THE International Sugar Journal

MARCH 1975

When you think of sugar machinery...

Unit Equipment for every station of the factory.

MILL SPARES
AND
REPLACEMENTS

COMPLETE ROLLERS
SHELLS
RE-SHELLING SERVICE

...think of

Fletcher and Stewart Limited

DERBY - ENGLAND - DE2 8AB

Telephone: Derby 40261 Telex: 37514 Telegrams: Amarda Derby Telex

THE QUEEN'S AWARD TO INDUSTRY 1966

THE QUEEN'S AWARD TO INDUSTRY 1972

PP2

Sugar cane weeds defeated!

The safe and effective control programme of weeds in sugar cane is of first importance in growing profitable crops and May & Baker have developed two products specifically for this purpose.

Asulox 40

for the control of "difficult" grass weeds – even Johnsongrass *(Sorghum halepense)!*

Actril DS

for the control of the toughest broad-leaved weeds.

'Asulox' 40 and 'Actril' DS are fully compatible and together give a complete weed control programme.

M&B May & Baker

A member of the Rhône-Poulenc Group of Companies

HAS049

To:
May & Baker
Dagenham Essex RM10 7XS England

Please send me your latest publications on 'Asulox' 40 and 'Actril' DS.

Name_____

Address_____

_____

_____

'Asulox' and 'Actril' are trade marks of May & Baker Ltd.

RENOLD

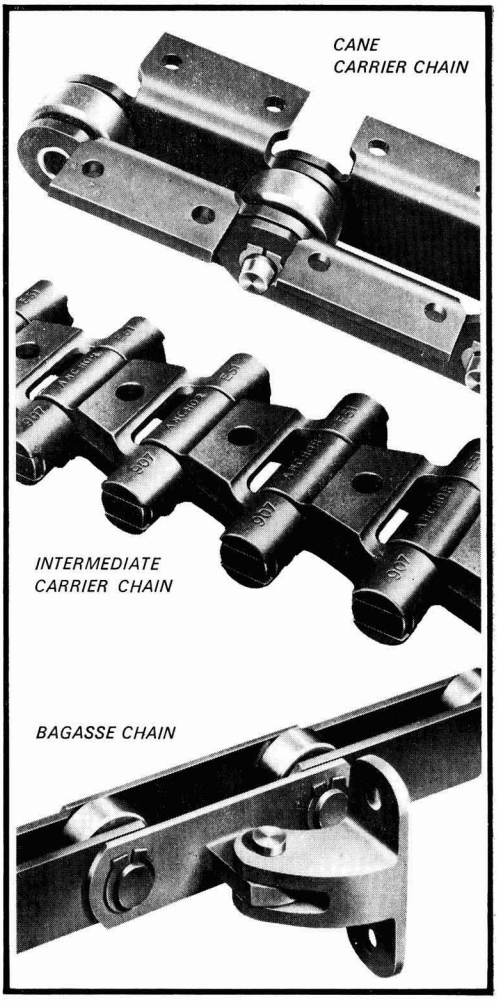
serving the cane sugar industry

CHAINS FOR MECHANICAL HANDLING

Specialised Renold chains have been supplied to the cane sugar industry since 1920.

90 years of precision chain manufacture ensure a product combining high strength with compactness, minimum weight and low cost for long life and trouble free operation.

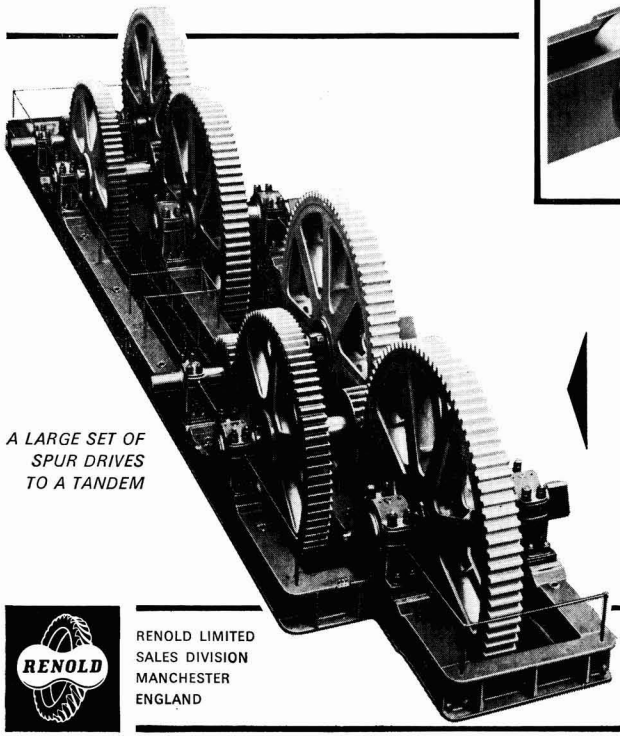
Precision power transmission chains and wheels are also available for all applications.



CANE CARRIER CHAIN

INTERMEDIATE CARRIER CHAIN

BAGASSE CHAIN



A LARGE SET OF SPUR DRIVES TO A TANDEM

POWER TRANSMISSION GEARING

Spur gears up to 127mm circular pitch, 760mm face and 4700mm diameter can be supplied for heavy tandem drives.

Other gear products include worm, spur, helical and bevel gear boxes and individual gears.

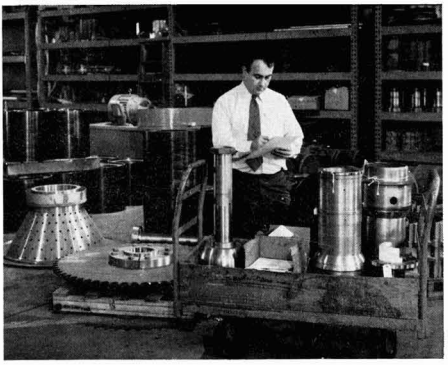
RENOLD

RENOLD LIMITED
SALES DIVISION
MANCHESTER
ENGLAND

Other Renold group products:
PRECISION ROLLER CHAINS AND WHEELS
HYDRAULIC AND MECHANICALLY OPERATED VARIABLE SPEED SYSTEMS
COUPLINGS, CLUTCHES AND BRAKES
POWER TRANSMISSION ANCILLARIES

think SERVICE.

"Level is level" . . . that's a favorite expression of our Service Manager, Tom Boughen. It means do the job right the first time – halfway is no good. With Tom Boughen and his compatriots, your centrifugals will be "level".



Bill Madaffari, Spare Parts Manager, has a new middle name: "Rush". When you need parts in a hurry he knows how to get your order on the next truck or airplane.

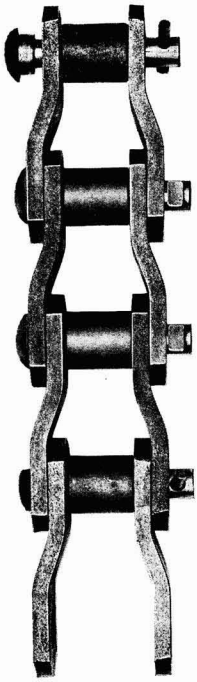
.think Western States

Keeping your Western States centrifugal in operation, especially during crop and peak seasons, is a vital concern to everyone at Western States . . . time of day (or night) is not.

Service is a factor that should be considered when making the purchase decision. Let's face it, no matter how high the original standards of design and manufacturing, the day will come when service is required . . . certain moving parts do wear out and need to be replaced. That's the day service becomes imperative.

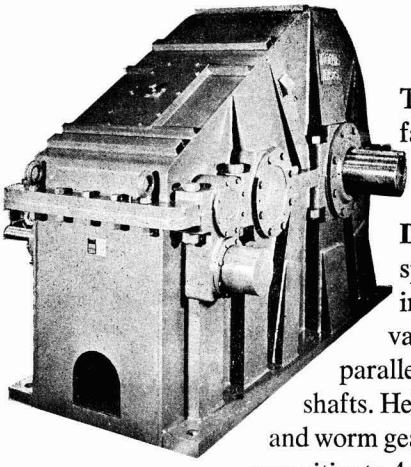
Western States has a reputation of being "johnny-on-the-spot" when it comes to service . . . and we have every intention of maintaining that reputation. This service philosophy is especially important during crop and peak operating periods. We don't want you "out-of-business" for the need of a part. Men like Tom Boughen and Bill Madaffari will do everything possible to make sure you're not. Contact Mr. James Coleman, General Sales Manager.

THE WESTERN STATES MACHINE COMPANY
Roberts Centrifugals
Hamilton, Ohio, 45012, U.S.A.

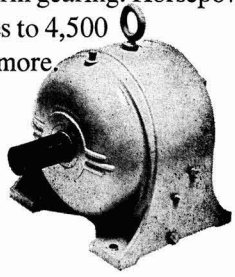


Jeffrey now serves the international sugar industry with over 32,000 power transmission products.

The standard and special engineered class chains of **Jeffrey Chain Division** drive, convey, and elevate the industry's materials and machinery.

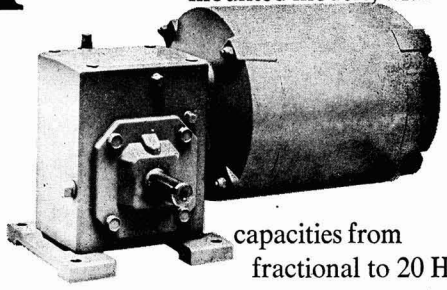


The manufacturing facilities of our **Electra Motors** and **Foote-Jones Divisions** produce speed reducers in problem-solving variety. Concentric, parallel, and right angle shafts. Helical, spiral bevel, and worm gearing. Horsepower capacities to 4,500 and more.



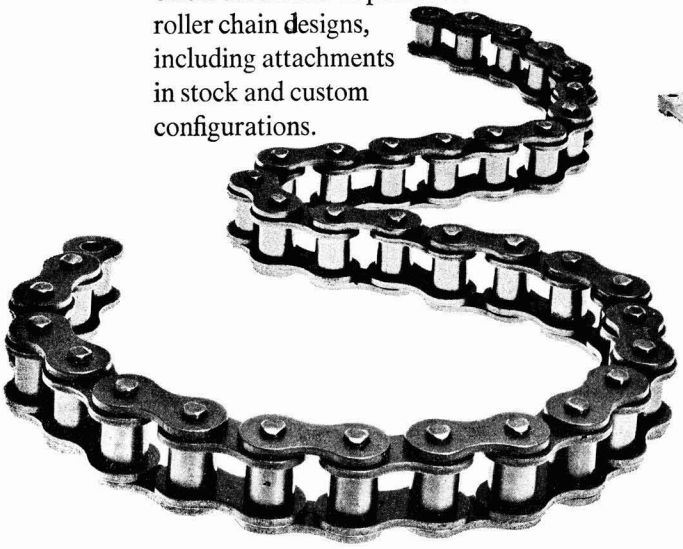
Jeffrey & Sugar

Electra and **Foote-Jones** worm gearmotors are available in adaptable, fixed base, and shaft-mounted models, with



capacities from fractional to 20 HP. Helical gearmotors come in more than 3,000 catalogued combinations, with capacities from fractional to 200 HP.

Whitney Chain Division offers thousands of precision roller chain designs, including attachments in stock and custom configurations.



We've got more information on all of our products.
Write Jeffrey Galion Americas Corp., North Fourth Street, Columbus, Ohio 43216, U.S.A.

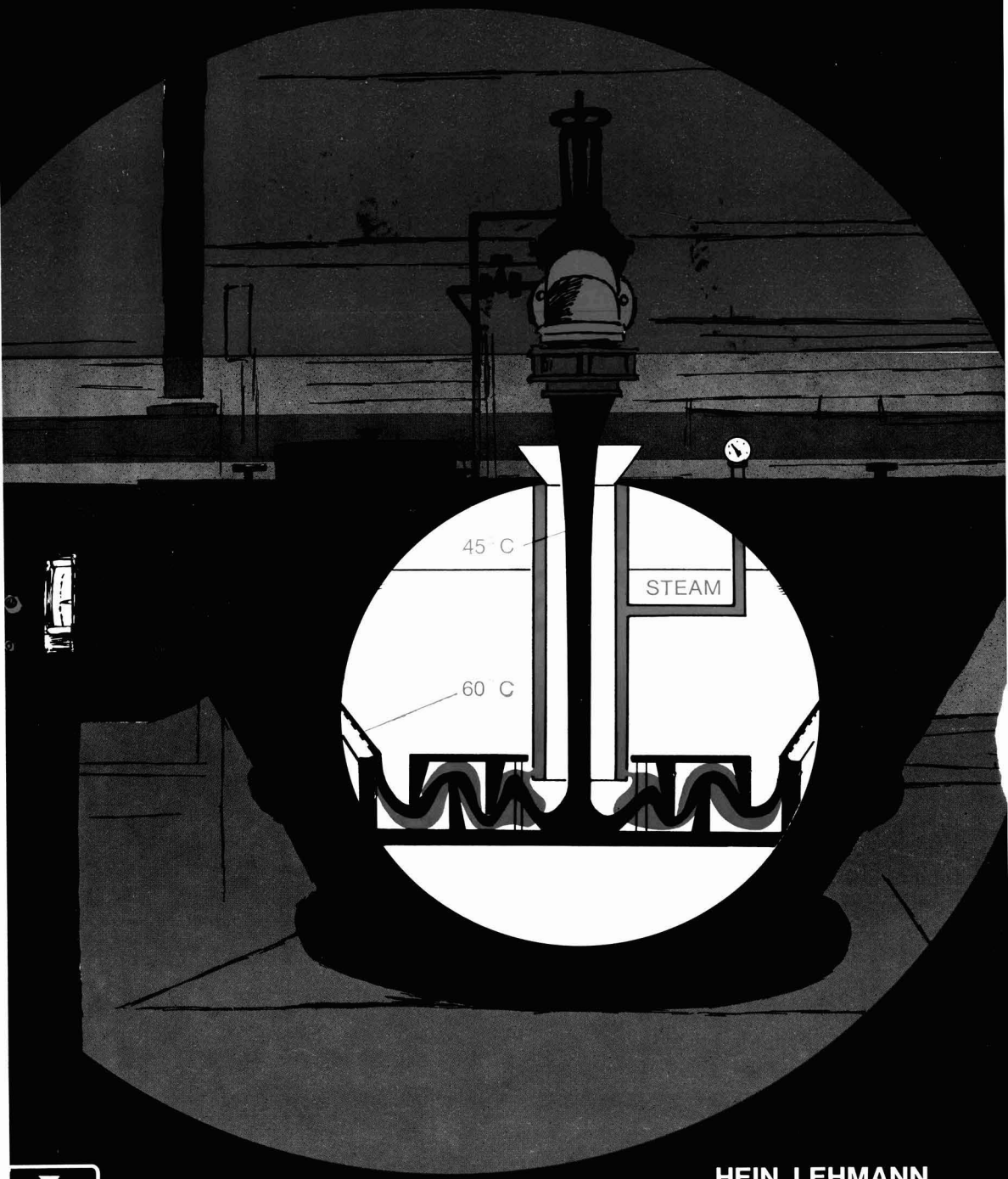
JEFFREY

Konti 10-DC

Hein, Lehmann Centrifugal

New with inner heating syste

Much more capacity
Better sugar quality
Lowest molasses purity



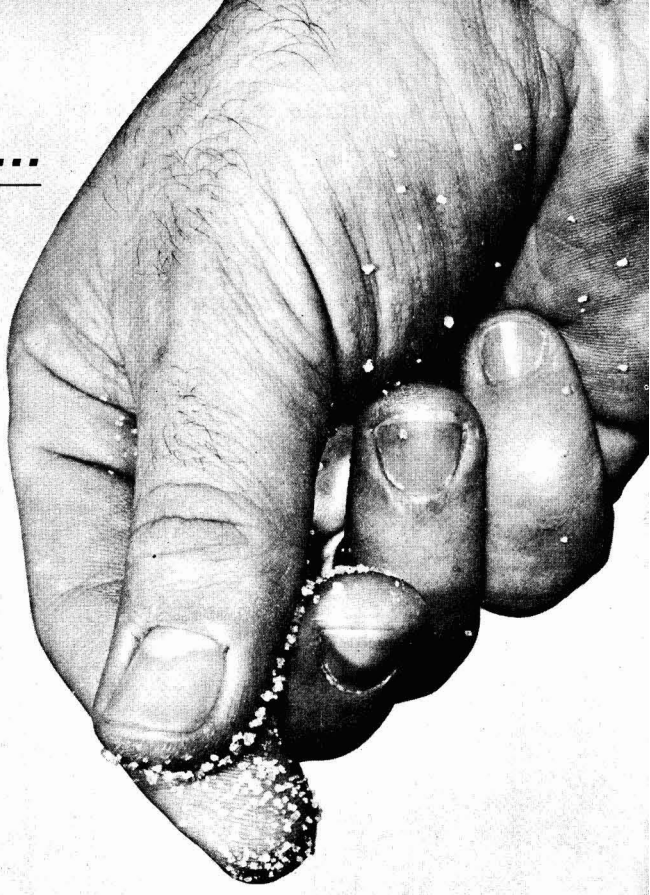
HEIN, LEHMANN AKTIENGESELLSCHAF
D-4000 Duesseldorf 1, P.O.B. 41
Telex 8582740 hld

Now More Than Ever...

Increase Sugar Recovery

Increase Pan Floor Output

With Hodag CB-6



Hodag CB-6, an easy-to-use additive, permits boiling pans to a higher brix and boiling of lower purity syrups. **Increased exhaustion of final molasses and recovery of more sugar is the result.**

A small amount of patented Hodag CB-6 makes possible greater processing capacity by increasing fluidity and circulation and reducing surface tension of syrups and massecuites.

Pan floor output is increased because boiling time is reduced—a vital improvement especially where pan or crystallizer capacity is limited.

CB-6 also helps overcome operating headaches caused by burnt, muddy, or delayed cane. It can keep your pan floor operating in spite of low purity, hard-to-boil syrups.

This product can improve the quality of your sugar—helps to achieve higher purity, lower ash, better color, and better filterability through more uniform crystal formation, better purging.

Why not benefit from the experience of factories and refineries throughout the world that use Hodag CB-6. Let a Hodag representative show you how to use CB-6 to improve your boiling house operation.

Send the coupon below for more information.

- ☐ Please have a Hodag representative contact me.
- ☐ Please send complete literature and case history data on Hodag CB-6.
- ☐ Send information on other Hodag products for the Sugar Industry.

Name _____

Title _____

Company _____

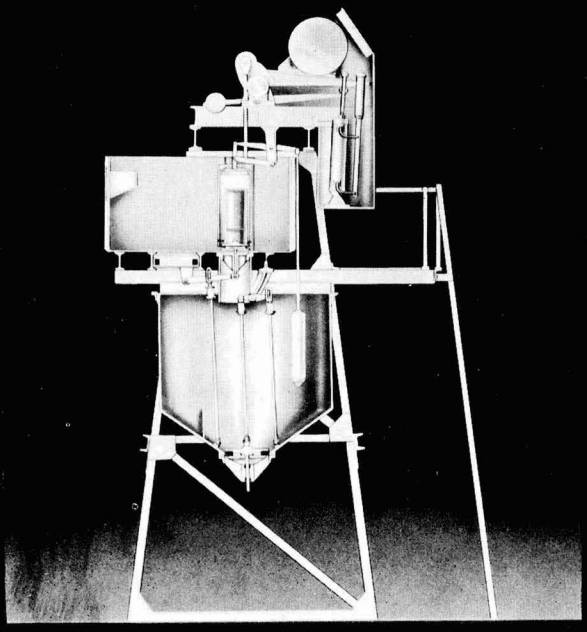
Address _____

City _____ State _____

Country _____

HODAG CHEMICAL CORPORATION / HODAG INTERNATIONAL S.A.
7247 North Central Park Ave., Skokie, Illinois 60076 U.S.A.
Cable Address: HODAG SKOKIEILL Telex: 72-4417

When you think of sugar machinery...



The Automatic Liquid Scale

TARE PRINCIPLE ENSURES MAXIMUM ACCURACY

SIMPLICITY OF DESIGN REDUCES MAINTENANCE COSTS

SELF ACTUATING

AUTOMATIC ADDITIVE DOSING

EXCISE SEALS EASILY FITTED

...think of FS

FS design and construct complete factories and refineries, and supply a fully comprehensive range of unit equipment and spares for the sugar industry

FS Fletcher and Stewart Limited

DERBY - ENGLAND - DE2 8AB

1966 1972

Telephone: Derby 40261 Telex: 37514 Telegrams: Amarilla Derby Telex

A Member of the Booker McConnell Group of Companies

Published by
The International Sugar Journal Ltd.
23a Easton Street, High Wycombe,
Bucks., England.
Telephone: High Wycombe 29408
Cable: Sugaphilos, High Wycombe

* * *

Annual Subscription: £5.00 or $15.00 post free
Single Copies: 60p or $1.80 post free

* * *

UK ISSN 0020–8841

International Sugar Journal

March 1975

Contents

SOMMAIRES : ZUSAMMENFASSUNGEN : SUMARIOS

Composition des polysaccharides dans le floc des boissons carbonatées. T. MIKI, S. SAITO et M. KAMODA. *p.* 67–69

On décrit des recherches qui avaient comme but d'identifier les constituants polysaccharides des sucres bruts australiens. Ces constituants étaient responsables de la formation du floc dans les boissons carbonatées. Les résultats indiquent la présence du glucose, galactose, mannose, arabinose, xylose et rhamnose dans le polysaccharide qui fut reconnu jourant un rôle important dans la formation du floc.

* * *

Choix d'équipement pour l'industrie sucrière. ANON. *p.* 69–70

On donne une liste des sujets les plus importants traités au cours d'une discussion particulière de l'industrie sucrièer qui a été organisée par l'Organisation du Développement Industriel des Nations Unies à Vienne du 25 au 28 novembre 1974. L'objet principal de la réunion était le sélectionnement d'équipement et de procédés aptes à traiter soit de la betterave, soit de la canne. On a également discuté des problèmes au sujet des procédés et du contrôle de la qualité des produits.

* * *

Nouvelle plaine à betterave à la British Sugar Corporation. ANON. *p.* 70–71

On décrit en détail et à l'aide de dessins la nouvelle plaine à betteraves de l'usine de York de la British Sugar Corporation Ltd. L'installation permet le déchargement des betteraves à partir des véhicules de route et l'empilage à raison de 400 tonnes l'heure.

* * *

Dosage direct de traces d'éléments dans le jus de canne, le sucre et la mélasse par spectrophotométrie d'absorption atomique. S. L. SANG, W. C. CHENG, H. I. SHIUE et H. T. CHENG. *p.* 71–75

On décrit une méthode rapide et simple pour le dosage par absorption atomique du Ca, Mg, K, Na, Fe, Al, Si, Zn, Cu, Mn, Co et Mo dans le jus de canne, les mélasses et le sucre. Aucune séparation préalable n'est requise et on a trouvé que les résultats étaient précis et reproductibles.

Zusammensetzung der Polysaccharide im Floc kohlensäurehaltiger Getränke. T. MIKI, S. SAITO und M. KAMODA. *S.* 67–69

Es wird über Untersuchungen berichtet, welche das Ziel hatten, die Polysaccharide in australischem Rohzucker zu identifizieren, die für die Floc-Bildung in kohlensäurehaltigen Getränken verantwortlich zu machen sind. Aus diesen Versuchen ging die Anwesenheit von Glucose, Galactose, Mannose, Arabinose, Xylose und Rhamnose in der Polysaccharid-Fraktion hervor, die als wichtiger Faktor bei der Floc-Bildung ermittelt wurde.

* * *

Auswahl der technische Ausrüstung für die Zuckerindustrie. ANON. *S.* 69–70

Eine Aufstellung enthält die Hauptpunkte, die auf einer von der Organisation für industrielle Entwicklung de Vereinten Nationen vom 25. bis zum 28. November 1974 in Wien veranstalteten Diskussionstagung behandelt wurden. Hauptthema dieser Tagung war die Auswahl einer geeigneten technischen Ausrüstung und brauchbarer Verfahren für die Verarbeitung von Rübe und Rohr. Weitere Programmpunkte betrafen die Prozessregelung und die Qualitätskontrolle des Endproduktes.

* * *

Neue Anlage zur Rübenlagerung für die British Sugar Corporation. ANON. *S.* 70–71

Einzelheiten und Bilder der neuen Anlage zur Rübenlagerung in der Zuckerfabrik York der British Sugar Corporation Ltd. werden wiedergegeben. Die Anlage ermöglicht die Entladung von Strassenfarhzeugen und die Stapelung der Rüben mit einer Geschwindigkeit von 400 metr.t pro Stunde.

* * *

Direkte Bestimmung von Spurenmetallen in Zuckerrohrsäften, Zucker und Melasse mit Hilfe der Atomabsorptions-Spektralphotometrie. S. L. SANG, W. C. CHENG, H. I. SHIUE und H. T. CHENG. *S.* 71–75

Es wird eine schnelle und einfache Methode der Atomabsorptionsspektroskopie zur Bestimmung von Ca, Mg, K, Na, Fe, Al, Si, Zn, Cu, Mn, Co und Mo in Zuckerrohrsäften, Melasse und Zucker ohne Trennung beschrieben. Es wurde festgestellt, dass die Ergebnisse genau und reproduzierbar sind.

Composición de polisácaridos en grumo formado en bebidas gaseosas. T. MIKI, S. SAITO y M. KAMODA. *Pág.* 67–69

Se describen investigaciones que tuvieron como su objeto la identificación de los polisácaridos en azúcar crudo australiano que estan responsable de la formación de grumo en bebidas gaseosas. Resultas han indicado la presencia de glucose, galactosa, manosa, arabinosa, xilosa y ramnosa en el polisácarido, que se ha indicado como un importante factor en la formación de grumo.

* * *

Selección de equipamento para la industria del elaboración de azúcar. ANON. *Pág.* 69–70

Se presenta una lista de los puntos mayores que se han tratado en una discusión especial sobre problemas de la industria azucarera, organizado por la Organización de Desarrollo Industrial de las Naciones Unidas, celebrado en Viena el 25 a 28 de noviembre de 1974. El foco de la reunión fué la selección de equipamente y procesos apropriado al tratamiento de remolacha y de caña, mientras que problemas asociadas se han discutido también, por ejemplo, control del proceso y calidad del producto.

