SOME OBSERVATIONS ON ENTOMOPHAGOUS NEOAPLECTANA ON POPLAR STEM BORER, *Apriona cinerea* Chev. IN NWFP

M. Ismail Chaudhry & Hanif Gul*

Introduction

The present era may be termed as cellulose age as almost every thing in our daily use contains cellulose. The increased use of such products is causing the pulp wood and construction industries to expand dramatically to keep pace with the enlarging population, and this is motivating the plywood and lumber mills to intensify their demands. This ever increasing requirements for new products put more and more pressure on tree growers to maximize wood yield from the same land in the shortest possible time.

Our forests, have to be well managed to keep pace with increasing demands. The quantities of wood products needed are far greater than can be supplied without greatly intensifying forest management on millions of acres. The problems are compounded by shrinking area on which marketable wood can grow. As the population grows, demands increase for more recreational use of forest lands hence additional forest areas will have to be reserved and managed on modern production lines. Also such continuous expanding encroachments of civilization as dams, highways and urban housing developments decrease the acreage of productive timber land.

In order to meet these demands, foresters are changing their concepts of forest managements and are now beginning to orient their thinking in much the same way as that of Agricultural formers, improve plant stock, change cultural techniques to include silvicultural practices and effectively, economically and safely control insect pests and diseases.

Poplars the fast growing tree species providing wood for match, paper, pulp and packing indurstires and other soft wood requirements have been introduced in the country. Unfortunately these trees are subject to the attack of variety of insect pests. Among them the borers are most destructive which spoil the real wood wealth.

Chemical and other methods of conventional control for the borers are least effective because the borers are concealed feeders and have successful safety adaptations. Naturally other methods of control are to be sought out especially the biological control through the natural enemies.

During the survey of natural enemies of poplar borers a nematode of *Neoaplectana* group was recorded among the natural enemies of *Apriona cinerea* Chev. at Mingora Swat. The infected borer grubs were collected and brought to laboratory at Peshawar for further studies.

* Authors are Director Entomology and Systematic Entomologist in Pakistan Forest Institute, respectively.

Review of Literature

The potential use of nematodes as natural regulators of insect populations has been discussed by Glaser and Wilcox as early as 1918. Zwaluwenburg (1928) and La Rivers (1949) presented early lists of nematode insect associations. Theodorides (1950) cited over 100 species and sub-species of nematodes associated with insects in France and Ruhm (1956) listed a similar number of nematodes associted with Scolytids in Germany. Massey (1966) recorded several nematode parasites considerably reducing reporductive potential of bark beetles by causing sterility and in some cases killing the host. Couturier (1963) described two species of mermithids parasitic in common chafer, *Melolontha melolontha.* Artyukhovshii (1955) described nematode association with forest Lepidoptera in Voronezhshoblast.

Dutdy (1959) reported DD-136 strain of *Neoaplectana* carpocapsae as carrying a bacterium, *Achromobacter nematophilus* as a symbiont into the ventricular portion of the intestinal lumen of the infective insect larvae. The nematode releases the bacterium in the haemocoel of the insect where it multiply to kill the insect and create bacterial soup upon which the nematodes feed.

Entomogenous nematodes have been tried to control field populations of insect by many workers since Glaser (1932) showed high mortality of Japanese beetle grubs in pasture plots. Dutky (1959) showed 60% and higher mortalities of codling moth larvae by using DD-136 strain of *Neoaplectana carpocapsae.* Chamberlin and Dutky (1958) sprayed *Neoaplectana carpocapsae* DD-136 strain (cultured on wax moth larvae) in doses of 5×10^6 nemas per 100 plants in water suspension which gave 80—85% reduction of tobacco budworm, *Heliothis viescens* under very moist conditions.

Poiner (1971) has tabulated a number of workers having reported culturing *N. glaseri* and *N. carpocapsae* on wax moth larvae and other media and tried against a variety of lepidopterous, Coleopterous and other pests with varying degree of pest mortality leading to protection of damage in a few cases while in others even the mortality of pest larvae did not reduce damage to the crops.

Materials and Methods

During the course of survey of natural enemies of poplar borers few grubs of *Apriona cinerea* Chev. were found infected by nematodes of Neoaplectana group from Swat.

Laboratory trials on the infectivity of borer grubs by these nematodes were conducted. The nematodes were picked and released on the body of the grubs of *A. cinerea* being reared in the poplar billets in the laboratory at the Pakistan Forest Institute, Peshawar.

