Effect of *Tephrosia purpurea* Extract on Fecundity Of *Corcyra cephalonica* (st.)

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**Abstract:** The naturally occurring allilochemics play a promising role in insect control by deterring insect feeding by their effects as insect growth regulators, as antihormones or as insecticides. Effect of *Tephrosia purpurea* extracts on reproductive ability i.e. fecundity was reduced at more than 40.08 %. There is reduction in hatching percentage also. It may be due to reduced juvenile hormone titre which resulted inhibition of egg development. It changes the hormone pool hence disturbs the egg maturation process. It indicates that *Tephrosia purpurea* extract would make a substantial contribution to the recent efforts towards a safer and more effective pest control programme.

**Keywords:** *Corcyra cephalonica, Tephrosia purpurea, Fecundity, Growth, Development*

**1 Introduction**

In insects corpus allatum (CA) secretes juvenile hormone (JH) which plays an important role in insect growth metamorphosis and reproduction\(^1,2\). Further the research work continued and centered round such aspect as implication of CA hormone on the life cycle and morphogenesis of external and internal structures. This aspect was considered for hormonal control of insect development and the term was coined as “Third generation pesticides”\(^3\). The need for such pesticides was due to growing awareness of environmental hazards from synthetic insecticides and associated problems of pest resistance to insecticides pest resurgence, detrimental effects of non-target organisms\(^4\). So there is urging for safe, effective and economical insecticide. The plant kingdom can provide such chemicals with diverse biological activities. A host of new insecticides growth regulators (Juvenile hormone and its bioanlogue, ecdsone and its bioanalogues), antifeedants, attractants and repellents etc. isolated from plants having insecticidal, juvenomimetic and other type of activities. The realization of the potential danger for man from the use of chemical insecticides encouraged a search for new method of insect pest control. The method at present being explored involves interference of the mechanisms controlling insect growth and development by exogenous application of regulators and antifeedants etc. Such studies are needed to unravel the entire picture of pest control strategy. Juvenoids are considered promising for controlling the insect pests, and promise to be environmentally safer than the classical insecticides\(^4\). Moreover by
saving predators and parasitoids, they may promote the establishment of a balance in which the outbursts of pests would be checked by their natural enemies. Among the promising natural insecticides investigated to date the neem tree constituents are reported to possess significant biological effects against a variety of insect pests. A good number of plants tested against Corcyra showed insecticidal growth regulatory, ovicidal and antifeedant activity. Similarly Azadirachta indica was also tested against large number of lepidopteran insects, as well as Corcyra cephalonica which showed the reduced number of adult emergence. The plant isolates have activities of entomological interest and have attracted attention of many workers. In present investigation effect of Tephrosia purpurea extract on fecundity of Corcyra cephalonica (st.)

2 Materials and Methods
The biological material for the present study i.e. Corcyra cephalonica (st.) larvae from the laboratory maintained culture were taken for the experimentation. The adult is a pale, greyish brown moth. It is short lived. The young larva is dirty creamy white colour with a prominent broad yellowish head. A fully grown larva measures about 20 mm long. The larvae generally feed on broken parts of grains. The older larvae are capable of feeding on sound grains also. During feeding the larva weaves a silken webbish shelter around the grains and remains inside it. A large amount of grain is lost due to feeding and webbing. The life history is completed within 60-80 days.

To maintain the culture of Corcyra cephalonica in laboratory sorghum grains have been found to be more suitable medium for rearing. The rich standard culture of Corcyra was maintained in the laboratory on a normal dietary medium composed of coarsely ground jowar (Sorghum vulgare) mixed with 5% (w/w) powdered yeast inside large glass containers (150 mm diameter, 200 mm height) at 26 °C and 93 5% R.H. A group of 5th instar larvae was selected and treated with Tephrosia purpurea extract as 5µl of sublethal dose in acetone applied topically on the abdomen of the test larva with the help of Hamilton microliter syringe. The dose applied was 26.36%. Controls were treated with 5µl of acetone only. They were kept in the batches of ten larvae in each Petri dish. Three replicas were maintained. They were allowed to feed on the food. So as to record average fecundity, the adults developed from the treated larvae were collected. The male and female moths were selected and paired separately and kept in separate specimen tubes for egg laying. So as to study the effect of plant extracts on reproductive potential of Corcyra cephalonica and to estimate the number of eggs laid in each treatment they were counted daily till the female died. It was replicated for five times. For percent hatchability a random sample of twenty eggs was taken from each replica and placed on a cello tape to prevent the escape of newly hatched larvae. At the same time incubation period of eggs was also recorded for each treatment. All the results were subjected to analysis of variance.

