapon is now identified as a lasting feature in the government armoury of many countries. However, there is no theory of exchange control as such in the economic literature. The vacuum in economic theory in the context of developing countries is well noted in the sphere of exchange control and exchange rate policies.

The purpose of this study is mainly two-fold. First, it will define exchange control and examine its characteristics against the perspective of a theory of exchange control. Secondly, the evolution of Sri Lanka's exchange control policy will be examined in greater detail to see how it could be fitted into a rational framework of exchange control.

A basic conclusion of this study is that exchange control creates distortions in production and consumption on the one hand and in exchange and money markets, on the other. As in many other countries, Exchange Control in Sri Lanka is an *ad hoc* and bureaucratic mechanism not suited to any programme of planning and development. Rationality of exchange control as a second best measure is examined to derive conclusions.

AN EXPORT CREDIT INSURANCE CORPORATION FOR SRI LANKA

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The main purpose of this study is to outline proposals for an Export Credit Insurance Corporation in Sri Lanka and indicate terms and conditions under which the proposed Corporation (ECIC) should function as a means of promoting exports. The work of ECIC is mainly two-fold. One is to issue export credit insurance policies to exporters to protect them against non-payment of proceeds by the buyers abroad due to commercial and political risks. The other is to issue guarantees to the banks against non-payment of advances by exporters.

Export credits and bank guarantees are examined against the perspective of Sri Lanka's economic and financial prospects. This will show how present pre-shipment and post-shipment credit needs are inadequate for the promotion and diversification of exports. The proposed ECIC should be self-supporting and commercial. The objectives of ECIC are many. In addition to those mentioned above, it will also (a) help exporters to find new markets, (b) grant financial and other facilities, (c) provide a flexible and comprehensive refinancing scheme, (d) undertake market studies abroad, (e) obtain credit intelligence information and (f) effect institutional changes in the country's export finance structure. Principles with regard to premium rates, spread of risks, voluntary insurance, type of cover, payment of claims, bank guarantees, policy assignment and recourse are formulated for the guidance of policy makers.

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