SUGAR MILLING RESEARCH INSTITUTE

Technical Note No. 02/07

Title	:	Results of questionnaire on the effects of cane variety on factory performance
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Introduction

As part of its Research Programme, the Sugar Milling Research Institute (SMRI) is investigating the effect cane variety has on factory processing. To gain more information on what varieties are currently believed to cause processing problems in the factory, the SMRI compiled a questionnaire. The main aim of the questionnaire was to use this information to guide further research into cane characterisation.

Methods

The questionnaire was divided into two parts. The first part concentrated on milling of the cane and the second part investigated processing of the juice into sugar. Five questions were asked on milling (Q1 to Q5) and another four on processing (Q6 to Q9).

Results

The questionnaire was sent to all the South African Factories on 22 December 2006. Out of a total of 14 factories, 8 replied (53%). The factories that completed questionnaires were UK, SZ, ES, UC, UF, PG, ML and KM. Unfortunately no Tongaat Hulett factories completed the questionnaire. The questions asked in the questionnaire and the subsequent responses are shown below.

Q1) **Are varieties entering the factory being recorded timeously? If not, would there be a major benefit to the factory if the recording of varieties entering the factories be improved?**

Mill	Responses (summarised)
UK	Varieties entered as they enter the factory.
SZ	No comment.
ES	Varieties not been recorded timeously, but plan to institute better policy in 2007.
UC	Are been recorded accurately but there are some errors.
UF	Yes. No benefit for factory.
PG	Yes. Useful for growers and millers.
ML	No. No major benefit for factory.
KM	Yes been recorded timeously, but data integrity highly dependent on growers updating field data.

Question 1 gave mixed responses; about 40% of the respondents did not think that varieties were recorded timeously while 50% thought that varieties were being recorded timeously. There were 25% of the respondents who stated that there was no benefit of recording varieties timeously and about 40% who stated there was a major benefit.

Q2) Are shredder settings or mill settings adjusted for different varieties of cane? Are there any noticeable differences in softness/hardness of individual varieties?

Mill	Responses (summarised)
UK	Yes some varieties are harder to mill than others and shredder settings are adjusted. Mill setting not varied. Effect of cane hardness seen on cane knife and shredder pressures.
SZ	No, shredder and mill settings not adjusted. N21 does not cut easily and can cause chokes.
ES	Not adjusted for variety but for percolation characteristics. Link between percolation and variety unknown. No noticeable difference observed in hardness/softness of different varieties.
UC	No setting adjusted. Difficult to notice differences in cane.
UF	Washboard setting adjustments carried out on DRI results.
PG	No settings adjusted.
ML	Adjustments carried out on fibre loading and not variety. Difficult to note differences in softness and hardness of cane.
KM	Not normally adjusted; only if there is excessive pith in the cane.

Only one factory adjusted shredder settings based on variety. Another factory noticed that variety can be difficult to prepare. Most of the respondents would adjust shredder and mill settings based on fibre loading. Some commented that it is difficult to notice varietal effects when a multi variety intake of cane is crushed.

Q3) Have there been varieties that have had a large amount of pith? If so has this caused problems during extraction?

Mill	Responses (summarised)
UK	Yes, experienced when fibre%cane is low. Although extraction can remain high, flooding and sometimes washout does occur.
SZ	No problems.
ES	High pith cane has occurred, normally associated with frosted cane. Effect of variety not been explored.
UC	Do not know.
UF	No problem. Seasonal fibre loading has a major influence on extraction.
PG	Problem not significant. N25 has high pith.
ML	Yes, varieties with large amount of pith does cause problems in the diffuser and contributes to flooding phenomena, bed blinding and low percolation rates.
KM	Yes, N14 has excessive pith after flowering and later in the season (after October). N14 and N19 also have high pith content under drought conditions.

Of the 8 factories that responded, 6 of them experienced problems with high pith content, with the northern irrigated areas most affected. N14, N19 and N25 were highlighted as problematic varieties concerning their pith content.

Q4) Have there been problems with particular varieties concerning chokes in chutes, problems with milling, flooding in diffuser and high moistures in bagasse?

Mill	Responses (summarised)
UK	Most choke points been eliminated. Operational issues mentioned always take place sometimes during the year and are not variety specific.
SZ	No problems.
ES	Unknown. These type of problems more associated with high ash/sand levels in cane.
UC	Difficult to know in a multi-variety intake.
UF	No. Flooding is common in the diffuser mainly due to the large amount of sand coming in with the cane and affecting the percolation rate.
PG	Cannot attribute to a single variety, even though N25 appears to increase flooding in the diffuser
ML	Yes but these are problems largely associated with cane quality. If the quality of the cane is further analysed, the effect of cane variety cannot be ignored.
KM	Flooding at KM has been associated with abnormal amounts of pith.

The problems in the front end of the factory are mainly caused by cane quality and it is difficult to attribute the causes of these problems to variety.

