EFFECT OF ULTRA VIOLET LIGHT ON EFFICACY OF *SPODOPTERA LITURA* (F.) (LEPIDOPTERA: NOCTUIDAE) NUCLEAR POLYHEDROSIS

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Introduction

For the development of viral insecticides ultraviolet (UV) spectrum of sunlight is the main obstacle and limiting the consistent success of entomopathogens as microbial control agent. All representative types of microbial insecticides (i.e. bacteria, fungi, protozoans, viruses) are inactivated by exposure to the ultraviolet-A (UV-A), ultraviolet-B (UV-B) spectrum (280- 400 nm) of sunlight (Ignoffo et al. 1977). In many cases, field applied pathogens lost at least 50% of their original activity within several days. Factors among temperature, pH, Chloride ions, water quality and sunlight– solar radiation was found as the most significant factor to inactivate the polyphagous *Spodoptera litura* controlling nuclear polyhedrosis virus (SlNPV) in a brief period of exposure (Tuan et al. 1995,). In this study effects of three ranges of UV light UV-A (365 nm), UV-B (300 nm), UV-C (254 nm) were studied which will provide information to develop UV protectant and formulation of viral pesticide.

Materials and Methods

Ultraviolet radiation study: In this study, 20 ml of polyhedral inclusion bodies (PIBs) suspensions (1x 10^8 PIBs / ml) were pipetted onto the bottom of glass petri dishes (90 mm) and exposed to UV-A (365 nm, 8 Watt, UVA-18, Ultra- Lum Inc., California), UV-B (300 nm, 8 Watt, UVB-18, Ultra-Lum Inc., California) and UV-C (254 nm, 8 Watt, UVC-18, Ultra-Lum Inc., California) with open lids at a distance of 10 cm from the UV light sources. Virus suspensions were exposed to UV for 1h, 5h, 20 h, 168h (7d) and 360 h (15d). After the exposure period the volumes were adjusted to 20 ml and PIBs were suspended and dispensed into glass bottles and stored at –20° C until bioassay. Third instar larvae were bioassayed (5 x 10^6 PIBs / larva) with standardised leaf disc method (Im et al. 1988) until the larval death or pupation. Treatments were replicated four times using thirty larvae per replicate per treatment. Larval mortalities were transposed to obtain the mean and standard error of the mean and subjected to an analysis of variance (ANOVA) appropriate for a randomised block design. Treatment means were separated by Duncan's multiple range procedure (DMRP) ($\propto$ = 0.05) (SAS Institute Inc. release 6.12).

Results and Discussion

UV-A did not affect adversely on *Spodoptera litura* Nuclear Polyhedrosis Virus (SlNPV) upto the exposure of 20 hours (% original activity remaining (OAR) was 100%). No significant difference was found after the exposure of SlNPV for 20 hours to UV-A and UV-C and 5 hours exposure to UV-B with the unexposed. Significant effect of UV was found after 168 hours (7d) of exposure to UV-A and UV-C and 20 hours exposure to UV-B with the unexposed. Viral infectivity was completely destroyed (OAR was 0%) after 360 hours exposure (15 d), both for the UV-B and UV-C with no significant difference with the untreated control. on the contrary, OAR was 22% in case of UV-A exposed for the same time. But the effect of UV-B occurred significantly earlier (20 hours of exposure) with unexposed virus. From this study it can be assumed that UV-B (280-315 nm) is causing more deleterious effect on virus than UV-A (315+ nm), because sunlight UV spectrum actually reaching the earth surface is UV-A and UV-B (290- 400 nm) (Ignoffo and Garcia, 1992). Similar observation was found by Jones et al. (1993). Ignoffo and Garcia (1992) found no significant effect of pH (3, 6, 9) and temperature (10, 22, 35, 50 °C) but presence of free water can significantly extent the PIB inactivation by sunlight. Sunlight may have a direct effect on viral DNA by inducing deleterious cross linkings, strand breaks or development of labile sites or both.

Conclusions

UV-A , UV-B and UV-C were effective in reducing the viral activity but UV-B was the most deleterious. Sunlight UV spectrum actually reaching the earth surface is UV-A and UV-B (290-400 nm) not UV-C. From this study it can be suggested that more emphasis should be given to protect UV-B than UV-A of sunlight spectrum to develop UV protectant or to formulate viral pesticides.

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