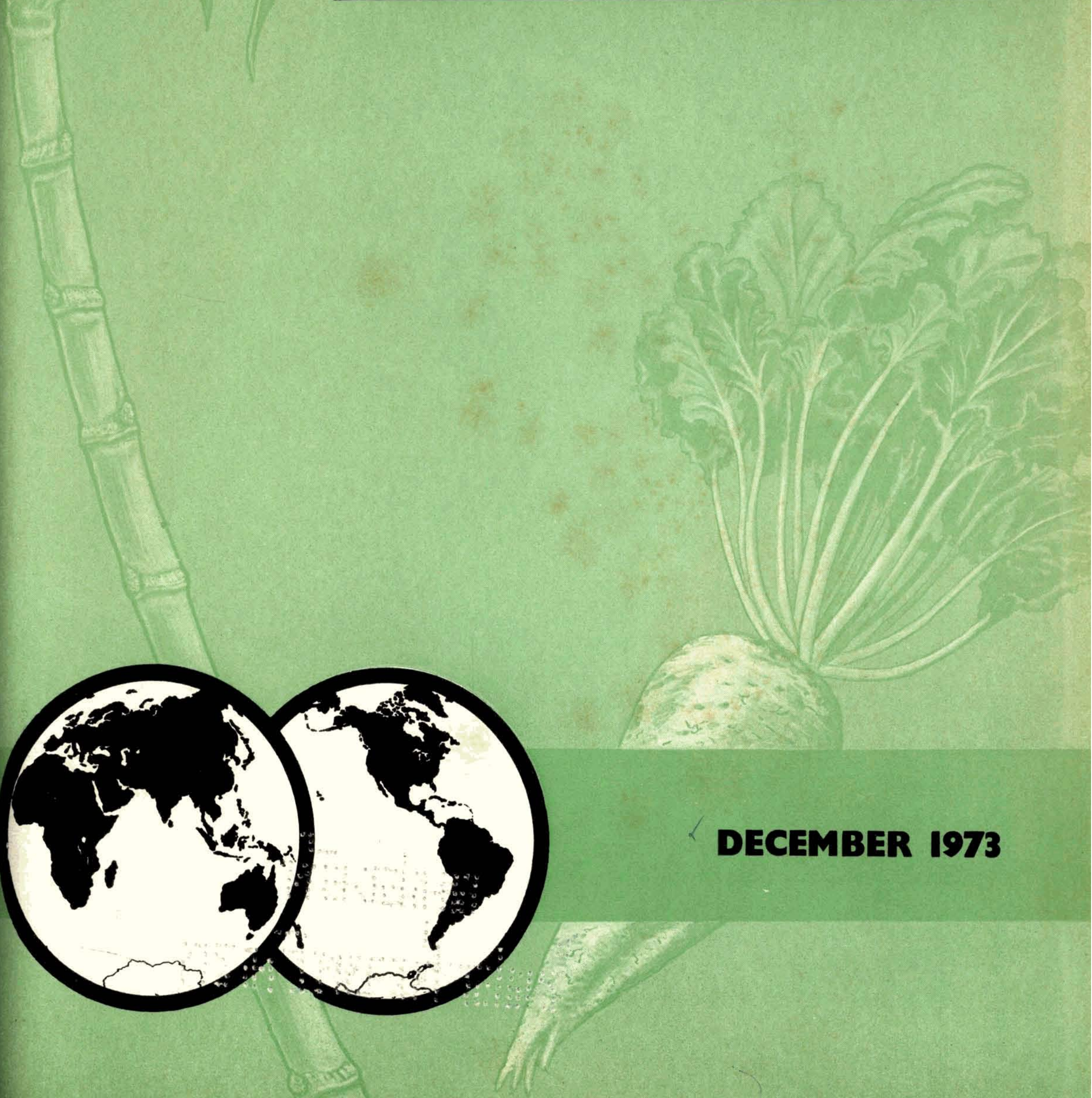
THE

International Sugar Journal



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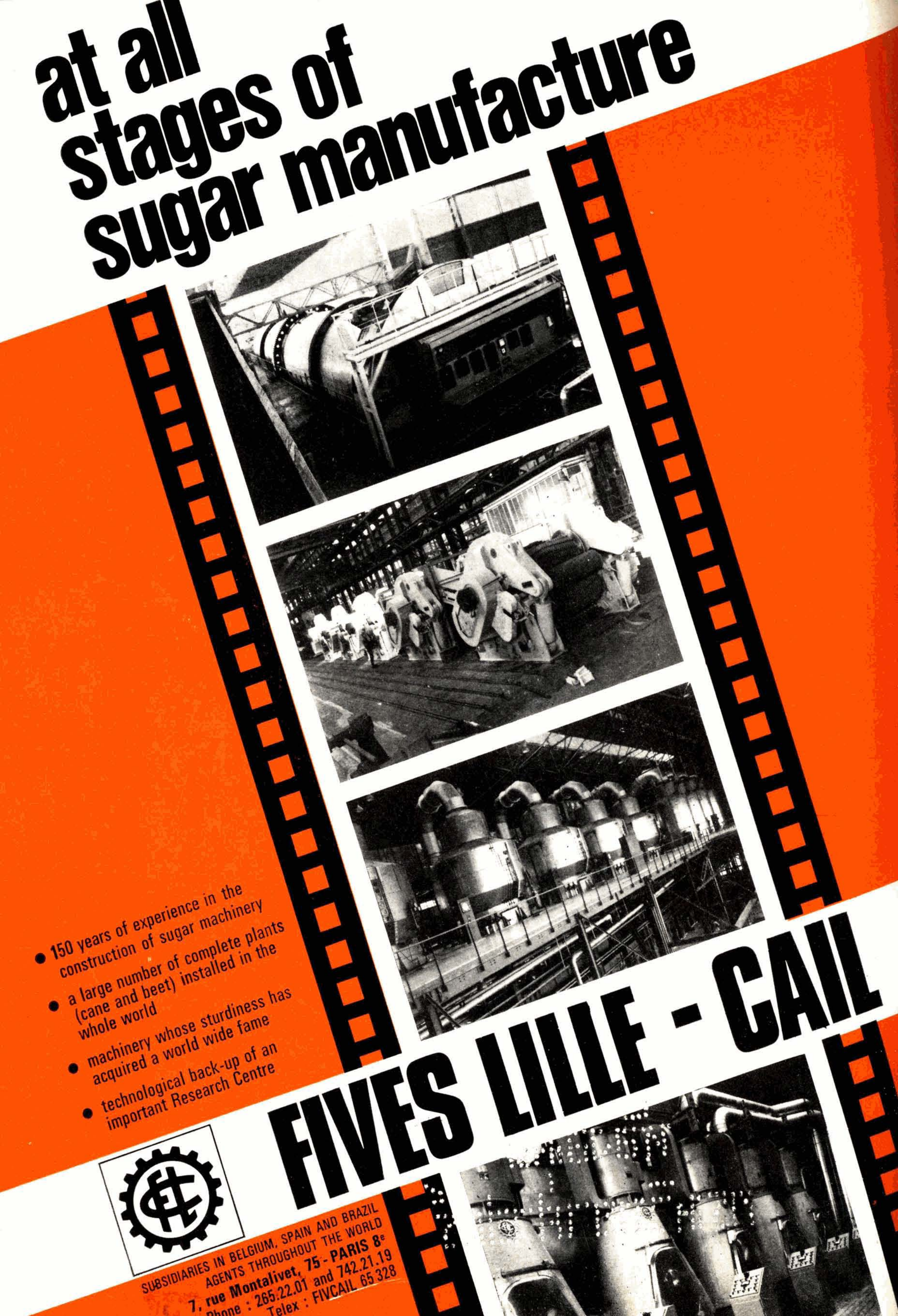
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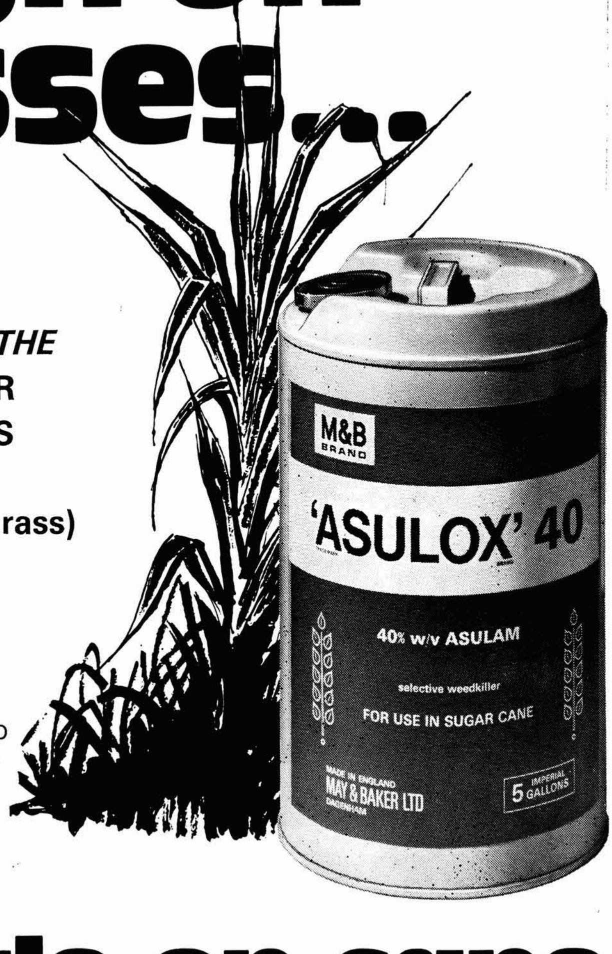

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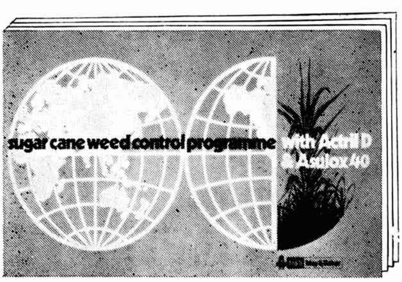

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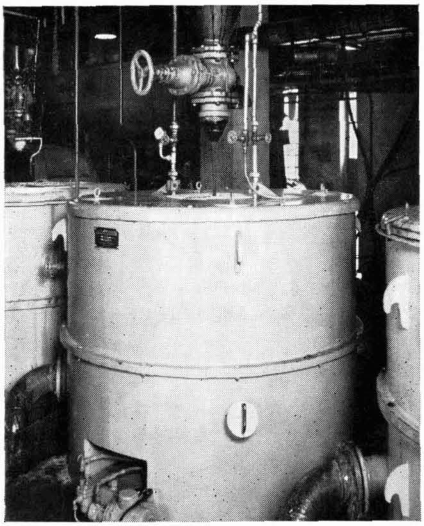

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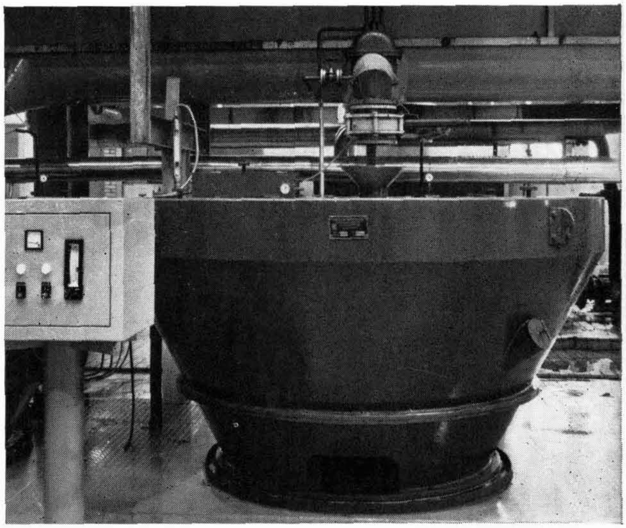

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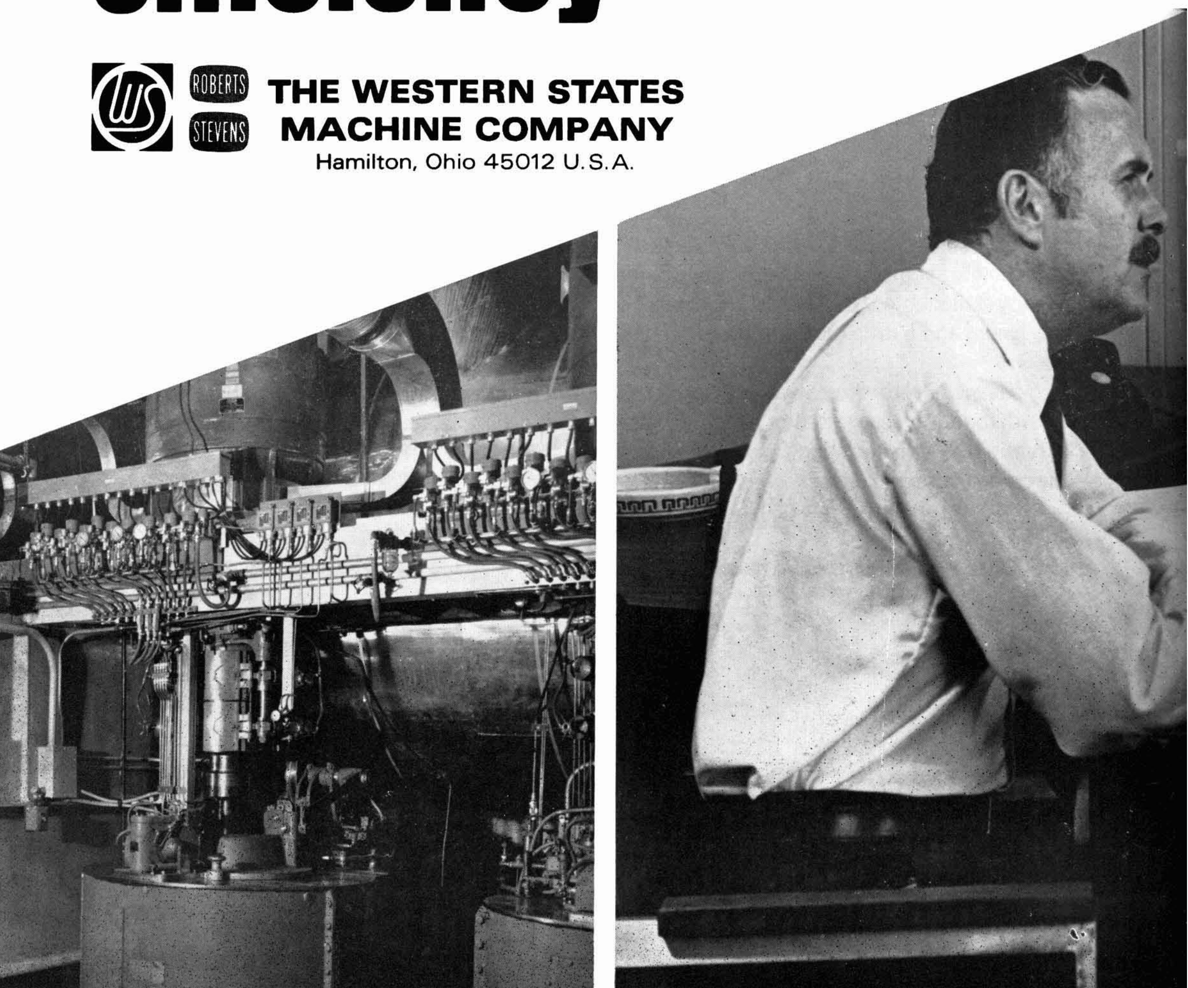

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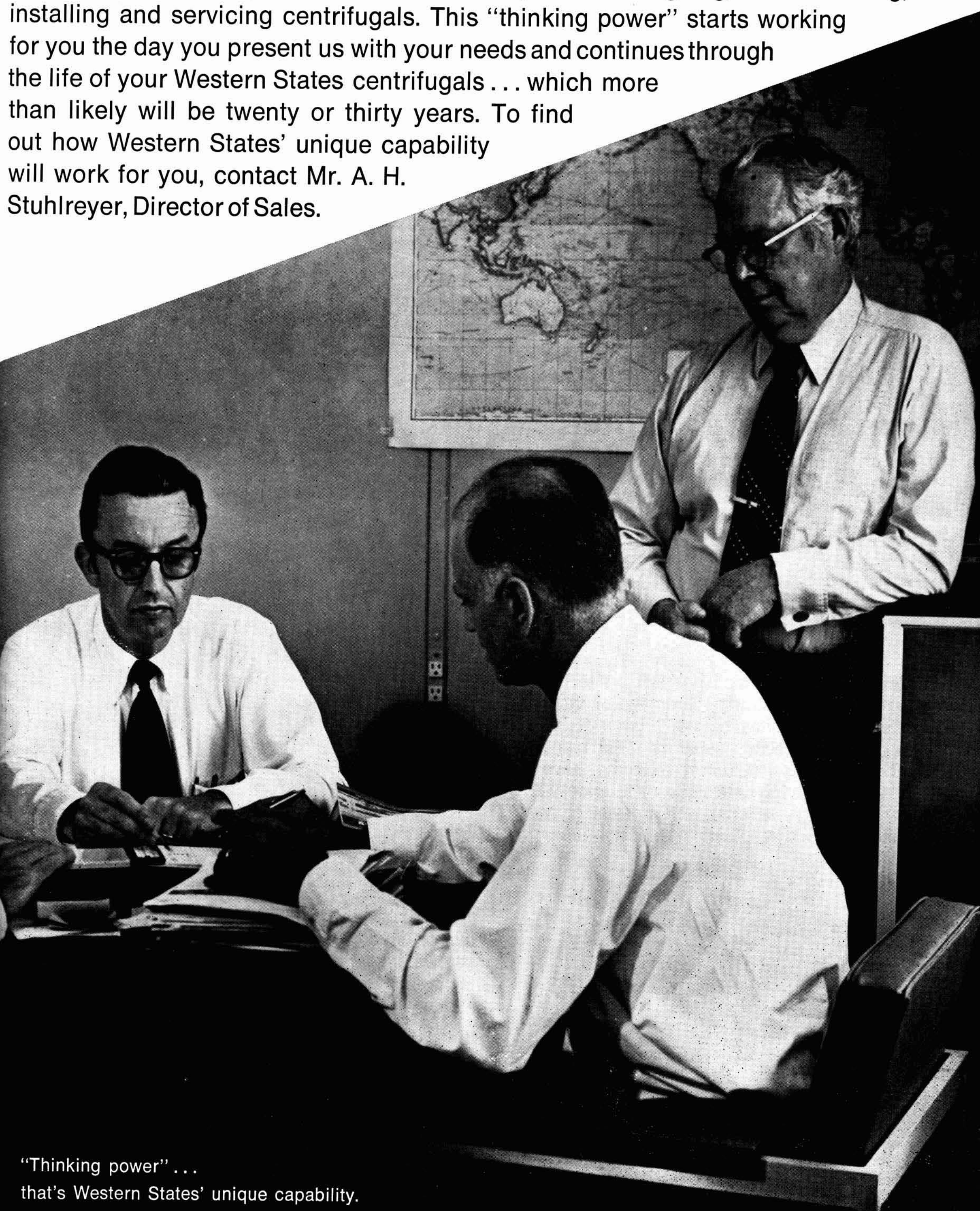

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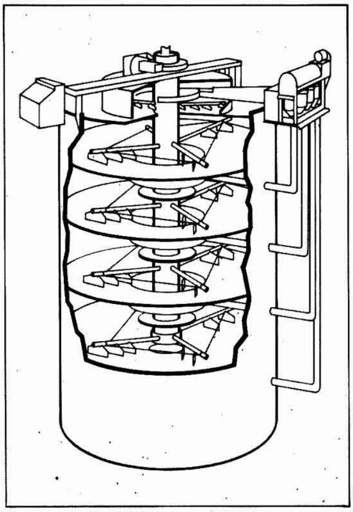

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On continue les recherches sur les auto-corrélations et les corrélations croisées dans le cas de la pression de la canne en vue de déterminer les fréquences et les retards temporels pour des moulins 1–6 en tandem. On montre que les corrélations croisées donnent des résultats plus précis que les essais au colorant bien que cette dernière méthode soit simple. On a pu utiliser des fonctions d'auto-corrélation pour déterminer les fréquences prédominantes dans les données. On examine le composant périodique d'un nombre de variables. En annexe on traite des fonctions de corrélation et de leurs dérivations.

* * *

Contrôle chimique des nématodes parasites dans la canne à sucre. IIe Partie. K. SINGH et S. R. MISRA. *p.* 369–371

On décrit le contrôle des nématodes à l'aide de dichloropropene-dichloropropane (DD) pour des plantations en rangées alternées (espace entre les rangées alternativement longue et courte). Le labour de bandes de terre donnaient un bénéfice maximal par unité de nématicides appliqué. La culture en rangée alternée, qui convient bien lorsque d'autres cultures sont faites entre les rangées de canne, a aidé à accroître de manière appréciable le rendement, tout en utilisant des quantitiés plus faibles de DD que celles nécessaires au traitement général conventionnel.

* * *

Les possibilités d'un tandem de presses à vis. S. G. SMART. *p.* 371–375

On examine mathématiquement un schéma théorique qui comprend l'utilisation d'un tandem de trois presses à vis au lieu d'un tandem de pression conventionnelle. On montre que la performance d'une presse à vis est approximative équivalente à celle de deux moulins conventionnels. L'efficience du mélange et les effets de la macération sont calculés pour chaque cas. On examine également en détail la possibilité d'utiliser un tandem à quatre presses.

An einem Mühlenaggregat beobachtete Frequenzen und Stillstandszeiten. Teil II. W. McWHINNEY. *S.* 363–368

Die Untersuchung über Auto und Crosskorrelationen beim Mahlprozess zum Zweck der Bestimmung der Frequenzen und Stillstandszeiten wird für die Mühlen 1 bis 6 eines Tandem-Mühlenaggregats fortgesetzt. Es wird gezeigt, dass Crosskorrelationen genauere Resultate geben als Anfarbeversuche, obwohl die letztere Methode einfach ist. Autokorrelationsfunktionen lassen sich zur Ermittlung der vorherrschenden Frequenzen in einer Datenaufstellung verwenden. Die periodische Komponente einer Anzahl von Variablen wird untersucht. Ein kurzer Anhang enthält Korrelationsfunktionen und ihre Ableitung.

* * *

Chemische Bekämpfung parasitischer Nematoden in Zuckerrohr. Teil II. K. SINGH und S. R. MISRA. *S.* 369–371

Die Bekämpfung von Nematoden mit Dichlorpropen-Dichlorpropan (DD) beim Zuckerrohranbau in wechselnden Reihenabständen (abwechselnd lange und kurze Reihenabstände) wird beschrieben. Obwohl bei der Bandspritzung der stärkste Wiederbefall pro Einheit des angewendeten Nematizides eintrat, hat der Anbau in wechselnden Reihenabständen, der vorteilhaft ist, wenn andere Kulturen zwischen den Zuckerrohrreihen stehen, zu beachtlichen Ertragssteigerungen bei geringeren DD-Mengen geführt, als bei der konventionellen Flächenspritzung angewendet wurden.

* * *

Die Leistung eines Tandem-Schraubenpressenaggregats. S. G. SMART. *S.* 371–375

Der Verfasser untersucht mathematisch ein theoretisches Schema, in dem ein Tandemaggregat von drei Schraubenpressen anstelle eines konventionellen Tandem-Mühlenaggregats verwendet wird. Es zeigt sich, dass die Leistung einer Schraubenpresse ungefähr der von zwei Mühlen entspricht. Mischleistungen und die Wirkung der Verbundmazeration werden für alle Varianten berechnet. Die Möglichkeit der Verwendung eines Vierpressentandems wird etwas weniger ausführlich untersucht.

Frecuencias y demoras observado en un tandém de molienda. Parte II. W. McWHINNEY. *Pág.* 363–368

Investigación de auto-corelaciones y contra-corelaciones de molienda de caña, con el fin de determinar frecuencias y demoras, se ha continuado para los molinos 1–6 de un tandém, y se demuestra que las contra-corelaciones dan resultas más precisas que el método con ensayos usando tintes, mientras que ésto es más sencillo. Funciones de auto-corelación pueden usarse para determinar las frecuencias predominantes en un registro de dados. Se examine el componente periódico de algunas variables. Un breve apéndice se incluye respecto de funciones de corelación y su derivación.

* * *

Control químico de nemátodos parasíticos en caña de azúcar. Parte II. K. SINGH y S. R. MISRA. *Pág.* 369–371

Se describe control de nemátodos con dicloropropeno-dicloropropano (DD) para planteación en filas tambaleadas (filas con intra-espacios alternamente largo y corto). Mientras que cultivación en tiras de suelo produció los máximos ingresos por unidad e nemáticida aplicada, cultivación en filas tambaleadas, conveniente cuando otras cosechas se cultivan entre filas de caña, ha ayudado dar crecimientos notables en rendimiento con cantidades de DD usado menores que en tratamiento convencional de todo el superficie.

* * *

El potencial de un tandém de prensas a tornillo. S. G. SMART. *Pág.* 371–375

Un esquema teórica, que involve el uso de un tandém de tres prensas a tornillo en lugar de un tandém convencional de molinos, se examina matemáticamente, por lo cual se demuestra que el cumplimiento de una prensa a tornillo es casi equivalente a éllo de dos molinos. Eficiencias de mezcla y los efectos de maceración compuesta se calculan en todos casos. La posibilidad de usar un tandem de 4 prensas se examina también en algo menos detalle.

THE

INTERNATIONAL SUGAR JOURNAL

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Notes & Comments

International Sugar Conference

It was announced on the 12th October that the conference which had been in session since the 10th September had failed to attain its objective of a new Agreement to replace the one due to expire at the end of 1973. In a communiqué issued when the talks were concluded, it was mentioned that "the main issues for consideration by the Conference were basic export tonnages, prices, including the problems of inflation and exchange rates, reciprocal rights and obligations between exporters and importers including questions of supply commitments and purchase commitments, the status of the International Sugar Agreement in relation to special arrangements, shortfall distributions and the other elements of the quota mechanism designed to balance supply and demand and to stabilize the market price within a price range. It was unfortunately not possible to resolve all these major issues of policy.

"On some of these issues the Chairman made proposals, principally on basic export tonnages, prices and quota mechanism. There were some reservations as to the recommendations on basic export tonnages and agreement could not be reached on the proposals made by the Chairman, in consultation with the Secretary-General of UNCTAD, for a price range of 5·40 to 7·90 cents a pound and a supply commitment price of 8·90 cents a pound.

"An Agreement with economic provisions could not be negotiated at the present time. Instead, the Conference concluded a new Agreement to come into effect on 1st January 1974 which will contain no economic clauses but will keep in being the International Sugar Organization. The Council of the Organization, apart from the continuing duty of collecting statistical and other information on sugar, has been authorized to arrange for studies to be made and discussions to be held between Members and with non-Members and other organizations with a view to determining the basis for an Agreement that will be in the general interest, and particularly in the interest of developing countries. It will then be for the Council to decide when the circumstances are propitious for inviting the Secretary-General of UNCTAD to convene a new United Nations Sugar Conference for the purpose of negotiating a new Agreement with full economic provisions."

