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Effects of Leaving Burnt Cane in the Field on Yield and Quality of Sugarcane

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ABSTRACT

Three varieties of sugarcane : U-thong 1, U-thong 2 and F140 were used to determine the yield and quality of sugarcane using different treatment before harvesting. In the first group, the canes were burnt and the whole-stick were cut and left to stand in the field for several days. The second group was green harvest the cane over a range of different times. It was found that burnt cane whole-stick cut and left in the field lost more weight than the green cane. During the hotter harvest months of November and March, burnt canes lost more weight than those of January harvest. U-thong 2 and F 140, the high sugar content varieties lost more weight and CCS than U-thong 1. The March harvest lost more cane weight than the November and January harvest. Green harvest whole-stick cut cane could be left for more than 14 days with only a slight decline in CCS, as compared to the burnt canes. However, both green and burnt cane should be transported immediately to the mill after harvesting. The average purity of the green harvest whole-stick cut cane was significantly higher than those of the burnt cane when left in the field for more than 5 days.
Key words : burnt cane, harvesting, sugar content, fiber

INTRODUCTION

In the milling year 1993/94, 37.6 million tons of cane were crushed in Thailand. Out of this, 25 percent or 9.5 million tons were burnt cane, compared to 5.1 percent or 1.8 million tons in the milling year of 1992/93. The average rate of sugar recovery in 1993/94 was 101.5 kg per ton of cane compared to 104.1 kgs in 1992/93. The production of molasses developed much more in 1993/94, with an average of 50.6 kg per ton of cane compared to 46.1 kg in the previous year. Burning of the cane resulted in a low recovery of sugar which took a longer time to process. Burning of the cane also causes pollution of the air, together with a fire risk from airborne burning materials spreading to adjoining fields and farm houses. A decline in the quality of burnt cane sets occurs within only a few hours, and this decline increases rapidly thereafter. The objective of this trial was to investigate how much difference the quality of burnt cane as compared to green cane. The observations used were loss of cane weight over time and changes in the quality of sugar.

In Queensland, Waddell (1957) reported that when the Q 50 cane variety was burnt and whole-stick cut cane left in the field for 9 days, the losses of weight and sugar content were 15.4 % and 14.8 %, respectively compare with green cane harvest and whole-stick cut cane left in the field for 9 days, lost 12.2 % of its weight and 18.7 % of sugar content. Du Toit (1962) reported that NCo 339 cane variety lost sucrose diminutively when it was harvested green and whole stick cut left in the field for 17 days. The loss of sucrose was rapid when the cane was burnt and left standing in the field.

MATERIALS AND METHODS

The experiment was conducted at Suphan

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Buri Field Crops Research Center, U-Thong, Suphan Buri from March 1993 to March 1994, in a split-split plot design with 4 replications. The main plots were composed of the times of harvest, these being November 1993, January 1994 and March 1994. The subplots consisted of 3 sugarcane varieties, which were U-thong 1, U-thong 2 and F140. Each variety plot was divided into subplots of methods of harvest, these being 1) green harvesting, 2) burning and whole-stick harvesting and 3) burning and standing in the field (and harvesting thereafter). Each plot size was 5.2 × 6 m. Cane was planted in March 1993 and harvested in November 1993. At harvesting, in the green harvest treatment, all 3 varieties were cut green and each variety was left 200 kgs in the field to determine cane yield and juice quality deterioration at 1, 3, 5, 7 and 14 days after cutting. In the burning treatment, the cane was burnt and devided into two halves, one for burnt cane left standing in the field another one was burnt, cut and left 200 kgs in the field. The deterioration of cane yield and juice quality were determined as same as in the green cut cane. These harvesting and evaluation techniques were also used for cane harvested in January and March.

RESULTS AND DISCUSSION

All the varieties of cane lost more weight when burnt, whole-stick cut and left for 14 days in the field compared to green cane (Figure 1). Burnt cane and whole-stick cut left in the field lost an average of 22.4 % of weight compared to 18.3 % of green cane (Figure 2). This happened also in the January harvest (Figure 3) where burnt cane and whole-stick cut lost an average of 19.7 % weight compared to 14.2 % of green cut, left in the field for 14 days (Figure 4). A similar trend occurred also with the March cutting (Figure 5 and 6). F140 cane lost more weight than U-thong 1 and U-thong 2 when harvested in January and March 1994. In the November harvest, burnt U-thong 2 lost more weight than U-thong 1 and F140. In the March harvest, all varieties lost their weight whether no matter burnt or green cane.

