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**EVALUATE SUGAR BEET FOR POTENTIAL
TO PRODUCE SUGAR AT
MACKAY SUGAR EXPERIMENT STATION**

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INTRODUCTION

Can sugar beet be profitably grown at Mackay?

Sugar yields from beets are continuing to increase in overseas countries. Results from experiments at Kalamia Estate in the Burdekin area indicated that sugar beet out-yielded the sugarcane variety Q117 for sugar production on highly sodic soils by as much as 400% and gave similar yields on medium sodicity soils (T Morgan, pers. comm.). There could therefore be an opportunity for increasing production of sugar by planting sugar beet in areas which are marginally suitable for canegrowing due to soil sodicity or salinity and cane diseases. Sugar beets may be useful as a break-crop for sugarcane, thus reducing the build-up of soil pathogens.

Sugar beet is used as a break-crop in rotation with cereals in Europe. Heat tolerant varieties of sugar beet are now being developed to grow in tropical climates.

This project aimed to:

- ! measure the yield of sugar from six heat tolerant varieties of sugar beet grown at the Sugar Experiment Station, Mackay.

METHOD

The six varieties of sugar beet evaluated were from seed imported from California, and were claimed to be heat tolerant.

The varieties were: Beta 44-0435 KW 1119, Hilleshog HM 8351, Hilleshog WS 91, Tachig HM, Beta 1996 32-0315 and an unidentified variety. Seeds were planted on 2nd October 1992 into a peat moss-sand mixture (1:1) in coolite seedling trays (80 compartments) at the rate of two per compartment. Germination was approximately 80% and the seedlings were thinned to one per compartment. Seedlings received a daily irrigation and each week were saturated with Aquafeed solution (21.6 N, 3.3 P, 17.9 K, 8 g/5 L) and Shirtan (methoxy ethyl mercury chloride, 250 mL/200 L).

Seedlings were transplanted into Block F4 on Mackay Sugar Experiment Station on 18th November 1992. Planting rate was 80 000/ha (row spacing 0.5 m x 0.25 m) in plots of 4.75 m x 1.5 m. Three replicates of each variety were planted with seedlings. A fourth replicate was planted with seed.

The soil had a brownish sandy clay loam topsoil overlying a brown medium clay subsoil; non-calciic brown-Great Soil Group; Db 2.51-Principal Profile form; Pachic Haplumbrept-Soil Taxonomy Unit. The soil had the following analyses: P mg/kg 47, pH 5.13, Ca me% 2.70, Mg me% 0.78, Na me% 0.6, Exchangeable K me% 0.13, Nitric K me% 1.35, SEC mS/cm at 25°C 0.02.

Soil was rotary hoed after applying 5 t/ha of lime on 12th November 1992, then fertilised with 400 kg/ha of Crop King 44 (providing 33 N, 36 P, 105 K kg/ha) and this was incorporated by grubbing. After transplanting, seedlings were sprinkler irrigated (20 mm) on 18th November 1992. Sprinkler irrigations were also applied on 19th November 1992 (20 mm), 25th

November 1992 (20 mm), 4th December 1992 (20 mm), 29th December 1992 (50 mm) and 6th January 1993 (20 mm).

Urea was broadcast before irrigating on 4th December 1992 at 65 kg N/ha, giving a total of 98 kg N/ha. Weed seedlings were sprayed with Fusilade 0.5 L/ha on 23rd November 1992. Seedlings of a *Cyperus* sp. were chipped on 24th December 1992. Insecticides were applied on 3rd December 1992 (Carbaryl, 80WP), 23rd December 1992 (Endosulfan, 350EC), 24th December 1992 (Carbaryl, 80WP) and 7th January 1993 (Carbaryl, 80WP).

Rainfall was: November 1992, 9 mm; December 1992, 118 mm; January 1993, 477 mm with 420 mm of this falling on 11th to 12th January. Mean minimum and maximum temperatures (°C) were: November 1992, 19.1-31.4; December 1992, 21.9-31.2; January 1993, 21.9-29.2.

