Chandrashekaran, S. and R.P. Sharma. Indian Agricultural Research Institute, New Delhi, India. A new dominant temperature sensitive lethal induced on the SM5 balancer In(2LR) al^2Cy lt^v cn^2 sp^2 chromosome.

Dominant temperature sensitive (DTS) lethals are useful in crossing schemes where a large number of homozygous mutagenised lines are to be established for screening purposes. It is all the more advantageous if the DTS lethal is on a balancer chromosome, so that non-DTS recombinant-escapers are avoided. DTS lethals on the second chromosome balancers CyO and Pm were reported by Falke & Wright (1970) and third chromosome balancers with DTS lethals were constructed by Marsh (1978).

Reported here is a new dominant temperature sensitive lethal induced on the SM5 balancer.

The DTS lethal was induced by feeding 0.03 M Ethyl Methane sulphonate in 2% sucrose to 2 day old SM5/+ males. The mating and screening scheme is shown in Fig. 1.

The vials where no Curly winged progeny hatched at 28°C were maintained after retesting, by isolating SM5/+ female and male flies from the 19° vial.

Of the 3,293 cross II vials set up, 3,100 were scored at 28°C and 8 putative DTS lethals isolated. Seven were found to be leaky when reared in larger populations producing 2-10% Curly escapers.

Figure 1. Scheme for isolating DTS lethals on the SM5 balancer.

Cross I Canton-S ♀♀ x In(2LR) SM5 al^2Cy $lt^v cn^2 sp^2$/+ ♂ (Fed with 0.03 M EMS) (mass mated in 250 ml bottles)

Cross II Canton-S ♀♀ +/+ x SM5*/+ single ♂ (pair mated in vials)

Vial 1 →→→→→→→→→→→→ Vial 2 Flies from vial 1 transferred to fresh vial and reared at 28±2°C
reared at 19±2°C

SCREEN VIALS: Select vials which produce SM5-Curly flies only at 19° and not at 28°.

SM5*/+ ; +/+ 19°C SM5*/+ ; +/+ Dies 28°C

Table 1. Lethality at the embryonal, larval and pupal phases in F_1 individuals from a CS ♀ x SM5 448/+ ♂ mating at 19° and 28°C.

Growth temperature	Number of Eggs	Unhatched Eggs	% Embryonic Lethality	Expected Larvae	Pupae seen	% larval Lethality	Adults Cy	Adults Cy^+	% pupal lethality
19°C	1014	174	17.15	840	540	35.71	148	244	27.40
28°C	1167	720	61.69	447	153	65.77	0	87	43.13

Table 2.

Female parent	Male parent	Growth Temperature	Total Progeny	Cy Progeny ♀	Cy Progeny ♂	Cy^+ Progeny ♀	Cy^+ Progeny ♂	Proportion of Cy progeny*
SM5 DTS/+	+/+	19°C	484	128	120	128	108	0.512
SM5 DTS/+	+/+	25°C	685	141	126	224	194	0.389
SM5 DTS/+	+/+	28°C	438	0	0	220	218	0.0
+/+	SM5 DTS/+	19°C	280	26	18	154	82	0.157
+/+	SM5 DTS/+	25°C	523	10	18	270	225	0.053
+/+	SM5 DTS/+	28°C	462	0	0	226	236	0.0

* Number of Cy flies divided by total number of flies.

Table 3. Lethality at the embryonal, larval and pupal stages of individuals from a reciprocal mating of SM5 DTS/+ and +/+ flies at 25°C.

Female parent	Number of Eggs	Unhatched Eggs	% Embryonic Lethality	Expected Larvae	Pupae seen	% larval Lethality	Adults Cy	Adults Cy^+	% pupal lethality
+/+	1008	284	28.17	724	550	24.03	0	298	45.81
SM5 DTS/+	932	142	15.20	790	748	5.30	239	301	27.80

One fully penetrant line designated SM5 DTS 448 was analysed for its viability at various temperatures and its effective lethal phase at the non-permissive temperature.

Eggs laid by Canton-S virgin females mated to SM5 448/+ males were counted and allowed to develop at 19 and 28°C. The surviving individuals at the end of the embryonal, pupal and adult phases were counted.

Lethality at all the stages were calculated, the data for which is shown in Table 1.

It was concluded from the data in Table 1 that DTS 448 was a multiphasic lethal. However, it is evident that the non-DTS individuals were also surviving poorly at both growth temperatures, the survival frequency of Cy^+ being 0.4 at 19° and 0.09 at 28°C (calculated as observed Cy^+ individuals ÷ expected Cy^+ individuals).

To further assess the viability of the DTS carrying SM5 flies and non-DTS flies, two way crosses with SM5 DTS 448/+ either as the female or male parent with Canton S as the other parent were made. Twenty pairs of flies were mated for 5 days each in 250 ml bottles at each temperature, transferred for another 5 days to fresh bottles and then discarded. Progeny from each set of bottles were counted and sexed. Data presented in Table 2.

The recovery of SM5 DTS/+ flies is 3.3 times more at 19°C and 7.4 times more at 25°C when the female parent is SM5 DTS/+ than when the female parent is +/+. Because of this differential recovery of SM5 DTS progeny, the eggs from a SM5 DTS/+ ♀ x Canton S ♂ and Canton S ♀ x SM5 DTS/+ ♂ were allowed to complete development at 25°C and the number and percentage of individuals surviving at the end of each developmental phase calculated (Table 3).

The data shows that the survival frequency of DTS448 SM5/+ flies at 25°C is raised from 0 to 0.4 when the female is SM5 DTS/+ instead of being Canton S. The DTS448 gene appears to be a pupal lethal since nearly 50% of the individuals are pupal lethal. However, the lethal effect can be rescued when the $DTS448^+$ individuals are derived from a DTS 448/+ female rather than from a wild type female. In this respect DTS448 behaves as a recessive since it is rescuable prior to fertilization by the DTS448/+ gene product that may perdure in the egg cytoplasm. The rescue is not however possible at the non-permissive temperature probably because the mutant product is malformed beyond rescue.

References: Falke, E.V. & T.R.F. Wright 1972, DIS 48:89; Marsh, J.L. 1978, DIS 53:155.