In Thailand, the temperature in March is higher than in November and January. Cane harvested in March lost more weight than that harvested in November and January, even though the harvesting moisture content of cane in March is higher. Cane cut and left in the field in November lost more weight than that cut in January. The hot temperatures caused greater loss of weight in the burnt cane. The juice in the outer parenchyma and vascular bundles actually boils in fire and perforates the epidermal tissue. Burnt cane cut and left in the field in November and March, which have higher temperatures lost more weight than the cane

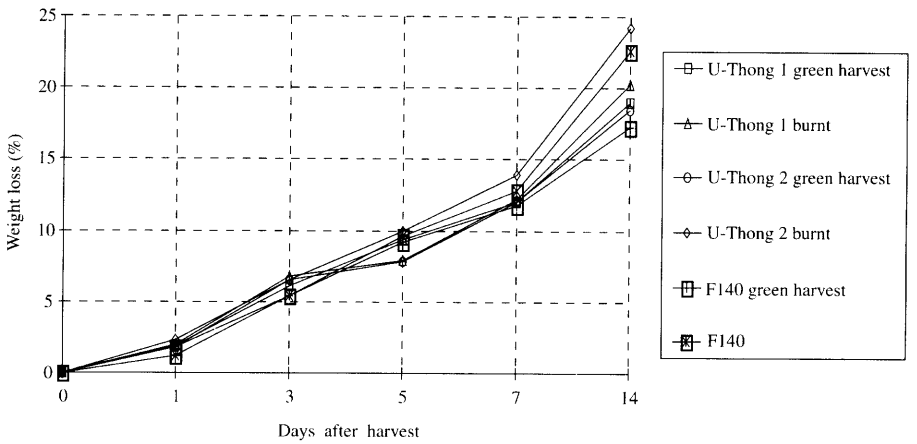

Figure 1 The percentage of weight loss in each variety under burnt and green cane harvest in November harvest.

Table 1 Humidity and temperature during the harvesting months.

	Humidity (%)		Average	Temperature (°C)		Average
	Minimum	Maximum		Minimum	Maximum	
November 1993	40	82	61.0	21.0	31.6	26.3
January 1994	33	84	58.5	18.4	32.7	25.6
March 1994	42	91	66.5	23.0	35.1	29.0

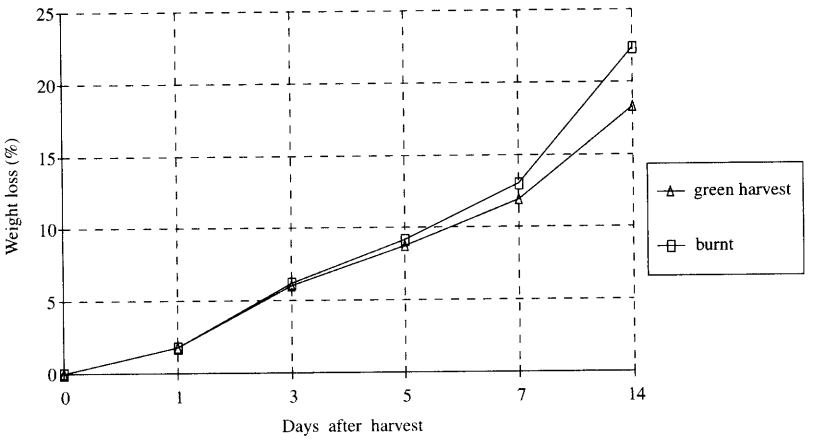

Figure 2 The percentage of weight loss under burnt and green cane harvest in November harvest (average from three varieties).

