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***Alternanthera sessilis*: Dwarf copper leaf weed is infected with alternanthera yellow vein mosaic virus in Tamil Nadu**

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Abstract

Alternanthera sessilis, is a member of the Amaranthaceae family. *Alternanthera* is an invasive weed that grows in both wetlands and uplands. Highly valued in traditional medicine and are widely consumed across Asia for their significant medicinal and nutraceutical properties. This versatile weed has been traditionally used to treat a wide array of human ailments, including cardiovascular diseases, diabetes, hypertension, and inflammatory conditions like asthma, bronchitis, and hepatitis, in addition to its use as a painkiller. Now in recent years during field inspection in Tamil Nadu, *Alternanthera sessilis* is found with virus (Alternanthera Yellow Vein Mosaic Virus) in throughout Tamil Nadu and the intensity is 70-80% which is alarming. Only few plants are healthy. Transmission of *Alternanthera* to *Alternanthera* is confirmed whereas to other weeds to be studied. It is found in some other weeds (*Croton sparsiflorous*, *Abutilon indicum* etc.,) the same vein clearing symptom was observed nearby *Alternanthera* in Melbhuvanagiri block, Cuddalore district.

Hence a lab study may be conducted on transmission of this viral disease to other weeds and crops. It is suggested that a transmission study may be conducted in advance on transmission of Alternanthera yellow vein mosaic virus (AIYVMV) to pulses especially Blackgram.

Keywords: *Alternanthera sessilis* - invasive weed - infected with AIYVMV - Alternanthera Yellow Vein Mosaic virus - 70-80% - Tamil Nadu

Introduction

Alternanthera sessilis is known by various colloquial names, such as sessile joyweed and dwarf copper leaf. *Alternanthera* is an invasive weed that grows in both wetlands and uplands. Around 1900, the perennial herb *Alternanthera* was brought to the United States for the first time (Surendra Kumar *et al.*, 2011) [8]. *Alternanthera sessilis*, a member of the Amaranthaceae family, comes in both Green and Red cultivars. Both are highly valued in traditional medicine and are widely consumed across Asia for their significant medicinal and nutraceutical properties. This versatile weed has been traditionally used to treat a wide array of human ailments, including cardiovascular diseases, diabetes, hypertension, and inflammatory conditions like asthma, bronchitis, and hepatitis, in addition to its use as a painkiller (Omilla Ragavan *et al.*, 2023) [6]. *Alternanthera* leaves are consumed as a vegetable in many parts of the world, either cooked or raw in salads. *Alternanthera* is a prevalent weed in both agricultural and non-agricultural ecosystems in India. It mostly spreads by wind and water-dispersed seeds. However, *Alternanthera* is a weed that is frequently established in a variety of ecological situations and can survive all year long in places with adequate moisture (Alveera Singh *et al.*, 2009) [1]. Under some conditions, *Alternanthera*, a perennial plant that roots at stem nodes, can also reach a height of one metre and have strong tap roots. In addition to becoming more problematic in the agricultural cropping system, *Alternanthera*, a weed plant, serves as a host for a number of plant pathogenic viruses (Marcia and Wayne, 1997) [5]. According to Hallan *et al.* (1998) [3], a number of weeds are thought to be begomovirus reservoirs and can contribute significantly to plant disease outbreaks on a variety of crops infected by bacteria, viruses, and fungi. While some plant viruses, like the Begomoviruses affecting cotton and cassava in the Old World, are believed to have originated from weed hosts. Despite evidence of geminivirus infection in

