FACTORS AFFECTING CANE QUALITY IN JAMAICA

By

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Abstract

The Jamaica Recoverable Cane Sugar (JRCS), a measure of cane quality, was employed as the dependent variable for regression analysis conducted to determine the factors influencing cane quality during the period 1993 to 1998 at three sugar estates in Jamaica namely Frome, Worthy Park and Appleton. An analysis of the effect of temperature, rainfall, age at harvest, and tonnes delivered revealed that temperature and rainfall one month before harvesting had the most significant influence on cane quality. At Worthy Park, where the mean temperature is 18.12°C and a standard deviation of 1.33 compared to Frome’s 20.67°C and a standard deviation of 1.48 (Table 1), the impact of temperature on cane quality was less significant.

R2 = 0.38AGE - 0.12TEMP - 0.00RAIN1 - 2.25E-05TONNES + u.

Where:
• AGE—AGE AT HARVEST;
• TEMP1—Minimum temperature one month before harvesting;
• RAIN1—Rain one month before harvest;
• TONNES—Tonnes cane harvested;
• u—other factors (residual error).

Rainfall, age and minimum air temperature collectively had the most significant influence on the quality of the cane harvested from the Frome estate. Statistical analysis of the rainfall data showed that the adverse effect on cane quality was significant as cane quality decreased with increased rainfall.

‘Temp 1’ showed a more significant effect on cane quality than the rainfall as indicated by the t-statistic -6.32 with probability 0.000 for temperature compared with t-statistic -2.02 and probability 0.051 for rainfall. Also, as temperature decreased, there was a corresponding increase in the JRCS—correlation coefficient -0.73.

The ‘temp 1’ was significant indicating that the minimum temperature in the preceding one month before harvesting influences cane quality. At Worthy Park, where the mean temperature is 18.12°C and standard deviation of 1.33 compared to Frome’s 20.67°C and a standard deviation of 1.48 (Table 1), the impact of temperature on cane quality was less significant.

KEYWORDS: Jamaica Recoverable Cane Sugar (JRCS), Cane Quality, Minimum Air Temperature, Rainfall.
Cane quality improved with age, as there was an accumulation of sucrose indicated by the t-statistic 9.96 and probability 0.0045. The variables: age, rainfall, temperature and tonnes cane explained less than 35% of the variation in JRCS at Appleton and Worthy Park. In the case of Appleton the minimum air temperature was the only significant variable (t-statistic -3.69, probability 0.0008). This variable indicated that a decrease in minimum air temperature was associated with a corresponding increase in JRCS.

Results from the regression analyses conducted indicated that minimum air temperature had the most significant effect on cane quality at Frome. There is less variability in age of cane harvested, minimum temperature and rainfall throughout the harvesting period at Worthy Park.

Rainfall and temperature do have a significant effect on quality as shown in the analysis of Frome's data. The relationship is not as strong at Appleton with temperature being a less significant determinant than at Frome. The effects of temperature and rainfall were not significant at Worthy Park, although it can be inferred that there is a relationship with the lowest temperature and consistently higher sucrose percentage. The non-significant effect of temperature over the cropping period suggests that Worthy Park management practices are better able to counter the negative effects of high minimum temperature and rainfall.

Conclusions

The main factors that influence cane quality at Frome are age, temperature and the amount of rainfall one-month before harvesting. Only the minimum air temperature one-month before harvesting was shown to be a significant influence on the cane quality at Appleton. Neither rainfall nor temperature had a significant influence on cane quality at Worthy Park, although the mean temperature was 18.12°C (std 1.33) compared to Frome's 20.67°C (std 1.48). Sucrose was not at the maximum when immature or over-mature canes were harvested. This suggested that age at which canes are harvested (ie. less than 10 months and >13 months) should be judiciously monitored to optimise sugar yield.

Age of canes harvested, 'kill to mill', and consistency during the harvesting period appeared to be factors impacting on cane quality and sugar yield. If canes are harvested at the correct age and delivered within 48 hours, this could result in improved cane quality leading to an increase in the amount of sugar produced. The judicious management of these controllable variables at all times will maximise sugar yields when weather conditions are ideal.

REFERENCES


FACTEURS AFFECTANT LA QUALITE DE LA CANNE EN JAMAIQUE

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Résumé

Le sucre récupérable au Jamaïque, une mesure de la qualité de la canne, a été utilisée comme une variable dépendante dans une analyse de régression pour identifier les facteurs qui ont influencé la qualité de la canne de 1993 à 1998 sur trois propriétés sucrières, à savoir Frome, Worthy Park et Appleton. Une analyse des effets de la température, de la pluviométrie, de l’âge à la récolte et du tonnage réalisé a démontré que les paramètres de température et de pluviométrie avaient la plus grande influence sur la qualité de la canne durant le mois précédant la récolte. A Frome, les variables analysées constituaient 67% de la variation. A Worthy Park et Appleton, deux usines privées, la pluviométrie et la température avaient moins d’effet sur la qualité. Cette information peut être utilisée pour améliorer la gestion de facteurs contrôlables influençant la qualité afin d’optimiser le rendement de la canne et finalement la viabilité financière de l’industrie sucrière de la Jamaïque.

Mots clés: Sucre récupérable, qualité de la canne, température minimale de l’air, pluviométrie.

FACTORES QUE AFECTAN LA MADURACIÓN DE LA CAÑA EN JAMAICA

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Resumen

El azúcar recuperable en Jamaica, es una medida de la calidad de la caña y fue empleado como una variable dependiente para un análisis de regresión realizado para identificar los factores que afectaron la calidad de la caña en el periodo de 1993 a 1998 en los ingenios Frome, Worthy Park y Appleton de Jamaica. El análisis de la temperatura, precipitación, edad de cosecha y las toneladas entregadas revelan que la temperatura y la precipitación del mes anterior a la cosecha tuvieron el mayor efecto significativo en la calidad de la caña. En Frome las variables analizadas explicaron el 67% de la variación. En Worthy Park y Appleton, dos ingenios privados, la precipitación y la temperatura fueron menos importantes en la determinación de la calidad de la caña. Esta información puede ser utilizada para mejorar el manejo de los factores controlables que afectan la calidad de la caña y también para optimizar la producción de azúcar y mejorar la viabilidad económica de la industria en Jamaica.