POPLAR STEM BORER, *APRIONA CINEREA* CHEVROLET, (LAMIIDAE: COLEOPTERA) AND ITS CONTROL

By

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Introduction

Pakistan is deficit in wood production. To overcome this shortage in the country fast growing tree species like poplars and eucalyptus are being introduced. Poplar wood is very useful for paper-pulp, match and plywood industries. With the separation of East Pakistan where most of the match and paper industries were situated, the country is facing a grave situation. A huge amount of foreign exchange is being spent on import of these products and the government is planning to establish match and paper industries in N.W.F.P. and other parts of the country. Raising of poplar plantations would be needed to feed these industries. In Pakistan poplars grow very well in hilly areas with enough rainfall such as Murree, Hazara, Swat, Tribal belt of N.W.F.P. and Azad Kashmir. The poplars are very heavily infested by leaf stitchers and defoliators in the plains but are quite safe from their attack in hills. Unfortunately hybrid poplars are seriously attacked by poplar stem and root borer, *Apriona cinerea* Chev. in hilly areas.

The adult beetles, (Fig. I (iv)) emerge in June and feed on bark and twigs of poplar and damage them by girdling. Eggs are deposited in eye shaped slits, made by female for oviposition on branches and stem of trees. The egg (Fig. I (i)) is creamy in colour and is large elongated 6—8 mm long and 3 to 4 mm wide. One end is broader than the other. The grubs (Fig. I (ii)) on hatching bore into branches of old trees and stem of young plants from the top and start tunnelling down towards the base where they enter the main stem or roots of young plants. The grubs make ejection holes smaller and nearer in the beginning and bigger and wide apart later, through which the frass is ejected and the galleries are kept clear (Fig. 2(i)). Accumulation of ejected frass at the base of trees is conspicuous and clear indication of its infestation. In young plants there is only one grub tunnelling down from the top shoot to the root, while in old trees (Fig. 2(ii)) even a dozen or more

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grubs enter the main stem from different branches. A single grub constructs more than 5 metres long gallery in a branch or stem in its life time. The grub constructs a pupal chamber in the stem or root by plugging the main gallery with frass in spring where it remains inactive before its pupation. It pupates in May and emergence of the beetles takes place in June by cutting out round emergence holes. The life cycle completes in two years. In Hazara, Swat, Azad Kashmir and Parachinar 10 to 100 per cent poplar trees are infested by this pest. Since it feeds on pith and heartwood the trees usually do not die but the ejection holes made at every 15—20 cm hampers tree growth and makes the timber useless for plywood, packing cases and match industry.

The present study was undertaken with a view to kill this serious pest at larval stage effectively and economically.

Review of Literature

Stebbing (1914) reported *Apriona cinerea* Chev. as borer of Mulberry in India while Beeson (1941) recorded on *Morus alba*, *Ficus* sp. and *Debregeasia hypoleuca*. Chatterjee (1964) for the first time reported the pest as serious stem and root borer of poplar in India. Chaudhry & Ahmad (1973) during their study on "Population Dynamics of two poplar defoliators" found *Apriona cinerea* Chev. as serious borer of poplars in hilly areas of Pakistan. Detailed ecology is being studied under P.L. 480 project.

Trehan (1957), Pruthi and Bhatia (1960) and Singh (1964) have recommended use of fumigation with Carbon bisulphide or with a mixture of Chloroform and Creosote (2:1) in apple orchards against this pest. Chatterjee (1969) controlled 100% larvae with injection of 5 ml of Paradichlorobenzene in Kerosine oil, Creosote+Chloroform (1:2), Ethylacetate, Napthalene+Creosote+Carbon Bisulphide (5:2:1) and Carbon bisulphide but a phytotoxicity of 10%, 20%, 30%, 40% and 50% respectively was also experienced. Sharma (1969) succeeded in controlling *Aeolesthes holosaricea*, Apple stem borer by inserting cotton wicks soaked in dichlorovos, dimethoate or methyl demeton in the galleries of the borer, Kang (1971) recommended injection of 0.57.%Folidol into larval tunnel for the control of poplar borer, *Cryptorhynchus lapathi* in Korea.

Material and Method

Bidrin at the rate of 4 ml, 6 ml and 8 ml per tree was implanted in sapwood portion of infested stem with the help of Mauget applicator during 1971.

