

VIRAL DISEASES OF CUCURBITS CROPS AND THEIR MANAGEMENT IN NEPAL

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ABSTRACTS

Number of viruses infects cucurbits. In Nepal, Cucumber mosaic virus (CMV), Zucchini yellow mosaic virus (ZYMV), Watermelon mosaic virus (WMV) 1 and 2, Squash mosaic virus (SqMV) and Cucumber green mottle mosaic virus (CGMMV) are infecting cucurbits. These viruses were identified serologically by Enzyme Linked Immuno Sorbent Assay (ELISA). Among the viruses of cucurbits, majority are mechanically transmissible in the sap of infected plants. Some are seed-borne such as CMV, ZYMV, CGMMV and SqMV. Usually more than one virus infect cucurbits at the same time and cause economic losses. The objective of the experiment was to find suitable methods to minimize viral diseases of cucurbits. Antiviral products and locally available materials known to have antiviral properties as Victovirus, Bioleafcare, Fresh cow milk, Liposome, Turmeric powder, Jeebatu, Anti-V S (Natural Plant Virus Control Agent) and Oshin, the insecticide, also were tested to manage viral diseases of zucchini squash on pots and in field condition. Fresh cow milk, Anti-V S, Liposome and Victovirus helped to lower virus disease severity up to 6 weeks of diseases observation.

Key words: cucurbits, cucumber mosaic virus, watermelon mosaic virus, zucchini yellow mosaic virus antiviral agents.

INTRODUCTION

Several species of cucurbits are important vegetable crops of Nepal. A large number of viruses have been reported to infect cucurbits. Most of them are economically important. In Nepal, some viral diseases of cucurbits were identified by Direct antigen coating Enzyme linked immune sorbent assay (DAC ELISA). The identified viruses are Cucumber mosaic virus (CMV), Zucchini yellow mosaic virus (ZYMV), Watermelon mosaic virus (WMV) 1 and 2, Squash mosaic virus (SqMV), and Cucumber green mottle mosaic virus (CGMMV). These viruses infect cucurbits either individually or in combination with more than one virus at the same time. In addition to these, several other viruses also infect cucurbitaceous crops. Most of these viruses can infect a number of plant species belonging to different genera and families, but a few restricted to the cucurbitaceae. Majority of these viruses are mechanically transmissible in the sap of infected plant and some are seed-borne in cucurbits as CMV and CGMMV, SqMV and ZYMV (Joshi et al., 2010). CMV, the type member of cucumovirus group, has a wide host range. The other viruses as SqMV, CGMMV, WMV group under cucumovirus and polyvirus are restricted mostly to cucurbits. Infestation of the virus does not affect seed germination. Seedlings from infested plants help secondary spread of the virus by insect vectors and by mechanically (Joshi et al., 2010). Seed-borne viruses such as CMV and ZYMV once established through seed in the field can spread efficiently either through aphids or mechanically.

ZYMV due to its seed-borne and easy mechanically transmissible nature has become one of the most destructive viral agents affecting cucurbits in many countries. In Nepal, generally cucurbits were found affected by more than one virus (PPD, 2005). The cucurbits samples from the farmers were also infested by 3 to 5 virus (PPD, 2006). Crop yields reduced in quantity and quality due to virus infection. Plants are seriously affected in the field.

In cucumber, melon and squash CMV causes severe plant stunting, foliar yellow mosaic, malformation and drastic reduction of leaf size and stem internodes. Flowers of severely affected plants may have prominent abnormalities and greenish petals. Infected fruits become distorted and often discolored and usually remain smaller. Symptoms by WMV include green mosaic, leaf rugosity, green vein banding, chlorotic rings and malformation. ZYMV incites yellow mosaic, severe malformation, blisters, extreme reduction in the size of leaf lamina, necrosis and severe plant stunting. Squash and pumpkin fruits develop knobby areas, which cause prominent deformation.

Generally symptom in the field appears when the plants are about 6 weeks old and growing vigorously. There is no chemical which can be directly applied to crops for the control of viruses. Therefore, the present study tried to evaluate available antiviral agents to manage cucurbit viruses.

MATERIALS AND METHODS

In the year 2011, squash, variety True Green (hybrid), were planted on pots. All plants were inoculated with sap from infected plant one week before application of treatments. Four sprays of treatments at an interval of 1 week were done. Following treatments were used with the given doses in 2011:

Fresh cow milk (25 ml/l water)

- Victovirus (3 ml/l water)
- Bio Leafcare (3 ml/l water)
- Fresh turmeric powder (3 g/l water)
- Jeevatu (20 ml/l water)
- Control (water spray)

In 2012, the experiment was conducted in the field condition at Khumaltar, Lalitpur with modified treatments as follows:

- Victovirus (anti viral product, World Natural Source Ltd., Germany) 3 ml/l water.
- Bio leafcare (antiviral eco-friendly product, Ranker Agro P. Ltd., India) 3 ml/l water.
- Fresh cow milk (25 ml/l water).
- Anti-V (Natural Plant Virus Control Agent) 1 g/l water. (Korean)
- Egg yolk + edible oil. (Liposome)
- Control

Seeds of squash, variety Sondo (hybrid), were sown on pots on February 16, 2012. All plants were inoculated by complex virus mechanically before transplanting. The seedlings were transplanted in field on March 19, 2012 and necessary agronomical practices were followed.