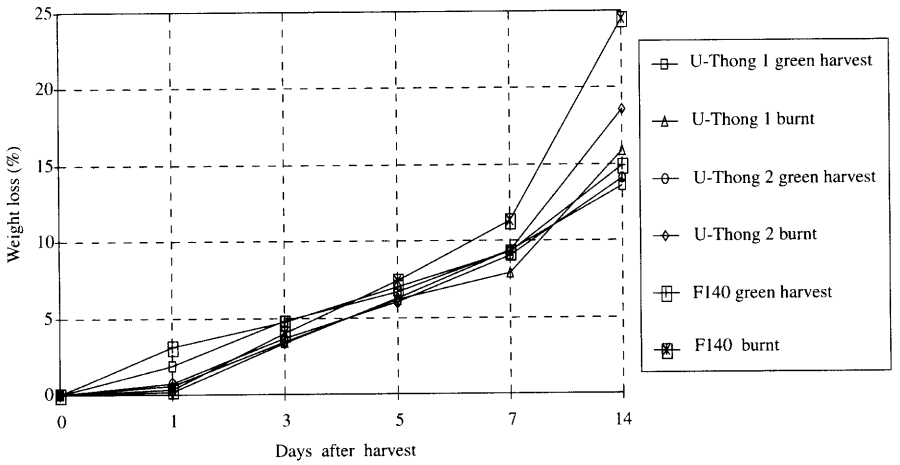

Figure 3 The percentage of weight loss in each variety under burnt and green cane harvest in January harvest.

harvested in January because of the severe burning and extreme evaporating conditions. This agrees with the findings in Queensland (Anonymous, 1981), which measured losses of sugar and water from cane in fires. It was found that burnt cane with moderate fires had the smaller mass loss than burnt cane with severe fires.

In November, the average CCS content in burnt cane was higher than in the green cane in the first three days. (Figure 7). After the third day, the CCS in burnt cane declined rapidly. At burning the water in cane stalk was rapidly evaporated by fire caused a very high concentration of cane juice. This also increased CCS of the cane harvest in November. However, after burning there was a strong discharge of soil water into the cane stalk because of high moisture level still remained in the soil in November. High water uptake of burned cane will dilute cane juice and breakdown sucrose into other forms of sugar. Finally the CCS in

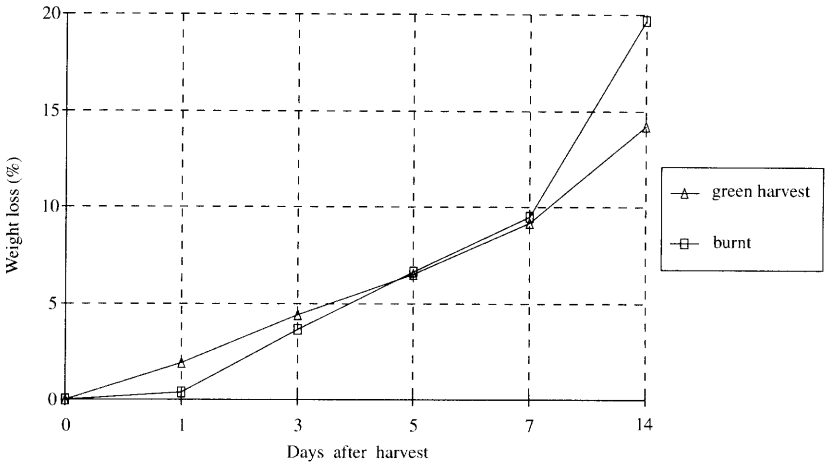

Figure 4 The percentage of weight loss under burnt and green cane harvest in January harvest (average from three varieties).

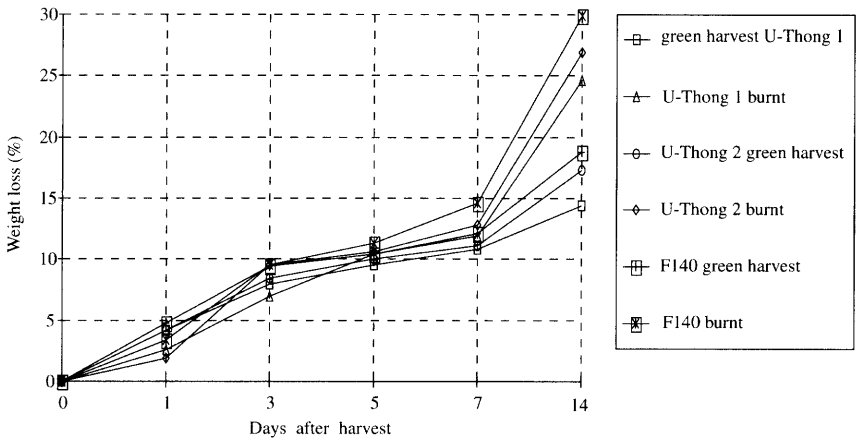

Figure 5 The percentage of weight loss in each variety under burnt and green cane harvest in March harvest.

November burnt cane declined rapidly. In the case of burning therefore, cane should be transported to the mill within three days.

Within 24 hours, burnt cane contained a higher CCS content than the green cane in January. (Figure 8) Therefore burnt cane should be transported immediately to the mill.