As mentioned in our last issue, the price proposals by the importers were, in absolute terms, only slightly higher than those of the 1968 Agreement while in real terms they are below, because of the fallen value of the US dollar. It was only to be expected, in view of current world market price levels, that the exporters would reject these proposals as unrealistic and inadequate. On the other hand, while the current values may be expected to remain for some time, they are untypically high and it is not surprising that some exporters' wish to have them as a basis for the Agreement was not acceptable to the importers. It is a great pity that both sides were so unprepared to compromise by moving farther from their initial stances.

As to the future, F. O. Licht K.G.[1] comment: "The world sugar economy is thrown into disarray and will have to live without an Agreement for at least one year but this will not change the situation dramatically because the present price and quota regulations have been out of force for quite a time. But nevertheless the sugar market is nervous. It is argued that importers will no longer receive their usual quantities from exporting members at the SCP in the present Agreement... Therefore it is expected that there will be a rush by importers either to purchase actual sugar or at least to buy hedge purchases on the terminal market to cover their sugar requirements. Such a market behaviour could of course lead again to a substantial improvement in world market values....

"Some quarters expect that exporters might scramble to sell in the future markets. Furthermore, it is feared that the high prices and absence of regulation of exports to the free market could encourage the pursuit of policies of irresponsible expansion of production. These considerations could result in a downward trend in prices at least in the short run.

[1] *International Sugar Rpt.*, 1973, **105**, (29), 1–2.

"In general the collapse of the negotiations in Geneva is no disaster for the world sugar economy. Exporters have the opportunity to show production possibilities without restrictions, the EEC has time to clarify its own sugar policies—one of the big unknowns—and the importers can wait for a supply position which is less tight than the present one. The chances for a new Agreement might be much better in a year, two years or even three. The countries which attended the negotiations have already indicated in the Press statement that they hoped to try again 'when the circumstances are propitious'. Next time it might be a good idea to start the discussions with the crucial issues like prices and quotas."

* * *

World raw sugar price

Reports of crop damage in Australia and Brazil, and reduced estimates of European beet sugar production, coupled with increased demand for sugar, raised prices on the London Terminal from £90 or so in mid-September until a new record of £106 per ton was reached on the 11th October, the uncertainty about the ISA negotiations and the Middle East War also having contributed at the end of this period.

Following the breakdown in the Geneva talks there was a swift and marked decline to £96·50 per ton. But with renewed demand and notification of reduced availability from the EEC, an upward movement of prices began and on the 2nd November a new record price was established of £108 per ton.

* * *

UK sugar industry future

There has been much discussion on the future of the British sugar industry of recent weeks. The refiners —Tate & Lyle Ltd. and Manbré Sugars Ltd.—have refining capacity greater than the two million tons of cane raws they currently handle per year in addition to the 250,000 tons of beet raws they have taken from the British Sugar Corporation Ltd. With British entry into the EEC the Corporation's obligation to deliver these raws has gone and it is economically preferable to produce only white sugar in the beet factories in any case. Further, assuming the 1·4 million tons from Commonwealth suppliers continues after 1974 but that Australian supplies cease, this will mean only 65% of present raw sugar tonnage will be handled by equipment currently under-used. In addition, the 1·4 million tons does not need to come to the UK; the Commonwealth could supply raw sugar instead to other countries of the EEC for refining. Thus it seems inevitable that there must be a contraction for the refining industry.

A complicating factor arises because of the refining margin: that set by the EEC of six members was £11.50 a ton for the small amount of granulated refined sugar made from cane raws. A much higher margin was allowed for cube and tablet sugar which is the common form in which cane sugar appears on the Continent. The British market is mainly for granulated sugar, however, and the refining margin before Britain joined the EEC was £17 per ton. Following a warning of financial difficulties, a Treasury subsidy of £5.50 a ton was given and, although this is strictly against the EEC rules, the Commission in Brussels allowed it until the 30th June 1974. Should the Commission insist that the subsidy cease after next June, Tate & Lyle would lose money on its sugar refining operations which would have to cease—and what would happen then to the commitment to import Commonwealth raws? There would be considerable political trouble also for a Government that allowed the loss of 6000 jobs in the refineries as well as those indirectly dependent on the industry.

It is expected that the British representatives will argue strongly that the subsidy should continue after June at least until February 1975 when the Community's new sugar policy must be worked out; this will supercede previous arrangements. But in the meantime the future shape of the UK sugar industry must be worked out and discussions have been going on for many months in an effort to settle this. The Government are reported to favour a unified sugar industry processing both beet and cane raws and are said to be prepared to provide finance for the reconstruction. Neither the B.S.C. nor T & L favour this plan and it is pointed out that a single body would be very easy to nationalize if the Government of the day so decided. In addition, it is likely that such a body's formation would fall foul of EEC anti-trust authorities in Brussels.

* * *

US sugar supply quotas 1973

Movement of the US spot price above its corridor creates conditions under which the US Secretary of Agriculture is obliged to increase the overall quota and this occurred on the 28th September when 100,000 short tons, raw value, was added to bring the total to 11,600,000 tons. At the same time, the Department declared deficits of 106 tons for Paraguay and 47,667 tons for the Domestic Beet area (its entire share of the enlarged overall quota). As it was necessary to obtain sugar as quickly as possible to relieve a shortage for the immediate future, the balance of the increase not allocated to the Mainland Cane area, 82,773 tons, was made available on a first-come, first-served basis to foreign suppliers (other than Cuba and Rhodesia) able to make delivery on or before the 16th November instead of the usual proration to all quota holders.

Offers were made and accepted for most of this amount when on the 5th October a further deficit was declared for the Texas Cane area in the amount of 15,000 tons. This also was made available on a first-come, first-served basis, and on the 12th October, the Department announced allocations of the entire 97,773 tons. Changes in quotas as a result of the allocations are given in the table published elsewhere in this issue; also included are an increase of 723 tons in the quota for Nicaragua which is to fill the deficit in its quotas previously reallocated to and now deducted from the quotas of Costa Rica, Guatemala and El Salvador, fellow-members of the Central American Common Market.

Frequencies and time delays observed in a crushing train

By W. McWHINNEY

(Sugar Research Institute, Mackay, Queensland, Australia)

PART II

The auto-correlations for speed, lift and escribed volume for the first mill are shown in Fig. 7 while the cross-correlations for speed/escribed volume and lift/escribed volume are shown in Fig. 8. The auto-correlations of speed and escribed volume are quite similar in form and different from the lift auto-correlation, suggesting that speed is the controlling variable at the first mill. The cyclic components in the escribed volume were probably due to speed variations. The speed/escribed volume cross-correlation shows a strong period of approximately 2·25 minutes while the lift/escribed volume cross-correlation does not oscillate significantly.

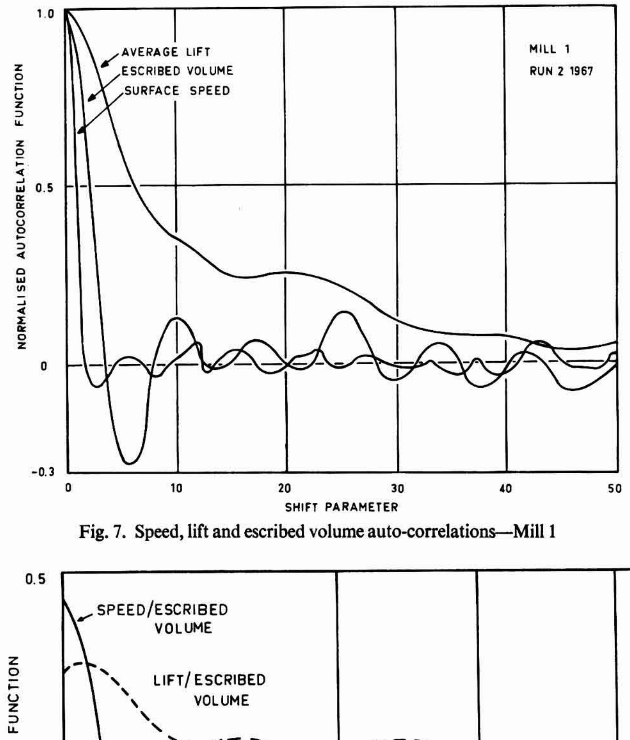

Fig. 7. Speed, lift and escribed volume auto-correlations—Mill 1

The speed/lift/escribed volume interactions were quite different at the final mill. The mean lift was between 30 and 40% of the work opening at zero lift. The auto-correlations shown in Fig. 9 have no cyclic components. However, the cross-correlations shown in Fig. 10 suggest that the speed/escribed volume correlation is more significant than the lift/escribed volume correlation.

The auto-correlations for the preparation equipment showed quite distinct oscillations as indicated in Table VI. The correlations for the combined power to the knives and the shredder in run 8/1968 are shown in Fig. 11. The form of these curves was typical of those for the preparation equipment. Both the knives and the shredder showed approximately the same period of 2·6 to 2·8 minutes which was very close to twice the period of tipping of a truck of cane.

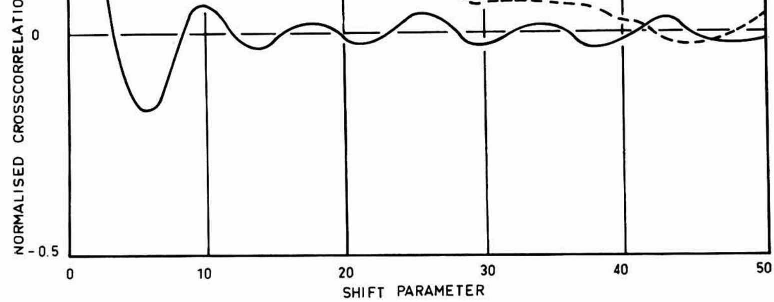

Fig. 8. Speed, lift and escribed volume cross-correlation—Mill 1

Time delay estimates

The cross-correlation functions produced from the Fourier smoothed data could be used to estimate some time delays in the crushing train behaviour. Table VII lists time delays so obtained.

Not all the cross-correlations contained definite maximum values from which the time delays could be estimated. This was particularly true of correlations involving combined knife power. Since the power to the top and bottom knives could not be measured separately, the recorded data were confounded by the interaction of the two sets of knives. Fig. 12 shows the significant cross-correlations obtained. Plot A shows a clear maximum for run 10 at 14 shift units and a less distinct maximum for run 15 at 16 shift units while Plot B has a group of runs with maxima averaging 3·3 shift units. The occurrence of these two distinct time delays is explained as either the top or bottom set of knives contributing most to the recorded power for a given experiment. In Plot A, the bottom knives are using the major share of power and the computed delay is from the bottom knives to the shredder. In Plot B the delay recorded is from the top knives to the shredder. Run 15 in Plot A shows a peak close to the delay computed in Plot B while all curves in Plot B show secondary peaks corresponding to the delay in Plot A. From the geometry of the preparation equipment and its operating speed, time delays of 3·8 and 0·9 minutes are feasible. In runs that had indefinite forms in the cross-correlation function, both the top and bottom knives should have contributed the major power at different times in the run so that no maximum existed in the cross-correlation.

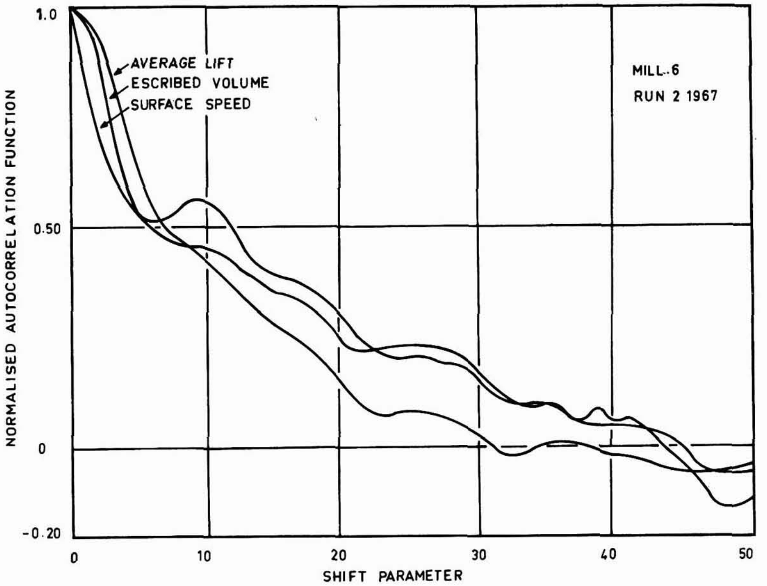

Fig. 9. Speed, lift and escribed volume auto-correlations—Mill 6

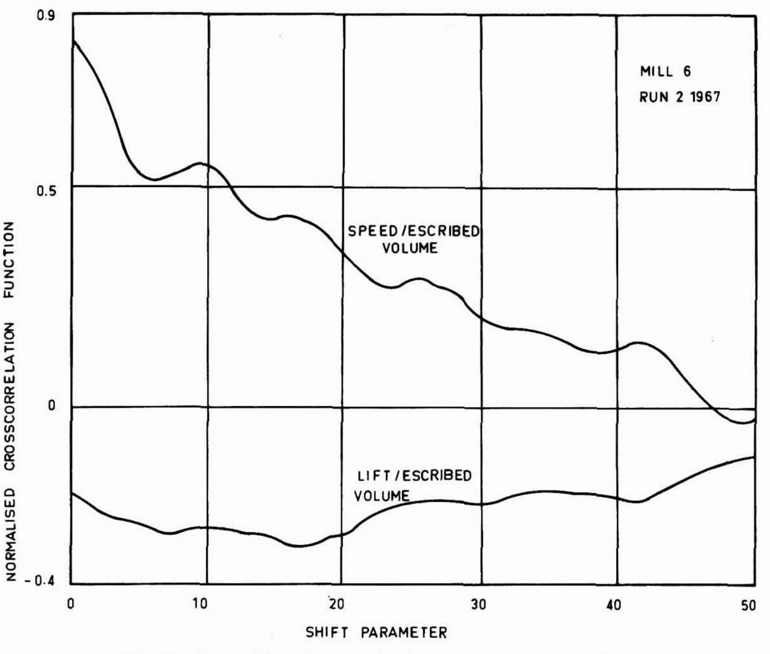

Fig. 10. Speed, lift and escribed volume cross-correlation—Mill 6

Fig. 13 shows the cross-correlations used to estimate the delay from shredder to the delivery opening of the first mill in the crushing train. These curves agree well in form and position of maximum value. The elevator from shredder to feed hopper for the first mill was 17·4 metres long and moved at an average

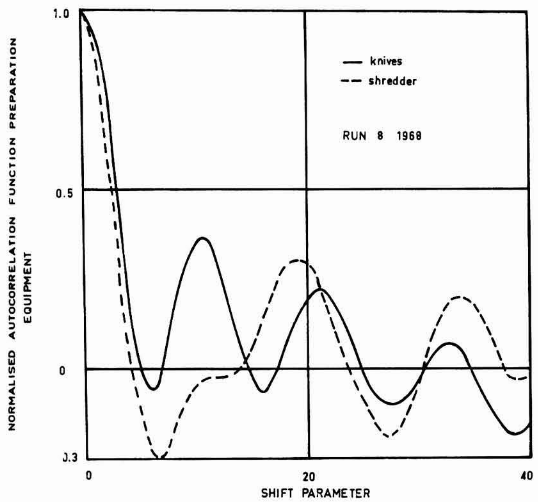

Fig. 11. Preparation equipment correlations

speed of approximately 15·2 m/min. Allowing one minute residence in the feed hopper, the time delay of 2·1 minutes from shredder to delivery of mill 1 is acceptable.

Table VI. Periods observed in auto-correlation functions for preparation equipment

1968 *Run number*	*Auto-correlation period, minutes* Knives	Shredder
5	2·5	2·75
8	3·0	3·75
9	2·75	2·25
10	2·25	3·75
12	2·25	2·25
13	2·25	2·50
15	3·75	2·50
Mean	2·67	2·82

Table VII. Time delay estimates

Delay between		*Delay in minutes* 1967	1968
Knives and shredder:	min. ..	—	0·9
	max. ..	—	3·8
Shredder and Mill 1		—	2·1
Mill 1 and Mill 2		2·5 (3·0)	2·0 (1·2)
Mill 1 and Mill 6		9·8 (11·0)	7·0 (7·6)
Feed and Delivery Mill 6		0	0

NOTE: (1) Delays in brackets determined by dye tests.
(2) No tests were performed on preparation equipment in 1967.
(3) Combined power was recorded for top and bottom knives.

The cross-correlations of the juice flows from mills 1 and 2 showed very definite and repeatable (in 1968) time delays as shown in Figs. 14 and 15. Run 2/1967 with a maximum number of data points (1150) was the only significant cross-correlation in the first year's experiments. However, the cross-correlations for the 1968 season show remarkably similar form and give a very good estimate of the time delay between juice expressed in the first mill and juice expressed

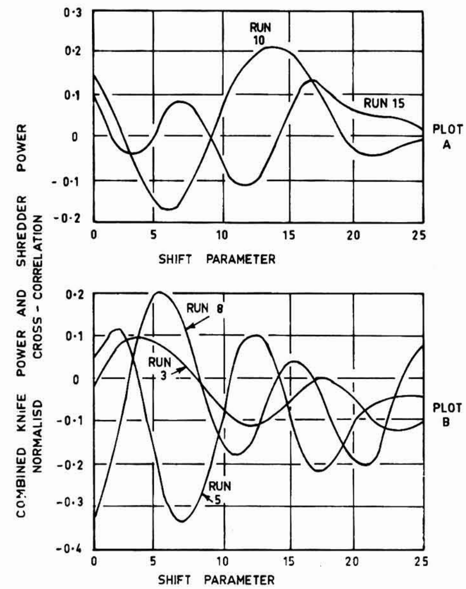

Fig. 12. Estimation of time delay from knives to shredder

Run No.	*Time delay Plot A* *Shift Units*	*Minutes*	*Time delay Plot B* *Shift Units*	*Minutes*
10	14	3·50		
15	16	4·00		
3			3	0·75
5			2	0·50
8			5	1·25
Average		3·8		0·9

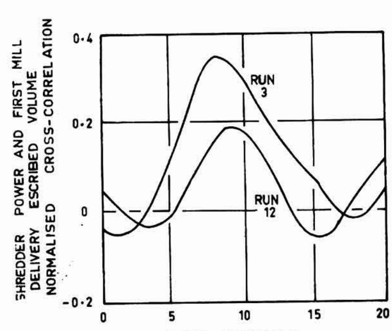

Fig. 13. Estimation of time delay from shredder to first mill

Run No.	*Time delay* *Shift units*	*Minutes*
3	8	2·00
12	9	2·25
Average		2·1

in the second mill. Allowing for the time for the expressed juice to drain into the pump sump and be recorded by the venturi flowmeter (0·75 minutes as determined from the cross-correlations in Fig. 16), the 1968 estimate of the delay between first and second mills would be 1·25 minutes compared with 1·0 and 1·4 minutes (average 1·2) from the dye tests.

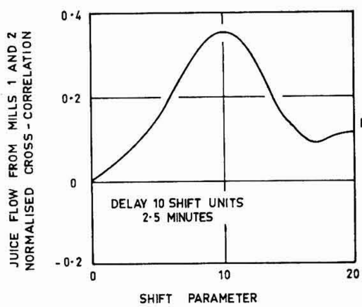

Fig. 14. Estimation of time delay between Mill 1 and Mill 2 for 1967 tests

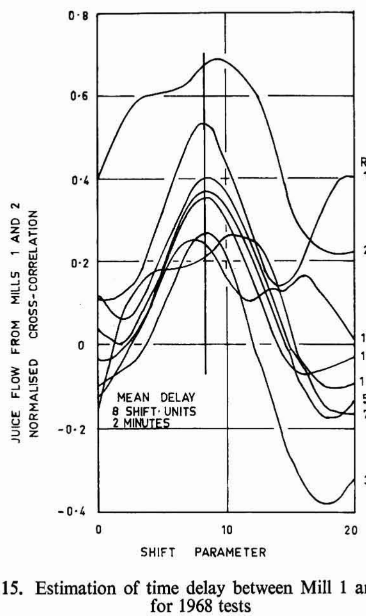

Fig. 15. Estimation of time delay between Mill 1 and Mill 2 for 1968 tests

The cross-correlation of the recorded escribed volumes gives two time-delay estimates. By correlating the delivery escribed volumes from the first and sixth mills, an estimate of the total delay in the bagasse stream from first to last mill can be determined. Run 3/1968 and Run 4/1967 shown in Fig. 17 give estimates of this delay as 6·3 and 9·8 minutes, respectively. In the 1968 crushing season the crushing rate (and mill speed for substantially the same settings and hydraulic pressures) was higher. The second estimate from escribed volume correlation is that of the time delay within a single mill in the crushing train. Fig. 18 shows clearly that the feed and delivery escribed volumes cross-correlate well at zero shift and the correlation rapidly decreases for increasing shifts. In other words, the time delay within a mill is small enough to neglect in this study. From the geometry of a mill and typical roller surface speed (say 12·2 m/min) the time for the bagasse to move from feed opening to delivery opening is approximately four seconds. Using a sampling period of 15 seconds, time delays of this magnitude cannot be resolved.

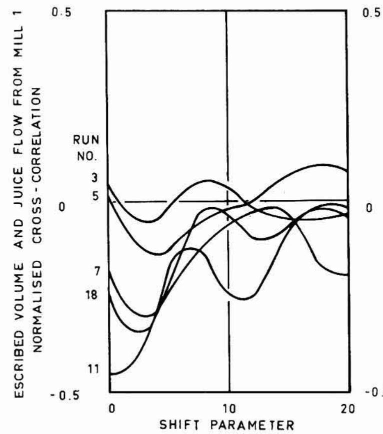

Fig. 16. Estimation of drain-down time within a single mill

Run No.	*Time delay, shift units*
3/1967	3·5
5/1968	4·0
7/1968	3·5
11/1968	1·5
18/1968	2·5
Average	3·0 (0·75 min)

Another estimate of the delay between first and last mills in the crushing train can be obtained from the cross-correlation of the flow of outside imbibition (variable 13) and the flow of expressed juice (variable 11) from the second mill. The order in which the individual time delays are encountered is different from that for the escribed volumes where the order was 1 to 2, 2 to 3, 3 to 4, 4 to 5, 5 to 6. In this latest correlation the order is 5 to 6, 4 to 5, 3 to 4, 2 to 3 and 1 to 2. Fig. 17 shows two typical cross-correlations for variables 13 and 11. These flow correlations showed a much more consistent pattern in correlation than the escribed volume correlations.

Fig. 19 gives another estimate of the delay between first and last mill. In this figure the average lifts of the top and delivery rollers of the first and last mills are correlated. This correlation does not consider the effect of mill speed as does the escribed volume correlation. For the average lift correlation to be

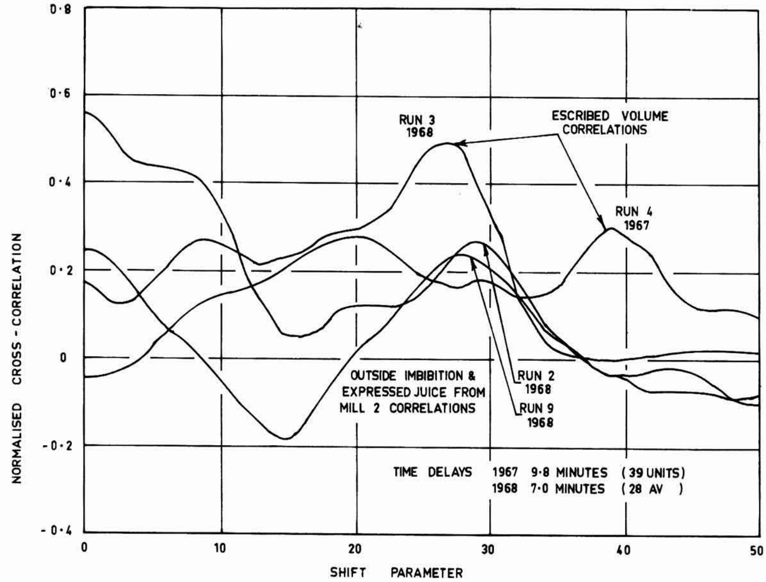

Fig. 17. Estimation of time delay between Mill 1 and Mill 6 using escribed volumes and flows

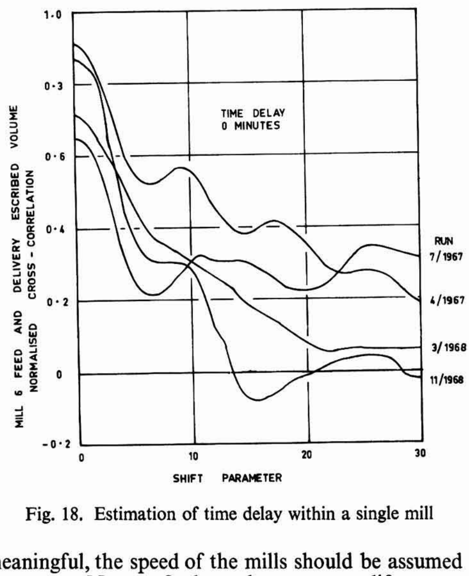

Fig. 18. Estimation of time delay within a single mill

meaningful, the speed of the mills should be assumed constant. None of the other average lift cross-correlations showed any reasonable peak.

Conclusions

The results of this investigation indicate the frequencies and time delays that could be expected in a typical sugar mill crushing train. The estimations of time delays by cross-correlations gave more precise results than could be obtained from dye tests simply because there are hundreds of data points in a cross-correlation estimate. However, for practical purposes the dye estimate may be preferred because of the ease with which it can be performed.

The auto-correlation functions could be used to determine the predominant frequencies in a data record even though the record may be only weakly stationary. The supply of prepared cane to the crushing train appeared to have a weak periodic component as indicated by both the knife and shredder correlations. The escribed volume data showed a similar periodicity at the first mill but at the final mill no periodicity was apparent. The major variations in the mixed juice flow were attributable to the fluctuations in the first mill expressed juice flowrate since its coefficient of variation was approximately twice that for the second mill and both first and second mill mean expressed juice flowrates were approximately equal. The second mill expressed juice flowrate showed a characteristic period for steady outside imbibition flow.

Deliberate perturbations in the outside imbibition flowrate over a reasonable range did not cause the second mill expressed juice flowrate to exhibit any tendency towards instability. The damping effect of the counter-current recirculation system is very large and probably eliminated any tendency towards instability.

