BUREAU OF SUGAR EXPERIMENT STATIONS

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# PROJECT BR 602

# POT AND INTENSIVE CARE YIELD TRIALS

## INTERIM REPORT

by

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## INTERIM REPORT

## 1. MATERIALS AND METHODS

### 1.1 Varieties

Eighteen varieties from the 1974 RVT's were planted to the pot and intensive care trials. The plant source was the Kamma isolation plot.

### 1.2 Treatments

Four pot trials were planted on 30th August at three fertilizer rates, low, medium, high, with two plant densities at the high fertilizer rate. Fertilizer rates were the same as those used in 1973-74. Each trial consisted of six replicates, with five replicates being buffered and the sixth forming part of that buffer. Pot spacing for the low, medium and high dense fertilizer rate trials was 61 cm x 27 cm and for the high fertilizer rate trial was 61 cm x 49 cm. Eight monthly fertilizer applications were made starting in September, 1974. All pots were allowed to tiller freely till mid-January, 1975 and then maintained at one stalk per pot.

The intensive care trial planted on 6th September had five replicates, three buffered and two forming part of that buffer. This trial was planted in normally opened drill furrows (145 cm apart), the plants being 60 cm apart within the furrow. Planting deep in the furrow provided an irrigation channel and precluded the necessity of later supporting the mature stools. In previous trials irrigation was provided by sprays.

Liquifert was applied one week after planting at the rate of 5 grams/plot. All plots were allowed to tiller freely.

### 1.3 Measurements

Tiller counts were made in the intensive care trial on 14th January and 20th March, 1975 and at harvest. Tiller counts in the medium, high and high dense pot trials were made prior to detillering on 14th January and subsequently in the high and high dense trials on 12th February, 5th March, 2nd April and 18th April.

The trials were harvested on 23rd and 24th June. In the pot trials, mid point hand refractometer Brixes were recorded prior to cutting, whilst the total above pot weight, the millable stalk weight and length, and the presence of arrows were recorded for the cut stalk.

In the intensive care trials, each stalk in a plot was sampled at the mid point for a composite hand refractometer Brix, and the stalk number was recorded. The millable cane weight was recorded using a set of clock face scales. The number of arrowed stalks was also noted.

C.C.S. determinations were made by bulking the stalks from all six replicates in the pot trials (excluding low), and bulking, over five replicates, one random stalk from each plot in the intensive care trials.

## 2. RESULTS AND DISCUSSIONS

The trials will be represented as follows: L = low, M = medium, H = high, HD = high dense, IC = intensive care.

### 2.1 Tillering

Correlations were calculated between the average stalk number per plot for farms and the various tiller counts in the yield trials.

Table 1

| r | 14.1.75 | | | | 12.2.75 | | 5.3.75 | | 20.3 | 2.4.75 | | 18.4.75 | | 23.6 | Average | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | H | HD | IC | H | HD | H | HD | IC | H | HD | H | HD | IC | H | HD | IC |
| Farms Stalk | .64 | .75 | .63 | .23 | .52 | .54 | .64 | .66 | .35 | .46 | .46 | .55 | .44 | .38 | .67 | .62 | .33 |

Tillering and farm stalk numbers were reasonably correlated in the pot trials at all counting dates. The lower correlations for the intensive care results are similar to the trends in trials in previous years. The reliable prediction of stalk number from the intensive care trials is not as important as in pots, as yield is taken directly as the amount of cane produced, not as a weight per stalk times tiller number as could be done with pots. The average of all tiller counts was used to calculate an alternative cane and sugar yield in the high and high dense pot treatments (i.e. millable weight x tiller number and millable weight x Brix/100 x tiller number).

## 2.2 Harvest Characters

Various correlations for characters measured at harvest with farm trial characters are given in Table 2.

