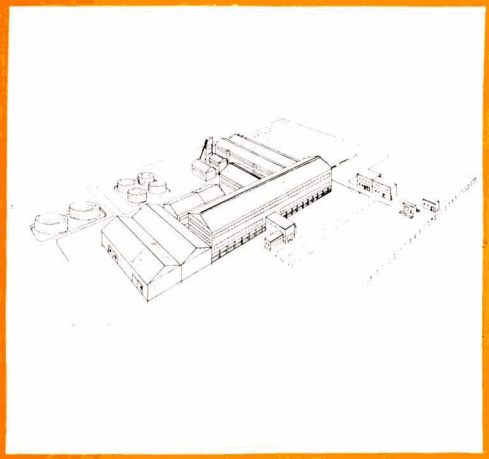
THE International Sugar Journal

AUGUST 1969



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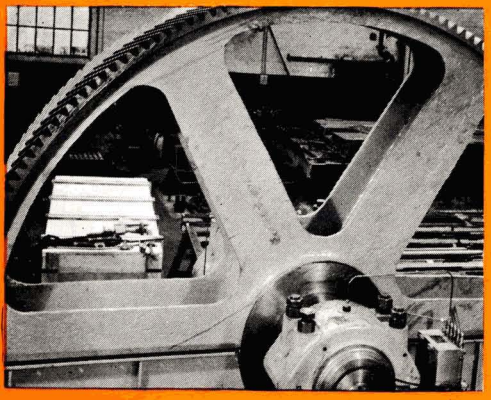

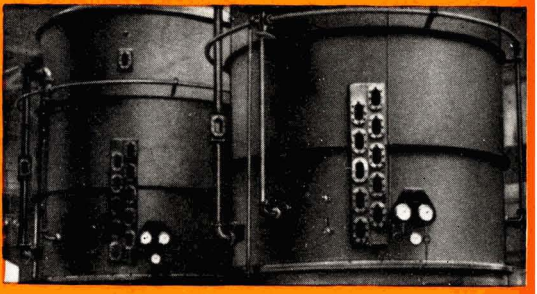

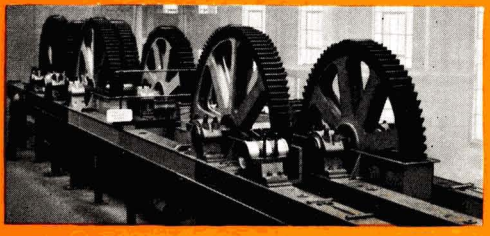

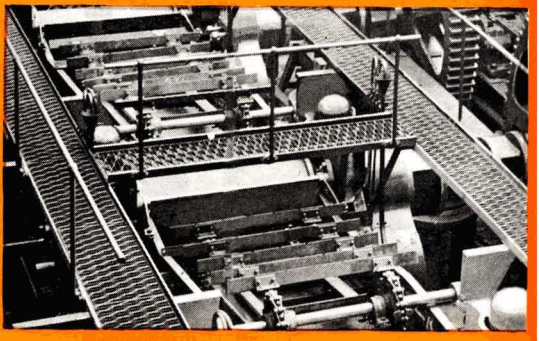

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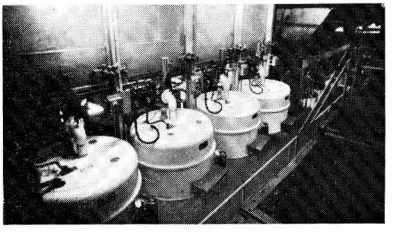

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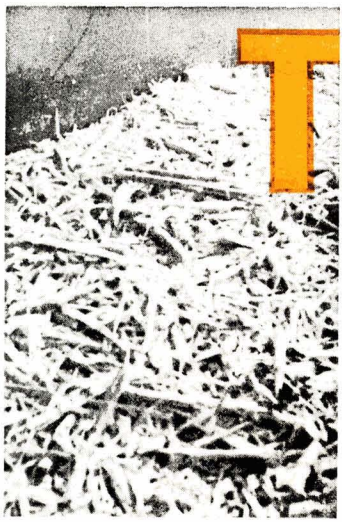
'Flora von Thüringen' Vol. 12, J. C. Zenker, Jena, 1855



Actual photo of cane prepared by the double-knife process. First knife was set 12" above the carrier and the second knife 1" above the carrier. Notice the preponderance of trouble makers: joints, splinters and rind.

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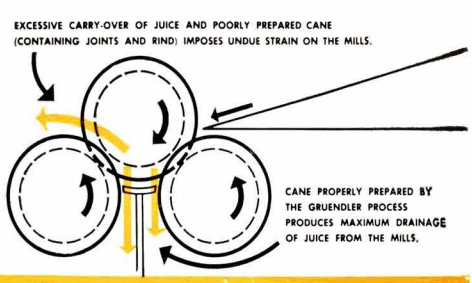

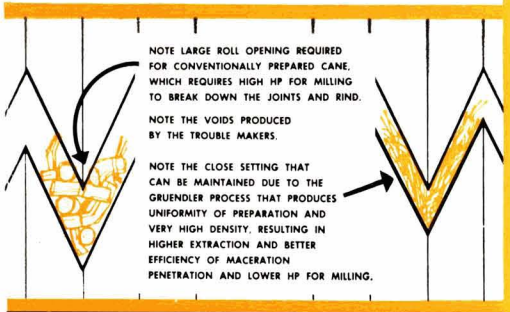

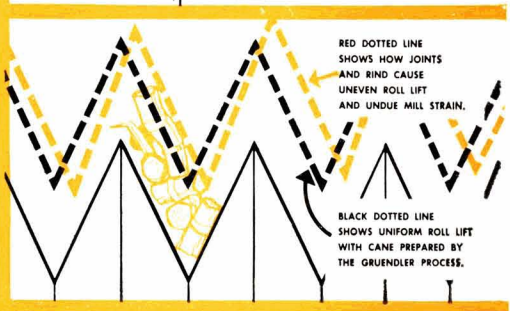

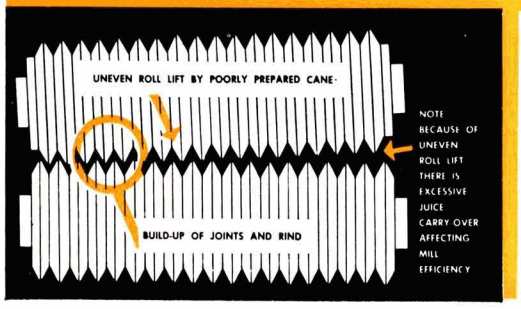

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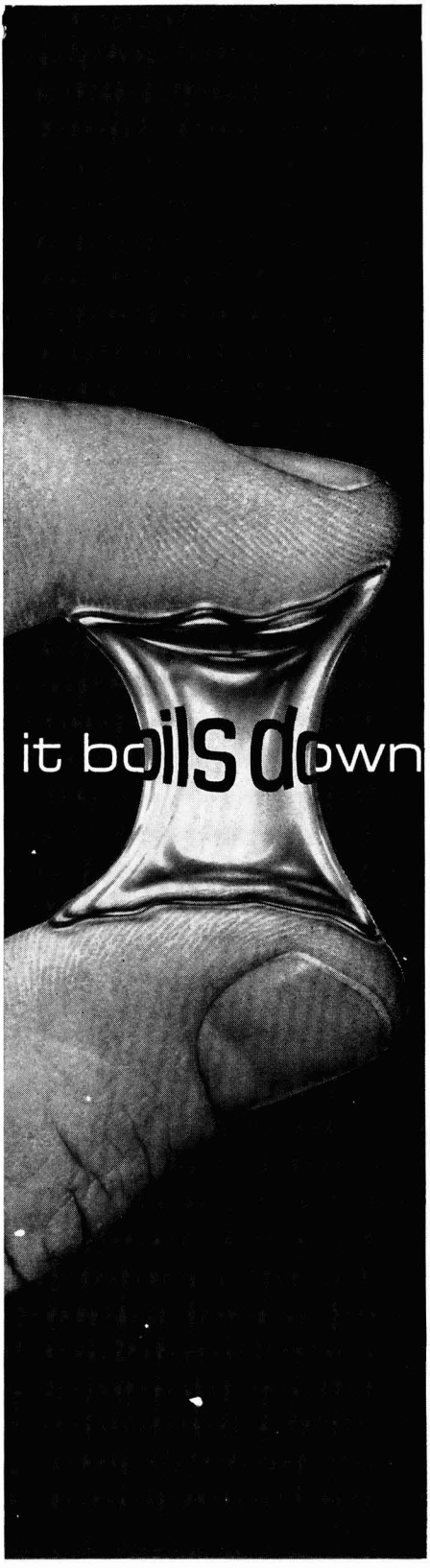

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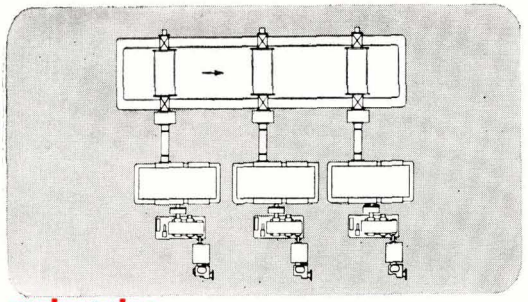

engineering

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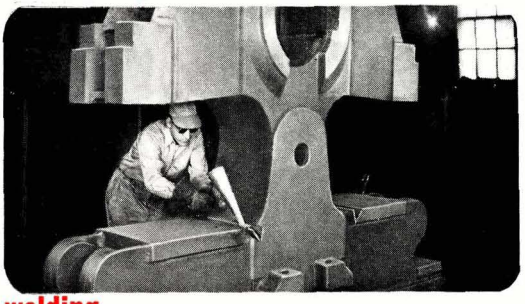

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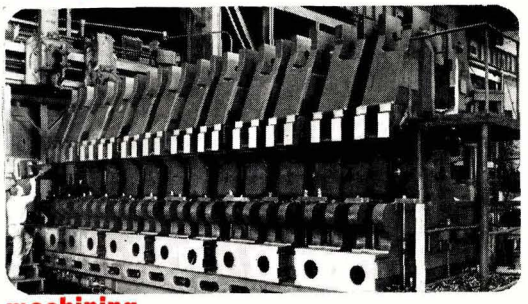

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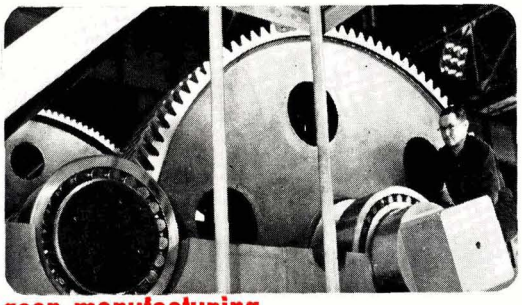
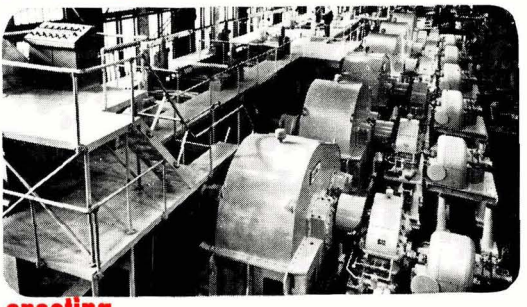


gear manufacturing



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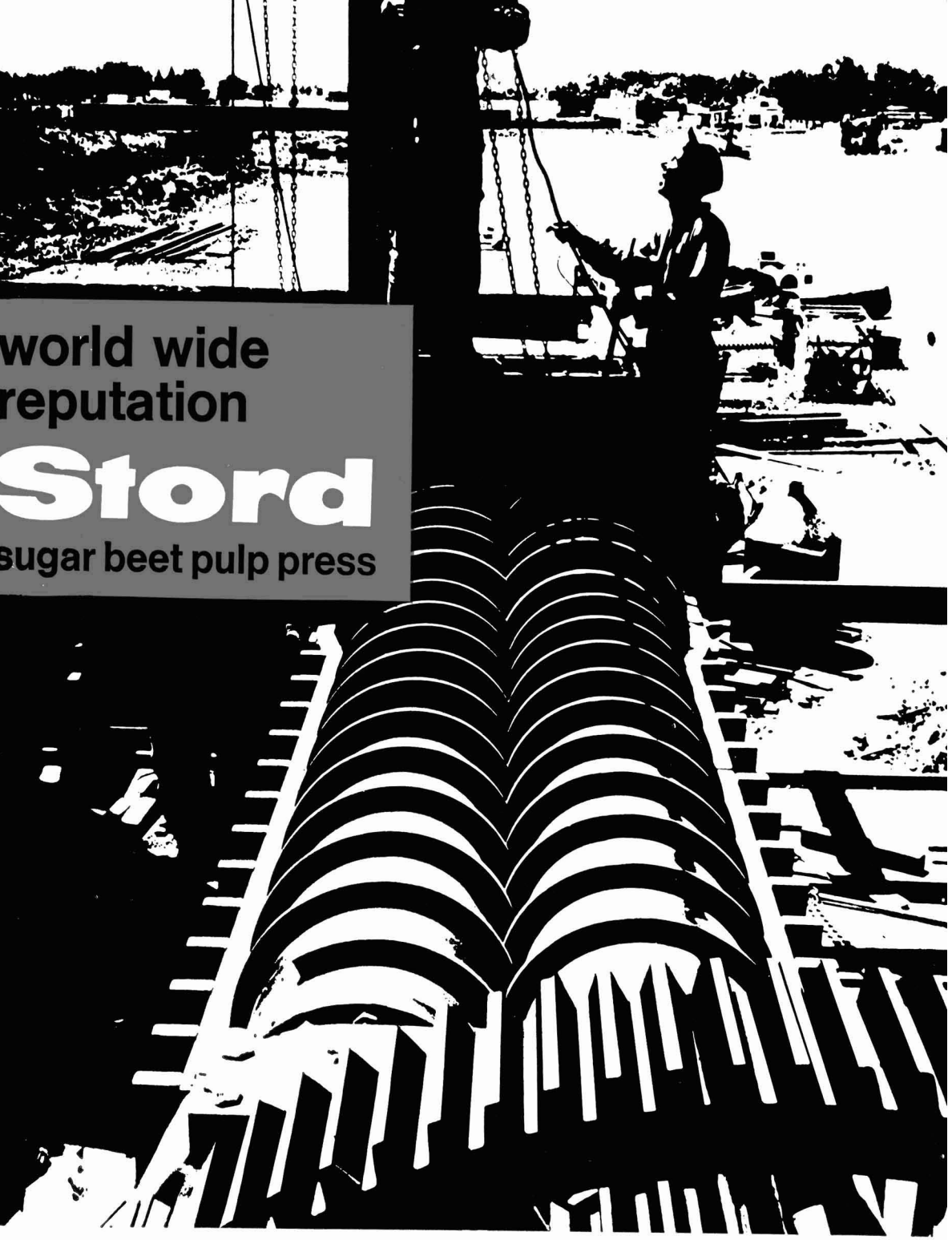

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Contents

SOMMAIRES : ZUSAMMENFASSUNGEN : SUMARIOS

Les effets de la salinité sur la canne à sucre à la Louisiane. T. Y. RIZK et W. C. NORMAND. p. 227–230

Quelques essais effectués dans une serre pour déterminer l'effet de la salinité du sol sur la canne à la Louisiane ont montré que les ions examinés avaient un effet toxique sur la canne suivant l'ordre décroissant: sodium > chlorure > sulfate > calcium.

* * *

Quelques améliorations dans la détermination du dextrane dans les produits de la sucrerie de cannes. J. S. KENIRY, J. B. LEE et V. C. MAHONEY. p. 230–233

Les auteurs ont examiné une méthode turbidimétrique développée par NICHOLSON et HORSLEY pour déterminer le dextrane dans les produits de la sucrerie de cannes, et ils ont proposé quelques petites modifications. Avec l'inclusion de moyens pour combattre les causes fréquentes d'intérférence dans les produits, la méthode est généralement applicable pour tous produits de sucre de cannes.

* * *

Recherches sur la canne à sucre à Maurice. p. 233–235

On présente un sommaire du rapport annuel (1967) de l'Institut de Recherches de l'Industrie Sucrière de l'Ile Maurice.

* * *

L'enlèvement de gaz incondensables à partir de faisceaux. S. ZAGRODZKI et J. DOBRZYCKI. p. 235–237

On décrit un nouveau transmetteur qui indique le degré d'enlèvement de gaz à partir du faisceau d'un effet d'un évaporateur. Le dispositif mesure la différence entre les températures de la vapeur à l'entrée et de la vapeur condensante. Des vannes d'évent devraient être ouvertes jusqu'à ce que le transmetteur indique une valeur de zéro.

* * *

Plus sur l'effet de la qualité de la canne sur la perte aux moulins. R. R. FOLLETT-SMITH. p. 237

Une expression donnée par l'auteur auparavant pour déterminer la perte aux moulins a été simplifiée.

Die Wirkungen von Salzigkeit auf das Zuckerrohr in Louisiana. T. Y. RIZK und W. C. NORMAND. S. 227–230

Einige im Gewächshaus durchgeführte Versuche, um den Einfluss von Erdsalzigkeit auf das Zuckerrohr in Louisiana zu bestimmen, haben gezeigt, dass die untersuchten Ionen eine toxische Wirkung auf das Rohr nach der folgenden abnehmenden Ordnung hatten: Natrium > Chlorid > Sulfat > Calcium.

* * *

Verbesserungen der Dextranbestimmung in Rohrzuckerfabrikprodukten. J. S. KENIRY, J. B. LEE und V. C. MAHONEY. S. 230–233

Eine von NICHOLSON und HORSLEY für die Bestimmung des Dextrans in Rohrzuckerfabrikprodukten entwickelte turbidimetrische Methode wurde untersucht und einige kleine Aenderungen wurden vorgeschlagen. Mit Einschluss von Mitteln gegen gewöhnlicher Störungsquellen in den Produkten, ist die Methode allgemein verwendbar für alle Rohrzuckerprodukten.

* * *

Zuckerrohr-Forschungsarbeit in Mauritius. S. 233-235

Eine Zusammenfassung des Jahresberichts (1967) des Forschungsinstituts der Zuckerindustrie in Mauritius wird gegeben.

* * *

Die Beseitigung von nichtkondensierbaren Gasen in Heizkörpern. S. ZAGRODZKI und J. DOBRYCKI. S. 235–237

Die Verfasser beschreiben einen neuen Messwertgeber, der das Grad von Gasbeseitigung aus dem Heizkörper eines Verdampfkörpers zeigt. Der Transmitter misst die Temperaturdifferenz zwischen dem Eingangsdampf und dem kondensierenden Dampf. Ablassventile werden geöffnet bis der Transmitter die Nullwert zeigt.

* * *

Mehres über den Einfluss von Rohrqualität auf die Verluste in den Mühlen. R. R. FOLLETT-SMITH. S. 237

Der Verfasser hat einen Ausdruck, den er früher für die Bestimmung von Verlusten in den Mühlen gegeben hat, simplifiziert.

Los efectos de salinidad sobre caña de azúcar en Louisiana. T. Y. RIZK y W. C. NORMAND. *Pág.* 227–230

Ensayos, ejecutado en un invernáculo para determinar el efecto sobre caña de azúcar de la salinidad del suelo en Louisiana, han demostrado que los iones estudiados tienen efectos tóxicos sobre la caña en el orden disminuendo: sodio > cloruro > sulfato > calcio.

* * *

Mejoramientos en la determinación de dextrana en materiales de la industria de azúcar de caña. J. S. KENIRY, J. B. LEE y V. C. MAHONEY. *Pág.* 230–233

Los autores han investigado un método turbidimétrico, desarrollado por NICHOLSON y HORSLEY, para determinar dextrana en productos de la industria azucarera, y proponen unas modificaciones menores. Por inclusión de medidas para superar fuentes comúnes de interferencia en los productos, el método puede aplicarse generalmente a todos productos azucareros.

* * *

Investigaciones sobre caña de azúcar en Mauricio. *Pág.* 233–235

Se presenta una sinopsis de la Memoria Anual (1967) del Mauritius Sugar Industry Research Institute.

* * *

Removimiento de gases no-condensables fuera de calandrias. S. ZAGRODZKI y J. DOBRZYCKI. *Pág.* 235–237

Detalles se presentan de un nuevo transmisor que indica el grado de removimiento de gas fuera de la calandria de un cuerpo de un evaporador. Mide la diferencia entre las temperaturas del vapor a la entrada y del vapor condensando. Válvulas de purga deben abrirse hasta el indicación del transmisor llega a cero.

* * *

El efecto de la calidad de caña sobre pérdida de molienda—un nota adicional. R. R. FOLLETT-SMITH. *Pág.* 237

Una fórmula presentado antes por el autor para determinar pérdida de molienda se ha simplificado.

THE
INTERNATIONAL SUGAR JOURNAL

VOL. LXXI AUGUST 1969 No. 848

Notes & Comments

100 years on.

On the 2nd August 1869 appeared the first issue of *The Sugar Cane*, described by its publishers as "a new Periodical, intended to represent the interests of an important industry..... It aspires to be the medium of communication between those directly interested in the growth of the cane and the manufacture of sugar in all parts of the world". In the subsequent 100 years the sugar industry has become even more important both in respect of production and its effects on the economic welfare of many nations.

With the increasing importance of beet sugar, the original name became inappropriate and was changed to *The International Sugar Journal*, a change also emphasizing the world-wide interests both of the sugar industry and the journal as a medium of communication. Successive Editors have endeavoured to maintain its value as such a medium and we believe that its reputation as a source of technological information is unrivalled in the sphere of sugar.

It is with confidence, therefore, that we set out on our second hundred years of service to the sugar industry and our readers.

* * *

Britain and the EEC.

