Table 1. Composition of diet fed.

Ingredient*	Percentage
Carbohydrate	56.58
Casein, vitamin-free	30.00
Corn oil	5.00
Methyl cellulose, 4000 cm/sec	1.00
Potassium phosphate, dibasic	1.55
Sodium bicarbonate	1.42
Mineral mixture 12†	4.45
Vitamin mixture 16†	+
Antibiotic mixture‡	+

* Ingredients were incorporated into a milk containing 20 percent solids.
† Becker *et al.* (2).
‡ A mixture of equal parts oxytetracycline HCl, procaine penicillin and bacitracin fed to supply 396.8 mg/kg.

On the sucrose or fructose regimen, all pigs failed to show body-weight gains. One pig fed sucrose and two pigs fed fructose survived the experimental period, although no increases in body weight were observed. Diarrhea was severe. Following 18 hr of feeding, pigs fed either sucrose or fructose showed severe diarrhea, although it was more acute with the former carbohydrate. The severity of the diarrhea progressed, with the pig becoming thin, weak, and unthrifty. Appetites remained excellent until the pig became moribund. Usually death followed, at which time the average loss in body weight was approximately 0.3 kg. All manifestations supported the view that the reaction to fructose was less severe than to sucrose.

In contrast to sucrose or fructose, pigs fed invert sugar showed satisfactory survival, being comparable to glucose-fed pigs. The single pig that died on invert sugar did exhibit a weight gain during the test. With regard to rate and efficiency of gains, the glucose-fed pigs were significantly superior ($P < 0.05$) to pigs fed invert sugar. The feeding of invert sugar produced an intermittent, moderate diarrhea.

Table. 2. Survival, growth, and feed data for baby pigs fed sucrose or related sugars.

Item of interest	Dietary carbohydrate			
	D-glucose	Sucrose	D-fructose	Invert sugar
No. of pigs	7	7	7	6
No. of deaths	1	6	5	1
Avg. time until death (days)	8.0	4.3	6.0	8.0
Avg. initial weight (kg)	1.24	1.29	1.33	1.29
Avg. final weight (kg)*	2.36	0.97	1.02	1.78
Avg. gain per pig (kg)	1.12	−0.32	−0.31	0.49
Solids intake per pig (kg)	1.53	0.43	0.61	1.46
Solids per kilogram gain (kg)	1.37			2.98

* Weight at death or termination of the test.

In view of the disastrous results with sucrose, the livability and weight gains recorded on pigs fed invert sugar indicate that the newborn pig lacks the ability to hydrolyze the glycosidic bond of sucrose. An intestinal sucrase accomplishes this feat in the older mammal. Hence, the presence and/or activity of such a carbohydrase in the newborn pig seems worthy of study.

A failure of the newborn pig to hydrolyze the glycosidic linkage between the fructose and glucose moieties of sucrose is apparently the primary factor in an explanation of the failure to grow and survive on diets high in this sugar. Assuming that a limited degree of hydrolysis could be accomplished, however, the inability of the pig to utilize fructose would probably restrict performance.

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Improvement in Low-Temperature Resistance of Sugar-Beet Seedlings Treated with Dalapon (2,2-Dichloropropionic Acid)

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An earlier communication of mine (*1*) reported improvement in frost resistance of parsnip tops sprayed with chemical growth substances in the fall. Similar subsequent field experiments during the autumn of 1953 did not show visible differences, probably because of a different complex of weather conditions. More recently Crane (*2*) has published observations on the effectiveness of 2,4,5-trichlorophenoxy-acetic acid in promoting growth of apricot fruits sprayed before frost.

This paper describes laboratory studies in which a sodium formulation of 2,2-dichloropropionic acid (Dalapon, Dow Chemical Co.) improved low-temperature resistance of sugar-beet seedlings grown and frozen under controlled conditions in replicated experiments.

Sugar-beet seeds of the variety Kuhn were planted in Petri dishes containing a measured amount of vermiculite, moistened to capacity at the outset with a standard volume of water or of chemical solution. The temperature was 21.5° to 22°C with the humidity at a high level during 6 days of incubation in a dark chamber. By this time seedlings had not yet stopped increasing in height.