Acknowledgments

The author wishes to express his appreciation to Dr. C. R. Murry of the Sugar Research Institute for

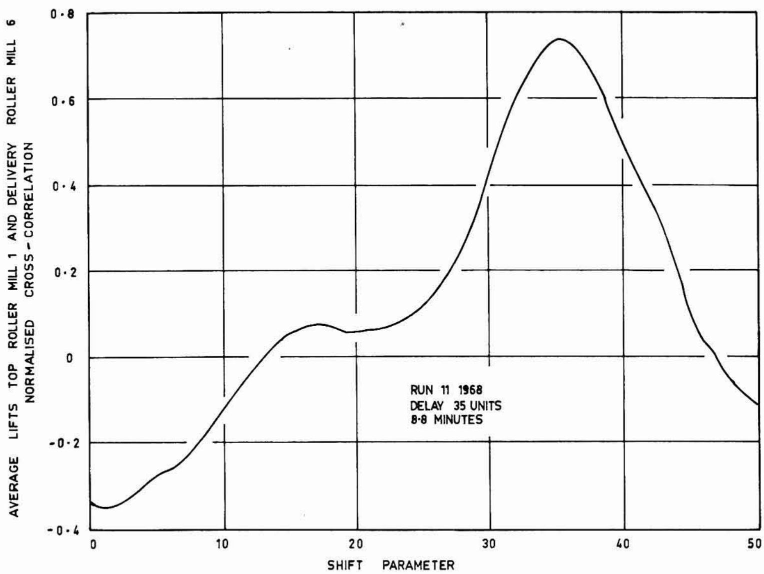

Fig. 19. Estimation of time delay between Mill 1 and Mill 6 using average lifts

his helpful discussions. The Australian Research Grants Committee has provided some financial support for this project.

APPENDIX

Correlation Functions

The auto-correlation function of random data describes the general dependence of the values of the data at one time on the values at another time. Consider a continuous time history record $x(t)$. An estimate for the auto-correlation between the values of $x(t)$ at times t and $t + \tau$ as shown in Fig. 20 may be obtained by taking the product of the two values and averaging over the observation time T. The resulting average product approaches the exact auto-correlation function as T approaches infinity or:

$$R_{xx}(\tau) = \lim_{T\to\infty} \frac{1}{T}\int_0^T x(t)\, x(t+\tau)\, dt \quad \ldots\ldots\ldots\ldots(2)$$

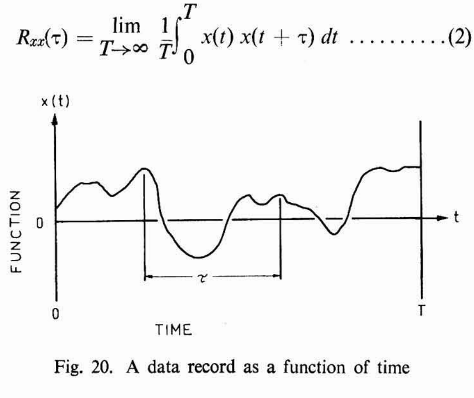

Fig. 20. A data record as a function of time

The quantity $R_{xx}(\tau)$ is always a real-valued, even function with a maximum at $\tau = 0$, and may be either positive or negative.

For a digital (sampled) data function of N values equally spaced in time and expressed as x_n ($n = 1, 2, \ldots N$) with zero mean value, the auto-correlation function at the displacement rh (where h is the sampling interval) is given as:

$$R_{xx}(rh) = \frac{1}{N}\sum_{n=1}^{N-r} x_n x_{n+r} \quad \ldots\ldots\ldots\ldots\ldots\ldots(3)$$

where $r = 0, 1, 2, \ldots\ldots m$

Equation 3 is only a convenient form of the continuous equation 2 but gives a biased estimate for the auto-correlation function. However, for N large and m small with respect to N, equation 3 gives values that differ very little from those obtained from equation 2. In these studies, N was as large as 1200 with m only as large as 60.

For cross-correlation functions between two variables, x and y, equation 3 becomes:

$$R_{xy}(rh) = \frac{1}{N}\sum_{n=1}^{N-r} x_n\, y_{n+r} \quad \ldots\ldots\ldots\ldots\ldots\ldots(4)$$

where $r = 0, 1, 2, \ldots\ldots$ m

Equation 4 formed the basis for the cross correlations developed in this paper.

Chemical control of parasitic nematodes in sugar cane

By KISHAN SINGH and S. R. MISRA
(Indian Institute of Sugarcane Research, Lucknow, India)

PART II

Subsequent to application of nematicide the population of plant parasitic nematodes decreased considerably in both cases. However, it appears that those nematodes which escaped fumigation multiplied very fast and within 4–5 months their populations were again as high as in the untreated plots (Fig. 2). The population of nematodes in the inter-row spaces was very low as compared with the planted rows of the untreated strip-tilled plot. In the treated plot, this trend was in conformity with the observations made above after about 4 months of treatment (Fig. 2).

Nematode control in staggered row planting

In the next experiment, planting of sugar cane by the conventional method, preceded by nematicide application, was compared with planting of paired rows of sugar cane preceded by application of DD. The following were the various treatments:

(i) *Conventional planting:* In one sub-treatment DD was applied overall at the rate of 400 litres per hectare and in another it was injected in rows spaced 90 cm by a hand injector at the rate of 135 litres per hectare.

(ii) *Staggered-row planting*: The preparation of the experimental plots was done as in the previous case. After preparation, lines were marked out in pairs. The distance between the two rows was 30 cm and the distance between pairs of rows was kept at 150 cm. DD was applied in one treatment along these lines at the rate of 135 litres per hectare and in the other treatment in the middle of the two lines at the rate of 68 litres per hectare by a hand injector. These were compared with non-fumigated control plots.

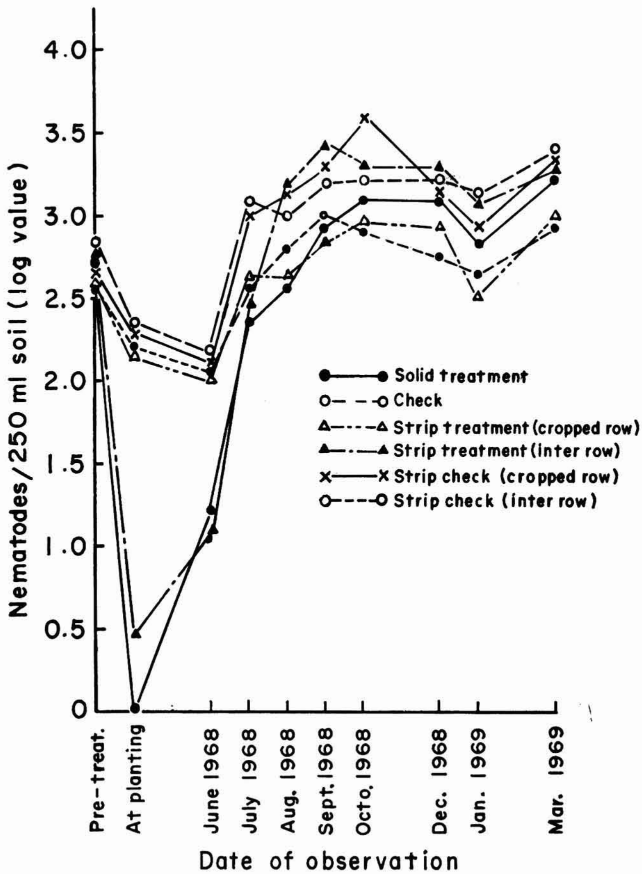

Fig. 2. Effect of DD on nematode population

The results obtained from the experiment (Table IV) indicate that there was an increase in the number of millable canes and yield of cane in all the plots treated with DD. The greatest increase in yield (20·2%) was recorded with overall application of DD and conventional planting. The increase in yield of sugar cane was smallest (8·8%) in the plots treated with DD at the rate of only 68 litres per hectare. These differences were statistically significant.

So far as control of nematodes was concerned, the maximum kill was obtained in the overall treated plots followed by row treatments (Fig. 3). As observed in the experiment 3, here too the build up of the left-over nematodes was very rapid and their populations reached almost the level of those present in the untreated plots within 5–6 months.

DISCUSSION

Since cane is planted in rows about 90 cm apart, and during the first 3–4 months up to the monsoon the plants make very little growth, presumably the extensive preparation of the soil confers very little benefit on the plant. On the other hand, this tilling and the spread of irrigation water into the inter-spaces would encourage the development of lateral roots and would also promote the development of weeds, rather than the deep vertical roots which are vital to the plant during the drought period. Perhaps the tillage requirements of the sugar cane crop would be fully met if a narrow strip along the row where cane setts are actually planted were tilled to a depth of about 20 cm. The distribution pattern of plant parasitic nematodes in the tilled strips and the untilled inter-spaces has been reported above. Here, the population of plant parasitic nematodes in the untilled inter-spaces was much lower than that in the tilled strips where the cane was planted. The distribution of nematodes when viewed in the light of observations made in the first experiment and rooting pattern in strip-tilled and conventional methods of planting as reported by MENON[1] fits into an expected pattern. This shows that in the strip-tilling method of planting, as the roots are restricted to a narrow linear strip, so are the nematodes restricted thereto. This indicated a possibility of reducing the amount of nematicide and thereby reducing the cost of the treatment.

This was confirmed in the third experiment when the amount of nematicide applied was reduced to one-third of that required for the conventional overall treatment. It would appear that the returns in terms of yield per unit of nematicide are higher than those with the overall application.

The same information was put to more practical use in the case of companion or inter-cropping of sugar cane where it is planted in pairs of rows 30 cm apart, the distance between two pairs being 150 cm. The nematicide can be safely applied only in the rows where the cane is to be planted without much loss in yield. The staggered-row planting of sugar cane has also been found helpful in growing an inter-crop such as sugar beet, wheat, etc., along with the cane[7] in addition to the possibility of reducing the expenditure on nematicide.

The above studies indicate that the increased yield can be obtained with strip application of the nematicides either in staggered planting or in regular planting. Further work is required to improve the efficiency of strip application.

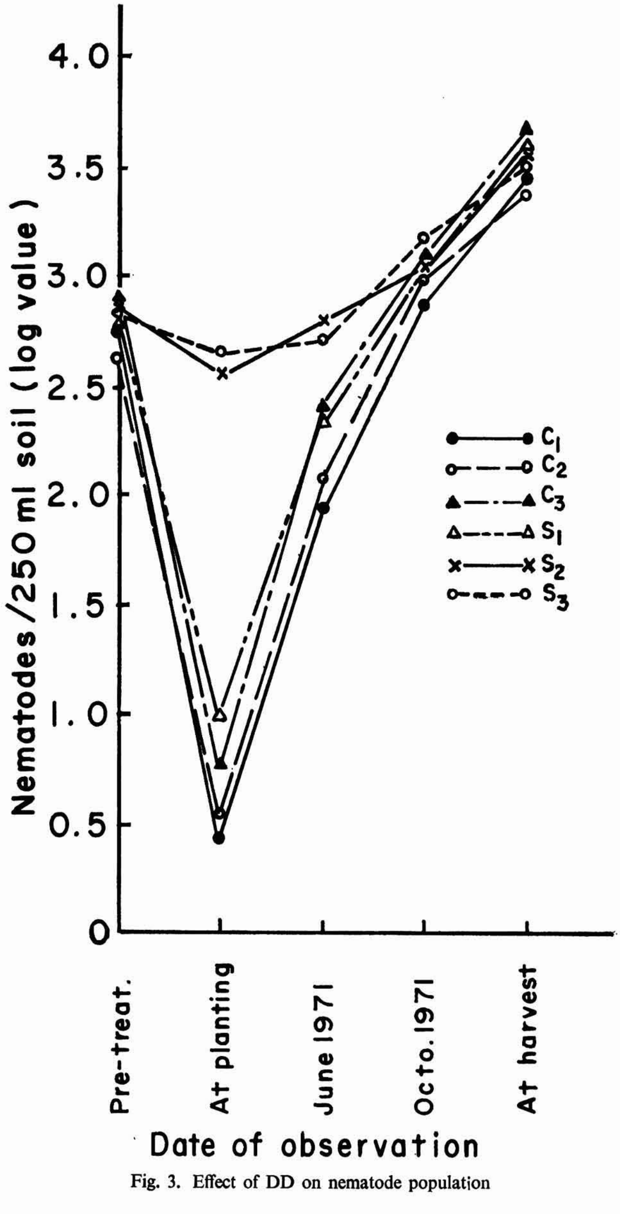

Fig. 3. Effect of DD on nematode population

Summary

In a set of four experiments data have been gathered to indicate the possibility of economizing on the quantity of nematicides for the control of nematodes affecting sugar cane. Distribution of nematodes as affected by spread of the roots, has been studied in two planes indicating heaviest nematode population in the feeder root zones. Strip tillage for cultivation offers maximum returns per unit of nematicide applied. Nematode control has been studied in the staggered-row method of cultivation. This method, suitable for companion cropping with cane, has helped to achieve appreciable increases in yields with smaller amounts of nematicides as compared with conventional overall treatment.

[7] SINGH: *Indian Sugar*, 1971, **20**, 203.

Table IV. Effect of preplant treatment of DD on growth and yield of sugar cane

Randomized block design; 4 replications; plot size 54 m^2, treatment applied on 9th March 1971; cane planted on 25th March 1971, harvested on 10th January 1972; variety Co 1158

Treatment	*Germination* %	*No. of millable canes (thousand/ha)*	*Yield (t/ha)*	*Increase in yield over control,* %
Conventional planting				
Application: overall (C1)	65·4	97·95	69·29	20·2
Application: row (C2)	62·0	92·18	61·38	9·9
No nematicide (C3)	55·4	89·30	55·25	—
Staggered-row planting				
Application: both lines of pair (S1)	56·5	82·55	56·87	11·6
In the middle of pair (S2)	58·9	78·98	54·07	8·8
No nematicide (S3)	53·4	77·50	49·26	—
S.E.		± 4·58	± 2·20	
C.D.		13·80*	6·63***	

* significant at 5% level; *** significant at 0·1% level.

The potential of a screw press tandem

By S. G. SMART, A.R.C.S.T., A.R.I.C.

IN an earlier paper[1] it was suggested that a tandem of screw presses could successfully replace a train of mills for the extraction of sugar from cane. A scheme is developed below for the use of a three-press tandem employing compound maceration with addition of 30% water added on cane. It is proposed that 10% of water on cane be added to bagasse fed to the second press and 20% on cane to bagasse fed to the third unit. Juice from the second press is added to the prepared cane fed to the first press, juice from which is sent to process. Juice from the third press is added, with the 10% maceration water, to the feed to the second press. Cush-cush need only be separated from the process juice and added to the feed to the second press; the avoidance of other separations thus simplifies plant layout.

Mixing efficiency

In practically all press installations the plant includes a mixing bin or screw conveyor system where the added water is intimately mixed with bagasse before feeding to the press. Based on actual measurements communicated privately to the author, the mixing efficiency achieved is calculated below; these calculations are based on Brix rather than pol since sucrose is subject to inversion whereas Brix does not alter unless complete destruction occurs.

A further step in these calculations is the comparison between observed and calculated sucrose in bagasse; the differences between these is difficult to explain if one accepts the complete accuracy of the analytical data, and it is strongly recommended that both cane and bagasse should be analysed for sucrose, fibre and moisture to provide sufficient information for a good accounting system since it is not sufficient to know only sucrose and moisture in final bagasse.

Laboratory data employed for a typical calculation are as follows:

Last mill bagasse:	Bagasse % cane	23·68%
	Pol content	3·45%
	Moisture content	54·33%
	Brix content (calc. from pol content and purity of last mill juice = 76·84)	4·49%
	Fibre content (100 — Brix — Moisture)	41·18%
Press bagasse:	Pol content	2·70%
	Moisture content	53·45%
Press juice:	Brix	4·83%
	Pol content	3·46%
Maceration:	% cane	6·2%
	% bagasse	26·182%

The press feed, i.e. last mill bagasse plus maceration, will comprise, per 100 parts of bagasse by weight:

Fibre	41·180
Solids	4·490
Water	54·330 + 26·182 = 80·512
	126·182

Since the moisture content of the press bagasse is 53·45%, the amount of water extracted by the press (Y) may be calculated by the following formula[1], assuming a mixing efficiency of 100%:

$$\frac{80{\cdot}512\ (80{\cdot}512 - Y)}{80{\cdot}512 \times 126{\cdot}182 - Y(80{\cdot}512 + 4{\cdot}490)} = 0{\cdot}5345$$

from which $Y = 29{\cdot}993$

Thus, solids extracted $= (29{\cdot}993 \times 4{\cdot}49)/80{\cdot}512 = 1{\cdot}673$

and pol extracted $= (29{\cdot}993 \times 3{\cdot}45)/80{\cdot}512 = 1{\cdot}285$

The Brix of the press juice $= 1{\cdot}673/(1{\cdot}673 + 29{\cdot}993) = 5{\cdot}283$

and pol of the press juice $= 1{\cdot}285/(1{\cdot}673 + 29{\cdot}993) = 4{\cdot}058$

[1] *I.S.J.*, 1969, **71**, 356–358.

Table I

Last mill bagasse																				
Bg%C	23·68	25·59	25·53	23·85	24·09	26·05	24·59	27·18	24·70	25·57	25·24	23·92	29·73	25·64	22·10	24·39	27·26	25·69	26·44	28·66
P%MB	3·45	3·54	3·45	3·52	2·92	3·40	3·22	3·29	3·36	3·59	3·43	3·38	3·31	3·21	3·04	3·14	3·40	3·33	3·49	3·20
M%MB	54·33	54·42	54·75	54·50	55·33	55·00	55·17	54·67	54·42	54·42	55·33	54·58	54·92	56·70	57·17	57·25	57·75	57·50	56·75	57·33
LMJ Py	76·84	76·64	77·76	78·21	75·70	75·60	74·36	75·62	74·92	74·35	75·67	75·14	75·62	74·68	74·13	75·27	76·29	74·44	75·79	74·65
Bx%MB	4·49	4·62	4·44	4·50	3·86	4·50	4·33	4·35	4·48	4·83	4·53	4·50	4·38	4·30	4·10	4·17	4·46	4·47	4·60	4·29
F%C	9·75	10·48	10·42	9·78	9·83	10·55	9·96	11·14	10·15	10·42	10·13	9·79	12·10	10·00	8·56	9·41	10·30	9·77	10·22	11·00
Maceration																				
AW%C	6·20	7·21	7·10	6·99	7·34	6·46	8·08	6·41	6·90	7·49	7·43	7·42	7·80	10·60	8·39	7·30	7·60	8·05	6·98	9·91
Press juice																				
Pol	3·46	3·28	3·37	3·66	3·28	3·40	3·20	3·38	3·47	3·99	3·84	3·31	3·24	2·88	2·58	3·22	3·33	2·82	3·59	3·26
Brix	4·83	4·45	4·50	4·93	4·63	4·60	4·56	4·67	4·80	5·52	5·35	4·68	4·45	4·18	3·73	4·33	4·83	4·08	4·95	4·57
Press bagasse																				
M%PB	53·45	51·92	51·42	50·64	51·60	49·25	52·90	51·43	50·67	51·50	52·59	51·25	51·67	54·50	56·17	57·17	55·67	54·63	54·75	53·08
Mixing Efficiency																				
Pol B	85·2	81·0	84·9	91·8	100·7	84·3	91·8	84·8	89·7	98·4	99·9	88·2	83·7	91·8	84·2	93·7	88·2	79·0	90·3	98·0
Brix B	91·4	84·0	88·2	96·7	107·5	86·2	97·2	88·7	93·0	101·2	105·4	93·7	86·9	99·5	90·3	94·9	97·6	85·2	94·4	102·5

KEY: Bg%C = Bagasse % Cane, P%MB = Pol % Mill bagasse, M%MB = Moisture % Mill bagasse, LMJ Py = Last Mill juice purity, Bx%MB = Brix % Mill bagasse, F%C = Fibre % Cane, AW%C = Added water % Cane, M%PB = Moisture % Press bagasse, Pol B = On Pol basis, Brix B = On Brix basis.

The composition of the press bagasse on the basis of this calculation for 100% mixing efficiency is, per 100 parts by weight of last mill bagasse:

Fibre	41·180
Solids (4·490 — 1·673)	2·817
Water (80·512 — 29·993)	50·519
	94·516

This composition, brought to a % basis is:

Fibre	43·57%
Solids	2·98%
Water	53·45%

and similar calculation for pol gives a content of 2·291%.

Since the measured Brix and pol of press juice were 4·83 and 3·46%, respectively, the mixing efficiency on a Brix basis is 4·83/5·283 × 100% = 91·425%, while on a pol basis the mixing efficiency is 3·45/4·058 × 100% = 85·260%. Similar calculations have been made from data obtained with a screw press installation added to an existing mill tandem and are given in Table I.

Taking the Brix-based mixing efficiency, for the reason given above, we may calculate that the solids extracted in the press, per 100 parts by weight of mill bagasse, are not 1·673 but 1·673 × 0·91425 = 1·5295 and pol extracted is 1·285 × 0·91425 = 1·1748. Thus the press bagasse composition is readjusted to

Fibre	41·1800
Solids	2·9605
(Pol)	2·2752
Water	50·5190 + X
	94·6595 + X

where X is a correction factor determined from the equation

$$\frac{50{\cdot}5190 + X}{94{\cdot}6595 + X} = 0{\cdot}5345$$

from which X = 0·1471, bringing the press bagasse moisture to 50·6661 parts per 100 parts of mill bagasse, and total press bagasse weight to 94·8066. This, brought to a percentage basis, gives a press bagasse composition of

Fibre	43·436%
Solids	3·123%
(Pol)	2·40%
Water	53·441%

The measured pol in press bagasse was 2·70% instead of 2·40%; since fibre and Brix content of the press bagasse were not reported it is not possible to check the calculated figures (which should be more reliable) against measured values.

It is possible to back-calculate to the pol and Brix content of the original press feed, as follows:

For 100 parts of last mill bagasse:

Weight of press feed = 126·1820 parts
Weight of press bagasse = 94·8066

∴ Weight of press juice = 31·3754

Weight of pol in press juice =
31·3754 × 0·0346 = 1·0856
Weight of pol in press bagasse =
94·8066 × 0·027* = 2·5598

∴ Total pol in press feed = 3·6454 parts

* Assuming that the measured pol in bagasse was accurate.

This compares with the measured pol in last mill bagasse of 3·45 parts.

Calculation on Brix values is more in accord with measured values:

For 100 parts of last mill bagasse

Weight of Brix in press bagasse
= 94·8066 × 0·03123 = 2·9608 parts
Weight of Brix in press juice
= 31·3754 × 0·0485 = 1·5217 parts

∴ Weight of Brix in press feed = 4·4825 parts which corresponds to the original value given above of 4·49 parts.

Analytical data assembled in Table I were obtained on consecutive operational days with a screw press. As may be seen, the mixing efficiencies, calculated on a Brix basis, varied between 84% and 107·5%. Obviously, efficiencies of over 100% result from errors in analytical or process data and, in fact, in one instance it was found that the water meter had been reading incorrectly, although it was subsequently put into order. There is no doubt that improved methods of measurement of maceration water, coupled with improved analytical techniques, would give improved data for control purposes. Nevertheless, on the basis of the efficiencies calculated in Table I, the writer believes it is justifiable to take, for convenience in calculation, a figure of 95% as representing the typical level of mixing efficiency which is to be expected from a screw press operating on bagasse or prepared cane.

Calculations for a three-press tandem

To make the calculations required, we start with a cane of assumed composition: 15% fibre, 16% solids and 69% water content. We assume also that the bagasse from the press will have a moisture content of 48%, a figure which is easily attained by press installations under normal factory conditions.

Thus, using the same method of calculation as above for Y_1, the water extracted in the first press at 100% mixing efficiency, we have:

$$\frac{69\,(69 - Y_1)}{6900 - 85Y_1} = 0{\cdot}48$$

from which $Y_1 = 51{\cdot}383$

Solids extracted at 100% efficiency would be

$$51{\cdot}383 \times 16/69$$

and at 95% efficiency $0{\cdot}95 \times 51{\cdot}383 \times 16/69 = 11{\cdot}3192$

Thus the first press bagasse comprises

Fibre	15·0000
Solids	4·6808
Water	17·6170 + X_1
Total	37·2978 + X_1

where X_1 is a correction factor for Y_1 to allow for the fact that the latter was calculated at 100% mixing efficiency instead of 95%.

X_1 is evaluated from the equation

$$\frac{17{\cdot}6170 + X_1}{37{\cdot}2978 + X_1} = 0{\cdot}48$$

from which $X_1 = 0{\cdot}5498$, and the first press bagasse comprises:

Fibre	15·0000
Solids	4·6808
Water	18·1668

To this is added 10 parts of maceration water per 100 parts of cane, giving

Fibre	15·0000
Solids	4·6808
Water	28·1668
	47·8476

During a second pressing to 48% moisture content, Y_2 parts of water would be expressed, calculated as before:

$$\frac{28{\cdot}1668\,(28{\cdot}1668 - Y_2)}{28{\cdot}1668 \times 47{\cdot}8476 - Y_2\,(28{\cdot}1668 + 4{\cdot}6808)} = 0{\cdot}48$$

Solving this, $Y_2 = 11{\cdot}8118$, so that solids extracted on a 95% mixing efficiency basis $= 0{\cdot}95 \times 11{\cdot}8118 \times 4{\cdot}6808/28{\cdot}1668 = 1{\cdot}8648$ parts

Thus the second press bagasse composition is given by

Fibre	15·0000
Solids	2·8160
Water	16·3550 + X_2
	34·1710 + X_2

where X_2 is the correction to allow for 95% mixing efficiency.

X_2, calculated as for X_1 above $= 0{\cdot}0906$, giving a corrected second bagasse composition

Fibre	15·0000
Solids	2·8160
Water	16·4456
	34·2616

To this is added 20 parts of maceration water per 100 tons of cane and the whole subjected to a third pressing. By similar calculations to those above, the water extracted in the third press $Y_3 = 21{\cdot}5361$ parts, containing 1·5808 parts of extracted solids, and giving a final bagasse of composition

Fibre	15·0000
Solids	1·2352
Water	14·9095 + X_3

or, after calculation of X_3, Water 14·9864

Extraction with the simple maceration process above is given by (16·0000 — 1·2352)/16·0000 = 92·28%.

Effects of compound maceration

In the first maceration cycle, the first press feed comprises the prepared cane plus 2nd press juice and will have the composition

Fibre	15·0000	= 15·0000
Solids	16·0000 + 1·8648	= 17·8648
Water	69·0000 + 11·8118	= 80·8118
		113·6766

From this feed, to give a bagasse of 48% moisture content, the water extracted, Y_1', is calculated as before and is evaluated as 63·4158. The solids extracted at 95% mixing efficiency becomes 13·3182, and the correction to Y_1' produces a 1st press bagasse of composition

Fibre	15·000
Solids	4·5466
Water	18·0429

and a juice comprising

Solids	13·3182
Water	63·4158

To this bagasse is added 10 parts of maceration water and the 3rd press juice giving a second press feed of

Fibre	15·0000	= 15·0000
Solids	4·5466 + 1·5808	= 6·1274
Water	18·0429 + 21·5361 + 10	= 49·5790
		70·7064

Calculating as above we obtain $Y_2' = 33{\cdot}9499$
Solids extracted = 3·9860
and a 2nd press bagasse having a corrected composition

Fibre	15·0000
Solids	2·1414
Water	15·8228
	32·9642

with a 2nd press juice comprising

Solids	3·9860
Water	33·9499

The feed to the third press comprises the second press bagasse plus 20 tons of maceration water, i.e.