With the election of a new French President, the question of Britain's application for membership of the EEC has again become a subject for discussion. A recent article in *Commonwealth Producer*[1] attacks the proposition that Britain's application should be unconditional and that traditional suppliers, e.g. the Commonwealth sugar producers, should be displaced by the Six. It points out that, under the Community's current high-cost agricultural policy, depressing surpluses have been built up and Britain would be obliged by the EEC's rules to pay £40 per ton for soft wheat that she could grow for £28 and £780 per ton for butter that she can import from New Zealand or Australia for £300.

But the article is not against Britain's joining the EEC, pointing out that "Before ever the Treaty of Rome was signed France insisted on the protection of the interests of her former colonies and her associated territories in North Africa. The resulting special convention for the 18 ex-colonial countries is a going concern. For several years the Moroccan protocol maintained the special relationship between France and the North African countries. Recently a new association agreement with Tunisia and Morocco has been signed which gives those two countries duty free rights of entry to the Community for most industrial goods and for many agricultural products. But products not covered by the new agreement still come under the original protocol annexed to the Treaty of Rome by which France may continue to grant preferential arrangements to products from Tunisia and Morocco. The protocol is merely suspended for those products to which a community preference applies. If the word community means anything it means "as one". If such treatment, therefore, is right for France's traditional trading partners, why should not Britain be allowed to maintain her existing trading relationships to the extent that they do not harm the other Community members?

"The British Government should boldly seek the same safeguards for its established trading partners as the other members maintain for their own historic trading relationships. There should be no need to be apologetic about the submission of such demands. If such a course were successfully followed, no Commonwealth primary producer would have any complaint if Britain assumed a political link which she considered to be advantageous to her. It would not be their concern. Nor would it be resented if, in the true spirit of community, Britain were asked to end her special preferences for Commonwealth countries in consideration of their being granted community preferences for an equivalent volume of produce."

It is of interest to note that M. EDGAR PISANI, the former French Minister of Agriculture, is reported by C. Czarnikow Ltd[2]. to have stated that Britain should be allowed a transitional period during which

[1] 1969, (431), 49–52.
[2] *Sugar Review*, 1969, (926), 119.

time her agricultural policies can be adjusted to those of the Community. He also said that Britain's commitments under the Commonwealth Sugar Agreement would obviously have to be honoured. Indeed, he went on to state that these commitments should be taken over by the enlarged Community, which would in due time negotiate their renewal.

* * *

South African sugar crop, 1968/69.

The final production figures for the 1968/69 season in South Africa show that 1,659,399 short tons of sugar were manufactured from 15,123,370 tons of cane. This is lower than the first estimates for the season and is due to drought which affected the industry. Even so, although less than the record production of 2,008,704 tons of sugar in the 1967/68 season, the 1968/69 production is the third highest in the history of South Africa.

Poor rainfall in Natal during the second half of 1968 adversely affected the sucrose content of the cane. Deliveries by planters were originally limited to 85% of their basic quotas but with the decline in production these restrictions were later removed. As a result of the International Sugar Agreement, South Africa's export quota has been set at 625,000 metric tons; exports will therefore be reduced from the 1967/68 figure when they reached a million tons for the first time. But the higher prices obtained will be a compensating factor.

* * *

USSR sugar statistics.

The International Sugar Council recently published details of imports and exports of sugar by the USSR during the years 1965–68[1] and these are reproduced elsewhere in this issue. Commenting on these figures, C. Czarnikow Ltd. note[2]:

"Exports, at just under 1·4 million tons, reached a record level last year, despite a substantial drop in the tonnage imported. For some years sugar from the USSR has been an important world market factor and shipments cover a wide range of destinations; last year Iraq, Sudan, Finland, Iran and Bulgaria all received more than 100,000 tons. This was the first time that the last-named country had appeared in the schedule since 1964; presumably this reflects the fall in the tonnage exported to Bulgaria from Cuba.

"Under the terms of the International Sugar Agreement the USSR may export up to 1·1 million tons during 1969 to world market destinations in addition to any exports which may be made to a group of socialist countries scheduled in the Agreement. Exports during 1968 to the world market as defined in the Agreement amounted to 1,090,000 tons. No real increase may therefore be anticipated in 1969, although provision has been made for a possible upward revision in the export entitlement from 1970 onwards.

"The fall in imports of course reflects the drop in the tonnage delivered from Cuba which, at just under 1,750,000 tons, was the lowest quantity since 1964. No figure for production in 1968 has yet been announced. Licht's latest estimate of output in 1968/69 is 9,925,000 tons, which may not differ greatly from production during the calendar year 1968. The International Sugar Organisation has estimated consumption in 1967 at 10·8 million tons. If this level was reached or possibly exceeded in the following year it would appear that a marked fall in stocks in the USSR occurred in 1968".

* * *

Optimistic prospects for Indian sugar[3].

Indian sugar production during the current season is now expected by the industry to exceed 3,300,000 metric tons. This compares with an end-February estimate of between 2,900,000 and 3,000,000 tons and last season's output of 2,250,000 tons. Still better production prospects are in line for next year and it is felt that the country can easily afford to export 200,000 metric tons of sugar during the current year, over and above the export of about 95,000 tons to the preferential UK and US markets.

* * *

Puerto Rico sugar industry proposals[4].

JUAN B. GARCÍA MÉNDEZ, Vice-President of the Association of Sugar Producers of Puerto Rico, and representatives of the Association recently visited the Governor of Puerto Rico to discuss a government-proposed plan to raise sugar production to one million tons within five years. Last year production amounted to 637,000 tons and, while there was sufficient cane in the fields to produce over 800,000 tons this year, shortage of labour, strikes and bad weather have combined to reduce the crop to the extent that shortfalls have had to be declared and the US sugar quota reduced to 340,000 tons.

The island has failed to meet its allotted quota of 1,270,000 tons each year for the past twelve years, and it is considered that Puerto Rico could lose part of its sugar quota when the US Congress reviews the Sugar Act next year.

Sugar production can only be increased through mechanization and the use of improved cane varieties, and the proposed five-year rehabilitation programme could take place without causing unemployment since displaced cane workers could be re-trained to operate mechanical harvesters and other field machinery.

The establishment of a comprehensive programme of sugar cane mechanization, based on cooperative action by the Government of Puerto Rico, the private sugar industry and the labour organizations, may offer some hope of improvement and recovery for the industry, which many feel is headed for disaster and oblivion if strong steps are not taken in time.

[1] *I.S.O. Stat. Bull.*, 1969, **28**, (3), 121–122.
[2] *Sugar Review*, 1969, (917), 78–80.
[3] *Public Ledger*, 10th May 1969.
[4] ***Sugar y Azúcar***, 1969, **64**, (5), **56.**

Effects of salinity on Louisiana sugar cane

By TAWAKOL Y. RIZK* and W. C. NORMAND
(*Louisiana Agricultural Experiment Station, Baton Rouge, Louisiana, 70803 U.S.A.*)

Introduction

THE problem of crop response to increasing levels of salinity already exists in some sugar cane-producing areas. As the shortage of arable land grows more acute and as irrigation of sugar cane continues and becomes more common, the problem is likely to become more serious. This is a report of the first efforts to study the potential problem in Louisiana sugar cane.

The study was conducted in the greenhouse, as naturally saline soils do not occur in the area in which the work was done. Much of the data cannot be taken as absolute values for field-grown sugar cane, since almost certainly any plant will tolerate greater levels of salt in the field than under the conditions of this experiment. BONNET[1], for example, has reported "poor growth" of sugar cane in Puerto Rico in a field with as much as 1·19% sodium chloride. RIZK and NORMAND[2] found that sodium chloride in that range of concentration severely stunted field-grown plants in Louisiana. In the present greenhouse study, similar sodium chloride concentrations killed all plants treated. Within the limitations of the greenhouse test, this report shows the response of sugar cane at various stages of growth to sodium chloride and compares this response with that caused by salts composed of comparable ions.

Materials and Methods

Cuttings of the variety CP 44-101 were planted 15 mm deep in polyethylene containers of either ½ or 6 gallons volume filled with washed river sand. Table I shows the results of chemical analysis of the sand at planting. A closeable drainage system was provided for all containers and the 6-gallon size was aerated uniformly at the rate of 12 ml/minute with compressed air. The cuttings consisted of one bud and a limited amount of the growth ring, root band, leaf scar, and wax ring.

Table I. The chemical analysis of three samples taken at random from the washed sand for certain elements in p.p.m., % soluble salts and pH

Analysis	*Sample I*	*Sample II*	*Sample III*
Available:			
P	9	20	12
K	24	16	20
Ca	136	136	135
Mg	8	15	10
Na	200	200	200
Soluble salts %	0·003	0·002	0·003
pH	7·1	6·8	6·7

A full nutrient solution was made up to the appropriate concentration with regard to each salt in the study and the sand was initially saturated with 6000 ml for the large or 500 ml for the small containers. Every two weeks the containers were drained and then saturated with basic nutrient solution without added salt. When leaching was desired, the drain was left open and the containers were filled with tap water daily for 20 days, then flushed with the basic nutrient solution for 10 days.

The three salts were applied at concentrations of 1N, 0·5N, 0·2N, and 0·1N. These treatments with their controls were set up in a randomized block design with six replications of each treatment. The experiment was conducted twice and all the data presented here represent averages of the two experiments. Sodium chloride was applied at germination and to plants which were 1, 2, and 3 months old. Calcium chloride and sodium sulphate were applied separately to month-old plants only.

Just prior to treatments, measurements were made to the nearest millimetre from the soil surface to the tip of the longest leaf of each plant. When month-old plants were treated, measurements were again made five days after treatment, but for all other growth stages the interval was 10 days. Fresh and dry weights of entire plants (excluding the seed piece), numbers of shoot roots, shoot diameters, and internode lengths were determined using four plants of each treatment.

The other two plants of each treatment were used in the leaching study. After the flushing procedure described above, drainage was cut off for 15 days and the same measurements as above were made.

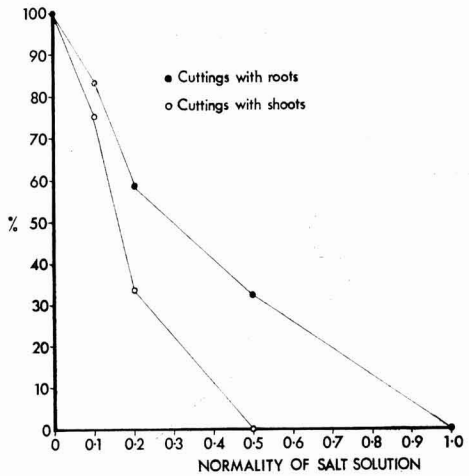

Fig. 1

* Present address: Ain-Shams University, Faculty of Agriculture, Plant Production Department, Shubra, Cairo, Egypt.

[1] *Proc. 8th Congr. I.S.S.C.T.*, 1953, 200–207.

[2] *Sugar Bull.*, 1966, **44**, 154–155.

Table II. Influence of varying concentrations of sodium chloride on average height, shoot root number, fresh weight and dry weight of sugar cane shoots and roots expressed as percentages of controls, measured at 1-month intervals

Plant age	*One month*				*Two months*				*Three months*			
Treatments	1N	0·5N	0·2N	0·1N	1N	0·5N	0·2N	0·2N	1N	0·5N	0·2N	0·1N
Height (cm)	4·8	8·2	35	69·8	2·0	6·3	47·7	71·90	10·9	16·62	41·0	68·43
Shoot weight												
Dry	35·9	38·5	63	73·0	54·5	65·0	67·0	72·40	64·3	65·7	78·4	86·7
Fresh	21·5	27·0	48	60·0	43·72	42·9	60·7	75·45	34·0	40·0	57·8	76·8
Shoot root number	0	0	0	0	33	50	116	100	71	63·2	84·2	81·6
Root weight*												
Dry	23·5	17·6	76·5	76·5	61·3	41·9		82·3	24·7	70·9	75·3	66·1
Fresh	40·5	32·4	73	59·5	42·4	34·0		53·7	48·7	56·6	68	63·1

* Shoot and set roots

Results and Discussion

The higher levels of sodium chloride unfavourably affected both the rate and the absolute percentage of germination. Initiation of roots was less affected than shoot initiation. Ten days after treatment with 0·5N sodium chloride a level of 0·2% total soluble salts and 790 p.p.m. available sodium was found. No shoots appeared in this treatment, but one-third of the cuttings developed roots (Fig. 1). Shoots were initiated in 75 and 33% of the cuttings in the treatments containing 0·03 and 0·05% total soluble salts, respectively (Table III).

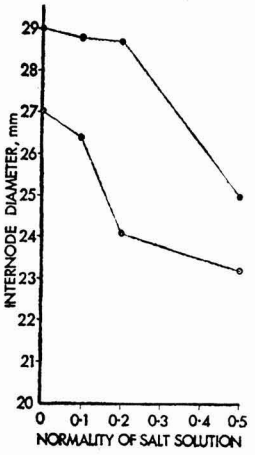

Fig. 2

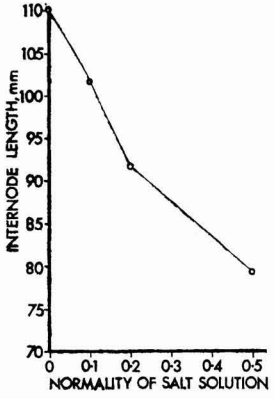

Fig. 3

Growth varied directly with both the concentration of the applied sodium chloride and with age of the plant at the time of any one treatment, as evidenced by the data in Table II and Figs. 2 and 3. The fluctuations in root weights may be attributed to difficulty in complete removal of roots from the soil, a consequence of variation in the distribution of roots in the containers. Comparison of Figs. 2 and 3 shows that length of internodes was affected more than was diameter by equivalent concentrations of sodium chloride. Similar effects on cane at the flowering stage have been reported from Hawaii[3].

Measured in terms of survival, it appeared that sensitivity to sodium chloride was quite different at germination from that at later stages and that increasing age meant less sensitivity (Fig. 4). The percentage of germination was reduced to 75 and 33% of controls with 0·1N and 0·2N sodium chloride and there was no germination in the 0·5N treatment

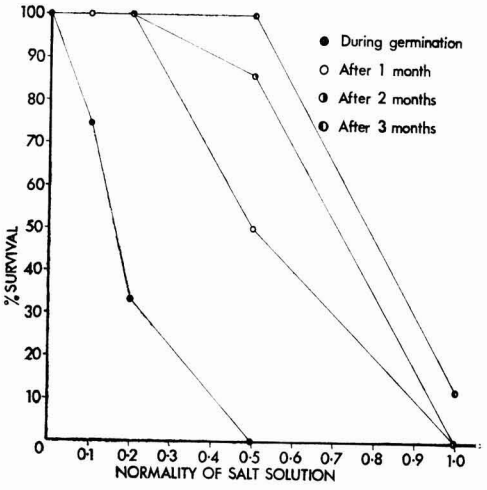

Fig. 4

[3] *Ann. Rpt. H.S.P.A. Expt. Sta.*,1962,7–8.

Table III. The analysis of soil samples for certain elements in p.p.m., % soluble salts and pH after treatment with various concentrations of sodium chloride after germination, after one month and after two months of sugar cane before leaching

	During germination					*After one month*					*After 2 months*				
Analyss	1N	0·5N	0·2N	0·1N	*Control*	1N	0·5N	0·2N	0·1N	*Control*	1N	0·5N	0·2N	0·1N	*Control*
Availaible:															
P	14	23	17	16	20	26	26	29	23	34	9	9	11	11	9
K	24	48	24	24	30	42	30	42	24	42	30	36	30	30	24
Ca	227	181	181	136	136	227	181	136	136	181	227	227	181	181	136
Mg	15	21	15	15	29	29	35	29	29	29	21	21	29	35	8
Na	850	790	360	270	120	690	550	410	270	140	1500	1200	520	760	110
Soluble salts % ..	0·26	0·20	0·05	0·03	0·01	0·15	0·10	0·04	0·038	0·02	0·41	0·21	0·09	0·13	0·007
pH	6·8	7·1	6·6	6·6	6·9	7·2	6·6	7·2	6·6	7·1	5·8	5·5	6·3	6·2	6·5

Table IV. Analysis of the soil samples for certain elements in p.p.m., % soluble salts and pH before and after leaching in the case of plants treated with sodium chloride after 3 months' growth

	1N		0·5N		0·2N		0·1N		*Control*	
	Before Leaching	*After Leaching*	*Before Leaching*	*After Leaching*	*Before Leaching*	*After Leaching*	*Before Leaching*	*After Leaching*	*Before Leaching*	*After Leaching*
Available:										
P	21	26	21	23	19	23	20	26	17	31
K	36	42	42	42	30	36	36	42	42	30
Ca	227	136	227	136	136	136	136	136	136	136
Mg	15	29	15	29	29	29	21	35	15	41
Na	1100	70	980	80	460	70	360	80	270	60
Soluble Salts %	0·42	0·019	0·32	0·018	0·08	0·018	0·05	0·017	0·02	0·018
pH	7·2	6·6	7·4	6·6	7·3	7·0	7·5	7·0	8·2	7·0

At the same concentration, i.e. 0·5N, half of the one-month and all of the three-month plants survived. Similar results have been reported for plants other than sugar cane[4]. Effects of total soluble salt and sodium content of the soil on growth are summarized in Tables III and IV. The limits of tolerance rose markedly with increasing plant age.

The influence of varying concentrations of sodium sulphate and calcium chloride applied one month after planting was similar to that of sodium chloride at equivalent concentrations. There were, however, some differences in the rate of growth reduction, as measured by height and fresh and dry weights (Figs. 5 and 6). The effects of the anion (i.e. chloride and sulphate) on growth were less than those of the cation on an equivalent basis.

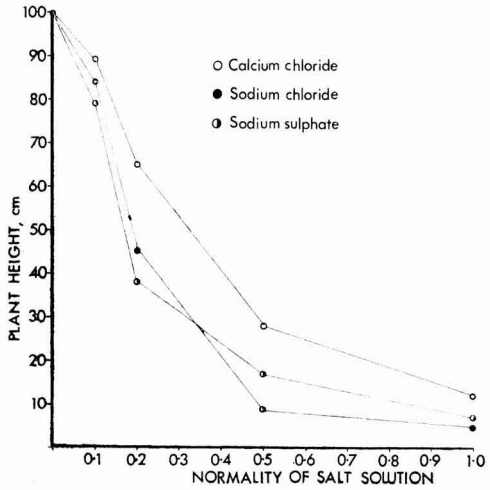

Fig. 5

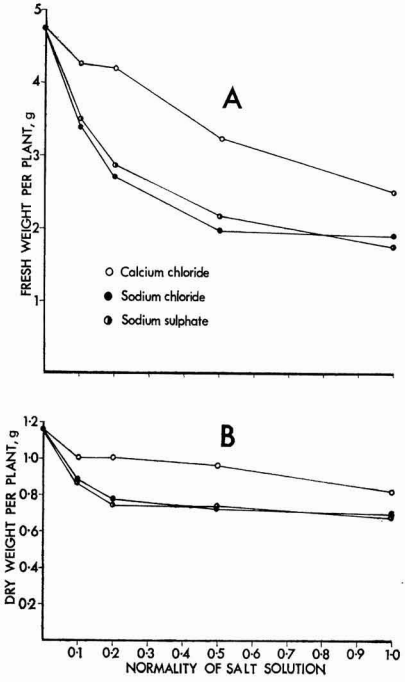

Fig. 6

[4] AYERS and HAYWARD: *Proc. Soil Sci. Soc. Amer.*, 1918, **13**, 224–226.

The inhibitory effects of salts on plant growth are generally attributed to one or more mechanisms. Inhibition of water absorption by unfavourable osmotic pressures of the soil solutions is one of the more generally accepted[5,6,7,8], but ample evidence exists that certain ions are directly toxic and also that nutritional aberrations are caused by excess salinity[6,9,10,11,12]. In the present case, it appears that sodium ion toxicity may be involved, in view of the greater toxicity of the sodium salts when compared with calcium salt solution at equivalent osmotic pressures. The toxicity of the ions studied for the present report may be ranked thus in decreasing order: sodium, chloride, sulphate, and calcium. Similar results have been reported by WADLEIGH and GAUCH[13] but contrary results were obtained by others[14,15].

[5] BUFFUM: *Wyoming Agric. Expt. Sta. Bull.*, 1896, **29**, 119–253.
[6] EATON: *J. Agric. Res.*, 1942, **64**, 357–399.
[7] SHIVE: *New Jersey Agric. Expt. Sta. Ann. Rpt.*, 1916, **37**, 455–457.
[8] UHVITS: *Amer. J. Bot.*, 1946, **33**, 278–285.
[9] GAUCH and WADLEIGH: *Bot. Gaz.*, 1944, **105**, 379–387.
[10] HAYWARD and LONG: *Plant Physiol.*, 1943, **18**, 556–569.
[11] HAYWARD *et al.*: *U.S. Dept. Agric. Tech. Bull.*, 1946, (922), 1–48.
[12] HAYWARD and SPURR: *J. Amer. Soc. Agron.*, 1944, **36**, 287–300.
[13] *Proc. Amer. Soc. Hort. Sci.*, 1942, **41**, 360–364.
[14] *Ann. Rpt. H.S.P.A. Expt. Sta.*, 1963, 6.
[15] LEE and WELLER: *Rpts.* 1927 *Meeting Hawaiian Sugar Tech.*, 69–72.

Improvements in the dextran assay of cane sugar materials

By J. S. KENIRY, J. B. LEE and V. C. MAHONEY
(The Colonial Sugar Refining Co. Ltd., Sydney, New South Wales, Australia)

INTRODUCTION

THE formation of dextran in mechanically harvested chopped-up cane has been related[1,2] to a retrogression in the processing quality of that cane. Recent work by SUTHERLAND[3] and SUTHERLAND and PATON[4] has shown, on a laboratory scale, that dextran itself is particularly harmful to the sucrose crystallization process.

Routine measurements of the dextran concentration in cane juices could provide millers with an indication of the freshness of their cane supply. Such measurements to achieve this purpose would require to be fast, accurate and made expeditiously. We have studied a dextran assay method, reported previously by NICHOLSON and HORSLEY[5], with the aim of improving the reliability and increasing the range of sugar products to which it is applicable.