* * *

Nueva planta para almacenaje de remolacha en la British Sugar Corporation. ANON. *Pág.* 70–71

Se presentan detalles y ilustraciones de la nueva planta para construcción de montones de remolacha azucarera a la usina York de la British Sugar Corporation Ltd. La instalación permite descargamiento de remolacha de camiones y almacenaje a una velocidad de 400 toneladas métricas por hora.

* * *

Determinación directa de metales vestigiosos en guarapo de caña, azúcar y melaza por espectrofotometria de absorción atómica. S. L. SANG, W. C. CHENG, H. I. SHIUE y H. T. CHENG. *Pág.* 71–75

Se describe un método rápido y sencillo, usando espectrofotometría de absorción atómica, que se ha desarrollado para determinación, sin separación, de Ca, Mg, K, Na, Fe, Al, Si, Zn, Cu, Mn, Co y Mo en guarapo de caña, melaza y azúcar. Las resultas obtenido se han demostrado preciso y reproducible.

THE

INTERNATIONAL SUGAR JOURNAL

VOL. LXXVII MARCH 1975 No. 915

Notes & Comments

EEC sugar supplies

The EEC Council of Ministers met in Brussels on the 20th–21st January and discussed the Commission's proposals for the Common Agricultural Policy prices in 1975. Decisions in many areas were left until the next meeting in February; however, the Council decided in principle to subsidize imports of a further 300,000 metric tons of sugar as the second stage of the Community's import subsidy scheme, and adopted specific arrangements to deal with 200,000 tons of this at once. Under these, it is provided that either a simple import subsidy may be paid, or the import-export type of subsidy under which 155,000 tons had already been subsidized for the United Kingdom. This is the larger part of the 200,000 tons of the first stage, which was completed at a tender held on 15th January.

The subsidized price was also raised slightly to £181 per ton for refined sugar, but it still remains far lower than the current UK equalized price (on a comparable basis) of about £275.

Following lengthy negotiations with the representatives of the ACP (African, Caribbean and Pacific) sugar-exporting countries, agreement was finally reached on the 1st February in Brussels on future arrangements for supplies to the EEC. This involved two separate negotiations: the first was between the ACP sugar group and the British Government and concerned the price the latter should guarantee for sugar shipped to the UK in 1975. The price agreed was £260 per ton c.i.f. This price is somewhat above the equalized price but will not involve any further rise in the retail price of refined sugar on the domestic market.

This agreement on price made possible the conclusion of the second negotiation. This was between the ACP countries and the EEC Commission, acting on behalf of the Community and in accordance with the mandate agreed by the Council of Agriculture Ministers. Agreement was reached on a protocol which embodies the principle of indefinite duration of access arrangements. The ACP countries will be able to send up to 1·4 million tons in a full year if they choose. The first full year will begin on 1st July 1975 but special quotas have been agreed for the six months from January to June 1975. With reasonable assumptions about the figures for St. Kitts, Belize and India, the total for these months is about 380,000 tons. It is clear that in future more of the sugar will be shipped in the second half of the year.

The basic price guaranteed in future years by the Community will be negotiated annually, within the price range obtaining in the Community, taking into account all relevant economic factors.

The UK Minister of Agriculture stated: "I regard this as a very satisfactory agreement. It greatly eases our own supply situation in this difficult year. More important, it fulfils entirely the assurances given to the Commonwealth developing countries. They can now send, if they choose, a full 1·4 million tons for the indefinite future; and at no time will they get a price below the range of Community prices. This agreement gives them the security they need; and it gives us the promise of a continued supply of cane sugar for our refineries and for the British consumer."

Unfortunately, as a consequence of the words "if they choose", there is no security of supplies for the EEC from the ACP countries and, if the World Price were again to rise to the dizzy heights of last November, there would again be the need for EEC negotiators to try to secure supplies from the ACP countries able to obtain better returns from the World Market, while the EEC would be precluded from expanding its production to attain self-sufficiency and independence because of the commitment to take 1·4 million tons of sugar when the world price was less attractive than the EEC price. The ACP exporters seem to have much the better of the bargain.

* * *

World raw sugar price

The London Daily Price continued its fall until the 10th January and then moved in a comparatively small range between £365 and £395 until the end of the month. Towards the end of the month there had been a rally following the suspension of Philippines sugar exports pending assessment of damage by a typhoon. With release of statements that damage was negligible, and announcement of the agreement reached between the EEC and ACP negotiators, the price continued its fall and had reached £335 per ton by the 4th February.

* * *

Australia—Japan sugar trade agreement

Negotiations have been taking place since November for a long-term agreement under which Australia would supply raw sugar to Japanese refiners but disagreement about price had caused considerable delays. At the beginning of January, however, the

Chairman of the Sugar Board, Mr. C. LLOYD HARRIS, confirmed that agreement had been reached on the supply of three million tons of sugar over the five-year period from July 1975 at a price subsequently reported as £229 per ton[1]. Commercial implementation of the contract depends on the attitudes of the Governments of the two countries, who now have the matter under consideration. C. Czarnikow Ltd. comment[2]: "Japan has been an important market for Australian sugar since 1954 and shipments have grown until they have sometimes exceeded 600,000 tons in a calendar year. This contract, however, provides valuable guarantees to buyers and sellers alike and marks an important step forward in the growth of bilateral trading arrangements."

The Japanese Sugar Refiners' Association is reported to be asking its Government to approve plans to form a sugar import cartel. The refiners have to share the Australian sugar imports in accordance with a pre-arranged plan, and a cartel is necessary for the industry to be exempt from the provisions of the Japanese anti-monopoly legislation.

* * *

UK retail prices for sugar

The British Government has announced an increase in the price which the refiners are permitted to charge to cover the higher cost of their raw sugar supplies. The British Sugar Corporation has raised its home market prices to match, and the retail price of a 2-lb packet has risen from around 19p to around 30p. Food manufacturers who use sugar as an ingredient have protested at the way the refiners have been exempted from a 28-day notice period for price increases whereas they have had to absorb the higher cost before being allowed to raise their own prices.

It is anticipated that such an increase—over 50% —will result at least initially in a drop in consumption of sugar.

* * *

Barbados sugar industry contraction[3]

In 1971, according to the *Barbados Sugar Industry Review* of December 1974, smallholders provided 16·7% of the cane crushed on the island while by 1974 this had fallen to 12·76%. From 18,000 smallholders in 1972, the number had dropped to 11,000 in 1974 while their cane acreage fell from 12,000 to 8000 acres. This is attributed partly to a lack of farming knowledge by the present owners of the smallholding who have found it uneconomical to employ skilled labour and who have lost the facilities for buying fertilizer on credit and for harvesting and transporting of their cane which were provided by the island's sugar factories before they were amalgamated under the one operating company. The fall in cane area and sugar production represents a large potential sum which is being lost to the island's economy.

To bring the land back under cultivation, the *Review* proposes increasing incentives by establishing a cooperative scheme between plantation owners, factories and smallholders to use plantation transport on Saturdays for the benefit of the last, as well as the supply of fertilizers by the factories, the cost to be recouped when the cane is reaped.

Caroni Ltd. 1974 report

The 1974 crop was a poor one, sugar production reaching 167,231 tons as against 165,412 in the previous year and the 1969/73 average of 194,923 tons. Drought again affected the cane, as did industrial unrest over a period of about 4½ months, so that the crop was extended and the recovery figure 10·53 tons cane per ton sugar, as against 10·61 in 1973. The impossibility of smooth take-off of the crop raised costs and adversely affected operations. It had been anticipated that a further loss would be sustained but, thanks to the volume of sales on the world market at high prices, a pre-tax profit of of £1,962,607 was made, compared with a loss of £783,017 in 1973. A further profit of £3·6 million has been realized on stocks of sugar and molasses held at 30th June 1974 and will figure in the 1975 accounts. A capital rehabilitation programme is being carried out and, in addition, the 1975 crop is expected to be much better than the previous two in spite of the delays in the replanting programme due to industrial action.

* * *

Philippines sugar marketing recommendations

A report has been prepared by the National Economic and Development Authority[4] which has studied the potential buyers of Asia and has identified 14 countries (Japan, China, Malaysia, Sri Lanka, South Korea, Pakistan, South Vietnam, North Korea, Singapore, Hong Kong, North Vietnam, Bangladesh, Indonesia and Brunei) which jointly import more than 5 million tons annually. Three major suppliers—Australia, Brazil and Cuba—provide some 64% of these supplies and the Authority has suggested that, as the nearest major sugar exporting country, with the exception of India, Taiwan and Thailand, the Philippines should exploit its geographical position to seek long-term agreements with the importing countries, at the same time making efforts to improve efficiency and reduce production costs so as to gain full benefits from high prices in world markets.

* * *

Indian sugar export prospects[5]

The outlook for the 1974/75 sugar crop in India has improved considerably since the beginning of the year. At one time it was anticipated that no more than 3·8 million tons of sugar, tel quel, would be produced but current indications are that the crop is likely to reach some 4·2 million tons. Meanwhile, the Indian Government is restricting domestic consumption in order to ensure that as large as possible a tonnage is made available for export. An example of this policy may be seen from the fact that the quantity of sugar to be released for internal consumption in February 1975 was no more than 250,000 tons against 338,000 tons in the corresponding month last year. Current indications are that some 800,000 tons of Indian sugar will be available for export during the calendar year 1975, which figure will include shipments to the UK and the USA.

---

[1] F. O. Licht, *International Sugar Rpt.*, 1975, **107**, (1), 10.
[2] *Sugar Review*, 1975, (1212), 1.
[3] *Financial Times*, 19th December 1974.
[4] *Public Ledger*, 9th November 1974.
[5] C. Czarnikow Ltd., *Sugar Review*, 1975, (1216), 20.

Composition of polysaccharides in carbonated beverage floc

By T. MIKI, S. SAITO and M. KAMODA
(Research Laboratory, Japan Sugar Refiners' Association, Tokyo)

INTRODUCTION

NUMEROUS investigations of floc have been directed toward predicting whether a particular sugar would flocculate. STANSBURY & HOFFPAUIR[1] found that cane sugar floc consisted of starch, lipids, protein, silicates and decolorizing carbon, and they concluded that carbon and the organic components were the constituents responsible for acid floc formation. COHEN *et al.*[2] reported that acid floc contained protein, inorganic material and some polysaccharides, and the presence of polysaccharides in acid floc was probably not of special significance. However, no one has systematically dealt with the constituents capable of causing commercially carbonated beverage floc.

In September 1973 considerable amounts of floc had been observed in carbonated beverage manufactured with sugar made mainly from Australian raw sugar shipped from Mackay, and we found that certain cargoes of Australian raws had serious floc potential. Thereafter we developed a rapid method for testing raw sugar or washed sugar for its floc-forming potential according to the floc test used by Japanese carbonated beverage manufacturers[3], and we have checked their floc-forming tendencies on all raw sugars imported into Japan. However, no raw sugar has been responsible for cottony floc except the above Australian raws.

Our investigative work has been directed toward verifying the presence of flocculating material in the above sugar and identifying the constituents of polysaccharides present in carbonated water floc. The results obtained on the latter are as follows.

EXPERIMENTAL

Preparation of floc

Refined sugar: 5·5 g of sodium bicarbonate was put into a 500 cm^3 bottle, and 54 g of granulated sugar was added. After deionized water filtered through a 0·45μ-membrane filter was gently added up to the level of $\frac{1}{4}$ inch below the 500 cm^3 level, 6·0 cm^3 of 85% phosphoric acid was added. The bottle was capped, and the contents thoroughly mixed. The solution had a Brix of approximately 10·5°, a gas volume of 3·8 cm^3 and a pH of approximately 2·5. The bottle was allowed to stand for ten days at ambient temperature.

Raw sugar and washed sugar: Raw sugar or washed sugar was dissolved in deionized water filtered through a 0·45μ-membrane filter and diluted to 50°Bx. The sugar solution was heated for one hour at 75°C in a water bath and, while still hot, was filtered through a filter paper, Toyo Roshi No. 5c (Whatman No. 542 or equivalent) to remove suspended coarse particles. 110 g of the filtrate was bottled by the above method.

Isolation of floc

After allowing to stand for ten days, the bottle was opened and as much supernatant as possible was pipetted. The floc sedimented in the bottom was collected from 10 to 15 bottles and centrifuged. Washing with 70% ethanol and centrifuging was repeated until sugar was not detected in the supernatant. The resulting floc was finally washed with absolute ethanol and dried at ambient temperature under a vacuum.

Acid hydrolysis of floc

The above floc was hydrolysed with acid according to the modified LEONARD & RICHARDS method[4].

About 1 mg of the dried floc was mixed with 0·1 cm^3 of 80% (w/w) sulphuric acid at 30°C for one hour and diluted with water to 4% sulphuric acid, The mixture was heated in a sealed glass ampoule at 100°C for three hours. After cooling, the contents were neutralized with barium carbonate and centrifuged to remove barium sulphate. The hydrolysate was freeze-dried, ready for analysis by paper partition chromatography (PPC) and gas-liquid chromatography (GLC).

PPC of hydrolysate

In the case of neutral sugars the irrigating solvent system was either 7:1:2 *n*-propanol:ethyl acetate: water or 6:4:3 *n*-butanol:pyridine:water, while the acid solvent system 5:5:1:3 ethyl acetate:pyridine: acetic acid:water was used for uronic acids. Silver nitrate, diphenylamine-aniline and *p*-anisidine hydrochloride were used as spray reagents.

GLC of hydrolysate

The neutral sugars in the hydrolysate were converted to the aldononitrile acetate derivatives and chromatographed by the procedure of VARMA *et al.*[5,6] using a Model K 23 Hitachi Gas Chromatograph with flame ionization detector.

A stainless-steel column (3 mm × 1 m) packed with 4%-PEGS-0·5%-phosphoric acid on "Diasolid L" (60–80 mesh) was used, and column temperature and injection temperature were maintained isothermally at 190°C and 240°C respectively. Helium was used as the carrier gas at a flow rate of 65 $cm^3.min^{-1}$.

The aldononitrile acetates of sugars in the floc hydrolysates were prepared as follows:

The dried hydrolysate from about 1 mg of floc was dissolved in 0·1 cm^3 of pyridine, and 2 mg of hydroxylamine hydrochloride was added. The mixture was heated in a sealed glass ampoule at 90°C for 30 minutes. After cooling, the top part of the ampoule was opened and 0·3 cm^3 of acetic anhydride added. The ampoule was sealed again and heated for 30 minutes. The cooled solution was evaporated to dryness under reduced pressure at 40°C. The residue was dissolved in a few drops of chloroform, and 0·003–0·006 cm^3 of sample was used for GLC analysis.

---

[1] *J. Agric. Food Chem.*, 1959, **7**, 353–358.
[2] *Proc. 29th Meeting Sugar Ind. Tech.*, 1970, 123–165.
[3] Unpublished report.
[4] *I.S.J.*, 1969, **71**, 263–267.
[5] *J. Chromatogr.*, 1973, **77**, 222–227.
[6] *ibid.*, 1973, **86**, 205–210.

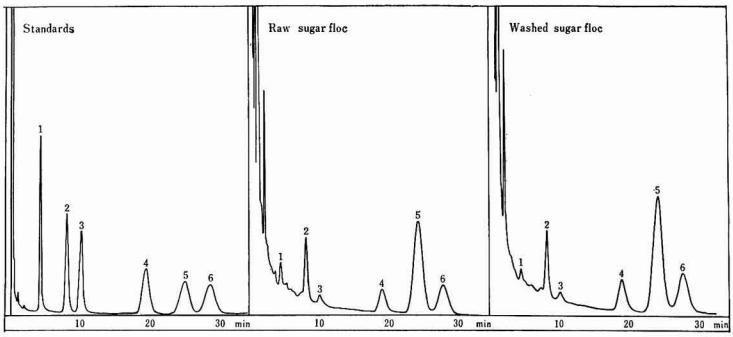


Fig. 1. GLC separation of monosaccharides in floc hydrolysates obtained from raw sugar and washed sugar. Column: 3 mm × 1 m stainless steel column packed with 4% PEGS—0·5% PA on "Diasolid L" (60–80 mesh); Carrier gas: helium at 65 $cm^3.min^{-1}$; Column temperature: 190°C; Injector temperature: 240°C; Detector: FID. GLC peaks: (1) rhamnose; (2) arabinose; (3) xylose; (4) mannose; (5) glucose; (6) galactose

Results and Discussion

By the PPC separation four spots—glucose, galactose, arabinose or mannose, and xylose—were detected in the floc hydrolysates.

Figs. 1 and 2 represent chromatograms for the GLC separation of the aldononitrile acetates of monosaccharides in the floc hydrolysates and authentic sugars.

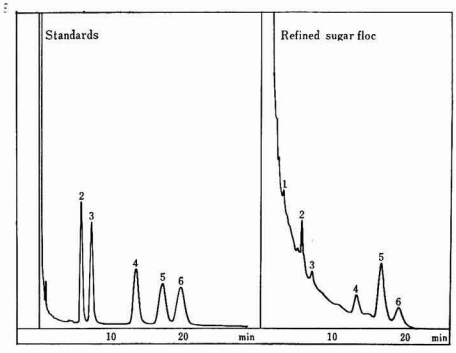


Fig. 2. GLC separation of monosaccharides in floc hydrolysates obtained from refined sugar. GLC conditions and peaks as in Fig. 1 except for carrier gas flow rate, 75 $cm^3.min^{-1}$

The aldononitrile acetates of authentic sugars were prepared by the above procedure used for the floc hydrolysates, except that a mixture containing 1 mg of each sugar was treated with pyridine (0·3 cm^3), hydroxylamine hydrochloride (5 mg) and acetic anhydride (0·9 cm^3). The residue obtained was dissolved in 0·1 cm^3 of chloroform for GLC analysis.

Figs. 1 and 2 show that glucose, galactose, mannose, arabinose, xylose, and rhamnose exist in all floc hydrolysates.

From the area of peak pattern representing sugars in the hydrolysates and authentic sugars, the relative molar ratios to galactose were calculated. As shown in Table I, these results illustrate similar values regardless of sample origin—raw sugar, washed sugar and granulated sugar.

Table I. Molar ratio of monosaccharides in acid hydrolysates of carbonated water flocs from various sugars

	Raw sugar	*Washed sugar*	*Refined sugar*
Rhamnose	0·2	0·1	0·2
Arabinose	0·6	0·5	0·6
Xylose	0·1	0·1	0·2
Mannose	0·4	0·5	0·7
Glucose	2·4	2·4	2·8
Galactose	1·0	1·0	1·0

It was well known that gum prepared from raw sugar or washed sugar contained pentosan such as araban and xylan, and glucan such as starch and dextran. We also confirmed qualitatively that trace amounts of starch were present in the carbonated water floc by using an iodine test and α-amylase reaction. So it is too early to decide from the above relative molar ratios whether the polysaccharides present in the floc are a mixture of various polysaccharides or simple heteropolysaccharides. If the polysaccharides contained in the floc are a mixture, however, the relative molar ratio of monosaccharides should be different according to sample origin. It seems reasonable to conclude that the polysaccharide is heteropolysaccharide consisting of glucose, galactose, mannose, arabinose, xylose and rhamnose, and when the floc is formed, trace amounts of starch may be included within the floc.

Table II shows the content of polysaccharides, protein, and inorganic matter in the carbonated water floc. The polysaccharides content was determined by the anthrone method[7], using a mixture of authentic sugars which was prepared according to the above molar ratio. The protein was determined by the Lowry-Folin method[8] using egg albumin as a standard.

Table II. Analysis of carbonated water flocs formed from raw sugar, washed sugar and refined sugar

	Poly-saccharides	*Protein*	*Inorganic matter*
Raw sugar	22·2%	28·1%	40·8%
Washed sugar	28·2	23·1	36·5
Refined sugar	66·9	7·0	—

[7] Whistler & Wolfrom: "Methods in Carbohydrate Chemistry" Vol. I. 1962, p. 389.
[8] Lowry *et al.*: *J. Biol. Chem.*, 1951, **193**, 265.

The flocs originating from raw sugar and washed sugar contained considerable amounts of polysaccharides and protein while, in the floc originating from granulated sugar, the polysaccharides content was more than 60% and the protein content decreased remarkably. This suggests that the protein present in raw sugar is easily removed in the refining process, while the polysaccharides responsible for carbonated water floc cannot be eliminated.

As a result of this work, it may be concluded that the polysaccharide present in the carbonated water floc consists of glucose, galactose, mannose, arabinose, xylose, and rhamnose, and that it is water-insoluble and resistant to acid hydrolysis. It is also evident that the polysaccharide plays an important role in the formation of floc.

SUMMARY

Since September 1973 sugar refiners and the carbonated beverage bottlers in Japan have had a floc problem, and we found that certain cargoes of Australian raws were responsible for cottony floc in the carbonated beverages.

The carbonated water flocs originating from the above raws and from granulated sugar produced from the above raws were prepared, and the constituents of polysaccharides present in them were identified as consisting of glucose, galactose, mannose, arabinose, xylose, and rhamnose; the polysaccharide was found to be an important factor in the formation of carbonated water floc.

Selection of equipment for the sugar processing industry

THE United Nations Industrial Development Organization is aware of the problems resulting from unsuitable food processing systems and/or equipment purchased and installed by industrialists in developing countries. It is felt that the elaboration and publication of guidelines for the selection of food processing technologies and/or equipment might prevent the repetition of many unfortunate investment decisions and subsequent purchases of wrongly sized or obsolete equipment and industrial production systems which have been made in the past.

In view of the fact that the sugar industry as a large-scale industry with a high investment potential plays a very important role in many developing countries and because of the increasing world market demand of sugar and sugar products and the expanding tendency of the sugar industry, it was decided to make it the issue of the first evaluation work and the substantive content of an Expert Group Meeting which was held in Vienna during the 25th–28th November 1974 under UNIDO auspices.

The suitability of up-to-date sugar beet and sugar cane processing equipment in connexion with an appropriate processing technology was reviewed. The problems of process and product quality control methods and their practical application were discussed and a sugar production plant's industrial production efficiency was highlighted.

A draft guideline document for the selection of sugar beet and sugar cane processing technologies and equipment was presented to the meeting for discussion and approval.

The following substantive issues were dealt with within the framework of the draft guideline document prepared by UNIDO and presented at the Meeting:

(*a*) *Questions of nomenclature:* The most important terms and expressions frequently used in the sugar industry (glossary terms) were explained and defined in their meaning and unified value. Such terms for example are: Brix, clarifier, clarified juice, mixed juice, syrup, vacuum pan, blackstrap molasses, etc.

(*b*) *Process flow diagram:* A process flow diagram based on sugar cane and sugar beet processing was elaborated describing a technically up-to-date production process with all the required auxiliary facilities and by-product utilization processes. The flow diagram was accompanied by a description of the unit operations and equipment requirements and by a material balance sheet based on experienced figures and data characterizing each unit operations.

(*c*) *Unit operations and processes:* The various unit operations and processes from the field to the sugar end-product storage and distribution were discussed and their techno-economic criteria determined.

(*d*) *Security and sanitary requirements:* The security aspects and sanitary requirements of a sugar factory in general and those of specific equipment in particular were pointed out, characterized and determined.

(*e*) *Water, steam, gas (CO_2 or SO_2) and energy supply:* The complex problem of water, steam, gas and energy consumption and supply was defined and their impact on a sugar factory's industrial production efficiency and economy highlighted.

(*f*) *Thermotechnical evaluation:* A heat exchange and utilization diagram in relation to the material flow diagram was presented for discussion in connexion with the equipment specification and equipment characteristics.

(*g*) *Quality control requirement:* The quality criteria of raw materials, semi-finished products, by-products and end-products, were determined and the most suitable methods of chemical analysis recommended.

(*h*) *Equipment and spare part specification:* Guidelines were prepared for the equipment specification, building and structural materials in connexion with the plant lay-out. Special emphasis was laid on the chemical and biological requirements, corrosion problems and questions of repair and maintenance.

(*i*) *Industrial feasibility calculations:* The main items to be considered in industrial feasibility calcu-

lations for the establishment of an integrated sugar production plant were determined and characterized. The proceedings involved were outlined in connexion with the definition of capacity, size, duration of season, grade of integration, location, rate of mechanization and producivity, financial considerations, economic evaluation, etc.

(*j*) *Offers and quotations:* The technical, financial and economic information required by an investor were outlined and recommendations made with respect to the form and substantive content of quotations to be submitted by equipment producers to investors in connexion with the supply of sugar processing equipment and turn-key plants.

(*k*) *Test runs and take-over certificate:* The general rules to be observed by both suppliers and investors for carrying out test runs, fulfilment of performance and workmanship guarantees and the appropriate form and substantive content of taking over or acceptance certificates were outlined and defined.

Further information on the Meeting may be obtained from UNIDO at Lerchenfelder Strasse 1, P.O. Box 707, A-1070 Wien, Austria.

New beet storage plant for the British Sugar Corporation

PART of the British Sugar Corporation's progressive policy of up-dating beet mechanical handling is the phased introduction at various factories of improved facilities.

The latest example of this is a new sugar beet piling plant at the York factory. This replaced the elevated road system from which the beet was tipped into a silo below, the main disadvantage of which was the amount of breakage due to the distance of fall.

More precise and controlled placement minimizes damage to the crop, and facilitates more efficient inflow to process.

W. W. Brown & Partners Ltd., the Dartford-based mechanical handling engineers who designed and installed the new plant at York, have been in this highly specialized field for 25 years.

Fig. 1. A load of beet about to be tipped into receiving hopper. The beet then travels under the road via apron chain conveyors to the main belt system, and thence to the travelling boom stacker seen in the background.

