

## A NEW NOBILISATION SYSTEM IN SUGAR CANE (*SACCHARUM SPP.*)

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**KEYWORDS:** Sugarcane, Nobilisation,  
Chromosome Number.

### Abstract

A NEW nobilisation system (NSN) in sugarcane (*Saccharum spp.*) is presented to compare with the traditional style of nobilisation (TSN). A group of parents with  $2n+n$  chromosomes has been used to transmit this character to their progenies. The system has increased the chromosome numbers in some parents of our breeding program. We suggest a new nobilisation system in combination with the traditional one in order to increase the genetic base of sugarcane cultivars in any breeding program.

### Introduction

The sugarcane breeding programs in most countries from the beginning of the 20th century, up to the present, have been performing hybridisation processes in a Traditional Style of Nobilisation (TSN) using a few original varieties of *Saccharum officinarum*, *S. spontaneum*, and complex hybrids from a similar genetic background.

Therefore, most of the current commercial varieties have a similar genetic base (Campo Zabala and Pérez Oramas, 2004). The special cytogenetic behaviour of the hybrids between *S. officinarum* and *S. spontaneum* throughout generations (**G**) of nobilisation with  $2n$  female gametes with duplicated number of chromosomes has not been exploited because of the reduced parental material and the use of the conventional crossing system (Price, 1958).

Sugarcane breeders are still searching for complex hybrids with better commercial characteristics. Therefore, the  $2n$  gametes system has not been exploited in all its magnitude.

The aim of this paper is to promote the use of parents with  $2n+n$  genetic endowment to apply in a new nobilisation system to help increase the genetic base in sugarcane breeding programs.

### Materials and methods

Information on cytogenetic studies of the Cuban and introduced varieties during sugarcane nobilisation, parental ancestors, commercial varieties, and their progenies was analysed. In addition, results of breeding programs of the main sugarcane countries were compared, including crosses evaluated in different phases of selection, among  $2n+n$  genotypes, commercial varieties and  $n+n$  parents (Jorge *et al.*, 2002).

### Results and discussion

Varieties from the series POJ from Java were the first commercial hybrids obtained in the world (Figure.1), especially POJ2878, which became, with its relatives, one of the most used parents up to the present. Most sugarcane commercial varieties around the world share their origin due to a continuous use of similar parental materials in the breeding programs by means of a Traditional Style of Nobilisation (TSN). Therefore, most current commercial varieties have a narrow genetic base (Walker, 1987; Campo-Zabala and Pérez, 2004).

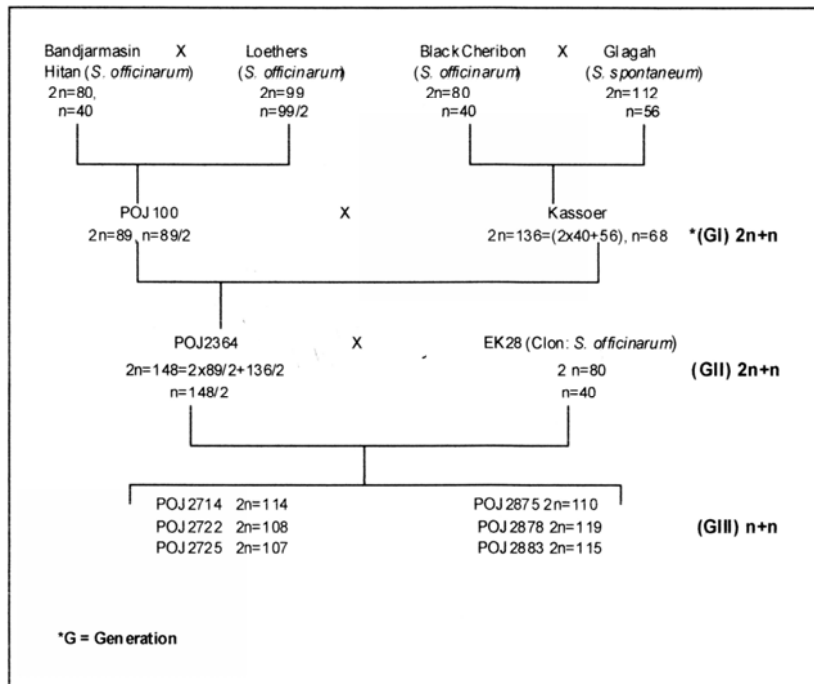


Fig. 1—Traditional style of nobilisation (TSN) to obtain varieties of POJ series.

The commercial varieties in production have to be replaced frequently, either for their poor productive stability, or for the high incidence of diseases and insect pests. However, there have been genetic advances which can not be ignored such as the quality of the juice, sucrose percentage, vigour, etc. obtained from TSN.

Results from Java (Bremer, 1962) and Cuba (Campo-Zabala and Pérez, 2004) showed that selecting parental materials after an evaluation of their ancestors (genealogy), origins and chromosomal numbers of type 2n+n made possible a practical use of the New System of Nobilisation (NSN) (Figure 2).