METHOD OF NICHOLSON AND HORSLEY

The method is standardized against a purified dextran prepared either from a culture of a strain of *Leuconostoc mesenteroides* or from a cane juice that had undergone spontaneous dextranous fermentation. Aliquots (containing 1 to 12 mg of dextran) of a solution of this dextran are pipetted into 25 ml volumetric flasks containing 0·5 ml of 10% trichloroacetic acid and 5 ml of 50% standard sucrose solution. The total volume in each flask is adjusted to 12·5 ml with distilled water. Ethyl alcohol is added from a burette to the 25 ml mark of each flask with gentle swirling. The contents of the flask are gently mixed without violent shaking. Fifteen minutes after the completion of mixing, the haze is read at 720 nm against water dilutions of the aliquots.

In the dextran assay of raw juices, 20 ml of 10% trichloroacetic acid is added to 100 ml of the juice and the mixture vacuum-filtered with 2% of a diatomaceous filter aid. A 12·5 ml aliquot of the filtrate is taken into a 25 ml flask, ethyl alcohol added and the haze read as described above.

For raw sugars, a 20°Bx solution is incubated, using 10 mg "Bacterase" (Norman Evans and Rais Ltd., England) per 100 ml solution to destroy the solublized starch, before the addition of trichloroacetic acid and subsequent filtration and development of the dextran haze.

MODIFICATIONS TO THE METHOD

The modified method is essentially similar to that described above and, for this reason, a detailed description of it will not be given. Rather, differences between the two methods will be indicated below, and the reasons for the changes are discussed under the appropriate headings.

The modified method is standardized against a commercial dextran (Dextran 110, lot No. To 5404 of AB. Pharmacia, Sweden). The time between the completion of alcohol addition and reading of the dextran haze has been increased from 15 to 20 minutes.

Calcium sulphate and, to a lesser extent, other inorganic salts have been identified as particularly troublesome impurities in juices and process materials

[1] KENIRY *et al.*: *I.S.J.*, 1967, **69**, 330–333.
[2] *idem ibid.*, 357–360.
[3] *ibid.*, 1968, **70**, 355–358.
[4] *ibid.*, 1969, **71**, 131–135
[5] *J. Agric. Food Chem.*, 1959, **1**, 640–643.

which interfere with the dextran haze formation. In cane juice analysis, interference from this source has been overcome, when necessary, by addition of a suitable volume of barium chloride solution prior to the filtration step.

A more thorough purification step, involving ion-exchange resins, has been introduced for process materials. "Kleistase GM-16" (Daewa Kasei, Japan) has been preferred to the enzymes used by previous workers[1,5] for removing solubilized starch.

Discussion

Standard Dextran

The choice of a standard dextran requires careful consideration. Since there is no certainty that dextrans isolated from different samples of deteriorated cane will have similar solubilities in alcohol, the use of such dextrans would not be advisable from the view-point of comparing results among laboratories. The haze characteristics of the dextran used for standardization should be reproducible and should, if possible, approximate those of dextrans isolated from samples of deteriorating cane.

Nicholson and Horsley[5] reported dissimilar alcohol solubilities for dextrans produced by different species of micro-organisms. We have found that the haze characteristics of 1:6 linked dextrans varied with molecular weight. Fig. 1 shows the standard graphs, derived by the procedure of Nicholson and Horsley, for 7 different dextrans, some properties of which are shown in Table I. Absorbance was determined at 720 nm, using 1 cm cuvettes and a Hitachi-Perkin Elmer 139 spectrophotometer.

Fig. 1 indicates that the calibration graph for the cane juice dextran was very similar to those for dextran from *Leuconostoc mesenteroides* and dextrans

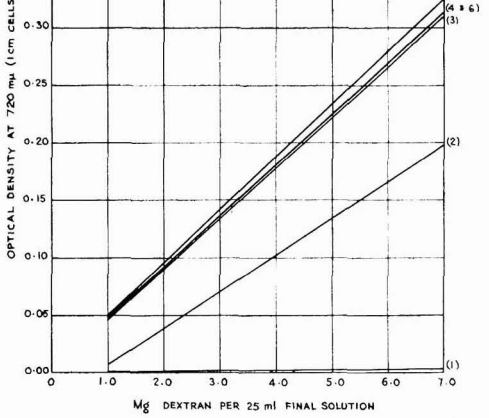

Fig. 1. Standard curves for seven different dextrans (method of Nicholson and Horsley)

110, 500 and 2000. Thus it was concluded that any one of the above three commercial dextrans would be suitable for use as a standard material. Dextran 110 (lot No. To 5404) was preferred as a standard because of its ease of solubility in water and because it had a lower ash content (0·06%) than the Dextran 500 (0·79% ash). There is no implication that Dextran 110 resembles dextran from deteriorated cane either in molecular weight or structure.

Table I

No.	*Description of dextran*	*Molecular Weight**	*Water solubility*
1	Dextran 10 (Pharmacia)	10,000	readily soluble in cold water
2	Dextran 40 (Pharmacia)	40,000	,,
3	Dextran 110 (Pharmacia)	110,000	,,
4	Dextran 500 (Pharmacia)	500,000	,,
5	Dextran 2000 (Pharmacia)	2,000,000	soluble in boiling water
6	Dextran from deteriorated cane	unknown	,,
7	Dextran from *Leuconostoc mesenteroides*	,,	,,

* Manufacturer's specification

Haze Development Time

Nicholson and Horsley found that the absorbance of the dextran haze produced by addition of alcohol increased with time and became reasonably constant after 15 minutes. The haze developed more slowly at low concentrations than at high concentrations. Reading the absorbance of dextran standards after 15 minutes yields a standard graph which intercepts the absorbance axis below the origin. In the above authors' work, the intercept was at an absorbance of —0·030. In practice, the "O" mg dextran standard has been found to lie at a point between 0·000 and +0·002 absorbance. Thus the relationship between the absorbance and dextran concentration is non-linear at low concentration when a 15-minute development time is used.

The linearity of the relationship is improved by allowing a 20-minute development time, but even so the standard graph is slightly concave upwards at low dextran concentrations. A standard graph prepared by the method of Nicholson and Horsley, but using Pharmacia Dextran 110 (lot No. To 5404) as the standard, and a haze development time of 20 minutes ±10 seconds, is shown as Fig. 2.

Interference in Raw Juices

The dextran assay method for raw cane juices described by Nicholson and Horsley[5] has been shown, in our experience in Fiji, North Queensland and New South Wales, to be remarkably free from interference. In only a very small percentage of the juices tested has interference been detected or even suspected. In these cases, the source of interference has been eliminated by treatment of the juice with an adequate volume of barium chloride solution immediately following the addition of trichloroacetic acid reagent.

The correct amount of barium chloride to be added in such instances obviously depends on the amount

of inorganic sulphate present in the juice. The amount required can be estimated by adding barium chloride solution (say 5% w/v) dropwise to an aliquot of the de-proteinated, filtered juice, until the addition of an extra drop of reagent causes no further precipitation

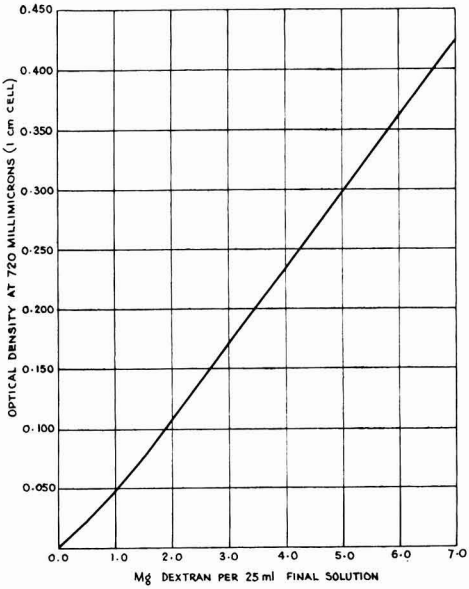

Fig. 2. Dextran standard curve (modified method)

of barium sulphate. Considerable excess of barium chloride reagent appears to have little effect on dextran recovery. Table II contains the results of a series of dextran analyses on three juices to which were added, prior to analysis, varying amounts of barium chloride and standard Dextran 110. Further work with juice number 3 showed that coagulation could be prevented by either treatment of the juice with 0·1 g oxalic acid (to remove calcium) or by shaking the 100 ml juice with 5 g of the ion-exchange resin mixture, described below under "process materials and raw sugar."

Table II

	Reagent added per 100 ml juice			*Dextran detected/ 100 ml juice*	
Juice No.	*Trichloro-acetic acid (g)*	*$BaCl_2$ (g)*	*Dextran (mg)*	*mg*	*% recovered*
1	2·0	0·00	0·0	0·0	—
1	2·0	0·25	0·0	0·0	—
1	2·0	0·00	50·0	49·0	98
1	2·0	0·25	50·0	51·0	102
2	2·0	0·00	0·0	28·4	—
2	2·0	0·25	0·0	29·1	—
2	2·0	0·00	50·0	80·9	105
2	2·0	0·25	50·0	80·6	103
3	2·0	0·00	0·0	haze coagulated	
3	2·0	0·10	0·0	slight coagulation	
3	2·0	0·20	0·0	0·0	

Starch has never been shown to cause interference in raw juice analysis provided the vacuum-filtration step, involving Whatman No. 5 filter paper and HCl-washed "Supercel", has been properly conducted.

Starch Removal from Process Materials

Since starch is insoluble in 50% aqueous ethanol, this constituent must be removed from sugar solutions before the dextran haze is developed. The starch in raw sugars and process materials is mainly in the solubilized form and cannot, therefore, be completely removed by filtration. It can be conveniently removed enzymatically. In previous work[1] "Biokleistase" was used for this purpose. However, this enzyme contained, as a heat stabilizer, appreciable amounts of calcium sulphate, a substance that should not be willingly added to solutions that are to be subsequently analysed for dextran. We have found that "Kleistase GM-16", although it contains starch, is eminently suitable for starch removal. This enzyme, when used at the rate of 0·20 g/100 g solids, will remove the starch from diluted (40°Bx) process materials, and raw sugars in a one-hour incubation period at 20°C.

Removal of Interfering Substances from Process Materials and Raw Sugars

In process materials, interference from calcium sulphate and other inorganic salts has previously been overcome[1] by suitable dilution of the material before the addition of alcohol. However, this procedure reduces the sensitivity of the method and is therefore not desirable. We have investigated various other means of overcoming this source of interference. The means have included removal of salts by the addition of barium chloride, barium carbonate, oxalic acid and ammonium oxalate, both alone and in combination. None was wholly successful, indicating that a more thorough purification was required. Purification with ion-exchange resins—a mixture of equal weights (dry basis) of "Amberlite IR-120(H)" and "IR-45(OH)"—has proven successful.

In our method, 50 ml of 40°Bx solution of process material or raw sugar is shaken for one hour, at room temperature, with a suitable quantity of resin mixture. For raw sugars 1·0 g (dry basis) of the mixture is adequate, while for process materials containing up to 10% ash on solids 10·0 g (dry basis) is sufficient. The incubation to remove starch is conducted concurrently with the ion-exchange step. At the conclusion of this step, the sugar solution is decanted through a 100-mesh gauze and the resin washed with distilled water, the washings being added to the decanted solution. The total volume (solution and washings) is made to 100 ml, and 10 ml of 10% (w/v) trichloroacetic acid added and the solution vacuum-filtered through a No. 5 Whatman paper using acid-washed "Supercel" as a filter aid. Dextran in the filtrate is determined in the normal way.

Recoveries of added standard dextran are about 90% for this method. The cause of the low recovery is, as yet, unexplained. There appears to be no absorp-

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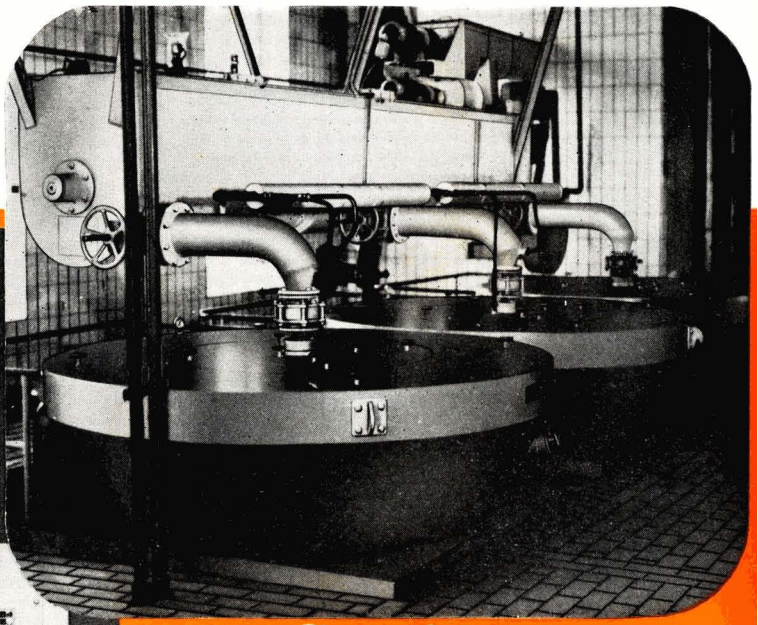
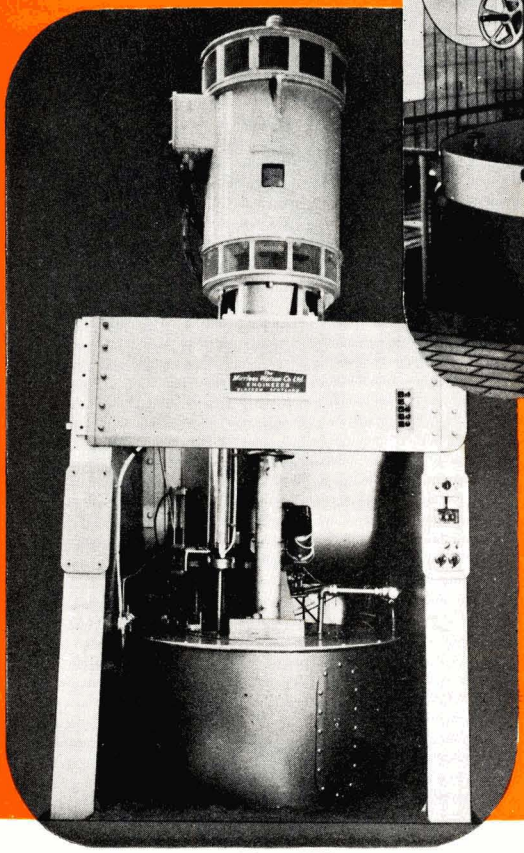




Batch Type

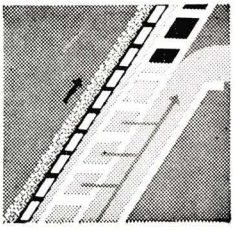
The modern lines of Mirrlees Centrifugals are illustrated in the above photograph of one machine of a battery of 13–48" x 30" Fully Automatic Re-cycling Centrifugals being erected in our works. Note the complete and uncluttered accessibility of the working front; the control console incorporating a mimic diagram of the cycle stages and the fault annunciator on the pelmet.

Continuous

HEIN LEHMANN DESIGNED

Thin-layer principle

The continuous separation of molasses is only possible according to the thin-layer principle, i. e. a thin massecuite layer must slide over the centrifugal screen in order to permit good separation of the molasses in a short time. The thickness of the layer is determined by quantity and viscosity of the massecuite and by the basket speed.



The Mirrlees Watson Co Ltd No. 1 COSMOS HOUSE, BROMLEY COMMON, BROMLEY, BR2 9NA, GREAT BRITAIN

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tion of the standard dextran by the ion-exchange treatment, nor does the incubation process affect the recovery of standard dextran from prepared mixtures of starch, dextran and sucrose. It is possible that impurities that are present in process materials but not in juices, or vice versa, and that are not removed by the ion-exchange treatment, influence the particle size distribution of the dextran haze and/or the solubility of dextran in 50% aqueous ethanol.

SUMMARY

A previously published method for the determination of dextran in cane sugar materials has been investigated. Minor modifications to the standardization procedure have been proposed. Additionally, techniques have been developed for overcoming common sources of method interference in raw juices and, more particularly, in process materials. The method is now generally applicable to all sugar cane materials and can be done rapidly, with little demand for sophisticated apparatus and reagents.

As with all turbidimetric methods of analysis, the method has a high susceptibility to errors arising out of variations in experimental technique or interference from normal constituents of sugar cane materials at abnormal concentrations, or simply from abnormal constituents. For these reasons, it is advisable to conduct analyses with extreme care, and also to check the contents of cuvettes, after reading, for signs of flocculation of the dextran haze.

Sugar cane research in Mauritius

(Mauritius Sugar Industry Research Institute, Annual Report 1967)

ATTENTION is drawn to the now inadequate income the Research Institute derives from the statutory levy on sugar exports and the serious consequences this can have on its research. On account of various unavoidable increases in expenditure which have taken place during the year under review, the Institute had once again to modify and restrict the programme of work which had been planned in order to balance its budget. With a view to improving the situation, a request was made to the Government for altering the Ordinance governing the Institute and applying the statutory levy to the total tonnage of sugar produced in any calendar year, instead of to the amount of sugar exported.

Nutrition and soils

Interest in other countries on the use of "slow-release" nitrogen fertilizers led the Institute to assess the value of such fertilizers under conditions in Mauritius where leaching of nitrate may present a problem. The first result from these trials showed no response to nitrogen application, but the trials were carried out with virgin cane and first ratoons which generally give a poor response to nitrogen. It is hoped that more conclusive results will be obtained from the next crop. The relative efficiency of the ammonium and nitrate ions, particularly in respect of calcium ammonium nitrate fertilizer, were compared in lysimeter studies. Information is thus obtained on the leaching of nitrate ions in the presence of sugar cane roots and under different intensities of rainfall.

In connexion with the increasing use of water-soluble phosphate fertilizers, as against water-insoluble forms, a study was made of the effect of different soil constituents on the retention of phosphate by the soil. Results indicated the predominant influence of iron oxide in soils in dry areas.

Field trials were continued on the effect of leaf spraying of phosphate on the ripening of cane. No definite conclusions were reached, but the timing of spraying in regard to the age of the cane was all-important.

With regard to potash, the only soils in which potassium nutrition presents difficulties in Mauritius are the montmorillonitic dark magnesium clays. A series of pot experiments was initiated to study the effect of soil moisture and other factors on potassium uptake in these soils.

Trials were carried out to test the value of calcium silicate slag (obtained from Japan). This followed from the interesting results obtained in other countries (e.g. Hawaii) on the use of calcium silicate slag in highly weathered soils. Fields with soils showing the lowest values of extractable silicon were chosen for the trials. Pot experiments with these soils showed a definite beneficial effect of calcium silicate on plant yields, with a decrease in plant Mn/SiO_2 ratio and soil extractable aluminium.

Soil-plant-water relations

The effect of different water régimes on cane growth was studied on two varieties growing under greenhouse and field conditions, and some progress was made in elucidating the factors affecting drought tolerance and susceptibility. Field-scale measurements of the moisture index of the 4th-5th internode showed that this method should be used more widely under Mauritius conditions to determine the optimum time for harvesting on irrigated estates. Results are given on the effect of different soil-water régimes on cane growth. A study of the development of the root system of two varieties, Ebène 1/37 and M 147/44, showed that the former is entirely dependent on its sett roots which explore only the top 15–20 cm of

soil during the first three months of growth, whereas M 147/44 produces shoot roots as early as two months after planting. The better location of the root system of M 147/44 in the deeper soil layers at an early age, which is an inherent character, seems to be one of the most important factors that contribute to the drought tolerance of this variety. Experimental work with the herbicide "Sinbar" indicated that drought-resistant varieties were tolerant towards it while drought-susceptible varieties were usually affected, as shown by leaf chlorosis even at low dosage rates. It is thought that a broad and rapid classification of newly developed varieties into categories as regards drought resistance may be possible by this means.

Cane variety situation

Because of the long ratooning cycle in Mauritius, varietal changes are normally relatively slow since only 12% of the cultivated area is replanted annually. However, the outbreak of gummosis in 1964 hastened varietal replacement. Details of the varietal changes that have taken place during the last ten years are given. Of the varieties released in 1966 and 1967 confirmation was obtained during the year of the high sugar potentials of M 13/53, M 13/56 and M 377/56, the last in particular showing a wide range of adaptation. The variety M 409/51 requires exacting environmental conditions; N:Co 376 is an excellent early maturing variety in regions of high rainfall. The general varietal position is considered to be far better than it was a few years ago.

Cane breeding and selection

Reference is made to the newly created Biometry Section which has helped considerably to rationalize the whole experimental procedure. The data assembled on punched cards has facilitated the choice of desirable parents. Selection criteria are also more critically defined. Because of several factors, 1967 was a bad year for crossing. Strong winds proved detrimental to the viability of the flowers.

Investigations on the physiology of flowering were continued and the conclusions reached summarized. Different varieties of sugar cane may require different conditions for induction of flowering. In a leaf-cutting experiment it was observed that the lopping of old leaves on the stalk resulted in earlier emergence compared with the control, whilst lopping of young leaves resulted in delay. There is an indication therefore that flowering may be controlled by a balance between flowering inhibitors and promoters.

Diseases

The varietal situation in relation to cane diseases in Mauritius is discussed, radical changes having taken place because of the toll taken by the new strain of the gumming disease bacterium (*Xanthomonas vasculorum*). Some of the established varieties have proved to be particularly susceptible to it. Twenty-two varieties were included in the list of canes for commercial cultivation. Four of these are no longer planted and another three are doomed because of high susceptibility to the new strain of gumming disease. The merits and defects of the fifteen remaining are discussed.

