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CYTOLOGICAL IDENTIFICATION OF TRANSLOCATED CHROMOSOMES IN *PENNISETUM TYPHOIDES* (BURM.) STAPF. AND HUBB. BY OBSERVING HYBRIDS BETWEEN TRANSLOCATION HOMOZYGOTES AND TRANSLOCATION TESTERS

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Four translocation homozygotes have been detected in the progenies of translocation heterozygotes induced by gamma irradiation in an inbred line, I-55, of *Pennisetum typhoides* (Burm.) Stapf. and Hubb. The chromosomes involved in these translocation homozygotes were identified by crossing them with a set of translocation tester stocks and studying the chromosomal associations in the meiosis of the F_1 hybrids. The chromosomes involved in different translocation homozygotes were identified as 4-5 (C316-21), 2-7 (C324-3), 2-4 (C408) and 1-6 (C449). The figures in parenthesis stand for the translocation homozygotes.

INTRODUCTION

Reciprocal translocations are of considerable importance both from theoretical and practical point of view. They have been used for identifying the linkage groups, gene mapping, duplication of loci, synthesising complete translocation stocks for gamete selection and inbred production and for maintaining stocks of lethal or sterile genes (Anderson 1956; Blixt 1959; Burnham 1956; 1962; Carlson 1973; Gopinath & Burnham 1956; Hagberg 1962, 1965; Phillips *et al.* 1971; Ramage 1963, 1966; Ramage & Tuleen 1964; Sisodia & Shebeski 1965; Tuleen 1963; Tyagi & Singh 1974a, b; Yu and Peterson 1971). Translocations further constitute an important source of trisomics in plants (Avery *et al.* 1959; Burnham 1930; Catcheside 1954; Das & Kalloo 1972; Das & Srivastava 1969; Khus & Rick 1967; Minocha *et al.* 1974; Muller 1975; Narendra 1973; Ramage 1960; Reeves 1969; Sybenga 1966; Tsuchiya 1969; Tyagi 1976b). Thus, in view of their manifold utility, a programme was initiated to produce translocation stocks in *Pennisetum typhoides* (Burm.) Stapf. and Hubb. involving different chromosomes at different break points. The present communication reports on the identification of the chromosomes involved in the translocation stocks so far established.

MATERIALS AND METHODS

Four translocation homozygotes viz., C316-21, C324-3, C408 and C449, involving two pairs of chromosomes, isolated from the progenies of translocation heterozygotes

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induced by gamma rays in an inbred line, I-55, applying method of Tyagi (1975) were used for this study. These translocation homozygotes were crossed with a set of five translocation tester stocks established by Singh and Tyagi (1973). The meiosis of the hybrids was examined to identify the chromosomes involved in translocations.

For cytological examination, sporocytes were fixed in modified Carnoy's solution (6 parts absolute ethyl alcohol, 3 parts choloroform and 1 part glacial acetic acid) saturated with Fe-acetate and squashed in 1.5% aceto-carmine.

Results and Discussion

By examining the chromosome associations at diakinesis and/or M I in the hybrids between translocation homozygotes and translocation tester stocks, the chromosomes involved in unknown translocation homozygotes are identified. If the F_1 shows 7 II, indicating complete pairing of chromosomes, the unknown translocation homozygote is considered to involve the same chromosomes as tester stock. However, a quadrivalent may also be observed if the chromosomes involved are the same but have different locations of translocation break-points (Hagberg, 1954; Kasha and Burnham 1965; Tyagi 1975). On the other hand, if the F_1 shows a hexavalent, it suggests that the unknown translocation has one chromosome common with the tester stock. If the chromosomes involved in the unknown translocation and tester stock are different, two quadrivalents will be seen in the F_1. In addition to these, other complex configurations depending upon the size of the translocated segment may also be observed under different situations (Hagberg 1954).

Chromosome associations in hybrids between unknown translocation homozygotes and a set of five translocation tester stocks viz., T 1–5, T 1–7, T 2–4, T 3–4 and T 3–7 (the figures stand for the chromosomes involved in translocation) selected by Singh and Tyagi (1973) are presented in Table I. In crosses with translocation testers, the translocation homozygote C316–21 shows 1 VI+4 II (Fig. 5) with T 1–5, T 2–4 and T 3–4. This indicates that two of the chromosomes 1, 2, 3, 4 and 5 may be involved in the translocation. Moreover, crosses with T 2–4 and T 3–4 show that chromosome 4 is the common, while cross with T 1–5 suggests that either chromosome 1 or 5 is involved. However, a configuration of 2 IV+3 II (Figs. 2, 3 and 4) with T 1–7 and T 3–7 indicates that chromosomes 1, 3 and 7 are not involved. Thus, in translocation homozygote C316–21 chromosomes 4 and 5 appear to be involved in the translocation.