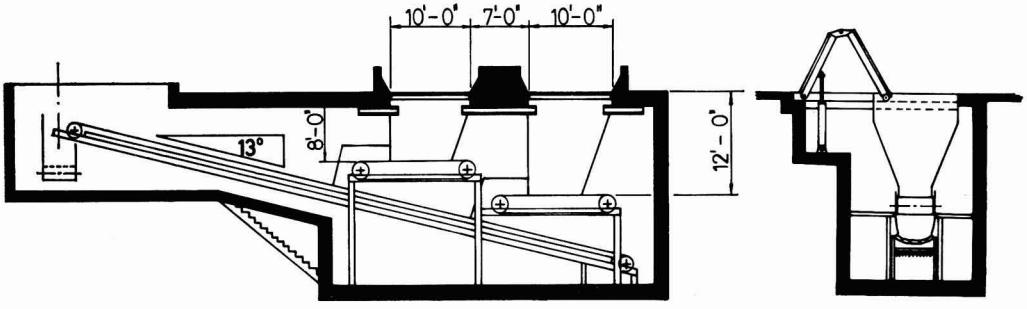


Fig. 2. Section through unloading hoppers and (right) jack knife door open to receive load

The new system (Fig. 1) can be described as a travelling boom elevator system, fed from two unloading hoppers sealed by heavy jack-knife trap doors. into which vehicles discharge their loads (Fig. 2). The travelling boom (Fig. 3), which from counterweight to the end of the boom arm is 42 feet, works through an arc of 270°, ensuring acceptable standards of dispersal, and even stacking throughout the silo length.

Overall length of the silo and the main belt conveyor is 550 ft; the travelling boom track is 440 ft, and the actual travel distance of the boom itself is 377 ft.

The capacity of the new plant is about 400 metric tons an hour; the old system's output was about 260 tons an hour (an improvement of some 54%).

After the lorry has passed over the weighbridge—where the gross weight of the vehicle and its load are established and recorded on computerized records, and a sample taken to determine sugar content—it proceeds to one of two jack-knife trap doors.

Passing over this it assumes the unloading position, that is, with the tail just over the edge of the trap door. The driver then activates the jack-knife mechanism by pressing a button enabling the load to be tipped into the receiving hopper.

As the empty lorry moves off it passes over an induction loop which automatically closes the jack-knife door ready for the next vehicle.

The beet thus discharged passes beneath the road at right angles at a controlled rate by means of variable-speed apron chain conveyors and thence to the main belt system (Fig. 4), again at right angles, and up to the travelling boom stacker.

The stacking of the beet is controlled on either side of the silo so that it forms even piles.

Once in the silo the beet is transported hydraulically to the factory by means of high-pressure jets. These cause the beet to move into the flumes in the bottom of the silo, and thence it is pumped into an elevated canal to the beet washer.

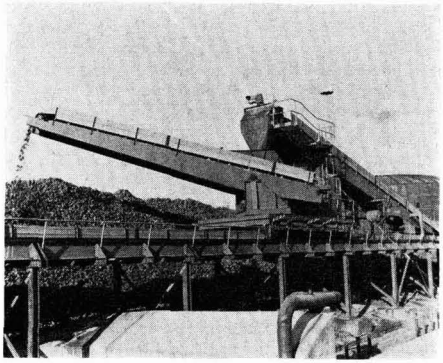


Fig. 3. Travelling boom stacker

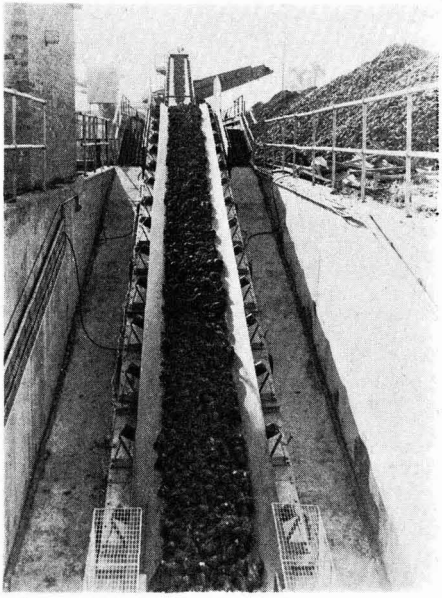


Fig. 4. Beet moving up to the travelling boom stacker

Direct determination of trace metals in cane juice, sugar and molasses by atomic absorption spectrophotometry

By S. L. SANG, W. C. CHENG, H. I. SHIUE and H. T. CHENG
(Taiwan Sugar Research Institute, Tainan, Taiwan)
Paper presented to the 15th Congr. ISSCT, 1974

Introduction

IT is known that more or less 32 inorganic elements have been found in sugar cane or cane juices[1]. The determination of these inorganic elements is important for cane physiologists, agronomists, sugar technologists and chemists, but in most cases the analytical procedures are extremely time-consuming. Many colorimetric methods are very accurate but they are so complicated that the number of steps may introduce many errors. Recently, instrumental analysis has been developing so rapidly that much of its application is acceptable in the sugar industry.

[1] HONIG: "Principles of Sugar Technology". Vol. 1. (Elsevier, Amsterdam), 1953, p. 292.

As to inorganic analysis, SINGH[2] and O'SULLIVAN[3] determined K, Na, Ca and Mg in juice and molasses by flame photometry. MAUCH *et al.*[4] determined heavy metals in sugar and molasses by polarography and GERASIMENKO *et al.*[5] determined trace metals in sugar by emission spectroscopy.

The use of atomic absorption spectrophotometry as an analytical tool is now firmly established[6,7,8]. Numerous papers have described its application in the analysis of feeds, foods, plant materials, soil, fertilizer, etc. In the sugar industry, the atomic absorption technique was applied by MEE & HILTON[9] for determining zinc in sugar and molasses; also by SOFFIANTINI[10] for determining magnesium in molasses and, recently, by CARPENTER & BICHSEL[11] and PUYAOAN *et al.*[12] for the determination of Ca, Mg, Cu, Fe, Na and K in sugar and molasses. However, most of the methods are time-consuming and some cannot be used for determination of all the trace metals found in the sugar industry. The purpose of this study was to develop rapid analytical procedures with the atomic absorption spectrophotometer specially for determining trace metals in process juices, molasses and sugar.

EXPERIMENTAL PROCEDURE

Apparatus and operating conditions

A Techtron Model AA120 atomic absorption spectrophotometer unit coupled with an autosampler, a digital indicator, a curve corrector and a printer was used for the determination of K, Na, Ca, Mg, Fe, Si, Al, Cu, Zn, Mn, Co and Mo in this experiment. All procedures for determination and recording of results were automated except the preparation of samples and standard reagents. It is considered this recommended method could eliminate analytical error introduced by manual operations.

In order to achieve the best sensitivity, the absorbance of every element was studied with respect to fuel composition, slit width, wavelength and the height of the light beam above the burner head. The optimum operating conditions and flames have been selected for each element determined. Details of the operating conditions for each element are given in Table I.

Reagents

All of the reagents used are of guaranteed or analytical grade. Only distilled and then deionized water is used in the preparation of all reagents.

(1) Standard reagents: All standard reagents are prepared from the BDH reference solution of 1000 ppm.

(2) Lanthanum nitrate solution: 50,000 ppm La solution in 0·1N HCl solution.

(3) Strontium chloride solution: 50,000 ppm Sr aqueous solution.

(4) 1·0M Ammonium EDTA solution: A 1·0M solution is prepared by dissolving 292 g of reagent grade EDTA in about 600 cm^3 of water containing enough NH_4OH to dissolve the acid completely. Additional NH_4OH is added to raise the pH to slightly above 9 and the resulting solution is diluted to 1000 cm^3.

Preparation of samples

The determination work with the atomic absorption spectrophotometer is automatic except for the method of sample preparation. Hence the choice of a simple, rapid and reproducible sample preparation method is important. In this experiment, several methods of preparation of samples were tried and their combined application was also undertaken to compare the results obtained, including direct dilution, dry ashing, wet ashing, wet oxidation, suppressing reagents addition and extraction solvents application, etc. These methods of sample preparation were investigated as follows:

(1) *Direct dilution:* Weigh appropriate quantity of sample, dilute with 0·1N HCl solution to 100 cm^3 and filter.

(2) *Strontium suppressing reagent addition:* Add a certain amount of 50,000 ppm Sr solution to the sample solution prepared as above and dilute with 0·1N HCl so that the solution contains 10,000 ppm Sr.

(3) *Lanthanum suppressing reagent addition:* Add a certain amount of 50,000 ppm La solution to the sample solution prepared as method (1) and dilute with 0·1N HCl so that the solution contains 1500 ppm of La.

(4) *EDTA extraction reagent addition:* Add a certain amount of 1·0M EDTA solution to the sample solution prepared as method (1) and dilute with 0·1N HCl so that the solution contains 0·1M EDTA.

(5) *Citric acid extraction reagent addition:* Dilute the sample solution with aqueous citric acid to give a final concentration of 10% citric acid in the solution.

(6) *Dry ashing:* The sample is dried and carbonized by infra-red radiation and ashed in an oven at 525–550°C according to the AOAC method 7.073(a)[13]. Make subsequent dilutions with 0·1N HCl to bring sample solution into analytical range.

(7) *Addition of suppressing reagent to dry ashing solution:* Add lanthanum nitrate solution to the dry ashing solution prepared as by method (6), and adjust the solution to contain 1500 ppm of La.

(8) *Wet ashing solution:* Weigh the appropriate quantity of sample into a 100 cm^3 flask, mix well with concentrated H_2SO_4, cool, add gently 10 cm^3 of 35% H_2O_2, heat gently over a hot plate until sharp fumes no longer escape, and repeatedly add H_2O_2 until the solution is colourless. Finally, dilute with water to the desired volume.

(9) *Addition of suppressing reagent to wet ashing solution:* Add lanthanum nitrate suppressing reagent to the wet ashing solution prepared as by method (8), and adjust the solution to contain 1500 ppm of La.

RESULTS AND DISCUSSION

According to the result of the standard solution test, the optimum operating conditions for each element were selected as shown in Table I. The accuracy and reproducibility of results for every

---

[2] *Proc. 36th Ann. Conv. Sugar Tech. Assoc. India*, 1968, XXXX-1—XXXX-6.
[3] *I.S.J.*, 1968, **70**, 259–260.
[4] *Industrielle Obst u. Gemusever.*, 1969, **54**, (1), 1–6.
[5] *Izv. Vuzov, Pishch. Tekhnol.*, 1969, (5), 39–41.
[6] ELWELL & GIDLEY: "Atomic Absorption Spectrophotometry". (Pergamon Press, New York), 1966, p. 1399.
[7] ROBINSON: "Atomic Absorption Spectroscopy". (Marcel Dekker Inc., New York), 1966, p. 204.
[8] SLARIN: "Atomic Absorption Spectroscopy". (Interscience, New York), 1969, p. 115.
[9] *J. Agric. Food Chem.*, 1969, **17**, 1398–1399.
[10] *Proc. 45th Congr. S. African Sugar Tech. Assoc.*, 1971, 92–98.
[11] *J. Amer. Soc. Sugar Beet Tech.*, 1969, **15**, 369–378.
[12] *Sugar News* (Philippines), 1970, **46**, 376–378, 405–409.
[13] "Official Methods of Analysis," 11th Edn. (AOAC, Washington), 1970, p. 132.

Table I. Operating conditions

Element	*Wavelength, nm*	*Slit width, μ*	*Lamp current, mA*	*Fuel*	*Support*	*Flame*	*Scale Expansion*
Ca	422·67	100	5	Acetylene	Air	A – A*	×1
Mg	185·21	100	3	Acetylene	Air	A – A	×1
K	766·49	300	5	Acetylene	Air	A – A	×1
Na	589·00	200	5	Acetylene	Air	A – A	×1
Si	251·61	50	15	Acetylene	N_2O	N – A†	×10
Fe	248·33	50	5	Acetylene	Air	A – A	×1
Al	309·27	100	10	Acetylene	N_2O	N – A	×10
Cu	324·75	100	3	Acetylene	Air	A – A	×8–10
Zn	213·86	100	6	Acetylene	Air	A – A	×1
Mn	278·48	50	5	Acetylene	Air	A – A	×8–10
Co	240·73	25	5	Acetylene	Air	A – A	×10
Mo	313·26	100	5	Acetylene	N_2O	N – A	×10

* A – A Air-Acetylene
† N – A N_2O Acetylene

Table II. Comparison of sample preparation methods for determination of Ca, Mg, K and Na

		(1) *Dilution with HCl*	(2) *Dilution with HCl, Sr*	(3) *Dilution with HCl, La*	(4) *Dilution with HCl, EDTA*	(5) *Dilution with citric acid*
Ca	Average mg/g	6·57	8·95	8·56	7·99	8·44
	Standard deviation, mg/g	0·124	0·269	0·108	0·266	1·356
	Coefficient of variation, %	1·89	3·01	1·26	3·33	16·06
Mg	Average mg/g	4·47	4·26	4·44	4·36	4·64
	Standard deviation, mg/g	0·053	0·063	0·155	0·053	0·099
	Coefficient of variation, %	1·18	1·48	3·49	1·22	2·13
K	Average mg/g	31·13	26·85	29·45	29·05	30·36
	Standard deviation, mg/g	0·50	0·66	0·76	1·05	0 46
	Coefficient of variation, %	2·17	2·46	2·10	3·61	1·52
Na	Average mg/g	1·13	—	1·22	—	—
	Standard deviation, mg/g	0·034	—	0·050	—	—
	Coefficient of variation, %	3·00	—	4·10	—	—

Table III. Comparison of sample preparation by direct dilution, dry ashing and wet ashing methods

		Direct dilution		*Dry ashing*		*Wet ashing*	
		Dilution with HCl	*Dilution with HCl, La*	*Dilution with HCl*	*Dilution with HCl, La*	*Dilution with HCl*	*Dilution with HCl, La*
		(1)	(3)	(6)	(7)	(8)	(9)
Ca	Average, mg/g	7·10	9·93	7·02	9·71	9·57	10·04
	Coefficient of variation, %	0·96	1·23	1·49	0·82	2·33	2·04
	Recovery, %	84–96	100–103	86–101	99–102	96–104	95–111
	Mean recovery, %	90·1	102·0	92·9	100·8	99·1	101·6
Mg	Average, mg/g	5·36	5·28	5·17	5·02	5·54	5·41
	Coefficient of variation, %	1·14	2·30	0·64	1·75	6·01	1·38
	Recovery, %	97–104	99–108	97–103	96–100	94–106	98–104
	Mean recovery, %	101·0	103·6	99·9	98·3	101·4	101·6
K	Average, mg/g	30·47	30·14	28·16	27·92	30·37	29·57
	Coefficient of variation, %	2·17	2·10	0·86	1·43	1·81	2·28
	Recovery, %	100–106	98–102	99–104	99–108	95–103	98–103
	Mean recovery, %	122·4	100·4	102·9	102·5	99·7	101·0
Na	Average, mg/g	1·13	1·22	—	—	1·11	1·07
	Coefficient of variation, %	3·00	4·10	—	—	7·02	8·41
	Recovery, %	107–113	102–109	—	—	99–108	102–108
	Mean recovery, %	109·6	105·2	—	—	104·8	105·0

Table IV. Comparison of sample preparation methods for determination of Fe, Zn, Cu and Mn

		(1) *Dilution with HCl*	(5) *Dilution with citric acid*	(6) *Dry ashing; dilution with HCl*	(8) *Wet ashing; dilution with HCl*
Fe	Average, mg/g	25·40	25·07	24·39	25·38
	Coefficient of variation, %	3·54	6·30	2·64	3·79
	Recovery, %	101–104	103–110	96–102	93–101
	Mean recovery, %	102·5	105·4	99·1	97·4
Zn	Average, mg/g	11·31	10·70	10·78	10·94
	Coefficient of variation, %	5·32	6·22	6·00	6·81
	Recovery, %	99–106	95–104	95–102	99–106
	Mean recovery, %	102·3	98·8	99·3	108·1
Cu	Average, mg/g	25·9	25·1	26·6	25·3
	Coefficient of variation, %	11·07	5·59	4·50	3·05
	Recovery, %	97–104	99–104	97–104	101–110
	Mean recovery, %	102·0	100·9	100·1	105·5
Mn	Average, mg/g	28·5	25·9	26·3	28·1
	Coefficient of variation, %	11·31	6·27	3·64	1·32
	Recovery, %	102–104	98–102	88–101	99–108
	Mean recovery, %	102·4	99·8	96·2	104·6

sample preparation were investigated. The simplest and most suitable sample preparation was selected. The results may be summarized as follows:

Alkaline earths and alkalis

Six molasses samples were taken from factories, and sample solutions prepared according to preparation methods (1) to (5) as described above. Four replicate tests were run for each sample for determination of Ca, Mg, Na and K. The results of the determinations are shown in Table II, where the potassium was determined by emission spectrophotometry as its sensitivity was better. Methods No. 4 and No. 5 for determination of Na could not be used as the EDTA or citric acid reagent contained a high level of sodium.

From Table II it is seen that the best sample preparation for determining calcium is No. 3, i.e. additional La should be used to eliminate phosphate and silicate interferences, while direct dilution of the sample is the best for determining other elements.

The results of the direct dilution, dry ashing and wet ashing methods, with or without the suppressing reagent, are compared and are shown in Table III.

From Table III suitable preparation methods were selected as follows:

(1) *Calcium:* In all comparative sample preparation methods, the average value obtained with lanthanum added were higher than those obtained without addition of lanthanum. The results of determination using three lanthanum-addition methods, i.e. Nos. 3, 7 and 9, had no significant difference by the statistical F-test, so No. 3 procedure was selected to determine calcium because it is simple and rapid, and its accuracy and reproducibility are also satisfactory. The measuring range of this proposed method is 0–15 $\mu g.cm^{-3}$.

(2) *Magnesium:* Among six methods in Table III, the value of F-test was 0·397 compared with the tabular value of $F^{2,5}_{5}$ (0·05)=2·603, showing that the results of their measurement had no significant difference, and indicating that there were no interferences in the determination of Mg. Therefore the simplest method, direct dilution (No. 1), was selected. Its coefficient of variation is satisfactory, and the measuring range is 0·1–0·7 $\mu g.cm^{-3}$.

(3) *Potassium:* The sensitivity is greater if potassium is determined by emission spectroscopy. The results for determining potassium both in Table II and Table III were measured by the emission method. There is no interference in the determination of potassium in the same way as magnesium. The F-test showed that, among the 6 methods, the results had no significant difference and therefore the direct dilution method was also adopted. Its coefficients of variation are satisfactory and its measuring range is 0–8 $\mu g.cm^{-3}$.

(4) *Sodium:* According to the F-test, the results when determining Na by either direct dilution or wet ashing showed no significant differences. The coefficient of variation of direct dilution was better than others and it was therefore adopted. Its measuring range is 0–1·25 $\mu g.cm^{-3}$.

Iron, zinc, copper and manganese

The results showed that there was no interference in the determination of these four elements in molasses. Addition of suppressing reagents or extraction solvents was not necessary, only a common flame (acetylene-air) being required. A suitable sample preparation method for determining these elements should therefore be selected from methods 1, 5, 6 or 8. The results are shown in Table IV.

(1) *Iron:* The value of the F-test showed that the results using the above four methods had no significant difference. Therefore the simplest method, direct dilution (No. 1), has been adopted and its coefficient of variation is satisfactory. Its measuring range is 0·2–10 $\mu g.cm^{-3}$.

(2) *Zinc:* The value of the F-test showed that the results using the above four methods also showed no significant differences and the simplest method, direct dilution, was adopted. Its coefficient of variation is satisfactory and its measuring range is 0·02–1·3 $\mu g.cm^{-3}$.

(3) *Copper:* Although the value of the F-test showed the results using the four methods had no significant difference, the reproducibility of the direct dilution method was poor. The citric acid addition method (No. 5) was recommended because of its simplicity, precision and reproducibility. Its measuring range is 0·1–0·8 $\mu g.cm^{-3}$.

(4) *Manganese:* The value of the F-test showed that the results using the above four methods had significant differences. The reproducibility of No. 5 was considered quite good, and its coefficient of variation was satisfactory; therefore the citric acid addition method was adopted. Its measuring range is 0·1–0·6 $\mu g.cm^{-3}$.

Aluminium, silicon, cobalt and molybdenum

These four elements, except Co, form refractory oxides, and a nitrous oxide-acetylene flame was used for raising the flame temperature (about 3000°C) to atomize them. Experiments with oxygen-enriched air-acetylene, fuel-rich oxygen-acetylene and other flames, have met with reasonable results, but the nitrous oxide-acetylene flame is preferable because of its superior sensitivity and comparative safety in operation. The amount of aluminium or silicon in cane juice is moderate and much of it is removed in clarification; in addition, the sensitivity of determination is so low that the residual amounts of them in clarified juices, sugar and molasses are below the limit of detection. The amounts of cobalt and molybdenum in juice are also much lower. Therefore, for the determination of these 4 elements by direct dilution or with suppressing reagents or extraction solvents addition, their concentrations are too low to analyse by the AAS method. Several trials for increasing the concentration of samples have been made without success, because the burner formed carbon black and choked rapidly when the concentration of sample increased. The flame was therefore unstable and a larger measuring error was introduced. Extraction by organic solvents was not used, and wet ashing needed more concentration of sample and was time-consuming. Thus, all of these four elements can only be determined by dry ashing and the appropriate concentrations should be prepared. However, silicon determination seems to be an exception. The sample should be carbonized in a platinum crucible and the mass extracted with HCl-instead of H_2SO_4. If H_2SO_4 is used, the HCl-soluble silicon is insoluble on dehydration by H_2SO_4. The accuracy and the reproducibility of the determination by dry ashing is acceptable. The quantity of Mo contained in the sample is too low to determine unless the standard Mo reagent is added, as was done for the results shown in Table V.

Table V. Results of dry ashing method for determination of Al, Si, Co and Mo

	Al	Si	Co	Mo
Average, ppm	37·27	64·17	1·88	39·8
Coefficient of variation, %	4·49	2·21	1·06	1·34
Recovery, %	99–111	93–106	97–104	97–101
Mean recovery, %	104·5	102·1	100·3	99·5
Measuring range, $\mu g.cm^{-3}$	2–18	10–60	0·2–1·2	1–8

Reliability and reproducibility were prime considerations in making a choice of the best conditions for running the determination. From a series of investigations of sample preparations for each element the best method has been selected as shown in Table VI.

Table VI. Optimum determination methods

Element	*Method*	*Measuring range*, $\mu g.cm^{-3}$
Ca	(3) La addition	0–15
Mg	(1) Dilution with 0·1N HCl	0·1–0·7
K	,,	0–8
Na	,,	0–1·25
Fe	,,	0·2–10
Zn	,,	0·02–1·3
Cu	(5) Dilution with 10% citric acid	0·1–0·8
Mn	,,	0·1–0·6
Al	(6) Dry ashing	2–18
Si	,,	10–60
Co	,,	0·2–1·2
Mo	,,	1·8

The above selected methods as shown in Tables I and VI have been applied to analysis of all juices, sugar and molasses. Experimental data are presented in Table VII and Table VIII, which indicate that the atomic absorption technique can be applied for determining the amounts of trace metals in sugar processing. Table VII shows the results for the carbonatation process and Table VIII the results for the defecation process. These results show an acceptable degree of accuracy for the methods. The advantages of these procedures in time saved is apparent. Extension of these direct determinations of trace metals to other elements in the processing should not pose any real difficulties.

Conclusion

The selected methods as described above have been successfully applied to the determination of inorganic constituents in juices, sugar and molasses. Not only is it possible to determine trace elements in the sugar industry without complicated chemical separation of sample, but the methods provide accurate and reproducible results. Therefore, the simpler and quicker atomic absorption technique developed in this experiment is suitable for a series of routine and factory control analyses or even for research work.

Summary

A rapid and simple atomic absorption spectroscopic method has been developed for determining 12 elements (Ca, Mg, K, Na, Fe, Al, Si, Zn, Cu, Mn, Co and Mo) in cane juice, process juices, molasses and sugar without separation. Several operational conditions were tried and nine methods of sample preparation were undertaken to compare results. The optimum operating conditions and the most suitable sample preparations have been selected for the determination of these elements. The determination of magnesium, potassium, sodium, iron and zinc can be done by dilution of the sample in 0·1N HCl solution only but, for determination of calcium, 1500 ppm lanthanum should be added to the above diluted sample solution to eliminate phosphate and silicate interference. Copper and manganese can be determined directly by dilution of the sample in 10% citric acid solution. The sample for determining silicon, aluminium, cobalt and molybdenum should be ashed by a dry method before determination. The results obtained by the above determinations were shown to be satisfactory in accuracy and reproducibility. It is considered that the AAS method applied for juices, sugar or molasses analysis is not only as reliable and accurate as the conventional methods, but is also simpler and quicker.

Table VII. The inorganic constituents of carbonatation process materials

	Mixed juice	*1st carb. filtrate*	*2nd carb. filtrate*	*Thin juice*	*Fine syrup*	*Final molasses*	*White sugar*
	mg/kg on Brix solids						
CaO	2,411	10,624	7,144	7,140	3,775	17,978	75·6
MgO	3,059	291	284	264	244	1,166	2·3
K_2O	7,729	7,779	7,782	7,752	7,789	33,237	27·7
Na_2O	357	342	337	332	332	1,386	2·7
Fe_2O_3	279	76	60	81	74	479	0·96
Al_2O_3	587	49	25	23	22	66	1·50
ZnO	35	2·6	2·7	2·4	2·0	12·4	0·55
CuO	27	2·01	2·1	1·6 %	1·5	11·6	0·41
MnO	72	1·8	0·89	0·83	0·75	5·9	trace
CoO	0·67	0·67	0·51	0·46	0·43	1·97	0·006
Mo	trace	trace	trace	trace	trace	trace	trace
SiO_2	574	155	121	120	95	432	5·5

Table VIII. Inorganic constituents of defecation process materials

	Mixed juice	*Clarified juice*	*Raw syrup*	*Final Molasses*	*Raw sugar* RSC	*Raw sugar* BWC
	mg/kg on Brix solids					
CaO	3,389	4,466	3,575	13,835	942	553
MgO	3,936	3,178	3,158	10,773	497	98
K_2O	10,753	10,444	10,392	35,796	1,678	446
Na_2O	297	298	294	1,264	61	24
Fe_2O_3	307	47	70	263	13	7·7
Al_2O_3	1,720	16	7·2	46	6·4	3·0
ZnO	123	57	6·5	20	1·1	1·1
CuO	19	5·5	5·1	19	1·2	0·81
MnO	75	12	12	47	1·81	0·75
CoO	1·17	0·69	0·67	2·7	0·11	0·057
Mo	trace	trace	trace	trace	—	—
SiO_2	1,012	679	574	2,917	69	103

Sugar cane agriculture

The changing status of pests in Queensland cane fields. B. E. HITCHCOCK. *Proc. 41st Conf. Queensland Soc. Sugar Cane Tech.*, 1974, 111–114.—A survey is presented of pests prevalent in Queensland in the 1950's and since, and estimated crop losses from grubs, rats and soldier flies are indicated in graph form for the period 1952–72.

