Agri. Res. J. Kerala, 1981, **19** (1) 72—75

EFFECT OF NEEM LEAF EXTRACT AND TWO JH ANALOGUES ON THE DEVELOPMENT OF *CALLOSOBRUCHUS CHINENSIS* LINN. (COLEOPTERA: BRUCHIDAE)

B. AMBIKA, C. C. ABRAHAM and T. NALINAKUMARI

College of Horticulture, Vellanikkara 680 654, Trichur, ***Kerala***

A few successful attempts involving the utilisation of JH analogues and plant extracts for the control of pests infesting stored products have been reported (Hope and Suchy. 1975; Bhatnagar-Thomas, 1976; Sutherland and Greenfield, 1976; David, 1979). The juvenomimetic properties of neem **leaf** extract have been established recently (Abraham and Ambika, 1979) The present studies were taken up to evaluate the relative efficiency of neem extracts and some JH analogues in controlling *Callosobruchus chinensis* Linn. (Coleoptera: Bruchidae), a major pest of stored pulse seeds.

Materials and Methods

Stock cultures of *Callosobruchus chinesis* were established and maintained on green gram seeds. Freshly emerged adults were drawn out from the stock cultures for rearing on treated seeds.

Five ml of extracts containing 2 5 and 5.0 g dried neem leaves were prepared following the method adopted by Abraham and Ambika (1979). **The JH** analogue ZR-512 (Hydroprene) was applied at 0.25 μg, while MV-678 was applied at 0.5 μg and 0.25 μg. The required quantities of the analogues were first dissolved in a few drops of acetone and then the volume was made upto 5 ml using 1% emulsion water containing Trition X 100.

Sound greengram seeds of 12.5% moisture content were separated by immersing it in 15% sodium chloride solution and removing those which floated. The heavy seeds were washed thoroughly in tap water and dried under a hair drier. The leaf extracts and the JH analogues each at 5 ml were sprayed through Potter's Tower at 24 lb/sq in pressure to ensure thorough coverage of 50 g of seeds which comprised one replication. After spraying, the greengram seeds were dried under a hair drier. There were altogether seven treatments [Table 1] each with three replications Seeds treated with emulsion-water served as 'control'. Fifteen pairs of C. *chinensis* were introduced to the treated and 'control' seed lots maintained in cylindrical glass jars of 20 x 25 cm size which were covered over with muslin cloth held in position with a rubber band. The seed lots were kept at laboratory conditions for a period of two months. The mean fecundity per replication was ascertained by carefully examining the seeds on successive days under sterioscopic microscope and counting the eggs glued to the testa. The F_1 progeny production per replication was recorded by counting and removing the adults that emerged in seed lots on successive days unti! completion of the adult emergence. The adult mortality at 24 hours after exposure and the number of days for which the populations survived

in each replicate were also recorded. Square root transformation was applied to the data on survival, while mortality percentages were refined as $(\sqrt{x+\frac{1}{2}})$ values. The fecundity and progeny production were transformed as log $(\sqrt{x+\frac{1}{2}})$ values. The data were analysed by employing the analysis of variance technique.

Results and Discussion

Significant variability with regard to mortality 24 hours after exposure, survival, fecundity and F_1 progeney production in *C. chinensis* was detected under different treatments and the mean values are furnished in Table 1.

The mortality to adults recorded 24 hours after exposure was maximum (30.503%) under treatment with 0.25 μg of Hydroprene and this was higher than in the rest of the treatments as well as 'controls'. The lower dose of Hydroprene (T_4) showed the next higher mortality of 16.989%. Neem leaf extracts and MV–678 were found to be on par.

There was complete suppression of oviposition in green gram treated with higher dose (0.25 μg) of Hydroprene (T_3). The grains treated with *5%* neem leaf extract showed a mean fecundity of 27.425 and the treatments T_5 (MV-678 0.5 μg) T_2 (Neem 2.5%) and T_2 and T_4 (Hydroprene 0.1 25 μg) as well as T_4 and T_5 were on par.

In the present study, high dose of hydroprene (0.25μg) was found to be most effective in causing immediate mortality, less survival rate, reduced fecundity and inhibition of progeny production. Among the different treatments, the F_1 progeny production was completely suppressed on neem extract and hydroprene treated seeds and these treatments were on par with T_5. In the treatment of MV-678 (0.25 μg), the progeny production was lower than in control.

The adult survival under hydroprene at 0.25 μg was significantly lower (1.0 day) as compared to all the other treatments. The treatments T_1 and T_4, T_1 and T_5 and T_2 and T_4 were on par with reference to adult survival.

Among the different developmental characteristics of *Callosobruchus chinensis,* the progeny production is of vital importance from the point of view of progressive population build up and damage potential. It may be seen that neem leaf extracts at both doses are as effective as the JH analogue Hydroprene and 0.5 μg MV-678 in suppressing progeny production. Since both doses of neem leaf extracts are equally effective, the lower dose will be preferable for practical purposes Similar results have been reported by Sangappa (1971) with seed oils from sunflower, mustard and neem on *C. chinensis.*

Under indoor conditions, the JH analogues are reported to retain their bio-efficiency for reasonably long periods (Street, 1978; Injeyan *et al.* 1979) and since hydroprene, MV-678 as well as the neem leaf extracts reveal adequate potency against C. *chinensis,* it appears that there is scope for their utilisation in the management of the pest under godown conditions.

