Treated male × untreated female,
Untreated male × treated female.

Twenty five pairs were taken for treatment with each concentration. After 5 days of cohabiting the females were given blood-meal from a back and belly shaven rabbit. The eggs were collected in water-filled plastic bowls kept in cages, thrice during 10 days oviposition period and the number of eggs laid and larvae hatched was recorded.

In adults treated with both the compounds a significant fall in fecundity and fertility was recorded (table 1). The maximum sterility induced by Penfluron was 78.3 % when both the sexes treated with 0.001 ppm are mated against the maximum sterility of 23.6% only, induced by Furyltriazine at 10 ppm dose level when homologous cross is performed (table 1). The control adults showed normal egg production and hatching.

The compounds cause a dose-dependent reduction in the reproductive potential of the adults emerging out of treated fourth instar larvae. The main adverse effect is recorded on egg-hatchability. Both the sexes get affected but differ in degree. The reduction in the average number of eggs per female is maximum when the treated females mate with untreated males, whereas the maximum per cent sterility is induced on mating both the treated sexes.

Treated males may be affected in two ways: firstly, a failure to transfer sperms during mating according to Borkovec[4]; secondly, the transfer of chemical to untreated females during copulation as suggested earlier[5,6]. Such a transfer of compound during mating may be the cause of infertility in male *A. stephensi*. It was suggested earlier[7–9] that the chitin synthesis inhibitor compounds inhibit the glucose incorporation in chitin biosynthesis in developmental stages of insects resulting in abortive hatching of the eggs due to insufficient chitin.

The present findings and the earlier report[10] show that Penfluron is more effective than Furyltriazine and Diflubenzuron in suppressing the population of *A. stephensi*.

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1. Takeshi, M., Schaefer, C. H., Richard, M., Takahasi and Fred S. Mulligen III, *J. Econ. Entomol.*, 1976, **69**, 655.
2. Schaefer, C. H., Wilder, W. H. and Mulligan III, *J. Econ. Entomol.*, 1975, **68**, 183.
3. Post, L. C. and Vincent, W. R., *Naturwissenschaften*, 1973, **60**, 431.
4. Borkovec, A. B., Woods, C. W. and Terry, P. H., *J. Econ. Entomol.*, 1978, **71**, 862.
5. Wright, J. E. and Spates, G. E., *J. Econ. Entomol.*, 1976, **69**, 365.
6. Moore, R. F., Leopold, R. A. and Taft, H. M., *J. Econ. Entomol.*, 1978, **71**, 587.
7. Sowa, B. A. and Marks, E. P., *Insect Biochem.*, 1975, **5**, 855.
8. Saxena, S. C. and Mathur, G., *J. Adv. Zool.*, 1980b, **2**, 1.
9. Saxena, S. C. and Kumar, V., *Entomol.*, 1982, **7**, 141.
10. Saxena, S. C. and Kaushik, R., *Curr. Sci.*, (communicated).

EFFECT OF CEDARWOOD OIL ON REPRODUCTION OF *DYSDERCUS KOENIGII* (F.)

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UNDER the screening programme of plant extracts and natural products for insectistatic properties we found cedarwood oil as a source of insecticidal material against Indian mosquitoes adult under laboratory conditions[1]. With a view to finding out other sub-lethal effects of this material, an attempt was made to work out the bioefficacy of cedarwood oil on reproduction. The oil vapour of cedarwood distilled from *Cedrus deodara* Roxb was found to prolong incubation period while reducing the hatching percentage and offspring survival by affecting the fecundity and ovipositional intervals in the treated male of red cotton bug.

The newly emerged adult bugs of *Dysdercus koenigii* (F.) reared under laboratory conditions on water soaked cotton seed were taken as test insects. Cedarwood oil at the rate of 5 μl (0.20% concentration diluted in acetone) was applied topically on the abdominal tergites of either sex using microapplicator. The treated bugs were then sexed separately and allowed to mate with their acetone-treated counter-

Table 1 *Effect of Cedrus deodara oil on fecundity and fertility of red cotton bug**.

Treatment	Total eggs laid/pair	Egg hatch (%)	Survival (%)	Oviposition interval (days)	Incubation period (days)
T ♂ × U ♀	258.20	47.92	32.98	6.50	8.20
T ♀ × U ♂	268.20	68.86	48.05	6.50	8.06
U ♀ × U ♂	282.60	76.30	73.53	5.80	7.97

* Mean of 5 replications
T ♂ × U ♀ = Treated male × untreated female.
T ♀ × U ♂ = Treated female × untreated male.
U ♀ × U ♂ = Untreated female × untreated male.

parts. Acetone-treated pairs were taken as control. Five pairs of insects were taken in each treatment while keeping each pair in a separate beaker. Water-soaked cotton was provided as food. The effect on the following combinations was studied; treated male × untreated female; treated female × untreated male; and untreated male × untreated female. The effect of oil application was recorded on fecundity, incubation period, hatchability and survival of offspring.

The data presented in table 1 reveal that the application of cedarwood oil is effective in prolonging the incubation period and in considerably reducing the hatching percentage and survival of 1st instar nymphs. Although very little effect was observed on the fecundity, the eggs laid by the treated pairs of both the combinations were abnormal with a low percentage of hatching. Among treatments the male-treated combination produced more sterile eggs than female treated. This is suggestive of the fact that the cedarwood oil treatment to male bugs is effective in induction of male sterility. Further, the survival of the 1st instar nymphs within 24 hr of their emergence was also hampered in the case of male treatment. The reduction in control up to 25% was due to natural survival of insect under laboratory conditions. The reason for the mortality of nymphs just after their emergence from the eggs may be due to sublethal effect of the essential oil causing alteration in normal physiology of reproduction. The present findings on the fecundity and hatchability of red cotton bug are in accordance with the observations of earlier investigations on an antigonadal substance[2]. Efforts are being made to find out the active compound responsible for this property.

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1. Singh, D., Rao, S. M. and Tripathi, A. K., *Naturwissenschaften*, 1984, **71**, 265.
2. Koul, O., *Entomol. Exp. Appl.*, 1983, **34**, 297.

QUANTITATIVE CHANGES IN THE GLYCOGEN CONTENT DURING GROWTH AND DEVELOPMENT OF *CHILO PARTELLUS* (LEPIDOPTERA:PYRALIDAE)

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INSECTS can regulate the concentration of trehalose in their haemolymph[1], usually at the expense of fatbody glycogen[2]. Metamorphic changes in the holometabolus insects were usually accompanied by substantial depletions of their carbohydrate reserves[3-5]. Metabolic control of carbohydrate metabolism is often reflected in quantitative alterations in the glycogen, the major carbohydrate reserve. Hence a study was initiated to note the day-to-day variations in the tissue glycogen content during the development of *Chilo partellus*.

The stem borer *Chilo partellus* is the most destructive pest of *Sorghum vulgare* pers (jowar). For experimental purpose, the above insect was reared in the laboratory on artificial diet[6] at 27 ± 1°C and RH 65 ± 5%. Glycogen was extracted from the entire larvae, pupae and adult[7] and was determined by the method of Carrol *et al*[8] using d-glucose as the standard and expressed in g/100 g of the tissue.

On the first day of the first instar, the glycogen