various weeds exhibiting vein yellowing and yellow mosaic symptoms (Hallan *et al.*, 1998) ^[3] and reported 60% increase in begomovirus incidence across crops and weeds in Karnataka (Mahesh *et al.*, 2010) ^[4], comprehensive data on the transmission characteristics and virus-vector relationships of *Alternanthera* yellow vein mosaic virus (AIYVMV) in India remains scarce. AIYVMV can be effectively transmitted via whiteflies (*Bemisia tabaci*) and stem cuttings, achieving 100% transmission through cuttings. But it cannot be transmitted through seeds from infected plants. Whiteflies require a minimum Acquisition Access Period (AAP) of 20 minutes and an Inoculation Access Period (IAP) of 10 minutes to transmit the virus; transmission rates increase with longer AAP and IAP. Even a single viruliferous whitefly can transmit AIYVMV, while five viruliferous whiteflies are needed for 100% transmission from *Alternanthera* to *Alternanthera* (Chetan *et al.*, 2012) ^[2]. Novel *Alternanthera* Yellow Vein Virus Variant Infecting the *Ageratum conyzoides* (Shafiq *et al.*, 2023) ^[7] in Oman and in other weeds in Pakistan.

Now in recent years during field inspection in Tamil Nadu, It (*Alternanthera sessilis*) is found with virus (*Alternanthera* Yellow Vein Mosaic Virus) in throughout Tamil Nadu and the intensity is 70-80%. Only few plants in a colony are healthy.

Materials and Methods

A field survey was made in different villages of cuddalore district for Digital Crop survey and conducting various On Farm Trails and Front Line Demonstrations. During the survey it was found that wherever *Alternanthera* weed is present it is infected with vein clearing viral disease (*Alternanthera* Yellow Vein Mosaic Virus) almost entire Tamil Nadu. There is risk on transmission of this disease to the crop and other weed. Hence this is reported for further study and control.

Results and Discussion

Alternanthera is mostly found in bunds, road sides and in cropped fields at Manjakollai, Melbhuvanagiri, Puthukadai and Chidambaram (only selected villages were given) of cuddalore district. In a roving survey at entire Cuddalore district, it was found with Virus *Alternanthera* yellow vein mosaic virus (AIYVMV). It might be transmitted by the vector white fly and five viruliferous whiteflies are needed for 100% transmission from *Alternanthera* to *Alternanthera* and not transmitted through seeds (Chetan *et al.*, 2012) ^[2]. It is (the same vein clearing symptom) found in some other weeds (*Croton sparsiflorus*, *Abutilon indicum* etc.,) was observed nearby *Alternanthera* in Melbhuvanagiri block, Cuddalore district.

In cashew plantation of Regional Research Station, Vridhachalam, *Alternanthera* is reported to be the major weed and was always with virus infection (Photograph attached). Hence wherever the weed is present, it was observed with infection of *Alternanthera* yellow vein mosaic virus (AIYVMV). only few plants are healthy.



Alternanthera sessilis infection with Yellow Vein Mosaic Virus at Cashew orchard, Regional Research Station, Vridhachalam



At Naduveeranpattu, Cuddalore district



At Manjakollai, Cuddalore district



At Puthukadai, Cuddalore district



At Melbhuvanagiri, Cuddalore district



Croton sparsiflorus with same symptom at Melbhuvanagiri



AIYVMV infection at Sugarcane Research Station, Cuddalore

Conclusion

In this roving survey, we report the incidence of *Alternanthera* yellow vein mosaic virus in almost all the districts of Tamil Nadu. the incidence was to the tune of 70-80% only 10% are healthy and as the weed grows infection transmitted from the infected to the healthy plant. Virus transmission is mainly due to the vector whitefly as this is reported by Chetan *et al.* (2012) [2] and is not transmitted through seeds.

Transmission of *Alternanthera* to *Alternanthera* is confirmed whereas to other weeds to be studied. It is found in some weeds nearby *Alternanthera* in Melbhuvanagiri hence a lab study may be conducted on transmission of this viral disease to other weeds and crops. Mainly to the pulses as they are infected with mosaic which is the outbreaking problem in pulses production in Tamil Nadu. Crores of money is lost due to this YMV infection in blackgram, hence a transmission study may be conducted in advance on transmission of *Alternanthera* yellow vein mosaic virus (AIYVMV) to pulses especially Blackgram) While some plant viruses, like the Begomoviruses affecting cotton and cassava in the Old World, are believed to have originated from weed hosts. Keeping this in mind the transmission study may be conducted at the earliest.

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