An account is given of resistance trials with gumming disease, the reaction of progenies from resistant and susceptible parents, the effects of systemic infection on yield and the effect of strain variation in *Xanthomonas vasculorum*. Other cane diseases discussed in the report include pineapple disease, ratoon stunting disease, chlorotic streak, fusarium wilt and Fiji disease in Madagascar. Poor ratooning is at times a problem in the super-humid zone of Mauritius with certain varieties. As, on occasion, diseases such as chlorotic streak and leaf scald can be discarded, the trouble could be due to infection of buds and stumps by various unspecified fungi, bacteria or yeasts, especially when regrowth is retarded after harvest by cooler conditions or excessive soil moisture. An experiment to attempt to promote ratooning by fungicidal treatment is described, but no significant benefit appeared to result from the treatment.

Pests

Work on sugar cane pests in Mauritius during the year was concentrated on the breeding and liberation of the Javanese cane borer parasite *Diatraeophaga striatalis* for possible biological control of the cane moth borer *Chilo sacchariphagus*. It is not yet known whether environmental conditions in Mauritius in the different climatic zones are favourable or adverse to the parasite and the only means of finding this out is by mass liberations in several different areas. The number of adults released amounted to 12,974 mated females and 10,920 other adults, the latter being mostly males but including a small undetermined number of unmated females. It has been found that the number of large borers that can be collected in the field is the key factor that determines both the efficiency of breeding routine and the size of each parasitic generation reared. Full details of released made in 1967 are given in a table. Results of studies on the biology and life cycle of the parasite are given. These include the duration of the life cycle and reproduction in relation to age of adults. Other pests discussed or referred to in the report include thrips (*Fulmekiola serrata*), the scale insect *Aulacaspis tegalensis* and nematodes.

Weed control

Trials with 15 different herbicides are reported, 10 being tested under humid conditions for the first time. Results obtained are shown in a table. "Sinbar" was by far the best herbicide and gave excellent weed control even at the lowest dosage rate, but its high toxicity to the variety M 31/45 was striking. "Atracine", DCMU, "Herban", "Linuron" and BAS 2100 were more or less comparable in their effects on weed control and no toxic symptoms on the crop were apparent. The remaining 9 herbicides did not affect cane growth but showed inferior activity.

Intercropping

Results of trials on intercropping sugar cane in its early stages with certain foodcrops are given, the crops concerned being potatoes and sunflowers. With regard to potatoes it was concluded that potato growing in cane interlines requires much care for cultivation, control of weeds, pests and diseases. The cost of insecticides, fungicides and labour required for cultural operations is nearly the same irrespective of the density of the potato crop. It is therefore advisable to plant a double row of potatoes on every cane interrow instead of a single line.

Experiments are also reported on trials with sunflowers as an intercrop with ratoon cane. The sunflower plant, being tall, is able to survive with ratoon cane, crops such as potatoes, groundnuts and beans being unable to do so. The trials were carried out in the different climatic zones of the island. In spite of damage to the sunflower plants or seed by various pests, notably birds and rats, it was established that sunflower is a suitable crop for this purpose. Further experiments are planned to obtain data on the economics of this intercropping from the point of view of both oil and sugar production.

F.N.H.

Removal of incondensable gases from calandrias

By S. ZAGRODZKI and J. DOBRZYCKI

(Department of Food Technology and Sugar Industry, Institute of Technology, Lodz, Poland)

THE presence of incondensable gases in the steam entering the calandria of an evaporator body has a harmful influence on the efficiency of evaporation. This influence manifests itself in two ways. From each portion of condensed steam there remains a certain amount of uncondensed gas which covers the heating surface, forming a layer which blocks the way for the next portions of steam. This effect is often overestimated as it is largely compensated by the high diffusion coefficients of steam and gas.

Much more harmful is the second effect of gas content in the steam. The temperature of steam condensation corresponds not to the overall pressure but to the partial pressure of the steam. Pure water steam under a pressure of e.g. 2 kg/sq.cm. condenses at 119·6°C. If steam under this overall pressure contains 2% of incondensable gas, its partial pressure is only 1·96 kg/sq.cm. and its condensation point is only 119·0°C. An accumulation of 2% gas in the calandria causes, therefore, a temperature drop of 0·6°C. When the total temperature difference between the steam and the juice in the vessel amounts to 6°C, the loss of 0·6°C makes 10% of the active temperature difference. The efficiency of the evaporator can be sustained only by raising the pressure difference between the incoming steam and outgoing vapour, a remedy which has its limits.

The depression of the condensation point in the presence of incondensable gases in water steam can be used as a measure of the accumulation of such gases in the calandria. In order to avoid this harmful accumulation in each calandria fed with juice vapours we install special venting valves through which gases are extracted. It is impossible to separate them from the steam, and a certain amount of steam therefore escapes through the gas withdrawal valves. Even though venting pipes are usually connected with the vapour dome of the same body, this steam wanders from one vessel to the successive ones and eventually is lost in the condenser.

Thus, venting should be limited to the inevitable minimum as any excessive opening of the gas galves causes heat losses. An objective setting of the gas valves is only possible when using a transmitter indicating the gas concentration in the calandria.

*Transmitter**

The principal parts of the transmitter (Fig. 1) are: two thermometric resistors R_1, R_2, two ordinary resistors R_3, R_4, a galvanometer M, and a stabilized D.C. source U_z.

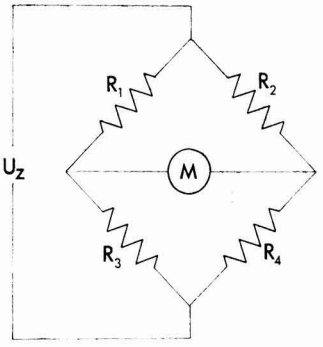

Fig. 1. Transmitter measuring the difference in temperature. R_1, R_2 are thermometric resistors.

* Patent applied for.

The principle of the transmitter consists in measuring the difference of steam temperature between the inlet to the calandria and inside the calandria. When the gas valves are in the right position and the incondensable gases do not accumulate in the calandria, this difference of temperature is near zero. In consequence both thermometric resistances are equal, the Wheatstone bridge is balanced and the galvanometer M shows zero. A larger difference of gas concentration at the inlet and inside the calandria causes an appreciable depression of the condensation temperature inside the calandria. The resistances R_1 and R_2 are then no longer equal and the pointer of the galvanometer moves from its initial position.

In the model transmitter used for factory tests the sensitivity was doubled by installing 4 thermometric resistors ($R_1 - R_4$). With a source of voltage of 10 V, we obtained large pointer deviations on a galvanometer having a range 0–16·75 mV with divisions in millimetres. Two resistance thermometer probes were put into sealed pockets in the inlet pipe conducting 1st vessel vapour to the 2nd vessel calandria. Two others were similarly inserted into the calandria of the 2nd vessel between the evaporating tubes. In both measuring points we installed also mercury thermometers with 0·2°C division.

Table I. Temperature difference corresponding to various setting of venting valves

Number of valves open	ΔT *Temperature difference, °C*	Y *Galvanometer readings, millimetres*	*Time, minutes*
4 valves, each 1/3 turn open	0·05	7	
4 valves 1/4 turn	0·04	7	
1 valve 1/4 1 valve 1/8	0·10	10	†
2 valves 1/8	0·09	8	
1 valve 1/8	0·12	9	
All valves closed	0·0	7	0
	0·1	9	5
	0·2	13	10
	0·3	18	15
	0·6	36	20
	1·0	96	25
	1·4	127	30
	1·5	134	35
	1·6	130	40
All valves 1/4 turn open	0·2	28	45
	0·1	17	50
	0·0	15	55

† Average values from observations during a suitably long period of time.

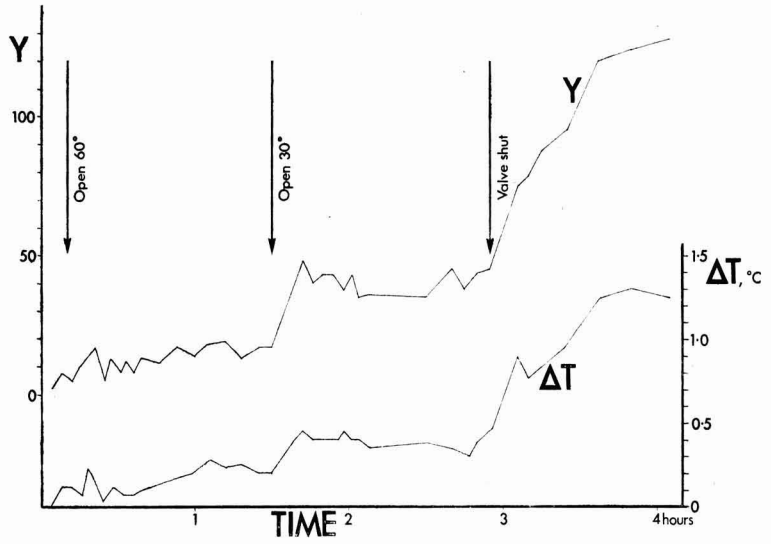

Fig. 2. Temperature difference (ΔT) and galvanometer readings (Y) during a factory test

Factory data from the first tests are shown in Table I. We noticed that for a good withdrawal of incondensables only a slight opening of the venting valves is necessary. The evaporator body had 4 symmetrically placed venting valves which were set each at $\frac{1}{3}$ turn of the hand wheel. With this setting the temperature in the calandria equalled the inlet steam temperature.

Closing two valves and throttling the two others did not cause an appreciable change in the state of degassing of the calandria. Setting only one valve at $\frac{1}{8}$ turn was still enough for sufficient removal of incondensable gases. With all valves shut the difference between inlet and inside temperature increased and after 40 minutes the condensation temperature inside the calandria was 1·6°C lower than the temperature of the incoming steam.

Setting all four valves at $\frac{1}{4}$ turn very quickly restored the normal state and after 5 minutes the mercury thermometers showed a difference of only 0·2°C. The resistance thermometers have a greater thermal inertia and need about 10 minutes to return to exact coincidence with the glass thermometers.

This test confirms our thesis that valve setting without an objective measure may cause unnecessary steam losses.

With this same transmitter we carried out a second

test, results of which are shown in Fig. 2. We opened only one valve, beginning with $\frac{1}{8}$ turn of the hand-wheel (an angle of 120°). After closing the valve to 60° the temperature difference did not exceed 0·2°C and the pointer of the galvanometer stood between 4 and 18 mm. When after 80 minutes the valve was set at an angle of only 30° (1/12 turn of the hand wheel), the indications were about 40 mm, corresponding to a temperature difference of about 0·4°C.

Total closing of this last gas valve was followed by a slow but large increase in galvanometer deviation and the temperature difference reached 1·3°C. In several analogous series we found that after some time the increase of temperature difference always came to a stop, so we could conclude that all incondensable gases of the vapour were dissolved and removed with the condensed water.

Fig. 3 gives the transmitter readings as a function of the valve opening. At a certain valve position the reading of the galvanometer approaches zero. Further opening is unnecessary and even harmful because it does not increase the efficiency of the evaporator and only causes unnecessary heat losses.

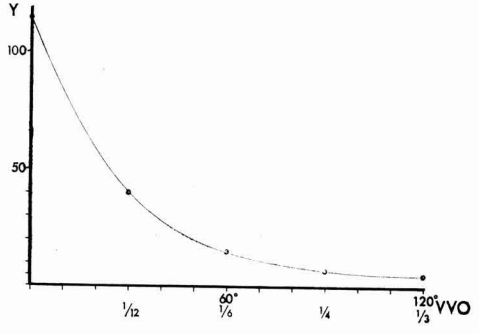

Fig. 3. Galvanometer readings (Y) as a function of venting valve opening (VVO)

Such measurements with our transmitter allow setting of the venting valves at the optimum point; the calandria is sufficiently degassed and the steam losses are held at their minimum value. When e.g. the indications are similar to those of Fig. 3, the valve is to be set at $\frac{1}{4}$ turn of the hand wheel.

This test for checking the optimum point must be repeated at regular intervals, because in various periods of the beet campaign the changing composition of the juice corresponds with different settings of the valves. During the tests of Table I an opening by $\frac{1}{8}$ was sufficient.

The control of the venting valves can be done automatically[1] e.g. by an appropriate controller which should slowly close the valves to the point when the unbalanced bridge would stop the movement of the controller.

SMITH[2] proposed placing one thermometer in the calandria, and another in the *incondensable gas pipe*. We consider this method inadequate because the difference of temperature must be chosen arbitrarily, without any objective evidence that this is actually the optimum.

SUMMARY

A new transmitter is described which indicates the state of the degassing in the calandria of an evaporator vessel. The principle consists in measuring the temperature difference between two points. One thermometer measures the temperature of the steam at the inlet, while the other is placed inside the calandria. The reading of the second corresponds to the temperature of the condensing steam, which depends on the content of incondensable gases. The venting valves are to be opened only until the point is reached when the reading of the transmitter approaches zero. Further opening is unnecessary and causes needless heat loss.

The effect of cane quality on milling loss—A further note

By R. R. FOLLETT-SMITH

The correction for variation in milling loss due to cane quality was given[3] as:

$$\frac{0{\cdot}416 \times \text{milling loss } (P_c - 13{\cdot}5)}{P_c}$$

Denoting original milling loss by *ml* and corrected milling loss by *ML*, the expression for *ML* would therefore be:

$$ML = ml - \left[\frac{0{\cdot}416\ ml\ (P_c - 13{\cdot}5)}{P_c}\right]$$

$$\text{or } ML = ml\left(0{\cdot}584 + \frac{5{\cdot}616}{P_c}\right)$$

Inspection of Table II[3] suggests that an alternative method for obtaining an expression for *ML* would be to take the mean of the whole reduced extraction and the reduced extraction (worked to a basis of 13·5% fibre in cane). Thus:

$$ML = ml\left(0{\cdot}50 + \frac{6{\cdot}75}{P_c}\right)$$

There is a considerable difference between the figures 0·584 and 0·50.

The original multiple regression, based on 21 runs, gave a definite indication that milling loss varied with cane quality but it could not be expected to give a precise figure for the partial regression coefficient, 0·416. Examples have since been worked out from other factories giving the following figures: 0·447, 0·616 and 0·592. The mean of these four estimations comes to 0·518 and it seems probable that with further examples the mean would approach 0·50.

From this it would appear that the simplest method of correcting the milling loss to a basis of 13·5% pol in cane and a fibre:pol ratio in cane of 1·00 would be

$$ML = ml\left(0{\cdot}50 + \frac{6{\cdot}75}{P_c}\right)$$

[1] ZAGRODZKI: *Gaz. Cukr.*, 1958, **60**, 105.
[2] *I.S.J.*, 1935, **37**, 22.
[3] *ibid.*, 1969, **71**, 138–140.

Sugar cane agriculture

A note on the incidence, economic importance and food plants of *Saccharicoccus sacchari*. R. L. YADAVA. *Indian Sugar*, 1968, **17,** 871–878.—This insect, the mealy bug, is cosmopolitan and occurs in all cane-growing countries, being usually regarded as a minor pest of cane. Information is given on the incidence of the pest in India, economic importance and alternative host plants. Its effect on different cane varieties is considered.

* * *

Problems of low yield of sugar cane in northern India. S. SINGH. *Indian Sugar*, 1968, **17,** 879–880.—The many factors that impede sugar production in northern India and especially Uttar Pradesh are discussed. The writer considers that there is a growing tendency among growers to place too much reliance upon varietal replacement, and although many new varieties have high yield potentialities they cannot be expected to grow out of nothing. Better cane agronomy is needed.

* * *

A new strain of sugar cane mosaic in Louisiana. R. L. TIPPETT and E. V. ABBOTT. *Plant Disease Reporter*, 1968, **52,** 449–451.—Observations on this new strain, designated "Strain I", and the degree of susceptibility of various sugar cane varieties to it, found from greenhouse and other experiments, are recorded. Other known strains of the disease are strains A, B, D and H. It is concluded that Strain I will not greatly increase the difficulty of selection of breeding stocks to develop mosaic-resistant commercial varieties.

* * *

New harvesters released. ANON. *Sugar y Azúcar*, 1968, **63,** (7), 51.—Two new combine harvesters, produced by the J. and L. Engineering Co., Inc., of Jeanerette, Louisiana, are described. The one, the S-6, is a track-mounted unit and is capable of cutting and loading up to 60 tons of cane per hour. The other, the S-9, a wheel-model harvester, will cut and load 40 tons per hour, working a single row with each pass. Large flotation-type tyres make the unit an ideal machine for adverse conditions, particularly in recumbent cane.

* * *

The behaviour of the root system of sugar cane at and after harvest. J. GLOVER. *S. African Sugar J.*, 1968, **52,** 511–515.—The growth and behaviour of sugar cane roots in soils of different textures was observed and measured behind the windows of the new Mount Edgecombe root laboratoratory, before, at and after the plant crop from two varieties of cane. A tracer radio-isotope was used. Some of the roots die slowly, taking 8 weeks, and assist the newly developing shoots of the ratoon crop. With surface soil moisture, adequate new roots quickly develop at the base of the new shoots. Under dry conditions the old roots are important to the developing ratoon crop.

* * *

The effect of harvest intervals on the yield of three sugar cane varieties in the Peshawar valley. O. J. MIAN. *W. Pakistan J. Agric. Res.*, 1966, **4,** (1/2), 173–178.—The effect of monthly harvest on the yield of three varieties was observed with plant and first ratoon crops. Harvesting in January gave crops which outyielded those in other months (November–May), December and February giving the next best yields. This applied with all three varieties and with both plant and ratoon crops.

* * *

The position of the spear guiding ring in *Xiphinema* **species.** J. R. WILLIAMS. *Nematologica*, 1966, **12,** 467–469.—Observations on this morphological feature in the nematode *Xiphinema elongatum* are recorded. One hundred and ten adult females, extracted from one soil sample in Mauritius, were killed by heating in water, fixed and mounted in glycerine. The distance of the ring from the head end and the position of the spear-tip relative to the head (i.e. the extent of withdrawal or protrusion of the spear) were measured using a micrometer eyepiece.

* * *

Observations on parasitic protozoa in plant-parasitic and free-living nematodes. J. R. WILLIAMS. *Nematologica*, 1967, **13,** 336–342.—A Protozoan parasite, apparently the same as that described from *Meloidogyne* spp.[1] was found in *Xiphinema elongatum* which is associated with cane roots in Mauritius. Photographs are given of the parasite *in situ* showing its various stages. A survey of the literature suggests that this parasite, or related forms of it, is widely distributed with many hosts among soil- and root-inhabiting nematodes.

* * *

Inter-genetic hybridization between *Saccharum* **(sugar cane) and** *Bambusa* **(bamboo).** J. T. RAO, M. P. ALEXANDER and P. A. KANDASWAMI. *J. Indian Bot. Soc.*, 1967, **46,** 199–208.—With bamboo as the male parent no true hybrid seedlings were obtained.

[1] WILLIAMS: *Nematologica*, 1960, **5,** 37–42.

With bamboo as the female parent 4 mature seeds were obtained from a total of 960 crosses; 2 of these seeds germinated and produced abnormal seedlings. Reasons for crosses being more successful with bamboo as the female parent are discussed.

* * *

Chemical control of *Lecanium deltae*. M. A. COSTILLA. *Revista Agron. Noroeste Argentino*, 1968, **6**, (1/2). 93–101.—An account is given of extensive trials with various insecticides in the control of this insect ("Delta cochinella") which has also proved troublesome with citrus, on which it was first recorded in Tucumán in 1932.

* * *

Preliminary studies on minimum cultivation of sugar cane in Louisiana. R. J. MATHERNE. *Sugar Bull.*, 1968, **46**, (19), 6–7, 10.—The trend to reduce the number of cultivations given to a sugar cane crop has been brought about largely by better (chemical) weed control and scarcity of labour. Ten years ago growers might have cultivated their crop 7 or 8 times. Results are given of experiments designed to evaluate the effects of various numbers of cultivations on yield. It is considered that more information is needed on problems connected with minimum cultivation.

* * *

Methods of selection of sugar cane varieties. J. A. MARIOTTI. *La Ind. Azuc.*, 1968, **53**, 105–106.—The writer emphasizes that a selection programme for Argentina must take into consideration the various climatic zones that constitute the sugar producing area, commercial development following selection of superior clones for each particular district.

* * *

Survey of cane growing in Natal Midlands area with particular reference to frost damage. G. J. F. WARDLE. *S. African Sugar J.*, 1968, **52**, 595–607.—The writer points out that the Natal Midlands constitute a relatively new cane area and cane growers have not had the experience of growers on the coast. With the higher altitude, cold is naturally more serious than on the coast. A summary of the totalled data extracted from the survey is given in a table.

* * *

Some varietal characteristics of the more important commercial varieties. D. T. LOUPE. *Sugar Bull.*, 1968, **46**, (13), 10.—The advantages and disadvantages of the following commercial cane varieties in Louisiana are discussed: CP 52-68, CP 48-103, CP 55-30, L 60-25 and CP 61-37.

* * *

Ratoon stunting disease. C. G. HUGHES. *Producers' Rev.*, 1968, **15**, (6), 19.—This is a brief report of a field day lecture at Ayr, Queensland. It is pointed out that many young cane farmers today are not aware of the great damage that this disease can cause because of the efficient control measures exercised in the last decade or so. Details are given concerning the disease and the need for constant vigilance is urged.

Q 87 and Q 88—two new varieties for the central district. E. A. PEMBROKE and A. A. MATTHEWS. *Cane Growers' Quarterly Bull.*, 1968, **32**, (1), 30–33. Details are given of these two promising new varieties for Queensland. Q 87 is highly resistant to mosaic disease and is resistant to red rot but susceptible to leaf scald and ratoon stunting disease. Q 88 is resistant to leaf scald and red rot but is highly susceptible to mosaic disease.

