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**Divya Srivastava**
D.M.P.G. College Sunderpur, Varanasi, Uttar Pradesh, India

**S Satpathy**
D.M.P.G. College Sunderpur, Varanasi, Uttar Pradesh, India

**S Rai**
D.M.P.G. College Sunderpur, Varanasi, Uttar Pradesh, India

**Corresponding Author:**
**Divya Srivastava**
D.M.P.G. College Sunderpur, Varanasi, Uttar Pradesh, India

# Effect of ultraviolet irradiation on the activity of SINPV and the effect of protectants against ultraviolet light

**Divya Srivastava, S Satpathy and S Rai**

**Abstract**
UV Protectant is a very sensitive factor which affect the NPV working on larvae. Both activated charcoal and metallic aluminum suppressed the impact of UV radiation on NPV. However the extent of protection was different particularly, when the NPV solution was exposed for more than 10 minutes. The differential impact of protection was not prominent at less exposure time (i. e. 5 min.) This may be due to the non – significant effect of UV on virulency of NPV at less exposure period. The main aim of this review paper is to provide the knowledge of less effect of NPV on pest due to UV radiation.

**Keywords:** *Spodoptera litura*, UV protectants, SINPV, virulacy

## Introduction
In India intensive agriculture using high yielding crop varieties resulted in accelerated use of chemical insecticides. Indiscriminate use of these agrochemicals resulted in development of resistance in insect and consequently poor yield. Entomologists were therefore forced to look at eco-friendly alternatives for pest management [2]. Due heavy infestation of *S. litura* causes - 37 to 67% losses in yield [3]. Traditional insecticides are used to control the pest but are often inadequate [4] SNPV use with UV protectent gives effective result, This paper report effectiveness of SINPV with UV protectent against *Spodoptera. litura.*

## Material and Method
The capacity of UV protectants on screening UV rays from different sources (UV light and sun rays) was studied by preparing the solution in the same way as mentioned earlier. In this experiment 15 larvae were exposed in each replication of each concentration, UV source and UV protectant combination. During the post infection period larval mortality of each combination was observed

Third instar larvae were adopted to find out the infectivity of viral solution having different UV protectant and sources at different concentrations on the basis of relative infectivity most suitable UV protectant was selected. Each of these experiments was carried out with 45 larvae forming 3 replication. Two addition treatments via. (a) virus exposed to UV light source and (b) virus unexposed, which served as checker were kept. Equal number of larvae was kept as control fed with water and portectents combination and other with water only.

## Result
The data on effect of UV protectants on SINPV on the basis of mortality after different time of exposure to UV source i.e. 5, 10, and 15 min is presented in table 1(A, B, C).

**Table 1:** Effect of UV Protectants on virulency of SINPV.

| (A) Mortality recorded after 5 minute exposure of SINPV solution to UV light. | | | | |
|---|---|---|---|---|
| **NPV concentration** | **Corrected mortality (%)** | | | |
| | **Activated Charcoal** | **Metallic Aluminium** | **Without UV protectant** | **Mean** |
| 10^7 | 98.00 | 80.83 | 69.16 | 82.79^a |
| 10^6 | 60.85 | 70.85 | 54.88 | 62.17^b |
| 10^5 | 47.70 | 54.08 | 37.16 | 46.29^c |
| Mean | 68.82^a | 68.56^a | 53.87^a | |

CD (P=0.05).UVP-5.23, Conc-5.23, UVP*Con-9.06.

| (B) Mortality recorded after 10 minute exposure of SINPV Solution to UV light | | | | |
|---|---|---|---|---|
| NPV Concentration | Corrected mortality% | | | |
| | Activated Charcoal | Metallic Aluminium | Without UV Protectant | Mean |
| 10^7 | 90.81 | 70.85 | 44.10 | 68.56^a |
| 10^6 | 54.48 | 60.05 | 36.52 | 50.34^b |
| 10^5 | 42.11 | 42.90 | 17.36 | 34.11^c |
| Mean | 62.44^a | 57.92^b | 32.65^c | |

CD (P=0.05): UVP-4.29, Conc-4.29, UVP x Conc-7.43

| (C) Mortality recorded after 15 minute exposure of SINPV Solution to UV light | | | | |
|---|---|---|---|---|
| NPV Concentration | Corrected mortality% | | | |
| | Activated Charcoal | Metallic Aluminium | Without UV Protectant | Mean |
| 10^7 | 78.04 | 66.46 | 23.41 | 55.92^a |
| 10^6 | 53.68 | 53.68 | 15.68 | 40.89^b |
| 10^5 | 41.71 | 43.70 | 3.32 | 29.59^c |
| Mean | 57.78^a | 54.59^b | 14.03^c | |

UV Exposure time: 5 minute

After 5 minutes expose to UV light, significantly more mortality (82.79) was produced at highest (10^7) POB concentration TABLE (A), There was reduction in level of mortality with decrease in concentration. The mean mortality was 62.17% and 46.29% at 10^6 and 10^5 POB/ml NPV concentration respectively.

Irrespective of inoculums concentration, the mortality trend indicates definite role of UV protectants in significantly higher in the NPV solution containing the UV protectants, respectively. The mortality in NPV without protectant was significantly lower (53.87%) than both the protectants. Maximum mortality (98%) was recorded with the recorded with the use of activated charcoal as UV protectants at highest inoculum concentration (10^7 POB/ml).