Burnt cane in the March cutting, sugar content reduced rapidly. (Figure 9) For burnt cane left standing in the field more than 3 days the CCS declined similar to burnt and whole stick cut cane left in the field more than 5 days. It must therefore be transported to the mill immediately. For burnt cane left standing in the field, the sugar contents of U-thong 2 and F140 (high sugar content) deteriorated quicker than U-thong 1 which is a high cane yield variety and low sugar content.(Figure 10). This observation keep along well with the result of

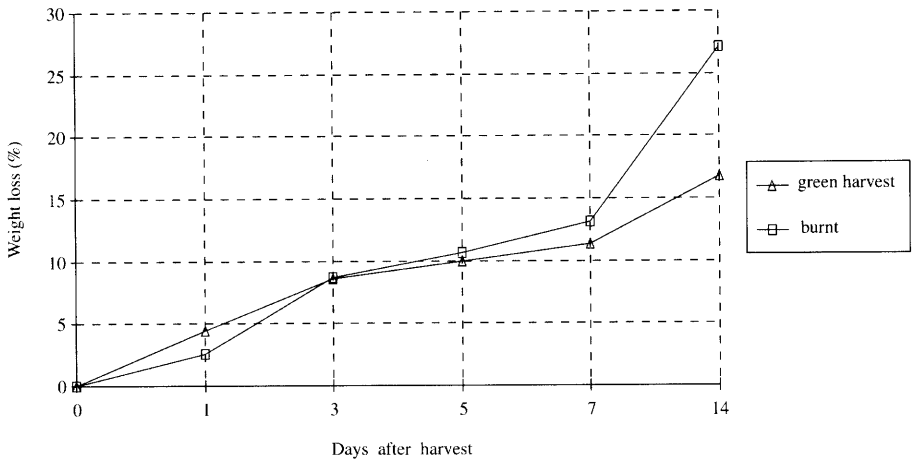

Figure 6 The percentage of weight loss under burnt and green cane harvest in March harvest (average from three varieties).

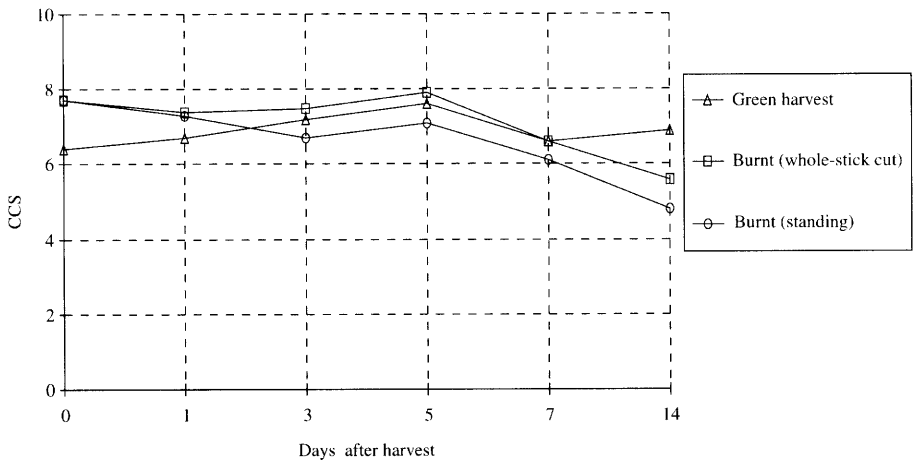

Figure 7 Changes in CCS of burnt and green cane after firing and left in the field in November harvest (average from three cane varieties).

Samuels and Cayere (1967), in Puerto Rico. Who evaluated over a 5-day period the sucrose changes in burned cane harvested immediately and ground at 1-day intervals, and cane left standing and ground at 1-day intervals. Of the two varieties studied, P.R. 1028 (a "sweet" variety) lost a greater percentage of sucrose than P.R.980 (a high tonnage variety). Burnt cane left standing in the field for more than 3 days contained significantly less sucrose than the green cane left in the field. The burnt whole-stick harvest, left in the field for more than 14 days contained significantly less sucrose than the green cane harvest left in the field (Figure 11). Burnt cane left standing in the field, lost more sucrose than burnt cane whole-stick cut left in the field. This result confirmed the finding of experiment in Phil-