* * *

Sugar cane: techniques for analysis of its commercial quality. J. A. DOMÍNGUEZ and M. A. HARO. *Publ. Inst. Nac. Tecn. Agropecuaria*, 1974, 20 pp.—This short course of instruction in cane analysis for personnel of the cane cooperatives includes notes on the taking of samples and analysis of primary juice for Brix and pol, calculation of available sugar by the WINTER-CARP formula and preparation of a sucrose balance from which it is possible to arrive at a valuation for the cane supply.

* * *

Stands. L. L. LAUDEN. *Sugar Bull.*, 1974, **52,** (14), 4. Poor stands of cane, particularly as ratoons, are indicated for certain varieties in the US. Particular mention is made of L 62–96, failure of which to ratoon is attributed chiefly to its susceptibility to ratoon stunting disease, although in the past the variety has been highly regarded for its ratooning ability. Continuation of the practice of heat treatment to combat RSD is recommended.

* * *

Will double-drill planting pay? R. C. HODSON. *Sugar Bull.*, 1974, **52,** (14), 8–11.—Aspects of double drill planting of cane are discussed, viz. the feasibility of mechanical planting, cultivation and harvesting, the practicalities of the system and the economics. Although a number of problems are incurred, the system has been shown to be profitable, and the author calculates the returns based on a 25–30% increase in cane yield.

* * *

Efficient use of water in sugar cane. U. S. SINGH. *Sugar News* (India), 1974, **5,** (9 & 10), 18–20.—Why and when to irrigate cane and with how much water are questions which are discussed in relation to Indian conditions.

* * *

Totally mechanized sugar cane harvest. R. P. HUMBERT. *World Farming*, 1974, **16,** (5), 5–7.—The author indicates one type of problem associated with cane mechanization, viz. compaction and "puddling" when the soils, particularly heavy clay, are wet, and cites results at Los Mochis in Mexico, where ratoon yields were very much lower than the plant cane yields. The equipment used widely in Mexico to apply fertilizer on both sides of the cane is illustrated; tillage in ratoon cane is now delayed until the compacted surface soil can shatter. Infield transport under wet conditions, where this cannot be avoided, requires use of wide, low-pressure tyres in order to reduce compaction, and the Toft STT600 "Hi-Lift" transporter is of advantage in this respect.

* * *

Classification and agrotechnical requirements of cane harvesters in Cuba. C. IGLESIAS and J. A. SILVEIRA. *ATAC*, 1974, **33,** (1), 4–12.—The various types of cane harvesters developed and used in Cuba are surveyed and classified in accordance with e.g. feeding mechanisms and method of locomotion. Changes in requirements between 1964 and 1970 in respect of stalk conditions, cutting height, trash permitted, etc., are tabulated.

* * *

Influence of cane burning on the soil microflora. N. MILANÉS. *ATAC*, 1974, **33,** (1), 22–25.—Examination of the top 10 cm of soil was sufficient to provide information on a study of the effect of cane burning on soil microflora. It was found that burning produced a significant reduction in soil fungi but that there was no significant effect on the bacterial population.

* * *

Effect of foliar feeding of phosphorus and potash on yield and juice quality of sugar cane. U. S. SINGH and –. NATH. *Indian Sugar*, 1974, **23,** 805–808.—Phosphorus and potassium applied as foliar sprays after a basal dressing of nitrogen failed to improve on the effect of nitrogen alone, which at 134 kg.ha^{-1} increased cane and sugar yield but decreased juice purity compared with the untreated control.

* * *

Performance of Co canes in the Mandya tract of Mysore State. G. HUNSIGI, B. P. URS, G. V. HAVANAGI and B. S. NADAGOWDAR. *Indian Sugar*, 1974, **23,** 809–810.—Experiments with 10 Coimbatore cane varieties over two seasons are reported.

* * *

Effect of infestation by the scale insect on some growth and quality attributes of sugar cane. S. SITHANANTHAM, K. SAIVARAJ and A. S. SATHIAMOORTHY. *Indian Sugar*, 1974, **23,** 811–812.—The effect of infestation by the scale insect (*Melanaspis glomerata*) on three Coimbatore cane varieties was studied, indicating reductions in weight, stalk girth and sugar content which differed between the varieties.

* * *

Co 1253—promising mid-late cane for the northern tract of Rajasthan. N. S. PARIHAR, D. S. OBEROI and S. K. BHATIA. *Indian Sugar*, 1974, **23,** 813–814. Results of experiments with this variety, first introduced for trials at Sriganganagar Research Station in 1959/60, are reported and its chief features described.

The yield performance of consecutive ratooning on spring and autumn cane. T. P. PAO. *Taiwan Sugar*, 1974, **21**, 18–24.—Experiments with six ratoon crops showed that maximum cane production was obtained with irrigation plus heavy fertilization (300 kg N, 150 kg P and 150 kg K per ha). The various combinations other than this gave varying results below maximum yield. (See also PAO: *I.S.J.*, 1974, **76**, 176.)

* * *

Investigations on the flowering of *Saccharum*. II. Number of spindle leaves and date of induction. P. H. MOORE. *Proc. 15th Congr. ISSCT*, 1974, 7–16.—The number of juvenile leaves growing within the spindle was determined for five genetic groupings of sugar cane: *Saccharum spontaneum*, *S. officinarum*, *S. sinense*, *S. robustum* and commercial hybrids. The number of leaves differed between and within the groupings and was apparently related to stalk diameter. The smallest number (average of 7·85) was found with clones of *S. spontaneum*, whilst the greatest number (average of 10·72) occurred in *S. officinarum* clones. The date of floral induction was determined from the time each leaf appeared as the spindle leaf and the number of juvenile leaves within the spindle. Differences in date of flowering induction only partly accounted for the differences found in date of flowering, the other governing factors being number of spindle leaves and rate of leaf development.

* * *

Philippine sugar cane breeding programme: philosophies and strategies. L. T. EMPIG. *Proc. 15th Congr. ISSCT*, 1974, 17–23.—The aims of the Philippine sugar cane breeding programme are set out and the basic steps in the programme explained. (See also EMPIG: *I.S.J.*, 1974, **76**, 271.)

* * *

Computer processing of sugar cane yield, breeding, and selection records. H. K. MEYER, D. J. HEINZ, E. LAWRENCE, N. KIMURA and S. L. LADD. *Proc. 15th Congr. ISSCT*, 1974, 24–35.—Details are given of the computer system used by the Hawaiian Sugar Planters' Association to analyse cane yield, breeding and smut test data; the individual programmes and results obtained are reported.

* * *

Control of sugar cane (*Saccharum* sp.) smut disease (*Ustilago scitaminea*) through breeding and selection of resistant clones. S. L. LADD, D. J. HEINZ and H. K. MEYER. *Proc. 15th Congr. ISSCT*, 1974, 36–45. Since the discovery of smut in Hawaiian cane in 1971, testing for the disease has been carried out on both commercial and non-commercial varieties. Of three inoculation methods studied for the screening tests, the most suitable has proved to be dipping of cane seed pieces in a suspension containing 5 million spore per ml of water; variable results were obtained when the suspension concentration was varied. While the two major commercial varieties, accounting for 50% of the cane area in Hawaii, are smut-tolerant, more than 60% of the breeding and other commercial clones have proved susceptible, including 16 out of the 20 most widely planted varieties.

* * *

Flowering of sugar cane in Louisiana as related to interspecific hybridization. E. D. PALIATSEAS. *Proc. 15th Congr. ISSCT*, 1974, 46–54.—Details are given of three cane flowering induction experiments at the Louisiana Agricultural Experiment Station. In the first experiment, concurrent flowering of commercial and *Saccharum spontaneum* clones permitted the making of first crosses; in the second experiment, flowering was induced at varying times in commercial clones, clones of *S. spontaneum* and in clones from *Saccharum* species hybrids; and in the third experiment, the flowering dates for ten commercial clones and four clones of *Saccharum* species hybrids were brought forward by 28 and 19 days, respectively.

* * *

Artificial induction of flowering in Natal. P. G. C. BRETT and R. L. HARDING. *Proc. 15th Congr. ISSCT*, 1974, 55–66.—In tests at the South African Sugar Association Experiment Station, flowering was induced in nearly all the clones by use of natural sunsets (with twilights) and artificial dawns to give day lengths which declined progressively by 30 seconds a day, combined with other treatments including controlled night temperatures, periodic removal of older leaves and a plentiful supply of water. The use of a heated glasshouse and constant artificial dawns has also given good results with many clones that do not flower under natural conditions in Natal, while constant artificial dawns have also been used to delay flowering in *Saccharum spontaneum* clones and related genera.

* * *

Evaluation of cane breeding plans. B. A. ROJAS. *Proc. 15th Congr. ISSCT*, 1974, 67–81.—The characteristics of a cane breeding plan are described and a set of rules set out for guidance in selecting a suitable procedure. A probability model and a cost function are developed as intrinsic characteristics of a plan. Probabilities of failure and of success are defined, and a minimax decision approach used to determine the optimum among a set of breeding plans. Comparison of 117 plans involving 100,000 to 1 million seedlings is used to illustrate the procedures developed.

* * *

The role of N:Co 310 in sugar cane breeding in Taiwan. S. C. SHIH and P. Y. JUANG. *Proc.15th Congr. ISSCT*, 1974, 82–88.—The importance of the part played by N:Co 310 cane variety, first introduced into Taiwan in 1947, in the breeding of new varieties is described. Progeny exhibit highly desirable characteristics, and most of the area under cane in Taiwan is occupied by four varieties (F 146, F 160, F 164 and F 167) bred from its hybrids.

* * *

The effect of environments on the effectiveness of clonal selection in sugar cane. J. A. MARIOTTI. *Proc. 15th Congr. ISSCT*, 1974, 89–95.—Experiments in three cane-growing areas of Argentina demonstrated the effects of environmental factors (climate and soil characteristics) on the performances of selected canes, although stalk diameter and weight appeared to be quite stable. The significance of the effects in cane selection is discussed.

* * *

Expected response to selection, heritability, genetic correlations and response to selection of some characters in sugar cane. R. CESNIK and R. VENCOVSKY. *Proc. 15th Congr. ISSCT*, 1974, 96–101.—Tests at two different sites in Brazil aimed at determining the responses to the factors given in the title showed that most genetic variance was due to segregation and

recombination produced by crossing. Estimates of response to selection favoured selection for most characters. Heritabilities were generally high, and genetic correlations and correlated responses to selection were found, with some exceptions, to be favourable for an overall genetic improvement in the material under test.

* * *

Selection studies in sugar cane (*Saccharum* sp. hybrids). I. Repeatability between selection stages. S. L. LADD, D. J. HEINZ, H. K. MEYER and B. K. NISHIMOTO. *Proc. 15th Congr. ISSCT*, 1974, 102–105.—In a study of the repeatability of the major yield characters of sugar cane (stalk number, stalk length, stalk diameter, refractometric Brix, cane volume and plot weight), all six were found to be repeatable, stalk diameter being the most and cane volume the least repeatable. Environment and type of cross had little effect on the extent of repeatability.

* * *

An evaluation of pot methods for clonal selection in sugar cane. N. D. STEVENSON, J. K. GALUINADI and G. D. PEDERSON. *Proc. 15th Congr. ISSCT*, 1974, 106–113.—Of four types of base on which to stand pots for cane growing the most successful in tests proved to be a mown lawn and not a concrete base, previously thought to be necessary. However, in subsequent tests an intensive-care field trial (ICT) proved as successful as the pots on mown lawn; in the ICT method, each clone was represented by a single, wire-supported stalk per replicate, with 30–40 cm spacing within rows of stalks and 60 cm spacing between rows, each stalk being grown from transplants struck in polyethylene bags. The ICT method has the advantage of ease of operation. However, because of the high correlation between field response and performance in pots or ICT, it is recommended to conduct the early stage of cane selection with a combination of both methods.

* * *

Influence of bunch size on the efficiency of selection from sugar cane seedlings. R. A. BURGESS and M. E. A. SHAW. *Proc. 15th Congr. ISSCT*, 1974, 114–117. The effect of bunch size on the efficiency of cane seedling selection was determined in tests with single seedlings and bunches of 2, 4 and 8 seedlings which were subsequently planted on an irrigated estate. Stalk diameter and height, number of tillers per clone and juice Brix were recorded at 11 months. Significantly fewer clones of acceptable stalk diameter were selected from the two larger bunches than from the single plants and bunches of 2. For selection purposes, the bunches of 2 were as useful as single plants, while the larger bunches were of little value for selection of desirable clones.

* * *

Histological studies on the origin and process of plantlet differentiation in sugar cane callus mass. M. C. LIU and W. H. CHEN. *Proc. 15th Congr. ISSCT*, 1974, 118–129.—In a histological study of organogenesis in cane callus, two types of media were used for initiation of callus from subapical meristems and rolled young leaves: one contained 2,4-D and was designated a non-organ-forming medium, while the other (an organ-forming medium) was the same but without 2,4-D, although it contained kinetin, naphthalene acetic acid and casein hydrolysate for shoot differentiation. Results obtained after varying periods of inoculated sample retention in the culture media are discussed in some detail with the aid of photomicrographs.

* * *

Fiji disease-resistant *Saccharum officinarum* var. Pindar sub-clones from tissue cultures. M. KRISHNAMURTHI and J. TLASKAL. *Proc. 15th Congr. ISSCT*, 1974, 130–137.—A description is given of a cane tissue culture technique which has been used to isolate 38 sub-clones of Pindar cane. Results are reported of chromosome counts in root tip meristems of the original Pindar clone from Fiji and 17 sub-clones. While the original Pindar cane and the sub-clones tended to have similar chromosome numbers, there were two exceptions in which the numbers were lower. While the sub-clones proved to be more resistant to Fiji disease than the original Pindar cane, four sub-clones proving highly resistant, the degrees of resistance varied between trials. In the search for causes of resistance changes, the authors ruled out gene mutation, but found evidence of alteration in the distribution frequency of cells of varying chromosome number. Three mechanisms are postulated to explain the existence of chromosomal mosaics in sugar cane; while photomicrographs suggest that all three may be operating in Pindar and its sub-clones, the relative importance of each is unknown.

* * *

Quantitative effects of radiation-induced mutation in sugar cane. B. T. ROACH. *Proc. 15th Congr. ISSCT*, 1974, 138–144.—Cuttings of Triton and Apollo cane were exposed to gamma rays from a ^{60}Co source. While a dose of 3000 r produced no apparent effect on germination of Triton, a 5000 r dose seemed to cause a slight reduction in germination but very few abnormal shoots resulted. Germination of Apollo cane, normally poorer than for Triton cane, was not greatly affected by either radiation dose, but many of the resultant plants were abnormal, particularly with the higher dose. Apparently stable Triton sub-clones were recovered which exhibited little or no flowering; while the average yield of some sub-clones was greater than for Triton, none was significantly greater. Generally, sugar and fibre contents were as for Triton, although some sub-clones were found which had significantly higher sugar content and significantly lower fibre content, so that it is concluded that mutation breeding may be of value in improving existing varieties.

* * *

β-Amylase isoenzymes as genetic markers in *Saccharum* and related genera. J. C. WALDRON and K. T. GLASZIOU. *Proc. 15th Congr. ISSCT*, 1974, 145–152. From a study of the β-amylase isoenzyme patterns in 99 clones from five *Saccharum* species and related genera, it is concluded that there were twenty basic bands, two or more of which could be assigned to each clone, showing genetic relationships between the groups. *S. officinarum*, *S. robustum* and *S. edule* had similar β-amylase patterns but these were distinctive from the patterns in *S. spontaneum* originating outside New Guinea. Most clones of *S. sinense* were indistinguishable from *S. spontaneum* outside New Guinea but had some bands characteristic of clones of *Ripidium* and *Sclerostachya*, two of the genera related to *Saccharum*. Clones of *Erianthus maximus* had bands common to *S. officinarum* and *Miscanthus*.

Rind hardness and fibre content. J C. SKINNER. *Proc. 15th Congr. ISSCT*, 1974, 153–167.—From a series of experiments, an efficient routine technique has been developed for measuring cane rind hardness using a portable penetrometer fitted with six flat-faced rods 1 mm in diameter. A sampling point half-way up the millable cane was more suitable than lower points, and an optimum sample size of twelve stalks per 3-row plot was established. While separate sampling of arrowed and non-arrowed stalks was not necessary, it did give more accurate results. Although rind hardness determination is of value in screening varieties for fibre content, a fairly high correlation being established between the two parameters, the portable penetrometer is considered too slow for routine use at the original seedling and 4-sett plot stages of selection, when a subjective estimate of hardness during Brix measurement is probably worthwhile.

* * *

An objective method for counting chromosomes in sugar cane root meristems. J. TLASKAL and P. B. HUTCHINSON. *Proc. 15th Congr. ISSCT*, 1974, 168–176.—A root tip squash technique for studying cane chromosomes is described which involves germination of cane cuttings in a humid atmosphere and cultivation of roots in a nutrient solution under controlled conditions in a special growth chamber. This is followed by a photographic counting method which is accurate and suitable for routine purposes.

* * *

The influence of stalk density on cane yield. J. D. MILLER and N. I. JAMES. *Proc. 15th Congr. ISSCT*, 1974, 177–184.—The average stalk density of 52 cane clones derived from four crosses was calculated as 1·06 g.cm^{-3} from the volume obtained by water displacement, and as 1·16 g.cm^{-3} from the formula $V = \pi(\frac{D}{2})^2 L$, where D is the diameter at the mid-point of the stalk and L is stalk length. Use of the formula resulted in considerable error, although 88% of the variation in volume was accounted for by stalk diameter and length. Path-coefficient analysis showed that stalk density had a positive but small influence on stalk weight when the volume was determined by the two methods above, whereas it was of minor effect on cane yield when yield was determined by weighing or estimated as the product of stalk weight and number. Stalk number was more important than diameter in cane yield determination, although its significance varied with the yield determination method used. Where the aim is for higher cane yield, attention should be focused on selection for stalk number, diameter and length as the major yield components.

* * *

Inhibition of germination and growth of sugar cane buds from seed pieces dipped in sugar cane juice from healthy and RSD-infected stalks. N. ZUMMO. *Proc. 15th Congr. ISSCT*, 1974, 185–188.—Dipping one-bud cuttings in juice from apparently healthy sugar cane generally, but not always, reduced germination and growth; the presence of ratoon stunting disease virus had no apparent effect on this reduction. Heating the juice to 100°C for 10 minutes before dipping destroyed the inhibitory factor, the nature of which has not been determined, although it is considered unlikely to be microbial growth, since the dipped cuttings remained intact until death of the shoots. The effects of shoot mortality and growth reduction were not always immediately apparent, some cuttings producing shoots but no roots; the shoots normally died when the food reserve in the seed piece was depleted, but if they continued to grow they approached or reached normal height. Some varietal differences were found.

* * *

Screening of varieties for red rot resistance. K. KAR, S. C. GUPTA and D. C. KUREEL. *Proc. 15th Congr. ISSCT*, 1974, 189–193.—The methods used at the Shahjahanpur research station in Uttar Pradesh to screen cane varieties for red rot resistance are described and results tabulated for Coimbatore varieties and crosses during the period 1966–71. The predominant varieties grown in UP, Co 1148 and Co 1158, are resistant to the disease.

* * *

Sugar cane quarantine procedures at Beltsville, Maryland. A. G. GILLASPIE and C. C. MCKNEW. *Proc. 15th Congr. ISSCT*, 1974, 194–199.—The procedures used at Beltsville in the USA in growing cane under quarantine about 1000 miles from the nearest cane-growing area are described. Imported cane is inspected, treated to destroy any insects and sent to the quarantine station where it is grown for at least a year. The mature seedling cuttings are treated for insect control and sent to the secondary quarantine station. Mature plants from stalk or root cuttings are treated with hot water and re-grown before being sent to secondary quarantine or to other quarantine facilities.

* * *

The Bundaberg clean-seed scheme. B. T. EGAN. *Proc. 15th Congr. ISSCT*, 1974, 200–203.—The Bundaberg scheme for providing seed cane which is free from Fiji disease is described.

* * *

Further evidence of population shift in the gumming disease pathogen in Mauritius. C. RICAUD and S. SULLIVAN. *Proc. 15th Congr. ISSCT*, 1974, 204–209. The situation in Mauritius with regard to gumming disease is examined. The occurrence of a new strain of bacterium which is more virulent than the older strain has caused certain cane varieties which were regarded as resistant to the disease to become susceptible. Moreover, while the older strain, which has survived for many years in a very small number of noble canes, can be expected to provide isolates which are quite stable, isolates of the new strain, responsible for a severe outbreak of the disease in 1964, can be expected to have a great number of variants because of the rapid multiplication in the population, and it is these further changes which are considered responsible for the susceptibility of the once-resistant canes. The impact of this situation on the variety selection programme in Mauritius is discussed.

* * *

Ratoon stunting disease history, distribution and control. D. R. L. STEINDL. *Proc. 15th Congr. ISSCT*, 1974, 210–212.—A brief résumé is given of the title subject. Particular mention is made of the impracticability of control of RSD by growing resistant varieties, and the danger of dependence on tolerant varieties is emphasized.

The economic importance of ratoon stunting disease. C. G. HUGHES. *Proc. 15th Congr. ISSCT*, 1974, 213–217.—While published estimates of commercial losses caused by RSD are rare, the author gives information on the situation in Queensland, where control measures have been in operation for more than 20 years and yet where, especially in a dry year, considerable reduction in mill receipts has occurred.

* * *

Nature of the ratoon stunting disease agent. A. G. GILLASPIE, R. E. DAVIS and J. F. WORLEY. *Proc. 15th Congr. ISSCT*, 1974, 218–224.—See *I.S.J.*, 1974, **76**, 369.

* * *

The causal agent of sugar cane ratoon stunting disease (RSD). D. S. TEAKLE. *Proc. 15th Congr. ISSCT*, 1974, 225–233.—From observations in Queensland and Puerto Rico and certain properties established for the micro-organism associated with RSD (ready sedimentation during centrifugation, difficulty in passing through bacteriological filters and sensitivity to bactericides but not to enzymes), the causal agent of the disease is considered to be a bacterium and not a virus.

* * *

Isolation of an organism resembling *Xanthomonas vasculorum* from sugar cane affected by ratoon stunting disease. L. J. LIU, A. CORTES-MONLLOR, K. MARAMOROSCH, H. HIRUMI, J. E. PÉREZ and J. BIRD. *Proc. 15th Congr. ISSCT*, 1974, 234–240.—Organisms isolated from stalk vascular bundles of ratoon stunting infected cane from three varieties were identified by biochemical and serological tests as probably *X. vasculorum*. One isolate produced symptoms closely resembling those of RSD. Juice expressed from diseased cane failed to reproduce RSD symptoms after passage through a Seitz bacterial filter.

* * *

Problems in the diagnosis of ratoon stunting disease. C. RICAUD. *Proc. 15th Congr. ISSCT*, 1974, 241–249. Problems associated with RSD diagnosis are discussed, and the resultant need for caution in accepting reports of outbreaks of the disease is mentioned.

* * *

The effects of ratoon stunting disease on three sugar cane varieties under different irrigation regimes. L. A. ROSSLER. *Proc. 15th Congr. ISSCT*, 1974, 250–257.—In tests with three cane varieties, adequacy of irrigation was found to mask ratoon stunting disease symptoms, whereas moisture stress was accompanied by clear symptoms. Reduction in yield fell with increase in the total amount of water applied. The plant crop yields were less affected by RSD than were the ratoons, and indications were that further reductions in yield could be expected in subsequent crops. Differences were found in varietal tolerance to the disease in terms of cane yield. In all three varieties, RSD caused a slight increase in % estimated recoverable sugar.

* * *

An insectary method for testing sugar cane varieties for resistance to white leaf disease. L. S. LEU. *Proc. 15th Congr. ISSCT*, 1974, 266–274.—Field- or greenhouse-grown cane plants, which had been infected with white leaf disease by nymphs of *Matsumuratettix hiroglyphicus* earlier fed on diseased cane, showed very low incidence of the disease when the minimum day temperature was below 20°C, while higher temperatures favoured its development. The incubation period required for the appearance of symptoms varied from 39 days to 1 year, but averaged 2–3 months. A technique for testing varieties for white leaf disease resistance is described.

* * *

Interaction between diseases on sugar cane: sugar cane mosaic and ratoon stunting disease. H. KOIKE. *Proc. 15th Congr. ISSCT*, 1974, 258–265.—Interaction between mosaic and RSD was studied in four commercial cane varieties. Results, reported in some detail, indicate that greater yield reductions in some varieties might be the result of the combined presence of the two diseases rather than the presence of each disease separately.

* * *

Culmicolous smut of sugar cane in Taiwan. V. Two pathogenic strains of *Ustilago scitaminea* Sydow. L.S. LEU and W. S. TENG. *Proc. 15th Congr. ISSCT*, 1974, 275–279.—Inoculation of single-eye cane cuttings or seedlings with teliospores and sporidial cultures of *U. scitaminea* revealed the existence of two strains of the culmicolous smut pathogen which could not be distinguished morphologically and physiologically but differed in pathogenicity. While cane of variety N:Co 310 was highly susceptible to one and probably immune to the other, the reverse was true for F 134 cane. The possible existence in nature of more strains is discussed.

