Comparative morphology of the wild sugarcanes in Japan Islands^{1)*}

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As a method of comparative studies of wild sugarcanes, *Saccharum spontaneum*, chromosome counting is of course a decisive and reliable one. But when given varieties of wild canes have the same chromosome number, it is quite difficult to distinguish them from each other.

By the present writer (1956), the chromosome number of wild sugarcanes in Japan proper, Amami Ōshima Island and Okinawa Island were determined to be $2n=112$, 104 and 112 respectively. On the other hand, two Formosan varieties were reported to have 112 and 96 somatic chromosomes (MORIYA 1950).

In this paper, the writer tries to distinguish these wild sugarcane forms from each other by some morphological characters. Comparative study of clones in Japan Islands and other places is of course important to know the relationship of various forms or clones of *S. spontaneum*.

Materials and method

Fresh materials were used for the clones in Japan proper, Amami Ōshima and Okinawa which are also used for the chromosome study. For the study of two varieties in Formosa, dried specimens were provided with.

On the comparative morphology of wild sugarcane, ARTSCHWAGER's report (1942) is a good reference. Among many morphological features, he illustrated shape and hair groups of prophyll, dewlap, ligule, sheath base and inner surface of blade joint. To make the investigation easy to compare with him, the writer also adopted the similar kind of illustrations drawn by him.

Observation

1) Clones in Japan proper (Figs. 1-2). Two clones from Chōshi and Tenryūgawa are shown here. In general, they resemble each other as seen in the drawing. Ligules are round deltoid. Stem len-

1) The report was partly read at the spring meeting of the Japanese Society of Breeding, 1955.

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Fig. 1. Clone Chōshi : A, Posterior side of prophyll ; B, anterior side of prophyll ; C, lateral view of outer surface of dewlap with adjoining sheath and blade portions ; D, ligule ; E, sheath base with adjoining internode and sheath portions ; F, inner surface of blade joint with ligule removed to show hair groups.

gth of clone Tenryūgawa reaches to about 1.5 m high, while clone Chōshi is nearly 1 m. Chromosome numbers in both cane are $2n=112$, and $n=56$, respectively.

2) Clone in Amami Ōshima Island (Fig. 3). Bud pattern (ARTSCHWAGER 1940) is rectangular. Hair group 4 is specially long. Sheath is very hairy owing to groups 56 and 60. Stem is about 13 mm in thickness. The shape of ligule is intermediate between clones in Japan proper ($2n=112$) and *Roxburghii* ($2n=96$) in Formosa, as in the case of chromosome number, but it is rather classified into falcate form. Chromosome number is $2n=104$.

Fig. 2. Clone Tenryūgawa : Legend in Fig. 1.

3) Clone in Okinawa Island (Fig. 4). General appearance of the plant resembles very much to the clones of Japan proper with stems 1 m long and 5 mm thick. Hairs on the prophyll are shorter than the latter and has hair group 16 instead of 26 which can be seen in the above mentioned clones. The shape of ligule is round deltoid. Chromosome number is $2n=112$.

4) var. *genuinum* in Formosa (Fig. 5). This material, which was collected in Anpin, Tainan, is one of the smallest form in *S. spontaneum* of Japan Islands. This clone can be distinguished from others by the most sparse hairs on both side of prophyll. Ligule is round deltoid as same as other clones which are $2n=112$. Hair group 53 on the margin of leaf blade is characteristic. Sheath base is glabrous. Chromosome number is $2n=112$, $n=56$.

5) var. *Roxburghii* in Formosa (Fig. 6). The shape of ligule is falcate. Sheath base is glabrous without hair group 59. Chromosome number is $2n=96$, $n=48$.

Discussion

Of course, we can find many morphological differences among clones in Japan proper (all $2n=112$). But they are negligible ones to say inter-varietal differences. As seen from Figs. 1-6, the most conspicuous key point for the discrimination of each other is the shape of ligules. All the clones, which are $2n=112$, in Japan Islands have deltoid ligules with round tops. *Roxburghii* ($2n=96$) in Formosa has falcate ligules. Ligules of clone Amami Ōshima ($2n=104$) are intermediate between *genuinum* (or clones in Japan proper) and *Roxburghii*, as in the case of the chromosome number. The external morphology of clone Amami Ōshima, however, do not always show intermediate between *genuinum* and *Roxburghii*. Thus, it is difficult to conclude that this clone is a descendant of hybrid between these two varieties. But considering from the chromosome number and the shape of ligule, it must has close relationship with *genuinum* and *Roxburghii*, especially with the latter.