**UV Exposure time: 10 minute**

After 10 minutes exposure the larval mortality was significantly maximum (68.51%) incase of highest incoulum dose i.e. 10^7POB/ml. Mortality decreases with decreasing in incoulum dose Table 2). After 10 minutes exposure time, irrespective of the incoulum concentration significantly highest mortality (62.44%) was observed with use of activated charcoal ac UV protectant being significantly more than metallic aluminium (57.92%) and without UV protectant (32.65%) incase of highest POB concentration along with activated charcoal the virulence was significantly highest (90.81%). Mortality percentage decreases when the exposure time increases, 15 minutes exposure time activates the NPV virus and by same incoulum dose mortality decreases (78.04,53.68 and 41.71) respectively.

**UV Exposure time: 15 minutes**

After 15 minutes exposure time also similar mortality trend was observed in case of different UV protectant and NPV concentration Table 3. Significantly highest mortality (55.92%) was recorded in case of highest concentration. On the other hand irrespective of concentration, activated charcoal provides significantly best protection by recording 57.78% mortality aluminium and no protectant respectively.

There was a general decline in mortality trend along with increase in UV exposure time. No doubt the morality rate showed increasing trend with increase in concentration. The morality trend indicated that the activated charcoal has definite role in suppressing the impact of UV light on POB. Both activated charcoal and metallic aluminium suppresses the impact of UV radiation on NPV. However the extent of protection was different particularly, when the NPV solution was exposed for 10 minutes. The differential impact of protection was not prominent at less exposure time (i.e. 5 min). This may be due to non significant effect of UV on virulency of NPV ay less exposure period. The role of activated charcoal as better UV protectant was also noted by Komolpith and Ramakrishnan (1975). Among various materials tested for UV protectant. The activated charcoal protected the virus better than other UV protectants (Komolpith and Ramakrishnan, 1975). The addition of metallic aluminium to NPV solution suppresses the impact of UV rays by reflecting off from the surface of viral solution.

**Effect of UV protectent on the virulency of POB**

Performance of UV protectants also studied in terms of LT 50 value of fixed dose (7.1 10^8 POB/ml) of SINPV after 5, 10, 15, and 20 min, exposure to UV source. Beside the LT50 value cumulative mortality was recorded in each case. The data is in table.2.

**Table 2:** Effect of protectants on the NPV exposed to ultra violet light.

| Protectants | 5 minutes | | 10 minutes | | 15 minutes | | 20 minutes | |
|---|---|---|---|---|---|---|---|---|
| | Cumulative Mortality% | LT50 (hour) | Cumulative Mortality% | LT50 (hour) | Cumulative Mortality% | LT50 (hour) | Cumulative Mortality% | LT50 (hour) |
| Activated charcoal (1%)+ virus | 99 | 88 | 86.7 | 94.0 | 95 | 97.8 | 94.0 | 99.0 |
| Metallic Aluminium (1%)+virus | 94 | 96 | 88.0 | 93.4 | 85 | 97.3 | 79.4 | 105.3 |
| Virus (Exposed) | 89 | 106.4 | 83.0 | 112.6 | 75 | 117.0 | 62.0 | 132.0 |
| Virus (Unexposed) | 100 | 80 | 100.0 | 83.3 | 100 | 82.0 | 100.0 | 81.2 |

**Con^n of Virus =7.1x10^8 POB/ml was used**

In case of unexposed virus the mortality was 100% which reduced to 89, 83, 75 and 62% after exposure of the NPV solution for 5, 10, 15 and 20 minutes respectively. With the addition of UV protectant there was improvement in the virulency over the solution without UV protectant which was comparatively more in case of activated charcoal (99%, 98%, 95%, and 94%) then metallic aluminum (94%, 90%, 88%,

79.4%). After 5 minute exposure there was slight increase in LT50 value (106.4 hrs.) compared to the un expose viral solution (80hrs).With addition of metallic aluminum and activated charcoal the LT50 value was reduced to 88 hrs. and 86.7 hrs. respectively compared to 106.4 hrs. in case of exposed viral solution without protectant. Further with increase in UV exposure time the LT50 value of expose virus increase to 112.6 hrs. 117hrs. and 132 hrs. Upon exposure for 10, 15, and 20 min. respectively. After 10 min. exposure the LT50 value in case of activated charcoal and metallic aluminum was 94 hrs. and 93.4 hrs. respectively After 20 min. the LT50 value with respect to these two UV protectants was 99.4 hrs. and 105 hrs.

It is evident from the result that on exposure of NPV solution to UV source the LT50 value increased. It is due to the fact that the incubation period is prolonged incase of exposed virus compared to the unexposed virus (Ramakrishanan, 1992)

## Concussion

UV protectant is a very sensitive factor which affect the NPV working of larvae. Both activated charcoal and metallic aluminum suppressed the impact of UV radiation on NPV. However the extent of protection was different particularly, when the NPV solution was exposed for more than 10 minutes. The differential impact of protection was not prominent at less exposure time (i.e. 5 min ).This may be due to the non- significant effect of UV on virulency of NPV at less exposure period. Activated charcoal was noted to be a better UV protectant than metallic aluminum.

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