NOTES AND COMMENTS

NEW CHROMOSOME NUMBERS IN *TRADESCANTIA VIRGINIANA*

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As part of a breeding programme with *Tradescantias* of the *virginiana* group (Vosa, 1962, 1963) many crosses were made between plants of different ploidy. The results (table 1) show that the cross between diploid and tetraploid is successful only when the former is used as female parent and that the triploid-tetraploid cross is possible when the tetraploid is used as pollen parent. The cross diploid-triploid is generally unsuccessful.

The following plants were used in the experiments:

- (1) *Tradescantia brevicaulis* (1/58) $2x = 12$
- (2) *T. virginiana* (42/58) $4x = 24 + 1B$
- (3) Eight of their triploid hybrids (1-8/59).

The plants were grown in the open air in the Genetic Garden of the Botany School, Oxford.

TABLE 1

*Success of crossing with diploids and polyploids in
Tradescantia virginiana*

♀ \ ♂	2x	3x	4x
2x	+	—	—
3x	—	—	+
4x	+	—	+

Pollen germination was found to be c. 85 per cent. in the diploid and 75 per cent. in the tetraploid. In the triploids the germinability was very low and never exceeded 5 per cent.

The pollination and cytological techniques were the same as those in earlier experiments (Vosa, 1962, 1963).

The results of the diploid-tetraploid cross are summarised in table 2. Although the number of chromosomes in the pollen grains of the tetraploid (Tr. 42) shows some variation (Vosa, 1963), all the 26 plants obtained had the triploid chromosome number ($3x = 18$).

The reciprocal cross was generally not successful. A situation exactly similar has been reported in *Datura* by Belling and Blakeslee (1922). Kihara and Nishiyama (1932) found the opposite condition in *Avena* where good seed development resulted only when the diploid was used as pollen

parent. The same results were obtained by Kihara (1951) for triploid water melons.

Of the eight triploid plants used in $3x \times 4x$ crosses, only the one (Tr. 8/59) with the highest pollen germination (4.8 per cent.) produced seeds. From crosses effected over three years between this plant and the tetraploid (Tr. 42), 102 seeds were produced and these yielded 22 plants whose chromosome numbers are shown in table 3.

TABLE 2

The result of the cross *T. brevicaulis* 1/58 ($2x = 12$) $\times$ *T. virginiana* 42/58 ($4x = 24 + 1B$)

Pollination	Seeds	Plants (all $3x$)
84	33	26

The difference in chromosome number did not affect the time of germination and the plants showed varying types of growth not very different from that found in regular polyploid *Tradescantias*. They are very floriferous and the time and duration of flowering is the same as in normal plants.

Their meiotic behaviour, as observed in the P.M.C's, is regular (plates I-II).

In crosses between plants of different ploidy, and especially in the cross $3x \times 4x$, the chromosome numbers of the progeny did not usually correspond with the gametic proportions, as in *Oenothera* (Van Overeem, 1921), *Zea* (McClintock, 1929) and *Solanum* (Lesley, 1928). In the case of triploids, they show differences depending on the direction of the cross and the ploidy of the other parent.

TABLE 3

Progeny of the $3x \times 4x$ cross (256 pollinations)

$2n$. . .	18	19	20	21	22	23	24
No. plants . . .	3	3	...	8	2	5	1

At meiosis in triploid plants the extra chromosomes are distributed at random at the first and second divisions so that the frequency of chromosome distribution in the gametes produced ranges from the haploid to the diploid number (Darlington, 1929; Mather, 1935).

The frequency of the various chromosome numbers in the pollen grains of the triploid *T. brevicaulis* (from Darlington, 1929) and of the triploid Tr. 8/59, used in the cross is shown in table 4.

The success of any cross depends not only on the interaction of pollen and style but on that of three other tissues of different origin, embryo, endosperm and the surrounding tissues of the mother plant, which are involved morphologically and physiologically, in seed development (Müntzing, 1933). In crosses between plants of different species or ploidy

Plate I

FIGS. 1. and 2.—Pollen mother cells in $3x+1 = 19+B$ (Tr. A5/61) and $3x+3 = 21$ (Tr. D4/61) *Tradescantia* at first metaphase.

FIG. 1.—Shows 1 double ring IV with quadruple chiasma (5 Xta)+1 branched IV (3 Xta)+2 III (5 Xta) 1 ring+1 rod II (3 Xta)+1 I+1B. This cell shows intrahaploid pairing.

FIG. 2.—Shows 2 linear trivalents (4 Xta)+3 ring II, 1 with interstitial chiasma (6 Xta) 2 rod II's (2 Xta)+5 I. The complement includes a short subterminal chromosom (arrowed).

FIGS. 1 and 2.—Pollen mother cells in $4x-2 = 22+1$ B (Tr. F/71) and $4x-1 = 23$ (Tr. F/13).

FIG. 1.—Shows 1 IV (3 Xta, 1 interstitial)+4 rod II (Xta)+10 I+1 B.

FIG. 2.—Shows 1 ring IV (3 Xta)+2 linear IV (6 Xta)+1 III (2 Xta)+1 ring and 3 rod II (5 Xta).

the unbalance caused by these interactions results often in sterility. This depends on the numerical or genetical relation which exists between the two species concerned and on the direction of the cross.

TABLE 4
Frequencies of different chromosome numbers in the pollen grains of triploid Tradescantia

No. of chromosomes	6	7	8	9	10	11	12	Total	Mean
<i>T. brevicaulis</i> (from Darlington 1929)	...	4	13	30	21	4	...	72	9.11
T. 8/59 . . .	4	9	14	57	20	16	5	125	9.18
Totals . . .	4	13	27	87	41	20	5	197	9.14

1. SUMMARY

All possible crosses were made between $2x$, $3x$ and $4x$ *Tradescantias*: all failed except $2x \times 4x$, which yielded $3x$ offspring, and $3x \times 4x$ which yielded plants with 18, 19, 21, 22, 23 and 24 chromosomes.

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