Table 2

| r | L | M | H | HD | IC |
|---|---|---|---|---|---|
| Farm C.C.S. | -.06 | .42 | Brix .71 | .50 | .59 |
| | | .26 | C.C.S. .23 | .43 | .70 |
| Farm T.C.P.H. | | | Millable weight | | |
| | .43 | .49 | .40 | .54 | .36 |
| | | | Mill. Wt. x Tiller No. (Av.) | | |
| | | | .54 | .56 | |
| Farm T.S.P.H. | | | Mill. Wt. x Brix/100 | | |
| | .51 | .56 | .50 | .64 | .40 |
| | | | Mill. Wt. x Brix/100 x Tiller No. | | |
| | | | .60 | .68 | |
| Farm Stalk Weight | | | Weight per stalk | | |
| | .44 | .80 | .77 | .81 | .71 |

Generally the correlations are similar to those in past trials. The Brix/c.c.s. and c.c.s./c.c.s. correlations are positive and may reflect the attempts to reduce the level of maturity attained in the pot trials. The average farm c.c.s. was 13.30 whilst the averages for the pot trials were (M, 15.35; H, 14.56; HD, 15.09; IC, 13.76). The intensive care trial gave the highest correlation with farms for c.c.s. and had an average c.c.s. nearest the farm average. The other yield characters showed correlations of 0.4 - 0.8 again with a good correlation between field and pot/IC trials for weight per stalk and reasonably high correlations for sugar yield. The characters total weight and length of millable cane were neglected as it is considered that use of these will not improve the pot trial technique of yield evaluation.

## 2.3 Buffering Replicates

Because of the time involved in preparing and maintaining pot trials, it would be beneficial if wasted buffering could be excluded. For example, the present trials (6 replicates x 18 varieties = 108 pots) require 46-52 additional buffer pots depending on the pot spacing. It was thought that partly unbuffered replicates would be too variable and it was with this in mind that the replicate layout as described in section 1.2 was used. To determine the effects of replicates grown as buffers, analyses of variance for Brix and millable weight were computed for all trials as set out in Table 3.

Table 3

| Source | d.f. |
|---|---|
| Blocks | (b-1) |
| (a) Buffers vs Remainder (A) | 1 |
| (b) Remainder (B) | (b-2) |
| Treatments | (t-1) |
| Error | (b-1) (t-1) |
| (a) (A) x Treatments | (t-1) |
| (b) (B) x Treatments | (b-2) (t-1) |
| Total | (bt-1) |

The results of these analyses are presented in Table 4.

Table 4

Brix

| Source | Low | | Medium | | High | | High Dense | |
|---|---|---|---|---|---|---|---|---|
| | M.S.S. | F | M.S.S. | F | M.S.S. | F | M.S.S. | F |
| A | 1.7216 | 3.14 | 6.7926 | 7.62* | 2.2061 | 5.50* | 17.746 | 44.30** |
| B | 4.0682 | 9.08** | 1.2530 | 5.13** | 0.9160 | 3.39* | 6.4772 | 11.32** |
| A x T | 0.5483 | | 0.8920 | | 0.2998 | | 0.4006 | |
| B x T | 0.4482 | | 0.2442 | | 0.4009 | | 0.5723 | |
| S.E./plot | 0.69 | | 0.62 | | 0.55 | | 0.74 | |
| S.E./plot (A) | 0.74 | | 0.94 | | 0.63 | | 0.63 | |
| S.E./plot (B) | 0.67 | | 0.49 | | 0.52 | | 0.76 | |

## Millable Weight

| Source | Low | | Medium | | High | | High Dense | |
|---|---|---|---|---|---|---|---|---|
| | M.S.S. | F | M.S.S. | F | M.S.S. | F | M.S.S. | F |
| A | 17497 | 25.40** | 9276 | 0.99 | 607090 | 17.09** | 322670 | 7.15* |
| B | 9519 | 11.28** | 8139 | 0.90 | 205700 | 7.07** | 332000 | 9.11** |
| A x T | 689 | | 9338 | | 35531 | | 45144 | |
| B x T | 844 | | 9070 | | 29084 | | 36439 | |
| S.E./plot | 29 | | 97 | | 175 | | 197 | |
| S.E./plot (A) | 26 | | 97 | | 188 | | 212 | |
| S.E./plot (B) | 29 | | 95 | | 171 | | 191 | |

