THE CONCENTRATION OF JUICE OF DIFFERENT JOINTS ALONG SUGAR CANE STALKS

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ABSTRACT

The observation of two cases in which the normal variation of the concentration of the juice along sugar cane stalks has been drastically upset was reported.

A case refers to the distribution of juice concentration observed along stalks produced by second ratoon from a seedling taken from the field. Of the seven stalks of the stool, one showed a Brix % on juice which was low at joints near the base (about 14% Brix), and increased to a maximum during the harvest season towards the top of the cane stalk (22.9% Brix at the last joints, at the last testing date on 11 September 1978). Purity values determined at this date were higher than 90% even in the low Brix joints. Another five stalks showed similar abnormalities, although not as striking. Only one stalk in the stool showed what can be considered a normal distribution of juice concentration.

The other case refers to the distribution of juice concentration observed along stalks that suffered some frost damage. In these stalks a low Brix % value (about 13% in some cases) was found in the juice of the lower joints. Brix % increased toward the top of the stalk, up to values higher than 21% in some cases. This was a prevalent phenomenon affecting an important proportion of the commercial field still standing at the end of the 1978 harvest at Tacuman, Argentina.

INTRODUCTION

It is generally accepted that the concentration of the juice of the above-ground joints of sugar cane stalks is higher near the base and decreases toward the top (Alexander1 van Dillewin4). The purpose of this note is to report the observation of two cases which do not follow the general trend.

The first case refers to the distribution of concentration observed along
stalks obtained as second ratoon from a seedling taken from the field at Estacion Experimental Agricola de Tucuman. During the harvest season the Brix % along the stalks was followed, and six of the seven stalks of the stool showed abnormalities, which were rather striking in one of them (stalk 5).

The second case refers to commercial plantations which had suffered some damage by frost (leaves and top arrow were destroyed). In this case an important proportion of the fields showed stalks with a notable depressed Brix % in the lower part, with higher values toward the top.

MATERIALS AND METHODS

As mentioned, in the first case the material consisted of a stool of seven stalks produced by second ratoon of a seedling taken from the field at the Estacion Experimental Agricola de Tucuman, and of another 50 stalks nearby. Brix % was measured at different joints along the stalks at three dates during the harvest season with a field refractometer. At the date of the last observation several joints (not punched in previous Brix observation dates) were individually pressed and Brix % (by laboratory refractometer) and Pol % (by weighing and diluting to 100 ml, and clarifying with dry basic lead acetate) were determined in some of the stalks.

For the second case, samples were taken from commercial fields which were damaged by frost in the 1978 season in the province of Tucuman, Argentina. The analytical methods were the same as mentioned for the first case.

RESULTS AND DISCUSSION

The First Case

Fig. 1 shows the variation of Brix % taken with field refractometer at the indicated three dates during the harvest season on one of the stalks (no. 5) of the stool mentioned above. The values labeled 4/6/78 show that at that date the Brix % of the juice had a comparatively low value at the lower joints increased to a maximum somewhat above the middle of the stalk, and decreased again toward the top of the stalk. The other curves show that this concentration profile changed during the harvest season with the concentration peak towards the top of the stalk, on 11/9/78 (Fig. 2).

Fig. 2 also shows the values of Brix % and Pol % of the juice of joints of the same stalk, and the corresponding Purity values. The Brix % values confirm those obtained by field refractometer. The Purity values are worth noting due to their high level, even in the low Brix juices. In fact, this situation constitutes an exception to normal Brix-Purity relations in normal cane stalk sections, in Fig. 3 the results of Fig. 2 are plotted in the Brix-Purity plane. The region of the plane labeled “Normal Zone” represents the region which contained the points obtained.
FIGURE 1: Evolution of Brix % along stalk no. 5 during the harvest season.

FIGURE 2: Brix %, Pol %, and Purity along stalk no. 5 at 11/Sept./78.
Figure 4. Variation of Brix % Poll % and Purity along a stalk of an MA 86-79. A Data Analysis.