Fibre	15·0000
Solids	2·1414
Water	35·8228
	52·9642

The water extracted $Y_3' = 21{\cdot}1680$ and
solids extracted = 1·2021,
giving a final bagasse with a corrected composition

Fibre	15·0000
Solids	0·9393
Water	14·7133

and a 3rd press juice comprising:

Solids	1·2021
Water	21·1680

Thus, on the first compound maceration cycle, overall extraction = (16.0000 — 0·9393)/16·0000
= 94·13%

On the 2nd maceration cycle, the first press juice added to the prepared cane is of the composition obtained from the calculation for the 1st maceration cycle; thus the feed to the first press comprises:

Fibre	15·0000	= 15·0000
Solids	16·0000 + 3·9860	= 19·9860
Water	69·0000 + 33·9499	= 102·9499
		137·9359

Using similar calculations to those before, the water extracted at 100% mixing efficiency is $Y_1'' = 86{\cdot}0807$ parts per 100 of cane

Solids extracted at 95% mixing efficiency = 15·8756 parts and the corrected composition of the first press bagasse is

Fibre	15·0000
Solids	4·1104
Water	17·6404

and that of first press juice

Solids	15·8756
Water	86·0807

The feed to the second press is thus composed of

Fibre	15·0000	= 15·0000
Solids	4·1104 + 1·2021	= 5·3125
Water	17·6404 + 21·1680 + 10	= 48·8084
		69·1209

Water extracted in the second press (Y_2'') = 33·4157 and solids extracted at 95% efficiency = 3·4552. Hence, by calculation the corrected composition of the second press bagasse is

Fibre	15·0000
Solids	1·8573
Water	15·5606

and that of the second press juice is

Solids	3·4552
Water	33·4157

The third press feed comprises the second press bagasse to which has been added 20 parts of maceration water per 100 parts of cane, i.e.

Fibre	15·0000	= 15·0000
Solids	1·8573	= 1·8573
Water	15·5606 + 20	=35·5606
		52·4179

By calculation as before, the water extracted (Y_3'') = 21·0131 and solids extracted 1·0426, giving a corrected final bagasse composition of

Fibre	15·0000
Solids	0·8147
Water	14·5982

and a 3rd press juice of composition

Solids	1·0426
Water	21·0131

The overall extraction for the second maceration cycle is given by (16·0000 — 0·8147)/16·0000 = 94·91%.

This procedure can be continued for further stages of compound maceration, and calculated results for up to nine cycles are given in Table II.

The total cane processed during the ten cycles is 1000 parts and the solids content 160 parts. Consequently the extraction of 151·7029 represents an overall extraction of 151·7029/160 = 94·81%.

Application to factory operations

The above calculations were made for a tandem of three presses. Since it is always advisable to allow for the possible mechanical breakdown of a press, it is suggested that it would be better to consider a four-press tandem with maceration distributed in the proportions of 10% to the feeds of each of the 2nd, 3rd and 4th presses. Again, the cush-cush need only be removed from the process juice extracted by the first press. A by-pass structure should be included, as suggested previously[1] so that, in the event of a breakdown, the press tandem operation could be changed from four to three presses with only a relatively small loss in extraction. This is a most important consideration in view of the very limited crop period dictated by the maturity of the standing cane.

Table II. Extraction from ten cycles of 100 parts of cane of assumed composition and at 95% mixing efficiency

Stage	*Solids extracted in process juice from first press*	*Bagasse losses*	*Extraction efficiency*
Virgin cane	11·3192	1·2352	92·28%
1st maceration	13·3182	0·9393	94·13%
2nd "	15·8756	0·8147	94·91%
3rd "	15·4524	0·7738	95·16%
4th "	15·3137	0·7604	95·25%
5th "	15·2682	0·7565	95·27%
6th "	15·2533	0·7548	95·28%
7th "	15·2470	0·7543	95·29%
8th "	15·2473	0·7541	95·29%
9th "	15·2474	0·7540	95·29%
	147·5413		
	3·1967	(2nd press juice solids from 9th cycle)	
	0·9649	(3rd press juice solids from 9th cycle)	
	151·7029		

The extent of the possible loss is demonstrated by figures in Table III, calculated for ten cycles as before but using four presses in series with maceration distributed as suggested above.

Table III

Stage	*Solids extracted in process juice from first press*	*Bagasse losses*	*Extraction efficiency*
Virgin cane	11·3192	1·0192	93·63%
1st Maceration	13·3182	0·8326	94·80%
2nd "	14·8361	0·7092	95·57%
3rd "	15·8765	0·6416	95·99%
4th "	15·6140	0·6105	96·18%
5th "	15·5042	0·5964	96·27%
6th "	15·4551	0·5901	96·31%
7th "	15·4331	0·5872	96·33%
8th "	15·4231	0·5860	96·34%
9th "	15·4187	0·5854	96·34%
	148·1982		
	3·4095	(2nd press juice solids from 9th cycle)	
	1·2464	(3rd press juice solids from 9th cycle)	
	0·3877	(4th press juice solids from 9th cycle)	
	153·2418		

The overall extraction over the ten cycles is 153·2418/ = 95·78%. The ten cycles total 1000 tons of cane and with a higher number the extraction figures tend to stabilize at 95·29% for three presses and 96·34% for four. Thus it may be seen that the performance of the screw press is equivalent to that of two mills approximately, while if one press of a four-press tandem became inoperative and a by-pass system with three presses were adopted, the loss of extraction would be only about 1%.

This might be considered an argument for limiting the tandem to three presses, but it is contended that the investment in the fourth press is economically justifiable since (a) there will be no need to shut down the complete tandem in the event of a press failure, and (b) the cost of the additional unit could be recouped in 5 or 6 crops depending on throughput.

From calculation using the figures above, the Brix of the mixed juice from the first presses sent to process is approximately 15·3, a figure somewhat higher than that published for mill data.

It has been repeatedly stated that the power requirements of presses are excessive compared with mills. Recent information available shows figures of between 27·5 and 27·8 h.p. per ton of bone-dry fibre per hour for presses, a figure which compares very favourably with some of the modern mill tandems of similar capacity with pusher feeders, etc. Further, it must be remembered that a screw press is a very much more efficient extraction unit than a mill so that fewer presses will be required for a similar level of extraction. An added advantage is that the press is capable of giving a much lower moisture figure as well as a 40–45% reduction of pol in final bagasse. This means that the bagasse has a higher calorific value and those factories needing to burn supplementary oil can obtain further financial advantage.

Capital outlay is about two-thirds of that of a mill of similar capacity and maintenance costs are lower. Press reliability has considerably improved over the years and time efficiencies of 99·5% have been reported by those factories employing a press unit at the end of their existing mill tandems. The capacity of modern presses is such that 5000–6000 tons of cane with a fibre content of about 15% can be handled per day. It has also been established in practice that no processing difficulties are experienced with the extracted juices so that the installation does give a genuine overall increase of sugar in the bag.

It is suggested that where new factories are to be set up, serious consideration should be given to a press tandem as the extraction unit. Furthermore, it is suggested that in factories where mills need extension or replacement, the press should be substituted. In all installations in the United States cane belt where presses have been installed an increase in sucrose extraction has resulted. In addition, where special presses have been used for cush-cush treatment, it has been found that the throughput of the existing tandem can be increased by as much as 10%. It therefore appears that a press installation can bring about an improvement in sucrose extraction at a lower cost per ton of sugar produced.

Sugar cane agriculture

Controlled-release fertilizers for sugar cane. M. ISOBE. *Rpts.* 1971 *Meeting Hawaiian Sugar Tech.*, 83–87. Some of the controlled-release fertilizers available for experiments on cane are briefly described and results of a field test given, which showed the advantages of sulphur-coated urea over ordinary urea in increasing cane and sugar yield per acre[1,2].

* * *

Response of ratoons to calcium silicate. H. H. HAGIHARA. *Rpts.* 1971 *Meeting Hawaiian Sugar Tech.*, 88–94.—Application of 3 tons of calcium silicate per acre to the soil surface 2½ months after ratooning at a soil residual silicon content of 56 lb/acre-ft gave the maximum increase in sugar yield (0·9 tons/acre) in trials, while the average increase was 0·5 tons/acre, compared with untreated controls. Recommendations for application of supplemental calcium silicate are given on the basis of economic considerations.

* * *

Protective coatings for sugar cane seed pieces. R. V. OSGOOD. *Rpts.* 1971 *Meeting Hawaiian Sugar Tech.*, 95–99.—The susceptibility of single-eye seed pieces to adverse soil and moisture conditions was overcome in tests by coating with a wax preparation which, under stress conditions, improved germination and growth compared with uncoated seed; however, initial growth was still slower than that of three-eye seed, although the introduction of fertilizers into the wax coatings is thought to offer a solution.

* * *

The estimation of sugar losses from cane damage due to rats, borers and other causes. A. H. TESHIMA. *Rpts.* 1971 *Meeting Hawaiian Sugar Tech.*, 100–103. Three years of sampling on a plantation owned by the Mauna Kea Sugar Co. in Hawaii have shown that rats on their own were responsible for the greatest amount of cane damage (19·24%). Borers on their own caused 3·95% damage, while rats and borers together damaged 8·24% of the cane. Sugar loss in the rat-damaged cane was 3·58%, 0·83% was lost in the borer-damaged cane, while 2·90% was lost in the cane damaged by both borers and rats. Of the remaining cane, 14·03% was damaged by agents other than rats or borers and 6·19% of the sugar was lost.

* * *

Projections for gibberellic acid. L. L. BUREN. *Rpts.* 1971 *Meeting Hawaiian Sugar Tech.*, 104–108.—Tests have indicated that maximum response of cane to gibberellic acid (GA) treatment occurred with young plants, increases with older cane being insignificant. Optimum response to GA treatment was also found to be governed by the time of year when GA was applied, maximum response being obtained with application during periods of low temperatures and/or short days.

* * *

"Sencor"—a new herbicide for Hawaiian sugar cane. R. V. OSGOOD. *Rpts.* 1971 *Meeting Hawaiian Sugar Tech.*, 109–110.—This herbicide, supplied by Chemagro Corporation as BAY-94337, has proved superior to "Ametryne" and "Diuron" in weed control and has low phytotoxicity towards cane.

* * *

Market potential for controlled-release fertilizers in Hawaii. W. G. PURDY. *Rpts.* 1971 *Meeting Hawaiian Sugar Tech.*, 111–112.—Advantages of controlled-release fertilizers for Hawaiian cane growers are discussed and the various types and proprietary brands available are briefly described.

* * *

Losses caused by RSD and need for hot-air treatment. R. J. STEIB and S. J. P. CHILTON. *Sugar Bull.*, 1972, **50**, (19), 8–11.—Since the dominant cane varieties now grown in Louisiana are susceptible to ratoon stunting disease, the authors emphasize the need for hot-air treatment. Yields per acre of each of five varieties when grown from 100% infected seed are compared with yields from disease-free cane.

* * *

Quality of sugar cane in relation to sheath moisture. T. R. SRINIVASAN and A. MARIAKULANDAI. *Indian Sugar*, 1972, **22**, 83–87.—Irrigation plus N at 150 lb/acre gave maximum c.c.s. in the 10th and 11th months, increased N fertilization beyond this being accompanied by reducing c.c.s. In the 9th month 300 lb/acre gave the highest sugar yield. A negative correlation was found between leaf sheath moisture and c.c.s. during the maturation phase, a moisture content of 74–76% giving the highest sugar yield.

* * *

Rôle of seed material in carry-over of wilt disease of sugar cane. K. KAR, G. P. SINGH and R. SHUKLA. *Indian Sugar*, 1972, **22**, 89–90.—In experiments at three research stations in Uttar Pradesh, the incidence of cane wilt was considerably greater in crops raised from infected seed, which also adversely affected germination and yield, than in cane raised from healthy seed.

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[1] See also HAGIHARA & DOI: *I.S.J.*, 1972, **74**, 212.
[2] ISOBE & YAMASAKI: *ibid.*

Factors affecting the incidence of the stalk borer (*Chilotraea auricilia*) in the western districts of Uttar Pradesh. V. G. RAJANI and P. NATH. *Indian Sugar*, **22,** 91–95.—High rainfall was accompanied by high incidence of stalk borers during the years under investigation (1964–1969); lodged cane also suffered increased damage, as did autumn-planted compared with spring-planted cane. Increased N fertilization and irrigation increased cane growth which attracted greater attention from the pest. Varietal differences were negligible, no variety remaining immune with a heavy attack.

* * *

Studies on the response of sugar cane to potash application on light soils of the Punjab. S. SINGH and S. S. SAINI. *Indian Sugar*, 1972, **22,** 97–99.—Tests on application of K in combination with N and P and with N alone showed no advantages, in terms of cane and sugar yield, over N and N-P applications.

* * *

Variety L 65-69. ANON. *Sugar Bull.*, 1972, **50,** (20), 3.—Properties of this Louisiana cane variety, a seedling of CP 52-1 × CP 48-103, are given in a notice of release.

* * *

Wide drill and double drill planting. E. J. HICKS. *Sugar Bull.*, 1972, **50,** (21), 6–7.—Preliminary results of tests have indicated the advantages, as regards cane stalk population per acre, of planting double drills 15 inches apart compared with the methods using drills with a standard or a wide opening between. On the other hand, some drawbacks to the double drill method are suggested.

* * *

Sub-surface drainage. G. J. DURBIN. *Sugar Bull.*, 1972, **50,** (21), 8.—Five-year trials with sub-surface irrigation in Louisiana in which the water table level was kept constant throughout the year showed that the method yielded 44% more cane and 27% more sugar per acre than did controls in which the water table fluctuated normally. The level of the water table (24, 32, 40 or 48 in below the soil surface) had no significant effect. The up-and-down variations in water table level appear to reduce cane yields by "pruning" the roots.

* * *

Canal Point sugar cane crosses in 1970-71 and 1971-72. N. I. JAMES and J. D. MILLER. *Sugar Bull.*, 1972, **50,** (21), 10–14.—Work at Canal Point, Florida, on seed production from cane crosses and the results achieved in 1970/71 and 1971/72 are reported and plans for the 1972/73 crossing season briefly discussed.

* * *

Sterilize machinery and eliminate crop losses. ANON. *Producers' Rev.*, 1972, **62,** (7), 57–60.—Attention is drawn to the need to sterilize cane harvesters and hold demonstrations of harvesters in disease-free cane blocks in order to stem transmission of ratoon stunting disease, which is responsible for higher cane losses in Queensland than is any other disease. Ratoon stunting viruses are not airborne but are most commonly spread by equipment.

* * *

Aerial rat baiting again at Proserpine. ANON. *Producers' Rev.*, 1972, **62,** (7), 60.—Aerial rat baiting in the Proserpine mill area of Queensland, in which 19,592 acres were baited, is reported.

* * *

Short billets no help to cane growers. N. J. KING. *Producers' Rev.*, 1972, **62,** (7), 66–67.—While full-length (6-ft) cane stalks with two cut ends dry out rapidly, the same stalks, when passed through a chopper harvester, will be cut into six 12-inch billets having a total of 12 ends which do not dry rapidly because of the protection afforded by surrounding billets. The result is faster deterioration than in the case of the 6-ft stalks, the rate increasing with reduction in billet size, short billets also splitting more easily than long ones and thus being susceptible to attacks by bacteria.

* * *

Smut in the state of Rio de Janeiro. J. P. S. L. NETTO. *Brasil Açuc.*, 1972, **80,** 31–36.—An account is given of the occurrence of smut in Brazil where it was first observed in 1948. The history of the disease, its cause, transmission and control are described, the technique used in Brazil being the cultivation of resistant varieties. A table lists the susceptibility or resistance of a large number of varieties.

* * *

Fertilization in the cane-growing region of the state of Rio de Janeiro. A. A. PEIXOTO. *Brasil Açuc.*, 1972, **80,** 37–43.—An account is given of the results of N-P-K trials on a number of estates in Rio de Janeiro.

* * *

Economic aspects of the chemical control of weeds in sugar cane. G. M. AZZI. *Brasil Açuc.*, 1972, **80,** 50–53.—It is pointed out that the cost of manual weed control is high if the workers are to be paid wages comparable to factory workers, with indirect benefits amounting to 85% of their direct wages. In addition, the flight of such workers from the land to the cities has caused a scarcity of labour. Under such circumstances, use of herbicides has been successful in holding down weed control costs. A single general-application herbicide is recognized as not possible and economy must be achieved through selective use of appropriate quantities of different chemicals or mixtures.

* * *

The starch content as a function of the stage of ripening of cane. M. A. A. CESAR and M. R. MAZZARI. *Brasil Açuc.*, 1972, **80,** 54–67.—Starch contents of three cane varieties were measured in two locations in São Paulo with analyses at 15-day intervals and the data compared with Brix, pol, reducing sugars, phosphate, ash and available sugar % cane; the only positive correlation found was with ash. Starch contents were generally low, increased initially, then decreased and behaved irregularly afterwards. Differences occurred between varieties in the same area and between the same variety in different areas.

* * *

Sugar cane herbicides—double doses. J. FERNANDES. *Brasil Açuc.*, 1972, **80,** 85–89.—Experiments have shown the possibility of using different doses of herbicide for treatment of the cane rows and the inter-rows, and three methods of such application are indicated.

* * *

Some observations on the mechanized harvest of sugar cane in Mexico. A. L. FORS. *Sugar y Azúcar*, 1972, **67,** (8), 19–21.—The problem of excessive trash accompanying cane into the sugar factory where mechanical harvesters, particularly the chopper type, are used under local conditions is the chief aspect of this article which describes the various harvesters working experimentally in Mexico. (Some information is also given on mechanical cutters introduced in the 1950's and 1960's but which proved unsuccessful.) Among solutions to the problem of "trashy" cane suggested is the installation of dry cleaners in the field and wet cleaners at the factory. However, it is pointed out that the cane grower lacks incentive to invest in such schemes, since he is paid for cane on a weight basis and has merely to guarantee a commercial sugar recovery of 8%.

* * *

Cane planting. L. L. LAUDEN. *Sugar Bull.*, 1972, **50,** (22), 5.—Advice on manual cane planting is given and guidance given on use of a Julien cane planter.

* * *

Some varietal characteristics of the more important commercial varieties. ANON. *Sugar Bull.*, 1972, **50,** (22), 18–19.—Advantages and disadvantages of the more important cane varieties grown in Louisiana are listed.

* * *

Sugar cane variety recommendations for Louisiana for 1972. ANON. *Sugar Bull.*, 1972, **50,** (22), 19–20.—Of the varieties recommended for 1972, L 62-96 and CP 61-37 are considered the generally most adaptable under Louisiana conditions. Soil recommendations are given for the varieties in each of the five major cane-growing areas of Louisiana.

* * *

Recommendations for the control of ratoon stunting disease in sugar cane in Louisiana, 1972. ANON. *Sugar Bull.*, 1972, **50,** (22), 22–23.—For hot-air treatment of seed cane to combat RSD, guidance is given on checking ovens for efficient operation so that the cane stalk internal temperature is maintained at between 50° and 54°C during treatment. Seed cane should be selected from heat-treated progeny, and all cane machinery should be cleaned. Recommendations are also given on prevention of mosaic infection in heat-treated cane.

* * *

Controlling Johnson grass seedlings and annual weeds in sugar cane planted in Louisiana in summer and fall 1972. ANON. *Sugar Bull.*, 1972, **50,** (22), 23–24. Recommended herbicides are listed and their most suitable application procedures described, as well as supplementary practices.

* * *

The biology of *Physcus seminotus* Silv. and *P. subflavus* Annecke & Insley (Aphelinidae), parasites of the sugar cane scale insect *Aulacaspis tegalensis* (Zhnt.) (Diaspididae). J. R. WILLIAMS. *Bull. Ent. Research*, 1972, **61,** 463–484.—Details are given of the host insect and breeding methods, immature stages, female and male development, egg deposition, superparasitism, life span and fecundity, adult feeding habits and size variations, and mating habits of these two parasites of the cane scale insect which have been deliberately introduced into Mauritius from East Africa.

* * *

How to operate a fully mechanized sugar (cane) farm. E. L. CLAPAROLS. *Sugarland* (Philippines), 1972, **9,** (4 & 5), 6–10, 30–31.—Details and illustrations are given of the various operations from land preparation to cane harvesting on a fully-mechanized cane plantation (as demonstrated at Hacienda Claparols).

* * *

Soil compaction. L. G. VALLANCE. *Australian Sugar J.*, 1972, **64,** 205–207.—Soil compaction and its effects on first and second ratoon cane growth are discussed and means of overcoming the problem briefly described.

* * *

What about lime? ANON. *S. African Sugar J.*, 1972, **56,** 403.—The liming of acid soils and its advantages in such areas of South Africa as the Midlands region of Natal, where aluminium toxicity is a frequent problem, are discussed and the economics examined.

* * *

Sugar cane pests in Mexico. S. FLORES. *Bol. Azuc. Mex.*, 1972, (268), 4–9.—With the great enlargement of the cane area in Mexico after 1930, infestation by pests which had formerly been slight increased markedly. The literature on pests in Mexico is reviewed and the present situation discussed regarding rodent pests, particularly rats and gophers.

* * *

Use of pipe drops in sugar cane fields. D. E. MENARD. *Sugar Bull.*, 1972, **50,** (24), 7.—To avoid soil erosion in cane fields caused by excessive drainage water at ditch outlets, the author advocates the use of pipes to take the drainage water from the ditch to a large canal.

* * *

Efficacy of hot air treatment in controlling ratoon stunting disease in different sugar cane varieties in the Punjab. S. S. SANDHU and R. S. RAM. *Indian Sugar*, 1972, **22,** 143–147.—Experiments using single-budded setts of four susceptible varieties showed that the causative virus was inactivated and the disease completely eradicated by hot air treatment in an oven at 54°C for 8 hours. Germination loss ranged from 13·8 to 59·2% but the weight of millable canes from the germinated setts was raised by 40–15% for the corresponding varieties, and the first ratoon yield by 138·4–30% respectively, compared with untreated controls.

* * *

Effect of "Eptam" and "Tillam" on the weeds and various phases of the sugar cane crop. K. KAR. *Indian Sugar*, 1972, **22**, 149–154.—Trials were conducted over three years with "Eptam" (ethyl di-*n*-propylthiol carbamate) and "Tillam" (S-propyl 1-N-butyl 1-N-ethyl thiol carbamate) for pre- and post-emergence weed control in cane. Two applications of each were more effective than one but neither controlled *Cynodon dactylon* or *Digitaria sanguinalis*. None of the doses employed affected germination or tillering, juice quality or cane yield. Plots treated with 2·8 or 5·6 kg/ha of "Eptam" gave cane yields equal to those obtained using normal cultivation and trash mulching for weed control.

* * *

Reappraisal of sugar cane variety CoL 9. C. N. BABU, S. S. SANDHU and B. K. RATTAN. *Indian Sugar*, 1972, **22**, 159–160.—This variety has been cultivated less than formerly because of its susceptibility to ratoon stunting disease. It is also damaged by the top borer and is prone to shy germination. However, these three can be overcome simply by hot water treatment of setts, application of "Endrin" and sett disinfection with "Agallol", respectively, under which circumstances the variety could be of wide application in northern India which is seriously affected by red rot, a disease to which CoL 9 has proved remarkably resistant during trials with many strains over 23 years.

* * *

Co 1053—another sugar cane variety for Orissa. K. C. PANDA, K. C. MISHRA *et al.* *Indian Sugar*, 1972, **22**, 161–163.—Co 1053 is a mid-maturing heavy-yielding cane with an erect habit and is resistant to red rot. It is gradually replacing Co 897 in Orissa.

* * *

Green cane harvesters. L. G. VALLANCE. *Australian Sugar J.*, 1972, **64**, 249–261.—An illustrated description is given of the new chopper-harvester for green cane designed by Mr. R. GREVER and built for him by Toft Bros. Industries Ltd. of Bundaberg. The cane is cut at 20–30 tons/hour and the extraneous matter separation is most impressive. The Mizzi green cane cane harvester is provided with a series of five blunt-toothed cleaning rollers between the chopping blades and the elevator, the latter also having spiral cleaning scrolls as its base. It is a compact and manoeuvrable machine with a designed harvesting rate of 32–50 tons/hour. The Raiteri harvester also uses mechanical assistance to blower separation of trash from the cane.

* * *

Biological control. S. NAGARKATTI. *Indian Sugar*, 1972, **22**, 313–315.—Aspects of biological control of cane pests are discussed and it is emphasized that success in the past has invariably been by establishment of an exotic parasite or predator rather than intensive breeding and release of an indigenous one. Reasons for this are explained and circumstances favouring successful release outlined. The economics are discussed; while insecticides are a recurrent cost, successful introduction of a natural enemy of a particular pest will mean that the initial research and release are the only costs involved.

* * *

Implementation of a sugar cane research objective. C. N. BABU and K. L. BEHL. *Indian Sugar*, 1972, **22**, 317–318.—Valuable work has been done in selection for improved cane varieties at Coimbatore, yet the country's average cane yield and sugar recovery remain low and disease and pest problems are still unsolved. The authors believe that the objectives of breeding work should be re-defined and simultaneous work done to obtain high-yielding varieties and disease-resistant varieties. Irradiation of the former may produce mutants which are also disease-resistant, while the latter may be further screened for higher-yielding canes. Work should also be done on new forms of insecticides such as hormone types for control of pests while intercropping with plants harmful to cane pests should also be studied as a means of control.

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Intercropping of sugar cane with onion. K. KAR, R. L. BHOJ and P. C. KAPOOR. *Indian Sugar*, 1972, **22**, 321–326.—Intercropping of cane with onions did not interfere with its germination but affected production of tillers and millable stalks. This could be countered by application of additional nitrogen and irrigation, and the highest cane yield was obtained using additionally 56 kg N/ha and six irrigations. The juice quality was observed to be somewhat poorer as a result of the extra N and irrigation.

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Sugar cane culture in Puerto Rico and Louisiana. R. S. KANWAR. *Indian Sugar*, 1972, **22**, 329–333. Agricultural practices in Puerto Rico and Louisiana are summarized.

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Occurrence of *Schizotetranychus andropogoni* Hirst on sugar cane in the Punjab and its control. S. K. GUPTA, A. S. SIDHU and M. S. DHOORIA. *Indian Sugar*, 1972, **22**, 335–337.—This mite had been reported in other parts of India but appeared in the Punjab in 1970. It may be controlled by application of "Carbophenothion", "Dicofol" or "Plictran" as 0·05% sprays applied at 1200 litres.ha^{-1}, and "Monocrotophos" as a 0·75% spray. They had a quick knock-down effect and kept the plants free of mites for up to 15 days after spraying.