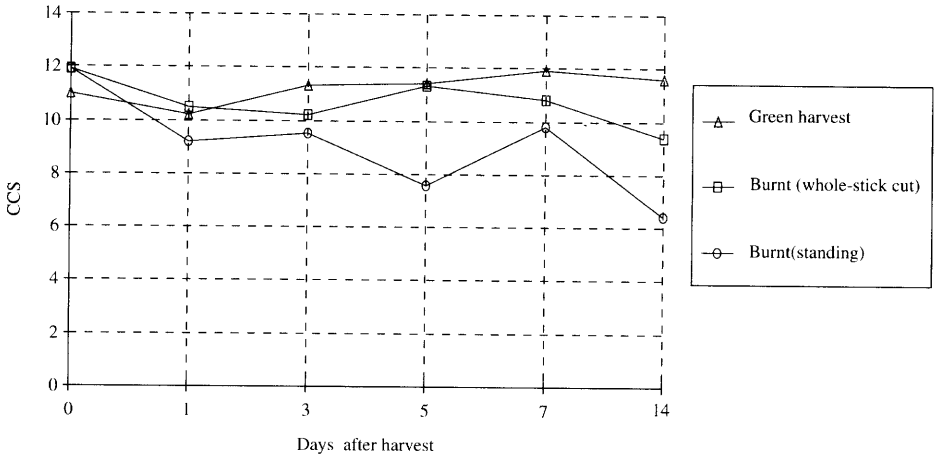

Figure 8 Changes in CCS of burnt and green cane after firing and left in the field in January harvest (average from three cane varieties).

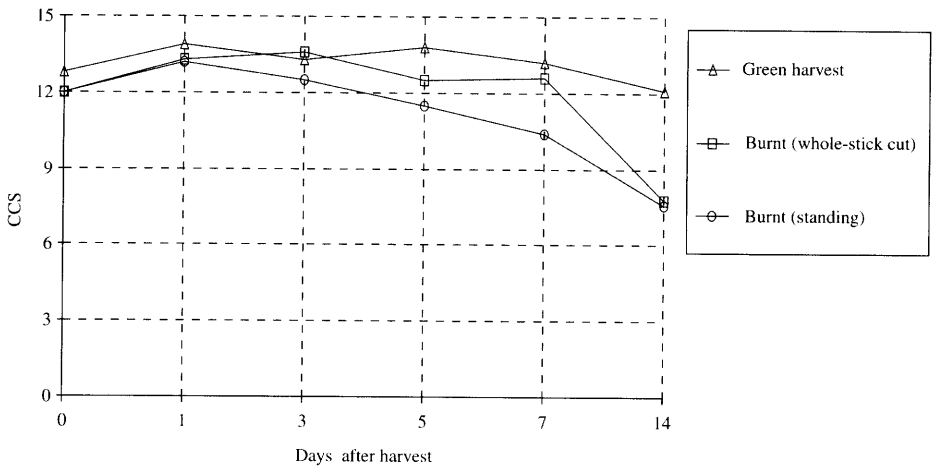

Figure 9 Changes in CCS of burnt and green cane after firing and left in the field in March harvest (average from three cane varieties).

ippines (Calma, 1941).

The average purity in the green cane harvest whole-stick cut cane was significantly higher than in the burnt cane when left in the field for more than 5 days (Figure 12). However, the purity in the green cane harvest treatment was slightly declined after leaving the cut cane in the field more than 7 days.

SUMMARY

1. Burnt cane whole-stick cut and left in the field lost more weight than the green cane. During the hotter harvest months of November and March burnt cane lost weight quicker, this applied to all three varieties.

2. For each of the varieties burnt cane whole-stick cut and left in the field, lost differing

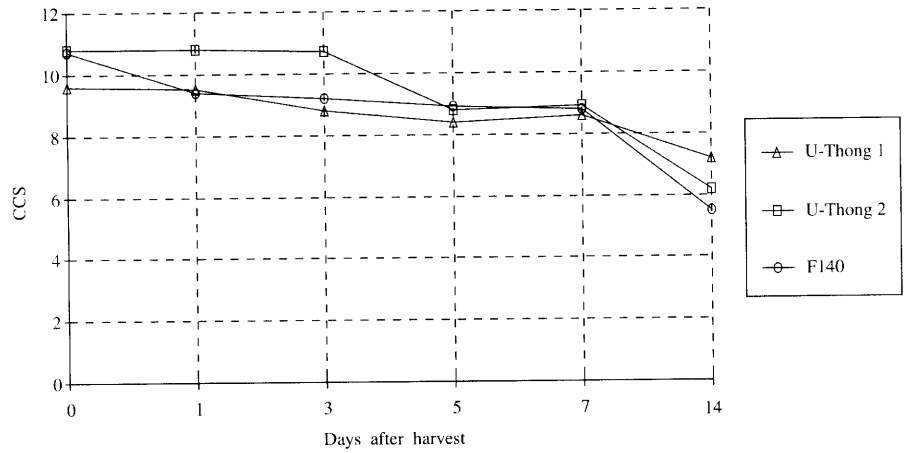

Figure 10 Changes in CCS of three cane varieties after firing and left to stand in the field (average from times of harvest).