The first experiment for the trial of insecticides and fumigants against *Apriona* grubs was conducted in December, 1972 at Abbottabad. All ejection holes were plugged with cotton except the lowest or the most recent through which the insecticides and fumigants were injected with medical syringe and closed with mud. The chemicals used were Bidrin, Ekalux, D.D.V.P., Kerosine oil, E.D.C.T., at the rate of 1,2 and 3 ml per borer hole, Phostoxin at 1, ½ & 1/4th tablet and F.A. saffa sticks at 1,2 & 3 sticks per borer hole.

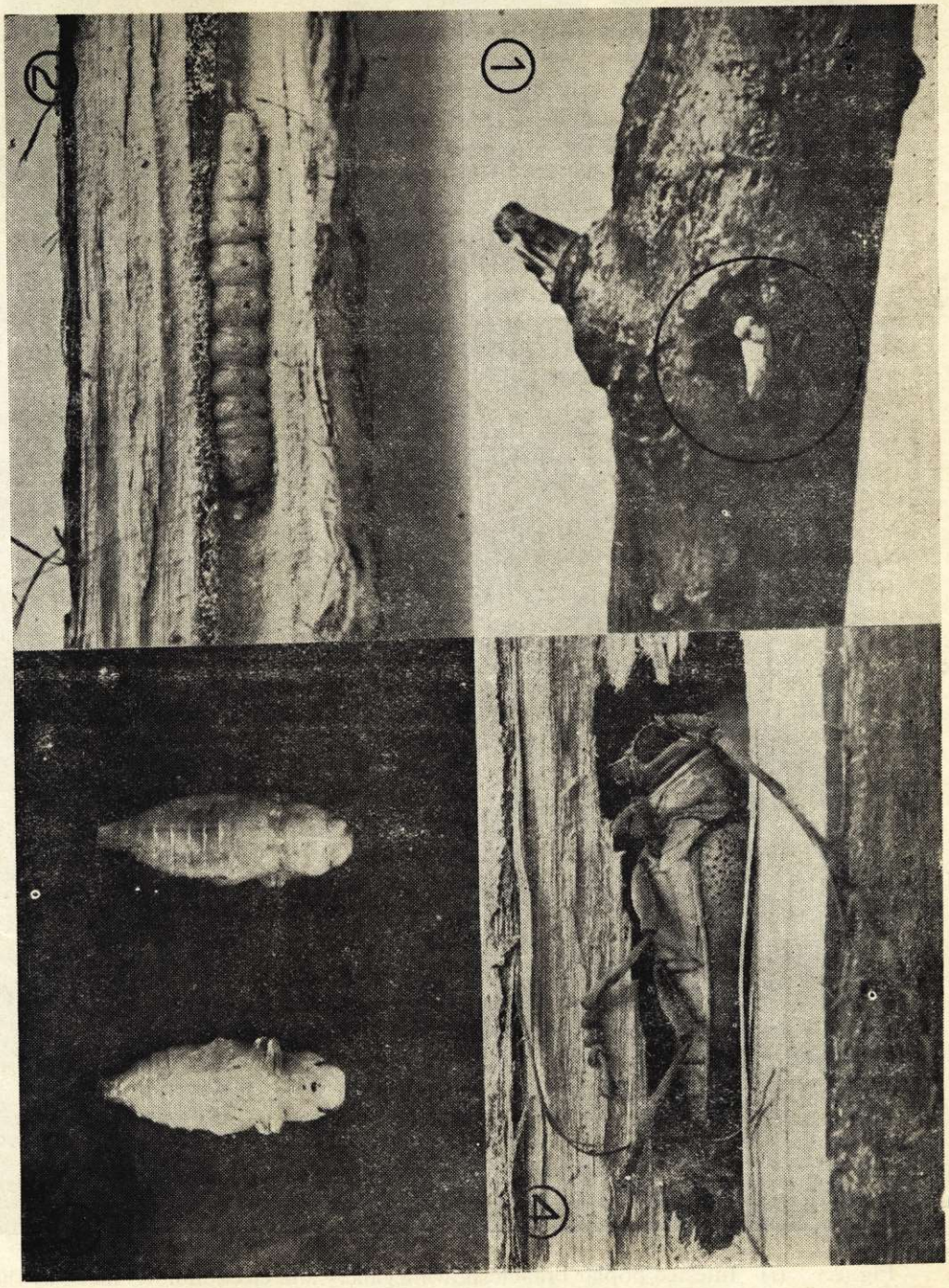

Fig. 1. (*i*) Hatched egg exposed from the slit made by female
(*ii*) Grub shown feeding in its tunnel
(*iii*) Pupae dorsal and ventral view.
(*iv*) Adult shown in its pupal chamber before emergence.