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Potash with "Endrin" spray for control of sugar cane shoot borer. S. SITHANANTHAM and S. C. DANIEL. *Fertilizer News*, 1972, **17**, (8), 36.—Using two varieties, cane was sprayed with 3% KCl solution, with 0·1%

"Endrin" and with a mixed spray containing both KCl and "Endrin" at the same concentrations as when used alone. Water sprays were used as controls. Borer infestation, 30·5% in the control, was hardly affected by the KCl alone (28·7% infestation) but was reduced by the "Endrin" to 21·1% and by "Endrin" + KCl to 16·7%.

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Preliminary results of biological action against the leaf froghopper of sugar cane in the state of Pernambuco. P. Guagliumi. *Brasil Açuc.*, 1972, **80**, 325–327. Limited effects were observed in regard to egg parasitation by the microhymenopterous insect *Acmoolynema hervali* liberated during the 1970 season in cane fields where the froghopper *Mahanarva posticata* was established as a cane pest. The fungus *Metarrhizium anisopliae*, on the other hand, became abundant in the fields after application of an aqueous suspension of spores to the fields infested by the froghopper. The fungus is able to kill an average of 35–45% of adults and nymphs and was found to persist during more than a year.

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Tile drainage. A. I. Linedale. *Cane Growers' Quarterly Bull.*, 1972, **36**, 40–43.—Where clay or rock prevents the drainage of subsoil, waterlogging can occur and tile drains, although expensive, may be the only way of removing the excess water. A description is given of the method with reference to an instance at Nambour where they have been found necessary to drain cane lands.

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Cane production in the Burdekin—Trends over the past 25 years. I. T. Freshwater. *Cane Growers' Quarterly Bull.*, 1972, **36**, 44–46.—Cane yield in the Lower Burdekin area has increased from an average of 34·62 tons/acre in 1946/50 to 44·80 tons/acre in 1966/70. The sugar per acre figure has risen from 5·29 tons in 1950 to 6·92 tons in 1970. This is the more remarkable since the amount of land under ratoon cane is now 20% greater than the plant cane area, whereas in 1950 it was only 40%. The causes for the improvement are a matter of argument; varieties have played an important part but so have better farming equipment, pest and disease control, and improved fertilization and irrigation.

* * *

Fiji disease makes isolation plots necessary. C. L. Toohey. *Cane Growers' Quarterly Bull.*, 1972, **36**, 47–48.—Experimental plots at the Bundaberg Experiment Station have been infected in the past and remain at risk of further occurrence of Fiji disease. Consequently an isolated area 50 miles away has been adopted for production of disease-free cane for use in trials for control of the vector and breeding for resistance.

* * *

Protect your greatest asset—soil. C. M. McAleese. *Cane Growers' Quarterly Bull.*, 1972, **36**, 49–50.—Soil erosion by wind and water are discussed as are measures to overcome the loss of soil which ca turn cane land into areas which will not even gro grass.

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Hot water treatment—give it a chance. A. W. Fori *Cane Growers' Quarterly Bull.*, 1972, **36**, 51–5 Points to observe in hot water treatment for diseas control are mentioned; these include taking the see cane from well grown cane as disease-free as possibl The cane should be cut a few days before treatmer to "harden up" and afterwards should be handle carefully to avoid eye damage. Cane knives to cu whole stalks into setts should be sterilized as shoul be planters. If germination is poor, gaps should b supplied only with treated cane.

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Easy fertilizer calibration. E. F. Copley. *Can Growers' Quarterly Bull.*, 1972, **36**, 54–55.—A illustrated description is given of a method of checkin the accuracy of the fertilizer distributor by replacin a tube with a suitable bag and weighing the fertilize collected over a distance of one chain. A table give the proper weight for different rates and inter-ro distances.

* * *

Harvesting hazards. L. K. Kirby. *Cane Growers Quarterly Bull.*, 1972, **36**, 57–60.—The introductio of mechanical harvesting and chopper-type machine in particular has brought with it a much greate hazard from infection of the cut surfaces by *Leucuno stoc* with attendant difficulties. The cutting of extr short billets has increased this tendency even mor and should be stopped in order to save considerabl financial losses.

* * *

Refractometers and profit—use and abuse. P. J Nielsen. *Cane Growers' Quarterly Bull.*, 1972, **36** 61–63.—The use of the pocket refractometer in th field to measure juice Brix in cane as an indicato of cane maturity is explained. Interfering factors ar also discussed.

* * *

***Antitrogus mussoni*—major cane pest of the Bundaberg district.** R. M. Bull. *Cane Growers' Quarterly Bull.*, 1972, **36**, 64–67.—This cane grub, its identification and life cycle and damage it can cause are described as is its control by broadcasting of BHC dust or its application in a half-open drill. For ratoon cane it is best applied as a side dressing.

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Compaction rollers for aqua ammonia unit. L. G. W. Tilley. *Cane Growers' Quarterly Bull.*, 1972, **36**, 67. After application of aqueous ammonia as a fertilizer using a tine injector, the soil should be somewhat compacted to prevent escape. A method of doing this with rollers mounted behind the tines is described and illustrated.

A mechanical device for fertilizing standover cane. J. WRIGHT. *Cane Growers' Quarterly Bull.*, 1972, **36,** 68–69.—A device is described and illustrated whereby a fertilizer distributor from a commercial planter is mounted on a tractor with a drive from the tractor wheel using chain and sprockets such that the required amount of fertilizer is released for a length of cane row.

* * *

Cane planters. L. G. VALLANCE. *Australian Sugar J.*, 1972, **64,** 297–305.—An illustrated description is given of the Don-Gough machine which accepts whole-stalk unstripped cane which it cuts into setts, sprays, fertilizes and opens and closes the furrow. It is operated by a three-man crew—including the tractor driver—and is in commercial production by Wyper Bros. Ltd. of Bundaberg. Another planter, operated by only one man—the tractor driver—is the Populin and Scalia automatic unit, also made by Wypers. The two-row Etwell cane planter uses setts cut by a chopper harvester designed to avoid undetected misses. It requires a three-man crew, the two on the planter ensuring that there is an even flow of setts from the two 1-ton bins to storage hoppers and to the chute leading to the drill.

* * *

Solving salinity in sugar cane. R. P. HUMBERT. *World Farming*, 1972, **14,** (10), 6.—Soil salinity in land for cane should be removed by irrigation with water from rivers, underground aquifers, etc., and the rate of application should be adjusted to correspond to the quality of the irrigation water, i.e. using larger amounts when the water is of good quality and smaller amounts when the quality is not so good. Illustrations show the levelling of land in Peru and installation of drains for removal of the saline water. Removal of salinity is needed to avoid scorching of the cane which restricts green leaf area available for photosynthesis.

* * *

Practical and theoretical assessments of sugar cane yield potential in Natal. J. GLOVER. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 138–141.—Cane of variety N55/805 was grown on a coastal red sand soil under the best management conditions known and the yield compared with the estimated maximum theoretically possible on a basis of 100% efficiency of use of incoming sunlight energy in the production of sunlight. The yield attained was 70% of this theoretical maximum.

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The effects of age and time of harvest on the productivity of irrigated sugar cane. H. ROSTRON. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 142–150. Well-irrigated and fertilized cane was planted and harvested at different times of the year. The first ratoon crop was then harvested in portions at ages ranging from 32 to 72 weeks and the effect of its start, i.e. time of harvest of the plant crop, on the change in the recoverable sucrose content of the ratoon crop with age was studied. Details are presented of the changes found and it is concluded that, in South Africa, crops that begin to lodge at the beginning of summer should not be allowed to carry over for harvest in the following season.

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Deterioration losses in whole-stalk sugar cane. R. A. WOOD, J. L. DU TOIT and J. BRUIJN. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 151–157.—Losses in cane weight and recoverable sugar content and changes in juice quality and composition were determined in whole-stalk cane burnt and unburnt, cut immediately or harvested a few days after burning. It was concluded that deterioration starts immediately the cane is burnt or harvested, the rate varying with weather conditions. Unburnt cane deteriorates more rapidly than burnt cane during the first week after harvesting but thereafter burnt cane deteriorates more rapidly. It is recommended that all cane should be milled as soon as possible after harvesting and only enough cane should be burnt for one day's harvesting.

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Sugar cane variety and incidence of *Numicia viridis* **Muir (Homoptera:Tropidichodae).** A. J. M. CARNEGIE. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 158–159.—Although significant differences in numicia numbers on different cane varieties were detected, they were inconsistent in different locations and cannot be considered important.

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Sugar cane trash caterpillars (Noctuidae) and effects of defoliation on the crop. A. J. M. CARNEGIE and J. DICK. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 160–167.—At least seven species of noctuid moths have been reared from caterpillars collected beneath trash in cane fields and some, at least, feed at night on leaves of young ratooning cane. Natural enemies included six tachinid flies, an ichneumonid wasp, a species of *Entomophthora* and what appeared to be a polyhedral virus. Insecticide trials showed that, in spite of the trash blanket's protective covering, a measure of control was achieved with "Endosulfan", DDT, "Carbaryl" and *Bacillus thuringiensis.* The moths have been caught in light traps, which may have some practical application as indicators of forthcoming infestations. Artificial defoliation of young ratoon cane to simulate the effect of the pests caused a significant reduction in yield with smaller internodes and lower sucrose content.

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Critical growth stages for 2,4-D phytotoxicity to sugar cane in South Africa. F. E. RICHARDSON. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 168–176.—Yield losses were found when plant or ratoon cane with three or more unfurled leaves were band-sprayed with 2,4-D amine at a rate of 3·3 kg a.e. per hectare, the loss increasing with greater foliar development. Addition of a surface-active material considerably increased the crop loss, but directed sprays which minimized foliar contact caused no loss, even at susceptible growth stages, except where excessive doses (20 kg.a.e. ha^{-1}) were used. Differential varietal tolerance was recorded, but no residual effect was observed in ratoons.

* * *

Further results from experiments with five varieties harvested at different ages. L. A. ROSSLER and P. K. MOBERLY. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 177–180.—It was found that maximum production of sucrose in cane grown to 2nd ratoon (3rd ratoon in the case of 12-month cycle cane) was maximum with plant cane harvested at 20 months, 1st ratoon at 12 months and later ratoons at progressively greater ages. Adhering to a strict 12-month crop cycle gives maximum returns only if the crop is harvested in spring or early summer. Should this be impossible, a longer cropping cycle is advocated since yields of sucrose from old sugar cane are least affected by the time of harvest. Varietal differences were observed.

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Four years' experience with maturity testing on Mhlume sugar estate. R. D. TRUEN. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 181–187.—Ripening of cane is assisted by control of fertilization and irrigation supply to restrict growth in the month before harvesting. With stand-over cane and cane harvested at different times during the previous crop, the degree of maturity will vary and a harvesting programme needs to be based on maturity assessment to give maximum sugar recovery from the total weight of cane. The most satisfactory guide has been found at Mhlume to be that based on analyses of the 8–10 internodes taken from single stools at the rate of one stool per four hectares. The samples were subjected to direct analysis[1] for judgement of the maturity.

* * *

Some effects of varieties on seasonal fluctuations in cane quality. J. M. GOSNELL and M. J. P. KOENIG. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 188–195.—Cane quality varies during the season and studies of such variations demonstrated the optimum harvesting periods for a number of cane varieties grown in Rhodesia.

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A review of rainfall stimulation by means of cloud seeding and its possible application in the Natal cane belt. E. HUGHES. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 196–200.—Work carried out on cloud seeding with silver iodide particles to induce rain is reviewed with 18 references to the literature, and the value of such a technique to the South African sugar cane industry briefly discussed.

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Quantitative clay mineralogical analysis of highly weathered Natal soils. J. LE ROUX. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 201–203.—Analyses of three types of cane soil are presented and discussed.

The rôle of strip planting in conservation farming in the sugar belt. C. T. WISE. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 204.—The adoption of strip planting on hillsides is recommended, rather than ploughing an entire hillside and leaving bare to the elements, which is conducive to erosion.

* * *

Deep tillage investigations on five soil types of the South African sugar belt. P. K. MOBERLY. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 205–210.—Where specific soil factors that limit growth can be identified, deep tillage may be beneficial, but as a standard field practice for cane land preparation the extra costs are not justified. The conventional plough depth of 20–25 cm is apparently adequate under most conditions and a useful guide might be to plough or subsoil to a depth approximately 10 cm lower than the depth of the proposed planting furrow.

* * *

Smut incidence in variety trials. G. L. JAMES. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 211–215.—Results are tabulated of smut resistance trials over several crops using 68 varieties. Two methods for establishing smut resistance are discussed; the better is that based on whip population observations. The necessity of finding a variety or varieties of equal agronomic potential to that of the susceptible N:Co 376 is emphasized.

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Effects of cane row spacing and 50% population reduction upon smut expression in an infected crop. G. L. JAMES. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 216–217.—A 50% reduction of populations in plots of N:Co 376 at 3 months of age was shown not only to stimulate the production of more tillers but also to increase smut incidence as the seed cane was infected. It was concluded that roguing of heavily smut-infected fields will increase rather than decrease incidence of the disease. The importance of not allowing infection to develop beyond low incidence level is emphasized.

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A survey of commercially available hot water treatment tanks for the control of ratoon stunting disease (RSD). R. F. KING and G. M. THOMSON. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 218–219.—Six types of hot water treatment tanks were examined and found satisfactory as was the general standard of operational control at the sites visited during the survey.

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Sugar cane pesticides and their residue analysis. A. J. M. CARNEGIE and R. A. WOOD. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 220–223.—Samples of cane and final molasses were examined by the South African Bureau of Standards for residues of a range of pesticides which may be used in the sugar industry. Of these, only "Aldicarb" was detected at

[1] BUCHANAN: *S. African Sugar J.*, 1966, **50**, 1049–1059.

higher than the tolerance level (0·12 ppm *vs.* 0·10 ppm) in 6-months-old immature cane, but no residue was found in harvestable cane. Small amounts of DDT, EDB and DBCP were detected, all within acceptable tolerance limits.

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Analyses of composite samples of filter cake from South African sugar factories. K. E. F. ALEXANDER. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 224–225.—Measurements of the plant nutrients in filter cake collected in 1971 from South African sugar factories are tabulated, and their value expressed in the fertilizer cost equivalent to the N-P-K contents.

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Effects of nematicides and methods of applying them on field-grown sugar cane. R. H. G. HARRIS. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 226–229.—Comparison of several chemicals showed that highest cane yield was obtained using "Aldicarb". At the rates employed, no difference was found between application (i) three weeks before planting, using a tine-mounted injector, along a line on which the planting furrow was to be drawn and (ii) into the base of drawn planting furrows. Both applications were more effective than overall injection using multiple tines 38 cm apart. Nematodes found in the experiment are identified.

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Deep tillage investigations on five soil types of the South African sugar belt. P. K. MOBERLY. *S. African Sugar J.*, 1972, **56,** 415–423.—See *I.S.J.*, 1973, **75,** 382.

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Whole-stick cutters *vs.* combine chopper harvesters. ANON. *S. African Sugar J.*, 1972, **56,** 483–484. Advantages and disadvantages of both types of machine are listed. Reference is made to the development of green cane harvesters in Australia, and factors affecting the choice of a harvester for South African conditions are summarized and discussed, as are the size and cost of the machinery.

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The Louisiana sugar cane variety census for 1972. R. J. MATHERNE. *Sugar Bull.*, 1972, **51,** (2), 6–7.—The acreage planted to individual varieties in Louisiana changes rapidly and seldom does one variety remain a major choice for more than 10 years. In 1972 no single variety was dominant, the highest percentage of the total area being that of L 60-25 (25·2%) while CP 52-68 occupied 24·7%, CP 61-37 19·0%, L 62-96 11·2% and N:Co 310 10·1%, the balance being made up of other varieties. L 62-96 is the variety showing the most marked increase compared with 1971.

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Prospect of autumn planting of sugar cane in the Punjab. R. S. KANWAR. *Sugar News* (India), 1972, **4,** (5), 15.—By planting in autumn, a higher cane yield is achieved at the expense of a lost rabi crop, e.g. wheat, so that it is unattractive to farmers. By inter-planting the autumn-planted cane with another crop such as potato, onion or wheat, the practice becomes profitable.

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It is beneficial to apply pesticides to the soil. R. S. KANWAR. *La Ind. Azuc.*, 1972, **79,** 153.—See *I.S.J.*, 1972, **74,** 172.

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Sugar cane mosaic strains E and C in India and new sorghum differentials. S. M. P. KHURANA and S. SINGH. *Sugarcane Pathologists Newsletter*, 1972, (9), 6–8.—Cane mosaic virus Strains E and C are reported for the first time from India. Sorghum AKS 614 and 633 were found to be new local lesion indicators for Strain C which can be identified by round lesions on these and systemic infection on sorghum Atlas, the local lesion indicator for Strain E.

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Additional hosts for red stripe disease of sugar cane. S. R. S. DANGE and M. M. PAYAK. *Sugarcane Pathologists Newsletter*, 1972, (9), 8.—The causal agent of this disease, wrongly named *Xanthomonas rubrilineans* by many previous workers, is *Pseudomonas rubrilineans* (Lee *et al.*) Stapp. It has been common on maize in India and during 1971 was observed for the first time on *Euchlaena mexicana.*

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Effect of smut incidence in plant and ratoon crops on yield and quality. K. T. S. RAJA, S. NATARAJAN, N. J. AHMED and D. PADMANABHAN. *Sugarcane Pathologists Newsletter*, 1972, (9), 9–10.—The incidence of smut in Co 419—a susceptible variety—rose from 1·56% in plant cane to 40·40% in the third ratoon, while the yield decreased by 67%. Three other varieties showed similar effects. The increase is attributed to spread of the fungus from one stool to another with infection of young shoots by spores from an adjacent stool.

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***Aphis nerii* Boyer, an additional vector of sugar cane mosaic virus.** K. M. LAL and K. S. BHARGAVA. *Sugarcane Pathologists Newsletter*, 1972, (9), 10–11. After plants of *Calotropis procera*, a common weed found near cane fields, were found to be infested with *Aphis nerii*, transmission experiments were conducted in which *A. nerii* was cultured on the weed and then fed for 2 minutes on maize and cane donor plants infected with cane mosaic virus. The aphids were then transferred to maize seedlings, which were subsequently found to be infected with the disease; with maize as donor plant, 40% of the seedlings were infected, while with cane as donor the rate was 20%.

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Entomogenous fungus on *Pyrilla* sp. in Uttar Pradesh (India). K. KAR and S. C. GUPTA. *Sugarcane Pathologists Newsletter*, 1972, (9), 11.—A description is given of a fungus, similar to *Metarrhizium anisopliae* (Metsch) Sorokin, which has recently been found as a parasite on large numbers of *Pyrilla* sp. (leafhopper) adults in cane fields of Uttar Pradesh. The possibility of establishing the fungus in the field for leafhopper control is being studied.

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Corn, sorghum and Fiji disease. P. B. HUTCHINSON, G. N. R. FORTEATH and A. W. OSBORN. *Sugarcane Pathologists Newsletter*, 1972, (9), 12–13.—Preliminary results of experiments indicate that corn and sorghum are alternative Fiji disease hosts and could transmit the disease to cane if grown as an intercrop or in plots adjacent to cane fields. The disease is transmitted by the leafhopper *Perkinsiella saccharicida*, which is capable of wind-borne flights over many miles, so that isolated plots of susceptible corn or sorghum could serve as stepping stones in transmission of the disease to distant cane-growing areas. Transmission through corn or sorghum seed is unlikely, but remains to be confirmed.

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Strain E of sugar cane mosaic virus infecting St. Augustine grass in Florida. J. L. SALADINI and F. W. ZETTLER. *Sugarcane Pathologists Newsletter*, 1972, (9), 14.—Aphid transmission of the strain found on St. Augustine grass (*Stenotaphrum secundatum*)[1] was found in experiments with the grass, corn and cane to be low. While the grass was less susceptible than corn to infection by manual inoculation of adaxial leaf surfaces, once infection took place the symptoms persisted.

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Insect transmission of mosaic virus in sugar cane. H. DAVID, K. C. ALEXANDER and K. ANANTHANARAYANA. *Sugarcane Pathologists Newsletter*, 1972, (9), 15–16.—Five vectors of cane mosaic occurring in Coimbatore (South India) are: *Rhopalosiphum maidis*, *Melanaphis* (*Longiunguis*) *sacchari*, *M. indosacchari*, *Hysteroneura setariae* and *Assamia moesta*. The last two are newly recorded as vectors in India; *H. setariae*, which is found in sorghum, maize and a number of grasses around cane fields, infected 40–60% of plants in transmission tests, while *A. moesta*, which probably acts more as a mechanical carrier than true vector and occurs only in cane, infected 6–10% of the plants.

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Culmicolous smut of sugar cane in Taiwan. L. S. LEU. *Sugarcane Pathologists Newsletter*, 1972, (9), 16–17. Work on germination and storage of teliospores of *Ustilago scitaminea* Sydow, the causal fungus of culmicolous smut of sugar cane, is reported. Germination did not decline after 1 year's storage under dry conditions, and even after 4 years 92% germination occurred in cold conditions, whereas under wet conditions no germination was observed after only half a month. Teliospores germinating after storage had the potential to induce smut, as confirmed by inoculation.

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Mosaic testing methods. J. DICK. *Sugarcane Pathologists Newsletter*, 1972, (9), 17.—While artificial methods of cane mosaic inoculation led to significantly higher levels of infection than did natural field transmission tests, even with the artificial methods there were marked differences between the responses of different cane varieties. Hence, artificial methods are considered unsuitable.

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Fiji disease blows up in the Bundaberg District. B. T. EGAN. *Sugarcane Pathologists Newsletter*, 1972, (9), 18.—Reference is made to the outbreak of the disease in the Bundaberg area of Queensland, where 35% of the farms have infected cane and the situation is worsening. Two factors of significance are the huge increase in the numbers of insect vectors transmitting the disease, and the rather high tolerance of N:Co 310 cane (constituting nearly 90% of the cane grown in the district) to the disease, with the result that marked symptoms or stunting do not occur until after a long time and field inspections are inadequate, making risky the planting of cane from within a diseased area.

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Association of ants and aphid vectors of sugar cane mosaic. S. M. A. RIZVI, K. S. BHARGAVA and R. D. JOSHI. *Sugarcane Pathologists Newsletter*, 1972, (9), 21.—Four species of ants (*Polyrhancis binghami*, *Lophomyrmex bedoti*, *Camponotus* sp. and *Cremastogaster politula*) were found, in studies, to be associated with colonies of *Melanaphis* (*Longiunguis*) *sacchari*, *M. indosacchari* and *Rhopalosiphum maidis*, aphis vectors of cane mosaic. The ants carry the aphids from one cane plant to another and from cane to alternative hosts and *vice versa*.

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Leaf scald at Mackay, Queensland. C. G. HUGHES. *Sugarcane Pathologists Newsletter*, 1972, (9), 22.—An outbreak of leaf scald at Mackay, infecting cane (mostly Q 63) on a large number of farms, is reported.

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Effect of saline water irrigation on N:Co 310 and H 50-7209 cultivars of sugar cane. I. Growth parameters. M. M. SYED and S. A. EL-SWAIFY. *Trop. Agric.* (Trinidad), 1972, **49**, 337–346.—The cultivars were irrigated with solutions of NaCl, Na_2SO_4 and seawater (at concentrations adjusted to give required electrical conductances in the range 2–8 mmho cm^{-1}) during growth in a low humic latosol structurally resistant to salinity and sodium effects. Salt accumulation was minimized by permitting water excesses to leach through the soil with each irrigation. Increasing salinity in the solutions caused dry matter and green weights to fall compared with the controls irrigated with fresh water. The loss in dry matter ranged from 10% at low salinity to 35% at high salinity, the effects being greater with N:Co 310 than with H 50-7209, especially at lower salinities. Salinity also adversely affected stalk elongation, sheath weights and sheath moisture contents. The effects on stalk elongation agreed with published data on moisture stress effects, suggesting that the osmotic component of salinity was more responsible for the reduction in cane yield than were specific ion effects.

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[1] *See also I.S.J.*, 1973, **75**, 383.

Sugar beet agriculture

Beet research in respect of progress achieved and future problems. M. MARTENS. *Publ. Trimest. Inst. Belge Amél. Betterave*, 1972, 43–78.—See *I.S.J.*, 1973, **75**, 350.

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Harvesting losses and their significance. G. L. MAUGHAN. *British Sugar Beet Rev.*, 1972, **40,** 215–217. Investigations conducted during the 1971/72 campaign in the UK revealed that an average of 1·17 tons of beet per acre was lost in mechanical harvesting by being left undug in the ground or falling from the harvester, the former category constituting 63% (0·74 tons) of the loss. The total loss represents nearly 7% of the beet crop, and the author calls for greater attention to setting of the machines and their operation.

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Weed control. R. A. FOGG. *Sugar Beet J.*, 1972, **36,** (1), 2–4.—Control of perennial weeds in beet fields, which have been on the increase in the author's area of Michigan, USA, particularly where crop rotation is used, is discussed and recommendations offered.

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Efficiency in sugar beet harvest. F. B. RUSSELL. *Sugar Beet J.*, 1972, **36,** (1), 5–6.—Information is given on the system of beet delivery to Buckeye Sugars Inc., Michigan, USA, whereby the total number of road trucks used has been reduced.

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The total fertilization programme. G. E. NICHOL. *Sugar Beet J.*, 1972, **36,** (1), 7.—The author recommends determining the next year's nitrogen fertilizer requirements for beet well in advance, considering any nitrogen in fertilizer ploughed into the soil in the autumn as being available in the following season.

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Soil sampling and soil testing. J. C. SCHICKLUNA. *Sugar Beet J.*, 1972, **36,** (1), 8–10.—A procedure for soil sampling in Michigan beet fields is described.

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An evaluation of soil testing today and the soil fertility conditions in the major sugar beet-producing areas of Michigan. L. S. ROBERTSON and E. C. DOLL. *Sugar Beet J.*, 1972, **36,** (1), 11–14.—Soil testing at Michigan State University is described and results given for lime requirements and P, K and Mg levels in soils of the major beet-growing areas as well as the average for the state.

Systemic activity of triphenyl tin chloride in sugar beet seedlings. A. N. MUKHOPADHYAY and R. P. THAKUR. *Plant Disease Reporter*, 1972, **56,** 776–778.—Triphenyl tin chloride (TPTC) dissolved in potato-dextrose agar to give concentrations of 100 and 300 μg/ml was used in bioassay studies on *Alternaria tenuis* control *in vitro*. Extracts from beet leaf, petiole and root tissues dipped in the TPTC all inhibited growth of the fungus compared with untreated controls, the root extracts exhibiting greater control than the others. Positive correlation was found between TPTC uptake and translocation and between its concentration and time of exposure. TPTC has already demonstrated its fungicidal properties in field control of *Cercospora* leaf spot.