In another trial the infected larva was crushed and mixed in 100 ml of water to make the sprayable suspension. The material was sprayed on the grubs of *A. cinerea* keeping 20 grubs in a lot, replicated thrice. The treated grubs were then shifted back to the poplar billets, one grub in each billet. A lot of 20 grubs was also kept untreated as check for comparison.

Results and Discussion

Entomogenic nematodes were recorded from the galleries of *A. cinerea* Chev. in November, 1979 from Swat. The nematodes were extracted and identified as belonging to Neoaplectana group of Neoaplectanidae.

Incidence of nematode parasitism on *A. cinerea* Chev. was studied in Swat. The results are given below:

Incidence of Neoaplectana on *A. cinerea* in Swat.

Year	No of Grubs studied	Infected Grubs	% Infection
1979	115	2	1.74
1980	81	1	1.23
1981	400	1	0.25

As seen from the table the natural incidence of Neoaplectana on the borer grubs was very low as only 0.25 to 1.74% borer population was infected during the year 1979 to 1981.

In order to test the possibility of infectivity of the nematode, healthy grubs of the borer were released in a glass dish containing a grub parasitised by nematodes. The grubs were taken out from the contaminated glass dish and shifted to their galleries in the poplar billets after few hours. Within two days the creamy white grubs became sluggish, stopped feeding and making their galleries. With the advancement in the activity of the nematodes the body colour of the grubs changed to reddish brown and they died in 4—6 days of the release of nematodes. In another similar trial the borer grubs became sluggish and stopped feeding within 10—12 hours and died in 22—36 hours of the release of the nematodes.

The nematode infectivity potential as a result of spraying the nematode suspension was studied in the laboratory. The results are on next page.

After about 15 hours of nematode suspension spray the infected grubs stopped feeding and became sluggish. The whitish colour changed to reddish brown later turning dark brown. 20 to 35% grubs got infected and died as a result of nematode infection caused by suspension spray where as no mortality of grubs occurred in check.

The mean mortality of 28.3% *A. cinerea* grubs is less than 60% codling moth larvae shown by Dutky (1959), 80—85% Tobacco budworm (Chamberlin and Dutky 1958) and 40%

grubs of *Popillia japonica* (Glaser and Farrel 1935) but is more than the mortalities shown by Creighton et al (1968), Jaques (1967) and Tanda and Reiner (1960).

The utility of the entomogenous nematodes as biocontrol agents of pest insects is well admitted but there is a need to develop methods of their propagation, application and perpatuation in the natural environments for installing these useful organisms as permanent components of the ecosystem as insect population regulators and equilibrium setters.

Laboratory Infection of *A. cinerea* grub *by* Nematode spray in 4 days.

Replication	Grubs sprayed	Grubs infected	% Infection
1	20	7	35
2	20	4	20
3	20	6	30
Check	20	0	0
Mean	20	5.66	28.3

REFEERENCES

Artyukhovskii, A.K. (1955) Voronezhsk. Lesokhozyaystevennyy Inst, 37–40.

Chamberlin, F.S. and Dutky, S.R. (1958) J. econ. Ent. 51: 56.

Couturier, A. (1963) Annls Epiphyt. 14: 203–267.

Dutky, S.R. (1959). Adv. Appl. Microbial. 1: 175–200.

Glaser, R.W. and Wilcox, A.M. (1918) Psyche 25: 12–15.

Glaser, R.W. (1932). New jers Dept, Agric. Bureau Plant Industry, Circular 211: 3–34.

Glaser, R.W. and Farrell, C.C. (1935). J. New York ent. Soc. 43, 345–371.

Jaques, R.P. (1967) J. econ. Ent. 60, 741–743.

La Rivers, I. (1949) Wasmann Collector 7: 177—206.

Massey, C.L. (1966) Bull. Ent. Soc. Am. 12: 384—84.

Poinar, G.O. (1971) Microbial Control of Insects and Mites. Edited by H.D. Burges and N.W. Hussey 181—203. Acadamic press London.

Ruhm, W. (1956) Par Schriftenreihe. 6: 437.

Tanada, Y. and Reiner, C. (1960) J. Insect Path. 2, 230—246.

Theodorides, J. (1950) Vie et Milieu 1: 53—68.

Zwaluwenburg, R.H. Van (1928) Bull. Exp. Sta. Hawaiian Suger Planters Ass. 20: 68.