Table 1

Mean mortality at 24 hours after exposure, fecundity per female, survival and F_1 progeny production of C. *chinensis* reared on green gram seeds treated with neem leaf extracts and the JH analogues Hydroprene (ZR-512) and MV-678

Treatments	Developmental characteristics			
	Mortality at 24 hors. after exposure	Mean fecundity per female	Survival (in days)	Progeny production
T_1 (Neem 5%)	15.285 [3.973]	27.425 [1.446]	2.214 [1488]	0 [-.301]
T_2 (Neem 2.5%)	11.947 [3.528]	148.436 [2.173]	2.487 [1.577]	0 [-.301]
T_3 [Hydroprene 0,25 μg]	30.503 [5.523]	0,0 [-.301]	1 0 [1.0]	0 [-.301]
T_4 [Hydroprene 0.125 μg]	16.989 [4.182]	166.994 [2.224]	2.31 [1.52]	0 [-.301]
T_5 [MV-678 0.5 μg]	15.158 [3.957]	128.622 [2.111]	3 316 [1.821]	0.675 [0.07]
T_6 [MV-678 0.25 μg]	8.0 [2.912]	302.889 [2482]	4.322 [2.078]	3.536 [.606]
T_7 [Control]	0.607 [1.052]	814,204 [2.911]	12.96 [3.60]	561.84 [2,75]
CD	0.490	0 876	0.282	0.4567

Figures in parenthesis are the re-tranformed values.

Summary

In studies on the comparative effectiveness of neem extract and the juvenile hormone analogues Hydroprene (ZR-512) and MV-678 against *Callosobruchus chinensis*, it was found that in greengram seeds treated with 0.25 ug of Hydroprene, there was significant reduction in fecundity and progeny production of the insect. The neem leaf extracts at 2.5 and 5.0% and MV-678 at 0.5 ug were as effective as Hydroprene in suppressing progeny production. The feasibility of utilising JH analogues and neem leaf extracts for the management of *C, chinensis* has been discussed.

സംഗ്രഹം

പയർ വിത്തിനങ്ങളിൽ ഗണ്യമായ നാശം വരുത്തുന്ന കാലസൊബ്രൂക്കസ് ചൈനൻസിസിന് എന്നവണ്ടിനെതിരെ വേപ്പിലസത്തും (2.5, 5.0%) ഹൈഡ്രോപ്രീൻ (0,25, 0.125 മൈക്രൊഗ്രാം) MV-678 (0.5, 0.25 മൈക്രൊഗ്രാം) എന്നീ ജൂവനൈൽ ഹോർ

മോൺ അനലോഗുകളും പരീക്ഷിച്ചു നോക്കിയതിൽ കീടങ്ങളുടെ വംശവർദ്ധനവിനെ തടസ്സപ്പെടുത്തുന്നതിനു് 2.5% വീര്യമുള്ള വേപ്പിലസത്തിനു് 0.25 മൈക്രോഗ്രാം വീര്യമുള്ളഹൈഡ്രോപ്രീനു തുല്യമായ ശക്തിയുള്ളതായികണ്ടു.

Acknoweldgement

The authors are grateful to Dr. P. C. S. Nair, Associate Dean, College of Horticulture, Vellanikkara for providing facilities and to Shri. V. K. G. Unnithan, Assistant Professor for statistical analysis They are also thankful to Dr. K. C. Dev Raj Urs, Chief Scientific Officer, UAS Regional Station, Mandya and to M/s. Zoecon Corporation, Palo Alto, California, for supplying samples of the juvenile hormone analogues. The first author is indebted to the CSIR for providing the Research Associateship.

References

Abrham, C. C. and Ambika, B. 1979. Effect of leaf and kernel extracts of neem on moulting and vitellogenesis in *Dysdercus cingulatus*. *Curr. Sci.* 48, 554–256.

Bhatnagar–Thomas, P. L. 1976. Laboratory evaluation of tablets and strips of juvenile hormone analogue Altozar R for the control of *Trogoderma granarium*. *Food Science and Technology,* 13, 159–161.

David, A. N. 1979. Insect growth regulators–New protectants against the almond moth in stored inshell peanuts. *J. Econ. Entomol.,* **72,** 816-819.

Hoppe, T. and Suchy, M. 1975. Present status on insect growth regulators for the protection of stored grain. *Eppo. Bull.,* 5, 193–196.

Injeyan, H. S. Rapport, E. 1979. The effects of exogenous juvenile hormone treatment on embryogenesis in *Schistocerca gregaria Can. J. Zool.*, *57,* 838-845

Sangappa, H. K. 1977. Effectiveness of oils as surface protectants against the bruchid, *Callosobruchus chinensis* infestation on redgram. *Mysore J. Agrl. Sciences,* 11, 391–397.

Street, M. L. 1978. The effect of juvenile hormone analogues on the eggs of *Pieris brassicae L. Experentia* , 34, 544-535.

Sutherland, 0, R. W. and Greenfield, W. J. 1976. A toxin for black beetle and grass grub larvae in resistant *Lotus pedunculatus* root. Paper presented at 10th International IUPAC Symposium-Chemistry of Natural products. August 1976.

(M S Received: 19-8-1980)