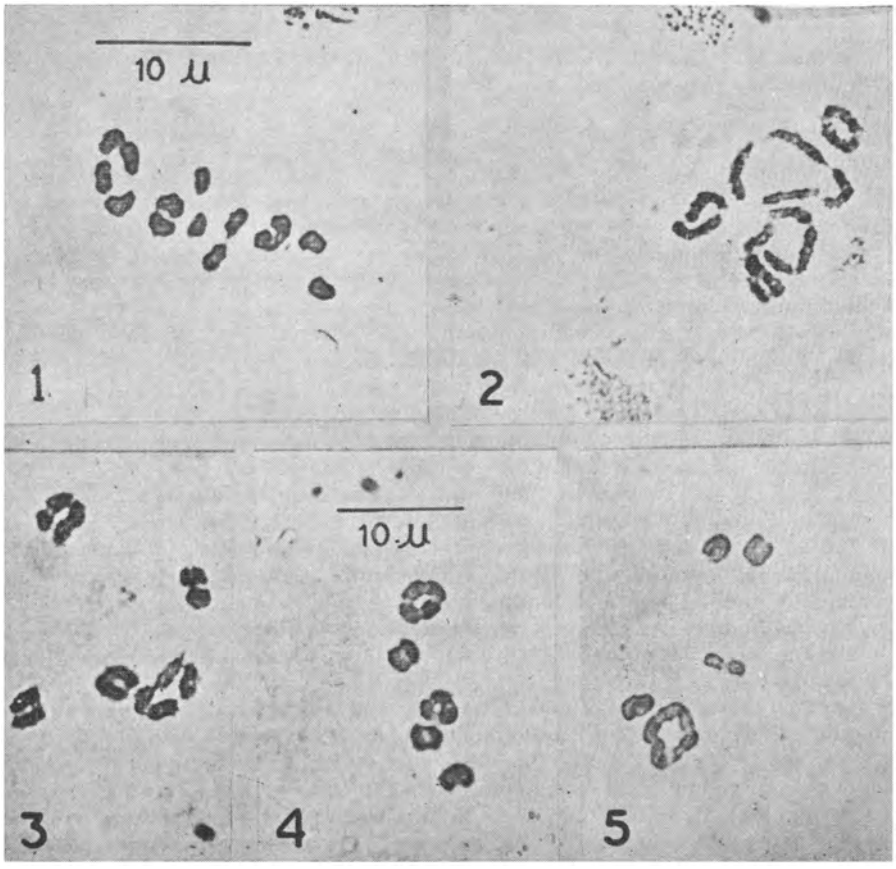
Translocation homozygote C324–3 showed 2 IV+3 II with tester stock T 1–5 and T 3–4. The results of these crosses indicate that the chromosomes 1, 3,4 and 5 are not involved, while in the crosses with T 1–7, T 2–4 and T 3–7 a configuration of 1 VI+4 II was observed indicating that one of the two chromosomes involved in these tester stocks is common. As chromosomes 1, 3 and 4 are already eliminated from the crosses T 1–5 and T 3–4, the chromosomes involved in translocation homozygote C324–3 appear to be 2 and 7.

In the crosses between the translocation homozygote C408 and tester stocks, only three were successful. Crosses with T 1–5 and T 3–7 produced a configuration of 2 IV+3 II thus, indicating that chromosomes 1, 3, 5 and 7 are not involved. Cross with T 2–4 exhibited 7 II and some cells with 1 IV+5 II (Fig. 1) suggests that the chromosomes

TABLE I

M I chromosome configurations of hybrids resulting from translocation homozygotes × translocation tester stocks crosses in Pennisetum typhoides

Translocation tester	Homozygous translocation			
	C316-21	C324-3	C408	C449
Standard normal	1 IV + 5 II	1 IV + 5 II	1 IV + 5 II	1 IV + 5 II
T 1-5	1 VI + 4 II	2 IV + 3 II	2 IV + 3 II	1 VI + 4 II
T 1-7	2 IV + 3 II	1 VI + 4 II	—	1 VI + 4 II
T 2-4	1 VI + 4 II	1 VI + 4 II	7 II and some with 1 IV + 5 II	2 IV + 3 II
T 3-4	1 VI + 4 II	2 IV + 3 II	—	2 IV + 3 II
T 3-7	2 IV + 3 II	1 VI + 4 II	2 IV + 3 II	2 IV + 3 II
Chromosomes involved in translocation	4-5	2-7	2-4	1-6



FIGS. 1-5. Meiotic chromosome associations in the hybrids between homozygous translocation lines and translocation testers of *Pennisetum typhoides*. 1, M I showing 1 IV + 5 II; 2 & 3, Diakinesis showing 2 IV + 3 II; 4, M I showing 2 IV + 3 II; 5, M I showing 1 VI + 4 II.

involved in this particular tester stock and the unknown translocation homozygote are common. Therefore, the chromosomes 2 and 4 are involved in translocation homozygote C408.

The data presented in the table show that in crosses involving translocation homozygote C449 with T 2–4, T 3–4 and T 3–7 a configuration of 2 IV+3 II is obtained. This indicates that chromosomes 2, 3, 4 and 7 are not involved in translocation. A configuration of 1 VI+4 II observed in crosses with T 1–5 and T 1–7 suggests that common chromosome is 1. Since the only chromosome which is not involved in any tester stock is chromosome 6. Therefore, the chromosomes involved in the translocation homozygote C449 are 1 and 6.

Further, pachytene analysis to determine the break-points of the chromosomes in these translocation homozygotes and their linkage relations is in progress.

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