3 Results and Discussion
The reproductive ability of the moths emerging from larvae treated with Tephrosia purpurea extract reduced greatly. There was great reduction in egg production per female. It was 70.4 %. The hatchability percentage was affected due to the seed extract. The incubation period of eggs laid by female of Tephrosia purpurea extract treated larvae was not affected significantly.

The results obtained from the Tephrosia purpurea extract treated larvae on fecundity show that the Corcyra was significantly affected. The reproductive ability i.e. fecundity was greatly reduced at more than 40.08%. There is reduction in hatching percentage also. It may be due to reduced juvenile hormone titre which resulted inhibition of egg development. It changes the hormone pool hence disturbs the egg maturation process. These results agree with the previous work. That the effect of larval nutrition on egg production was by injected proteins particularly organic nitrogen. Proteins
are well known for growth, survival and fecundity of insects\textsuperscript{14}.

Table – Effect of \textit{Tephrosia purpurea} extract on development and fecundity of \textit{Corcyra cephalonica} (st.)

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>\textit{Tephrosia purpurea} extract treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Larval period</td>
<td>10.2 ± 1.12</td>
<td>9.1 ± 1.05 * (10.78)</td>
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<tr>
<td>Pupation period</td>
<td>7.2 ± 0.92</td>
<td>8.1 ± 0.93 * (-12.5)</td>
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<tr>
<td>Adult emergence</td>
<td>96.4 ± 3.48</td>
<td>52.9 ± 4.36 * (45.1244)</td>
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<tr>
<td>Eggs laid /female</td>
<td>159.4 ± 5.32</td>
<td>77.5 ± 6.25 * (51.3801)</td>
</tr>
<tr>
<td>Hatchability</td>
<td>92.52 ± 6.47</td>
<td>60.8 ± 2.98 * (34.2844)</td>
</tr>
<tr>
<td>Incubation period( days)</td>
<td>5.9 ± 0.85</td>
<td>6.9 ± 0.47 * (-6.949)</td>
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Each value is the mean of three observations ± S.D. Values in parentheses indicate % variation over control. Values are significant at P < 1\textsuperscript{*}

Fig. 1 - Effect of \textit{Tephrosia purpurea} extract on development and fecundity of \textit{Corcyra cephalonica} (st.)

Pandey reported significant inhibition of Aphid fecundity due to \textit{Lantana camera}, \textit{Azadirachta indica}, \textit{Ipomea cornea} and \textit{Theventia nerifolia}\textsuperscript{15}. Some scholars also recorded the inhibition in vitellogenic oocyte development due to azadirachtin. It was explained that azadirachtin reduced the juvenile hormone titre and inhibited egg development\textsuperscript{16}. It disturbs moulting and egg maturation processes in insects primarily by changing the hormone pool. The results of present findings can be explained on similar line. Khanam and Talkder evaluated the significant reduction in fecundity of \textit{Tribolium confusum} due to \textit{Polygonum hydropiper} and \textit{Aphanamixis polystachya}\textsuperscript{17}. Sundarraj reported considerable reductions in egg production of \textit{Taragama sivia} due to neem seed kernel powder extract\textsuperscript{18}. Shanthi and Logiswaran found the decreased fecundity in \textit{Sitotroga} due to extracts of \textit{Eucalyptus}\textsuperscript{19}. Maheshwari and Dwivedi reported that dry leaf powder of \textit{Tephrosia appolinea} showed that oviposition of \textit{Tribolium castaneum} was affected\textsuperscript{20}. It indicates that \textit{Tephrosia purpurea} extract would make a substantial contribution to the recent efforts towards a safer and more effective pest control programme. It is also indicated that chemicals from plant source have provided interesting, challenging and explorable research to entomologists for discovering newer allochemics of plant origin.

4 Conclusions

From the above findings it can be concluded that plant products affect the survival and growth of the insects but also make them available to natural enemies for a longer period and increase the probability of mortality. Plant extracts disturb moulting and egg maturation process by changing the hormone pool.

5 References

6. Bhargav, M.C., Role of juvenile hormone analogues/chitin synthesis inhibitor and indigenous compounds (natural plant extracts) in evolving pest management.