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Studies on crop-logging of sugar cane in Nellikuppam in Madras State. E. I. D. PARRY LTD. *Fertiliser News*, 1968, **13**, (7), 11-16.—A major cause of low quality cane (low sugar) reaching the factory at Nellikuppam is the use of excessive and late nitrogen fertilizers. An attempt was made to educate sugar cane growers against this by conducting field experiments on the factory's farm and in progressive growers' fields. In one of the treatments the foliar diagnostic technique of crop-logging was adopted. Details are given of the field experiments.

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Water duty experiments with sugar cane on two soils in Natal. G. D. THOMPSON and P. J. M. ROBILLARD. *Experimental Agriculture*, 1968, **4**, 295–310.—This work was initiated in an attempt to find out the extent to which limited supplies of available irrigation water should be used under climatic conditions prevailing in the Natal sugar belt. A "water duty" is conventionally defined in the South African sugar industry as the area to be irrigated by one cusec of water pumped or available at the water source, one cusec of water representing 1 inch of water on 24 acres in 24 hours. Results showed that maximum productivity could be achieved on a sandy soil when 1 cusec of water was used to irrigate approximately 200 acres, but on a clay soil maximum productivity was obtained with the largest water duty (442 ac/cusec). Reasons for this wide difference are discussed.

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Effect of nitrogen on the yield of sugar cane in the Hyderabad region. M. M. SIDDIKI, T. M. CHOUDHRY and A. S. SHAIKH. *West Pakistan J. Agric. Res.*, 1967, **5**, (1), 1–8.—Nitrogen trials with cane on a clay loam at the Agricultural Research Institute, Tandojam, are reported. Nitrogen was applied at 40, 80, 120 and 160 lb/acre in split doses. The rate recommended was 80 lb N/acre as ammonium sulphate in two split doses.

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A review of the problem of frost and the selection of sugar cane varieties in the Peshawar valley. O. J. MIAN. *West Pakistan J. Agric. Res.*, 1967, **5**, (2), 87–94.—It is concluded that as far as the maintenance of juice quality over a long period is concerned, even after frost there are certain varieties, notably CP 44/101, CP 43/47 and CoL 29, that may be depended upon in both plant and ratoon crops, as well as the varieties N:Co 310 and CP 48/103.

Studies on the keeping quality of frosted sugar cane. O. J. MIAN, A. R. KHAN and M. I. KHAN. *West Pakistan J. Agric. Res.*, 1967, **5**, (3), 19–26.—Two varieties were kept under observation. The quality of the harvested crop, whether stripped or unstripped, deteriorated faster than when the crop was left standing in the field. A varietal difference showed in the maintenance of juice quality. High fibre appears to be effective in reducing rate of deterioration. Unstripped cane kept better than stripped.

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Some studies on the marcotting of sugar cane. F. D. FASIHI and S. AHMED. *West Pakistan J. Agric. Res.*, 1967, **5**, (3), 27–83.—The working out of a suitable method of large-scale marcotting of sugar cane in the Murree Hills for the segregation of flowering stalks for breeding work is described, prevailing temperatures being lower than in most cane growing countries. The rooting compound used was farmyard manure and soil in the ratio 4:1. Different varieties responded differently to marcotting.

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Performance of some promising early maturing cane varieties at the Sugar Cane Research Station, Risalewala, Lyallpur. S. D. FASIHI and H. AHMAD. *West Pakistan J. Agric. Res.*, 1967, **5**, (4), 10–17.—Eight promising early maturing varieties were tested and compared with the standard variety for the area, CoL 29. Data were recorded on germination, tillering, number of millable canes, cane yield and sugar content. The variety BL 4 was considered the best available at present, giving higher yields than the standard variety CoL 29.

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The yield of sugar cane as affected by different rotations in the Peshawar valley. O. J. MIAN and A. R. KHAN. *West Pakistan J. Agric. Res.*, 1968, **6**, (1), 54–59. The results of twelve years of field trials with different rotations are discussed. A legume in the rotation influenced the cane crop immediately following it, but effects on ratoon crops were not evident. Cane as a sole crop gave the highest yields. The gross cash income from the rotation maize-wheat-cane-cane-cane was the highest, although it gave the lowest actual cane yield.

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Some studies on the flowering of sugar cane at higher altitudes. S. D. FASIHI and S. AHMED. *West Pakistan J. Agric. Res.*, 1968, **6**, (1), 39–53.—The behaviour of different varieties at different altitudes in regard to flowering is discussed. In general, the higher altitudes gave earlier and more profuse flowering with most varieties.

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Studies on the sporulation of *Colletotrichum falcatum* on sugar cane juice of susceptible and resistant varieties. K. V. B. R. TILAK. *Phytopath. Z.*, 1968, **61**, 286–291; through *Rev. Appl. Mycol.*, 1968, **47**, 482.—Production of spores was better and growth sparse and submerged on agar medium containing juice of a resistant variety. Juice agar of a susceptible variety supported poor sporulation and profuse aerial growth. The addition of asparagine to the resistant substrate favoured sporulation.

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Influence of host exudates on conidial germination in *Colletotrichum falcatum*. P. SINGH. *Acta phytopath. Acad. Sci. Hung.*, 1968, **3**, (1), 13–22; through *Rev. Appl. Mycol.*, 1968, **47**, 482.—Passive exudation of nutrients from the aerial parts of sugar cane plants, with the exception of the leaf blade, stimulates germination of spores. Exudates from older plants were more stimulatory than those from young plants. This may account for the more frequent infection of older plants.

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A review of quantitative genetics in plant breeding with particular reference to sugar cane. D. M. HOGARTH. *J. Australian Inst. Agric. Sci.*, 1968, **34**, 108–120.—The author, who is in the Plant Breeding Division of the Bureau of Experiment Stations in Queensland, is a specialist in biometrics and the quantitative inheritance of sugar cane characters. Discussion in this highly technical paper is concerned with the estimation of parameters, designs for estimating parameters and the general application of quantitative genetics to sugar cane.

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Effects of nitrogen on the growth and yield of three clones of sugar cane. I. Plant cane. C. N. YOON and C. A. KOK. *Malayan Agric. J.*, **46**, 270–285; through *Soils and Fertilizers*, 1968, **31**, 460.—Application of 30–120 lb/acre N had no significant effect on yield but produced a significant difference in sugar content; maximum sugar could be produced by using 66 lb/acre N.

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Studies of sugar cane ratoon stunting virus disease. M. T. EL-BANNA, M. A. MOURSI and F. NOUR-EL-DIN. *Agric. Res. Rev.* (Cairo), 1967, **45**, (1), 74–92; through *Hort. Abs.*, 1968, **38**, 858.—Results of four years' observation, including anatomical studies, are given. The paper consists of two separate parts: (*A*) Properties of the causal virus and control of the disease, and (*B*) Effect of the disease on sugar and amino acid contents and sugar cane yield. Stalks of diseased canes had a slightly higher percentage of sucrose and total sugars.

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The most important pests of sugar cane in the Philippines and their control. J. D. RECUENCO. *Philipp. Sugar Inst. Quart.*, 1967, **13**, (2), 49–56.—See *I.S.J.*, 1969, **71**, 174.

Sugar beet agriculture

Trials of commercial varieties of sugar beet. L. A. WILLEY. *British Sugar Beet Rev.*, 1968, **36,** 163–168. Results of sugar beet variety trials for 1967 are given. These trials are grown in each of the 18 sugar factory areas. Only the trial at one area (Ely) failed, owing to blowing of the soil on the trial field. Results are given largely in tabular form. The trials included 10 multigerm varieties and 4 monogerm varieties. In addition, the trials included the virus yellows-tolerant variety "Maris Vanguard". The recommendation for this variety is at present restricted to certain districts where virus yellows disease is bad.

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Co-operation among beet growers in Scotland. ANON. *British Sugar Beet Rev.*, 1968, **36,** 169–170.—Reasons for the revival of interest in sugar beet cultivation in Scotland are discussed. More up-to-date labour-saving machinery is being used. One group of 9 farmers returning to sugar beet cultivation will be operating machines owned in common. How this co-operative venture will operate is explained.

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Beet without ploughing. R. J. HAGEN. *British Sugar Beet Rev.*, 1968, **36,** 180, 183, 186, 189.—An experiment on a 20-acre field of growing sugar beet without ploughing is here reported. In the past the field had always blown and had never really produced a successful yield. Herbicide was applied in autumn to control couch grass. "Kainit" and slag were applied to provide K and P. The unconventional drilling procedure in the spring is explained. The crop yielded an average of $12\frac{3}{4}$ tons of washed beet to the acre with a cash value of £80 9s.

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Studies on the influence of harvesting time on the yield and sugar content of sugar beet varieties in the Peshawar region. O. J. MIAN. *West Pakistan J. Agric. Res.*, 1966, **4,** (1/2), 39–44.—Three-year trials at the sugar cane research station at Mardan with two varieties of sugar beet are reported. The best yield was obtained when the crop had completed 7 months growth.

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Studies on losses of sucrose in sugar beet roots in storage in the Peshawar valley. O. J. MIAN. *West Pakistan J. Agric. Res.*, 1966, **4,** (1/2), 45–50.—Sugar beet has come to stay in the Peshawar valley with 3 factories now processing. It is produced mainly by small-scale cultivators. It was shown that considerable loss of sucrose takes place owing to delayed supply of harvested and topped beet. Such losses may reach 10%.

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Fertilizer experiments on sugar beet in Eire. P. A. GALLAGHER. *Inf. Nitr. Corp. Chile*, 1967, (98), 17 pp.; through *Field Crop Abs.*, 1968, **21,** 261.—Results of field trials over a 5-year period are given. The amount of N required for maximum yield varied between different factory areas but an average of 80 lb N/acre was the optimum. P requirement varied from 40 lb/acre in soils medium and high in available P to 72–108 lb/acre on soils low in available P. In regard to K, 200–300 lb/acre was generally required. A basal dressing of 5 cwt sodium nitrate, 8 cwt superphosphate and 2 cwt potassium chloride per acre is recommended. Na increased sugar yield more than the expected increase from a corresponding additional K application.

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Fixing of the most appropriate ration of N-P-K fertilizers for sugar beet and sunflower on chernozem and forest soil. N. MARKOVIC and Z. STOJANOVIC. *Zemlj. Biljka*, 1966, **15,** 339–352; through *Field Crop Abs.*, 1968, **21,** 261.—The optimum fertilizer rates for sugar beet were 150 kg N, 150 kg P_2O_5 and 125 kg K_2O/ha on chernozem soil and 120 kg N, 150 kg P_2O_5 and 100–150 kg K_2O/ha on forest soil.

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Growth, pests and diseases of sugar beet in Belgium during 1967. Development of the crop. L. VAN STEYVOORT. *Publ. Bimest. Inst. Belge pour Amél. Betterave*, 1968, (1), 1–18.—After a bad start with poor or slow seedling emergence owing to unfavourable weather, the crop developed well, but sugar content was poor. Early aphid attack led to severe losses from virus yellows causing an estimated loss of 11%, as against 5·7% in 1966 and 1·2% in 1964 and 1965.

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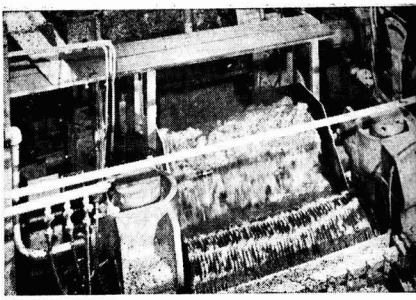
Results of trials carried out in 1967 (in Belgium) to control virus yellows of sugar beet. L. VAN STEYVOORT and Y. BAREEL. *Publ. Bimest. Inst. Belge pour Amél. Betterave*, 1968, (1), 19–30.—Treatment with systemic insecticides proved highly profitable in 1967. The efficiency of some new insecticides was compared with results obtained from "Demeton-methyl". The addition of white mineral oil to insecticides did not improve their efficiency under practical conditions, despite the fact that these oils have a certain inhibiting effect on the transmission of one virus, the beet yellows virus (BYV), by aphids.

Cane sugar manufacture



Chemicals used in white sugar manufacture. A. C. CHATTERJEE. *Proc. 1st Conv. S. Indian Sugar Cane & Sugar Tech. Assoc.*, 1968, (1), 51–56.—A survey of chemicals used is presented, with brief notes on their applications, functions, advantages and disadvantages, etc.

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Individual mill efficiency. P. V. S. RAO. *Proc. 1st Conv. S. Indian Sugar Cane & Sugar Tech. Assoc.*, 1968, (1), 67–73.—An example is presented to illustrate the method of calculating individual mill efficiencies from pol and Brix balances, and construction of a curve of absolute juice % fibre.

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Cane preparation. B. A. RIGLEY and V. GURUSWAMY. *Proc. 1st Conv. S. Indian Sugar Cane & Sugar Tech. Assoc.*, 1968, (2), 42–45.—Trials at the authors' sugar factory showed that primary extraction in the mill tandem was 65% on juice when knives alone were used for cane preparation, and 70–72% when a shredder was included. In a discussion of optimum cane preparation, it is considered that as fine a preparation as is possible with knives plus shredder will raise mill capacity and extraction with cane of moderate to high fibre content.

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Recent developments in milling. B. A. RIGLEY and M. ANAND. *Proc. 1st Conv. S. Indian Sugar Cane & Sugar Tech. Assoc.*, 1968, (2), 46–51.—The subject is discussed under a number of headings, including nature of cane and the effect of mechanical harvesting on the extraneous matter entering the factory; cane preparation; hydraulic pressures in milling; cane mill design, with particular mention of inclined housings; mill roller speeds and grooving; the mechanics of milling; and cane diffusion.

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Effectiveness of coarse groovings. G. K. CHETTY. *Proc. 1st Conv. S. Indian Sugar Cane & Sugar Tech. Assoc.*, 1968, (2), 52–56.—The pros and cons of coarse grooving on mill rollers are discussed and a number of letters from various authorities, including M. MATIC, G. H. JENKINS and C. R. MURRY, on this question are reproduced.

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Subsidation and clarifier design. V. GURUSWAMY. *Proc. 1st Conv. S. Indian Sugar Cane & Sugar Tech. Assoc.*, 1968, (2), 57–62.—The mechanism of sedimentation and the factors affecting settling are discussed. After a consideration of clarifier requirements, various types of subsiders are described and factors of importance in the design of a subsider are dealt with.

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The optimal purity of final massecuite. R. PEDROSA P. *Bol. Ofic. A.T.A.C.*, 1967, **22,** (4/5), 51–58.—Three statements by CLARK and GARCÍA LÓPEZ[1] are discussed; these are (i) that an increase in massecuite purity, yielding a higher purity sugar, is accompanied by a lower production of molasses per strike—this is exemplified by a calculation of molasses production for two cases differing in purities; (ii) that a final strike boiled at higher than 60 purity gives a higher than normal molasses purity—this is contested by means of a table of results for the 37 factories in Oriente Province which indicates the optimum purity for minimum molasses loss to be 62; (iii) that final strikes of higher purity entail a greater volume of massecuite, i.e. a greater number of strikes of the same volume—this is also refuted by calculated examples.

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Disinfection of the milling plant. O. A. ESPINOSA DE LA T. *Bol. Ofic. A.T.A.C.*, 1967, **22,** (4/5), 59–63. The importance of maintaining cleanliness in the milling plant and measures for preventing development of micro-organisms are discussed; the latter include frequent washing with hot water, and application of bactericides. A simple device for producing a constant flow of bactericide solution to the mills is described and illustrated; it includes a float within a reservoir, with a tube held by the float so that there is a small and constant difference in level between the solution and the top of the tube, the bottom of which is connected by a flexible rubber tube to the exit pipe and valve.

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Technical aspects of the theoretical setting of the mills. A. B. CHIRGWIN. *Bol. Ofic. A.T.A.C.*, 1967, **22,** (6), 53–62.—A description is given of a method of calculating the bagasse roller setting, while the feed opening is estimated at $1\frac{3}{4}$–4 times the bagasse opening. The gap between the top roller and the turnplate is generally taken as $\frac{1}{16}$ inch per inch of plate width.

[1] *Paper presented to the 37th Conf. Asoc. Técn. Azuc. Cuba.*

Theory of the milling process. C. E. JOFRE. *Thesis, Dept. of Chemical Engineering, Universidad Central de Venezuela*, 1968, 109 pp.—The milling process is studied theoretically after a preliminary introduction to the raw material, and milling machinery. The process is separated into five unit operations: size reduction, lixiviation, expression, liquid flow at the roller entry and transport of material between the rollers. Each is considered separately. The Ponchon-Savarit method is applied to calculation of material balances in a mill where imbibition is added, while an analogue involving pistons is devised from which conclusions are drawn which are considered apposite to the formation of the "stationary pool" of juice at the entrance to the mill[2]. The calculations made on flow of materials between the rollers take into consideration its two-dimensional nature.

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Juice purification. ANON. *Ann. Rpt. Indonesian Sugar Expt. Sta.*, 1966, 30–31; through *S.I.A.*, 1968, **30**, Abs. 68–614.—Laboratory and factory tests of a sulphi-carbonatation process[3] are reported. Mixed juice at 60–70°C was treated with ½–1% by volume of 18°Bé milk-of-lime and sulphitated to pH 7, prior to a normal carbonatation process using 4–6% of milk-of-lime. In the laboratory, the CaO % Brix and the reducing sugar ratio were higher and the colour was better after this process than after normal carbonatation using 10% of milk-of-lime; in the factory there was little difference between the processes. Limestone and coke consumptions were reduced, but that of sulphur increased.

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Integrated automatic control of cane sugar mills. H. S. WU and C. J. LU. *Sugar y Azúcar*, 1968, **63**, (9), 32–33. The automatic equipment at Kaohsiung sugar factory[4] has operated for a complete crop and has demonstrated the possibility of successfully integrating control of modern and antiquated machinery. Benefits reaped from the installation are surveyed; they include higher cane throughput, reduced steam consumption, easier clarification, reduced labour requirement, and improved bagasse economy in steam generation. Further improvements are expected in uniformity of cane unloader power requirements under automatic control, higher milling efficiency by controlling mill speed in accordance with feed rate, closer control of almost all variables in the clarification and evaporator stations, and better pan boiling in respect of purity drop and productivity.

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Sucrose preservation in juice. ANON. *Sugar y Azúcar*, 1968, **63**, (9), 72.—Tests in Puerto Rico have shown that addition of more than 20 micromoles of sodium metasilicate per litre of cane juice inhibited the adverse action of invertase on the sucrose and retarded microbial growth. While, in the absence of silicon, levulose and dextrose formed within 8 hr and virtually all sucrose was utilized within 48 hr, when silicon was added as metasilicate inversion was evident only after 48 hr, and a large amount of sucrose remained even after 96 hr. The use of metasilicate holds promise for juice preservation during mill interruptions.

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Heating of second carbonatation juice depends on the optimum pH also. B. B. PAUL and I. S. SAXENA. *Indian Sugar*, 1968, **18**, 29–31, 38.—Heating of second carbonatation juice has been considered necessary to hinder development of micro-organisms causing sucrose decomposition and to complete precipitation and thus improve filtrability. It was observed, however, in 1966/67 that 2nd carbonatation juices were darker than the 1st carbonatation juices, and to restore the normal relationship whereby the 2nd carbonatation juice became lighter, it was necessary to bring it to a temperature of 68–70°C (instead of 76–78°C) at the optimum pH for minimum CaO content, i.e. 8·7–8·8. Alternatively, normal juice colour relationships occurred when the juice was heated to 75°C but the pH was reduced to 8·4–8·5. It is considered that samples of 1st and 2nd carbonatation juices should be examined regularly and the temperature of the latter adjusted to maintain a lighter colour, since darker juices lead to increased losses in the evaporator and pan stations.

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Recent advances in sugar technology in India (1967). S. C. GUPTA. *Indian Sugar*, 1968, **18**, 131–136.—A survey of Indian research work reported in the literature is presented, with 25 references.

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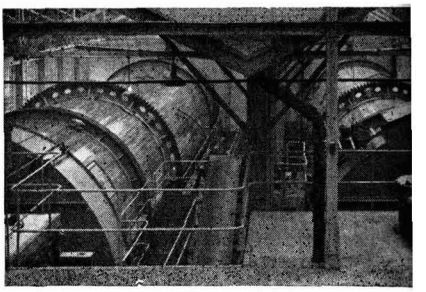
A milling study. J. W. HILL. *Proc. 35th Conf. Queensland Soc. Sugar Cane Tech.*, 1968, 65–80.—A new physical model for the compression of bagasse is introduced, leading to an equation for blanket pressure around the rollers. This leads to the well-known relationship between exit bagasse dryness and roller load found in fully-floating bagasse mills. The influence of roller speed and diameter are predicted and tested against available information. It is conjectured that future large mills will be able to give better extraction only through increased roller loading or slower operation. The foregoing is indicated to apply irrespective of any blanket extrusion, i.e. reabsorption. A simple criterion for extrusion is suggested, and the combined hypothesis explored. A standard relationship during extrusion between fibre density and time is predicted and tested, from which a description of the reabsorption process is formulated. The probable ways in which preparation enters into the foregoing analysis are indicated, and a possible new criterion for mill slip is mentioned.

[2] MURRY & HOLT: "The mechanics of crushing sugar cane" (Elsevier, Amsterdam). 1967, p. 46.
[3] *I.S.J.*, 1969, **71**, 178.
[4] *ibid.*, 1968, **70**, 168.

Beet sugar manufacture



Cleaning the heating surface of raw juice heaters. R. A. SHIRING. *Sakhar. Prom.*, 1968, **42**, (8), 32–33. Details are given of a recirculation scheme for juice heater cleaning with 8–10% NaOH solution. The process takes 5–6 hr and no scale was found on the tubes after 102 days during the first campaign in which the scheme was used.

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The use of hydrocyclones to purify water wetting the glands of centrifugal pumps. A. M. FOMINYKH. *Sakhar. Prom.*, 1968, **42**, (8), 36–37.—Tests are described in which a hydrocyclone was used to remove suspended particles from water used to create the hydraulic seal for preventing air entering the pump and for cooling the shaft.