RESULTS

Seedlings were transplanted successfully despite the high temperature on the day of planting. Seedling growth was rapid. Grasses were adequately controlled with Fusilade but a *Cyperus* sp. was not controlled and had to be hand clipped. Beets were infested by the beet webworm (*Hymenia recurvalis*) larvae which fed on the lower leaf surface, so at first the upper leaf surface remained intact as a thin colourless membrane (see Attachment). These larvae were readily controlled, despite the difficulty of spraying them as they sheltered under the leaf. The larvae are capable of completely defoliating young plants within a few days. The life cycle of the beet webworm is short and repeat sprayings at approximately weekly intervals were necessary to eliminate leaf chewing. Leaves were colonised by a large range of insects which were not identified as only the beet webworm was damaging the plants. The moths of the beet webworm were very numerous at all times and flew as a cloud if they were disturbed. The beet webworm infests pig weed (*Portulaca oleracea*) in the absence of sugar beet.

Wilting of leaves occurred during hot days, and was acute during hot dry periods if soil moisture was inadequate. During these periods sugarcane adjacent showed little sign of stress.

By 7th January 1993 some plants were infected with *Sclerotium rolfsii* and some had been killed (Table 1). This fungus caused rotting of the crown and leaf stems. Following the heavy rain on 11th-12th January there was flooding to a depth of 300 mm for approximately 6-8 hours. Following this event the *Sclerotium* fungus spread rapidly throughout all varieties in the experiment and by 27th January 1993 most plants had died (see Attachment).

Table 1

Number of plants killed by *Sclerotium rolfsii* by 7th January 1993

Variety	Replicate			
	1	2	3	Total
Beta 44-0435 KW 1119	7	10	11	28
Hilleshog HM 8351	5	8	6	19
Hilleshog WS 91	15	24	8	47
Tachig HM	5	8	14	27
Beta 1996 32-0315	8	4	6	18
Unidentified	6	7	8	21

Total plants per replicate = 80

Hilleshog HM 8351 had the best growth (Table 2) and it also appeared to have more resistance to *Sclerotium rolfsii* than the other varieties. Despite this comparative resistance to *Sclerotium* most plants of this variety had died and all were infected with *Sclerotium* when the experiment was terminated on 27th January 1993.

Table 2

Visual score of yield on 7th January 1993 (1 low - 9 high)

Variety	Replicate			
	1	2	3	Mean
Beta 44-0435 KW 1119	7	3	7	5.7
Hilleshog HM 8351	9	9	7	8.3
Hilleshog WS 91	2	2	3	2.7
Tachig HM	7	4	2	4.3
Beta 1996 32-0315	4	5	3	4.0
Unidentified	3	6	6	5.0

Some beets reached a weight of approximately 1 kg but all were infected with *Sclerotium*. Even with this infection a brix of 10° was measured in the juice.

No seeds planted directly into the soil germinated, despite the ideal conditions.

CONCLUSIONS

None of the varieties listed could be recommended for growing during the hot summer months. They may be suitable for growing during the winter months when the temperature is lower and *Sclerotium rolfsii* may not be so active.

The site used was well drained, lime had provided a suitable pH for sugar beet and cultural treatments were ideal, but the experiment failed to get any plants through to maturity.

The failure to get any seedlings to germinate in the field demonstrated that the young plants require careful husbandry for the crop to become established.

In any future attempt to grow sugar beet at Mackay the services of pathologists and entomologists would be desirable.

I think it will be a challenge to establish and grow sugar beet on saline/sodic soils at Mackay, which are marginal for cane growth, as they are difficult to prepare into a seed bed and form a crust on drying. Adequate irrigation would certainly be a prerequisite as sugar beet wilt very rapidly as soon as they are submitted to moisture stress and the plant available water in saline/sodic soils is less than in the soil used for this experiment.

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