A SECOND GENE arthritic (art-2) ON CHROMOSOME 3

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The spontaneous mutant arthritic (art), isolated by L. G. Cruger and named and described by Marx, is located on chromosome 6 (1, 2). A mutant with a seemingly identical phenotype was recovered after treating seed of the cv. 'Paloma' (Wt 3527) with 200r Nf + 0.014% NEU (see Figs. 1 and 2 in [1]). The induced mutant was given the number Wt 16125 in the Wiatrowo collection. Segregation in M2 and M3 indicated that it is a monogenic mutation. Wt 16125 was crossed with WL 1238, a multi-marker line from Weibullsholm. In a preliminary analysis, a portion of the F2 seeds was sown in the greenhouse in the autumn of 1981. The segregation of the mutant character confirmed the monogenic inheritance but the dihybrid segregation pointed to a close linkage (~11 units) between Wiatrowo's gene arthritic and gp on chromosome 5 (Table 1).

Table 1. Phenotypic distribution in F_2 populations segregating for arthritic from cross WL 1238 x Wt 16125.

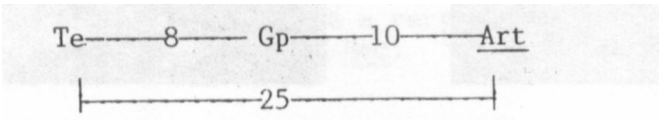
A. Art - art F_2 segregation

Art	art	Total	Chi square (3:1)
355	111	466	0.35

B. Joint segregation of art with gp (repulsion)

Art Gp	Art Gp	art Gp	art gp	Total	Joint chi square	Recomb. fract.
256	98	110	1	465	30.8	10.7

Because the above finding was unexpected and surprising, a locus identity test cross was conducted twice: Wt 16126 - type line for gene art (Marx's C78-346) x Wt 16125, Wiatrowo's mutant. In both cases (in 1982 and 1984) the F1 plants were normal, indicating that the arthritic mutants from Geneva and Wiatrowo reside at different loci. The second part of the F2 population of the cross WL 1238 x Wt 16125 therefore was sown in the field in 1983 localize on chromosome 5 more precisely. The dihybrid segregation between arthritic and markers te and gp (Table 2) produced the following estimated Cr-0 values and gene order:



It is suggested that the symbols art–1 (chr. 6) and art-2 (chr. 5) be used to designate the genes from Geneva and Wiatrowo, respectively. But before this proposal is finally accepted, Wt 16126 and Wt 16125 should both be crossed with WL 110 (standard karyotype) to ascertain that translocations of the art segment between chromosome 5 and 6 are not involved.

1. Marx, G. A. 1981. PNL 13:38-39.
2. Marx, G. A. 1982. PNL 14:50-52.

Table 2. Phenotypic distribution in F2 population segregating for arthritic from WL 1238 x Wt 16125.

A. Monohybrid F_2 segregation

Te	te	Total	Chi square (3:1)
317	122	439	1.82
Gp	**gp**		
339	116	455	0.06
Art	**art**		
355	103	458	1.54

B. Joint segregation of arthritic with te and gp

Te Art	Te art	te Art	te art	Total	Joint chi square	Recomb. fract.	S.
223	94	115	7	439	29.4	24.8	
Gp Art	**Gp art**	**gp Art**	**gp art**				
238	101	114	1	454	38.8	38.8	
Te Gp	**Te gp**	**te Gp**	**te gp**				
304	12	26	96	438	281.8	8.3	