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Payment for raw material in the beet sugar industry. N. I. BULAVIN. *Sakhar. Prom.*, 1968, **42**, (8), 39–41. The advantages to beet growers and sugar producers of payment for beet on the basis of sucrose content are discussed against the background of conditions in the Soviet Union.

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Improvement in the performance of DDS diffusion through changes in the heating system. W. MAJEWSKI, J. SOLTYSIAK and J. WOLAŃSKI. *Gaz. Cukr.*, 1968, **76**, 159–163.—Modifications to the steam heating system for a DDS diffuser at Kluczewo sugar factory in Poland have permitted a reduction in the temperature fluctuations (45–85°C). Details are given of the changes, which basically involve rearrangement of the steam distribution to the 13 heating cells. An addendum to the article by J. PULACZEWSKI (*ibid.*, 163–164) criticizes the arrangements and recommends a system involving 5 temperature regulators as supplied by the French firm of Semac instead of the 4-regulator system used at Kluczewo.

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Heat measurements in sugar factories. A. CHLOPECKI. *Gaz. Cukr.*, 1968, **76**, 164–168.—Factors affecting the heat economy of sugar factories are discussed in the light of data obtained from a number of Polish sugar factories. Means of evaluating the heating efficiency of evaporators and other heat plant are illustrated by concrete examples from two sugar factories.

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Improvement in the waste water economy at Lublin sugar factory. Z. ZAREBA, M. PITROWSKI and A. BANACH. *Gaz. Cukr.*, 1968, **76**, 168–172.—Details are given of modifications to the arrangements at Lublin sugar factory where the fresh water requirements have been reduced from 160% to 135% on beet and the quantity of effluent from 224–352% to about 125% on beet.

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Refrigerated air cooling of sugar beets. W. G. BICKERT, F. W. BAKKER-ARKEMA and S. T. DEXTER. *J. Amer. Soc. Sugar Beet Tech.*, 1967, **14**, 547–554.—With increasing amounts of beet to be sliced, the quality of piled beet at US sugar factories has become a problem. Ventilation is not sufficient to prevent a rise in temperature to 50°F by the beginning of December, with consequent sugar losses. Tests were therefore made for a study in which piles, with insulation in the form of plastic coverings, would be cooled by means of refrigerated air. In the initial tests beets were cooled in a chamber to determine the effects of root position relative to air flow, variation in air flow, and beet size; only in the last case was there any effect, larger beets taking more time to cool than smaller roots. Refrigeration and air flow requirements are calculated and the costs of such a system worked out; the investment may be recovered in two or perhaps three years through improved recovery of sugar.

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Drying and cooling in the modern sugar industry. G. C. BOWMER. *Paper presented to Symposium on Tech. Innovations in Polish Exports of Sugar Ind. Plants* (Mironovka), 1968.—The types of moisture in white sugar defined by RODGERS[1], i.e. free moisture, bound moisture and inherent moisture, are discussed and the attributes of the original drum sugar dryers or granulators, which only removed the first, are indicated. With increasing demand for white sugar with a sparkle and lustre, the scratching caused by the older dryers became unacceptable and dryers have been designed for drying with gentler crystal movement. Brief mention is made of the drums with cruciform internals and vibrating conveyors, and more attention given to the tray-type dryer—probably the gentlest type—which has, however, the disadvantages that dust can settle on the heat exchangers to impair their efficiency, and that it is susceptible to caking on the trays. The "Rotary Louvre" dryer made by the author's company also offers gentle sugar handling without caking, and while it is like the original drum in external appearance, the internal louvres increase the heat exchange surface

[1] *I.S.J.*, 1963, **65**, 80.

from e.g. 28·3 to 97·5 sq.ft. for a 6 ft dia. × 25 ft long dryer. The low velocities reduce dust entrainment to a very small amount while power requirement is small. The drums can embody different heating and cooling zones and one installation at Siegendorf, Austria, includes a low-temperature pre-drying zone, a hot main drying zone and a cooling zone within the same drum. In this way bound moisture may be removed from the sugar.

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Improvement of beet juice clarification at Raffinerie Tirlemontoise. G. DUCHATEAU. *Sugar J.*, 1968, **31**, (3), 15–16.—See VANDEWIJER & PIECK: *I.S.J.*, 1969, **71**, 212.

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Sugar beet plant solved its waste water problem before bowing to (an) economic one. ANON. *Industrial Canada*, July 1968, 29.—Waste effluents at Chatham beet sugar factory (now closed) were separated: condensates had a BOD level lower than the target and could be discharged directly into the river. A "dry" mud pumping system was installed for filter cake disposal, eliminating surplus polluted water from this source, and the beet flume and wash water was treated by simple ponding and was recirculated so that the surplus was reduced from 5000–6000 g.p.m. to less than 100 g.p.m. The BOD level rose from 500 to 2500 but, by cooperation with the local authority, the surplus could be discharged into the municipal sewage plant at convenient times, resulting in elimination of polluted waste flow into the river.

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Mass transfer processes in the initial phase of aqueous sugar extraction from beet cossettes. D. SCHLIEPHAKE and A. WOLF. *Zucker*, 1968, **21**, 489–493.—Studies with disc-shaped slices showed that under the effects of temperature and diffusion time, mass transfer can be divided into three basic processes: osmosis of the water through the semi-permable cells, flow of juice from the denatured cells, and molecular diffusion of the cell substances. The length of the initial phase, which largely coincides with scalding, can be determined from the disappearance of those mass transfer processes which are caused by pressure differences. This initial phase in diffusion is explained with the aid of experimental results obtained with a BMA tower having a pre-scalder.

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Automatic continuous measurement of some technological values during sugar factory processing. H. SCHIWEK. *Zucker*, 1968, **21**, 494–510.—A method is described for automatic continuous measurement of the pol of press water, diffusion juice (at any point in the diffuser), raw juice, predefecation juice, defecation juice, thin and thick juice after the test samples have been filtered or treated by counter-current dialysis. Possible applications of the method are given. Direct measurement of the optical rotation and refractive index as a means of determining the purity of intermediate products in the pan station is also described, as well as apparatus for automatic preparation of the samples to be measured. The suitability of this method has been confirmed by parallel tests involving conventional methods. Other methods for direct determination of process factors are also discussed, such as determination of pressed pulp dry solids by reflection in the infra-red spectrum, of potassium, sodium and calcium in juice by means of selective glass electrodes, and determination of alkalinity and total CaO in juices by automatic titration.

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Treatment of carbonatated juices with Grand-Pont and Choquenet filters. C. PINET. *Sucr. Belge*, 1968, **87**, 769–771.—First carbonatation muds, discharged from a GP filter-thickener in an experimental installation at Wanze sugar factory at a density of 650 g/litre, were diluted to 350 g/litre with sweet-water and pumped to a Choquenet automatic filter-press. By handling mud from the GP filter instead of the whole juice, only one Choquenet filter is required instead of battery of five for the same juice quantity, and the cycle time is reduced from 80 to 30 min. The press cake solids content was raised from 64·20% to 66·74%, while sweetening-off was improved so that the loss in press cake was reduced from 1·11% to 0·70%. The labour required was less and residence time was cut, while the juice obtained was of high quality and costs were reduced. It is proposed to extend the system for the whole of the factory throughput (from 10,000 tons of beet per day), employing ten 100-sq.m. GP filters and six 128-sq.m. Choquenet filters, which will be operated by only two men.

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Storage characteristics of sugar beets in a surface layer of a pile. D. I. KAPELYUSHNYI and A. M. KYSIL'. *Kharchova Prom.*, 1967, **33**, (3), 39–40; through *S.I.A.*, 1968, **30**, Abs. 68–622.—After the formation of a pile, surface beets lose moisture rapidly, then reabsorb slowly from the (wetter) atmosphere (or, if the pile is covered, from beet further in); this is shown in a table of mass losses for the three surface layers of uncovered piles built in September and October 1964. The thickness of the wilted layer was 2–2·5 m at the bottom of the sides, 10–20 cm at the top of the pile. Tabulated processing characteristics are compared for beets from these piles and from a covered October control pile. Covering a pile costs less than the extra sugar losses incurred by more than 60 days' open storage.

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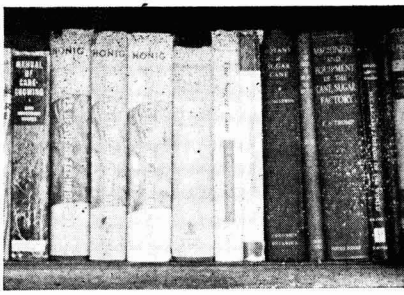
Dependence of diffusion coefficient of sugar in beet tissue on the variety, maturity and length of storage period of the beet. S. ZAGRODZKI and J. KUBIAK. *Gaz. Cukr.*, 1968, **76**, 181–184.—The method developed by the authors[1] was used to determine the effect of the title factors on the diffusion coefficient. It was found that the coefficient is higher in polyploid than in diploid varieties, is greater in ripe than in unripe beet, and falls with prolonged storage.

[1] *I.S.J.*, 1963, **65**, 28.

New books



The Australian sugar year book. Vol. 28, 1969. 352 pp. + xxiv; 7¼ × 10 in. (The Strand Press Pty. Ltd., 236 Elizabeth St., Brisbane, Queensland, Australia.) 1969. Price: $A 6.50; 60s 6d.

The first section of the 1969 Australian sugar year book gives information on Australian sugar organizations; the second section includes the annual reports of the Queensland Cane Growers' Association, the Queensland Cane Growers' Council, some papers from the 1968 Conference of the Queensland Society of Sugar Cane Technologists and papers presented by Australians at the 1968 ISSCT Congress besides a number of agricultural articles and reports from New South Wales. Then follows a 31-page collection of sugar statistics, after which is a section giving information on Australian sugar mills and districts, including details of major tourist attractions. For those seeking information on the Australian sugar industry there is probably no better buy than this book.

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Renold Limited 1956-1967. B. H. TRIPP. 188 pp.; 5½ × 8¾ in. (George Allen & Unwin Ltd., Park Lane, Hemel Hempstead, Herts., England.) 1969. Price: 45s 0d.

This is a sequel to the author's first book about the company, covering the period 1879–1955. The present work concerns the rapid developments that have taken place in the 1956–1967 period, in which time Renold Group has widened its interests, moving into the field of positive power transmission with the acquisition of John Holroyd & Co. Ltd., worm-gearing manufacturers. [After the book was completed Crofts Engineers (Holdings) Ltd., makers of nearly 100 kinds of transmission and related products, was also acquired.] The Renold Group will probably be best known to our readers for the chains used for cane mill drives in a number of sugar factories in various countries. The book makes very interesting reading, particularly the section dealing with worm-gear design and development.

* * *

The Gilmore West Indies sugar manual 1968. Ed. C. O. DUPUY. 90 pp.; 8½ × 11 in. (The Gilmore Sugar Manuals Inc., 516 South 7th St., Moorhead, Minnesota, 56560 USA.) 1968. Price: $10.00; £4 4s 0d.

The cane sugar industries of Antigua, Bahamas, Barbados, British Honduras, Grenada, Guadeloupe, Guyana, Jamaica, St. Kitts and Trinidad & Tobago are covered by this directory, which treats each sugar factory separately, giving details of managements, capacities, equipment (both field and factory), as well as general and agricultural information. Other information includes the cane areas harvested and quantity of cane milled in each country in the period 1953–66 inclusive and in the West Indies and Guyana as a whole, besides rainfalls, sugar production, consumption, exports, molasses production and production and disposal of Jamaican sugar. Factory results submitted by the Barbados Sugar Technologists' Association for 1967 and 1968 are also reproduced, and information is given on the Centres Techniques de Canne à Sucre in Martinique and Guadeloupe, the West Indies Sugar Association and the Barbados Sugar Producers' Association. The manual will undoubtedly be of great value to those interested in the West Indies sugar industries.

* * *

Pests of sugar cane. Ed. J. R. WILLIAMS, J. R. METCALFE, R. W. MUNGOMERY and R. MATHES. 568 pp.; 7 × 10 in. (Elsevier Publishing Co. Ltd., 22 Rippleside Commercial Estate, Ripple Rd., Barking, Essex, England.) 1969. Price: £10 15s 0d.

This authoritative work will be welcome in many quarters, insect and other pests being of major concern in cane-growing countries all over the world. The book constitutes a fitting counterpart to "Sugar cane diseases of the world"[1], which appeared a few years ago and has meant so much to the sugar cane pathologist. This new book should provide the same kind of service to the sugar cane entomologist or nematologist.

The four editors, all well known for their research work on sugar cane pests and working in countries as far apart as Mauritius, Jamaica, Queensland and the USA, state in the preface that "owing to the great diversity and large number of sugar cane pests, emphasis has necessarily been placed on the broader aspects of the subject matter and on pest groups rather than on particular pests. The book, therefore, does not purport to be a handbook of cane pests where data on particular species may be readily acquired. Its contents are selective rather than exhaustive, and will be of interest primarily to the biologist whose functions are instruction, experi-

[1] *I.S.J.*, 1964, **66**, 197.

mentation and research on pests of sugar cane. As such it is hoped that this book will be of lasting value, picturing present knowledge (or the lack of it) in a number of relevant subjects and constituting a guide to the literature".

The list of contributors includes two dozen names, the editors themselves making notable contributions in their respective fields. The first chapter is of a general nature and will interest many readers besides entomologists, being entitled "Distribution, origins and spread of sugar cane insect pests". This is followed by nine chapters on cane borers and their control, these insects probably constituting, as a group, the worst insect pest of the cane plant throughout the world. Other chapters are devoted to froghoppers, white grubs, mealy bugs, scale insects, locusts and grasshoppers, termites and *Fulgoroidea* and related insects. There is a chapter on insect vectors of sugar cane virus diseases and one devoted to population studies of insects attacking sugar cane. The information given under "New approaches to the control of insect pests" will interest many, the following being some of the subjects discussed: sterilization by irradiation, sterilization by chemosterilants, use of sex attractant pheromones, use of synthetic attractants and use of antifeeding compounds.

The two chapters on nematodes cover 36 pages and are entitled "Nematodes as pests of sugar cane" and "The results and prospects of nematocidal soil treatments in sugar cane fields". The chapter on "Rodents in sugar cane" (20 pages) deals with their biology, economic importance and control.

The book is well written and produced, on good, durable paper. It will prove a valuable reference work, the large number of bibliographical references being a notable feature. There is a subject index. Some readers, lacking an entomological background, may feel that as the book is in English it is a pity that greater use was not made of the English common names of the insects discussed in some of the chapters. The scientific name may be all that the entomologist requires, but this may not apply to some cane agronomists and others.

F.N.H.

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The laboratory handbook of methods of food analysis. R. LEES. 181 pp.; 5½ × 8¾ in. (Leonard Hill Books, Book Division, Grampian Press Ltd., 8/10 King St., London W.6, England.) 1968. Price: 63s 0d.

This work is described by the publishers as a "practical work book designed entirely with the needs of the laboratory bench worker in mind". It is divided into three sections, the first being "Notes on general laboratory methods used in food analysis"; this is split into six chapters, covering sampling; laboratory techniques; chromatography; optical analytical techniques; taste panel testing; and useful information for the food analyst, including some conversion data, log and anti-log tables, atomic weights and brief hints on clarification of solutions. Section II is an index to methods of analysis for named foodstuffs, while Section III contains the methods of analysis listed in an alphabetical-numerical arrangement corresponding to the details given in Section II. Of possible interest to our readers are the methods for analysing refined sugar and sugar syrup, perhaps even confectionery. The major flaw in the book as regards sugar is that while it is stated that "All the methods and analytical techniques suggested have been chosen for their suitability for use in the factory laboratory, and wherever possible are the most advanced at present adopted by industry", the methods described do not always tally with the ICUMSA methods[1]. For instance, reducing sugar determination as invert sugar is covered by the Lane & Eynon method and the Luff-Schoorl method, whereas the latter is not among those recommended by ICUMSA. Ash determination is a general method to cover all foodstuffs, while of inorganic constituents which could be present in refined sugar, only sulphur dioxide is included in the book. As far as sugar chemists are concerned, there is little to be gained from this work that could not be obtained elsewhere, and its generality makes it of limited value. This may not be true for other foodstuffs, but it certainly is for sugar; this may be a special case, however, in that generations of work and study have gone into developing its analytical techniques.

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Photosynthesis in sugar cane. ANON. 81 pp.; 8¼ × 12 in. (Tate & Lyle Research Centre, Ravensbourne, Westerham Rd., Keston, Kent, England.) 1969.

This volume is an account of the proceedings of an international symposium held in London on 12th-13th June 1968 on this subject. The conference was sponsored by the Imperial College, University of London, and Tate & Lyle Ltd. The objectives were to summarize information on photosynthesis in sugar cane and to compare the photosynthetic process in tropical grasses with that in other species.

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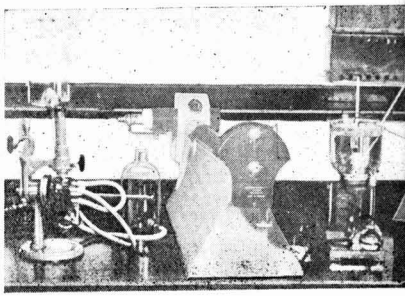
The Gilmore Central America sugar manual 1968. Ed. C. O. DUPUY. 87 pp.; 8½ × 11 in. (The Gilmore Sugar Manuals Inc., 516 South 7th St., Moorhead, Minnesota, 56560 USA.) 1968. Price: $10.00; £4 4s 0d.

This is a new directory in the Gilmore series and covers the sugar factories of Costa Rica, Guatemala, Honduras, Nicaragua, Panama and San Salvador. It gives full details of the agricultural practices and equipment, factory equipment and capacities, and results for the 1966 and, in some cases, 1967 seasons.

[1] "ICUMSA methods of sugar analysis", Ed. DE WHALLEY (Elsevier, Amsterdam) 1964.

Laboratory methods & Chemical reports



Molasses formation. G. VAVRINECZ. *Ind. Sacc. Ital.*, 1968, **61**, 59–68.—See *I.S.J.*, 1966, **68**, 28; 1968, **70**, 377.

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Effect of small doses of calcium and magnesium salts on molasses viscosity. M. I. BARABANOV. *Sakhar. Prom.*, 1968, **42**, (6), 7–10.—After solutions of Ca and Mg salts had been added in increasing quantities to a molasses sample of known Brix, sugar and water contents, the mixture was exposed to a constant temperature of 40°C for 4 days. The molasses was then separated from the crystals and its Brix, sugar content and viscosity determined. Small doses of the salts (0·15–0·25% on weight of molasses non-sugars) caused a considerable drop in molasses viscosity compared with molasses to which no salt had been added, but with further increase in the salt dosage the viscosity rose again. Reasons for this are given.

* * *

Determination of lime quality. YU. G. GONCHAROV. *Sakhar. Prom.*, 1968, **42**, (6), 17–18.—Details are given of a method for preparing a lime sample and subsequently determining the active CaO content. Data indicate the greater quantity of inactive CaO in lime from a kiln fired with anthracite compared with samples from a gas-fired kiln.

* * *

Preparation of saccharide acids of D-glucose. R. BRETSCHNEIDER, B. KOPŘIVA and D. VESELKOVÁ. *Listy Cukr.*, 1968, **84**, 134–140.—Methods of preparing gluconic, glucuronic and glucaric acids are surveyed. Those suitable for laboratory work and giving high yields and product purity were selected for preparation of standards. Product purity was checked chromatographically. The results obtained are compared with data obtained by the authors of the various methods.

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Dissolution of sucrose in relation to the presence of dislocations demonstrated by the "etch pits" technique. G. MANTOVANI, C. A. ACCORSI and F. FAGIOLI. *Ind. Sacc. Ital.*, 1968, **61**, 141–148.—Experiments have been made on the dissolution of sucrose crystals by 1:1 aqueous ethanol, and dislocations demonstrated by this technique are illustrated by photomicrographs. The effect of raffinose and carboxymethyl cellulose in the solvent is also illustrated. The presence of dislocations is associated with tensions in the crystal structure which result in different tendencies to pass into solution near and away from the dislocation. Formation of etch pits may be stimulated other than in the sites of dislocations when impurities are present in the solvent, and the mechanism is discussed.

* * *

Kinetics of sucrose decomposition under massecuite boiling conditions. L. I. TREBIN and K. D. ZHURA. *Sakhar. Prom.*, 1968, **42**, (7), 18–20.—Equations are presented for calculation of the rate constant for sucrose decomposition in terms of the catalytic effects of (i) hydrogen and hydroxyl ions, and (ii) non-sugars. Values for (i) and (ii) are empirical. The equations apply to temperatures in the range 80–110°C at intervals of 10°C. Calculated and experimental values are compared for purities of 60, 70, 80 and 90. The pH at which the decomposition rate is minimum is also calculated for the above temperatures.

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Separation of colouring substances by gel filtration. I. F. BUGAENKO, I. P. BULGAKOVA and I. I. PAVLOV. *Sakhar. Prom.*, 1968, **42**, (7), 41–45.—Details are given of experiments in which the components of colouring matter solutions were separated on a "Sephadex G-50" column. The studies involved separation of caramelization products, of invert sugar alkaline decomposition products, and of a mixture of products from these two groups. Changes in the optical density of the separated fractions and their spectral characteristics are indicated by graphs.

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The theory of sucrose solubility in the presence of non-sugars. M. I. DAISHEV, I. F. ZELIKMAN and L. M. DAISHEVA. *Izv. Vuzov, Pishch. Tekhnol.*, 1968, (3), 32–37.—The theory of sucrose crystallization in impure solutions is discussed with 23 references to the literature. Within the concentrations normally encountered in sugar production, non-sugars do not react directly with sucrose, but their nature and type of reaction with water in the solution will determine changes in the solubilizing properties of the water. Provided it does not affect the qualitative properties of the non-sugars, temperature will not affect the saturation coefficient. The complex nature of the relationship between the coefficient and electrolyte concentration is determined by the degree of electrolyte dissociation, whereby the ionized section of the electrolytes will reduce and the non-ionized section will increase the coefficient. An equation is derived for calculation of this relationship. Supplementary dissociation of the electrolytes among the non-sugars will cause reduction in the saturation coefficient of low-purity sugar solutions under the effect of a

variable electric field and will thus permit a greater quantity of sugar to crystallize out of such solutions.

