Triplo-Polyploidy in *Saccharum spontaneum* L.

AN examination of a large number of clones of *Saccharum spontaneum* collected from various parts of India, Burma, and the East Indies have shown that this species includes a polyploid series with $2n = 48$, $2n = 56$, $2n = 64$, $2n = 72$, and $2n = 80$ in India and $2n = 80$, $2n = 96$, $2n = 112$ in further India and the East Indies. One would be led to conclude from these chromosome numbers that 8 is the basic number in this species and forms with $2n = 56$, $2n = 64$ and $2n = 72$ are $7x$, $8x$ and $9x$ forms respectively. The presence of an odd set of chromosomes in the $7x$ and $9x$ forms would naturally lead one to expect univalents or multivalents at meiosis in these types. A study of the chromosome behaviour of a number of clones collected in India have shown, however, that 28, 32 and 36 bivalents are formed regularly at meiosis in these types. Consideration of the above has led me to conclude

that these forms of the species are dibasic, having arisen by hybridization of a form with ($x = 10$) and one with ($x = 6$).

Of these two types $2n = 80$, $8(x = 10)$ which is a wide-leafed form (variety *aegyptiacum* of Heckel) is found distributed in the more tropical parts of South-Eastern Asia and East Indies, while the $2n = 48$, $8(x = 6)$ which is a thin-leafed form (variety *juncifolium* of Heckel, is confined to the subtropical region of North-Western Asia and Southern Russia. The form very widely distributed in Peninsular India is one with $2n = 64$, which I have considered as a natural hybrid between the $2n = 48$ and $2n = 80$ types (Janaki Ammal, 1936).[1] Its chromosome complement can be represented as $4(x = 6) + 4(x = 10)$.

Plants with 56 and 72 chromosomes have a more restricted distribution being found in mixed populations of the $2n = 64$ chromosome type and the two primary forms (varieties *juncifolium* and *aegyptiacum*) with 48 and 80 chromosomes respectively. I have also been

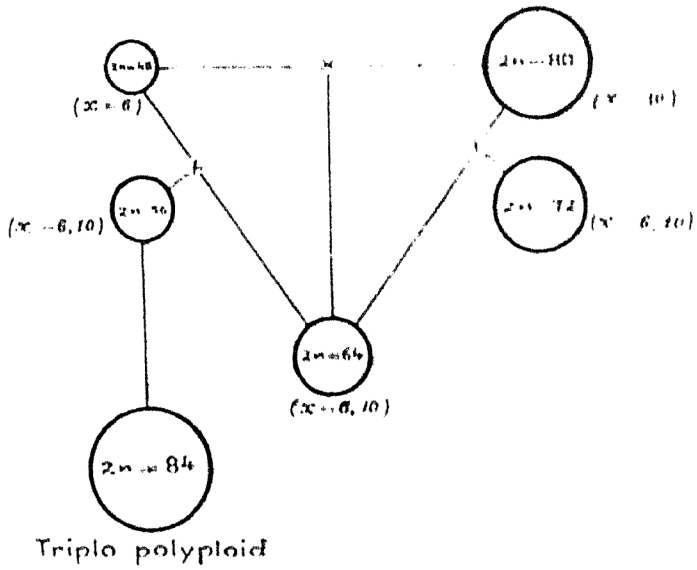

FIG. 1

Diagrammatic representation of the types of *S. spontaneum* found in India and the relation of the "triplo polyploid" to the x form.

able to synthesize the $2n = 72$ type by crossing the wide-leafed Dacca *S. spontaneum* ($2n = 80$)

FIG. 2

A field of *S. spontaneum* showing the "triploid" giant amongst the diploids

with the local Coimbatore form ($2n = 64$) (Janaki Ammal, 1936 *b*).[2] On this basis they may be considered as true back crosses (Fig. 1). Their chromosome complexes are, therefore, as follows:

$$2n = 56 = 6(x = 6) + 2(x = 10)$$
$$2n = 72 = 2(x = 6) + 6(x = 10).$$

In studying a population of 100 selfed seedlings of a form with $2n = 56$ collected at Dehra Dun, I noticed two giant plants which stood out amongst the rest by their greater height, thickness of stem, width of leaves, size of inflorescence and increased sugar content (Figs. 2, 3 & 4). Chromosome counts in root tips of these plants showed 84 chromosomes which is thrice the haploid complement of the parent (Figs. 5 & 6). The plants are therefore "triploids", having arisen by the fertilization of an unreduced ($2n = 56$) gamete with a reduced one ($n = 28$). They are semi-sterile, but have yielded a number of seedlings on selfing. A study of meiosis in the "triploid" revealed the presence of univalents and multivalents besides a large number of bivalents. As the plant from which this "triploid" has arisen is already a complex polyploid, I have used the term "triplo-polyploid" to designate this type of derivation. In vegetative characters these "triplo-polyploid" plants stand intermediate between the *S. spontaneum* of India and the indigenous cultivated sugarcanes which they resemble. It is therefore not unlikely that