The concentrations of Dalapon (acid equivalent) reported here had no visual adverse effect on the growth of seedlings. Table 1 summarizes data in support of this conclusion. There is, of course, consider-

Table 1. Emergence and shoot and root length of sugar-beet seedlings grown with water or with Dalapon solution. Mean values for three replications per treatment 6 days after planting.

	Check	Dalapon 4 ppm	Dalapon 8 ppm
Emergence (No. of plants from 40 seed balls)	54	54	53
Root length (mm)	49.6	47.4	47.4
Shoot length (mm)	52.9	51.8	53.5

able natural variation in growth of individual plants from seed balls within treatments, but there was no statistically significant difference in total measurements between treatments.

Following removal from the growth chamber, the dishes containing the seedlings were in some experiments placed intact on a slowly rotating shelf in a deep freezer. In other tests the shoots were first severed and their basal region pressed lightly in a horizontal position on widely spaced bands of 0.5-in. Scotch tape stretched across the top of a shallow box-shaped wire frame.

Dishes with contents were exposed for periods of the order of 30 min at −10°C. Isolated shoots required only about 5 min of rotation at this temperature to permit detection of the differences between survival of chemically treated and untreated plants. Appreciably longer exposures killed all plants.

Survival was recorded on a percentage basis within the first minute or two after removal of material from the freezer to room temperature. Frozen seedlings collapsed almost immediately, but unaffected ones survived for several days, either rooted in moist vermiculite without added nutrient or when transferred from the tapes to dishes of water kept at room temperature in the laboratory.

Table 2. Effect of Dalapon on low-temperature resistance of sugar-beet seedlings.

Expt.*		Replications	No. in each sample	Time†	Mean percentage survival after timed exposure at −10°C: Check	Dalapon 4 ppm	Dalapon 8 ppm
†1	1952 seed	3	30	*a*	43	76	77
2		3	20	*a*	45	80	80
3	1953 seed	8	25	*a*	52	81	—
				b	35	73	—
4		8	25	*a*	59	74	—
				b	44	65	—
				c	34	63	—

* Expts. 1, 2, 3: Tap water was used with these experiments; distilled water was used with expt. 4 for moistening the checks and for preparing the chemical solution.

† (*a*) Five minutes at −10°C before 2 or 3 min of observation at room temperature; (*b*) A second exposure of same material for 6 min at −10°C and removal to room temperature; (*c*) A third exposure for 7 min at −10°C.

Of the two freezing techniques, the tape procedure gave least variability in amount of improvement from chemical treatment in different experiments. This method was free from probable discrepancies occurring during cooling of entire dishes and contents.

Table 2 summarizes data from some representative statistically analyzed experiments employing the tape technique during freezing periods. The conclusion can be drawn that highly significant differences in low-temperature resistance existed between chemically treated and untreated seedlings within different seed lots and when either tap water or distilled water was used in preparation of the experiments. At the same time, quantitative growth of the seedlings was apparently unaffected

Limited preliminary experiments with similarly treated Saunders wheat, Polish rape, Earliana tomatoes, and Redwing flax have shown no increase in low-temperature resistance of seedlings treated with Dalapon.

Grateful acknowledgment is expressed to the University of Alberta, the National Research Council of Canada and the Federal Department of Agriculture who will provide assistance to extend this research. The Dow Chemical Co. has donated supplies of chemicals, and Canadian Sugar Factories Ltd. provided sugar-beet seed.

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Uranium Determination by Use of the Photodecomposition of Oxalic Acid

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The photodecomposition of oxalic acid in the presence of uranyl ion has long been used as a means of measuring light intensities. Leighton and Forbes (*1*) have shown that this reaction,

$$H_2C_2O_4 + (UO_2^{++})^* \rightarrow (UO_2^{++}) + H_2O + CO_2 + CO,$$

with photosensitized UO_2^{++} is very nearly quantitative. We have endeavored to determine microgram quantities of uranium by measuring the extent of decomposition of oxalic acid with varying quantities of uranium (*2*).

It has been reported in the literature (*3*) that 10^{-3} g/lit of uranium can be determined with the use of photoelectric photometers and spectrophotometers; 10^{-11} g/lit, by fluorometric means; and 10^{-3} g/lit, polarographically. These figures represent the limits of determination under optimum conditions. The method, as outlined here, has proved effective on solutions of known uranium concentration in the range