* * *

Comparison of inoculation techniques for smut disease testing in Hawaii. R. S. BYTHER and G. W. STEINER. *Proc. 15th Congr. ISSCT*, 1974, 280–288.—Five different inoculation methods and their modifications were compared in tests to determine cane smut reaction. Dip, paste and spray inoculations of stem cuttings gave generally comparable results which correlated with field reactions, while the wound-paste method did not give consistent results. The dip method has the advantage of permitting large numbers of clones to be tested with a minimum of skilled labour. Covering the buds with polyethylene bags after inoculation generally increased infection with all methods. Infection resulting from inoculation of lateral buds on standing cane, with or without removal of their terminal portion, correlated with field susceptibility. Susceptibility to infection remained for nine days after removal of the terminal portion.

* * *

Varietal susceptibility to smut (*Ustilago scitaminea* Sydow) in relation to bud characters. S. MUTHUSAMY. *Proc. 15th Congr. ISSCT*, 289–291.—In tests with cane from twenty varieties, correlations were established between smut incidence, bud size and stalk borer infestation. In most of the resistant varieties the germpore adopted a subapical position in the bud, while in the susceptible varieties the position was apical; the position is considered to be associated with the tendency to sprout, which makes the bud more vulnerable to entry of promycelium and hence more prone to infection. In the tests the sprouting observed was due to stalk borer attack. Bud shape differed in both susceptible and resistant varieties, but in general, varieties with triangular buds were susceptible.

Stord Bartz Industri a·s

C. Sundtsgt. 29 Bergen, Norway

Culmicolous smut of sugar cane and the effects of its control on yield. G. L. JAMES. *Proc. 15th Congr. ISSCT*, 1974, 292–299.—The effects of cane roguing on yield and smut incidence were studied in tests with two cane varieties. While disease control and yield responses resulting from roguing were much better in one variety than in the other, roguing increased incidence of the disease in both varieties when the infection levels were high. Higher incidences were recorded on poor soils than on good soils, and a relationship between the effectiveness of roguing and soil type was also established, whereby whip removal controlled the disease on better soils but increased incidence on poorer soils. Smut incidence was related to moisture availability to the cane, in which it increased sugar content but reduced yield. Incidence of the disease increased to a maximum by the 2nd ratoon, after which it declined.

* * *

Losses due to sugar cane mosaic reduced by use of a greater amount of seed cane. R. J. STEIB and S. J. P. CHILTON. *Proc. 15th Congr. ISSCT*, 1974, 300–304. While the recommended rate of cane planting in Louisiana is two running stalks + 10% overlap with the aim of reducing yield losses caused by mosaic, tests were conducted with two varieties in which three stalks + 10% overlap were planted. Comparison was made between the yields from two- and three-stalk planting (+ overlap), where all the seed cane was infected with mosaic, and between these and the same rates of planting of uninfected cane. Results indicated that the higher rate of planting of diseased cane considerably reduced the yield loss sustained with the lower rate of diseased cane with both plant and 1st ratoon cane, but that the yield with the higher rate of diseased cane was still lower than with the lower rate of uninfected cane.

* * *

Sugar cane mosaic virus strain L: a new virulent strain of sugar cane mosaic virus from Meigs, Georgia. N. ZUMMO. *Proc. 15th Congr. ISSCT*, 1974, 305–309. A report is given on a new strain of cane mosaic virus, designated L, which has been isolated from cane growing in the South Georgia and North Florida areas of the USA.

* * *

Study of sugar cane resistance to mosaic virus in Cuba. V. KOLOBAEV, R. MORÍN, O. CARAVAJAL and I. OTERO. *Proc. 15th Congr. ISSCT*, 1974, 310–318. Details are given of the artificial inoculation method used at the Sugar Cane Research Institute of the Academy of Sciences in Cuba to test cane seedlings for mosaic resistance. High correlation has been found between results of the technique used and results of exposure to natural infection. The procedures used in selecting resistant cane varieties are also described.

* * *

Influence of disease tolerance on commercial planting of varieties infected with mosaic and RSD. R. J. STEIB. *Proc. 15th Congr. ISSCT*, 1974, 319–326.—The situation regarding cane mosaic and ratoon stunting disease in Louisiana is recorded and the inter-relationship of the two diseases discussed. Details are given of the techniques used for testing cane for resistance and tolerance to mosaic and RSD and ratings tabulated for a number of varieties. It is emphasized that tolerance to disease plays an important role in the selection of commercial varieties; if there were no tolerance to mosaic and RSD, the situation in Louisiana would be much more serious.

* * *

The effects on sugar cane of plant-parasitic nematodes in non-sterile monospecific cultures. R. H. G. HARRIS. *Proc. 15th Congr. ISSCT*, 1974, 327–337.—Descriptions are given of growth effects and symptoms which developed in the roots of pot-grown sugar cane as a result of the activity of the following nematodes: *Meloidogyne javanica, Trichodorus christiei, Pratylenchus zeae, Tylenchorhynchus* sp., *Hemicycliophora labiata, Xiphinema elongatum, Criconemoides sphaerocephalum* and an unidentified nematode in the subfamily Hoplolaiminae. Each set of symptoms is illustrated by photomicrographs of parts of the root system, development of which was affected in all cases.

* * *

Chemical control of nematodes on sugar cane in the Punjab. S. S. SANDHU and D. S. BEHAR. *Proc. 15th Congr. ISSCT*, 1974, 338–342.—The effects of three chemicals on the nematode population, cane yield and a number of cane growth factors were tested in 1972/73 and 1973/74 with CoJ 46 cane. While all three reduced the nematode population substantially, best results in terms of yield increase (108·6% compared with the untreated control) were obtained with "Dasanit" ("Fensulfothion") systemic insecticide at 400 kg.ha^{-1} (5% a.i.); this performance was attributed to the significant reduction in shoot and top borer incidence plus nematode reduction caused by the chemical. The next best in terms of yield were "Nemagon" (DCBP) at 60 litres.ha^{-1} (yield increase of 48·5%) and D-D at 450 litres.ha^{-1} (yield increase of 45·8%). In 1973/74 a fourth chemical, "Vapam" (sodium methyl dithiocarbamate) was also tested at 800 litres.ha^{-1}; this also sharply reduced the nematode population, but its performance in terms of yield increase is not given.

* * *

Pathological effects of the sugar cane white leaf agent on chlorophyll content and chloroplast ultrastructure. C. T. CHEN and M. J. CHEN. *Proc. 15th Congr. ISSCT*, 1974, 343–347.—Comparison was made between the chlorophyll contents and plastid ultrastructures of white leaf-infected and healthy cane leaves, showing that while three chlorophyll components were present in both diseased and healthy leaves, the chlorophyll content in the infected leaves was only about 7·6% of that in the healthy leaves. Electron microscopy showed that the size of the chloroplasts in the diseased leaves was about 25–33% the size in the healthy leaves. The mesophyll cell plastids in the infected leaves appeared to have proplastid structures containing immature grana, and the internal membrane of bundle sheath plastids was poorly developed. It is concluded that white leaf may affect chlorophyll biosynthesis quantitatively but not qualitatively, and may consequently disturb the development of both types of plastids.

* * *

Grassy shoot disease of sugar cane in the Punjab, India. S. S. SANDHU and R. S. RAM. *Proc. 15th Congr. ISSCT*, 1974, 348–353.—Tests to determine the effects of hot air treatment (54°C for 8 hours) and hot water treatment (50°C for 2–3 hours) of grassy shoot-infected cane are reported, and results indicated in

terms of yield increase for the three varieties investigated. (See also SANDHU *et al.: I.S.J.*, 1973, **75**, 200–201.)

* * *

Factors affecting yellow spot development, its control and effect on cane and sugar yields. C. RICAUD. *Proc. 15th Congr. ISSCT*, 1974, 354–364.—The effects of climatic conditions on yellow spot incidence (particularly favoured by rain and high relative humidity) are discussed against the background of experience in Mauritius. While the disease has been found to affect the sucrose content but not yield in early harvested cane, in mid-season or late cane the effect on sucrose decreases and yield is increasingly affected, with a mean reduction in yield of 13·9%. Tests on spraying with "Benomyl" have shown that its positive effects do not last sufficiently long and protection is not transferred to leaves that develop after spraying. (See also RICAUD: *I.S.J.*, 1973, **75**, 313.)

* * *

Fauna dynamics of sugar cane nematodes in Cuba. A. A. RAZJIVIN, J. P. O'REILLY and J. R. PÉREZ. *Proc.15th Congr. ISSCT*, 1974, 365–373.—The occurrence of nematodes in cane roots and in the rhizosphere was studied; of the total 124 species found, 108 occurred in the rhizosphere and 88 in the roots, a total of 71 were found in the soil as well as the rhizosphere, 36 were found only in the soil and 16 were found only in the roots. A list is given of the plant parasitic species found. The numbers in each ecological group were established for each month from July to December, inclusive, when cane growth is maximum and the nematode populations highest. Correlations between nematode populations and major environmental factors were established. Increase in the soil populations was accompanied by decrease in the root populations and vice versa. Nematodes which are pathogenic to plants as well as free-living nematodes are more numerous than saprobiotic or mycobiotic forms.

* * *

Studies on aggressiveness of *Fusarium moniliforme* Sheldon, causal agent of pokkah boeng in sugar cane. A. F. DA EIRA, P. C. T. DE CARVALHO and A. SANGUINO. *Proc. 15th Congr. ISSCT*, 1974, 374–383.—A study of the influence of spore concentration on inoculation results and of variability in *F. moniliforme* on the symptoms of pokkah boeng produced showed that isolates differed in their aggressiveness, which influenced the phase of the disease which developed and the screening of cane varieties. The optimum inoculum concentration must be determined as a function of agressiveness.

* * *

"Belang merah", a new leaf disease of Ps 41. H. HANDOJO. *Proc. 15th Congr. ISSCT*, 1974, 384–386. A brief description is given of a new disease, "belang merah" ("red spot"), which has been observed on the leaves of Ps 41 cane, the most promising variety in Java and occupying some 16% of the total cane area. While the symptoms differ from those of red leaf spot (*Dimeriella sacchari*) and other known leaf disease symptoms, diseased tissues have not revealed the presence of any micro-organisms and no causal agent has been isolated. The disease is transmitted in cuttings from diseased cane but not by contact between diseased and healthy cane. Use of healthy cuttings and the roguing of diseased stools are effective measures in its control.

Introduction of Eulophidae into Réunion Island for the control of sugar cane borers. J. ETIENNE. *Proc. 15th Congr. ISSCT*, 1974, 387–392.—Information is given on the borer parasites introduced into Réunion to combat the stalk borer *Chilo sacchariphagus* and pink borer *Sesamia calamistis*. While *Trichospilus diatraeae* has parasitized pupae of both borers, *Pediobus furvus* seems to develop only on *S. calamistis*, while conclusions on *Tetrastichus israeli* have yet to be drawn.

* * *

An attempt to control sugar cane stem borers with the dipterous parasite *Diatraeophaga striatalis* (Towns.). W. A. BOEDIJONO. *Proc. 15th Congr. ISSCT*, 1974, 393–396.—*Chilo sacchariphagus* and *C. auricilus* are the two most important stem borers which attack cane in Indonesia, joint infestation averaging 15–20% annually. Trials on their control with *D. striatalis* on one estate showed that joint infestation was reduced after the first year of release from 16·3% to 10·7%, followed in subsequent years by a further reduction to 6·0%, 5·4% and finally 4·2% in 1971/72. Expansion of biological control to other areas and mass rearing of the parasite are to be undertaken.

* * *

Methods and recommendations for mass rearing of the natural enemies of the sugar cane borer (*Diatraea* spp.) (Lepidoptera: Crambidae). M. DE SOUZA GUERRA. *Proc. 15th Congr. ISSCT*, 1974, 397–406.—Details are given of techniques for use in rearing parasitic flies such as *Lixophaga diatraea* and egg parasites such as *Trichogramma* spp. for use against borers *Diatraea* spp. *Galleria mellonella* and *Achroia grisella* are used as hosts, and guidance is given on rearing them on a diet specially formulated by the author, as well as advice on large-scale production of *G. mellonella* eggs.

* * *

Notes on *Trichogrammatoidea nana* (Zhnt.), an egg parasite of sugar cane moth borers. G. T. LIM and Y. C. PAN. *Proc. 15th Congr. ISSCT*, 1974, 407–410. Information is given on the breeding of *T. nana*, an important enemy of cane stem borers *Eucosma isogramma* and *Proceras sacchariphagus*, using *Corcyra cephalonica* (rice moth) as intermediate host. The numbers and percentages of borer eggs parasitized are tabulated for 1970 and 1971.

* * *

Natural immunity of *Diatraea centrella* to *Paratheresia claripalpis* and *Metagonistylum minense*. M. N. BEG and F. D. BENNETT. *Proc. 15th Congr. ISSCT*, 1974, 411–422.—While *P. claripalpis* is an important parasite of *Diatraea saccharalis* and *D. impersonatella* in Trinidad, it had been found earlier that the local strain could not be satisfactorily bred on *D. centrella* (yellow headed moth borer). Investigations showed that females of *P. claripalpis* do not discriminate between suitable and unsuitable hosts in the field and that *D. centrella* larvae are in fact regularly attacked. However, the parasite maggots fail to develop because of encapsulation by host haemocytes; a similar phenomenon has been observed in Guyana where larvae of *Metagonistylum minense* are also encapsulated by *D. centrella*.

Sugar beet agriculture

A Danish seed preparation and pelleting plant at Selyp. K. HANGYAL and E. SMED. *Cukoripar*, 1974, **27,** 7–10, 46–51.—See *I.S.J.*, 1974, **76,** 211.

* * *

Beet agriculture in Finland. K. VUKOV. *Cukoripar*, 1974, **27,** 55–58.—A survey is presented of the Finnish sugar industry and beet agriculture.

* * *

What is the right spacing? R. FLETCHER. *British Sugar Beet Rev.*, 1974, **42,** 29, 32.—With the intention of demonstrating that it is not possible to give a universal recommendation on beet spacing, the author cites trials in which the yields obtained with 5-inch spacing were greater than with 8-inch spacing at one farm, whereas at another farm the 8-inch spacing gave the greater yields. It is emphasized that the objective should be a final plant population of 25,000–40,000 per acre.

* * *

Chemical weed control. Some thoughts on herbicides use after crop emergence. N. V. TURNER. *British Sugar Beet Rev.*, 1974, **42,** 39–44.—Reference is made to experimental investigations at the School of Agriculture, Nottingham University, which showed that a 80–95% reduction in beet yield occurred if there was no weed control, but that no loss in yield occurred if weed control was delayed until four weeks after emergence. It was also demonstrated that the period of essential weed control was relatively short: mid- to end-May in the case of crops sown in March or early April, and end-May to mid-June with crops sown from mid-April to early May. However, pre-emergence residual herbicides are considered to be useful in that they retard weed seedling growth and prolong the period during which "Betanal E" post-emergence herbicide can be effectively applied. Because of herbicide scarcity, and since the author still considers eradication of weeds after mid-June desirable because of e.g. problems with knot grass and the wish to prevent extensive seeding of weeds, a weed cutter mounted at the front of a tractor has been developed by the British Sugar Corporation which can deal with all weeds which are higher than the beet. Application of nitrogen to beet in the hope of stimulating growth, and thus helping to minimize weed competition where weed control has not been successful during the critical period, has been found to stimulate weed growth and reduce beet yields still further.

* * *

Investigations on use of inflatable structures as silos for beet storage. M. Z. KHELEMSKII *et al. Sakhar. Prom.*, 1974, (5), 46–50.—The use of inflatable silos for storage of food crops as well as various other items is discussed with reference to experience in the USSR and elsewhere, and particular attention is focused on their use for beet storage. Tests in which beets were stored inside an artificially ventilated inflatable silo (made of rubberized fabric with a caprone base) showed that daily sugar losses were the same as in a control pile covered with flexible insulation panels, while total weight losses were lower, as was the quantity of thawed beet with blackened tissue. No frozen beets were found in the experimental pile.

* * *

Effect of sugar beet wilting on its storage properties under Kirgiz conditions. L. A. KIRPICHENKO. *Sakhar. Prom.*, 1974, (5), 51–55.—The extent of beet wilting in Kirgiziya and the effect this has on losses in beet storage are examined. To reduce wilting, mainly a result of climatic conditions, the author suggests irrigation no earlier than 20 days before harvesting and minimization of the interval between harvesting and storage.

* * *

Effect of sugar beet harvest times on efficiency of sugar production in Kazakh SSR. M. M. MUNATAEV. *Sakhar. Prom.*, 1974, (5), 55–58.—Under conditions in Kazakhstan it is suggested that the start of beet harvesting be delayed from the first ten days of September to the 21st of September, with the bulk of lifting being carried out in October, and thereby ensure that the first beet lifted are mature. The author indicates that, other factors being equal, the change would permit an extra 18,000 tons of sugar to be produced.

* * *

Examination of sugar beet seed pelleting in a continuous plant. V. S. BUD'KO, G. A. AKSEL'RUD and O. P. KALINOVSKAYA. *Sakhar. Prom.*, 1974, (5), 58–61.—Results of tests on continuous beet seed pelleting are discussed.

* * *

Some innovations in Belgian beet equipment. A. VIGOUREUX. *Le Betteravier*, 1974, **8,** (76), 7–10. Descriptions and illustrations are given of a number of self-propelled beet harvesters and a loader which were put into operation in Belgian beet fields in 1973.

* * *

Aspects of mechanical sugar beet harvesting. A. SKIERSKI. *Gaz. Cukr.*, 1974, **82,** 72–75.—Some information is given, with illustrations, on beet mechanical harvesting equipment from France and West Germany which was demonstrated in Poland.

* * *

The beet lace-bug and means of combating it. M. KUBACKA-SZMIDTGAL. *Gaz. Cukr.*, 1974, **82,** 102–104. The beet lace-bug, *Piesma quadratum*, has been slowly spreading in Poland since 1972. The stages in which the pest has gradually migrated to beet fields are briefly indicated, and information given on other *Piesma* spp., including *P. masculatum* and *P. variabilis*. Illustrations are given of the three species named, and recommended chemicals for their control are listed.

Mechanization of field spring work in sugar beet agriculture. A. GRAF. *Gaz. Cukr.*, 1974, **82,** 98–102. Mechanization of spring work as practised in Austria, including disease control, is described.

* * *

Results of comparative tests on sugar beet varieties in Belgium from 1971 to 1973. N. ROUSSEL, R. VANSTALLEN and W. ROELANTS. *Publ. Trimest. Inst. Belge Amél. Betterave*, 1974, (1), 1–42.—Results are given of varietal trials involving 43 beet varieties, of which 24 were monogerm.

* * *

Growth, pests and diseases of sugar beet in Belgium in 1972. L. VAN STEYVOORT. *Publ. Trimest. Inst. Belge Amél. Betterave*, 1974, (1), 43–58.—Information is given on the climatic conditions, average beet yield and sugar content, pests and diseases in Belgium in 1972. Damage caused by pests and diseases was not as great as that caused by adverse weather and pesticide phytotoxicity. Virus yellows occurred late in the growing period and caused lower sugar losses than in the previous year.

* * *

Genetic monogerms and their influence on sugar beet selection methods. A. JANVIER. *Sucr. Belge*, 1974, **93,** 201–210.—The main characteristics of the sugar beet are described and the two conventional methods of selection (mass selection of interesting phenotypes, and selection based on genealogy) explained. An outline is also given of the methods of approach adopted in improving monogerm varieties.

* * *

Sugar beet for more sugar in India—research and development. P. S. BHATNAGAR. *Proc. 38th Ann. Conv. Sugar Tech. Assoc. India*, 1972, (2), A147–A152.—The advantages of sugar beet growing in India and the results so far achieved are discussed, while reference is made to research on beet breeding and the possibility of commercial seed production.

* * *

Productivity and processing qualities of sugar beet varieties from various selection lines. M. Z. KHELEMSKII *et al. Trudy Vsesoyuz. Nauch.-Issled. Inst. Sakhar. Prom.*, 1973, **19,** 41–62.—Experiments conducted during 1962–68 on mono- and multi-germ, diploid and polyploid beet varieties from the USSR and elsewhere were concerned with their agricultural and factory performances. The tests are reported in detail.

* * *

Processing properties of beet from various regions of the USSR. M. Z. KHELEMSKII, N. T. POEDINOK and D. G. GOMANYUK. *Trudy Vsesoyuz. Nauch.-Issled. Inst. Sakhar. Prom.*, 1973, **19,** 63–75.—Results of tests to determine the processing properties of beet from different areas of the USSR in 1966–69 are reported.

* * *

Aspects of the occurrence of beet leaf miner and black bean aphid in 1974. H. BERNARDOVÁ, E. SCHELLEROVÁ and J. SAFRÁNKOVÁ. *Listy Cukr.*, 1974, **90,** 93–96. Infestation by *Pegomya betae* and *Aphis fabae* in various beet-growing areas of Czechoslovakia was reported. The intensity of infestation varied between districts; there was correlation between incidence of the pests and climatic conditions. Photographs of the pests and the damage they cause are reproduced.

Sugar beet harvesting as shown by the figures. D. R. BRISBOURNE. *British Sugar Beet Rev.*, 1974, **42,** 62–64, 68.—Data collected under the British Sugar Corporation crop reporting system are summarized to show the trends in beet harvesting, storage, loading and top disposal in the UK during the period 1968–73.

* * *

Sugar beet crop's vital role in maintaining fertility on Norfolk farm. D. CHARLESWORTH. *British Sugar Beet Rev.*, 1974, **42,** 65–68.—Information is given on the system used in running a mixed farm of 720 acres in Norfolk, where the animals (particularly pigs) are fed on the beet tops, and humus produced from the livestock units is of value on the 130 acres of land devoted to beet.

* * *

Virus yellows. R. HULL. *British Sugar Beet Rev.*, 1974, **42,** 73–76.—While spraying with insecticides to control aphids *Myzus persicae* (which transmit beet yellows virus and beet mild yellowing virus) and *Aphis fabae* (beet yellows virus vector) is the chief means of combating virus yellows, the author emphasizes the importance of good farm hygiene in eliminating possible sources of aphid infestation and virus infection. While beet varieties bred specifically for yellows resistance or tolerance have tended to be low yielders of low sugar content, a recent monogerm introduction, "Vytomo", has a high sugar content and juice purity and gives very good yields. Crops having a full, uniform stand of beets (about 30,000 per acre) suffer less from yellows than do gappy stands, while crops sown in March or beginning of April suffer less than late-sown crops; young plants are more susceptible to aphids and yellows than older ones, so that early sowing ensures that the plants have reached an advanced stage by the time of the first aphid attacks, while freedom from infestation is also possible with a full canopy, since winged aphids avoid fields with leaf cover. The possibility of biological control with aphid predators such as ground beetles is briefly mentioned. The severity of the virus yellows outbreak in the UK in 1973/74 is attributed to the occurrence of mild winters followed by warm, dry, calm weather in spring, conditions which favour aphid development and activity, although adoption of the measures mentioned above contributed to the comparative freedom from the disease during the 1960's.

* * *

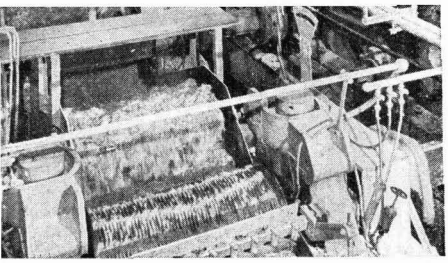
High-speed harvesting by improved NIAE lightweight topper. J. H. ARMSTRONG. *British Sugar Beet Rev.*, 1974, **42,** 78–79.—Details are given of a beet topper designed by the National Institute of Agricultural Engineering, a prototype of which was tested in 1973 and found to give uniform topping at high speeds even with irregular stands, while providing a low top tare without crop loss.

* * *

Trials of commercial varieties of sugar beet. L. A. WILLEY. *British Sugar Beet Rev.*, 1974, **42,** 82–86. Tabulated results are given of beet varietal trials carried out in the UK in 1973; data for 1971 and 1972 are also presented alongside.

* * *

Modern methods of sugar beet breeding. P. KOLAGO. *Gaz. Cukr.*, 1974, **82,** 129–135.—Modern methods of breeding polyploid beet varieties are discussed generally and information given on the system used in Poland.



Cane sugar manufacture

Recent tests on multicyclone fly ash collectors. R. N. CULLEN and P. C. IVIN. *Proc. 41st Conf. Queensland Soc. Sugar Cane Tech.*, 1974, 133–141.—Bagasse furnaces installed before introduction of the Clean Air Act in Queensland may have fly ash collectors of efficiencies well below the 90% level considered necessary for compliance with the regulations (stack emission of less than 0·69 g.standard m^{-3} for new installations and less than 0·80 g.standard m^{-3} for existing installations). Tests were therefore conducted to determine the effect of a secondary collector system. Results showed that only a wet scrubber as secondary system could raise the efficiency to a level sufficient to meet the requirements, while a dry system would not conform. (On the other hand, a "Sirocco RF" multicyclone unit on a recently installed furnace gave efficiencies well above 90%.) The proportion of bagasse ash entering the furnace which was discharged as fly-ash was also determined at the two sugar factories involved.

* * *

Fly-ash collectors for bagasse-fired boilers. B. W. FLOOD and R. FREW. *Proc. 41st Conf. Queensland Soc. Sugar Cane Tech.*, 1974, 143–149.—While a multicyclone system had a measured overall efficiency of 91·2% for fly-ash of given size distribution and thus complied with the New South Wales Clean Air Act (maximum permissible emission of 0·4 g.standard m^{-3}), a prototype wetted-louvre collector of the zig-zag passage type, in which the passage walls have sharp pointed corrugations running downwards in the direction of gas flow, had an overall efficiency of 98% for the same ash size distribution. Tests were also conducted on ash collection at elevated waste gas temperatures (of up to 260°C), from which the temperature drop across the collector could be estimated for incinerator-type furnaces.

* * *

Performance of tungsten carbide tipped detachable wear pads for shredder hammers. E. L. HORNIBLOW and F. JOHNSON. *Proc. 41st Conf. Queensland Soc. Sugar Cane Tech.*, 1974, 151–160.—Details are given of tests on the use of shredder hammer detachable wear pads tipped with tungsten carbide which showed that, on the basis of 400,000 metric tons of cane crushed, hammer maintenance costs were A$ 0·0106 per metric ton compared with A$ 0·0215 per metric ton for arc hard-faced hammers, the costs of the latter type not including a number of extra costs, including those of removal and replacement of the hammers as well as duplicate hammer sets which are required.

