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Evaluation of Certain Botanicals as Stressors of Nuclear Polyhedrosis Virus in Larvae of *Helicoverpa armigera**

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The gram caterpillar *Helicoverpa (=Heliothis armigera)* is attacked by a nuclear polyhedrosis virus (NPV) (Rabindra and Subramanian, 1974). NPV is transmitted to the offsprings of host insects by vertical transmission (Hamm and Young, 1974) and often the virus can exist in the host population in occult form (Podgwaite and Mazzone, 1986). Such latent infections or occult viruses are some times activated by stress, both biotic and abiotic, resulting in the outbreak of the disease in the host insect populations (Aruga, 1963).

In the course of laboratory studies with botanicals, the authors found that larvae of *H. armigera* exposed to aqueous extract of leaves of certain plants showed higher levels of NPV infection than those not exposed to plant extracts. Hence, a laboratory experiment was conducted with second instar *H. armigera* larvae to see the effect of certain botanicals on the expression of latent NPV infection.

The leaves (10 g in each) of *Tagetus patula* L., *Prosopis juliflora* Sw., *Calotropis gigantea* L. and *Vitex negundo* L. were macerated individually in an all-glass pestle and mortar and extracted with small quantities of distilled water. The extract was passed through a muslin cloth and the final volume made upto 100 ml to get 10 per cent extracts. Similarly, a one per cent seed kernel extract of neem (*Azadirachta indica* A. Juss) was prepared. Teepol was added to the extracts at 0.1 per cent as a surfactant. Chickpea (*Cicer arietinum* L.) leaves were dipped in the different extracts to give a thorough wetting and the excess shaken off by jerking the shoots thrice. For control, the leaves were dipped in distilled water containing 0.1% Teepol only. The petioles of the leaves were kept immersed in water taken in glass vials and after shade-drying, 13-15 second instar larvae of uniform age and size were allowed to feed on them for 24 hours. The treatments were replicated thrice. After 24 hours, the larvae were removed from the treated leaves and released individually into penicillin vials containing semi synthetic diet. As and when the larvae died, smears were examined under a phase contrast microscope to see if they had died due to NPV or other causes. The experiment was terminated on the eighth day and the individual weights of the surviving larvae were recorded in a sensitive electronic balance (Sartorious Al 205). Percentage mortalities were subjected to angular transformation and all the data were subjected to analysis of variance. Means were separated by L.S.D.

The data revealed that, 10 per cent aqueous extracts of leaves of *T. patula* and *C. gigantea* when fed to larvae of *H.armigera* activated the latent virus infection whereas, *P.juliflora, V. negundo* and neem seed kernel extract did not do so (Table 1). *T. patula* and *C.gigantea* extracts had obviously acted as stressors activating the latent viral infection. *T. patula* is known to contain two principles *viz.*, 5-(3 buten -1 nyl) 2-2 bithienyl (PA) and terthienyl (PB) (Morallo Rejesus and Eroles, 1978) which are toxic to Lepidopterous insects. *Calotropis* leaf decoction was used for the control of insects like thrips (CSIR, 1959). Eventhough, there was no significant increase in the mortality due to the insecticidal activity of *T.patula* and *C. gigantea* in the present study, sublethal effects could be seen in the surviving larvae. The larval weight in these treatments were significantly lesser than those in control indicating stress on the larvae. Eventhough similar stress effect was seen in larvae exposed to neem seed kernel extract, there was no mortality due to NPV. It

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Table 1. Evaluation of certain botanicals as stressors of latent NPV infection in *H.armigera* larvae

Treaments	% mortality* due to		Weights $ mg/larva
	NPV	Other causes	
Tagetus patula 10%	36.27[a]	11.97[b]	70.97[c]
Prosopis juliflora 10%	3.03[b]	11.87[b]	190.97[a]
Calotropis gigantea 10%	40.13[a]	4.97[c]	94.82[c]
Neem seed kernel extract 1%	0.0[b]	89.10[a]	1.0[d]
Vitex negundo 10%	7.30[b]	7.40[c]	120.89[bc]
Control	8.83[b]	14.90[b]	208.66[a]

* In vertical columns, means followed by similar letters are not different statistically (P=0.05) by L.S.D.

$ Recorded in surviving larvae 10 days post inoculation

is obvious that NSKE acted faster than the virus and most of the larvae were probably killed before the latent virus had an opportunity to invade the susceptible tissues and multiply. The larval weights in *V. negundo* were also significantly reduced but *V. negundo* did not activate the virus infection.

The role of stressors in activating latent viral infection has been reported earlier. Stress as a factor in insect disease was reported by Steinhaus (1958). Kovacevic (1960) found that sublethal doses of DDT increased the nuclear polyhedrosis virus infection in the gypsy moth *Lymantria dispar* L. Mechanical stress increasing virus infection in *Trichoplusia ni* was reported by Jacques (1961).

The results of the present study show that *T. patula* and *C. gigantea* leaf extracts could be used to detect the latent NPV infection in insects. When used in the field, it can either activate latent virus infections in field populations of pest insects or increase the efficacy of field-applied virus since earlier studies had shown that addition of aqueous leaf extract of *T.patula* to NPV increased its efficacy against *H. armigera* larvae and comparison of mortality data showed that there was supplemental synergism (Balasaraswathy, 1990).

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