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Different Wavelengths of Light Effect on Susceptibility of Pre and Post Inoculation Exposure of *Lageneria Siceraria Standl.* to CMV and WMV

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Abstract

Cucumber mosaic virus and watermelon mosaic virus diseases are affected by Bottle gourd (*L. Siceraria Standl*) pre-and post inoculation treatment of *L. Siceraria Standl.* seedlings with light period of different length as it reduced their susceptibility to both CMV and WMV.

The reductions in susceptibility were more pronounced when the seedlings were exposed to the increased light periods after inoculation.

CMV inoculate seedlings when exposed to dark periods (up to 36 hours) before inoculation showed increased susceptibility. However, susceptibility decreased with prolonged dark periods (48 and 60 hours). Post inoculation treatment of seedlings showed a gradual decrease in their susceptibility to both CMV and WMV. *L. Siceraria Standl*. and its two viruses' susceptibility increases in blue light and is reduced in yellow light and red lights.

Post inoculation seedlings when subjected to light of different wave lengths decreased their susceptibility to both viruses up to 36 hours. There is a gradual increase in susceptibility of CMV as well as WMV when the seedlings were exposed to lights of different wave lengths for 48 and 60 hours.

Keywords: Water Melon Mosaic Virus, Cucumber Mosaic Virus, Inoculation, Susceptibility.

Introduction

During survey CMV and WMV of mosaic disease were collected. The two distinct isolates showing mild and severe symptoms were selected for detailed studies in respect of their identification. Bottle guard, one of the most important vegetable, was reported of being affected by a viral disease. Some viruses may have two or more strains reported naturally occurring on bottle gourd from various parts of the world.

Pre and post inoculation treatment of *L.siceraria* seedlings with light periods of different lengths reduced their susceptibility to both CMV and WMV. The reductions in susceptibility were more pronounced when the seedlings were exposed to increased light periods after inoculation than before inoculation

Review of Literature

According to F.C. Bawden etal. (1947) influence of light intensity on the susceptibility of plants is certain viruses and another scientist H.W. Gonzales. etal. (1963) said temperature is responsible of cabbage virus to infect Nicotina glutinosa. S.B. Lal etal. (1961) worked on distribution cucumis virus-2C in mosaic infected Bottle gourd (*Ligeneria siceraria Standl*.) plants. P.Singh (1972) recorded watermelon mosaic virus strain along with its vector. Nagarajan and Ramakrishnan (1975) characterized different strains of melon mosaic virus on *Cucurbits* species. Bhargava etal. (1977) isolates distinct strains of watermelon mosaic virus from Gorakhpur region. Andotra etal. (1995) recorded characterized seven groups of viruses causing mosaic disease on *cucurbits* based on symptoms of cucumber and other hosts. Ohshima etal. (2016) studied the temporal analysis of ressortment and molecular evolution of CMV: Extra clues from its segmented genome.

Material and Methods

During survey different isolates of mosaic disease were collected. Out of these, two distinct isolates showing characteristic mild and severe

symptoms were selected for detailed studies in respect of the identification. Viruses are able to infect even susceptible plants only under certain conditions such as higher population of insect vectors, favorable environment for the movements of insect vector.

Aim of the Study

The present study was undertaken to find out the effect of varying light periods on the susceptibility of bottle gourd plant depending on mild and severe isolates of mosaic. Bottle gourd seedlings were exposed to different photoperiods before and after inoculation.

Five lots of forty bottle gourds seedlings each were taken. Twenty plants in each lot were were kept under 12, 24, 36, 48, and 60 hours light periods respectively. Remaining 20 plants in each lot was taken as control and was kept under normal condition of light. Out of 20 seedlings treated under each light period 10 seedlings were inoculated with mild and 10 with severe isolates at the end of required light periods. Control plants were also inoculated with the two isolates simultaneously with the treated plants. The inoculated plants were kept under normal day and light periods along with control plant mosaic.

To observe the effect of post inoculation treatment of seedlings to different photoperiods, five lots of forty bottle gourds seedlings were taken. Twenty plants in each lot were inoculated with mild and remaining 20 with severe isolate. After inoculation 10 seedlings from each lot were kept under 12, 24, 36, 48, and 60 hours light periods respectively. Rest of the 10 seedlings in each lot was taken as control. The plant was transferred immediately to glasshouse after the completion of desired light period observations were taken after 15-20 days after inoculation.

Results

The environmental conditions under which plants are grown before inoculation, the conditions at the time of the inoculation and during the development of disease (after inoculation) can have profound effects on the course of infection. A plant that is highly susceptible to a given virus under one set of conditions may be completely resistant under another. If infection occurs, the plant may support a high or a low concentration of virus and develop either severe disease or remains almost symptomless depending on the conditions.

To study the effect of different wavelengths of light on susceptibility of *L. Siceraria* plants to cucumber mosaic virus and water melon mosaic virus, the seedlings were exposed to blue, yellow and red lights for different periods before and after inoculation. The results of the experiment are presented in tables 1, 2, 3 and 4.