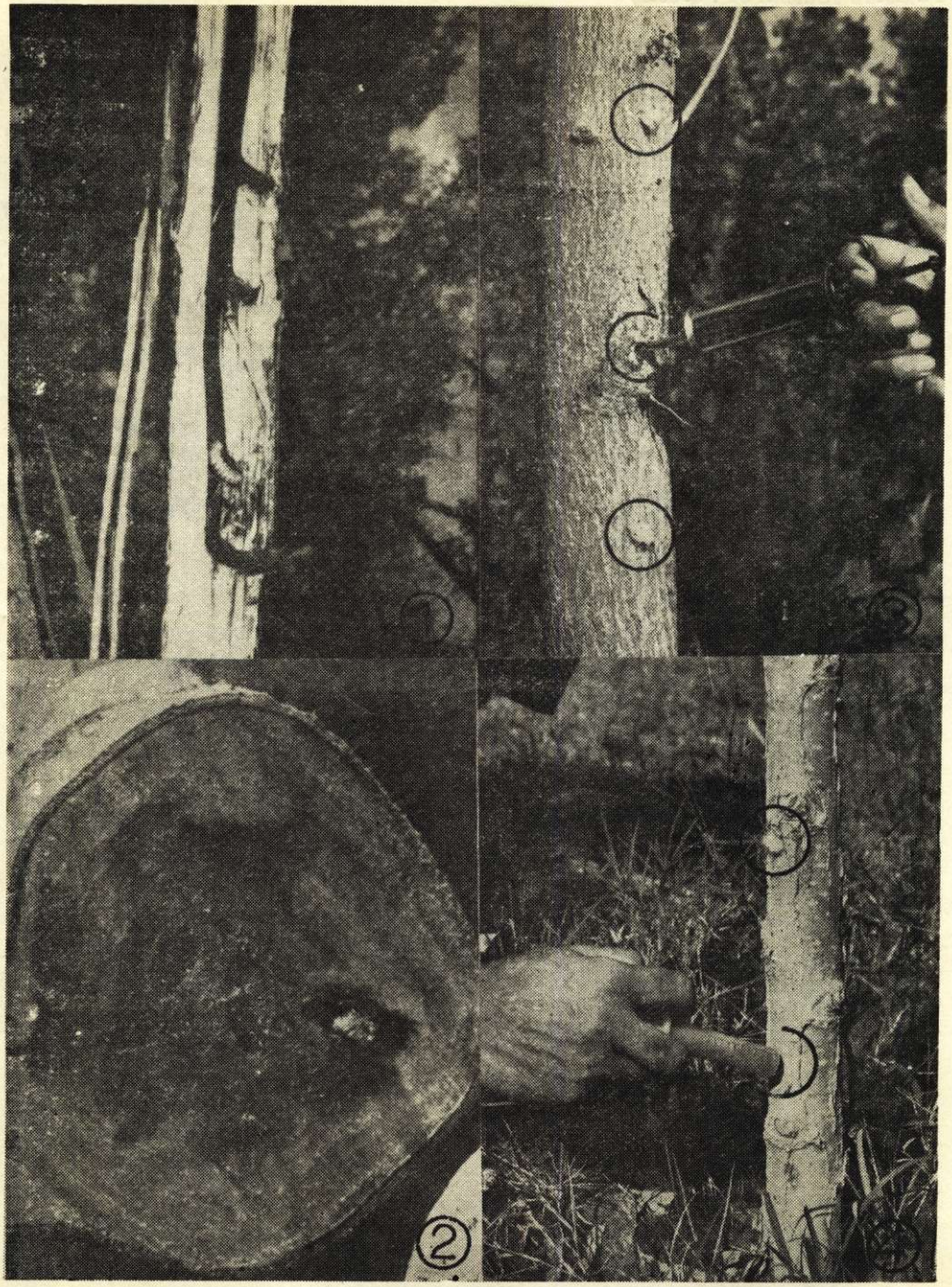

Fig. 2. (*i*) Infested poplar branch showing gallery and ejection holes made by the grub.
(*ii*) Cross section of poplar stem showing galleries in the pith.
(*iii*) Chemical being injected with the syringe in the second last hole.
(*iv*) Chemical being injected in the last hole where grub entered the roots.