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Microbiology of sugars. I. Study of mesophilic and thermophilic micro-organisms of "black sugar". J. P. STUPIELLO and S. JOLY. *Brasil Açuc.*, 1968, **71**, 508–516. Chemical and microbiological analyses were made of ten samples of crude sugars; all contained mesophilic and thermophilic bacteria, fungi and yeasts, and the sucrose content was diminished the greater was the extent of infection. The sugar samples were all condemned as unfit for consumption.

* * *

The influence of temperature on the pH of cane sugar factory products. E. C. VIGNES. *Ann. Rpt. Mauritius Sugar Ind. Research Inst.*, 1967, 121–123.—Examination of clear juice, syrup, *A*- and *B*-molasses using a pH meter with a range of 10–100°C was carried out at 10° intervals over the range 30°C–90°C and also at 95°C. In all cases the pH fell with rise in temperature, but the change was not linear and it was apparent that the pH under working conditions cannot be calculated with accuracy from pH determined in the laboratory after cooling to room temperature, as has been the practice in those Mauritius factories which have adopted liming at the boil.

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Investigation into the possible causes of differences between densimetric and refractometric Brix of final molasses. F. LE GUEN, M. RANDABEL and M. ABEL. *Ann. Rpt. Mauritius Sugar Ind. Research Inst.*, 1967, 145–146.—No statistical relationship could be established between the differences in densimetric and refractometric Brix and invert sugar or individual ash constituents in molasses, but there was a linear relationship significant at 1% level between sulphated ash and the difference. For 1965 molasses samples the difference was equal to (1·3 ash—13·6) and for 1966 samples (0·8 ash—6·5). It is therefore possible to infer that high ash content is accompanied by large differences between densimetric and refractometric Brix, but that there are probably other additional factors that affect this difference.

* * *

Collaborative study of the analysis of molasses and molasses products. B. KVIESITIS and L. HERRIMAN. *J.A.O.A.C.*, 1968, **51**, 755–761.—A collaborative study was made by ten laboratories who determined invert sugar and total sugars as invert in samples of food and animal fodder grades of liquid and solid molasses. The effects of sample size and solution treatment with EDTA and potassium oxalate were investigated but found not to affect the precision of the analysis. The Lane & Eynon standard and constant volume methods were used, and the results obtained by the collaborative workers were in good agreement.

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Experiments on determination of pol in cane. J. A. LÓPEZ H. *La Ind. Azuc.*, 1968, **73**, 99–101.—An account is given of tests which confirmed the precision and reliability of the method for determining pol in cane as recommended by the Tucumán Experiment Station. A sample of cane was taken from the carrier between the knives and the first mill, and 25 kg passed through a laboratory mill (in some experiments 50 kg was used). The juice Brix and pol were measured and a 1-kg portion of the weighed bagasse sent to the Experiment Station for determination of its dry matter content. The pol in cane was then calculated using the Java ratio method employing a value of 0·79 for the Java constant, as stipulated by the Argentina sugar authorities.

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Investigation of molasses viscosity at Ukrainian sugar factories. E. A. GRIVTSEVA, K. N. KALISHEVSKAYA and M. YA. GERASIMENKO. *Sakhar. Prom.*, 1968, **42**, (8), 10–14.—Detailed studies showed that the viscosity of beet molasses rose with increase in the lime salts and colloid contents and fell with increase in the K-Na ash and total nitrogen contents. The results are given in the form of graphs.

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The amino-acid composition of molasses. L. E. FLEISHMAN and N. A. CHASHCHINA. *Sakhar. Prom.*, 1968, **42**, (8), 29–31.—Differences between the proportions of acid, neutral and basic fractions of amino acids in beet molasses as determined by the present authors and by BELOVA[1] are attributed to faults in the preparation of the molasses hydrolysates by BELOVA.

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A new rapid method for determining invertose (invert sugar). F. TÖDT and J. G. ABRAHAM. *Zeitsch. Zuckerind.*, 1968, **93**, 415–422.—The method described measures the quantity of periodic acid need to oxidize the invert sugar present in a test solution. Graphs are presented showing a linear relationship between the acid consumption and invert sugar content up to 3 mg in the presence of varying quantities of sucrose in standard solutions. The determination, using a gold amalgam measuring electrode and a zinc reference electrode in conc. KCl solution at 20°C, takes only 5 min, including pre-clarification of the test sample with lead acetate. Results of tests are discussed. Linearity was indicated between the current measurements and the periodic acid content.

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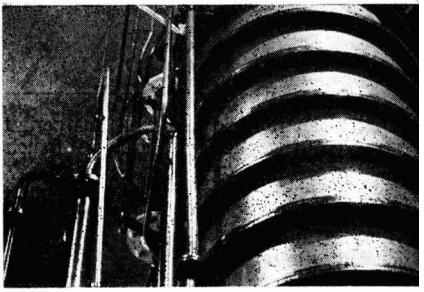
Formation and composition of beet molasses. VIII. Change in the optical rotatory power of sucrose caused by alkali compounds and betaine. G. VAVRINECZ. *Zeitsch. Zuckerind.*, 1968, **93**, 427–431.—The effect of alkali hydroxides, carbonates and other alkali salts involved in molasses formation on the specific rotation of sucrose was determined and the findings compared with results obtained by other authors. Borax and the alkali hydroxides caused a reduction in the specific rotation, their individual effects being greater than those of other alkali salts. Betaine caused a slight reduction in the specific rotation. No relationship was found between the amount of sucrose "concealed" by the reduction and the amount of "bound" sucrose according to the saturation function. The effects of several salts present simultaneously were found to be additive.

[1] *I.S.J.*, 1969, **71**, 122.

By-products



Yeast as a by-product in alcohol distilleries. B. ZACHARIASSEN. *Paper presented to the 13th Congr. ISSCT*, 1968.—Yeast can be the main product of molasses fermentation, when production requires much capital outlay on plant. Where alcohol is the sole product, it is possible to amend the process cheaply whereby yeast may also be produced without any loss of alcohol production. This involves pre-clarification and sterilization of the molasses, and separation of the yeast from the fermented wash before it goes to the distilling column. By using one-third of the yeast cream for a pre-fermentation and subsequently for main fermentation, the fermentation efficiency is increased, cycle time reduced and alcohol yield raised by 5–10%. The remaining yeast cream is washed, separated and dried for sale.

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Utilization of by-products and wastes from sugar factories by cellulosic fermentation. S. C. GUPTA and J. P. SHUKLA. *Paper presented to the 13th Congr. ISSCT*, 1968.—The production of biogas (methane) and biomanure from bagasse and cane trash, etc., by anaerobic fermentation in the presence of certain additives is described[1].

* * *

Feasibility study on furfural and structural board from bagasse. C. I. NEE and W. C. HSIEH. *Paper presented to the 13th Congr. ISSCT*, 1968.—The possible use of bagasse as raw material for furfural and fibre board production is discussed and a scheme described for a furfural plant having a daily output of 3·5 tons of furfural operating in conjunction with a fibre board plant of 20–30 tons daily bagasse cooking capacity.

* * *

Utilization of sugar cane bagasse for manufacture of bleached pulp at Hsinying pulp mill, Taiwan Pulp & Paper Corporation. T. P. WU. *Paper presented to the 13th Congr. ISSCT*, 1968.—The sulphate pulping and multistage bleaching processes used at Hsinying for bagasse pulp manufacture are described and the possibility of producing dissolving (alpha) pulp, having an α-cellulose content of at least 90%, is briefly discussed.

* * *

The simultaneous production of furfural and levulinic acid from bagasse. E. RAMOS, L. A. CARLO and R. VÁZQUEZ R. *Paper presented to the 13th Congr. ISSCT*, 1968.—Tests in which sulphuric acid was used as a catalyst for conversion of bagasse into furfural and levulinic acid showed that a total yield of the two chemicals of 25% on bagasse dry weight was obtained, compared with a combined potential yield of 45·50%. At a constant bagasse quantity, the levulinic acid yield was linearly dependent on $r = \left(\frac{100 \times \text{sulphuric acid concentration}}{\text{bagasse dry weight}}\right)$ while at constant acid concentration yield was linearly dependent on log r. Furfural yield depended on the rate of distillation at optimum r values. The economics of furfural and levulinic acid production are considered.

* * *

Diversification within the Australian sugar industry. C. W. DAVIS. *Paper presented to the 13th Congr. ISSCT*, 1968.—Potential sugar factory by-products in which there has been interest in Australia are surveyed, although it is emphasized that there is little diversification within the Australian industry.

* * *

Sugar industry diversification. H. BRÜNICHE-OLSEN. *Paper presented to the 13th Congr. ISSCT*, 1968. Activities of the Danish Sugar Corporation in sugar beet seed breeding, and development and manufacture of machinery for beet and cane sugar factories are briefly surveyed.

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Sugar industry diversification in the Philippines. T. R. MCHALE. *Paper presented to the 13th Congr. ISSCT*, 1968.—Sugar industry diversification in the Philippines is briefly reviewed and the theoretical economics of diversification are discussed.

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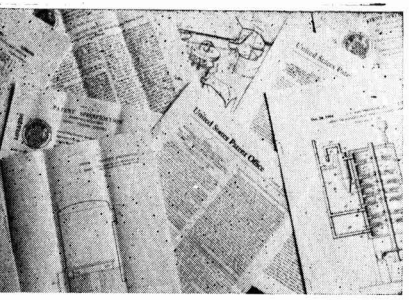
A review of industrial and agricultural diversification in the South African sugar industry. T. G. CLEASBY. *Paper presented to the 13th Congr. ISSCT*, 1968. Diversification in South Africa is considered under the headings: molasses, bagasse, agriculture and miscellaneous undertakings.

* * *

Sugar industry diversification (in Taiwan). H. S. WU. *Paper presented to the 13th Congr. ISSCT*, 1968. Experience of the Taiwan Sugar Corporation in diversification, including bagasse board, pulp and paper manufacture, molasses utilization, pineapple growing and canning, crop diversification and pig farming, is discussed.

[1] BARTHA: *I.S.J.*, 1967, **69**, 91.



Patents

UNITED STATES

Sugar manufacture. J. A. CASEY, of Pepper Pike, Ohio, USA. **3,401,059.** 22nd January 1965; 10th September 1968.—To reduce pan boiling time and to improve sugar crystallization and molasses separation, 10–15 p.p.m. on sucrose solids of a water-soluble salt of a sulpho-succinate ester [di-octyl, di-*iso*-butyl, di-hexyl or di-tridecyl sodium, potassium or ammonium sulphosuccinate (dioctyl sodium sulphosuccinate)] (together with ethyl alcohol or propylene glycol) is added to the sugar solution before it enters the evaporators, when it is in the evaporators or pans, or as it is discharged to the crystallizers.

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Cane handling apparatus. H. A. WILLETT, of Thibodaux, La., USA, *assr.* THE THOMSON MACHINERY CO. INC. **3,403,796.** 26th January 1965; 1st October 1968.

Cane is brought to the factory in wagon 46 the body of which is in two connected sections of triangular cross section. Hooks 88 of the hoist 76 engage with arms at the upper corner and when raised cause the upper portion of the wagon to pivot about the upper right corner, discharging half the contents. Further raising of the hooks causes the right side of the lower half of the wagon to separate from the chassis, pivoting about the bottom left corner, and discharging the remainder of the cane. This falls on to the belt conveyor 32 which travels upwards between side panel members 24 and thus forms a trough which carries the cane upwards between the lower and upper sprocket wheel assemblies 28 and 30. The cane passes under two sets of levelling knives 36, 38 and is discharged between side panels 42 onto rollers 40 between panels 41, and thence to the feed of the mill tandem. The cane in its passage over the rollers 40 is sprayed with wash water delivered by pipe 44 to spray heads 43.

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Cane planter. R. J. BOUDREAUX, of Thibodaux, La., USA. **3,404,808.** 24th January 1966; 8th October 1968.

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Active dry yeast containing a sucrose diester. S. POMPER and E. AKERMAN, *assrs.* STANDARD BRANDS INC., of New York, N.Y., USA. **3,410,693.** 20th October 1965; 12th November 1968.—An active dry yeast having a moisture content below about 7·5% (4–7%) by weight and of superior leavening activity is obtained by incorporating a small amount (1–3%) of a sucrose diester (sucrose distearate or dipalmitate). The yeast may also contain (0·025–0·5% by weight of) an antioxidant (butylated hydroxyanisole or butylated hydroxytoluene).

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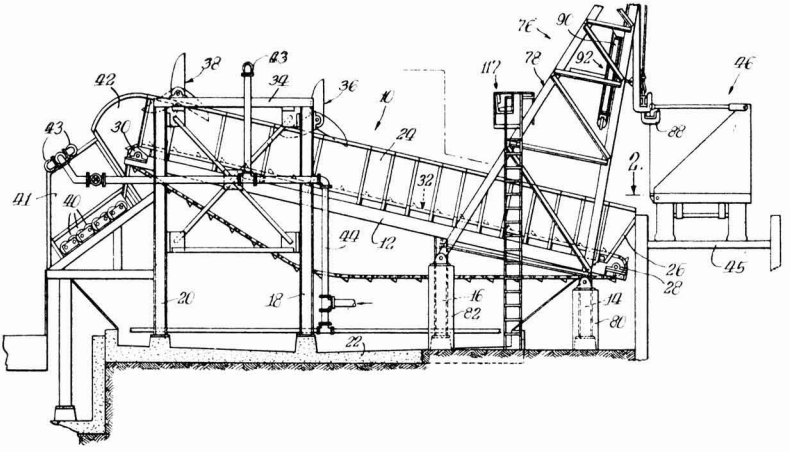
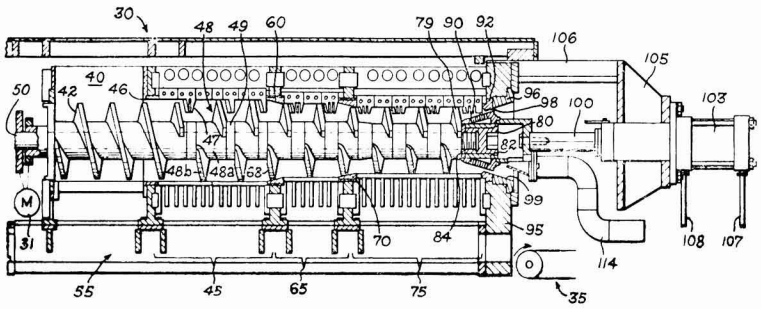


Screw press for bagasse. A. W. FRENCH and F. J. STARRETT, of Piqua, Ohio, USA, *assrs.* THE FRENCH OIL MILL MACHINERY CO. **3,411,435.** 18th October 1966; 19th November 1968.

Bagasse from a diffusion unit, containing 85–90% moisture, enters the inlet hopper 40 of screw press 30 over the feed worm 42 and is carried into the first section 45 of the press. It is forced past the breaker bar 47 and

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 (price 4s 6d each). United States patent specifications are obtainable from: The Commissioner of Patents, Washington, D.C. 20231 U.S.A. (price 50 cents each).



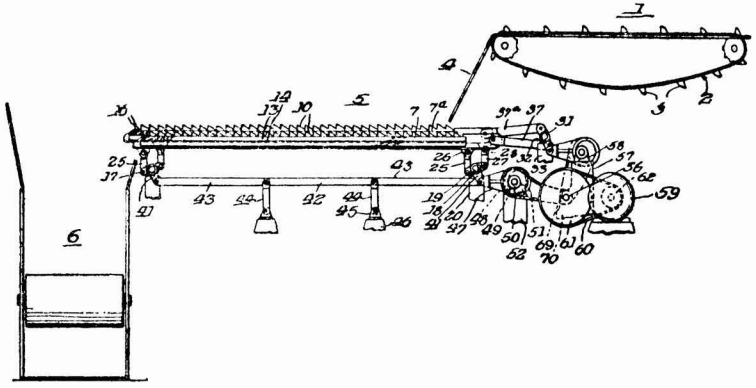
toward the first of several working and pressure worms 48, the flights 48b of which have a clearance of a few thousandths of an inch from the walls of section 45. The flights are interrupted by collars between worm shaft sections 48a and breaker bars are located within the section at these places.

The bagasse continues to a second section 65 where it is further compressed, since both the shaft and case diameters are reduced, and then a third section 75 where it is further compressed. The case walls of all three sections have drainage openings so that the juice content of the bagasse may be expressed, and the bagasse is thus reduced to a moisture content of 45% or less by the time it reaches the end of section 75. Here it is expressed through the gap between the inner surface 99 of the ring at the end of the frame and the non-rotatable conical sleeve 90 which is located about the end of the screw shaft and is held against the shaft by hydraulic pressure, through the movable rod 100.

* * *

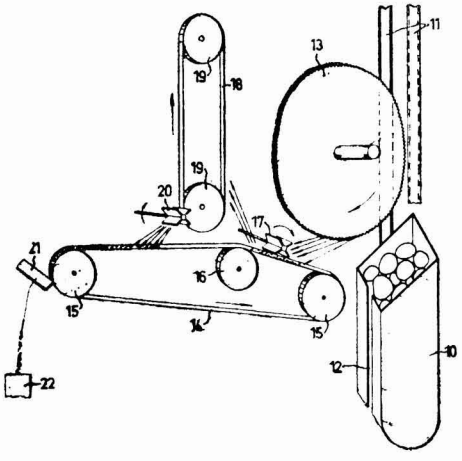
Cane jouncing equipment. S. A. THORNTON, of Jeanerette, La., USA, *assr.* S. A. THORNTON, Jr. **3,412,859.** 9th December 1965; 26th November 1968.

In order to assist separation of extraneous matter from cane passing along a feeder table, so that it may be more easily separated at the discharge end of the table, the cane is subjected to agitation by means of two groups of agitator bars 7, 7a driven by two rockably-mounted shafts 17, 18 or by a third rocking shaft 31, all actuated by eccentric means, so that the bars of one group reciprocate vertically and opposite to the movement of the bars of the other group, or, alternatively, the bars of each group are reciprocated toward the discharge end of the feeder table during upward movement and toward the receiving end during downward movement and in opposite relation to the bars of the other group.

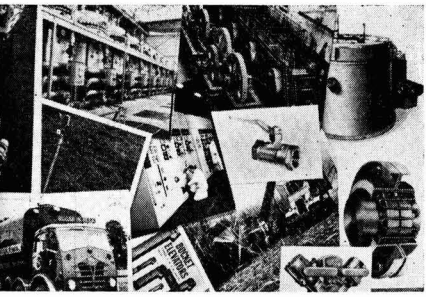


* * *

Preparing a homogeneous mash of beets for sampling and analysis. N. R. M. WEIBULL, of Malmö, Sweden, *assr.* INGENIÖRSFIRMAN NILS WEIBULL A.B. **3,411,558.** 31st October 1966; 19th November 1968.



A container 10 of beets is provided with a slot 12 so that when it is raised along vertical stationary guides 11 the rotating circular saw blade(s) 13 cut through the beets and throw particles of the root onto the substantially horizontal belt 14, which carries them away. They pass under the rotating vane wheel 17 which throws the mash against the vertical conveyor belt 18 from which it is removed by rotating vane wheel 20. This transfer from belt to belt homogenizes the mash which is then removed from belt 14 by blade 21, which directs it to container 22.

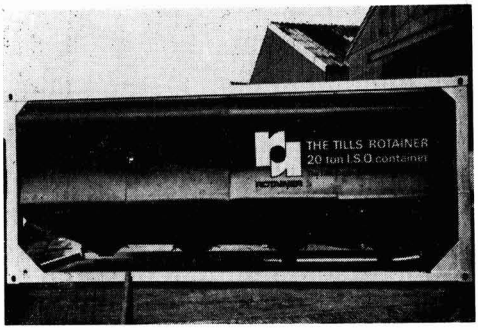


Trade notices

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.

The Tills "Rotainer". The Tills Engineering Co. Ltd., Arbour Lane, Kirkby Industrial Estate, Liverpool, Lancs., England.

This new development is a method of transporting 20-ton loads of sugar by road or rail at minimum cost. The "Rotainer" is a compartmented tank supported within a framework conforming to the International Standard container unit of 20 ft long × 8 ft wide × 8 ft high. The partitions between each compartment provide added strength, and, as illustrated, the contents may be discharged either by



gravity (where the frame is located on an open-bed truck or railcar) or pneumatically. It has a sloping bottom to ensure complete emptying and this also ensures complete filling since the tank rotates about its longitudinal axis until the discharge ports are uppermost (when they become feed ports) and the slope of the bottom (now the top) is the natural angle of repose of sugar. The ports in this position extend above the frame and the "Rotainer" has therefore to be turned to its discharge position for transport.

* * *

Metal detector. Goring Kerr Ltd., Hanover Way, Windsor, Berks., England.

The S-J-U unit is an advanced, all-transistor metal detector which operates by sensing of a change in electromagnetic field strength induced by the presence of metals, whether ferrous or non-ferrous, in a stream of sugar. The detector head is coupled to a control unit which can operate a deflector plate, when the sugar is in the form of a falling stream, or a discard device when the detector is mounted over a conveyor belt. Alternatively an alarm may be sounded or the conveyor stopped.

* * *

Fertilizers for sugar beet. Fisons Ltd., Fertilizer Division, Harvest House, Felixstowe, Suffolk, England.

Three new beet fertilizers by Fisons Ltd. are announced: "52-special Magnesium", which contains 4 parts of Mg in the form of kieserite (to make the Mg quickly and easily available) plus N-P-K in a ratio of 16:8:8. Its advantages in Mg-deficient soils have been demonstrated. "52-plus Boron" has an N-P-K-B composition of 20:10:10:0·32 and is effective against crown or heart rot in boron-deficient soils. The third product is "Superbeet", which has a markedly low proportion of phosphate; its N-P-K composition is 17:8:24.