On the comparative study of clones in Japan Islands and in other places, the writer tried to classify clones or varieties of *S. spontaneum* accor-

Fig. 3. Clone Amami Ōshima : Legend in Fig. 1.

Fig. 4. Clone Okinawa: Legend in Fig. 1.

Fig. 6. var. *Roxburghii*: Legend in Fig. 1. Fig. 5. var. *genuinum*: Legend in Fig. 1. Fig. 7. Classification of *Saccharum spontaneum* by the ligule patterns.

ding to ARTSCHWAGER's ligule patterns. The patterns are shown in Fig. 7, in which clones or varieties were classified by him and added by the writer. Table 1 and 2 are the comparison of the shapes of ligules of clones having 112 or 96 chromosomes.

Table 1. Ligule patterns of $2n=112$ clones.

Locality	Ligule patterns	Workers
Japan proper	Round deltoid	MORIYA
Okinawa	"	"
Formosa	"	"
Algiers	Crescentiform	ARTSCHWAGER 1942
Java	Crescentiform, rarely inverted deltoid	" "

Table 2. Ligule patterns of $2n=96$ clones.

Locality	Ligule patterns	Workers
Formosa	Falcate	MORIYA
	"	ARTSCHWAGER 1942*
	Flattened rhomboid	" "
Burma	Crescentiform	" "
New Guinea	"	" "

* ARTSCHWAGER's materials Formosa 4 (Imp. No. 719) and Formosa (Imp. No. 928) seem to belong to *Roxburghii* judging from his description.

It is obvious that clones with round deltoid ligules are found only in Turkmenistan and Japan Islands. The Turkmenistan clone Amu Darya has about 50 chromosomes. So that 112-chromosomed clones in Japan Islands, namely in Japan proper, Okinawa and Formosa, are divided from others only by the chromosome number and ligule pattern. The same conclusion can be drawn for *Roxburghii* in Formosa and clone Amami Ōshima.

Therefore, clones or varieties of *S. spontaneum* in Japan Islands are clearly distinguished from those of other places by the shape of ligule and the chromosome number. In other words, *S. spontaneum* in Japan Islands show an independent dis-

tribution from the neighbouring area, as postulated by the present writer (1950).

Summary

1) Shapes and hair groups of prophyll, dewlap, ligule, sheath base and inner surface of blade joint were studied.

2) The shape of ligule is most discriminative among many morphological features.

3) By the chromosome number and the shape of ligule, clones or varieties of Japan Islands are clearly divided from those in neighbouring area.

Key to *Saccharum spontaneum* in Japan Islands

A. Ligule falcate

B. Prophyll rectangular, hair group 26 present, group 4 specially long, leaves 1.5 cm width.....Amami Ōshima

BB. Prophyll triangular, groups 26 and 4 wanting, stem length 1.5-2 m, group 59 wanting.....var. *Roxburghii*

AA. Ligule round deltoid

B. Group 59 wanting, prophyll nearly glabrous.....var. *genuinum*

BB. Group 59 present

C. Group 26 wanting, margin of prophyll inconspicuously hairy.....Okinawa

CC. Group 26 present.....(Japan proper)

D. Groups 1 and 2 present.....

Tenryūgawa

DD. Groups 1 and 2 wanting.....Chōshi

Literature

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日本列島産野生甘藷の比較形態学的研究

森 谷 憲

甘藷属の各種を外形態学的に比較するには色々の方法があるが、ARTSCHWAGER(1942)は芽鱗(prophyll), 肥厚帯(dewlap), 葉舌(ligule), 葉鞘基部(sheath base), 及び葉片接合部(blade joint)の内表面などの形態と毛群を図示して野生甘藷の識別に応用した。著者はこれと同じ方法で日本列島の野生甘藷を比較した。

上述の形態のうちでも葉舌の形が最も特徴的であつて第7図に示したように、世界各国産の野生甘藷の葉舌は

大体7型に分けられる。著者が調べた日本列島産(台湾を含めて)の野生甘藷を葉舌の型で示すと、 $2n=112$ の変種はすべて円三角形で、同じ染色体数を示す他地域のものとは異っている。同様に $2n=96$ の台湾産及び $2n=104$ の奄美大島産の変種も鎌形の葉舌を有し、染色体数と対照してみると、他地域のものとは異っている。従つて日本列島の野生甘藷は近接地域にあるものとはかなり違つたものであることが分る。