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New means of controlling the pygmy mangold beetle (*Atomaria linearis* Steph.) in beet. K. KÜTHE. *Zucker*, 1972, **20,** 657–661.—Results of field trials on chemical control of this beet pest are reported, showing the efficacy of applying granular insecticides at or after sowing without the need for preliminary seed dressing. In some cases, the beet fly (*Pegomya betae*) was also controlled, almost complete elimination being achieved with granule treatment after spraying with "Mercaptodimethur", which was also highly effective against *A. linearis* when used in granular form.

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Effect of planting density and N fertilization on sugar beet performance. II. K, Na and α-amino-N. K. H. BAROCKA, H. GEIDEL and W. MÜLLER. *Zeitsch. Zuckerind.*, 1972, **97,** 556–565.—Further results of tests to determine the effects of planting density and N are reported[1]. While increased applications of N caused increase in K, Na and α-amino-N, increase in planting density had an opposite effect. Hence, in order to reduce molasses sugar it is preferable to reduce N application and increase planting density, which has an even greater effect at low N applications. The K:α-amino-N ratio can be used to predict molasses sugar.

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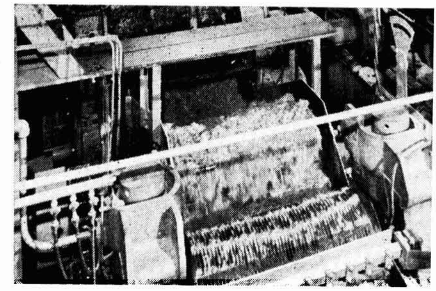
Soil and climatic factors in Irish sugar beet yields. J. LEE and C. K. COMERFORD. *Sugar J.*, 1972, **35,** (4), 17–21.—The results of the preliminary phase of a long-term project concerning possible relationships between beet yields and soil and climatic factors in Ireland are discussed for the 3-year period 1966-68.

[1] *See I.S.J.*, 1973, **75,** 250.

Cane sugar manufacture



A modern sugar mill in the Philippines today. A. GELLY. *Sugarland* (Philippines), 1972, **9**, (1, 2, 3), 10–17, 28, 46.—Details are given of the layout of Tolong sugar factory and of its equipment. The factory, which started operations in 1970, was built by Soc. Fives Lille-Cail for a daily capacity of 3000 t.c.d. expandable to 6000 t.c.d. The equipment includes four self-setting mills and four horizontal vacuum pans of Fives Lille-Cail design and construction.

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The progressive liming tank in cane sugar factories. J. DE CRÉMOUX. *Ind. Alim. Agric.*, 1972, **89**, 1033–1035. Details are given of a vertical progressive liming tank with top juice feed and bottom milk-of-lime feed. Mixing is carried out by means of rotary paddles fitted to a central shaft, one paddle in each of 2 to 5 compartments. The limed juice leaves at the bottom of the tank.

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Gur from sweet sorghum. A. K. GHOSH. *Indian Sugar*, 1972, **22**, 11–12.—Preliminary experiments are reported for using sorghum in gur manufacture in India, subject to a suitable method of removing the starch. Gur prepared from sorghum in the laboratory at the Indian Institute of Sugarcane Research, Lucknow, compared favourably with gur prepared from sugar cane.

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A comparison of the processing of burned and unburned sugar cane. G. E. SLOANE and L. J. RHODES. *Hawaiian Planters' Record*, 1972, **58**, 173–182.—Comparisons were made between the advantages of cane burning and non-burning in a series of five tests. Results showed that processing unburnt cane caused a substantial increase in harvesting and hauling requirements in terms of both men and equipment; a moderate to substantial reduction in factory operating rates with existing facilities; almost the same extraction at reduced grinding rates as with burnt cane, but a slight reduction in boiling house recovery and slightly lower overall recovery; a small but significant improvement in sugar yield per acre (apparently a result of smaller losses in the cleaning plant); and considerably poorer sugar refining properties in terms of colour and filtrability.

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Stale cane. G. H. RICHARDS. *Producers' Rev.*, 1972, **62**, (6), 23.—Research work on cane deterioration by *Leuconostoc mesenteroides* at James Cook University in Queensland is reported. In efforts to find suitable enzymes (dextranases) which would be capable of destroying the dextran formed by the *L. mesenteroides*, four have been isolated, but all have maximum activity at 45°C, whereas a temperature of at least 65°C is required for use in a cane sugar factory.

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A new approach to the exhaustion of cane final molasses. R. M. MORRIS and L. W. ROBERTS. *S. African Sugar J.*, 1972, **56**, 407.—Two hypotheses are put forward to describe why cane molasses exhaustion is limited with the use of conventional equipment. The first argues that, since the density difference between the sugar crystal and molasses is negligible, the relative shear between the two will also be negligible, except in high gravitational and centrifugal fields. During crystal growth, the layer of molasses will become progressively depleted of sucrose with no surface renewal or local turbulence to restore its concentration, so that conventional crystallization may not be adequate and a high shear technique may be desirable. The second theory postulated concerns polysaccharides or other long-chain organic molecules in the molasses which may coat the sugar crystal and inhibit further growth. Separation of the layer and reseeding may be necessary to increase the degree of exhaustion. Further dilution of the molasses may be possible without reaching a concentration below the equilibrium solubility of the molasses sucrose.

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The cane sugar factory/refinery in Cameroun. A. BERNARD. *Ind. Alim. Agric.*, 1972, **89**, 1115–1124. Details are given of the sugar factory/refinery built by Soc. Fives Lille-Cail at M'Bandjock, 90 km from Yaoundé in Cameroun[1]. Information is also given on the cane agriculture.

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Chemical cleaning of evaporator vessels. R. R. TROTT and R. MALONEY. *Sugar J.*, 1972, **35**, (4), 13–15. Investigations at the end of the season at Haymans sugar factory, Barbados, in 1970 and 1971 are reported in which the 3rd effect of a quadruple-effect evaporator was boiled out with NaOH solution and then treated with Hodag "PH-2" descaling chemical. The treatment was highly successful in scale removal, completely clean tubes being obtained with subsequent mechanical cleaning, while alkali treatment of the 4th effect followed by mechanical cleaning was not adequate but improved the condition of the vessel

[1] *See also* DELAVIER & HIRSCHMÜLLER: *I.S.J.*, 1972, **74**, 215.

compared with that before the start of the crop. However, mechanical cleaning caused significant damage to the tube surfaces. Comparison of the direct and indirect costs of manual and chemical cleaning favours the latter treatment.

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Brazil inaugurates modern bulk sugar and molasses terminal at Recife. D. SMITH. *Sugar y Azúcar*, 1972, **67**, (9), 15–17.—See *I.S.J.*, 1971, **73**, 384; 1972, **74**, 384; 1973, **75**, 57, 151.

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Chemical cleaning of evaporator vessels. R. R. TROTT and R. MALONEY. *Sugar y Azúcar*, 1972, **67**, (9), 18–20.—See *I.S.J.*, 1973, **75**, 386.

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Development of sugar machinery manufacture in India. A. C. CHATTERJEE. *Indian Sugar*, 1972, **22**, 273–275. Development of sugar machinery manufacture by Indian companies has been rapid since its start in 1955 and stimulation by the foreign currency crisis of 1957. As a result, the country now has the capability of providing a wide range of equipment up to and including complete cane sugar factories.

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A critical assessment of the working of DDS diffusers in India: comparison with the results achieved by milling alone. S. K. D. AGARWAL, B. K. GUPTA, R. K. DIXIT and R. P. SHUKLA. *Indian Sugar*, 1972, **22**, 277–312.—The three DDS diffusers in operation in India were each designed for a throughput of 2000 t.c.d. but have worked at 1400, 1500 and 1800 t.c.d., respectively. Extraction has been 95–97%, achieved by increasing maceration from 20–25% to 30–35% on cane. The Brix of last mill juice is higher than with milling alone while its purity is lower, the latter possibly owing to low pH (4–4·5) which might have caused inversion. Suggestions are made (diffusion juice recirculation to the primary bagasse hopper, reducing the temperature in the latter part of the diffuser, using cold maceration at the dewatering mills) whereby diffuser performance may be improved.

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High sugar recovery in Maharashtra for the season 1970/71. R. K. KULKARNI and P. B. LONDHE. *Indian Sugar*, 1972, **22**, 339–342.—Higher sugar recovery compared with the previous season was found by comparison of factory data to have been due to higher cane quality, higher crushing rates and shorter season, and to lower process losses.

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Scale control in multiple-effect evaporators. C. K. CLONINGER. *Sugar J.*, 1972, **35**, (5), 9–11.—Trials are reported on the use of "Busperse 49" (Buckman Laboratories Inc.) for control of scale formation. Addition to first expressed or clear juice in amounts of 5–30 ppm (usually 10–15 ppm) reduced scaling in evaporators and heaters, so increasing the time between cleaning. Addition of 2 litres of "Busperse 49", diluted with 6 litres of water, for each 1000 ft^3 (28 m^3 or 28,000 litres) of massecuite decreased its viscosity, improved heat transfer and reduced scaling. Case histories are recorded from a number of countries. Another material, "Busperse 47", when added in 0·1% concentration to caustic solutions and in 1% concentration to acid solutions, improved their power to penetrate and remove scale.

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Sugar research in Australia. J. R. ALLEN. *Sugar Research Inst.* (Mackay, Queensland) *Ann. Review*, 1971–72, 20 pp.—A computer programme has been prepared and used to establish schedules for cane transport to mills on a basis of delivery point activity, trucks available, etc. Evaluation of the performance of milling trains is provided for mills which are members of Sugar Research Institute Ltd. and the basic programmes have been updated to allow for changes in cane preparation. Trials have been made with new blocks for the brakes of cane transport locomotives, while train resistances have been studied using a dynamometer truck. Investigation of losses in milling and diffusion has shown that both are small and much the same for both processes. Molasses crystallization rates, viscosities and exhaustibilities were little different from diffuser and milling plants and were what would have been expected from the reducing sugars:ash ratio. Investigations were made on noise problems and their alleviation in locomotive cabins, near the shredders and gearboxes, etc. Special truck wheels and automatic roller arcing machines have been developed, while trials on a bactericide marketed world-wide for several years were repeated, again indicating no effect on mill train microflora. Effluent aeration treatment has been adopted at a number of member mills but in some they were operated above capacity; a primary settling vessel is recommended to give reliable and regular performance of the aeration unit. Flocculants have been found to vary from their stated specification and it is thought desirable to establish standards and ensure that supplied materials meet these. Bagasse pulp manufacture was the theme of a seminar held in Mackay in November 1970; this showed up areas where more knowledge was needed and a feasibility study was begun. A complete instrument system has been devised which monitors mill juice flow, buffer tank level, etc., and has produced a smoothed juice flow from the mill. Investigation of very short billets being produced by some harvesters showed that the increased surface area exposed to infection results in appreciable sugar losses and dextran formation. An experimental shredder has been built of full-scale diameter but with a width of only 18 inches; it is equipped for studies of shredder operation and has been used at rates equivalent to 450 t.c.h. for a 7-foot full-scale unit. Experiments have continued with a 3000-gal continuous vacuum pan; operation and control were found to be quite easy and modifications have been made to increase throughput. A pan at one member mill was modified to permit computer control tests during the 1972 season. A new massecuite resistance heater has been developed with stainless steel scroll electrodes. Data logging equipment has been improved and a radio transmitter, encapsulated inside a ball and having the same density as massecuite, has been developed for use in pan circulation studies. Computer control installations have been made at a number of member mills.

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Automatic regulation of feed to the first body of a multiple-effect evaporator. G. K. CHETTY. *Sugar News* (India), 1972, **4**, (3), 11–13.—Juice feed to the evaporator first body from the clear juice tank is via a device which includes a telescopic tube within a tank, the upper (overflow) level of the tube being set to a height (about 30% of the tube height above the bottom tube plate) such as to maintain a proper juice level in the body. The juice is pumped from the clear juice tank to the evaporator; if the evaporation rate is too low the excess juice flows over the top of the tube into the surrounding tank from which it is pumped back to the clear juice tank.

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Rôle of improper mill house sanitation leading to the production of *Leuconostoc* on the overall recovery in sugar factories. S. C. GUPTA and S. K. D. AGARWAL. *Sugar News* (India), 1972, **4**, (3), 14–18.—Examination of erratic juice analyses at two factories showed that they were attributable to high and variable invert content arising from microbial contamination of the mills. Methods of countering such contamination are briefly surveyed; their application at the two factories caused a rise in juice purity and eliminated the erratic behaviour. The savings resulting are calculated.

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Benefits of the defeco-melt-phosflotation process over the sulphitation process. A. C. CHATTERJEE. *Sugar News* (India), 1972, **4**, (4), 6–8.—The process referred to is similar to the defeco-melt crystallization process[1] but involves clarification of the melt liquor by the phosphatation-flotation process employed in sugar refining. Sulphur usage is eliminated and recovery is higher, with reduced molasses and undetermined losses, lower chemical costs for the process and for evaporator cleaning (the reduced scaling also permits a higher crushing rate and shortening of the crushing season), etc.

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Operation and control of the molasses mixing plant at the South African sugar terminals. A. J. RADFORD and B. C. E. GORDON. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 27–29.—Addition of molasses to high-pol raw sugar to produce the desired shipment sugar[2] originally employed final molasses but this has been changed to high-test molasses. Moisture addition to maintain a suitable safety factor could be discontinued, as could the washing of the pipes with water after each loading run—the pipes were left with a coating of molasses and corrosion was eliminated. By running the pumps at lower speed the molasses could be pumped cold in the summer although some direct steam injection heating is needed in the winter. The original single manifold for molasses distribution has been replaced by a double unit to give better curtains and more uniform mixing. Control of the operation by computer is to be replaced by a simpler ratio controller. Calculation of the weights of molasses required from the weight of sugar and the pol analyses show discrepancies with the actual weight used, and the method of analysis requires investigation.

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Gradual enlargement of evaporator capacity. A. VAN HENGEL. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 30–32.—A method for gradually increasing the capacity of a quintuple-effect evaporator is explained; it involves adding a new vessel and running the two last vessels as a fifth effect with steam flow in parallel but juice flow in series; this raises capacity by 25%. Repeating this to give a two-vessel fourth effect increases capacity by a like amount and by adding more vessels the evaporator capacity can be doubled in stages.

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Specification and evaluation of boiler plant tenders in the sugar industry. H. BIEBER. *Proc. 46th Congr. S. African Sugar Assoc.*, 1972, 33–36.—A guide is presented to compilation and assessment of tenders for new boiler plant; this covers aspects of the specification including plant capacity, temperature and pressure conditions, fuels, performance at various loads, efficiency and heat-trap equipment, duplication and backtrap equipment, scope of supply and purchasing specification. For evaluation, consideration should be given to scope of supply and services, operational cost, ease of operation, maintenance cost, design and construction, service and spares facilities as well as prices and terms.

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Dunder disposal. L. L. RENNIE. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 37–39.—It is recommended that factory waste water be collected, oil and suspended matter removed and the pH adjusted to make it acceptable for irrigation and that it should be pumped continuously to a dam serving a spray irrigation system and with several days' capacity. It should then be used for irrigation during daylight for disposal combined with the reclamation of its plant nutrient content. Only if spray irrigation is impossible to provide or too expensive need biological treatment be considered.

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First impressions of a wet type scrubber on a bagasse-fired boiler. B. S. C. MOOR. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 100–101.—General observations are made on a Peabody wet scrubber for flue gas installed at Tongaat sugar factory.

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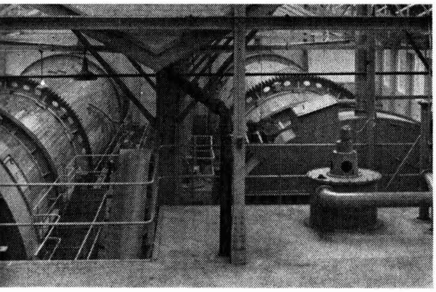
[1] GUPTA *et al.*: *I.S.J.*, 1966, **68**, 340.
[2] *See* ALEXANDER: *ibid.*, 1972, **74**, 227–230.



Beet sugar manufacture

Application of ion exchange membranes in the sugar industry. K. Číž. *Ind. Alim. Agric.*, 1972, **89**, 1037–1042.—Electrodialysis applications in the sugar industry are discussed, including juice demineralization, making sugar solution alkaline, sugar solution inversion, adjustment of condenser water pH for diffusion and treatment of regenerant solutions from ion exchange units. Diagrams of an electrodialysis test scheme and of the components of an electrodialyser are given. Some test results are briefly mentioned.

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Corrosion of sugar industry evaporators. A. Lemaitre. *Ind. Alim. Agric.*, 1972, **89**, 1049–1056.—Aspects of the subject discussed include types, causes and detection of corrosion and possible means of reducing it from the processing side or from the tube manufacturing side. Results from French sugar factories are cited, and tabulated values given of the iron content in thin juice, juice from a 2nd evaporator effect and thick juice as determined by colorimetry and atomic absorption.

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Thick juice storage—syrup processing plant. M. Beauvisage. *Ind. Alim. Agric.*, 1972, **89**, 1059–1065.—A beet sugar factory can increase its daily throughput by increasing the capacity of all its processing plant or by storing thick juice for post-campaign processing and increasing only the plant preceding the pan house. In this study the author calculates the capital, fuel and labour costs involved in sugar manufacture to permit comparison of the two possible solutions and find the threshold at which thick juice storage is the more economical solution. The calculations are based on a campaign of 80 days, a beet sugar content of 16·7% and a sugar yield of 14%.

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Automation of vacuum pans. M. Garabet. *Ind. Alim. Agric.*, 1972, **89**, 1067–1071.—After a brief discussion of automatic boiling, the author gives details of the system used in the Fives Lille-Cail horizontal vacuum pan. A chart, showing conductivity, massecuite level and vacuum during five strikes, is reproduced.

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Washing devices in sugar centrifugals. R. Crabeil and J. M. Vicaigne. *Ind. Alim. Agric.*, 1972, **89**, 1073–1078.—Experiments conducted on a test bench and in centrifugals to compare various types of washing devices are reported.

Graphical control of low-grade products in a beet sugar factory. J. Genotelle. *Ind. Alim. Agric.*, 1972, **89**, 1089–1093.—Formulae and graphs are given for rapid determination of low-grade massecuite mother-liquor purity, non-sugars:water ratio, supersaturation and temperature when the saturation coefficient in terms of the non-sugars:water ratio is known. Graphs are also given for rapid calculation of the non-sugars: water ratio and massecuite crystal content.

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Auto-degradation of molasses in storage. M. Friml. *Ind. Alim. Agric.*, 1972, **89**, 1095–1097.—Spontaneous decomposition of 780 tons of beet molasses and subsequent explosion are reported and the molasses analysis tabulated. Possible means of avoiding the problem are briefly discussed.

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The electro-magnetic flow meter in the sugar industry. B. Lepenne and J. P. Merlet. *Ind. Alim. Agric.*, 1972, **89**, 1099–1112.—The fundamentals of electro-magnetic flow measurement are explained and possible applications in the sugar industry described. More detailed reports are given on concrete examples, including RT diffusion, juice purification and the filling of road tankers with thick juice at a juice station.

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Continuous centrifugalling of low-grade products. O. Adriaensen. *Sucr. Belge*, 1972, **91**, 427–431. Tests at Moerbeke-Waes factory are reported, in which centrifugalling of low-grade massecuite in continuous and batch machines was compared. Despite higher molasses sugar in the case of the continuous machines (30·4 kg/100 kg massecuite compared with 29 kg/100 kg for the batch centrifugals), they are preferred because of the lower investment and operating costs and for a number of other reasons given.

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Boiling low-grade massecuite with "Intrasol FK" surface-active additive. O. Krieger. *Zucker*, 1972, **25**, 688–691.—See *I.S.J.*, 1973, **75**, 288.

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Generalization of data on heat exchange during boiling of sugar solutions in annular ducts. Yu. D. Petrenko and I. I. Sagan'. *Izv. Vuzov, Pishch. Tekh.*, 1972, (3), 156–159.—An empirical equation, derived from experiments in which aqueous sugar solution was boiled in a vertical annular duct, is shown to be applicable to calculation of heat transfer under optimum conditions.

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Effect of frequency and amplitude of fluctuations in temperature of supersaturated sucrose solution on crystal formation intensity. I. S. GULYI *et al. Izv. Vuzov, Pishch. Tekh.*, 1972, (3), 163–166.—Experiments are reported which showed that deliberate fluctuations in boiling temperature to either side of a "constant average" increased the rate of crystal formation; increase in the frequency and amplitude of such fluctuations reduced the length of the latent period and boiling "semi-period".

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Molasses sugar extraction. A. KACIMI. *Sucr. Maghrebine*, 1972, (2), 14–18.—Using data from Beni-Mellal beet sugar factory, where an experimental Asahi ion exchange plant has been used to demineralize 2nd strike raw syrup, the author compares the technological and economic advantages and disadvantages of molasses sugar extraction by the Steffen process and by ion exchange treatment and decides in favour of a Steffen plant annexed to the factory.

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Use and growth of protococcaceae for sugar factory waste water treatment. Z. D. ZHURAVLEVA and K. P. GONCHAROVA. *Sakhar. Prom.*, 1972, (9, 17–20.—The use of algae for waste water treatment[1] is discussed. Targets set for treated water are: pH 7–8; BOD 2–15 mg O_2/litre; dissolved oxygen content 5–10 mg/litre; and complete absence of smell and colour. Advice is given on how to grow the necessary quantity of algae, and on disposal of the treated water.

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Decomposition of sugars in juices and syrups. A. R. SAPRONOV and R. G. ZHIZHINA. *Sakhar. Prom.*, 1972, (9), 24–27.—A method of calculating the kinetics of sucrose and invert destruction[2] at varying pH and temperatures was applied to comparison of conventional carbonatation with a scheme involving predefecation mud removal before further juice processing. Results indicated that in both cases 0·035% sucrose (by weight) was decomposed during evaporation, while the reducing sugar content in thick juice resulting from conventional carbonatation was 24·3% compared with 19·6% in the other, and differences in colour increase occurred accordingly. Hence, the new carbonatation scheme gives a juice of greater thermal stability.

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Effect of juice circulation on KDA diffuser performance. N. S. KARPOVICH. *Sakhar. Prom.*, 1972, (9), 27–29. Difficulties are frequently encountered as a result of the inability of side screens in the pre-scalder attached to the Soviet KDA tower diffuser to allow passage of sufficient juice used for cossette scalding. Thus, to maintain the necessary juice:cossette ratio and heat the cossettes to the required temperature, a greater quantity of raw juice must be withdrawn from the tower, putting greater load on the diffuser screens and adversely affecting diffuser performance. Greater attention to scalder screen maintenance is required.

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Distribution of alkali concentrations in juice in the standard 1st carbonatation vessel. I. M. FEDOTKIN *et al. Sakhar. Prom.*, 1972, (9), 29–33.—Investigations using a specially modified carbonatation vessel to allow juice samples to be taken from a number of points up and across the juice space showed irregularities in gas-juice mixing where gas was fed tangentially. Discrepancies in juice residence time were also discovered.

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Method of calculating sugar losses as a function of campaign length. B. E. GRABOVETSKII, V. V. DMITRASH and T. S. SHKOL'NIKOVA. *Sakhar. Prom.*, 1972, (9), 45–47.—From statistical evaluation of data obtained at two Soviet sugar factories, a formula has been developed which relates sugar losses to campaign length. Comparison of curves describing the relationship for calculated and true values for factories in the group shows very close agreement.

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Energy production in the export of Polish sugar factories. II. W. FACHINETTI. *Gaz. Cukr.*, 1972, **80**, 250–260.—Details and diagrams are given of boilers of various types supplied by Polimex-Cekop as equipment in sugar factories built by the Polish concern in various countries. Heating schemes are also shown.

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Theoretical questions of juice purification in the sugar factory. K. VUKOV. *Cukoripar*, 1972, **25**, 137–146, 163–171.—Facets of carbonatation examined in this survey include: the colloidal and physical properties of the system sucrose-lime-water-CO_2; conversion of invert, pectins and amides; formation and properties of non-sugar precipitates and non-sugar absorption by them; the effects of ash, amino-acids, invert, pectins and dextran on the quality of juice and mud; and the effects of basic parameters on juice purification, the major stages of which are described. Thin juice sulphitation is also discussed.

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Centrifugal basket of glass fibre-reinforced plastic. K. PAUSE. *Zucker*, 1972, **25**, 719–727.—Details are given of a glass fibre-reinforced plastic centrifugal basket constructed by Maschinenfabrik Buckau R. Wolf AG and used during the 1971/72 campaign for *B*-massecuite at Wevelinghoven sugar factory in West Germany, during which it handled 30,000 charges. Advantages of the material used include its great strength and durability, low specific weight, high chemical and thermal stability, high elasticity modulus and low price compared with special steels of similar properties.

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[1] *I.S.J.*, 1972, **74**, 118.
[2] WOOTTON: *ibid.*, 1958, **60**, 24.

Theory of cell-type diffusers—application. J. C. Giorgi. *Sucr. Franç.*, 1972, **113**, 455–460, 513–517. The laws of diffusion resulting from the theory of Silin are considered only approximately valid for the cell-type diffuser such as the De Smet and RT units. The conditions applying to a perfect or theoretical cell (where juice and cossettes leaving are in equilibrium) are therefore examined afresh and a new equation developed which also allows for possible recycling of press water. The second part of the article adopts two coefficients to allow for practical rather than theoretical circumstances and applies the theory to practical experience in the laboratory and in industry. A series of graphs are presented from which the effects of a change in one of the parameters may be observed.

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The development of sugar factory beet yards during the past 35 years (1937-1972). H. Brunke. *Zeitsch. Zuckerind.*, 1972, **97**, 435–439, 639–644.—Beet unloading devices, particularly tipping platforms and beet conveying systems, are surveyed and a number of photographs of the equipment reproduced.

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Certain aspects of the theory of continuous sectioned vacuum pans. I. S. Gulyi and I. M. Fedotkin. *Izv. Vuzov, Pishch. Tekh.*, 1972, (4), 144–150.—Continuous boiling is examined mathematically and an equation derived for calculation of massecuite residence time distribution. Comparison of calculated values with experimental data obtained in a laboratory and full-scale *B*-massecuite pan shows satisfactory agreement.

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Generalization of experimental data on heat transfer during sugar massecuite boiling in tubes. V. T. Garyazha and V. I. Pavelko. *Izv. Vuzov, Pishch. Tekh.*, 1972, (4), 156–159.—A formula which generalizes experimental data obtained by the authors of the present article and by other authors is presented for calculation of heat transfer to massecuite under optimum boiling conditions.