Another experiment was conducted in September, 1974 at Abbottabad on poplars planted on Murree road, in the golf club and in a private nursery on Mansehra road. Bidrin, Ekalux, Kerosine oil and E.D.C.T., at the rate of 1,2 and 3 ml per hole, Phostoxin in three doses of 1, 1/2 and 1/4 tablet and Fucelli Antitalo Saffa in three doses of 1,2 and 3 sticks per hole were applied. Each treatment was replicated five times.

To avoid escape of the gas or the chemical all the ejection holes were closed with cotton plugs except the 2nd lowest hole which was closed after introducing the chemical with the help of an ear syringe (Fig. 2(iii)). The treated holes and the last ejection holes even on untreated control trees were marked with red paint for ease in tracing fresh ejection holes at the time of observations. In November, 1974 treated plants in the nursery were cut and their galleries exposed to note the comparative mortality of grubs in all the treatments in one replication while in other 4 replications effect of insecticides was recorded on the basis of opening of treated holes and new ejection holes.

The final experiment was conducted in poplar nursery at Jullc in March, 1975. BHC, Lebaycid, Thiodan, Chlordane and Ekalux in 0.5%, 0.1%, and 0.05% concentrations were injected in three doses of 1 ml, 3 ml and 5ml. per borer hole. The method of application was same as applied in September 1974. The chemicals were injected in the 2nd last ejection hole in case of grubs feeding in the main poplar stem and last ejection hole (Fig. 2(iv)) in case of grubs entering root portion. Observations were taken four days after treatment by cutting the treated and untreated plants included in the experiment.

Results and Discussion

Bidrin implanted in cell-sap stream during 1971 showed no effect as the grubs continued feeding and making their galleries and ejection holes further on.

In the experiment conducted during December, 1972 some of the borer grubs died in lowest doses while in other cases some grubs survived in the highest doses of the same insecticides. It was evident that insecticides were effective even in lowest doses when the grubs came in contact with the poison but in cases where no contact with the poison occurred they survived even in highest doses. The reasons for this irregular results were thought to be blockade of tunnel by mature grubs for pupation or escape of the chemical back through the same hole before plugging and affecting the grubs due to defective method of application (Chatterjee 1969, used this method).

In the light of difficulties experienced in the above trial another experiment was laid out in September, 1974 when all the grubs were actively feeding and ejecting frass through ejection holes irrespective of their age. The method of application was also improved by plugging all the ejection holes except the 2nd lowest through which the chemical was injected with ear syringe which ensured contact of the grubs with the chemicals used for treatments. From the observations taken after two months in November, 1974 it was found that all treatments proved effective in killing borer grubs in their galleries

even at a minimum rate of 1 ml of emulsion concentrates, 1/4 Phostoxin tablet and 1 stick of F.A. Saffa. The observations also revealed that none of the treatments showed any adverse effect or phytotoxicity on poplar trees.

In one of the replications where all trees were cut and their galleries exposed, grubs in all treated trees were found dead while those in untreated trees were alive and had made 1-2 new ejection holes in two months time. In other four replications no treated hole was opened nor any fresh ejection hole was made except in untreated check treatment where the plugged holes were opened and fresh ejection holes were made by the grubs.

The observation on the final experiment conducted during March, 1975, revealed that all the insecticides viz. BHC, Lebaycid, Chlordane, Thiodan and Ekalux gave 100% mortality of grubs even with minimum dose of 1 ml of the lowest concentration of 0.05% per borer hole.

The treatment is most effective and cheapest method of controlling this serious borer. The cost of treating 1000 poplar trees, taking on an average 3 holes per tree, will be 10 paisas on account of insecticide (12.5 gm of BHC) and Rs. 100 as labour charges. With 15′×15′ spacing 1000 poplar trees will cover 5 acres and cost of controlling the borer per acre would be Rs. 20.