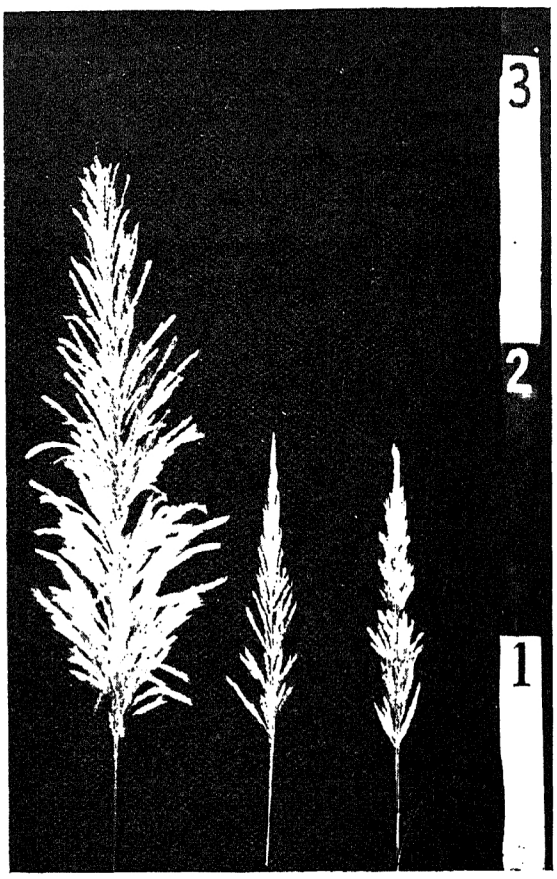

FIG. 4

Inflorescence of a "triploid" and two "diploid" *S. spontaneum* from the culture of selfed seedlings of the Dehra Dun form

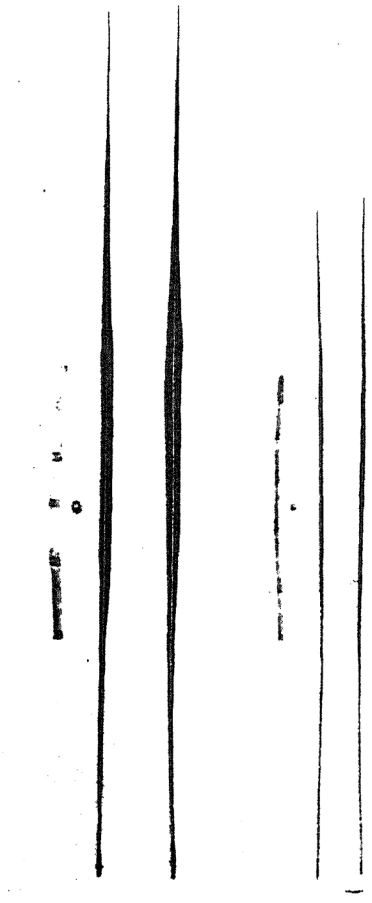

FIG. 3

Stem and leaves of "triploid" seedling of *S. spontaneum* (Dehra Dun) by the side of its "diploid" parent

FIG. 5

Somatic metaphase in *S. spontaneum*, Dehra Dun ($2n = 56$)

FIG. 6

Somatic metaphase in "triploid" seedling of the Dehra Dun *S. spontaneum* ($2n = 84$)

some of the sugarcanes of India have arisen from *S. spontaneum* as "triplo-polyploids". If it is so, there exists an interesting parallelism between the chromosome history of a cultivated plant like the sugarcane and the triploid mutants whose propagation as clones has likewise provided the best varieties of apples, pears, tulips and hyacinths.

E. K. JANAKI AMMAL.

Imperial Sugarcane Station,
Lawley Road P.O.,
Coimbatore,
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[1] Janaki Ammal, E. K., *Ind. Jour. Agri. Sci.*, 1936, 5, 1.

[2] — *Report of the Sugarcane Geneticist*, from July 1935 to March 1936.