* * *

Preliminary studies on the enzymic "removal" of dextran from deteriorated cane juice. R. P. FULCHER and P. A. INKERMAN. *Proc. 41st Conf. Queensland Soc. Sugar Cane Tech.*, 1974, 179–186.—Experiments on catalysis of dextran hydrolysis with two commercial enzymes are reported, and an enzymic process for removal of dextran from cane juice outlined; the process, it is emphasized, should only be used in the event of factory stoppages or delays in cane supply, because of the high costs of the process and the possible encouragement of harvesting inefficiency. The process is based on incubation of mixed juice with dextranase at 60°C for 40 minutes.

* * *

New pan stage arrangement—Mossman. S. C. GRIMLEY and T. A. TAYLOR. *Proc. 41st Conf. Queensland Soc. Sugar Cane Tech.*, 1974, 187–191.—The layout of the six-pan station at Mossman, where the No. 6 pan is computer-controlled[1], is described and general reference made to its performance during the 1973 crushing season.

* * *

Some thoughts on conductivity control of pan boilings. K. A. STUART. *Proc. 41st Conf. Queensland Soc. Sugar Cane Tech.*, 1974, 193–197.—The author explains the fundamentals of conductivity control in pan boiling and indicates the changes that take place in crystal content and supersaturation during boiling at constant set-point and required changes in the conductivity set-point to maintain a set supersaturation. It is pointed out that since most high-grade pans operate successfully at a set conductivity throughout the entire strike, the changes in the boiling variables must be largely compensating.

* * *

Pan stage scheduling. P. G. WRIGHT. *Proc. 41st Conf. Queensland Soc. Sugar Cane Tech.*, 1974, 199–206. From an examination of high- and low-grade boiling, it is concluded that high-grade pans would operate more efficiently if footing storage facilities were available for the strike (as opposed to magma) pans. This would overcome problems involved in scheduling pan station operation, as demonstrated by a system introduced at Mossman and Pleystowe in which a stirred receiver able to hold two or three strike pan footings enables the massecuite from the second magma boiling to be discharged into it while the strike pans can draw a footing from it; it thus acts as a buffer between magma preparation and strike pan operation. Calculation of massecuite quantities is demonstrated.

* * *

The 110 m^3 pan at Inkerman. G. R. NIELSON. *Proc, 41st Conf. Queensland Soc. Sugar Cane Tech.*, 1974. 207–210.—Details are given of a 110 m^3 working volume calandria pan installed at Inkerman where the previously largest pan had an effective volume of 63·6 m^3. Modifications were necessary because of the low footing volume of 32 m^3. Despite fears that the pan would have an adverse effect on the factory steam

[1] FREW *et al.*: *I.S.J.*, 1975, 77, 55.

balance, it has been found that it operates very efficiently and has reduced the pan station steam consumption. Operation of the centrifugal and sugar drying stations improved because of the greater volume of massecuite from the one pan, while filtrability of the sugar from the pan was better than from the smaller coil pans.

* * *

Effluent treatment at Farleigh mill. K. E. McNeil, J. F. Bond and W. C. Gampe. *Proc. 41st Conf. Queensland Soc. Sugar Cane Tech.*, 1974, 235–241. Details are given of the activated sludge plant at Farleigh. Superphosphate and ammonium hydroxide are added in quantities equivalent to 150 mg.litre^{-1} of nitrogen and 10 mg.litre^{-1} of phosphorus, the total hourly inflow of effluent being 40,000 litres. The COD is reduced from 1600–4000 mg to 50–150 mg per litre in the Passveer-type oxidation ditch which is located after the settling and aeration tanks, while the final effluent BOD_5 is 6–25 mg.litre^{-1} and the solids content <50 mg.litre^{-1}. It is planned to discharge up to 40,000 litres of sludge daily to mud hoppers for transport to fields. "Clean" water discharged directly from the sugar factory into the local waterway was found to have a BOD_5 of 120 mg.litre^{-1}, a sucrose content of 13·5 mg.litre^{-1} and a total organic carbon content of 109 mg.litre^{-1}. However, the volumes of such water being discharged are not great, although treatment would involve installation of a larger clarifier and re-utilization of as much as possible in order to reduce the hydraulic load on the plant.

* * *

Evaluation of a solid-bowl centrifuge for mud treatment. P. N. Stewart, A. G. Noble, G. A. Brotherton and K. Nix. *Proc. 41st Conf. Queensland Soc. Sugar Cane Tech.*, 1974, 249–259.—Tests on primary mud treatment in a "MercoBowl 16L" solid-bowl centrifuge operating at 3400 rpm and a scroll differential speed of 38 rpm showed that retention fell gradually with increase in feed rate from 50 to 130 kg.min^{-1}, that addition of flocculant ("Separan SG2") improved retention, but that addition of lime had only minor effect on retention, particularly at higher fibre contents, although excellent results (up to 96% retention) were obtained by liming to a pH greater than 11 and maintaining a dilution water usage of about 80% on feed at 50 kg.min^{-1} feed rate. Decrease in lime usage caused a marked fall in retention, which was greater at 3400 rpm than at two lower speeds tested. A reduction in speed also produced a significant increase in cake moisture and increased the susceptibility of the machine to pulsing and intermittent ejection of liquid with the cake. Variation in scroll differential speed did not affect cake moisture. Under optimum conditions of 3% feed fibre content, speed of 3400 rpm, scroll differential speed of 19 rpm, maximum water usage of 18·2 kg.min^{-1} as feed dilution and 36·3 kg.min^{-1} in the centrate pool, 30 ppm flocculant usage (on feed) and a relatively long drying beach (272 mm centrate ring), a pol loss of 0·67% pol in cane and a mud solids retention of 60% were obtained at 100 kg.min^{-1} feed rate, while respective values of 0·60% and 73% were obtained at 70 kg.min^{-1} feed rate. While the pol loss was lower than is normally achieved by many Queensland sugar factories using rotary vacuum filters for mud treatment, it was higher than with a *well-operated* filter station. The chief advantage of a centrifuge over a rotary filter is its overall simplicity and smaller space requirement, with lower ancillary equipment requirements. The centrifuge is simpler to operate and more easily controllable than a rotary filter, especially during start-up and shut-down.

* * *

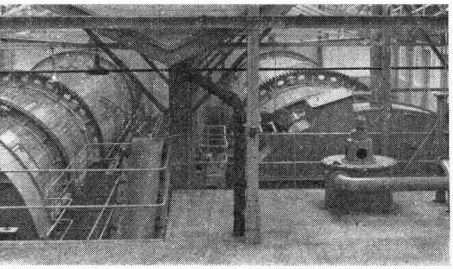
Mud centrifugation—preliminary trials. D. J. Hale, K. J. Meng, T. W. Meredith and E. Whayman. *Proc. 41st Conf. Queensland Soc. Sugar Cane Tech.*, 1974, 243–248.—Tests were conducted on treatment of muds in a Sharples solid-bowl centrifuge at 4000 rpm. Hot maceration water at about 85°C was used as dilution water, and flocculant added. Cake removal from the centrifuge was by means of an inclined screw conveyor which fed it to the factory main mud conveyor, while the centrate was recycled to the mixed juice pump sump. Results showed that bagacillo caused no improvement in mud retention, whereas flocculant did have a beneficial effect. However, best results (retention of 95%) were achieved when lime was added to the centrifuge feed, giving a clear centrate having a yellow colour characteristic of juice of high pH. The final cake weight was significantly affected by cake moisture content, which in turn appeared to be markedly influenced by the speed of the centrifuge scroll. Normal centrifuge load was equivalent to about 50 tons of cane per hour. At an average cane pol of 13%, a mud pol of 3·6 and a moisture content of 67%, the cake pol loss after centrifuging was estimated at 0·6. While mud retention was no problem at moderate loads and a high feed pH (10), with higher loads retention decreased and increasing recycling of solids would eventually lead to shut-down. On the other hand, a filter station is self-correcting, with retention increasing with cake thickness and output, but cake pol is higher than with a centrifuge. A wax fraction was found in the clear centrate, however, which could not be separated even by much higher *g* forces.

* * *

An engineer's guide to the "MercoBowl" centrifuge. R. J. Hunwick. *Proc. 41st Conf. Queensland Soc. Sugar Cane Tech.*, 1974, 261–267.—Application of a "MercoBowl" centrifuge to mud treatment is discussed, with outline schemes compared for both centrifuge and filter treatment. Among advantages claimed for the centrifuge are: lower pol loss than with normal filter operation (although it is admitted to be higher than with a well-operated filter station), smaller wash water requirements and lower cake moisture.

* * *

Studies on colour in sugar manufacture. D. P. Kulkarni and J. R. Unde. *Sugar J.*, 1974, **36**, (12), 23–29. Results are given of investigations on colour formation in plantation white sugar and raw sugar as well as cane sugar factory intermediate products and molasses. Values are given for each process in the factory and the effect of heat on colour formation particularly noted, especially at different initial pH values. In white sugar manufacture, greatest colour increase occurred in boiling, while in raw sugar production marked coloration took place in both evaporation and boiling. Colour formation in sulphitation syrup due to heating after addition of specific sugars showed than the additives had negligible effect on coloration. Colour formation in heated raw sugar was greater than in white sugar heated under identical conditions. Sucrose solution colour increased on heating to a greater extent with rise in pH.



Beet sugar manufacture

Rational beet cossette shape. YU. A. TERENT'EV and N. N. PUSHANKO. *Sakhar. Prom.*, 1974, (5), 23–26. Why square-sectioned cossettes are considered better than groove-shaped cossettes as regards sugar extraction is explained and some laboratory tests reported which demonstrated the validity of the argument.

* * *

Possible means of raising sugar quality when raw (cane) sugar is processed in beet sugar factories. M. I. DAISHEV, V. M. SHCHERBAK and L. M. DAISHEVA. *Sakhar. Prom.*, 1974, (5), 26–30.—Optimization of refining processes at Soviet beet sugar factories handling cane raws is discussed, and results are given of laboratory experiments involving treatment of 60–65°Bx liquor by carbonatation during which addition of spent carbon was found to improve juice parameters (optical density, purity, lime salts and reducing matter) compared with conventional carbonatation without carbon. This was followed by sulphitation, phosphatation and decolorization with active carbon to give an optical density averaging 0·56 compared with an initial 4·72 and a purity rise from 98·64 to 99·8.

* * *

Physical properties and chemical composition of Class I waste water from beet sugar actories. A. P. PARKHOMETS and S. A. TARGANCHUK. *Sakhar. Prom.*, 1974, (5), 30–34.—The ranges of values of physico-chemical parameters of the components in Class I waste water are tabulated. The category includes condenser water (sub-divided into three groups), cooling water and water emanating from hydraulic valve cylinders.

* * *

Device for automatic measurement of 1st carbonatation juice settling rate. V. P. KOVAL'CHUK and M. A. DUDA. *Sakhar. Prom.*, 1974, (5), 39–42.—A description is given of an electrically-operated device for measuring juice settling rate which operates on the basis of light penetration from a source to a photoelement on the opposite side of a settling tank. Measuring accuracy is $\pm$ 2·5%, as demonstrated by comparison with values obtained by laboratory methods.

* * *

Effect of formalin addition on cossette transport in trough-type diffusers. J. GRABKA. *Gaz. Cukr.*, 1974, **82**, 57–61.—Since formalin was found to have a noticeable effect on cossette physical properties only if the beet tissue was still not denatured, the author considers that the suggestion that formalin would markedly affect cossette transport in diffusion can be ignored.

* * *

Mixers without moving parts. L. KONOPKO. *Gaz. Cukr.*, 1974, **82**, 61–67.—A general survey is presented of fixed pipeline mixers, with brief mention of their possible application in the sugar industry, e.g. for milk-of-lime and CO_2 addition to juice.

* * *

Ion exchange technology in the sugar industry. B. BRANDEL and L. PAWLOWSKI. *Gaz. Cukr.*, 1974, **82**, 67–70.—Applications of ion exchange and ion exclusion in the sugar industry are reviewed.

* * *

"Anios BX5" in beet diffusion. C. CORNET, R. DETAVERNIER and P. DEVILLERS. *Sucr. Franç.*, 1974, **115**, 211–217.—Experiments are reported in which "Anios BX5" at 0·25% concentration proved as effective a disinfectant as did a much greater quantity of formalin in diffusion. At the concentrations tested, "Anios BX5" is not toxic or corrosive, and it is particularly effective against *Pseudomonas* spp., *Escherichia coli*, staphylococci, yeasts and moulds.

* * *

The induction flow meter and its use in the sugar industry. W. HOGREFE. *Zucker*, 1974, **27**, 237–244. The principle of the induction flow meter is explained and its application in beet diffusion, liming and carbonatation demonstrated with the aid of flow diagrams. Chief advantages are its independence of such physical parameters as temperature, density and consistency; the measuring tube has no moving parts and juice solids have no effect. Accuracy is of the order of $\pm$ 0·5%.

* * *

Drying processes in the sugar industry with reference to the present regulations on environmental protection. W. ROSE. *Zucker*, 1974, **27**, 259–260.—A report is presented of a one-day symposium organized by Büttner-Schilde-Haas AG concerned with aspects of drum dryers and their operation, particularly within the framework of the West German regulations on atmospheric pollution. Both beet pulp and sugar dryers/coolers were discussed.

* * *

The Bury St. Edmunds project. Conversion from raw to white sugar production. F. A. PEPPER and I. S. HIGGINS. *Paper presented to the 22nd Tech. Conf. British Sugar Corp.*, 1974.—Details are given of the new equipment installed and other changes made when the raw sugar factory at Bury St. Edmunds was converted to white sugar production during the period between the end of the 1972/73 campaign and the start of the 1973/74 campaign. The scheme is based on a daily slice of 7000 tons of beet, with white sugar production from 5000 tons per day and storage of thick juice from the remaining 2000 tons; white sugar storage capacity in the new silos totals 48,000 tons, while 54,000 tons of thick juice are to be stored. Despite the major changes and construction work, the campaign start at the factory was delayed by only 10 days. Some problems in factory operation

occurred, particularly in the balancing of the processes throughout the factory as a result of defective 1st carbonatation and evaporation, both of which had functioned well before the changes. The authors consider more prolonged training of personnel necessary.

* * *

Computer control of sugar boiling. R. J. BASS, M. F. BRANCH and J. DONOVAN. *Paper presented to the 22nd Tech. Conf. British Sugar Corp.*, 1974.—The computer control schemes used in the boiling house at Wissington sugar factory are described. All control operations are carried out by direct digital control which operates on an incremental basis unlike analogue control—each change in an output instruction to the plant is calculated by a control algorithm; each plant variable is transmitted to the computer by an analogue signal and converted to digital form within the interface equipment, all variables being scanned by the computer every second and the latest values stored within the computer memory. Each individual loop is processed by the relevant algorithm once a second and a new value for the control valve position transmitted. Control of feed to the four after-product pans is based on conductivity; each pan is controlled from its own individual programme, while there is a set of sub-programmes common to all pans. The three raw-product pans have two possible cycles of operation, one based on seeding and the other on "magmatization". As with the after-product pans, feed control is based on conductivity. For the six white sugar pans, feed control is based on temperature and mobility measurements. With 2nd and 3rd product pans, the operator can switch to analogue automatic or manual control on any one, or combination, of the pan control loops. Otherwise, he has only to start the cycle and act when he is advised that the pan is ready to discharge. With the 1st-product pans, fully-automatic control was anticipated for the 1974/75 campaign. Results have indicated a more standard product, even when new operators are being trained. The reliability of computer systems is briefly discussed.

* * *

The role of surface aeration in effluent treatment and its application at Wissington factory. J. N. SMITH, M. F. BRANCH and R. H. ROGERS. *Paper presented to the 22nd Tech. Conf. British Sugar Corp.*, 1974. After a survey of the various types of surface aeration plant used at British Sugar Corporation factories in the treatment of effluent, the authors give a more detailed account of the system used at Wissington to reduce waste water BOD and solids content to the levels required by law for discharge to the adjacent river (maximum permissible BOD of 20 mg.litre^{-1} and maximum solids content of 30 mg.litre^{-1}). The effluent (beet flume water) is fed to a Dorr thickener after beet and tails separation, the overflow recirculated and the underflow pumped to a series of lagoons where most of the solid material settles out and from which some water is recycled to the thickener as make-up. The rest of the effluent is fed through a small lagoon provided with two surface aerators and thence to two large lagoons where it is stored for later treatment and disposal. Water from the lagoon system is fed to a Pasveer ditch for final treatment and discharged to the river. The effluent is limed before being pumped to the thickener. The 3rd product condensers are fed from and discharged to the system with a resultant increase in temperature of the water in the circuit. Domestic sewage from site is fed directly to the Pasveer ditch. Experiences with the system over three years are described, and the major factors affecting rate and efficiency of the effluent treatment examined.

* * *

Application of a condensate still for boiler feed water. D. F. A. HORSLEY and D. R. RUSSELL. *Paper presented to the 22nd Tech. Conf. British Sugar Corp.*, 1974. Following the successful operation of a pilot plant at Peterborough in 1971/72, a full-scale condensate distillation plant was installed at King's Lynn in the 1973/74 campaign. Low-pressure steam which, after condensation, is returned to the feed water receiver, is used to heat 3rd condensate (2nd vapour condensate), and the vapour produced is added to exhaust steam entering the 1st evaporator effect whence it is returned to the boilers. The authors describe the modifications to the evaporator system necessitated by the installation of the still, and heat balance data are presented. The boiler feed water quality was improved to such an extent that there was a marked reduction in consumption of chemicals for water treatment, while post-campaign inspection of the boilers confirmed the expected improvement in internal conditions. Running costs of the still are shown to be much lower than of a comparable deionization plant.

* * *

First carbonatation end-point control. J. F. T. OLDFIELD, N. W. BROUGHTON and M. SHORE. *Paper presented to the 22nd Tech. Conf. British Sugar Corp.*, 1974.—Tests were carried out to compare the efficiencies of 1st carbonatation end-point control by means of pH and by control of juice conductivity (with the set point pre-determined by alkalinity titration) as used at British Sugar Corporation factories. The fundamentals of both types of control are examined, and conclusions drawn from the test results, which showed that conductivity was more sensitive to alkalinity change than was pH; moreover, maintenance of pH control equipment is more involved and costly than for comparable conductivity equipment.

* * *

Detection and protection to arrest corrosion in evaporators. M. CORNET and M. GIORGI. *Paper presented to the 22nd Tech. Conf. British Sugar Corp.*, 1974. Corrosion in evaporator tubes is detected by determining the juice iron content before and after evaporation by an atomic absorption method developed by PIECK, which is extremely rapid and accurate; the presence of tube corrosion is indicated by an easily detectable increase in juice iron. The actual vessel involved can be found by a series of determinations carried out after each effect. It has been suggested by CORNET *et al.* that, in view of preferential corrosion of new tubes in many partially re-tubed and phosphate-treated vessels, juice contains its own corrosion inhibitors. For these to have effect, the corrosion cell current must be cancelled, which is achieved at pH 11. Hence, addition of NaOH to the juice before the 1st effect will permit the thick juice leaving the evaporator to have a pH of 11 for a period of 4 hours. It is emphasized that this is purely a preventive measure before the start of the campaign, but should not be assumed to give complete protection from corrosion.

Thin juice decalcification. T. LUBIENSKI and B. MACKAY. *Paper presented to the 22nd Tech. Conf. British Sugar Corp.*, 1974.—Experience with thin juice deliming by ion exchange at British Sugar Corporation factories, and particularly at Felsted, is described in some detail. Difficulties resulting from poor regeneration with brine and from resin fouling, coupled with inadequate utilization of some of the resin in the vessel, have led to investigations of ways of improving backwashing.

* * *

Influence of 2nd carbonatation temperature on juice lime salts content. E. A. GRIVTSEVA, L. P. REVA, N. D. IZBINSKAYA and M. KH. LIKHITSKII. *Kharch. Prom.*, 1973, **17**, 122–126.—Experiments showed that, provided 2nd carbonatation was carried out with maintenance of optimum juice alkalinity, the lime salts content in the juice was practically the same, regardless of 2nd carbonatation temperature (within the range 60–100°C), and did not alter during evaporation.

* * *

Electrochemical behaviour of St. 3 steel in raw juice. V. V. SUPRUNCHUK *et al. Kharch. Prom.*, 1973, **17**, 128–133.—Investigations of electrochemical behaviour and corrosion of St. 3 low-carbon steel in sugar solutions and raw juice of varying dry solids are reported.

* * *

Coagulation of the protein-pectin complex. J. VAŠÁTKO, E. MÓROVÁ, A. DANDÁR and J. ŠTUDNICKÝ. *Sucr. Belge*, 1974, **93**, 193–199.—See *I.S.J.*, 1974, **76**, 151.

* * *

Beet reception and storage. M. Z. KHELEMSKII and V. A. KNYAZEV. *Trudy Vsesoyuz. Nauch.-Issled. Inst. Sakhar. Prom.*, 1973, **19**, 5–17.—Experiments conducted over a number of years on beet reception are reported and basic lines of development of new reception techniques are examined. A number of aspects of beet storage are also considered with a view to finding ways of reducing losses and improving the beet processing quality. One method which is given prominence is storage in forced-ventilation piles 9–10 m high, in which losses have been noticeably reduced compared with lower piles.

* * *

Prospective scheme for mechanization of loading-unloading and transport operations in beet yards. N. M. KICHIGIN and N. A. EMEL'YANOV. *Trudy Vsesoyuz. Nauch.-Issled. Inst. Sakhar. Prom.*, 1973, **19**, 31–40. Beet unloading, piling and reclaiming for factory processing are discussed and a scheme suggested for use in existing Soviet sugar factories; for new or reconstructed factories, a modified scheme is described.

* * *

Effect of various factors on the physical medium in beet piles. N. T. POEDINOK. *Trudy Vsesoyuz. Nauch.-Issled. Inst. Sakhar. Prom.*, 1973, **19**, 76–86.—Results of investigations on the effects of temperature, moisture, CO_2 and O_2 in beet piles are reported, in which it was found that the pile microclimates as expressed by the above factors were divisible into three categories corresponding to autumn, winter and spring, and that the piles taller than 3·5–4·0 m had a higher relative humidity and CO_2 content than did lower piles.

Sprouting of beet during storage and measures to combat it. M. Z. KHELEMSKII, V. B. VARSHAVSKAYA, I. R. SAPOZHNIKOVA and M. L. PEL'TS. *Trudy Vsesoyuz. Nauch.-Issled. Inst. Sakhar. Prom.*, 1973, **19**, 87–100.—From a long-term study of the problem of beet sprouting in beet piles and its effect on sugar losses, it was found that the quiescent period varied with beet variety, but was never very long, and that it was reduced by a rise in temperature and air moisture content; moreover, unripe beet sprouted sooner than mature beet. Tests showed that sprouting could be retarded by treatment with magnesium chlorate, "Reglone" and "Gramoxone" desiccants, by irradiation with a γ-ray source, and by treatment with the sodium salt of maleic hydrazide. While further work is to be carried out on the use of desiccants, the use of maleic hydrazide has been recommended officially for use in the USSR.

* * *

Investigation of the physical state of sugar beet with the aid of ultrasonics. M. Z. KHELEMSKII, I. A. EROSHENKO and N. M. ONISHCHENKO. *Trudy Vsesoyuz. Nauch.-Issled. Inst. Sakhar. Prom.*, 1973, **19**, 112–130. Ultrasonics were used to determine the physical condition of fresh, withered and frozen beet. The speed of penetration of the ultrasonic waves, nominal reverberation time and natural oscillation frequency were established and found, under otherwise equal conditions, to indicate physical differences between the beets with sufficient accuracy.

* * *

Experiment in beet storage in piles 7·5–9·0 m high (at Makovskii sugar factory). M. Z. KHELEMSKII, B. I. KRASNOKUTSKII and A. KH. STARUSHENKO. *Trudy Vsesoyuz. Nauch.-Issled. Inst. Sakhar. Prom.*, 1973, **19**, 131–136.—Tests over three campaigns showed that beet stored in piles 7·5–9·0 m high suffered lower daily sugar losses than in piles 1·5–2·0 m high, both piles being artificially ventilated.

* * *

Study on moistening of air used in forced ventilation of beet. M. Z. KHELEMSKII *et al. Trudy Vsesoyuz. Nauch.-Issled. Inst. Sakhar. Prom.*, 1973, **19**, 137–144. Three schemes for moistening air are described. Tests with them are reported, and the positive effect (in reducing daily sugar losses) demonstrated in comparison with dry air ventilation.

* * *

New covering for tall piles. M. Z. KHELEMSKII *et al. Trudy Vsesoyuz. Nauch.-Issled. Inst. Sakhar. Prom.*, 1973, **19**, 145–155.—Tests with various types of covering for tall beet piles under Soviet conditions are reported. Most suitable as protection and easiest to handle were special panels comprising paper wadding enclosed within a polyethylene film sleeve.

* * *

Hydrodynamics of ventilation and freezing of beet. V. A. KNYAZEV. *Trudy Vsesoyuz. Nauch.-Issled. Inst. Sakhar. Prom.*, 1973, **19**, 156–162.—Mathematical expressions are given for calculating the hydraulic resistance of a layer of stored beet subjected to forced ventilation; it is shown that the resistance is governed by such variables as root size, dirt tare and amount of other extraneous matter.

Synthetic surface-active substances in the sugar industry. I. L. SKÁLA and M. FRIML. *Listy Cukr.*, 1974, **90**, 76–80.—Two non-ionic surfactants manufactured outside Czechoslovakia for use in the sugar industry have been analysed: one (A) is a mixture of condensation products of higher fatty alcohols with ethylene oxide, while the other (B) comprises esters of glucose and higher fatty acids. In Czechoslovakia only surfactants of type (A) are manufactured, and "Slovapon N" comes closest to the imported product.

