CYTOLOGICAL STUDIES OF L-108. NILSSON'S N II

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In his Botanical Review article of 1962, S. W. Yarnell presented data and references concerning the then current status of translocation lines in Pisum (4). The G-line of his survey corresponds to my L-108, Nilsson's N II, T(2-6)a. I have completed the investigations published earlier by a study of the karyotype of L-108 and by linkage determinations between the T-point of this line and six marker genes of the chromosomes involved.

W. Gottschalk states, after a study of 24 translocation lines in Pisum, that in mitotic metaphase plates only relatively drastic interchanges can be reliably discerned (1). In L-108 at least one of the interchanged cnromosomes is very easy to recognize by its small size and by a submedian primary constriction. The shortest chromosomes of the standard karyotype, viz. chromosomes 1 and 2, have about the same length and yet cannot be confused with the still shorter 6^2 interchange chromosome. For a reliable recognition of the 2^6 chromosome, however, measurements are desirable since it might otherwise be confused with chromosome 6 of the standard type. The structure of the interchange characterizing L-108 is explained by the drawings in Fig. 1. These drawings are founded on measurements of eleven good mitotic metaphase plates of L-108.

An account of the linkage studies performed with L-108 in crosses with lines of the standard structural type is given in Tables 1 and 2. The results of cross Nos. 2 and 7 have been published earlier (3). Data concerning the backcross Nos. 3, 6 and 8 have been kindly put at my disposal by Dr. E. Nilsson. In future investigations it would be desirable to include at least three other genes, viz. .ar, mifo and i. Apart from the incompleteness and somewhat vague results of the present linkage studies, I have marked the approximative sites of the genes of Table 2 in the tentative diagram for the pairing at the prophase of meiosis in Fig. 1. As regards the genes of chromosome 6, the suggested localizations are supported by the results of other investigations (2). At the first metaphase of meiosis in the translocation heterozygote, chiasmata never occur in the interstitial segments indicating that the T-point must be proximal to the centromeres of the chromosomes forming a ring of four (cf. Fig. 1).

Finally, it should be mentioned that trisomic plants have been observed in the progenies of crosses between L-108 and lines of standard structural type. A cytogenetical analysis, however, has not been performed. The leaflets of these trisomies were broad and of the same type as those described from crosses with L-114, Nilsson's N I, T(4 6)a (2).

1. Gottschalk, W. 1978. The Nucleus 21:29-3*».
2. Lamm, R. 1982. PNL 14:32-35.
3. Lamm, R. and R. J. Miravalle. 1959. Hereditas 45:417-440.
4. Yarnell, S. H. 1962. The Bot. Review 28:465-537.

Table 1. Distribution of phenotypes in BC and F_2 progenies between L 108, T(2-6)a, and lines of the standard structural type.

Cross No.	Linkage pair	Type of prog.	Number of plants				
			Fertile		Semisterile		
			Dom.	Rec.	Dom.	Rec.	Total
1	T - Wa	F_2	259	111	343	106	819
2	T - Wa	F_2	138	59	178	52	427
3	T - Oh	BC	13	49	40	15	117
4	T - Oh	F_2	74	32	150	28	284
5	T - Wb	F_2	52	18	42	15	127
6	T - Wlo	BC	41	45	46	46	178
7	T - Wlo	F_2	109	24	115	28	276
8	T - P	BC	10	26	22	15	73
9	T - P	F_2	43	13	37	16	109
10	T - Pl	F_2	131	28	104	33	296

Table 2. The detection and estimation of linkage from the figures of Table 1.

Cross No.	Linkage pair	Chi-squares		Linkage T - gene	Recomb. fract.
		Fert./sem.	Dom./rec.		
1	T - Wa	7.63*	0.98	3.49	33.0 ± 4.4
2	T - Wa	2.55	0.23	2.91	31.0 ± 6.3
3	T - Oh	0.42	1.03	31.80***	29.9 ± 3.9
4	T - Oh	18.25**	2.27	9.00**	21.4 ± 4.4
5	T - Wb	1.33	0.07	0.00	-
6	T - Wlo	0.20	0.09	0.09	-
7	T - Wlo	0.36	5.38*	0.04	-
8	T - P	0.01	1.11	7.25**	34.3 ± 5.6
9	T - P	0.08	0.15	0.69	-
10	T - Pl	1.64	3.05	1.99	-