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Reversibility of adsorption of colorants in sugar production. M. I. Daishev and V. M. Shcherbak. *Izv. Vuzov, Pishch. Tekh.*, 1972, (4), 179–181.—Experiments with beet juice, syrup and molasses as well as colorant solutions showed that dilution with water and 1 hour's thorough mixing after the product had been subjected to decolorization by bone char or active carbon (the adsorbent was not removed during dilution and mixing) did not increase the colour content of the product, indicating irreversibility of colour adsorption. During a given contact period sucrose prevented complete utilization of the adsorptive properties of the char or carbon, this effect increasing with sucrose concentration.

Processing of sugar beet. D. P. Kulkarni, J. R. Unde and V. A. Ketkar. *Sugar News* (India), 1972, **4,** (5), 5–10.—Based on experience gained at Phaltan Sugar Works Ltd., Sakharwadi, where a DDS diffuser bought for cane extraction was also used for beet sugar processing, the differences between beet and cane as a raw material and between the two kinds of juices and their treatment are surveyed. Separate beet juice treatment requires additional plant and very much more lime; 10% of beet juice added to cane juice can be satisfactorily treated without changes, while 20% beet juice requires 25% more lime for good clarification using the sulphitation process. The unsuitability of beet pulp as a fuel means that vapour economy must be practised. While beet supply is low, the above methods will continue at Sakharwadi; separate processing will await development of beet cultivation, and will require beet varieties coming to maturity at the desired time and having a high sugar content and juice purity.

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Spray mixers and prospects of their use in the sugar industry. V. M. Rosinskii, I. M. Fedotkin and L. P. Zarudnev. *Sakhar. Prom.*, 1972, (10), 23–27.—The advantages of spray processing are discussed and details given of experiments at Soviet sugar factories involving spray sulphitation (with SO_2 in liquid or gaseous form) of juice and syrup, and spray heating of press and fresh water for diffusion using evaporator vapour.

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Treatment of water for sugar extraction from beet cossettes. A. A. Lipets and I. A. Oleinik. *Sakhar. Prom.*, 1972, (10), 27–31.—Addition of aluminium sulphate to condenser and press water before use in diffusion caused a marked reduction in the colloid content while the pH after 30 minutes' heating at 70°C increased in contrast to the fall when SO_2 was used for water treatment. Aluminium sulphate also led to a higher purity 2nd carbonatation juice compared with SO_2. A diagram is presented showing a scheme for water treatment with aluminium sulphate.

* * *

Preliminary establishment of an algorithm for the technological process in a KDA-25-59 tower diffuser. V. G. Drynov and V. G. Dmyshko. *Sakhar. Prom.*, 1972, (10), 32–34.—Use of an algorithm derived from experimental data obtained during the previous campaign led to a fall in diffusion losses of 0·05% (absolute) on weight of beet during the subsequent campaign at the same factory.

* * *

Effect of ultrasonics on scale deposition in sugar factory evaporators. I. M. Fedotkin, M. N. Chepurnoi, M. I. Klimenko and V. E. Shnaider. *Sakhar. Prom.*, 1972, (10), 40–43.—The use of magneto-striction devices placed at the bottom of evaporator bodies to produce an ultrasonic effect reduced scale formation and would, it is calculated, permit evaporator operation to continue a further 57 days before cleaning was needed (an increase of 80% on the time where ultrasonic treatment was not used). The heat transfer coefficients in untreated evaporator effects fell at a rate which was 1·6–1·8 times greater than in the treated vessels.

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Method of juice deliming by means of ammonia and soda. H. ZAORSKA and S. ZAGRODZKI. *Zucker*, 1972, **25**, 753–756.—See *I.S.J.*, 1973, **75**, 254.

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Automatic thyristor drive of a sugar centrifugal. M. TONDOS and H. WIDLOK. *Gaz. Cukr.*, 1972, **80**, 279–284.—Details are given of an automatic thyristor drive for a centrifugal of 1000-kg capacity developed in Poland. Advantages include better control of individual stages and of individual centrifugals independently in a battery, as well as ease of maintenance.

* * *

Suspension thickening after partial filtration of muddy carbonatation juice. S. M. ZAGRODZKI. *Zucker*, 1972, **25**, 778–781.—Tests on filtration of 1st and 2nd carbonatation juice using three different types of filter-thickeners are reported; the best results were obtained with a continuous model provided with rod elements from which the mud was removed by vibration. At a throughput of 43–44 $m^3 hr^{-1}$ (equivalent to a 3-minute retention) the suspension solids content was raised from 0·14 g per 100 cm^3 in 1st carbonatation juice to 7·32 g per 100 cm^3, giving a filtrate volume of 42·6 $m^3 hr^{-1}$. The filtrate was absolutely clear.

* * *

Operative parameters of a plant for decolorization by ion exchange in a sugar factory. S. LANDI and G. MANTOVANI. *Ind. Sacc. Ital.*, 1972, **65**, 132–137.—A detailed description is given of a plant installed at San Pietro in Casale sugar factory and its operation in the treatment of remelt liquor before boiling as a 1st refined strike. The plant includes five columns of "Kastel A-501D" resin (Montecatini Edison S.p.A.), only four of which were used in 1971. Results from that campaign are compared with those from 1968–70. The feed liquor colour was higher (9·2°St % Brix *vs.* 4·46–5·9°) and the number of cycles was higher (102 *vs.* 37–65) so that decolorization was poorer (81·7% *vs.* 81·4–88·8%) but the colour removal capacity was greater (3354 colour units/litre of resin *vs.* 2870–2980). The importance of the composition of the colouring matter is emphasized.

* * *

Laboratory and factory tests on juice purification with mud removal before main liming during the processing of Kuban' beet. G. A. VOVK and L. P. BUKETOVA. *Sakhar. Prom.*, 1972, (11), 19–21.—In the system described, 1st carbonatation is divided into three stages of simultaneous liming and gassing. The juice pH is adjusted to 8·8–9·5, 10·8–11·0 and 11·2–11·5, respectively, and 7–8 volumes of juice from stage 2 (per volume of stage 1 juice) is returned to stage 1, while 1 volume of stage 2 juice is settled and the mud removed before stage 3. Stage 1 replaces preliming whereby 25–35% of the total amount of lime used in carbonatation is added to the juice to which thickened suspension from 2nd carbonatation settlers has already been added; 15–20% of the lime is added at stage 2, and the remainder at stage 3. The juice is subjected to 2nd carbonatation as normally. Despite a number of setbacks and the processing of poor quality beet in 1971, juice purity rise was greater than in the previous two campaigns using the BMA carbonatation system, while juice and syrup colour was considerably lower than in 1966 when beet of about the same quality were processed.

* * *

Effect of interbody sulphitation of thick juice on wear of heat exchange tubes in evaporators. B. I. KATS. *Sakhar. Prom.*, 1972, (11), 26–27.—Investigation showed that sulphitation of thick juice withdrawn from the 3rd effect followed by further concentration in the 4th effect of a quadruple-effect evaporator (having brass tubes) led to an increase in corrosive wear of evaporator walls, tubes and tube plates as a result of the free SO_2 present. Only in the case of stainless steel tubes was there no deterioration, so that this metal is recommended for such circumstances.

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Re-pollution of waste waters. N. F. ERMOLOV and V. G. ZAMANAEV. *Sakhar. Prom.*, 1972, (11), 27–29. The argument that algae used to treat factory effluent will later die and recontaminate the treated water is examined and found to be mainly groundless.

* * *

Biological treatment of waste waters at Chervonoznamensk sugar factory. A. P. LAPIN and I. M. TAVARTKILADZE. *Sakhar. Prom.*, 1972, (11), 29–32.—Details, including costs, are given of the waste water treatment plant which includes biological filter towers, biological treatment ponds and normal settling ponds. The final BOD_5 is no higher than 2–3 mg/litre.

* * *

Determination of the strength of bags for sugar packaging. S. A. BRENMAN, I. I. PRILUTSKII and V. F. EVFIMENKO. *Sakhar. Prom.*, 1972, (11), 33–37. The strength of jute sugar bags as used in the USSR is discussed in view of the greater heights to which bagged sugar may be stacked and the ways in which a bag is used.

* * *

Selection of optimum juice draft for KDA (tower) diffusers. B. A. EREMENKO and B. N. VALOVOI. *Sakhar. Prom.*, 1972, (11), 43–46.—A mathematical model is presented describing the process in a KDA tower diffuser; this can be used to establish optimum diffusion conditions and juice draft. How to use a trial-and-error method to introduce optimum diffusion using thinnest practical cossettes is explained.

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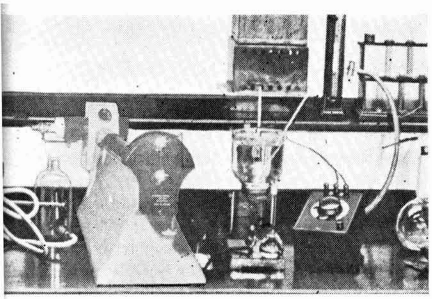

Laboratory methods & Chemical reports

Polarographic determination of iron. K. Číž and V. Čejková. *Listy Cukr.*, 1972, **88**, 235–238.—Polarographic determination of iron in thin and thick juice, refined sugar and condensate showed that juice from DDS diffusers contained considerably more iron than did juice from battery diffusers, although half of this was removed by carbonatation and a third was included in incrustation or was removed by ion exchange softening of thin juice. Iron and other heavy metals (Zn, Cu and Pb) were determined after their isolation by cation exchange resin in H^+ form and elution with N HCl. For polarographic determination, Fe^{+++} was reduced in a strongly alkaline medium (KOH) in triethanolamine.

* * *

Anion analysis in sugar factory products—a rapid method. F. Neubrunn. *Zeitsch. Zuckerind.*, 1972, **97**, 507–513.—The numbers of anions in groups having the same dissociation constants were calculated from potentiometric titration carried out with HCl on beet sugar factory products from press juice to final molasses. The rapid method used is described and the results tabulated. The procedure is applicable to process control where buffering is affected by the anions, such as in demineralization by ion exchange or dialysis, to comparison between different carbonatation systems, and to investigations on diffusion.

* * *

Grain size distribution in isothermally conducted sucrose crystallization. S. Orlowski and D. Schliephake. *Zucker*, 1972, **25**, 619–633.—A vertical moving bed "crystallizer" is described which was used in semi-commercial tests to investigate sucrose crystal size distribution. Crystals were injected into an ascending solution, thus permitting production of a homogeneous suspension. Under otherwise constant conditions, grain size scatter increased more rapidly with rise in crystallization temperature or with increase in the initial crystal content. Different environmental conditions in the crystallizer led to variations between the crystal growth along the *b*-axis relative to the *c*-axis and to the mass equivalent diameter; this is to be further investigated. Variation in grain size distribution with temperature was used as the basis of a method for calculating crystal growth rate. Linear growth numbers and their reciprocals were calculated and plotted against temperature, crystal content and length of the *c*-axis. The effects of resistance to mass transfer and to diffusion were examined. An activation energy mean of 78·3 kJ/mol was calculated for the surface reaction using the Arrhenius equation. Results of factory-scale boiling are briefly discussed in terms of grain size distribution.

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The standard criteria of raw sugar and the premium and penalty involved. A. H. Hiñola. *Sugar News* (Philippines), 1972, **47**, 255–256.—See *I.S.J.*, 1973, **75**, 222.

* * *

Determination of sugar losses in beet fluming and washing. J. F. T. Oldfield, J. V. Dutton, N. D. Morgan and H. J. Teague. *Sucr. Belge*, 1972, **91**, 433–441.—See *I.S.J.*, 1973, **75**, 289.

* * *

Application of radio-isotopes in sugar technological practice and research. H. Hirschmüller. *Proc. 46th S. African Sugar Tech. Assoc.*, 1972, 21–26.—A review is presented, with 26 references to the literature, of applications of radio-active materials in the sugar industry, including detection of evaporator tube corrosion, hopper level measurement and control, continuous weighing of sugar and bagasse on a belt conveyor, milk-of-lime concentration measurement, pan circulation research, measurement of retention in clarifiers, etc.

* * *

The determination of nitrogen-free organic acids in Natal cane molasses. J. Bruijn and M. Vanis. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 64–68. Diluted molasses from eight Natal sugar factories were deionized, concentrated *in vacuo*, and analysed by gas-liquid chromatography. Volatile acids were determined by the gas chromatography method of Kiely and O'Drisceoil[1]. The results showed that there were no major differences between the acids present in molasses from diffuser factories and those using only milling, four samples of each being examined.

* * *

Exhaustion of South African final molasses. J. Bruijn, J. R. Fitzgerald, S. Koenig and A. W. MacGillivray. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 103–109.—By equilibrating molasses with sucrose at 40°C and a viscosity of approximately 1000 poises, a relationship has been established for South African molasses between true purity (p), reducing sugar (r) and ash (a), namely $p = 51{\cdot}02 - 10{\cdot}89\ r/a$. The relationship gives a better indication of actual molasses exhaustion than the Douwes

[1] *I.S.J.*, 1971, **73**, 135.

DEKKER formula currently used in South Africa, although the possibility of a logarithmic form is to be investigated instead of the present linear one because of deviations above an *r:a* value of 1·35. Further work is to be done on validity of the relationship at different periods of the crushing season and on the influence of individual organic components.

* * *

Sugar factory material balance calculations with the aid of a digital computer. A. M. GUTHRIE. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 110–115. The mathematical models used to compute the materials balance at the various stations in a sugar factory are described and the overall logic of the computer programme to prepare a factory materials balance is discussed. The use of the programme to study the effect on the factory of varying one process parameter is illustrated and other applications of the programme are discussed.

* * *

Filtering quality of raw sugar. Influence of starch and insoluble suspended matter. J. P. MURRAY. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 116–132.—The filtrability of dissolved raw sugar was examined before and after carbonatation and related to the insoluble solids content and starch content of the melt; it was found that the suspended matter affected the filtrability of unprocessed raw liquor, starch having a minimal effect, while it was starch which profoundly affected the filtrability of carbonatated liquor, suspended insoluble matter being of much less importance. The mechanism by which starch affects the carbonate precipitate, so reducing filtrability, is discussed.

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Use of statistical quality control at the Durban sugar terminal. A. J. RADFORD. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 133–137.—Multiple analyses have been made of sugars for pol and moisture, starch, colour, reducing sugars, ash, filtrability, gums and phosphate, in order to establish means and standard deviations as a guide to the reliability of the different analyses. Where the standard deviations are high they are to be used to investigate the possibility of improving the accuracy and precision of the method and its application.

* * *

Flow anomalies of cane sugar factory molasses. D. H. SMOLNIK and H. J. DELAVIER. *Zeitsch. Zuckerind.*, 1972, **97**, 498–506, 615–628.—After a brief explanation of the fundamentals of viscosity measurement, with particular reference to impure sugar solutions, the authors discuss the rheological properties of beet molasses and cane molasses. While beet molasses are generally Newtonian fluids, measurements carried out with a rotary viscometer on 62 cane molasses samples from 14 countries showed that all but 8 were non-Newtonian in contrast to most findings which indicate that cane molasses exhibit Newtonian visco-elasticity. Values of the pseudo-plasticities and of the statistical means are given for temperatures in the range 20–80°C at 10° intervals. A marked correlation was found between temperature and pseudo-plasticity, which was unaffected, however, by the dry solids content. Dissolving of gums in the molasses with ethanol caused pseudo-plasticity to disappear. Air suspended in the molasses also induced pseudo-plasticity. A nomogram is presented for calculation of pressure drop in cane molasses flow along pipe-lines, and 154 references are given to the literature.

* * *

Chromatography of sugars and raffinose determination. M. ROCHE. *Ind. Alim. Agric.*, 1972, **89**, 1001–1006. The use of thin-layer chromatography for sugars separation is described and the various stages explained. R_f values obtained with various layers and solvents are given. While sucrose-raffinose separation is easy, trioses can interfere in raffinose quantitative determination; to avoid this, double development is used which gives better separation.

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Heat of solution of sucrose and specific heat of aqueous sugar solutions. YA. V. ZEL'TSER and B. M. MALYAROV. *Izv. Vuzov, Pishch. Tekh.*, 1972, (4), 49–52.—From experiments a relationship was found between heat of mixing of amorphous sucrose and water and change in volume of the components as a solution. Heats of mixing are tabulated for sucrose concentration in the range 5–50% by weight, calculated values being compared with experimental data in the temperature range 10–40°C. Specific heats calculated from two formulae are compared for sucrose of 10–50% concentration by weight at 10–40°C.

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Effect of sodium chloride on sucrose crystallization kinetics at different temperatures. V. F. DOBROMIROVA, V. M. KHARIN and S. E. KHARIN. *Sakhar. Prom.*, 1972, (10), 20–21.—In laboratory tests at 50, 60, 70 and 80°C NaCl caused a marked reduction in the number of sucrose crystals formed per g of sucrose and in a given volume of solution, as well as a noticeable increase in crystal size, compared with results obtained in the absence of NaCl.

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Melassigenic capacity of sulphite and sulphate ions and their effect on molasses viscosity. L. D. BOBROVNIK, G. P. VOLOSHANENKO and A. R. SAPRONOV. *Sakhar. Prom.*, 1972, (10), 22–23.—Experiments in which sodium sulphite and sulphate were added, respectively, to molasses before crystallization of its sugar during 4 days at 40°C showed that both sulphite and sulphate were slightly melassigenic, the sulphate being less so than the sulphite. Both reduced molasses viscosity.

* * *

Determination of alpha-amino-nitrogen in beet and raw juice. R. BRETSCHNEIDER, J. ČOPÍKOVÁ, P. KADLEC and E. FIALOVÁ. *Listy Cukr.*, 1972, **88**, 252–257.—In colorimetric determination of α-amino-N in press and raw juice by the method of STANĚK & PAVLAS, colorants and other non-sugars present had a reducing effect on the intensity of the blue colour formed. However, the error can be minimized by adding an aqueous solution containing asparagine, glutamine, aspartic acid and glutamic acid in given proportions and correcting the measured absorbancy value.

* * *

Application of ion exclusion in the sugar industry. III. K. Číž, V. Čejková and V. Hobíková. *Listy Cukr.*, 1972, **88**, 257–260.—Comparison of gel-type and macroporous resins used in ion exclusion treatment of model sucrose-KCl solutions showed that while the former type had greater separating power than did the latter type, flow through the column was slower, and so macroporous resins are considered more suitable. Separation of molasses components was more difficult. For ion exclusion treatment of eluates obtained after regeneration of decolorizing resins, the fraction having only a moderate colour content is more suitable than the low or high colour fractions.

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Sugar losses in flume water and their analytical determination. W. Uhlenbrock. *Zucker*, 1972, **25**, 771–773.—Relationships have been established between beet maturity and storage, degree of mechanical injury and sugar losses in flume water. Enzymatic analysis has proved suitable as an accurate and rapid method of determining flume water sugar content. The efficiency of any measures taken to reduce flume losses can only be gauged by continuous analysis.

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Effect of dilution on exchange of alkali ions in green syrup for magnesium ions. S. Landi and G. Mantovani. *Zucker*, 1972, **25**, 774–777.—Laboratory experiments are reported which were aimed at establishing whether it is possible, and to what extent, to improve the effective exchange capacity of a resin in the Quentin process by (i) reducing the flow rate to below the usual rate of 2 bed volumes per hour, or (ii) lowering the viscosity without detriment to the efficiency. Each measure studied individually was found to have a favourable effect by increasing K^+ and Na^+ and total (K + Na) exchange, although it is emphasized that there are practical disadvantages in a reduced flow rate and in the larger amount of dilution water to be evaporated (although the second factor can be partially balanced against a greater quantity of sweetening-off water for recycling).

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Determination of polysaccharides in cane juice and the products of the sugar industry. L. E. Leal G. and S. G. Kara-Murza. *Sobre los derivados de la caña de azúcar*, 1972, **6**, (2), 25–30.—The method proposed involves the separation of polysaccharides (as dextran) by gel filtration through a column of a Hungarian product "Akrilex 0-10" which has an upper passage limit of 10,000 M.W. The polysaccharide fractions are collected and the dextran content measured colorimetrically using the anthrone-sulphuric acid method.

Determination of the sucrose content in sugar cane. M. Demaux. *Brasil Açuc.*, 1972, **80**, 441–458.—An illustrated account is given of the direct analysis of cane by means of a FAPMO sampler, disintegration of the sample by a "Jeffco" or Waddell shredder, extraction of the juice with a Pinette Emidecau hydraulic press, and analysis of the juice using a Gallois automatic saccharimeter.

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Determination of the flow rate of supersaturated sucrose solutions during crystallization on the basis of a heat balance. S. Zagrodzki and Z. Sudomir. *Gaz. Cukr.*, 1972, **80**, 273–278.—Tests and the experimental equipment used are described in which the effects of circulation, temperature and purity on crystallization rate were studied in artificial massecuite, which passed from a heating chamber via a saturation chamber, pipeline and cooler to a crystallization chamber. Supersaturation was maintained constant. Flow rate in the heater and cooler was measured from the temperature differences. The method permitted the crystallization rate to be calculated by relating the flow rate to the area of the cross-section of the free space between the crystals in the crystallizer.

* * *

Amino-acid content in press juices. H. Gruszecka. *Gaz. Cukr.*, 1972, **80**, 288–291.—Ion exchange chromatography was used to determine amides and amino-acids in clarified press juice, and measured values are given for 1969/70 (after hydrolysis) and 1971/72 (without hydrolysis).

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Phenolic compounds in sugar beet and their physiological rôle. J. Trzebiński. *Gaz. Cukr.*, 1972, **80**, 292–293, 296 (a).—The distribution of phenols in the sugar beet, their reactions and their rôles in preventing rotting are discussed.

* * *

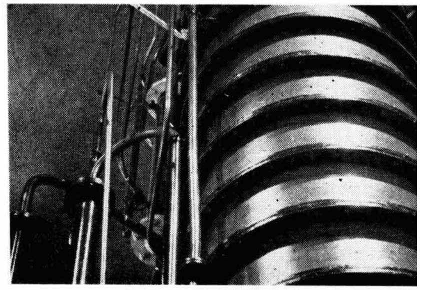
Boiling point elevation of sugar factory solutions and their supersaturation. II. Tabulated data and simplified equations. G. Vavrinecz. *Cukoripar*, 1973, **26**, 19–22.—Tables are presented showing supersaturation coefficients for boiling point elevation in the range 60–110°C. The data are applicable to purities in the range 80–94, and simplified equations are given for calculation of the correction factor to be applied at each purity to the calculation of supersaturation as a function of BPE.

* * *

Physico-chemical fundamentals of sugar technology. S. E. Kharin. *Izv. Vuzov, Pishch. Tekh.*, 1972, (6), 51–60.—The thermodynamics of aqueous sucrose solutions are investigated and equations derived for calculation of the coefficient of activity, heat of solution and heat of dilution as a function of solution composition and temperature. Calculated values of the activity coefficient of sucrose agreee closely with experimental values obtained by Perman[1], while sucrose solubility values in the range 20–80°C were in close agreement with those of Herzfeld and somewhat less so with those of Grut.

[1] *Trans. Faraday Soc.*, 1928, **24**, 330.

By-products



A molassed sugar beet pulp nut containing added urea, phosphate, trace elements and vitamins. R. G. HEMINGWAY and J. J. PARKINS. *British Sugar Beet Rev.*, 1972, **40**, 207–212, 214.—"Triple Nuts", a product containing beet molasses, pulp, 17% crude protein, 2·8% urea and 4·0% dicalcium phosphate, was used in animal feeding tests. Full details are given of the tests and their results, indicating generally that "Triple Nuts" can be incorporated in animal diets to a certain degree without any adverse effects on milk composition (50% inclusion of "Triple Nuts" reduced yield very slightly) or daily liveweight gain of growing cattle and for ewe nutrition in late pregnancy and early lactation.

* * *

Bagasse for paper. L. GALEAZZI. *Sugar y Azúcar*, 1972, **67**, (8), 16.—Reference is made to bagasse and paper pulp production at Cía. Industrial de San Cristóbal S.A. using the Cusi process, on the basis of which the firm was established in 1951 by the inventors. The types of paper for which bagasse is most suitable are mentioned, and it is emphasized that close attention must be paid to technological and economic requirements of bagasse pulp and paper production to make it a competitive raw material.

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Relationship between the tangent of the angle of beet pulp (dielectric) losses and the moisture and composition of the mixture. M. G. PARFENOPULO and N. E. KARAULOV. *Izv. Vuzov, Pishch. Tekh.*, 1972, (3), 76–79.—A special cylindrical capacitor was used in experiments on beet pulp and pulp-molasses mixtures to determine the relationship between the tangent of the angle of dielectric loss and moisture content (as well as molasses content in mixtures) for application to selection of optimum drying conditions in an electric field.

* * *

Molasses—spray feeding improves palatability of roughage. T. O. BELL. *Sugar J.*, 1972, **35**, (4), 9–11. Use of the patented "Sifon" spray system to apply molasses solution to pasturage is described and results given of tests showing the number of cattle consuming the various concentrations of molasses per hour. Advantages of the system are discussed.

* * *

Molasses—its economical utilization and future possibilities. K. N. PAUL. *Sugar News* (India), 1972, **4**, (3), 19–21.—A history is given of the production of ethyl alcohol in India on a basis of molasses, and it is pointed out that more could be produced whereas alcohol had to be imported to meet the country's requirements at a higher price than local production cost. A brief summary is given of other outlets for molasses utilization.

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The sulphite content in dry pulp and possible ways of affecting it. H. SCHIWECK, L. BÜSCHING and G. STEINLE. *Zucker*, 1972, **25**, 743–748.—Three-year investigations showed that the sulphite content of beet pulp is governed by the sulphite content of the heating medium, pulp dry solids, the quantity of SO_2 used for diffusion water treatment, molasses sulphite content and the mixing of boiler flue gases with gas used for drying of the pulp. While it has been found impossible to reduce the pulp sulphite content to below 400 mg/kg dry solids, an upper limit proposed by the EEC Commission, the author does not feel that a reduction is justifiable from the viewpoint of the animal's physiology.

* * *

Study of the action of sodium hydroxide on nitrated bagasse. L. HERNÁNDEZ C. and R. SUÁREZ R. *Sobre los derivados de la caña de azúcar*, 1972, **6**, (2), 60–73. During the production of α-cellulose from bagasse with nitric acid, the nitrated lignin and pentosans are removed by treatment of the bagasse with sodium hydroxide. The investigation records the effects of such extraction on the laboratory scale using NaOH concentrations of 0·8–18·8 g/litre and temperatures of about 50° to about 90°C. The two factors affected pentosan extraction to a much greater extent than delignification which occurred mainly in the first minutes of treatment. The limit of worthwhile concentration for the NaOH was 4·59%.