* * *

Condensate drainage from heating chambers of horizontal diffusers. Z. SOMORA. *Listy Cukr.*, 1974, **90**, 87–93.—The question of condensate removal from the steam jackets used to provide heat in a horizontal diffuser of the DDS type is discussed, and the most suitable means considered to be gravity feed to a lower-level flash tank.

* * *

Capital costs and production factors for thick juice storage in the beet sugar industry. P. VALENTIN. *Zucker*, 1974, **27**, 305–312.—The author examines in detail the capital and running costs of thick juice storage as a function of the quantity stored and period during which the factory plant is being used. It is shown that the optimum proportion of juice to store is 70% on beet, whereby the capital costs are about 15–22% lower than for conventional beet processing, all other factors being equal; alternatively, the running costs could be reduced by cutting the plant utilization period in the range 60–120 days.

* * *

Observations on formulae for yield in the phases of crystallization and clarification. D. LUCHERNI. *Ind. Sacc. Ital.*, 1974, **67**, 31–33.—The author introduces and discusses the use of formulae for calculating the yield of crystalline sugar from a massecuite on the basis of changes in the purity and non-sugar content. A similar method of calculation may be applied to the purification of raw juice to a filtered thin juice.

* * *

Raw juice purification with multi-stage pre-carbonatation. S. ZAGRODZKI, K. SZWAJCOWSKA, S. M. ZAGRODZKI and H. ZAORSKA. *Gaz. Cukr.*, 1974, **82**, 113–118.—See *I.S.J.*, 1973, **75**, 139–140.

* * *

Intensification of the work of tower diffusers in Ukrainian sugar factories. E. V. LITVINOV. *Sakhar. Prom.*, 1974, (6), 23–28.—The adverse conditions created at a number of Soviet sugar factories by installing tower diffusers of excessive rated throughput relative to the rest of the factory process stations have prompted an examination of means of solving the problems. Experiences with modification of the screens and fixed baffles to improve cossette transport and with modification of the cossette scalding system in order to reduce the quantity of juice recirculated for that purpose are described.

* * *

The physical properties and chemical composition of Class II waste water from beet sugar factories. A. P. PARKHOMETS and S. A. TARGANCHUK. *Sakhar. Prom.*, 1974, (6), 28–30.—Details are given of the range of values and mean values of a number of physical properties of and chemical components in flume and wash water as determined at 59 sugar factories.

Change in pH of sugar solutions during electrodialysis and its stabilization. L. D. BOBROVNIK and L. A. FEDORENCHENKO. *Sakhar. Prom.*, 1974, (6), 36–40. Why the pH of sugar solutions exposed to electrodialysis falls is explained, and results of experiments reported in which the pH was maintained at a reasonably constant level (i) by using either special corrugated interleaves which touch the cation exchange membranes and cause their polarization, or (ii) by use of bipolar membranes.

* * *

Calculation of the liming period in connexion with 1st carbonatation juice recycling to preliming. B. I. KATS. *Sakhar. Prom.*, 1974, (6), 30–31.—A formula is presented for calculation of the effective preliming or liming tank capacity required to permit maintenance of a given residence time when carbonatation juice is recycled.

* * *

Arrangement of shut-off and regulating elements with remote control for vacuum pan reheat steam pipelines. YU. V. TOVSTENKO, V. A. TOCHKOVOI, A. F. KRAVCHUK, V. D. NOVOSELETSKI, and P. A. KHOTYNENKO. *Sakhar. Prom.*, 1974, (6), 44–46.—The valve control system is designed for Soviet vacuum pans where no provision has been made for automatic control of steam feed as one of the more important factors in massecuite boiling.

* * *

Increasing the reliability of the control scheme for massecuite centrifugalling. V. N. POKROVSKII and M. V. BABKOV. *Sakhar. Prom.*, 1974, (6), 46–48. An outline is given of a programmed control scheme for use with Sangerhausen centrifugals on *A*- and *B*-massecuites.

* * *

An efficient method for coordinating sulphitation of juice, syrup and condenser water. M. A. ZHURBITSKII. *Sakhar. Prom.*, 1974, (6), 48–50.—A description is given of the sulphitation station at the author's sugar factory where juice, syrup and condenser water are treated in adjacent tanks instead of separately in the diffuser and filter stations and in the pan house.

* * *

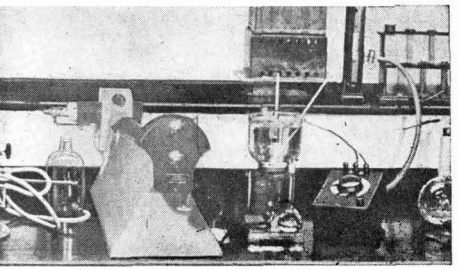
Fuel consumption for beet processing at Khodorovskii sugar combine. R. F. MITROPOL'SKII, V. A. PODLESNYI and V. A. FESIK. *Sakhar. Prom.*, 1974, (6), 54–55. Information is given on steam consumption at this sugar factory and on the distribution of vapour bled from the quadruple-effect evaporator. The various means by which the consumption has gradually been reduced since 1964 are outlined.

* * *

Use of polyphenols in the storage of sugar beet. M. Z. KHELEMSKII, M. L. PEL'TS, I. R. SAPOZHNIKOVA, A. G. ANTONENKO and G. G. TOVSTENKO. *Sakhar. Prom.*, 1974, (6), 56–58.—Of four polyphenols tested as fungicides with stored beet, pyrocatechol and hydroquinone proved the most effective in preventing beet deterioration, while all four reduced daily sugar losses compared with the untreated control.

* * *

Management information in the sugar industry. H. WIRNER. *Zeitsch. Zuckerind*, 1974, **99**, 293–303. Management information as a production factor (and hence subject to cost accounting) and methods used to collate such information are discussed in relation to beet sugar production and marketing.



Laboratory methods & Chemical reports

Depuration of beet raw juice by means of ultrafiltration membranes. S. LANDI, G. PALLA, N. MARIGNETTI and G. MANTOVANI. *Paper presented to the 22nd Tech. Conf. British Sugar Corp.*, 1974.—The theoretical aspects of mass transfer through semi-permeable membranes are explained, and tests described on raw juice ultrafiltration with the aim of removing colloidal macromolecules and suspended solids to permit the juice to be demineralized by ion exchange. Two tubular HFA-300 membrane modules[1] connected in series were used; each 134 cm long, 2·54 cm i.d. module consisted of the membrane supported by an inert porous polyethylene tube housed in a plastic shell with a permeate withdrawal region at one end. Total membrane area was 0·10 m^2, and flow rates up to 893 litres.m^{-2} per 24 hr were obtained, depending on recirculation rate. In all cases, the treated juice was absolutely free of turbidity, and filtration through 0·45 μ Millipore filters was instantaneous. No increase in invert content or change in pH was detected. Average permeate purity was about 1·5 units higher than that of the original juice. Pectin retention by the membrane averaged more than 90%, while protein retention was lower than expected at 70%. Some sucrose was also retained, although this does not occur when pure sucrose solutions are ultrafiltered; reasons for this are suggested. Some inorganic cation retention (expressed as sulphate ash) occurred; sodium and magnesium passed freely through the membrane, while calcium and magnesium were retained, since they are probably partially bound to the protein macromolecules.

* * *

Granulometric analysis of powdered sugar. S. GAWRYCH and E. SKRZESZEWSKA. *Gaz. Cukr.*, 1974, **82,** 85–86.—For accurate sieve analysis of icing sugar, the sample should first be dried to 0·03–0·05% moisture content and the sieves dried for 5–10 minutes at 103°C with subsequent cooling to room temperature.

* * *

Comparison of classic and membrane methods for counting the micro-organisms in sugar. K. MOSSAKOWSKA. *Pr. Inst. Lab. Badaw. Przem. Spozyw.*, 1973, **23,** 369–391; through *S.I.A.*, 1974, **36,** Abs. 74–673. The need for microbiological control in sugar factories and methods of microbiological analysis are reviewed with 28 references covering the period 1949–70, and comparative tests on methods for counting mesophiles, osmophiles and thermophiles are reported. The tests were performed on solutions of sugar samples taken from storage at various Polish factories in 1967–68 and 1968–69. Statistical analysis showed that methods based on membrane filters with average pore size of 0·5–0·6 μm gave results and reproducibilities similar to those of the classic methods based on Petri dishes, with lower consumption of media, and optimum incubation times of 1–3 days instead of 2–5 days.

* * *

Effect of vibrations on the rate of crystallization of sucrose. S. ZAGRODZKI and J. MARCZYŃSKI. *Kristall Tech.*, 1973, **8,** 483–490; through *S.I.A.*, 1974, **36,** Abs. 74–699.—The effect of the amplitude of vibrations of constant frequency 100 Hz on the rate of crystallization of sucrose was studied. Tests were carried out at 40, 60 and 80°C in solutions of low supersaturation (1·05) and of purities 100, 90 and 75, prepared from molasses, refined sugar and water. Vibrations were produced by an electromagnetic vibrator and the increase in weight in a given time of crystals suspended in a wire cage was measured. Results are tabulated and shown in graphs. In pure sucrose solutions, the crystallization rate increased with the amplitude of the vibrations, especially at the lower temperatures. In solutions of 90 purity, the increases in crystallization rate were less marked, while in solutions of 75 purity the rate was almost unaffected at the lower temperatures and decreased with increasing amplitude of the vibrations at 80°C.

* * *

Suspended impurities in cane sugar manufacture. D. P. KULKARNI and V. A. KETKAR. *Proc. 38th Ann. Conv. Sugar Tech. Assoc. India*, 1972, (2), M87–M99. The suspended impurities content in solutions of cane sugar factory products, including juice, syrup, molasses, raw and white sugar, were determined and the tabulated results are discussed. In general, the trends were as expected. Analysis of the molasses samples suspended matter for organic matter and certain constituents is also reported.

* * *

Gradation of Kolhapur gur. S. T. ANJAL and A. G. TABARE. *Proc. 38th Ann. Conv. Sugar Tech. Assoc. India*, 1972, (2), G105–G113.—Analyses are given of 14 gur samples from Kolhapur which were stored in the open to determine the effects of climate.

* * *

The effect of impurities on viscosity and diffusion in aqueous sucrose solutions. L. P. ZHMYRYA, M. N. DADENKOVA, R. S. BURDUKOVA, V. E. PLAKSIN and L. P. STEBLINA. *Kharch. Prom.*, 1973, **17,** 20–24. While addition of 0·3% pectin to aqueous sucrose solution caused a 35% rise in viscosity and a drop in diffusion at lower sucrose concentrations (approx. 5–10% by weight) compared with the absence of pectin, the difference gradually decreased with rise in concentration, as demonstrated by the diffusion curves which tended to converge at about 65% concentration (that for 1st carbonatation juice to which sucrose was added being almost the same as for pure sucrose solution). Separate addition of 0·1% invert, 0·05%

[1] Manufactured by Abcor Inc., of Cambridge, Mass., USA.

raffinose, 0·1% glutamic acid and 0·1% aspartic acid, i.e. in quantities as they normally occur in factories, had no effect on viscosity or diffusion.

* * *

Determination of the true dry solids in sugar factory products. A. P. KOZYAVKIN and L. D. BOBROVNIK. *Kharch. Prom.*, 1973, **17**, 101–104.—Equations are presented for calculation of the factor for conversion of apparent refractometric dry solids to true dry solids. It is shown that the lower the organic non-sugars:inorganic non-sugars ratio, the closer will be the RDS to the true dry solids.

* * *

A simplified starch determination for raw sugars. P. G. MOREL DU BOIL and K. J. SCHÄFFLER. *Proc. 48th Congr. S. African Sugar Tech. Assoc.*, 1974, 39–41. A method based on direct colorimetry is described which is proposed where there is need for a rapid estimation of starch content or where automatic monitoring is feasible; but the simplified method is not intended to replace the conventional colorimetric method used in South Africa. The new method, based on addition of potassium iodate, acetic acid solution and potassium iodide, followed by colour measurement at 600 nm, is highly susceptible to interfering substances (gums, dextran, colloids, colorants, etc.) in solution, and may not be applicable with other than very high purity sugar.

* * *

Calculation of the yield from sugar cane. F. J. RAMÍREZ S. and A. RIVERA B. *La Ind. Azuc.*, 1974, **80**, 269. The system of cane payment in Puerto Rico is based on a formula $R = F[S - 0{\cdot}3\ (B + 0{\cdot}1fc)]$, where R is the yield of 96° sugar, S is pol % cane, B is Brix % cane, fc is fibre plus extraneous matter % cane and F a correcting factor calculated on a basis of previous experience. A brief description is given of the method being introduced for cane sampling using a core sampler and direct analysis using a disintegrator.

* * *

Problems of the sugar laboratory. I. Observations on the measurement of soluble solids in sugar factory syrups. E. R. DE OLIVEIRA, J. P. STUPIELLO and A. J. TAVARES. *Brasil Açuc.*, 1974, **83**, 326–331.—Densimetric Brix measurements were made on different dilutions of several molasses samples and compared with refractometric Brix and total solids. It was concluded that dilution with an equal weight of water is most convenient for routine analysis but that refractometric Brix measurements are more precise.

* * *

Occurrence of micro-organisms in raw juice, mixed juice and imbibition water in a cane sugar factory. U. DE A. LIMA, J. S. GOLDONI, M. P. CEREDA and L. G. DE SOUZA. *Brasil Açuc.*, 1974, **83**, 337–343. An account is given of the micro-organisms identified; they include nine yeasts and six bacteria but did not include *Escherichia coli* as reported elsewhere.

* * *

Determination of standard molasses with the "Saturoskop". P. KADLEC, R. BRETSCHNEIDER, J. SOMMEROVÁ and J. MATĚJEC. *Listy Cukr.*, 1974, **90**, 80–86.—The "Saturoskop" method was used to determine the composition of standard molasses by measuring the saturation coefficient as a function of non-sugars in samples from a number of Czechoslovakian factories. Comparison of the values with results of crystallization tests showed that in most cases the "Saturoskop" method gave pol values which were just over 1 unit lower than the crystallization method, most values falling within the range 48–52. Hence, the "Saturoskop" method, which has the advantage of speed and simplicity, is recommended. Photomicrographs show the changes in crystal habit during dissolution at temperatures in the range 31–67°C.

* * *

Methods of determining the stability of sugar beet roots. M. L. PEL'TS and I. R. SAPOZHNIKOVA. *Trudy Vsesoyuz. Nauch.-Issled. Inst. Sakhar. Prom.*, 1973, **19**, 101–111.—Descriptions are given of methods for determination of suberin, phenols, choline and betaine as well as peroxidase activity in beet root tissue, as indicators of resistance to rotting under the effects of mechanical damage and/or infection.

* * *

Sampling of cane in the field for analytical determinations. M. A. A. CÉSAR, E. R. DE OLIVEIRA, O. VALSECHI and H. DE CAMPOS. *Brasil Açuc.*, 1974, **83**, 344–356.—Statistical analysis was made of the results of analysis of cane samples in which the number of stalks was varied, there being eight cane varieties under study, at 2nd, 3rd and 4th ratoon. Analysis of variance for Brix, apparent purity and available sugar % cane showed that it is better to sample more plots per area than to increase the number of samples per plot. The number of stalks to be harvested for each area depends on the precision required and, where an area is heterogeneous, it will be necessary to divide it into plots and collect samples separately.

* * *

The estimation value of fully-automatic beet analysis. W. UHLENBROCK. *Zucker*, 1974, **27**, 289–291.—The fully-automatic beet tare laboratory can give measurements of beet potassium, sodium and α-amino-N which are of sufficiently high accuracy. However, in the course of a single day, when 800 samples may be processed, deviation from the calibration curve may occur, and a second calibration be required. The author demonstrates how regression analysis can be used to calculate the mean deviation and shows that the greatest deviations occur in α-amino-N and Na determination, while K determination is much less liable to error. Application of values found by automatic beet analysis to determination of sugar losses in stored beet is described by way of example.

* * *

The determination of the structure of "dextrans" isolated from cane sugar. M. T. COVACEVICH and G. N. RICHARDS. *Proc. 41st Conf. Queensland Soc. Sugar Cane Tech.*, 1974, 171–177.—Results are given of investigations conducted on polysaccharides isolated from elongated samples of raw sugar. After purification by repeated precipitation from 47·5% alcohol solutions and fractionation by gel chromatography, nuclear magnetic resonance spectroscopy of the fractions (found to be a more reliable method than the periodate oxidation method) was carried out and revealed that the substances were α,1–6 glucans having branch points. The structure of these dextrans indicated that they would be readily degraded by dextranase enzymes to low molecular weight oligosaccharides. Similar investigations are being extended to a wide range of sugar samples to determine the range of molecular types likely to occur in raw sugar. Dextranase will also be used in a search for differences in molecular structure of the dextran samples.

reader inquiry service

If you wish to receive further information on the products and services mentioned in the advertisements please fill in the inquiry section of this card and post it to us.

reader inquiry service

Please arrange for me to receive without obligation further details of the products referred to below which are advertised in your.....19..... issue.

Advertiser	Product	Page

Signature.....

Block Letters

NAME ..... Date.....

Position.....

Firm.....

Address .....

photocopy service

We are able to supply one photocopy, for research or private study purposes, of most of the original papers abstrated in this journal. It should be noted that these are not translations but are in the original language of publication, which may not be English. Please ask us to quote you the cost of your requirements, indicating whether surface or air mail delivery is to be provided.

photocopy service

Please submit your pro-forma invoice for the supply of one photocopy of each of the following original papers, abstracts of which appeared in your.....19..... issue.

Page	Author(s)	Title

Air Mail/Sea Mail

Signature.....

Block Letters

NAME ..... Date.....

Position.....

Firm.....

Address .....

additional subscriptions

To receive additional copies of *The International Sugar Journal* all you need do is to complete the card with details of the subscription required, and return it with your remittance of £3.00 or U.S. $10.00 for supply by surface mail.

additional subscription order

Please send a further copy of your journal each month to the address below, starting with the issue

.....19.....

Block Letters

.....

.....

.....

.....

.....

Signature.....

Date.....

I enclose cheque/draft/M.O./P.O. for £3.00/$10.00

Reader Inquiry Service,
The International Sugar Journal Ltd.,
23a Easton Street,
High Wycombe, Bucks.
England.

Photocopies Dept.,
The International Sugar Journal Ltd.,
23a Easton Street,
High Wycombe, Bucks,
England.

Subscriptions Dept.,
The International Sugar Journal Ltd.,
23a Easton Street,
High Wycombe, Bucks.,
England.

Reflectance—a useful measure for raw sugar pol control. K. F. MILLER and P. TAYLOR. *Proc. 41st Conf. Queensland Soc. Sugar Cane Tech.*, 1974, 211–217.—Continuous measurement of raw sugar reflectance was tested with a specially devised system at Marian sugar factory during the 1973 season. The simple arrangement consisted of a light source, a photocell receiving the reflected light from the sample as it passed along a flat belt conveyor, and a conductivity bridge to which the photocell transmitted a signal. The measurements, which are compared with a set control value, have proved of some value in determining sugar impurity content based on a regression equation relating impurity content to resistance.

* * *

The effect of starch component concentrations upon filtration. A. C. RAMSAY and R. S. WATTS. *Proc. 41st Conf. Queensland Soc. Sugar Cane Tech.*, 1974, 223–228.—Potato starch amylose, added in varying quantities to refined sugar solution which was then carbonatated, suppressed the growth of $CaCO_3$ agglomerates, probably by acting as a protective surface colloid. On the other hand, potato starch amylopectin, on its own or in the presence of amylose (in cane starch the amylose:amylopectin ratio is approximately 1:4), had a negligible effect on filtration and appeared to act as a nucleus for the growth of the carbonate crystal. Phosphorus, commonly bound as esterified phosphate to amylopectin, may impart a high positive charge to the molecule, thus providing a suitable nucleation centre for growth of the calcite crystal. Although the amylose fraction from cane starch probably has a different molecular weight and chain length from potato starch amylose, a similar effect on filtration as observed in the tests is expected since the amylose-amylopectin distribution in the crystal matrix is similar for potato and cane starches.

* * *

Contribution of soluble and insoluble components to raw sugar filtrability. G. N. RICHARDS and P. N. STEWART. *Proc. 41st Conf. Queensland Soc. Sugar Cane Tech.*, 1974, 229–234.—Ultracentrifuging, alcohol precipitation, dialysis and multiple pressure filtration were applied in investigations on raw sugar samples of low filtrability, containing both high and low levels of dextran, to determine what effect dextran had on filtrability and its relationship with other filtration-impeding components. Removal of the insoluble material in the ultracentrifuge or by repeated filtration yielded solutions which still filtered more slowly than did pure sugar, so that it was concluded that filtration can be impeded by soluble as well as insoluble components, the soluble components, e.g. dextran, not being dialysable and therefore of high molecular weight. The considerable adverse effect of dextran on filtrability was found not to be due to increase in viscosity, but it is suggested that the effect of this and other soluble filtration-impeding components is a result of interaction between them and filter aid, although no mechanism for such interaction is yet known.

* * *

A study of sugar colour. A. C. CHATTERJEE, S. R. KALASWAD and P. D. KAMBUJ. *Sugar News* (India), 1973, **5**, (8), 6–12; 1974, **5**, (9 & 10), 6–17.—The subject of sugar colour is discussed in some detail, covering the theory of light absorption and colour observation, the origin of sugar colour (including those components present as pigments in the plant as well as those occurring as a result of reactions and colour precursors), laws covering colour measurement, the various standards used and conversion of colour scales. The procedure and equipment used in white and raw sugar colour determination at Walchandnagar are described, and some results for refined and white sugar from a number of countries are tabulated.

* * *

The theory of sucrose solutions. M. I. DAISHEV, L. M. DAISHEVA and N. V. ORLOVA. *Izv. Vuzov, Pishch. Tekh.*, 1974, (2), 40–44.—The theory of the effects of temperature and non-sugars on sucrose solubility and crystallization rate and of the existence of metastable and labile zones of supersaturation is examined with reference to the work of various authors. As starting point the authors make use of the assumption that the density of sucrose and its degree of hydration in solutions of varying concentration do not change at constant temperature but fall with rise in temperature, while saturation is attained when all the water passes into the hydration envelope of the sucrose molecule. The density of sucrose was determined at 20°C (1·5681 $g.ml^{-1}$), 40°C (1·5529 $g.ml^{-1}$) and 60°C (1·5378 $g.ml^{-1}$); the corresponding densities of the non-sucrose portion of pure solutions were also determined.

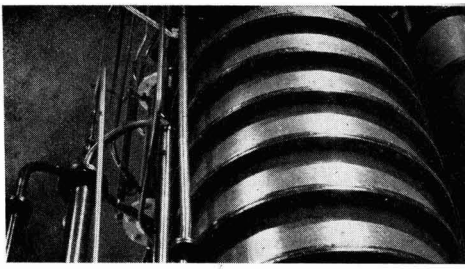
* * *

Investigation of sucrose crystallization by light diffusion. M. N. DADENKOVA, A. I. SHISHLOVSKAYA and R. S. BURDUKOVA. *Izv. Vuzov, Pishch. Tekh.*, 1974, (2), 69–71.—Light diffusion studies of sucrose crystallization kinetics in pure solution are reported in which, at supersaturation coefficients greater than 1·04, the diffused light indicatrix displayed asymmetry relative to the plane perpendicular to the direction of the light beam, indicating formation of heterogeneous particles having linear dimensions commensurate with the light wavelength. Increase in the asymmetry and in the light diffusion intensity with supersaturation was accompanied by increase in the number and size of the heterogeneous particles.

* * *

Determination of silicon in cane juice. N. A. DA GLÓRIA and A. A. RODELLA. *Rev. Agr.* (Piracicaba), 1972, **47**, (2), 125–136; through *S.I.A.*, 1974, **36**, Abs. 74-809.—Methods for determining total or soluble silicon in raw cane juice or molasses are described and discussed. Total silicon is determined by ashing the filtered sample at 500–550°C, dissolving the product in HCl, HF and H_3BO_3, and adding 5% ammonium molybdate solution and 5% oxalic acid solution, followed by an ascorbic acid-Fe^{++} solution; molybdenum blue is formed and the optical density of the resulting solution is measured at 800 and 675 nm. For the determination of soluble silicon, the filtered sample, diluted in the case of molasses, is decolorized by treatment with activated carbon, refiltered and reacted with molybdate, oxalic acid, ascorbic acid and Fe^{++} as before. The methods are considered to be accurate and precise, the recovery of added silicon being 100%; treatment with activated carbon did not appear to affect the level of silicon. The silicon contents of molasses from five Brazilian factories are given.

By-products



Utilization of sugar cane bagasse in the pulp and paper industry. Trial pulping experiments. C. R. GONIN. *Council Sci. Ind. Research Rpt.* (Pretoria), 1972, **48**, (July), 14 + 8 pp; through *S.I.A.*, 1974, **36**, Abs. 74-646.—The effects of various procedures for the pulping of bagasse on the precipitation of lignin and the mechanical properties of the pulp produced were investigated. With each pulping process used (the sulphate, soda and neutral sulphite processes) three different chemical charges were used, i.e. 10, 15 or 20% Na_2O or Na_2SO_3 on dry bagasse. The cooking times at 170°C were 10, 20 or 40 minutes for the sulphate and soda processes, and 60, 75 or 90 minutes for the neutral sulphite process; in each case the heating up and cooling down times were 45 and 30 minutes, respectively, and the liquor to solids ratio was 5·4:1. During alkaline pulping, a chemical charge of $\leq$ 20% should be used to prevent precipitation of lignin. The effects of pulping time and chemical charge on the strength of the pulp were not simple, but there was a general tendency for increased pulping time to cause a decrease in pulp strength.

* * *

Cattle fed from sugar by-products. ANON. *J. Agric. Soc. Trinidad & Tobago*, 1972, **72**, 282–287; through *S.I.A.*, 1974, **36**, Abs. 74-649.—Prospects for the increased use of cane molasses and bagasse in cattle feeding, especially in Jamaica, are briefly discussed. Use of a dry molasses product is recommended; since cattle can digest cellulose, but not lignin, it is preferable to mix the molasses with bagasse pith rather than with whole bagasse, in which case the bagasse fibre can be made into board.