Figure 3. Brix Purity values obtained for stalk no. 5.

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with fresh cane stalk sections analyzed in the laboratory in the years 1974-1978. It can be seen that several of the Brix-Purity points corresponding to the considered stalk, lay far outside of the normal zone.

At the first observation date (first days of June) three of the seven stalks of the stool already showed anomalous distribution of concentration similar to that of stalk no. 5 just described, but at the last observation date (middle of September) six of the stalks showed some degree of abnormality, characterized by a concentration peak near the top of the stalks. Only one of the seven stalks of the stool showed normal distribution of concentration at the three observation dates (detailed information will be published in a separate report by Hoffmann). The stalks under consideration had no external indication of abnormality, did not show symptoms of severe disease, were not affected by frost and did not show lateral shoots. Only two joints in the seven stalks were damaged by the borer.

Another 50 stalks, originating from other seedlings planted in the surroundings, were checked for their concentration tendency, and all were found normal.

The Second Case

The second situation of interest arose when stalks of NA 56-79, the more extensively planted variety in Tucuman, were analyzed joint by joint in December, 1978, in fields that had been affected by frost. The results obtained in one of these stalks are shown in Fig. 4. The low values of concentration toward the lower part of the stalk are striking. Purity values were rather high in the juice of all joints (usually above 90%). These values, taken to a Brix-Purity graph show deviations from the normal zone in a similar way as in the previous case.

After the discovery of this abnormality (Dec. 14, 1978), stalks of other varieties and from different places in the province were analyzed. Another example is given in Fig. 5 for the variety Tuc 68-19. It was found that probably more than 30% of the fields left standing were affected by the phenomenon. All the fields in which the abnormality occurred had leaves and top arrows damaged by frost, and the stalks had grown lateral shoots from the upper buds. However these were not of common occurrence because in some fields in which they occurred the stalks showed the normal distribution of concentration approximately uniform all along the stalk.

During the harvest season the concentration began to decrease, unaccountedly. One of the factories yet milling at the end of the season experienced during November a drastic drop in the Brix % of the first juice extracted.

The frequency of this phenomenon occurring in cane damaged by frost is unknown, but from the data of factory reports it has been observed that seasons
affected by frost are characterized by lower values of Brix % in the first juice that is extracted. It is reasonable to suspect that part of this Brix % decrease is due to this phenomenon.

REFERENCES


La concentración del jugo en diferentes nudos a lo largo de los tallos de cana de azúcar

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Resumen

El propósito de esta comunicación es informar la observación de dos casos en los cuales la variación normal de la concentración de jugo a lo largo de los tallos de cana han sufrido un vuelo drástico. Uno de estos casos se refiere a la concentración del jugo observado a lo largo de los tallos producidos por caña soca de 2 años en un seedling llevado a campo. De los siete tallos de la planta madre uno mostró un Brix % en jugo que ha sido bajo en las juntas (nudos) cerca de la base, (cerca del 14% del Brix) y aumentaba a un máximo con una posición que se movía durante la estación de cosecha hacia el extremo superior del tallo de la caña (obteniéndose un valor de 22,9% Brix en el último nudo en el periodo final de observación, el 11 de setiembre de 1978).

Los valores de pureza determinados a esta fecha fueron más altos que el 90%, aún en el brix de los nudos de la base.

Otros cinco tallos mostraron anormalidades similares, aunque no en tal grado. Solamente en tallo de la planta madre mostró lo que puede ser considerado una distribución normal en la concentración del jugo. El otro caso se refiere a la distribución de la concentración del jugo observado a lo largo de los tallos que ha sufrido algún daño por la helada.

En estos tallos un valor bajo de 10%, cerca del 13% en algunos casos, fue encontrado en el jugo de los nudos más bajo. El Brix % incremento hacia la parte superior del tallo hasta valores más altos que el 21%. En algunos casos este fue un fenómeno masivo afectando una importante proporción de los cultivos comerciales, permaneciéndolo aún hasta el final de la cosecha de 1978.