*P = 0.05; **P = 0.01; ***P = 0.001

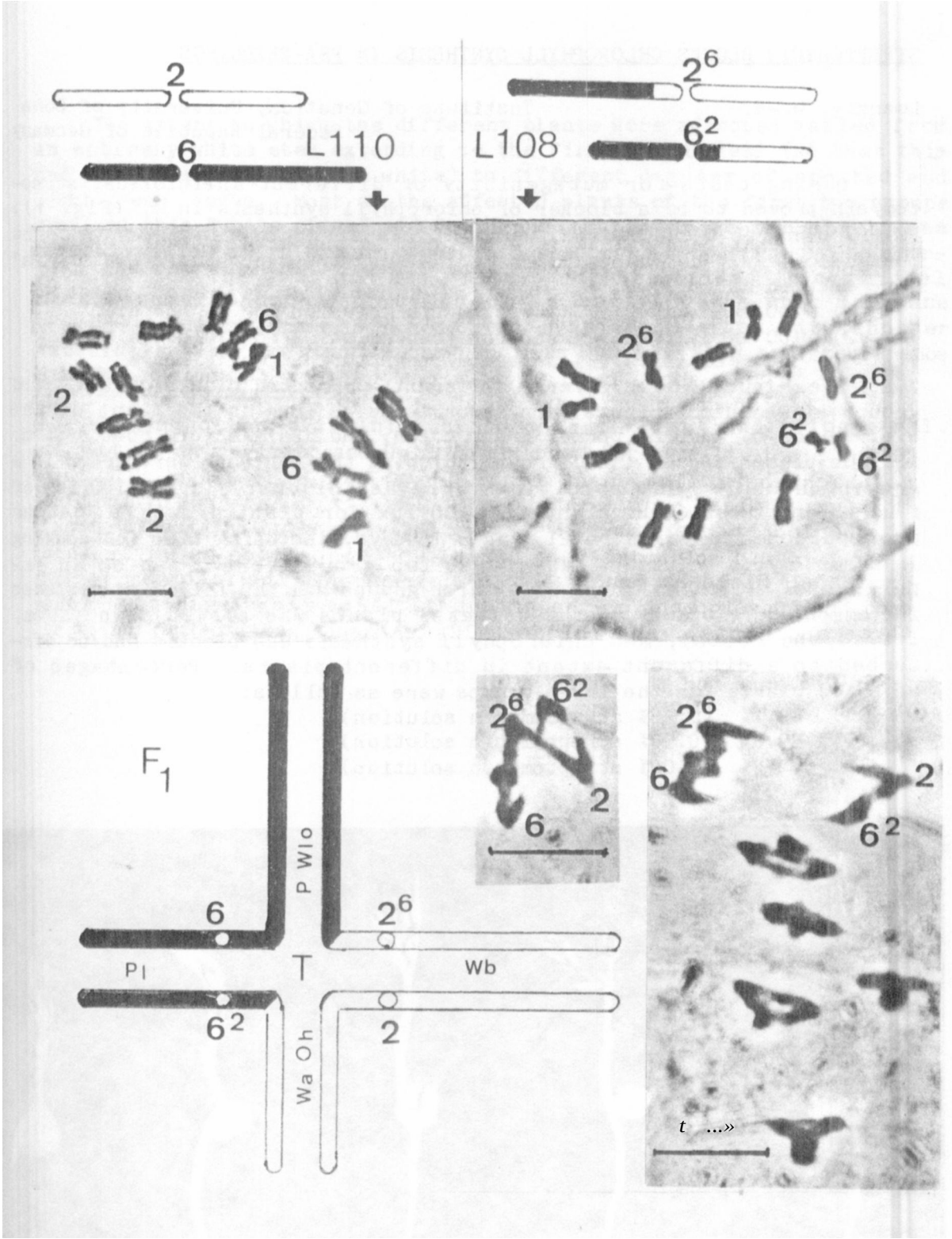

Fig. 1. Interpretative drawings of the reciprocal translocation characteristic of L-108 and illustrations of mitosis in root tips of L-110 (the standard structural type) and L-108, T(2-6)a. Below, a tentative diagram for the chromosome pairing at the prophase of meiosis in the F1 hybrid between these lines with a very approximative location of six marker genes together with illustrations of the ring of four at the first metaphase of meiosis. Bars represent 10 mkm