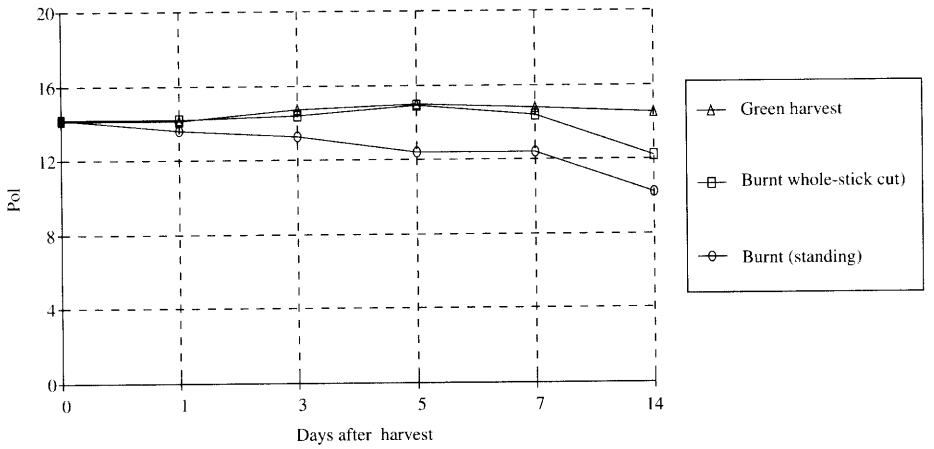

Figure 11 Changes in Pol of brunt and green cane after firing and left in the field (average from three cane varieties).

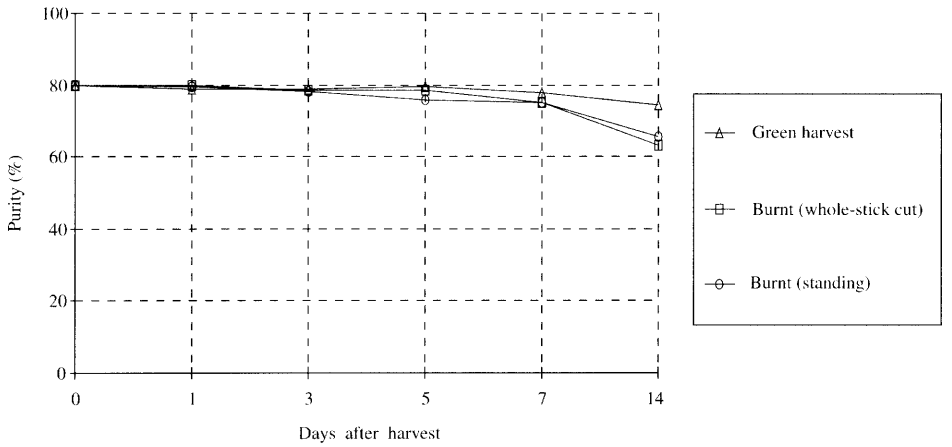

Figure 12 Changes in Purity of burnt and green cane after cutting and left in the field (average from theree varieties and three times of harvest).

amounts of weight. U-thong 2 and F140 lost more weight than U-thong 1.

3. March harvest cane lost more weight than November and January harvest cane especially when burnt.

4. Cane burnt in November should be transported to the mill within 72 hours but for cane burnt in January and March transportation should be within 24 hours.

5. Green harvest whole-stick cut cane can be left in the field for more than 14 days with only a slight decline in CCS.

6. Burnt cane left standing in the field lost CCS rapidly. A whole-stick cut, diminutively lost CCS in each variety of cane.

7. For the higher sugar content cane varieties (U-thong 2 and F140), when burnt, lost CCS quicker than the low sugar content variety (U-Thong 1).

8. The average purity in green cane whole-stick cut cane was significantly higher than in burnt cane when left in the field for more than 5 days.

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