Shekaran, S.C. & R.P. Sharma. Indian Agricultural Research Institute, New Delhi, India. Apang (apg)^{ts}: a temperature sensitive gene for tarsus development in Drosophila melanogaster.

While evaluating a total of 120 temperature sensitive lethal mutations on the second chromosome of Drosophila induced in our laboratory by feeding 0.3% EMS to OR-K males, one of the 'lethals' was found to be endowed with developmental defects in the tarsal segments of all the six legs, when grown at a restrictive temperature of 28±1°C. The typical phenotype of the legs of this mutant is represented in Figure 1. The major temperature dependent defects of this mutant are: (1) condensed, poorly developed and curved metatarsus and tarsi; (2) duplications in the tibia and tarsal segments; and (3) absence of claws. This mutant has been named 'apang' (apg) [the word 'apang' stands for an individual with mutilated and underdeveloped legs in Hindi]. Genetic studies reveal that the mutant genotype is controlled by a recessive gene located at 7.7 map units on the second chromosome. The penetrance of this gene was found to be 100% at restrictive temperature. Temperature shift up and shift down experiments, revealed that the temperature sensitive phase (TSP) ranged from early first instar to early pupa in the life cycle of the fly.

Fig. 1. A pair of mesothoracic legs from apang flies reared at 28°C.

Homozygous (apang(apg/apg) flies obtained from Cy/apg x Cy/apg matings at 28±1°C remained adhered to their pupal cases and eventually died. Such flies when retrieved from their pupal cases were unable to stand or walk. At the permissive temperature (19±1°C) on the other hand, apg/apg flies did eclose and were found to be near normal for tarsus development. However, occasional absence of one or both the claws was noticed in these otherwise normal flies. Homozygous apg/apg flies were fertile at 19°C, but when shifted to 29°C did not breed. They laid fertile eggs, which did not hatch. The unhatched embryos at 29°C were found to be associated with a range of germ band abnormalities.

A few other abnormalities associated with tarsus development, which were temperature independent, involved interruption of wing veins L_4 and L_5 and incomplete and partially fused abdominal segments. So far, a number of out crossing experiments undertaken have proved refractory in separating these temperature dependent and independent phenotypes associated with this mutation.

Shekaran, S.C. & R.P. Sharma. Indian Agricultural Research Institute, New Delhi, India. Phenol induced phenocopies of Shaker--a neurological mutant of Drosophila melanogaster.

Shaker (Sh^5), a neurological mutant on the x-chromosome (58.2 map unit) of Drosophila melanogaster when anaesthetised shows characteristic leg shaking and wing scissoring. This aberrant behaviour is caused by abnormal nerve transmission (Ikeda and Kaplan 1970) which is primarily due to defects in the potassium channel at the neuromuscular junctions (Jan et al. 1977).

In our laboratory we have observed that Shaker phenocopies can be induced by treating the normal flies with phenol. Wild type flies when after etherization are brought in contact with a thin film of phenol (0.1 ml of the test concentration smeared evenly over a 6"x6" ceramic tile) show vigorous leg shaking, abdominal twitching and wing scissoring within a few seconds of exposure. This behaviour is also expressed when etherized flies are exposed to an atmosphere saturated with vapours of the test concentration of phenol. This indicated the olfactory nature of the effect of phenol.

Table. Vigorous leg shaking and abdominal twitching similar to that of Sh^5 was observed at all concentrations of phenol. It could not however be quantified manually.

Conc. of phenol(M)	Wing scissoring/minute	
	Ore-K	Sh^5
0	0	76.4±7.91
0.5	0	76.8±8.26
1.0	55.4±6.37	82.7±3.55
5.0	67.8±11.45	69.0±9.21

The frequency of wing scissoring following exposure to phenol in both normal and Sh^5 flies was measured visually using a semi-automatic recorder. The results show (Table) that wing scissoring in phenol treated flies was of the same order as that in Sh^5. Phenol was not able to accentuate wing scissoring in Sh^5 flies.

In order to rule out the possibility that phenol might act as a surface irritant, various phenol derivatives as well as some commonly known corrosive agents were used. All compounds with a benzene ring and bearing structural affinity to phenol (Benzene, Pyrocatechol, Quinol, Toluene, etc.) were found to be highly effective in inducing Shaker phenotype. Other general surface irritants such as acetic aicd, propionic acid, 1 N hydrochloric acid, 1 N sodium hydroxide, carbon tetrachloride, ammonia and acetone were found to be ineffective. Since the phenols mimic the shaker phenotype which is known to be a neurological mutant, it is possible that these substances affect the nervous system of the fly. It would be worthwhile to investigate whether phenol affected the nerve membranes thereby influencing conduction or exerted its effect on the pre- or post-synapses.

Besides abnormal shaking behaviour other interesting observations on phenol treated flies were, extended recovery time and blackening maxillary palpi under prolonged treatment. This blackening probably indicates high localized activity of the enzyme tyrosinase in these organs.

Reference: Ikeda, K. & W.D. Kaplan 1970, Proc.Natl.Acad.Sci.USA 66:765-772; Jan, Y.N., L.Y. Jan & M.J. Dennis 1977, Proc.Roy.Soc. Lond.(B) 198:87-108.

Singh, B.N. Banaras Hindu University, Varanasi, India. Non-random association of linked inversions in D. ananassae.

The present communication reports new data on the asssociations between two linked inversions namely delta (3LA) and eta (3RA) in the opposite arms of the third chromosome of D.ananassae.

In many species of Drosophila, the linked inversions show non-random associations (Levitan 1958, 1961, 1973, 1978; Levitan & Salzano 1959; Brncic 1961; Prakash 1967; Sperlich & Feuerbach-Mravlag 1974). According to Levitan (1958) the main factor in maintaining the non-random associations of inversions is natural selection which involves interaction between widely separated loci.

D.ananassae is a cosmopolitan domestic species. Natural and laboratory populations of this species are frequently polymorphic due to the presence of three cosmopolitan inversions viz., alpha, delta and eta (Shirai & Moriwaki 1952; Futch 1966; Singh 1970, 1974a, 1982, 1983a). The data on the combinations between delta and eta inversions obtained earlier show that both these inversions occur in non-random association caused due to the suppression of crossing over and epistatic gene interaction (Singh 1973, 1974b, 1983b, unpublished results).

During the present study, the data on the intrachromosomal associations were obtained from two laboratory strains maintained under laboratory conditions for several generations. The frequencies of different combinations between 3L and 3R karyotypes are presented in Table 1. The expected frequencies are calculated under the assumption of randomness of combinations. In Calcutta strain, only five combinations could be detected. There is an excess of individuals which are homozygous for ST gene order in one arm and heterozygous for inversion in the other and χ^2 test for goodness-of-fit between observed and expected values shows that the differences are significant ($P<0.005$). In Shillong strain, there is over abundance of larvae showing homo-homo and hetero-hetero associations and other combinations are deficient. The χ^2value indicates that the deviation from randomness is highly significant ($P<0.001$). Thus it is evident from the present results that the linked inversions are associated nonprandomly. The present results also indicate that there are inter-strain variations regarding the pattern of association. The variations are attributable to strain (genic) factors.