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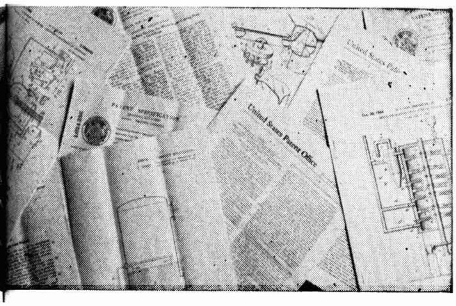
The efficiency of producing fat and lean meat in Yorkshire and Duroc Jersey pigs fed to 150 kg live weight on molasses-based biets. I. Performance to different live weights. M. VELÁZQUEZ, T. R. PRESTON and M. B. WILLIS. *Rev. Cubana Cienc. Agríc.*, 1972, **6**, 167–172. Daily gains with pigs fed on restricted high-test molasses plus fishmeal diets increased with slaughter weight up to 150 kg while animals fed *ad lib.* showed a reduced daily gain after 90 kg. In both cases intake increased and conversion deteriorated with increase in slaughter weight but protein conversion deteriorated only under *ad lib.* feeding. Differences in traits such as fat, bone, etc. proportions were observed between intermediate slaughter weights and between breeds.



Patents

UNITED STATES

Inhibition of inversion of sucrose in sugar cane juice. A. G. ALEXANDER, of Rio Piedras, Puerto Rico, *assr.* COMMONWEALTH OF PUERTO RICO. **3,698,950.** 18th March 1971; 17th October 1972.—Inversion in cane juice is inhibited by (filtering and treating with $ZnSO_4$ and $Ba(OH)_2$ before) adding [(40–60 (10–12) (2–3) moles.cm^{-3}] sodium metasilicate.

* * *

Joint production of furfural and levulinic acid from bagasse. E. RAMOS R., of San Juan, Puerto Rico, *assr.* COMMONWEALTH OF PUERTO RICO. **3,701,789.** 15th October 1970; 31st October 1972.—(One part of comminuted and acid-impregnated) Bagasse is heated in a closed reaction vessel under saturating pressure with (8–12 parts of) [1·0–1·62% (1·33%) v/v] aqueous sulphuric acid liquor to 160–170°C over a time ($\not>$ 70 minutes) and at such a rate that extensive depolymerization of carbohydrate polymers occurs but less than 20% and 55%, respectively, of the potential hexoses and pentoses are present in monomeric form. The furfural present and being formed is distilled off at a temperature within the above range (at 168°C) until substantially all the pentoses and pentose-producing carbohydrates have been consumed ($\not>$ 55 minutes) when the volume is reduced to give a 3–6 times higher concentration of H_2SO_4 than the original (about 4%) and 30–75% of the total possible amount of levulinic acid has been formed from the hexose-producing carbohydrates. The vessel is again closed and the temperature raised to 185–210°C (195°C) (in less than 8 minutes), maintaining this [for 5–20 (5) minutes] until production of levulinic acid is substantially complete (followed by rapid cooling) [and return of the mixture to the first stage until the mixture produced eventually contains $>$ 10% of levulinic acid which is then recovered by solvent extraction (as the Ca salt)].

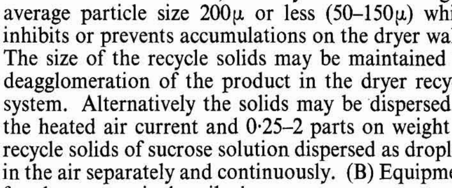
* * *

Drying of sugar solution. E. T. WOODRUFF and V. S. ANDERSEN, *assrs.* W. R. GRACE & Co., of New York, N.Y., USA. (A) **3,704,169.** 3rd May 1971; 28th November 1972. (B) **3,706,599.** 3rd May 1971; 19th December 1972.—(A) Droplets of a sucrose-containing solution (affination syrup or the last strike liquor from conventional sugar refinery crystallization) are continuously dried in a current of heated air in the presence of 0·4–5 parts by weight of separately and continuously introduced recycled solids on weight of solids in the solution, the recycled solids being of average particle size 200μ or less (50–150μ) which inhibits or prevents accumulations on the dryer walls. The size of the recycle solids may be maintained by deagglomeration of the product in the dryer recycle system. Alternatively the solids may be dispersed in the heated air current and 0·25–2 parts on weight of recycle solids of sucrose solution dispersed as droplets in the air separately and continuously. (B) Equipment for the process is described.

* * *

Sugar cane sampler. P. E. BEAUDOUX, of Dieppe, France. **3,704,627.** 30th August 1971; 5th December 1972.

The probe cylinder 2 is formed with a circumferential saw blade mouth 3 and fixed rigidly to the coaxial hollow shaft 4 which rotates in the probe chassis CS as a result of an electric motor driving pulley 6. The chassis is mounted so that it can slide parallel to the axis of the probe in a guide track 1 formed on the guide chassis CG. Concentric with the shaft 4 and mounted on the end 7 of the guide chassis is a hydraulic casing 12 holding a jack 10 carrying a



rod 11 connected to another rod 9 and piston 8 by means of a sleeve 13 in the form of two collars 14 separated to form a circular groove 15. A system of pins engaging with the groove, abutments, etc. allow the probe to move forward and rotate into the cane, accumulating a sample within it; the probe and chassis CS return and the rod 9 and piston then eject the sample. They then return to their original position, when the probe is ready to take another sample.

* * *

Cane harvester topping device. H. A. WILLETT, of Thibodaux, La., USA, *assr.* CANE MACHINERY & ENGINEERING CO. INC. **3,705,481.** 28th December 1970; 12th December 1972.

Copies of Specifications of United Kingdom Patents can be obtained on application to The Patent Office, Sale Branch block C, Station Square House, St. Mary Cray, Orpington, Kent, England (price 25p each). United States patent specifications are obtainable from: The Commissioner of Patents, Washington, D.C. 20231 USA (price 50 cents each).

Trade notices

Statements published under this heading are based on information supplied by the firm or individual concerned. Literature can generally be obtained on request from the address given.

Cane unloading. Muir-Hill, Bristol Rd., Gloucester, England.

Cane is unloaded from cane carts at a Jamaican sugar factory by means of chains fixed to one side of the cart and to a loosely laid bracket on the top of the other side. The chains are laid around the inside edge of the cart before the cane is loaded; on arrival at the yard, the bracket is raised by a gantry crane and the complete cane load is lifted by the chains over a specially-constructed wall and then falls free. The cane is then picked up by one of two A6000 Muir-Hill loading shovels fitted with Rockland grabs. The system replaces one in which the cane was unloaded in individual chained bundles and had to be released manually before being fed by crane grab to the mill. Use of the Muir-Hill units has permitted savings in manpower and increased throughput.

* * *

Hydraulic cane loading. T. T. Boughton & Sons Ltd., Bell Lane, Amersham, Bucks., England.

The illustration depicts a new "Mascane" 4-wheel-drive, hydraulic loading unit built by T. T. Boughton for Tate & Lyle Technical Services Ltd. Twenty such units have been despatched to the Philippines to solve a difficult handling problem, and the system is expected to find application in the cane industry wherever the terrain does not permit full mechanical harvesting.

In the new semi-mechanized system, a 5-ton pile of hand-cut cane is formed into a compact bundle (held by a pair of sling chains) by a tractor fitted with the "Mascane" winch loading system securely mounted on a reinforced safety frame and is then drawn up ramps onto a side-loading trailer, movement of which is restrained by two hydraulically-controlled front arms during loading. The quantity of extraneous matter accompanying the cane from the field is substantially reduced, and far more cane can be cut during each working period.

PUBLICATIONS RECEIVED

WORM GEAR UNITS. Renold Ltd., Renold House, Wythenshawe, Manchester, England.

A new 60-page brochure gives full details of Holroyd and Crofts single-reduction worm gear units, covering a range from small fractional hp units to large sizes capable of output torques up to 1,000,000 lb-ft/in (more in certain cases) and with ratios ranging from 5:1 to 70:1.

* * *

"CHEMICALS FOR PLANT PROTECTION, VETERINARY USES AND PUBLIC HEALTH." Shell International Chemical Co. Ltd., Shell Centre, London SE1 7PG, England.

A new 152-page brochure gives full details of Shell products covered by the above title, including chemical and physical properties, formulations, biological action, recommendations on use, residues, toxicology, handling precautions and medical advice. Of interest to beet and cane farmers are "Aldrin", "Dieldrin", "Endrin", "Azodrin", "Bidrin", "Gardona" and "Phosdrin" insecticides, D-D pre-emergence soil fumigant for nematode control, and "Bladex" herbicide for control of broad-leafed and grass weeds.

* * *

MAGNETIC SEPARATORS. Electromagnets Ltd., Boxmag Works, Bond St., Birmingham B19 3LA, England.

An 11-page brochure (No. 100) gives information on magnetic separators and lifting magnets produced by Electromagnets Ltd.

* * *

Steam turbines for the sugar industry.—Amalgamated Power Engineering Ltd., of Queens Engineering Works, Bedford, England, have received orders worth £559,000 for the supply of 19 steam turbines to sugar factories in Australia, Cuba, Indonesia, Iran, Malawi, Malaysia and South Africa. Of the turbines, 10 are single-stage Allen KKK machines and 9 are multi-stage Allen SLC machines. The units for Cuba are intended to drive pumps, while most of the others are back-pressure sets for driving alternators. Some of the machines for South Africa are to drive cane shredders, and the Malaysian order will include cane mill drive turbines.

International Society of Sugar Cane Technologists 15th Congress 1974

NINE months before the 15th Congress of the ISSCT membership had reached 1048, of which 924 are from outside South Africa. The indications are, therefore, that the Golden Jubilee Congress will be the biggest and most successful in the Society's history. The programme for the Congress is almost finalized, according to the latest ISSCT *Newsletter*, which emphasizes the opportunity for delegates to get together at cocktail parties and other functions arranged by the Organizing Committee in addition to the programme of work reported earlier[1].

A static display of the latest sugar industry equipment and materials is being arranged and will be held either in the Elangeni Hotel, Durban—headquarters of the Congress—or at a nearby site.

The Ladies' Programme has now been announced; while their menfolk are visiting the factory and field demonstrations at Transvaalse Suiker Bpk., the ladies will participate in a special tour, to be followed in the evening by a party and barbecue at the Kruger National Park where wildlife observation tours are arranged for the whole party. After journeying to Pretoria, members and their ladies will visit places of interest in the city before departing for Durban via Johannesburg.

In Durban the ladies will be given a display of African art and handicrafts with films and introductory talks and they will be presented with a booklet of information to aid them in shopping and visits to Durban's places of interest on their free days. An outing is arranged to the Tongaat sugar estate and there will also be a floral demonstration, a visit to the Durban-Westville University for Indians and the M. L. Sultan Indian Technical College with a parade of models of Indian saris. A day will be spent at the Clairwood Turf Club racecourse and a visit made to the Huletts Country Club with a display of Zulu dancing and a barbecue.

The ladies will also tour the Durban sugar terminal and enjoy a boat trip round the bay, with a visit to the Oceanarium and another to the Valley Trust health centre. Ladies will have tea at Mrs. JOHN CHANCE's farm at Gingindhlovu and visit a Zulu kraal, while at the hotel in Durban there will be a fashion show and a special lecture and demonstration on African music.

Throughout the Congress there will be luncheons and cocktail parties, and delegates and their ladies will be invited to spend an evening with private hosts so that they can see typical South African homes and farms. The Congress will end with a final banquet in the sugar terminal before departure for home or for the post-Congress visit to Mauritius.

The Organizing Committee have obviously done a great deal to ensure the success of the 15th Congress from both technical and social aspects and it should prove both professionally instructive and entertaining for all participants. Members who have not yet registered should ensure that they complete and submit application forms no later than 31st December 1973. These may be obtained from their Regional Vice-Chairmen or from Mr. J. L. DU TOIT, General Secretary/Treasurer, ISSCT 15th Congress, P.O. Box 507, Durban, South Africa.

The cost of ISSCT membership is US $20.00 while that of the package tour for the Congress is R525 (single) or R475 (shared accommodation) and the cost of the post-Congress tour in Mauritius from 30th June to 4th July is 740 (single) or 620 (shared) Mauritius rupees. Travel costs to South Africa and Mauritius are not included, of course, and members will have to make their own arrangements for air travel.

French sugar factories and water pollution[2].—French sugar factories have signed a formal undertaking to cut pollution by three-quarters by 1976. The companies will have to invest up to 100 million francs. The importance of the decision lies in the fact that the country's 71 factories account for an estimated 16% of water pollution in France.

* * *

US sugar factory closure plans[3].—The Smithfield and Poplar Grove sugar factories in Louisiana are now both operated by a new cooperative, The Smithfield Sugar Cooperative Inc. Both of the factories will operate during the 1973 crop but thereafter the Poplar Grove plant will close and most of its equipment will be transferred to Smithfield which is being expanded.

* * *

Syria sugar imports, 1972[4].—Imports of sugar by Syria in 1972 totalled 134,135 metric tons, raw value, of which Cuba supplied 101,147 tons, Brazil 32,825 tons and the remaining 163 tons came from the EEC. In 1971 imports had reached 217,017 tons; Cuba again was the major supplier with 113,705 tons while 25,000 tons came from Brazil and 14,414 tons from the EEC. Other suppliers included Yugoslavia with 38,072 tons, East Germany with 17,391 tons and the USSR with 4170 tons while the remainder came from other sources.

* * *

New cane varieties in Trinidad[5].—A new variety of cane, HJ5741, with a yield which is substantially superior to the well-entrenched B41227, is currently being extensively tested through Caroni Ltd.'s lands. As part of a drive to improve the yield of sugar per acre, Caroni's Research Station at Carapichaima is now in the final stages of exhaustive tests on a further four new cane varieties which should be ready for commercial extension in two or three years and which, on present indications, may also outstrip the standard B41227.

* * *

New sugar factory for Iran[6].—The Czechoslovakian firm Technoexport is to build a new sugar factory in Iran for the 1975 campaign. It will have a daily capacity of 1000 tons of beet.

1 *I.S.J.*, 1973, **75**, 295.
2 F. O. Licht, *International Sugar Rpt.*, 1973, **105**, (25), 22.
3 *Sugar Bull.*, 1973, **51**, (19), 4.
4 F. O. Licht, *International Sugar Rpt.*, 1973, **105**, (25), x.
5 *W. Indies Chron.*, 1973, **88**, 393.
6 F. O. Licht, *International Sugar Rpt.*, 1973, **105**, (25), 24.

Brevities

French sugar company merger[1].—The Boards of Société Nouvelle de Raffinerie Lebaudy-Sommier and Société des Raffineries de Sucre St.-Louis, both sugar refiners, have approved the terms of a merger, subject to shareholder approval, which involves exchange of shares.

* * *

Colombia sugar exports suspension[2].—In August the Colombian Government decided to suspend exports to the world market. The exports figure was originally set at 230,000 tons, including the US quota of some 72,000 tons, but this has now been reduced to 130,000 tons. About half the US quota has been supplied while 61,470 tons has been sold on the world market; the balance of the US quota will be met, but world market sales will be suspended until supplies are secured.

* * *

Tanzania sugar expansion plans[3].—Tanzania is to invest some 326 million shillings over the next nine years in an effort to make the country self-sufficient in sugar, the National Agricultural and Feed Corporation has announced. The aim is to raise production to 75,000 tons a year by 1982 from the present level of 6000 tons.

* * *

Cameroun sugar industry expansion loan[4].—The European Investment Bank will make a loan of 1·8 million units of account to the Société Sucrière du Cameroun in order to double the production capacity of the company to 30,000 tons per year. Production is entirely earmarked for domestic requirements. The entire project is understood to involve 6·54 million units of account.

* * *

Jamaica sugar production, 1973[5].—The final production of 1973 crop sugar amounted to 337,088 tons, compared with 377,765 tons for the 1972 crop. The average sucrose content of the cane was slightly higher, requiring 10·47 tons of cane per ton of 96° sugar in 1973 as against 10·52 tons in 1972.

* * *

Indonesia sugar imports, 1973/74[6].—Indonesia is to import 200,000 tons of sugar for the 1973/74 fiscal year in order to stabilize domestic prices.

* * *

St. Kitts sugar crop.—The 1973 sugar crop ended with a production of 23,364 tons as against 25,931 tons in 1972, the cane crushed having been reduced from 243,295 tons to 210,501 tons. The continuous drought during part of the 1973 crop hindered the replanting programme and it is anticipated that 1974 sugar production, although greater than that of 1973, will not exceed 25,000 tons. At this level sugar production is still not profitable but the new centralized field administration is aiming to increase both the acreage and tonnage of cane in 1975.

* * *

Greece sugar factory contract[7].—The Polish trade organization Polimex-Cekop is to build the fifth Greek sugar factory at Orestias in the Province of Thrace. It should be completed in 1975 and will have a slicing capacity of 3000 tons of beet per day.

* * *

New Bulgarian sugar factory[8].—A new sugar factory is to be built, with Polish help, at Dolna Metropoliya in the Pleven district of Bulgaria. The first stage will be completed in 1975 and will have a capacity of 3000 tons of beet per day.

US sugar supply quotas 1973

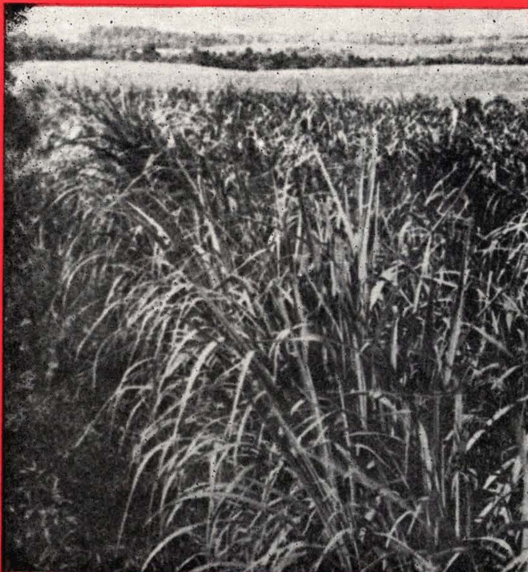
	Initial quotas	*Increases/ Shortfalls/ Redistributions*	*Quotas in effect*
	(short tons, raw value)		
Domestic Beet	3,500,000	0	3,500,000
Mainland Cane	1,591,000	17,333	1,608,333
Texas Cane	20,000	— 15,000	5,000
Hawaii	1,143,000	0	1,143,000
Puerto Rico	90,000	0	90,000
Philippines	1,440,052	0	1,440,052
Argentina	85,459	0	85,459
Australia	204,016	41,177	245,193
Belize	37,981	5,746	43,727
Bolivia	7,261	0	7,261
Brazil	616,641	0	616,641
Colombia	75,963	0	75,963
Costa Rica	81,299	14,811	96,110
Dominican Republic	714,946	17,510	732,456
Ecuador	91,046	0	91,046
Fiji	44,705	0	44,705
Guatemala	69,517	— 250	69,267
Haiti	15,295	0	15,295
Honduras	0	0	0
India	81,688	0	81,688
Ireland	5,351	0	5,351
Malagasy Republic	12,192	0	12,192
Malawi	15,037	0	15,037
Mauritius	30,074	14,544	44,618
Mexico	632,280	0	632,280
Nicaragua	75,000	723	75,723
Panama	52,500	0	52,500
Paraguay	7,261	— 106	7,155
Peru	426,245	0	426,245
Salvador	50,666	— 182	50,484
South Africa	57,709	2,934	60,643
Swaziland	30,074	264	30,338
Taiwan	84,939	0	84,939
Thailand	18,694	496	19,190
Venezuela	31,902	0	31,902
West Indies	60,207	0	60,207
	11,500,000	100,000	11,600,000

Bulk silo completed at Durban.—Completion of the third silo of the bulk sugar terminal at Maydon Wharf at Durban came near when a roof-wetting ceremony was organized recently by the consultant engineers and the construction contractors. The new silo has a floor area of more than 2½ acres and has cost nearly R 15,000,000 to date. With the building of the new silo the site of the terminal is now completely occupied and it is understood that any future terminal buildings in South Africa will be constructed at the new port of Richards Bay in Zululand.

* * *

Bagasse furfural plant in South Africa[9].—A plant is being established close to Sezela sugar factory in Natal, to be run by a newly-formed company, Smithchem (Pty.) Ltd. The overall cost of the project is R 2,000,000 and the plant will be the first continuous digestion plant in the world using bagasse as raw material. It is anticipated that commercial production will start in May 1974.

1 *The Times*, 19th September 1973.
2 F. O. Licht, *International Sugar Rpt.*, 1973, **105**, (24), 7.
3 *Public Ledger*, 22nd September 1973.
4 F. O. Licht, *International Sugar Rpt.*, 1973, **105**, (26), 6.
5 *Willett & Gray*, 1973, **97**, 339.
6 *Public Ledger*, 20th October 1973.
7 *Zucker*, 1973, **26**, 574.
8 *Zeitsch. Zuckerind.*, 1973, **98**, 589.
9 *S. African Sugar J.*, 1973, **57**, 379.



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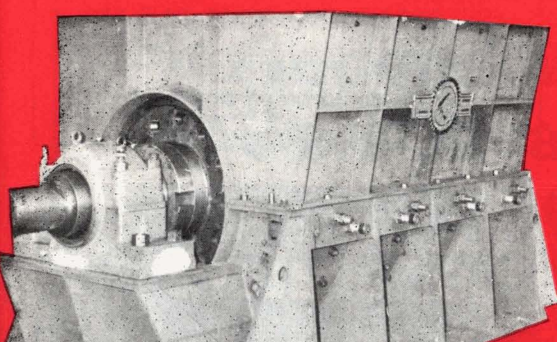

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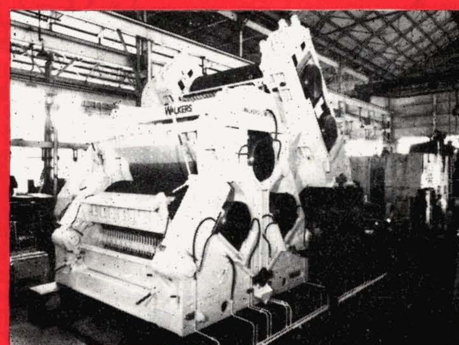

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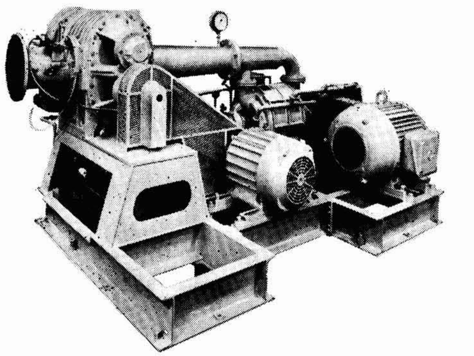

(*Photograph courtesy J. T. Rao*)

Flowering sugar cane

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ERRATA AND CORRIGENDA

Page 19.	Line 9 of column 1.	Read "in" for "from".
Page 22.	Line 41 of column 2.	Read "NARASIMHAM" for "MARASIMHAM".
Page 82.	Line 34 of column 1.	Read "G. M. AZZI" for "A. G. AZZI".
Page 83.	Line 35 of column 1.	Read "for" for "of".
Page 85.	Line 29 of column 2.	Read "1972" for "1971".
Page 111.	Line 11 of column 2.	Read "J. D. MILLER" for "D. J. MILLER".
Page 112.	Line 19 of column 2.	Read "1970" for "1971".
Page 118.	Line 15 of column 1.	Read "resins" for "granular carbons".
Page 118.	Line 16 of column 1.	Read "resin' for "carbon".
Page 118.	Line 19 of column 1.	Read "resins" for "carbons".
Page 150.	Line 9 of column 1.	Read "R. J. LEFFINGWELL" for "J. R. LEFFINGWELL".
Page 150.	Line 32 of column 2.	Read "ONOV" for "HONOV".
Page 151.	Line 30 of column 2.	Read "Guanabara" for "Guanagara".
Page 174.	Lines 10, 11 of column 2.	Read "S. FLORES C." for S. F. CACHRES".
Page 174.	Line 27 of column 1.	Read "C. N. BABU" for G. N. BABU".
Page 182.	Line 44 of column 2.	Read "computer" for "diffuser".
Page 185.	Line 31 of column 1.	Read "S. N. FLEITES" for "S. H. FLEITES".
Page 213.	Line 34 of column 2.	Read "cone-feed" for "cone-fed".
Page 216.	Line 11 of column 1.	Read "(11), 4-9; (12), 22-26" for "(12), 4-9, 22-26".
Page 218.	Line 39 of column 2.	Read "I. M." for N. M.".
Page 222.	Line 36 of column 1.	Read "S. N. FLEITES" for "S. H. FLEITES".
Page 237.	Line 14 of column 1.	Read "formation, the ballooning" for "formation, and the ballooning".
Page 238.	Line 6 of column 2.	Read "type cultures of *Clostridium*" for "type *ostridium* cultures of *Cl*".
Page 244.	Line 45 of column 2.	Read "MEADE" for "MEADS".
Page 245.	Line 41 of column 2.	Read "C. J. MONGELARD" for J. G. MONGELARD".
Page 246.	Line 29 of column 1.	Read "L. J. LIU" for "L. U. LIU".
Page 251.	Line 40 of column 1.	Read "leaf-inhabiting" for "leaf-inhibiting".
Page 253.	Line 17 of column 2.	Read "ARORA" for "AURORA".
Page 290.	Line 14 of column 1.	Read "DELGADO" for "DELGARDO".
Page 292.	Line 31 of column 1.	Read "PROCTER & GAMBLE" for "PROCTOR & GAMBLE".
Page 328.	Line 15 of column 1.	Read "Portuguese West Africa" for "Portuguese East Africa".
Page 358.	Line 50 of column 2.	Read "6500-tons" for "65-tons".

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SOME REMARKS ON ITS USE

In using this Index it should be noted that the principal entries cover the several stages of production : CULTIVATION (*see* Beet; Cane; Diseases; Fertilizer; Irrigation; Mechanization; Pests; Soil; Transport; Varieties; Weeds, etc.); SUGAR PROCESSING (*see* Bagasse; Boilers; Boiling; Carbonatation; Centrifugals; Clarification; Crystallization; Diffusion; Evaporators; Filter; Massecuite; Milling; Mills; Molasses; Pans, Vacuum; Scale; Sucrose; Sugar; Sulphitation; Water, etc.); REFINING (*see* Bone Char; Carbon; Refining; etc.); and BY-PRODUCTS (*see* Alcohol; Animal Fodder; By-Products; Fermentation; Paper; Pulp; Yeast, etc.).

Subjects covered separately include Ash; Bulk handling and storage; Colour; Control, Automatic and Chemical; Countries; Ion exchange; Juice; Micro-organisms; pH; Polarization; Transport; Weighing, etc. Glucose and Fructose are to be found under Dextrose and Levulose. Obituaries, Statistics and Trade Notices are collected together under those headings. "Sucrose" implies the pure chemical; "Sugar" the commercial product; and "Sugars" the chemical family, rather than grades of sugar. When looking under the author's name, it should be remembered that the surname may be the penultimate in Spanish.

(Abs.) indicates *Abstract*; (Brev.), *Brevity*; (N.B.), *New Books*; (Corr.), *Correspondence*; (N.C.), *Note and Comment*; (Pat.), *Patent*; (Stat.), *Statistics*; (T.N.), *Trade Notice*.

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