Introduction:
Banana fruit ripens quickly (Seymour, 1993; Banana. In: Seymour GB, Taylor JE, Tucker GA, editors. Biochemistry of fruit ripening. London: Chapman and Hall, 1993. p 83-106) and sweetens as the result of starch-reserve degradation and subsequent conversion to soluble sugars: mainly sucrose, and then after glucose and fructose (Cordenunsi and Lajolo, 1995; J. Agric. Food Chem. 43:347-351). The metabolism of sucrose has been studied, but mainly on varieties of Cavendish group. To get more insight sucrose metabolism of this fruit, we took into account 4 different varieties of our collection, not linked to Cavendish group, and considered as dessert or cooking ones. We determined their amounts in sucrose, glucose and fructose, and we measured main enzyme activities of sucrose metabolism to clarify the relationship between these activities and the amounts of sugars as a function of biodiversity.

Material and methods:
The 2 dessert varieties were IDN 110 (Musa diploid Acuminata) and Kirun (Musa diploid Acuminata). The 2 cooking ones were Galéo (Musa diploid Acuminata) and Sowmuk (Musa diploid Acuminata). Fruit ripening occurred on banana plant. The length of the growth step before ripening is designated as the “Interval between Flowering and the first Yellow banana appearing in the bunch” (IFY). The IFY is defined in accumulated temperature degrees, based on a heat-unit concept (Ganny and Meyer, 1975; Fruits 30:375-392). Harvests of green fruits of the median hand were made firstly from Hubbard et al. (1990; Plant Physiol. 94:201-208), and sucrose synthesis and hydrolysis were conducted with methods modified by Fils-Lycaon et al. (2008; Fruits 63:187-191). Sucrose-Phosphate Synthase (SPS), Sucrose Synthase (SuSy), and Invertase (Neutral IV and Acid IV)) extractions and assays were conducted with methods modified by Hubbard et al. (1990; Plant Physiol. 94:201-208), and Cordenunsi and Lajolo (1995; J. Agric. Food Chem. 43:347-351).

Results:
Sugar accumulation: Figure 1 shows the accumulation of sucrose of fruit during development and ripening. The varieties Galéo and Sowmuk differed drastically from all the 2 others since their sucrose content did not increase more than 1.3% of FW. This value was obtained at stage III, an early stage of ripening. It decreased then after to get close from zero. These two varieties can almost be considered as sucrose-free. In contrast, IDN 110 and Kirun varieties, presented a high level of sucrose (7% and 8.3%, respectively of FW). Figure 2 shows the patterns of changes in total soluble sugars (determined as sucrose + Glucose + fructose) of the varieties during fruit ripening. Total soluble sugars started to accumulate at breaker stage (stage III) to reach their maximal level at stage VI. All studied varieties followed the same pattern of changes with a final and average level of sugars around 12% of the FW. It is remarkable that Galéo and Sowmuk varieties, which did not accumulate sucrose, presented an amount of total sugars close to that of the other varieties; accumulating hexoses instead sucrose.

Conclusions
SPS activity increased at the beginning or during ripening of all varieties, concomitantly to total soluble sugar (sucrose + glucose + fructose) accumulation. This confirms the likely role of this enzyme in the synthesis of sucrose during ripening but we failed to find a correlation between the level of activity of the different varieties and their amount of sucrose or total soluble sugars. Interestingly, Galéo and Sowmuk varieties were found almost sucrose-free (although this is not the case for other cooking varieties (data not shown)) and presented an AIV activity 6.4-fold higher than that of the other varieties, which makes this activity as probably one of main determinants of the sugar composition of banana by correlating the ratio sucrose / glucose + fructose.