## Intensive Care

| Source | Brix | | Millable weight | |
|---|---|---|---|---|
| | M.S.S. | F | M.S.S. | F |
| ABC vs DE (A) | 0.3227 | 0.28 | 15.167 | 0.60 |
| ABC (B) | 5.2156 | 8.11** | 15.098 | 1.50 |
| DE (C) | 0.0400 | 0.02 | 0.380 | 0.02 |
| A x T | 1.1487 | | 25.186 | |
| B x T | 0.6430 | | 10.086 | |
| C x T | 1.9176 | | 19.150 | |
| S.E./plot | 1.04 | | 4.02 | |
| S.E./plot (A) | 1.07 | | 5.02 | |
| S.E./plot (B) | 0.80 | | 3.18 | |
| S.E./plot (C) | 1.38 | | 4.38 | |

The correlations between the buffer replicates and the remaining replicates were calculated as were correlations between a random pair (A) and the remaining three (B) completely buffered replicates.

| Buffer vs Remainder | L | M | H | HD | IC | (A) vs (B) | L | M | H | HD |
|---|---|---|---|---|---|---|---|---|---|---|
| Brix | .73 | .83 | .86 | .83 | .70 | Brix | .74 | .86 | .72 | .88 |
| Millable Weight | .52 | .46 | .75 | .77 | .52 | Millable Weight | .69 | .93 | .96 | .90 |

For Brix, there was a significant difference between the buffer replicate and other replicates in all except the low pot treatments but this was accompanied by significant differences within the other replicates in all pot treatments. Additionally, the standard errors per plot, calculated from the combined and partitioned error mean squares, do not show greater variation between the buffer and remaining replicates than within the remaining replicates, except perhaps in the medium treatment. If this was so, I would have expected a lower buffer vs remainder correlation for the medium treatment and this did not occur. The correlations within the buffered replicates and between the buffering and buffered replicates were very similar for Brix.

Millable weight showed a similar trend in that significant differences occurred both between buffer replicates and the remainder, and between the remaining replicates for all except the medium trial, in this case. Comparison of the different standard errors showed little difference in variation between the different replicate groups, although the correlations between buffered and buffering replicates are not as high as between the buffered replicates.

The intensive care analyses are interesting in that significant differences only occurred for Brix between the remaining (buffered) replicates. I had anticipated that the edge effect would have had a greater influence in this intensive care trial than in the pot trials, but in fact the differences between the buffering replicates (D-E) appears to be less than that between the other replicates (A-B-C).

The standard error figures show little difference in variation between the different replicate groups, although the correlations suggest, at least for millable weight, that the buffering replicates ranked varieties differently to the buffered replicates. Generally it would appear that complete replicates could be used to buffer both pot and intensive care trials.

### 2.4 Multiple Regression Analyses. Farm Trials vs Pot Trials.

Multiple regression analyses were computed on data from the 1973 and 1974, 1975 pot and intensive care yield trials and their corresponding farm trials. The aim of those analyses was to choose two

or three pot trial treatments which together or individually would best predict farm trial performance, primarily with regard to yield of cane. The suitability of treatments was gauged by comparing the relative differences in $R^2$ values when each variable in turn was excluded from the analyses. Additionally, the relative magnitude of the standardized regression coefficients b' and the simple correlation coefficients were considered.

For cane production on farm trials, pot trials were ranked in order of decreasing importance as follows:-

| | |
|---|---|
| 1973 (8 farms): | H, M and I |
| 1974 (7 farms): | $I_1$, H and D, M, ($I_2$ - H - L) |
| (2 farms, Group 1): | HD, (H - $I_2$), (M - L - $I_1$) |
| (3 farms, Group 2): | M, L, H, HD, $I_1$ $I_2$ |
| 1975 (3 farms): | (H - I), HD, M, L |

For average weight per stalk, the pot trials were ranked as follows:-

| | |
|---|---|
| 1973: | H, I, M |
| 1974 (7 farms): | $I_2$, $I_1$, (HD - H - M - L) |
| (Group 1): | ($I_1$ - $I_2$) (HD - H - M - L) |
| (Group 2): | $I_2$, $I_1$ (HD - H - M - L) |

From these results, the intensive care, high and high-dense treatments would probably be best suited for yield prediction, although this decision cannot be conclusive.

The current YOT-variety pot trials include low, high-dense and intensive care treatments and it is apparent from these results that the low treatment will not contribute to the selection of varieties of potentially high farm yield. For future trials, the low treatment will probably be excluded and only the two treatments used to evaluate varieties.