* * *

Seals for stainless steel pumps. Stainless Steel Pumps Ltd., Finmere Rd., Eastbourne, Sussex, England.

The latest "Sealol" Class 530, Type H mechanical gland seals are now being fitted to N.D. all-stainless steel positive rotary pumps manufactured by Stainless Steel Pumps Ltd. The seals can rotate in either direction and have an increased pressure capability through use of stainless steel-shrouded carbon rotary seal rings. Light load springs allow the rotor case/seal housing to be fitted without the need for draw-bolts, thus further facilitating pump servicing. Sugar solutions are among the liquids which can be readily handled by the pumps, which have outputs ranging from 5 to 20,000 gal/hr (25–90,000 litres/hr) at differential pressures up to 150 p.s.i. and vacuum extraction duties up to 28½ in Hg.

* * *

PUBLICATIONS RECEIVED

KEK VALVES. Kek Ltd., Hulley Road, Hurdsfield Industrial Estate, Macclesfield, Cheshire, England.

A new leaflet gives information on the Kek motorized rotary valves and hand-operated butterfly valves, the former having been specifically designed for use on the Kek grinding mills.

* * *

WEY PATENT SLIDE VALVES. Reiss Engineering Co. Ltd., Dalston Gardens, Stanmore, Middx., England.

A new leaflet describes and illustrates the Wey range of slide valves, both lightweight and heavyweight, of various materials, operated by hand or by pneumatic or hydraulic cylinder or electric motor, and including the V-notch slide valve for fine flow control.

LDH LOW-PRESSURE SWITCHES. Actuated Controls Ltd., Bower Ashton, Bristol BS3 2JW, England.

The new LDH range can be used as pressure, vacuum and differential pressure switches in a number of applications, including liquid level control in vessels. They have a diaphragm of nitrile copolymer and are enclosed in an aluminium alloy housing. The switches are available in four pressure ranges and are described in a leaflet available from the company.

* * *

SWENSON CRYSTALLIZERS, EVAPORATORS AND DRYERS. Swenson Division, Whiting Corp., Harvey, Ill., USA; Wellman Incandescent Furnace Co. Ltd., Cornwall Rd., Smethwick, Warley, Worcs., England.

A new brochure carries information on Swenson crystallizers, which cover practically all applications, evaporators of various types, and dryers (including spray, rotary and fluidized bed types and coolers).

* * *

SPP PUMPS. Sigmund Pulsometer Pumps Ltd., Oxford Rd., Reading, Berks., England.

Amongst the latest literature available from the Sigmund Pulsometer Plenty Group is a well-produced booklet showing various applications of SPP pumps and brochures describing HS (single-stage) and HSR (two-stage) horizontally-split casing centrifugal pumps, the DS single-stage, end-suction chemical process pump, type TM multi-stage high-pressure pumps and a news-sheet giving general information on the Group companies and some of their products.

* * *

WATER TREATMENT. Fabcon Inc., 33 Public Square, Cleveland, Ohio, 44113 USA.

A recent publication, available in English and Spanish, describes application and testing procedures for a number of Fabcon water treatment chemicals. These cover boiler water and small boiler water treatment, cooling water treatment, boiler cleaning during operation and fuel oil treatment. A monthly customer service report form and a daily boiler water record form are reproduced.

* * *

CONVEYORS. Gough Econ Ltd., Clough St., Hanley, Stoke-on-Trent, Staffs., England.

Flat flexible belt conveyors and zinc-coated steel "Armor-belt" conveyors are two types of conveyor described in Gough Econ brochures. These are suitable for the transfer of cartons and packages.

* * *

FLUID MIXING. Aiton & Co. Ltd., Aiton-Chemineer Division, Derby DE2 4BG, England.

Various types of Aiton agitators are described in publication ACD1/4.69, including top entering propeller agitators. "How to specify an agitator" is the title of a special report by the Chief Engineer of Aiton's Mixer Division.

* * *

IRON & STEEL CASTINGS. Crofts (Engineers) Ltd., Bradford 3, Yorks., England.

Publication No. 269 is a 16-page booklet just issued by Crofts which outlines their foundries' production facilities for iron and steel castings up to 12 tons capacity. Amongst the illustrations is one showing a core assembly for a mould to produce a high-carbon steel roller for a cane crusher.

* * *

DUNELT DRYERS, COOLERS, KILNS AND CALCINERS. Newell Dunford Engineering Ltd., 143 Maple Rd., Surbiton, Surrey, England.

A recent leaflet gives information on the various types of equipment mentioned in the title, particularly the Dunelt rotary cascading dryer which is applicable for a number of different products including beet pulp.

RENOLD LIMITED NEWS LETTER. Renold Ltd., Sales Division, Manchester, England.

Featured among the new products in the latest edition of the Renold News Letter are a new range of chains, known as Anchor "Non-Lub" chains, intended for use on drives where normal lubrication is restricted or prohibited, and the "Coventry" double-hinge slat band chain in stainless steel, which has a working load of 1000 lb with a 7·5-in wide slat. The new Renold "Two-Ten" overhead biplanar conveyor chain also described is a precision replacement for the type 458 chain of forged or pressed link construction which is widely used. Details and advantages of this chain are given.

* * *

Hamworthy heaters for the British Sugar Corporation.—The illustration shows two direct-fired air heaters leaving Hamworthy Engineering Ltd. for the Spalding beet sugar factory of the British Sugar Corporation Ltd. The total order was for three such heaters, each of which will burn 2000 lb of fuel oil per hr to provide hot air for beet pulp drying.

* * *

Queensland dewatering equipment for Hawaiian diffuser. Walkers Ltd., of Maryborough, Queensland, have received an order from Hawaiian Commercial & Sugar Co., of Maui, for a complete diffuser bagasse dewatering unit. The unit, which is turbine-driven through suitable gearing, comprises a single Walker pressure feeder in combination with a 3-roller mill. All five rollers are 42 inches in diameter × 84 in long, and the mill has both top roll and delivery roll hydraulic loading. The initial maximum capacity required of the unit is 5040 short tons of cane per day, and it has been designed to dewater the bagasse to a moisture content of 48%.

* * *

Continuous vacuum pan for German sugar factory.—Soc. Fives Lille-Cail are to supply a continuous vacuum pan to Zuckerfabrik Franken G.m.b.H., at Ochsenfurt in West Germany. The pan, which will have a daily output of 340 tons of white sugar, will be the third of this type that the company has supplied and the first outside France. Apart from higher crystal yields than batch pans, the Fives Lille-Cail continuous pan permits a 10% reduction in vapour consumption.

* * *

Refinery air heater order.—Urquhart Engineering Co. Ltd., of Perivale, Middx., England, have received an order for a double toroidal air heater for regeneration of exhausted bone char at Tate & Lyle's Thames refinery in London. The oil-fired heater burns with 10% excess air and produces only 1-2% oxygen in the combustion products throughout the 4:1 turndown ratio.

USSR sugar imports and exports[1]

	1968	1967	1966	1965
	(*metric tons, raw value*)			
Imports				
China	—	—	—	37,220
Cuba	1,749,058	2,479,736	1,840,894	2,253,004
Hungary	1,461	1,834	1,278	1,510
Poland	1,496	1,247	1,272	1,519
Other Countries	3,150	—	—	—
	1,755,165	2,482,817	1,843,444	2,293,253
Exports				
Afghanistan	12,584	66,307	114,007	57,621
Algeria	26,610	49,223	23,530	14,613
Belgium/Lux.	—	—	11,414	—
Bulgaria	123,698	—	—	—
Ceylon	91,929	85,368	38,151	33,021
Cyprus	1,950	592	2,940	1,023
Ethiopia	—	—	11,023	2,718
Finland	133,735	137,785	137,916	133,100
France	—	32,503	14,899	—
F. Somaliland	6,414	2,141	6,286	571
Germany, East	54,391	38,027	—	—
Ghana	63,711	23,003	12,718	26,701
Greece	—	—	1,512	—
Iran	118,235	115,766	136,243	84,020
Iraq	193,502	227,309	155,766	—
Italy	—	3,261	7,388	598
Jordan	27,428	24,041	27,937	11,032
Kenya	—	—	20,398	10,870
Korea, North	73,961	29,566	8	6
Lebanon	22,685	7,063	—	2,174
Libya	22,501	—	29,775	33,873
Mali	15,218	15,741	5,434	13,025
Malta	4,692	2,835	6,456	3,830
Mongolia	14,633	17,043	17,377	19,042
Nepal	2,908	2,173	—	3,243
Nigeria	3,304	20,237	5,444	3,834
Norway	7,856	7,271	3,316	2,663
Pakistan	24,609	—	—	31,794
Persian Gulf	13,255	31,280	8,511	34,608
Saudi Arabia	21,453	—	13,385	20,166
Sierra Leone	8,107	8,200	4,350	1,086
Somalia	—	—	—	6,766
Southern Yemen	18,259	14,008	16,632	10,248
Sudan	177,682	—	57,897	76,443
Sweden	6,637	22,946	30,220	14,771
Syria	—	10,870	—	—
Tunisia	—	11,413	11,443	3,261
UAR	4,565	88,282	11,213	11,049
UK	—	—	1,026	1,794
Yemen	40,155	43,061	62,017	50,093
Yugoslavia	54,336	61,360	151,722	10,421
Other Countries	6,082	1,956	4,497	554
	1,397,085	1,200,631	1,162,861	730,632

Congo (Kinshasa) sugar production[2].—During the 1968 campaign the Sucraf (Sucrerie et Raffinerie de l'Afrique Central) factory at Usumbara produced about 8000 tons, and is expected to reach 10,000 tons in 1969. The sugar factory at Moerbeke-Kwilu, belonging to the Compagnie Sucrière du Congo, produced about 35,000 tons in 1968, so that the country's total production amounted to some 43,000 tons.

* * *

Martinique sugar industry rationalization[3].—In an effort to reduce costs, the Martinique sugar industry and the French Government are discussing a plan to consolidate the six sugar factories on the island. The plan involves closing the factory at Petit-Bourg and transferring its cane to the Rivière Salée and Marin factories. Later, the Lareinty-Lamentin factory would also be closed. Eventually, with the help of Government financing, there would be a single sugar company processing all of Martinique's cane in three sugar factories.

Brevities

Swaziland sugar production 1968/69[4].—According to an announcement by the Swaziland Sugar Association, sugar production in the 1968/69 season amounted to 169,296 tons. Domestic and industrial consumption of sugar in Swaziland during 1968 amounted to 12,043 tons, while exports totalled 149,487 tons, of which the United Kingdom took 97,725 tons, Canada 37,795 tons, the United States 6,760 tons and Zambia 6,295 tons. Small lots of 720 tons and 192 tons were exported to Malawi and Rwanda, respectively. Molasses production in the 1968/69 season amounted to about 45,700 tons.

* * *

Argentina sugar factories nationalization[5].—In April, two Argentine sugar factories were nationalized with their associated cane plantations, namely Central Las Palmas in Chaco Province, and Central Arno in Santa Fé. In January the acquisition of Ingenio Tacuarendi by the Government of Santa Fé province had been announced[6].

* * *

US sugar quotas 1969.—Late on the 5th June the USDA reallocated a total of 100,000 short tons of additional deficit in the Puerto Rico quota under the US Sugar Act. This reduced the Puerto Rico entitlement to only 340,000 short tons, raw value, compared with the initial quota of 1,140,000 tons. Of the 100,000 tons shortfall, 50,000 tons was allotted to the Dominican Republic and the remainder distributed to Western Hemisphere suppliers so that the Dominican Republic gained another 11,249 tons, Mexico 11,502 tons, Brazil 11,249 tons, BWI 3994 tons, Ecuador 1637 tons, French West Indies 1256 tons, Argentina 1384 tons, Costa Rica and Nicaragua 1324 tons each, Colombia 1190 tons, Guatemala 1116 tons, Panama 833 tons, Salvador 818 tons, British Honduras 291 tons, and Bolivia and Honduras 134 tons each.

* * *

Europe beet sugar area[7].—The International Association for Sugar Statistics have released their first assessment of sugar beet areas in member countries which include most of Western Europe. F. O. Licht K.G. have also published new estimates for the non-members—Greece, Ireland, Italy and Yugoslavia—and the total is set at 1,921,765 hectares, which compares with 1,949,515 ha in Licht's previous estimate[8]. The difference is the aggregate of differences between the IASS and Licht figures of about 1000 ha for Holland, 2000 ha for the UK and 20,000 ha for Turkey, as well as a 5000 ha reduction in Licht's estimate for Yugolsavia.

* * *

Lebanon sugar factory proposal[9].—The Lebanese Government is considering the construction of a second sugar factory, to cost £L30,000,000, as the factory in Anjar, which has a capacity of 700 tons/day, is not able to process all of the sugar beet grown.

* * *

Bagasse paper and cellulose in Argentina[10].—Schcolnik and Massuh Industrial have announced plans to set up a paper and cellulose plant in the Province of Tucumán at a cost of about 3000 m pesos. The first stage of the project is expected to be in operation in 30 months with an annual production of 24,000 tons of cellulose and 33,000 tons of wrapping paper; the second stage, to be completed 12 months later, will allow additional production of 24,000 tons of bagasse cellulose.

[1] *I.S.O. Stat. Bull.*, 1969, **28**, (3), 121–122.
[2] F. O. Licht, *International Sugar Rpt.*, 1969, **101**, (13), 5.
[3] *Sugar y Azúcar*, 1969, **64**, (5), 58.
[4] F. O. Licht, *International Sugar Rpt.*, 1969, **101**, (3), 5.
[5] *Zeitsch. Zuckerind.*, 1969, **94**, 303.
[6] *La Ind. Azuc.*, 1969, **74**, (902), 19.
[7] F. O. Licht, *International Sugar Rpt.*, 1969, **101**, (16), 2.
[8] *I.S.J.*, 1969, **71**, 193.
[9] *Zeitsch. Zuckerind.*, 1969, **94**, 302.
[10] *Bank of London & S. America Review*, 1969, **3**, 369.

Brevities

New Polish sugar factory for Spain[1].—The Polish export trading organization CEKOP has recently signed a contract for the erection of a sugar factory in the southern Spanish province of Jaen. It will have a daily slice of 2000 tons of beet and will be the second factory supplied to Spain by Poland.

* * *

UK sugar surcharge.—In view of the fall in the world price of raw sugar on the London Market, the UK Minister of Agriculture, Fisheries and Food has increased the surcharge, with effect from the 2nd July, from 1¾d per lb (16s 4d per cwt) to 2d per lb (18s 8d per cwt).

* * *

Bagasse paper plants in Pakistan[2].—The East Pakistan Industrial Development Corporation's paper mill at Paksey is expected to be completed in 1970. It will use bagasse as raw material and will produce 90,000 tons/year of high-grade writing and printing paper. As with the 18,000 tons/year EPIDC paper mill being constructed for North Bengal Paper Mills Ltd., also using bagasse and to be completed late this year, machinery and foreign financing have come from a German, French and Italian consortium. A 30,000 tons/year bagasse paper mill is being built by the Pakistan Paper Corporation near Peshawar and is due to go on stream in late 1970. Finance for this mill has been made available by the International Finance Corporation, German, British and Pakistani sources. West Germany is providing the plant's equipment.

* * *

Cuban sugar for East Germany[3].—An agreement has been signed under which Cuba is to supply 275,000 tons of sugar to East Germany in 1970.

* * *

Queensland irrigation scheme[4].—In view of the drought which has been causing severe losses to Queensland cane farmers[5], a timely report has been compiled by the Department of Primary Industries and the Irrigation and Water Supply Commission on water conservation, underground water and an irrigation survey of the Bundaberg-Isis region of Queensland. The report proposes the construction over a period of 12 years of a $A 47m scheme to provide a stable water supply to farmers in the region and the authors claim that the comprehensive irrigation scheme is the only means of ensuring the stability and improved efficiency of the $A 30m sugar industry in the region.

* * *

Spanish sugar industry expansion[6].—An important reorganization of the Spanish sugar industry is currently envisaged by the Ministries of Industry and Agriculture. Several new beet sugar factories are to be constructed, none of which will have a capacity of less than 3000 tons of beet per day. Sugar factories of less than that capacity will be expanded. It is anticipated that, after this year, there will be a major increase in beet production in the regions of Bardenas (Navarre province), Monegros and Flumen (provinces of Zaragoza, Huesca and Lerida), and in the regions of Cuidad Real and Jaen in Andalusia. Taking into account the foreseeable increase in consumption, Spain expects to be self-sufficient in sugar by 1978.

* * *

New Indian sugar factory[7].—A cooperative sugar factory was inaugurated in March at Junagadh in Gujerat State. It has an annual capacity of 25,000 metric tons.

* *

New Japanese sugar factory[8].—Government permission has been given to the Nippon Beet Sugar Manufacturing Company to build Japan's biggest beet sugar factory in Hokkaido, the northernmost island of Japan. It is to be completed next year at a cost of 5500 m yen and will have a processing capacity of 3600 tons of beet per day.

Norway sugar imports[9]

	1968	1967
	(*metric tons, white value*)	
Belgium/Luxembourg	3,366	2,533
Cuba	6,408	19,531
Czechoslovakia	15,935	23,611
Denmark	33,948	25,160
Finland	23,822	9,317
Germany, West	4,980	174
Netherlands	3,735	11
Poland	31,822	27,955
Sweden	8,806	2,091
UK	41,377	41,273
USSR	4,488	6,813
Other Countries	406	997
	179,093	159,466

Portugal sugar imports[10]

	1968	1967
	(*metric tons, tel quel*)	
Belgium-Luxembourg	198	14
Brazil	—	2,155
Germany, East	—	107
Germany, West	301	449
Portuguese East Africa	111,452	124,374
Portuguese West Africa	8,944	23,875
Rhodesia	25,872	26,585
South Africa	1,515	3
Other Countries	36	125
Total	158,318	177,687

UK sugar factory closure.—The British Sugar Corporation Ltd. recently announced that it plans to rationalize sugar production in its factories. As a first step the Cupar plant in Scotland is to close at the end of the 1971/72 campaign, and it is planned to close two more factories by about the mid-1970's. The Cupar plant is one which for many years has made a substantial loss but which was kept in operation in response to representations of the National Farmers' Union of Scotland. Although the beet area serving the Cupar factory has grown to 13,600 acres the factory continues to incur considerable loss and, owing to rising fixed costs, it is becoming more difficult to operate small factories economically. The decision to close Cupar will not be implemented until after the 1971/72 campaign to allow farmers to adjust their cropping plans. The rationalization does not, of course, affect the total beet area, which is determined at the Annual Review by the Ministry of Agriculture, Fisheries and Food, and the transfer of beet area to soils more suited to the crop, together with transport over shorter distances to larger factories which can operate more efficiently, may result in greater yields of sugar for the UK beet industry.

* * *

Iraq sugar factory proposal[11].—The Ministry of Industry in Baghdad is calling for tenders for the construction of a beet sugar factory, which will be required to handle some 2000 tons of beets per day while also being capable of refining 290 tons of sugar per day outside the beet campaign. Facilities will also be needed to processing various by-products into pelleted dried molasses pulp. The proposed site of this project is at Sulaimaniyah in the east of the country.

[1] *Zeitsch. Zuckerind.*, 1969, **94**, 302.
[2] *Foreign Trade*, 1969, **131**, (10), 31; (12), 7.
[3] *Die Lebensmittelind.*, 1969, **16**, 191.
[4] *Commonwealth Producer*, 1969, (431), 67.
[5] *I.S.J.*, 1969, **71**, 224.
[6] *Agence France-Presse*, 19th April, 1969.
[7] *Indian Sugar*, 1969, **18**, 871.
[8] *Public Ledger*, 30th May 1969.
[9] C. Czarnikow Ltd., *Sugar Review*, 1969, (905), 28.
[10] F. O. Licht, *International Sugar Rpt.*, 1969, **101**, (10), viii.
[11] C. Czarnikow Ltd., *Sugar Review*, 1969, (926), 120.

Index to Advertisers

FOR BUYERS' GUIDE SEE JULY ISSUE pp. xxv-xlii

NORIT® GRANULAR CARBON DRK-1

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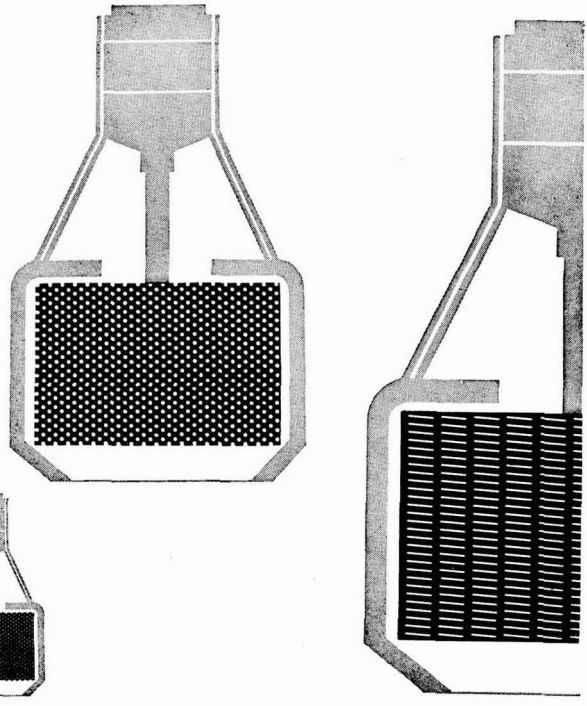

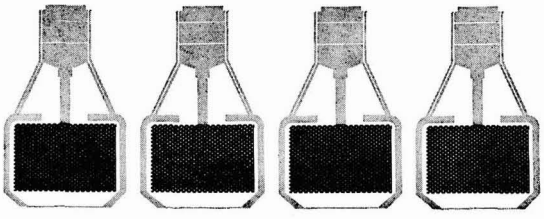

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