The common method for controlling such borers is to give a protective spray for preventing the adult beetles from laying eggs on tree trunks and branches (Cavalcasella. 1968, Harris 1965, Johnson 1965, Brizzi 1965 and Harris 1967). Such spray will cost Rs. 2,065 on account of insecticide and Rs. 50 for POL and labour (depreciation of spray equipment not counted) for treating 1000 poplar trees. The comparative efficacy of preventive treatment aside the cost of operation is 21 times the cost by the method evolved.

The cost of treatment with syringe will continuously be decreasing as the measure will reduce the infested trees every year but the cost of protective spray will remain the same as it has to be a preventive treatment on all the trees.

In the Irrigated Plantations interculture with fodders and other agriculture crops in poplar plantation is being recommended to make proper land use and increase per acre yield. The recommended method will have no ill effect on the crops while protective spray would not be possible on fodder and other crops.

The excessive use of insecticides is causing environmental pollution the world over. By use of this method poisonous effect of insecticides on useful insect fauna, domestic and wild animals, pollution of air, water and soil can be avoided.

It is therefore concluded that *Apriona cinerea* Chev. can be killed in grub stage feeding in the stem or roots of poplar trees with a nominal cost of insecticide. The main

item of expenditure would therefore be labour charges. Regular application of this method for consective three years will reduce incidence of attack considerably which will further reduce the cost of control measures and will make large scale raising of poplar plantations easily possible even with inter-culture.

References

1. Beeson, C.F.C. (1941) "The ecology and control of the forest insects of India and neighbouring countries" pp. 143.

2. Brizzi, G. (1965) "The bionomics of *Melanophila picta decostigmata*, a pest of young poplar plants." Redia, Firenze: 229—38.

3. Cavalcasells, B. (1968) "Comparative trial in chemical control of larvae and adults of *Cryptorhynchus lapathi* pubbl." Cent. Sper. Agri. For., Roma 10(2): 123—34.

4. Chateerjee, P.N., and R.S. Thapa. (1964) "Insect pests of fast growing tree species. I. Preliminary investigation on poplar stem borer *Apriona cinerea* in New Forest" Indian Forester Vcl. 90 pp. 681—687.

5. Chatterjee, P.N., P. Singh and G. Prasad. (1969) Insect pests of fast growing tree species II. Effect of various fumigants on poplar stem borer *Apriona cinerea* Chevrolet (Lamiidae) in New Forest plantation. Indian Forester 95(5) 369—371.

6. Chaudhry, M.I., and M.I. Ahmad. (1973) "Study of Population Dynamics of two poplar defoliators"—Final Technical Report of PL-480 project PFI Publication.

7. Harris, J.W.E. (1965) "Poplar and Willow borer *Sternochetus lapathi*, L, Coleoptera: Curculionidae" Abstr. of thesis in Dissent. (F.A. 1966 27 (964).

8. Harris, J.W.E. (1967) "Poplar and Willow borer *Sternochetus—Cryptorhynchus lapathi*" (Coleoptera: Curculionidae) in British Columbia. Can. Ent. 99(4): 411—8.

9. Johnson, N.E., and J.G. Zingg. (1966) "Tests of 12 insecticides for control of Sitka-Spruce weevil. (*Pissodes sitchensis* Hopkin". J.Econ. Ent. 58(3): 572—4.

10. Kang, J.Y., and K.W. Nam (1971) Study on the control of poplar insect pests in Korea, Research Report of Forest Research Institute, Korea. 1971 No. 18, 95—105.

11. Pruthi, H.S., and H.N. Bhatia (1960) "Some important fruit pests of North India", I.C.A.R. Bull. No. 80, p. 14.

12. Schnaider, Z., and M. Partyka (1969) "Chemical control of *Cryptorhynchus lapathi* in *Alnus glutinosa* plantation" Sylwan 113(5): 1—10 (F.A. 31—1970 No. 1027).

13. Sharma, P.L., and B.S. Attri (1969) "Control of Apple stem borer *Aeolesthes holosericea*" Ind. J. Ent. 31(1): 79-80.

14. Singh, Chotey (1964) Temperate Fruit Pests Entomology in India, The Entomological Society of India New Delhi, pp. 217.

15. Stebbing, E.P. (1914) Indian insects of economic importance Coleoptera pp. 374.

16. Trehan, K.N. (1957) Brief notes on the crop pest and their control in Punjab (India) J. Bombay Nat. Hist. Soc. Bombay, Vol. 54, pp. 615-616.