* * *

Bagasse and its utility. V. B. RAO and G. V. S. RAO. *Proc. 38th Ann. Conv. Sugar Tech. Assoc. India*, 1972, (2), G113–G117.—A brief survey is presented of the products obtainable from bagasse.

* * *

Production of monosodium glutamate from molasses. R. L. SRIVASTAVA and P. GUPTA. *Proc. 38th Ann. Conv. Sugar Tech. Assoc. India*, 1972, (2), G129–G133. Properties, characteristics and manufacture of monosodium glutamate from cane molasses are briefly discussed and the economics of production indicated.

* * *

Lincolnshire farm utilizes beet tops to expand beef unit. L. J. LOWTHORPE. *British Sugar Beet Rev.*, 1974, **42**, 99–101.—Information is given on the benefits of feeding fresh beet tops and ensilaged tops to growing beef cattle on a semi-intensive unit in Lincolnshire, England. Feeding of the tops, 7 tons of which are estimated by the farmer to be equivalent to 1 ton of oats, has enabled the stocking rate to be increased from 1·75 to 2 finished 18-month-old animals per acre. The system used to prepare the silage is described.

Particle board from bagasse. H. FRERS. *Sugar y Azúcar*, 1974, **69**, (5), 34–37.—Factors to be taken into consideration regarding installation of a bagasse board plant are discussed, including marketing prospects, bagasse availability and storage, and treatment of board against fungus and mould (of particular importance in tropical countries where most cane is grown).

* * *

The yield of glutamic acid and expediency of extracting it from eluates obtained during demineralization of sugar factory run-offs. K. P. ZAKHAROV and V. N. BELOUS. *Sakhar. Prom.*, 1974, (6), 31–36.—An algorithm is presented for optimization of glutamic acid production from eluates obtained in anion exchange demineralization of affination syrup.

* * *

Determination of supplemental fat in molasses for cattle feeding. J. D. MASTERS. *Sugar J.*, 1974, **36**, (12), 14–15.—After the introduction by the United States Sugar Corporation of molasses supplemented with fat for the feeding of cattle (found to increase the rate of growth and to improve the carcass grade compared with use of molasses on its own or supplemented with corn meal), a method was developed for determination of the fat percentage in the molasses-fat mixtures. Details are given of the method used, which is equally applicable to vegetable and animal fat.

* * *

Effect of molasses seeding with *Trichosporon cutaneum* yeasts on the fermentation process and quality of alcohol and bakers' yeasts. V. N. SHVETS, T. P. SLYUSARENKO and E. I. KNOGOTKOVA. *Izv. Vuzov, Pishch. Tekh.*, 1974, (2), 60–62.—Experiments in which molasses mash was treated with various strains of *Saccharomyces cerevisiae* and with *Trichosporon cutaneum* showed that the latter yeast caused a fall in the alcohol yield and in the concentration of higher alcohols and esters compared with the use of monocultures, although it did not affect the quantity of aldehydes and organic acids in the ripe mash. Maltase activity in *T. cutaneum* was somewhat high, and where it was higher than in certain strains of *S. cerevisiae* it had a marked effect on fermentation activity compared with the monoculture, whereas with *S. cerevisiae* strains of relatively high maltase activity it had a negligible effect. Addition of *T. cutaneum* resulted in a higher winter activity of most of the yeasts obtained from the molasses wort. Because of its action, it is recommended to heat sterilize molasses which has become infected with *T. cutaneum*.

* * *

The by-products industries of Taiwan Sugar Corporation in 1974. J. S. I. WANG. *Taiwan Sugar*, 1974, **21**, 7–12.—Information is given on the diversification programme of the TSC, covering by-products from cane, bagasse and molasses as well as non-sugar lines.

Food from waste

WITH dire forcasts of widespread famine and death from starvation in the developing countries, and rather less serious food shortages in others, the question of how best to increase supplies of food becomes more pressing. With suitable topicality the National College of Food Technology, part of Reading University, is to review a novel source of food at the next of its International Symposia "Food from Waste" to be held 7th–9th April 1975.

The symposium will cover the growth, preparation and recovery of foodstuffs from waste materials, from the aspects of total energy and selected nutrients. Experts from the UK, USA, Holland, Sweden, Poland, Australia, Ireland and elsewhere will speak and chair discussion groups relating to the preparation of protein foods, novel foods produced from various waste products, and their toxicological and socio-economic aspects. It is possible, with modern technology, to make useful forms of high biological value foods out of fungi, algae, or even waste paper. Indeed many of these processes have already advanced well beyond the pilot-scale stage of commercial feasibility.

The symposium will begin on Monday evening, 7th April, 1975, with a keynote speech by Professor S. TANNENBAUM of Massachusetts Institute of Technology, and a short presentation by Tate & Lyle Ltd. on their process of producing a high protein animal feed from agricultural wastes. Proceedings on Tuesday and Wednesday will include papers on "Food from waste paper" (by D. E. BROWN of the University of Manchester Institute of Science and Technology), "Meat waste recovery" (by R. GRANT of the Tasman-Vaccine Laboratory), "Production of microbial protein from carbohydrate wastes in developing countries" (by F. K. E. IMRIE of Tate & Lyle Ltd.) and "Microbial production of oils and fats" (by C. RATLEDGE of the University of Hull). The entire Symposium Proceedings will later be published as a book by Applied Science Publishers (probably in December 1975).

Full details of the Symposium may be obtained from:

The Secretary, National College of Food Technology, Weybridge, Surrey, England.

Tate & Lyle "know-how" deal with Japanese alginate producer. Tate & Lyle Ltd. has signed an agreement with Mitsui & Co. Ltd., of Japan. The agreement covers options in Japan only on Tate & Lyle's development of industrial polysaccharides (polymers derived from sugar). Mitsui's interest specifically concerns the application of microbial alginates from polysaccharides for use as substitutes for plant and algal gums (edible gums). Traditionally, alginates have been obtained from kelp seaweed and are widely used as thickeners, setting agents and sizing additives in the food, paper and textile industries. The development of sugar-derived microbial alginate from industrial polysaccharides, a patented process, is a result of the continuing programme of researching new food uses and more economic uses of existing raw materials by Tate & Lyle's Research & Development Department. Research also includes the development of replenishable substitutes for petro-chemicals and the production of plastics, detergents and alcohols from sugar.

* * *

Paris white sugar market decision reversed[1].—The Paris Appeal Court has reversed the decision by the President of the Paris Commercial Tribunal in December to apply Article 22 fixing sugar market settlement prices following closure of the Paris market, as reported earlier[2]. Whether there will be a counter-appeal to a higher court remains to be seen, however, in view of the large sums involved.

Brevities

Thailand-Japan sugar negotiations[3].—A group of four Japanese trading houses (Marubeni Corporation, Mitsui & Co. Ltd., Nissho-Iwai and C. Itoh & Co. Ltd.) has been negotiating for a private long-term contract for the import of raw sugar from Thailand, according to Japanese trade sources who also said that the deal was being negotiated with the Thai Sugar Corporation, authorized by the Thai Government. Under the five-year contract reported[4], Thailand will supply Japan with 60,000 metric tons of raw sugar in 1975, 250,000 tons in 1976 and 300,000 tons annually in 1977–79, at prices linked with the London Daily Price. There has been no official announcement, however, about lifting of the Thai Government's ban on export of sugar, imposed in September 1974 to prevent price rises on the local market.

* * *

UK sugar factory for Indonesia.—A contract of £7,500,000 for the supply and installation of a sugar factory by A. & W. Smith & Co. Ltd. to P.T. Radjawali Nusantara, of Indonesia, has been guaranteed by the Export Credits Guarantee Department. The factory will be situated 200 miles from Surabaya in Java and will produce 50,000 metric tons of white sugar each year for local consumption. Commissioning of the project is scheduled for July 1976.

* * *

Honiron sugar machinery business sale.—BUD CUNHA, formerly the manager of Honiron's Hawaiian Manufacturing & Engineering Division, has acquired the Honiron Hawaiian Sugar Machinery Department including all of the sugar machinery engineering and drawings. He will offer the Hawaiian sugar industry machinery and equipment and engineering from a number of well known manufacturers such as J & L Engineering Co. Inc. and Edwards Engineering Corporation of Louisiana, Honiron Philippines Inc., Diversified Metal Products Inc. of New Jersey, David Brown Gear Industries Ltd. and John Folkes (Lye Forge) Ltd. of England, and A. W. Fraser & Sons Ltd. of New Zealand. In addition a complete line of stainless steel and copper tubing, castings in all types of alloys, and heavy-duty custom steel fabrication will be offered, and bronze electrical inserts for electrical contractors are stocked. Bud Cunha Sugar and Processing Machinery is located at 1478 A Thurston Avenue, Honolulu, Hawaii, 96822 USA.

* * *

UK beet area, 1975.—The vice-chairman of the sugar beet committee of the National Farmers' Union said on the 4th February[5] that prices paid for beet were too low and that there might be a shortage of beet sugar next year through insufficient plantings unless growers were given a price rise of at least a quarter (as against the 16% already announced[6]. However, the British Sugar Corporation had already announced[7] that contracts had been accepted for 481,000 acres and that total plantings were likely to reach about 500,000 acres; this would be sufficient in a normal year to yield the increased *A*-quota of 1,040,000 metric tons, white value, and compares with 450,000 acres of beet which were actually grown in 1974 although 488,000 acres were initially planted.

* * *

New bagasse newsprint pilot plant in Cuba[8].—An $11-million pilot plant is under construction in Cuba, with the aid of a $3,100,000 grant from the UN, and it is expected to be finished by 1976. Full-scale production should be reached in 1980, according to Cuban officials. The pilot plant will be used in studies to overcome the problems of inadequate tear strength of bagasse newsprint and high cost of impurities elimination and introduction of refining additives; feasibility studies have indicated that these are on the way to being solved.

---

[1] *The Times*, 5th February 1975.
[2] *I.S.J.*, 1975, **77**, 33–34.
[3] *Public Ledger*, 11th January 1975.
[4] *Lamborn*, 1975, **53**, 14.
[5] *The Times*, 5th February 1975.
[6] *I.S.J.*, 1975, **77**, 34.
[7] *Public Ledger*, 1st February 1975.
[8] F. O. Licht, *International Sugar Rpt.*, 1974, **106**, (36), 12.

Brevities

Sugar factory proposal for Zaire[1].—A French study group hsa proposed that a new sugar factory be erected in Kisamba. The proposal includes the establishment of a sugar cane plantation with an area of 6500 hectares, and should start operating in 1977.

* * *

Indian sugar industry expansion[2].—The Government of the State of Tamil Nadu in India is to set up a Sugar Corporation for organizing and running mills to be set up by the Government in the Fifth Plan period, during which the mills are to be erected in order to achieve rapid development of the State's sugar industry.

* * *

Uganda sugar industry rehabilitation scheme[3].—Uganda is sending a 36-man economic mission headed by the Minister of Commerce and Industry to India and Japan to buy the sugar factory machinery necessary to get the country's two main sugar estates back to full production. Production at the two estates, formerly Asian-owned, has fallen by 75% because of transport bottlenecks and mechanical problems in the factories.

* * *

West European sugar machinery for the USSR?—The Soviet Union is reported[4] to be negotiating with the West German firm, Braunschweigische Maschinenbauanstalt, and with firms in Belgium, France and Denmark for the purchase of equipment for the USSR sugar industry for 1975/76.

* * *

New sugar factory for Brazil[5].—The Brazilian Government has authorized the setting-up of a new sugar mill complex in the state of Goias in Central Brazil. The new mill will produce 1,400,000 bags of sugar per year (84,000 metric tons) and will increase sugar cane production in the region which at present has only two sugar factories. The Instituto do Açúcar e do Alcool is opening bids on the building of the new mill and studying sites for its possible location.

* * *

Cuban sugar export deals[6].—Cuba recently proposed a long term sugar deal under which it would supply Japan with 250,000 tons of raw sugar per year for six years, according to Japanese trade sources. Cubazucar, the Cuban sugar corporation, proposed to sell the sugar at prices linked to the London Daily Price plus £20–£30 per ton. Negotiations between Cubazucar and the Japanese Sugar Refiners Association were unsuccessful, however[7], because the pricing terms were unacceptable to the Association. Only recently, Cuba and Spain signed a trade agreement which provides for the delivery of at least 200,000 tons of Cuban sugar to Spain in each of the next three years; in the past two years Cuban sugar exports to Spain were around 100,000 tons, raw value.

* * *

New Sudan sugar project[8].—Lonrho Ltd. has been given approval for its $180 million sugar project in the Sudan. It is claimed it will be the largest single sugar estate in the world. It is a joint venture linking European, Japanese and Arab capital with that of the Sudan Government which will have 51% of the equity of Kenana Sugar Company who will operate the estate. Kenana will have an issued capital of nearly $30 million. The estate will have a capacity of more than 350,000 tons (some 50,000 tons more than originally envisaged) of white sugar and will begin production in November 1977. The site has a fully developed potential of around 1 million tons per annum. Since 1971, when Lonrho initiated the scheme with the Sudan Government, more than 200 experts and technologists from Sudan, Europe, Japan, the US and elsewhere in Africa have been deployed by Lonrho on aerial, topographical and soil survey, site selection, mill design and the design of an extensive pump and irrigation scheme to be fed from the White Nile. At the site a canal has already been dug and water is due to commence flowing to the seed cane farm within one month. Meanwhile trials of cane varieties at the nursery site have already demonstrated promising results. Sudan is currently a heavy sugar importer and this scheme will not only make it independent of imports but will enable it to export around 150,000 tons.

Iran sugar imports[9]

Country of origin	1973*	1972*	1971*
	—— (*metric tons, raw value*) ——		
Argentina	48,760	0	0
Bahrein	0	398	158
Brazil	190,099	11,550	0
Cuba	0	51,845	25,458
EEC	12,984	12,937†	3,752†
India	22,401	0	0
Kuwait	0	141	505
Mauritius	13,302	13,353	0
Thailand	11,990	0	0
Turkey	3,261	10,869	0
USSR	0	5,870	66,377
Other countries	0	1	0
Total	302,797	106,964	96,250

* As reported by countries of origin
† Including 382 tons from the UK in 1971 and 407 tons in 1972.

* * *

Thailand sugar exports[10]

Destinations	1974	1973	1972
	—— (*metric tons, raw value*) ——		
France	0	0	13,440
Hong Kong	0	0	15,985
Indonesia	0	33,103	0
Iran	73,057	12,305	0
Iraq	34,769	10,834	0
Japan	226,405	0	34,961
Jordan	0	0	21,598
Lebanon	12,518	0	0
Malaysia	34,603	104,162	74,292
Nepal	0	0	6,466
Pakistan	0	0	45,336
Saudi Arabia	0	0	21,831
Singapore	11,219	0	2,194
Sri Lanka	12,213	24,283	76,532
Sudan	0	0	30,242
United States	23,862	17,640	16,806
Vietnam, South	0	62,703	68,918
Yugoslavia	0	0	10,260
Total	428,646	265,030	438,861

Irrigation equipment requirement for Morocco sugar industry[11].—The Moroccan Ministry of Agriculture and Agrarian Reform is appealing to foreign specialists for assistance in the equipment of irrigation networks totalling an estimated 170,000 hectares, mainly for sugar crops. The appeal follows King HASSAN'S announcement in November 1974 of a fresh programme to build six new sugar beet and cane processing plants in the next three years. Eight plants are already operating and a ninth is due to go on stream soon. Sugar beet and cane are grown on irrigated farmland which at present totals some 270,000 hectares with existing dams capable of supplying water to 440,000 hectares. The Ministry therefore wants to equip the remaining area urgently, Government sources said.

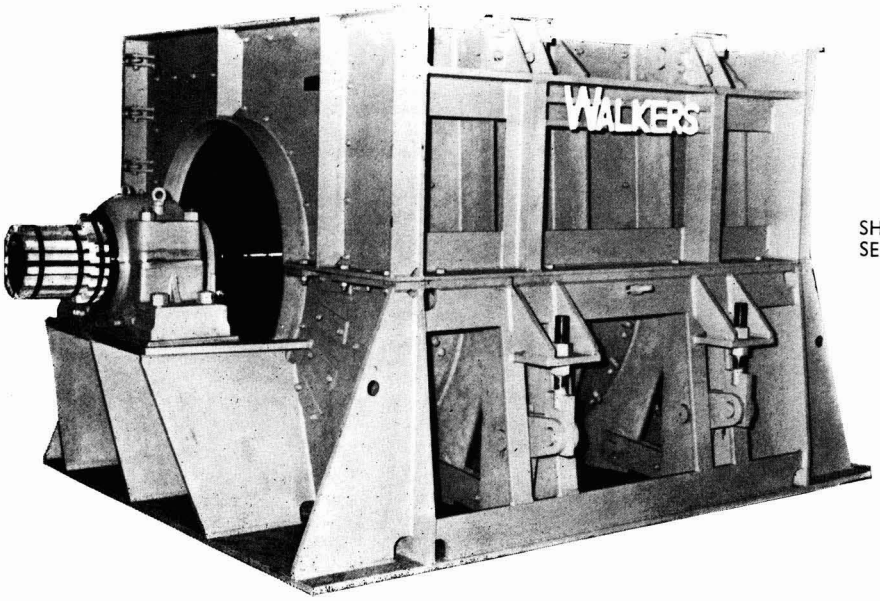
* * *

New sugar factories for Nepal[12].—The Trade and Industries Minister of Nepal has announced that two sugar factories are to be erected in the Kapilvastu and Sunsari districts which have been selected on a basis of economic studies as being more suitable for cane cultivation than other areas.

* * *

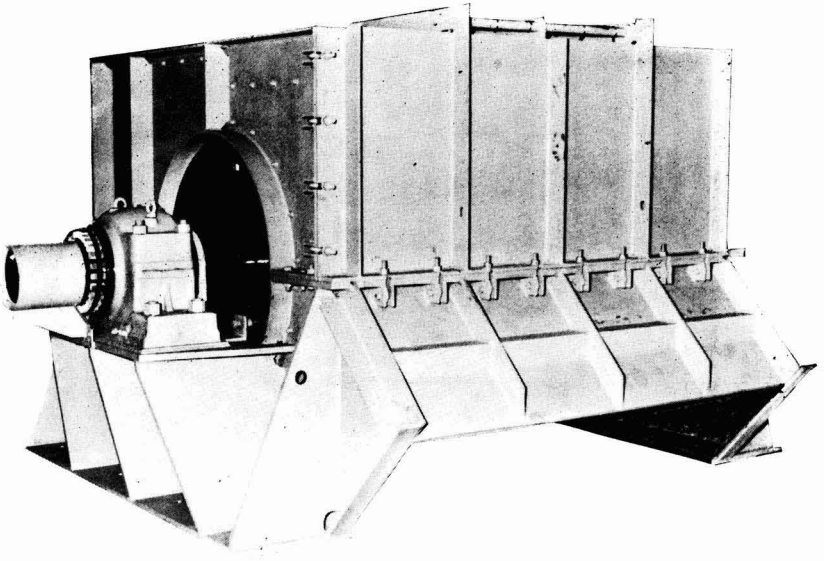
Portugal-Brazil sugar trade agreement[13].—Portugal has announced an agreement under which Brazil is to supply 70,000 tons of raw sugar in 1975 and 100,000 tons per year in the period 1976–79.

[1] F. O. Licht, *International Sugar Rpt.*, 1974, **106**, (35), 13.
[2] *Indian Sugar*, 1974, **24**, 238.
[3] *S. African Sugar J.*, 1974, **58**, 319.
[4] F. O. Licht, *International Sugar Rpt.*, 1974, **106**, (35), 12.
[5] *Sugar y Azúcar*, 1974, **69**, (11), 9.
[6] F. O. Licht, *International Sugar Rpt.*, 1975, **107**, (1), 7.
[7] *ibid.*, (3), 11.
[8] *The Times*, 24th December 1974.
[9] *I.S.O. Stat. Bull.*, 1974, **33**, (12), 58.
[10] F. O. Licht, *International Sugar Rpt.*, 1975, **107**, (3), xi.
[11] *Public Ledger*, 21st December 1974.
[12] *Zeitsch. Zuckerind.*, 1974, **99**, 674.
[13] *Amerop Noticias*, 1974, (14), 2.



SHOWING SHREDDER SECTOR ADJUSTMENT

REAR VIEW INDICATING SHREDDED CANE EXIT



THIS IS OUR LATEST HEAVY DUTY CANE SHREDDER. IT IS OF ALL STEEL CONSTRUCTION, WITH HEAVY CAST STEEL HAMMERS, AND AN ADJUSTABLE SHREDDING SECTOR. THE DIAMETER OVER THE TIPS OF THE HAMMERS IS 60 in. AND THE HAMMERS COVER AN AXIAL LENGTH OF 84 in. CELL RUPTURES OF UP TO 90% HAVE BEEN ACHIEVED WITH THIS TYPE OF SHREDDER.

CONSULT US ON YOUR SHREDDER PROBLEMS

WALKERS LIMITED

CONSULTANTS
DESIGNERS
ENGINEERS

P.O. BOX 211, MARYBOROUGH, QUEENSLAND, AUSTRALIA

Telex: 71578

Index to Advertisers

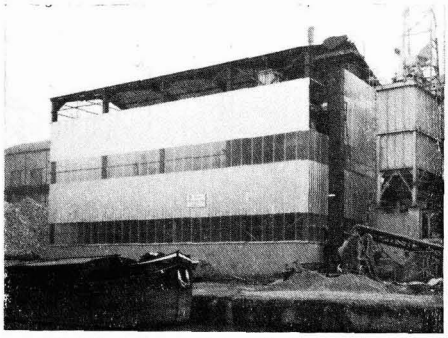
An answer to world's wide sugar shortage
Put more sugar in the bag!

use the CONTINUOUS R.T. SACCHARATE PLANT

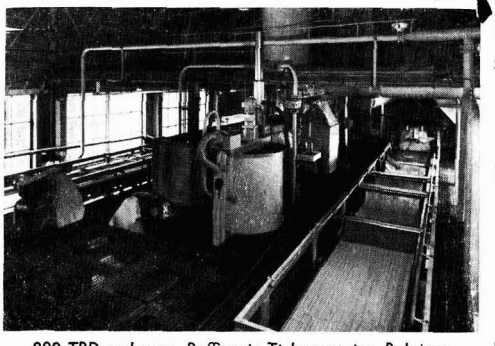
— for beet molasses only —

Plants ordered:

1971:	Tirlemont, Belgium	100 T/d.
1972:	Origny, France	130 T/d.
	Abkouh, Iran	100 T/d.
	Chirvan, Iran	100 T/d.
1973:	Extension Tirlemont	200 T/d.
	Zaio, Morocco	100 T/d.
	Mezzano, Italy	200 T/d.
	Esfahan, Iran	150 T/d.
	Kitami, Japan	110 T/d.
	Nagshe Djahan, Iran	75 T/d.



130 *TPD molasses, Origny St. Benoite, France*



200 *TPD molasses, Raffinerie Tirlemontoise, Belgium*

Full information including feasibility studies on request

SSEC 1 Aandorenstraat - 3300 TIENEN, BELGIUM

SOCIETE SUCRIERE D'ETUDES ET DE CONSEILS

CONSULTING ENGINEERS FOR THE SUGAR INDUSTRY

From seed to molasses

- PRECISION DRILLS
- BEET WASHERS AND STONE CATCHER
- RT CONTINUOUS DIFFUSERS
- AUTOMATIC G.P. FILTERS
- SUGAR SILOS

Phone 016/813011 Telex 22251

PA

Sugar Industry Consultants

Our client, a Sugar Industry Consulting Firm, is expanding its international operations and is appointing additional staff with sugar industry experience. Men to be appointed include those experienced in cane breeding, growing and transport, mill and factory operation and accounting. They will be employed on overseas consulting projects financed by international lending agencies or governments.

A candidate will have held or be holding a senior appointment in his field of specialisation or a managerial position. A minimum of 5 years' sugar industry experience is essential plus appropriate academic qualifications.

Previous consulting experience is not necessary. Ideal age is 35-55.

EMOLUMENTS: Basic salary plus overseas allowance; rent free accommodation; car allowance or provision; medical insurance; home leave and fares.

SECURITY: No details disclosed nor enquiries made without your permission. Please send curriculum vitae and personal details quoting:

Ref. N2608/IJN

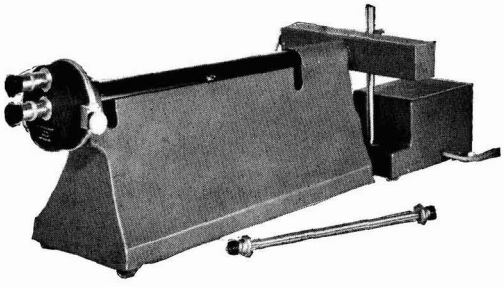
Mr. K. J. Donnollan

P.A. MANAGEMENT CONSULTANTS
PTY. LTD.

221 Miller Street, North Sydney, N.S.W. 2060

BS **Precision Instruments**

Saccharimeter



We have received so many enquiries for a Saccharimeter, that it has been decided to restore this model to our range of polarimeters. A modified version is now available using calcite polarising elements and fitted with International Sugar Scale −120° to +120° I.S.S. and subdivided by micrometer screw and drum directly to .05° and by estimation to .02°.

The trough, which accepts sample tubes of up to 400 mm length, is formed at the top of an easily cleaned base, and is provided at either end with drainage to prevent spillage entering the optical units.

A sodium lamp is supplied as standard equipment together with a suitable filter for operation at 589.3 nm.

SOLE DISTRIBUTORS IN U.K. OF SCHOTT INTERFERENCE FILTERS

BELLINGHAM & STANLEY LIMITED BS

64, MARKFIELD RD. LONDON N.15. TEL.01-808 2675

Printed by JOHN ROBERTS & SONS, Salford, Manchester; and published by the Proprietors THE INTERNATIONAL SUGAR JOURNAL LTD. at 23a Easton Street High Wycombe, Bucks. Entered at the New York Post Office as Second-Class Matter.

PRINTED IN GREAT BRITAIN.