Q5) Are there any other problems regarding the effect of varieties on milling?

Mill	Responses (summarised)
UK	Low feed rate on mills during fibre % cane part of the season.
SZ	No.
ES	No.
UC	No.
UF	No.
PG	Ash% bagasse is high, despite sand removal system. Maybe a function of cane lodging. Chokes in factory caused by extraneous matter, unknown if variety related.
ML	Yes, some varieties of cane have a tendency to lodge which is difficult to cut and causes problems in cane offloading and cane preparation.
KM	No other noticeable problems.

There appears to be a concern with cane lodging of some of the varieties. This causes an increase in the amount of sand/ash in the cane whilst being removed from the fields.

Q6) Is there a noticeable varietal effect on colour in the factory regarding colour of juice and sugar?

Mill	Responses (summarised)
UK	Not monitored.
SZ	Hard to quantify, at SZ mixed varieties are crushed.
ES	Unknown, cane freshness seems to have a noticeable affect.
UC	Difficult to say, but based on work done N12 and N16 have higher colours than cane grown in the northern irrigated areas of KM and ML.
UF	No, poor colour after long stops (old cane).
PG	Syrup colour generally low but VHP not always < 1000 ICUMSA units. Difficult to make comparisons unless controlled tests are done.
ML	No comment.
KM	Yes N25 has high noticeable high colour if cut young.

Most respondents felt that it was difficult to relate colour to variety due to a multi variety intake. Two of the respondents stated that high colour is associated with cane quality. Only one factory, KM, noticed a varietal affect on colour.

Q7) Does variety have any noticeable effect on clarification and mud filtration?

Mill	Response (summarised)
UK	Not monitored, no mud filtration at UK.
SZ	Hard to quantify.
ES	Unknown, freshness of cane and ash/sand seems to have noticeable effect.
UC	No, dextran is the biggest problem in these processes.
UF	No, poor clarification after rains and latter part of the season.
PG	Instances of turbid juices characteristic of high dextrans.
ML	No comment.
KM	No noticeable affect.

From the responses the effect of variety on clarification is not observed but rather linked to cane quality.

Q8) Do any particular varieties have high ash levels and are there any noticeable differences in exhaustion or target purity if different varieties are being crushed?

Mill	Response (summarised)
UK	Not monitored.
SZ	Hard to quantify.
ES	Unknown, cane freshness seems to have a more noticeable affect.
UC	Main varieties all have similar ash levels.
UF	Difficult to say.
PG	Difficult to say only if controlled tests are done. TPD variation has similar trends to rest of industry.
ML	No comment.
KM	No noticeable correlation.

Based on the results of the respondents there is no noticeable varietal effect on ash and on exhaustion and tpd.

Q9) Are there any other problems regarding the effect of variety on processing?

Mill	Response (summarised)
UK	No comment. No observations or trials done to verify effects of cane variety on processing.
SZ	Hard to quantify.
ES	Unknown.
UC	UC has increased non-pol loadings due to N31 being crushed. N31 which forms 10% of UC crush has low sucrose % cane and low purity.
UF	No.
PG	Almost 15 varieties crushed at any one time. Controlled tests would indicate appropriate trends.
ML	No comment.
KM	Main processing problem at Komati Mill is the appearance of needle grain after first seasonal rains. This cannot be attributed to any one variety.

With the exception of UC, none of the respondents could identify other problems with any variety. UC included a memorandum (Lutze and Waldron, 2006) with the questionnaire to highlight the problems they are having with N31. They have concerns that due to the high non-pol loading and low purities of N31, it will decrease crush rate and mill income will be affected.

Conclusions

The results obtained from this questionnaire have indicated that it is difficult to correlate the effects of cane variety on processing. Cane quality, seasonal changes and crushing different variety mixes will at most times mask any varietal effect. There appears to be a larger varietal impact on cane preparation and extraction plants, than at the back-end of the factory. This is probably due to the heterogeneous nature of the cane where it is easier to identify a variety that has just been crushed than juice, syrup and sugar streams that have been crushed hours before and are now well mixed with many other varieties.

The questionnaire was able to highlight the following issues for consideration:

- At SZ it was observed that N21 is a “hard” variety, being difficult to cut and prepare.
- At UK shredder washboard settings are adjusted for different varieties in some cases.
- PG has observed high pith content in variety N25.
- ML has experienced high pith varieties and KM has observed large amounts of pith in variety N14 (after flowering or under drought conditions) and N19 (under drought conditions). Both factories have experienced flooding problems associated with varieties having high pith content.
- Both PG and ML have observed that varieties that tend to lodge have been associated with high ash/sand in cane and/or difficulties in handling and preparation.
- KM observed that variety N25, if cut young has noticeable high colour.
- UC has experienced high non-pol loading with variety N31.

References

Lutze, R and Waldron, P (2006). The effect of delivery levels on mill throughput and income. Internal Memorandum UCL Company Limited, 2 pp