Treatments were started from April 12, 2012 and six sprays of treatments were done at an interval of 1 week.

Plants were tested by DAC ELISA before treatments applied and after last disease observation. The incidence of viral disease was noted before and after application of treatments.

The ELISA procedure of direct antigen coating was followed as described by Hobbs *et al.* (1987).

The source of antisera of CMV, SqMV, and CGMMV used for the test was Danish Seed Health Center (DSHC) Denmark, and ZYMV, WMV1 and 2 was American Type Culture Collection (ATCC) USA. The dilution used for CMV, SqMV and CGMMV was 1:500; and for ZYMV, WMV 1 and 2 it was 1:1000. The ELISA result was interpreted according to Sutula *et al.*, 1986.

RESULTS AND DISCUSSION

No significant difference was found among the treatments in 2011. In 2012, Victovirus, Fresh cow milk, Anti-V (Natural Plant Virus Control Agent) and Liposome helped to lower virus disease severity up to 6 weeks of diseases observation as shown in Figure 1.

Final ELISA results showed that maximum number of plants with virus inoculation were positive to WMV and ZYMV. Treated plants were also found positive. Some plants were positive to more than one virus as WMV and ZYMV and some were positive to CMV and WMV.

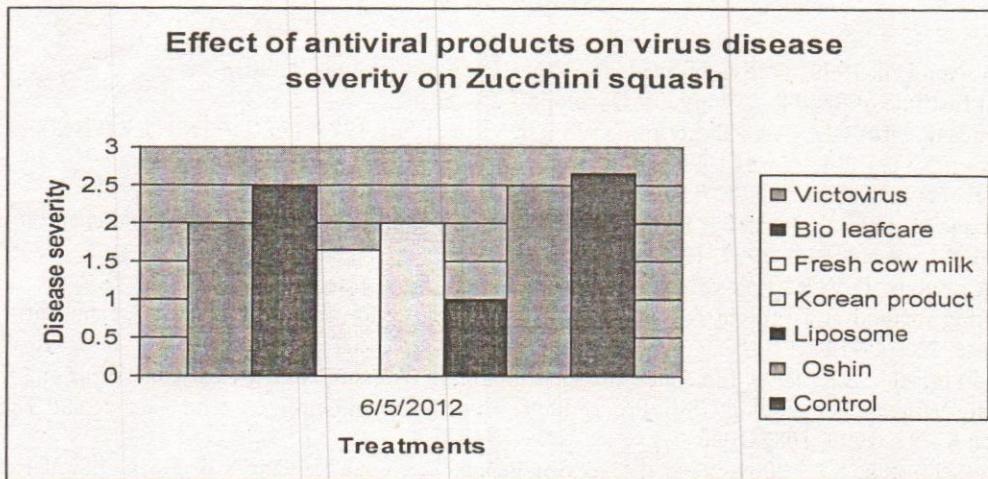


Figure 4

There is no chemical which can be directly applied to crops for the control of viruses. Resistant varieties could be the best method for control.

- CMV is an economically important virus of cucumber and is also seed and aphid-transmitted in several other cucurbits and other hosts.
- CMV has a wider host range and attacks a greater variety of cucurbits, vegetables, ornamentals and other plants than any other virus. The most important vegetable and ornamental crops affected by cucumber mosaic are cucumbers, melons, squash, peppers, spinach, tomatoes, celery, beets, beans, banana, crucifers, delphinium, gladiolus, lilies, petunias, zinnia and many weeds.
- In Nepal, besides cucumber, the disease has been found widely spread in other cucurbits, peppers, tomatoes and other wild and ornamental plants. Dahal *et.al.* 1997 found CMV in cucumber, chayote, pumpkin, zucchini and snakegourd of terai and inner terai locations.
- Shrestha and Albrechtsen (1992) identified severe viral infection in tomato due to combined effect of Potato virus Y (PVY) and Cucumber mosaic virus (CMV).
- Joshi and Shrestha (1999) found 47% of tomato and 41% of chili samples from Banke and Bardia districts to be positive to CMV.
- Hundred percent yield loss was observed in Zucchini squash due to combined infection by CMV, Watermelon mosaic virus 1, Watermelon mosaic virus 2 and Zucchini yellow mosaic virus in farmer's field of Bhaktapur and seed multiplication plot of Vegetable Seed Production Center, Khumaltar (PPD 2005).
- Joshi and Shrestha in 2004 reported CMV in pepper in terai as well as mid hills districts of Nepal, and the incidence varied from 30 to 80%. They also found five pepper lines resistant to CMV.

CONCLUSION

- Many viruses infect cucurbits crops causing great economic losses.
- The treatments as Victovirus, Fresh cow milk, Anti-V and Liposome, however, showed effective to some extent but need further field test for confirmation.

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