Table- 1 Effect of pre-inoculation exposure of *L. Siceraria* seedlings to different wave lengths of light on susceptibility to cucumber mosaic virus (CMV)

Dark Periods (hrs)	No. of plants infected out of 10 treated/trial											
	Control			Blue			Yellow			Red		
	I	II	Total	I	II	Total	I	II	Total	I	II	Total
12	8	10	18	8	10	18	8	10	18	8	9	17
24	10	9	19	10	10	20	8	6	14	8	8	16
36	9	10	19	10	9	19	6	6	12	7	6	13
48	9	9	18	10	9	19	5	4	9	6	6	12
60	8	10	18	10	10	20	3	4	7	5	6	11

Table- 2 Effect of pre-inoculation exposure of *L. Siceraria* seedlings to different wave lengths of light on susceptibility of water melon mosaic virus (WMV)

Dark Periods (hrs)	No. of plants infected out of 10 treated/trial.											
	Control			**Blue**			**Yellow**			**Red**		
	I	**II**	**Total**	**I**	**II**	**Total**	**I**	**II**	**Total**	**I**	**II**	**Total**
12	8	10	18	9	10	19	8	9	17	9	9	18
24	10	9	19	10	10	20	8	8	16	8	7	15
36	9	10	19	10	10	20	5	7	12	7	7	14
48	9	9	18	10	10	20	6	5	11	4	8	12
60	8	10	18	10	10	20	6	4	10	5	5	10

Data given in table 1 and 2 show that pre-inoculation exposure of *L. Siceraria* seedlings to blue light increased their susceptibility to CMV and WMV. Almost 100% infection was recorded in both the cases. Sixty hours of exposure to yellow light yielded maximum reduction in susceptibility. Only 35% and 50% seedlings showed infection with CMV and WMV respectively at 60 hrs exposure. Exposure of seedlings to red light before inoculation also had reducing effect on susceptibility to both the viruses. There was a gradual reduction with increasing exposure time. Only 55% and 50% infections were obtained respectively with CMV and WMV with a 60 hours exposure. The data clearly indicate that pre-inoculation exposure of seedlings to yellow and red light reduced host susceptibility.

Table 3: Effect of Post-inoculation exposure of *L. Siceraria* seedlings to different wave lengths of light on susceptibility to CMV

Dark Period (Hrs)	Number of plants infected out of 10 treated/trial											
	Control			Blue			Yellow			Red		
	I	II	Total	I	II	Total	I	II	Total	I	II	Total
12	10	9	19	8	9	17	8	8	16	8	9	17
24	10	10	20	9	8	17	6	7	13	7	9	16
36	9	10	19	8	6	14	5	6	11	8	6	14
48	9	9	18	7	7	14	6	6	12	8	8	16
60	8	10	18	7	9	16	8	7	15	9	9	18

I= First Trial, II- Second Trial

Table 4 : Effect of Post-inoculation exposure of *L. Siceraria* seedlings to different wave lengths of light on susceptibility to WMV

Dark Period (Hrs)	Number of plants infected out of 10 treated/trial											
	Control			Blue			Yellow			Red		
	I	II	Total	I	II	Total	I	II	Total	I	II	Total
12	10	10	20	9	8	17	8	8	16	8	9	17
24	9	8	17	7	8	15	7	5	12	8	6	14
36	9	10	19	6	6	12	6	5	11	7	6	13
48	9	9	18	7	8	15	6	7	13	7	8	15
60	10	8	18	9	9	18	7	7	13	8	8	16

I= First Trial, II- Second Trial

Data presented in tables 3 & 4 indicate that post-inoculation exposure of *L. Siceraria* seedlings to blue, yellow and red lights reduced their susceptibility to both CMV as well as WMV. However, reductions in susceptibility were noticed only up to 36 hours of exposure. There was an increase in susceptibility to both the viruses at 48 and 60 hours exposure. Seedlings exposed to different wavelengths of light showed almost similar changes in susceptibility to both CMV and WMV. Blue light had minor effects in decreasing (up to 36 hrs) and increasing (at 48 & 60hrs) the susceptibility whereas yellow and red lights produced more marked effects. At 36 hrs exposure to blue, yellow and red lights, susceptibility to CMV were reduced by 26.3%, 41.1% and 26.3% respectively.

Similarly, susceptibility to WMV was reduced by 36.8%, 42.1% and 31.6% and 36 hr exposure to blue, yellow and red lights respectively. It is evident from the data given in table 3 and 4 that post-inoculation exposure to different wavelengths of light reduced susceptibility of *L. Siceraria* seedlings to CMV and WMV up to 36 hrs. Exposure of seedlings for more than 36 hrs gradually increased the susceptibility of seedlings.

Discussion

Pre and post inoculation treatment of *L. Siceraria* seedlings with light periods of different wave lengths reduced their susceptibility to both CMV and WMV. The reductions in susceptibility were more pronounced when the seedlings were exposed to the increased light periods after inoculation than before inoculation.

Susceptibility of *L. Siceraria* seedlings to the two viruses increased when exposed to blue light (422-492 mμ) before inoculation. Reduction susceptibility was noticed when the seedlings were exposed to yellow (535-586 mμ) and red (647-760 mμ) light. Post inoculation exposure of seedlings to light of different wavelengths decreased the susceptibility of the viruses' up to 36 hours. There was a gradual increase in susceptibility to CMV as well as WMV when the seedlings were exposed to lights of different wavelengths for 48 and 60 hours.

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