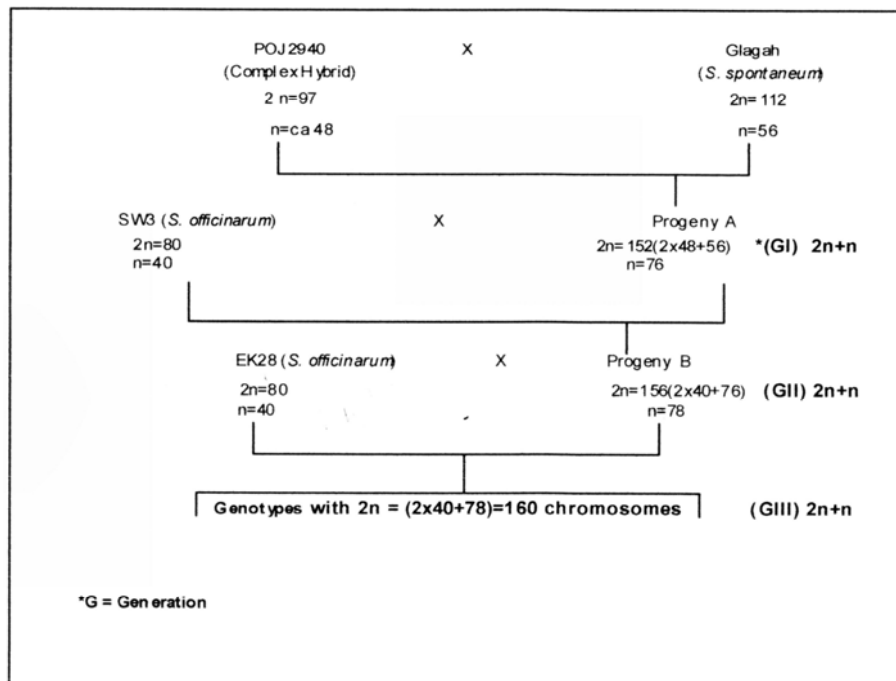


Fig. 2—New style of nobilisation (NSN) for sugarcane.

The basis of the NSN method is to use 2n+n complex hybrids, either as female or male parents, combining with wild relatives, rather than traditional forms of *S. officinarum* and *S. spontaneun*. The benefits of this method are to increase the chromosome number until a generation (G) is reached with good agronomic performance that a breeder is looking for.

The development and application of the NSN in Cuba has allowed selecting a group of parental clones with 2n+n chromosome number. These materials are being used in the sugarcane improvement program, in order to obtain parents with increased number of chromosomes to enrich the genetic base of the future commercial varieties. Table 1 shows several combinations with 2n+n genotypes obtained in the Cuban breeding program.

**Table 1**—Crosses frequently inducing production of 2n+n progenies.

Crossings	Seedlings	Clones selected
My5774 x C90-178	262	5
My5774 x C90-176	265	1
My5764 x My5777	292	11
51 NG 91 x C90-178	339	18
CSG222-92 x CP63-69	62	3
Geel Muntok x US56-15-8	210	5
Ja55-488 x C90-176	63	1
Q50 x My5774	5	1
C90-176 x C90-178	61	4
CSG489-92 x B49119	75	6
C174-92 x B49119	137	6
CSG336-92 x Ja54-4-87	287	1
Geel Muntok x CSG490-92	63	5
CSG227-92 x C227-59	68	2
CSG227-92 x Ja64-19	118	1
Ja55-488 x Ja64-19	96	2
CP52-43 x CSG225-92	153	3
CSG173-92 x Ja64-19	156	9
CSG487-92 x Ja64-19	12	1
51 NG 91 x My5764	27	2
Total: 20	2 751	87

**Conclusions**

The use of 2n+n genotypes and New Style of Nobilisation (NSN) facilitates the increase of the genetic base to improve the use of current germplasm in sugarcane. The system allows the introgression of new wild genes that provide progenies with better disease resistance and adaptation to different stress conditions. In addition, introduced varieties and a group of complex hybrids from the Cuban sugarcane germplasm allowed the development of the NSN and to establish the new hybridisation system. Further, at least 40 parental materials were proven to transmit 2n+n chromosomes to their progenies which enable the identification of crosses with 2n+n in the breeding program.

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### UN NOUVEAU SYSTÈME DE NOBILISATION DANS LA CANNE À SUCRE (*SACCHARUM SPP.*)

Par

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**MOTS CLÉS: Canne à Sucre, Nobilisation,  
Nombre de Chromosomes.**

#### Résumé

UN NOUVEAU système de nobilisation (NSN) de la canne à sucre (*Saccharum spp.*) est présenté en comparaison avec le style traditionnel de nobilisation (TSN). Un groupe de parents avec  $2n+n$  chromosomes était utilisé pour la transmission de ce caractère à la descendance. Le système a augmenté le nombre de chromosomes dans notre programme d'hybridation génétique. Nous suggérons un nouveau système de nobilisation en combinaison avec la méthode traditionnelle afin d'élargir la base génétique des cultivars de canne à sucre pour n'importe quel programme d'amélioration génétique.

### NUEVO SISTEMA DE NOBILIZACIÓN EN CAÑA DE AZÚCAR (*SACCHARUM SPP.*)

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**PALABRAS CLAVE: Caña de Azúcar,  
Nobilización, Número Cromosómico.**

#### Resumen

UN NUEVO sistema de nobilización (NSN) en caña de azúcar (*Saccharum spp.*) es presentado para comparar con el estilo tradicional (TSN). Un grupo de parentales con número cromosómico  $2n+n$  se han usado para transmitir este carácter a sus progenies. El sistema ha ayudado a incrementar el número cromosómico en algunos parentales de nuestro programa de mejoramiento genético. Sugerimos el uso del nuevo sistema en combinación con el sistema tradicional para incrementar la base genética de los cultivares que se desarrollan en un programa de mejora.