



SURVEY FOR THE OCCURRENCE OF YELLOW MOSAIC DISEASE IN MAJOR PIGEON PEA GROWING AREAS IN ANDHRA PRADESH

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ABSTRACT

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The reasons for sudden outbreak of yellow mosaic disease of pigeon pea in isolated patches in Andhra Pradesh during Kharif 2021 was not known. It may be due to association of more than one begomovirus with YMD of pigeon pea or variations in virus or climatic factors or vector biotypes in symptomatology was not known. Roving survey of yellow mosaic disease in pigeon pea was conducted from major growing districts of Andhra Pradesh during December-2022 to January -2023. The symptomatology of yellow mosaic disease in redgram was characterized by small yellow diffused spots on the leaves which gradually enlarged to form broad yellow patches. The percent disease incidence ranged from 2-23%. The overall incidence of YMD of Pigeon pea was very low though enough population of whiteflies were observed in the fields and source of inoculum was present on weeds and other pulses grown where the incidence goes upto 100%. Understanding the severity of a disease is crucial for advancing research and gaining valuable insights for further studies..

KEYWORDS: Yellow mosaic disease, begomovirus, survey, percent disease incidence.

INTRODUCTION

The Pigeon pea (*Cajanus cajan*) is a perennial legume from the Fabaceae family. It is significant drought resistant leguminous food crop, used both for dhal and also for vegetable purpose (Manjunatha *et al.* 2015). India is the leading country in both redgram production and consumption. Redgram is a staple meal that is high in protein. It has a protein content of roughly 22%, which is nearly three times that of grains. Redgram is ingested as split pulse known as dal, which is a crucial addition to a diet rich in grains (Khairnar *et al.* 2019). Red gram covers up around 11.8% of the nation's total pulse area and 17% of its overall pulse production.

India is the world's major producer of redgram, with 42.8 lakh tonnes grown on 48.24 lakh hectares in 2020–21 with the yield of 887 kg/hectare on average. Redgram was grown on 2.31 lakh hectares in Andhra Pradesh, yielding 0.83 lakh tonnes (ANGRAU Crop outlook report of Andhra Pradesh 2021). The productivity of pigeon pea can be impacted by different diseases including wilt, pigeon pea sterility mosaic disease, stem blight, stem rot, etc.

Williams *et al.* (1968) provided the first report of the yellow mosaic disease of pigeon pea's occurrence. Later Nene *et al.* (1971) reported based on white fly (*Bemisia tabaci*) transmission and symptomatology, the mung bean yellow mosaic virus (MYMV) was responsible for the yellow mosaic of pigeon pea. Raj *et*

al., (2005) reported Tomato leaf curl virus with YMD of red gram from Lucknow. Manjunatha *et al.* (2015) reported association of Horsegram YMV (HgYMV) with pigeon pea YMD in Karnataka based on full length sequence. Severe incidence in isolated patches exhibiting typical bright yellow mosaic symptoms with stunting was observed in redgram fields located at KVK farm, Anantapur. The total DNA was isolated from infected plants, PCR amplified, cloned and sequencing revealed the association of HgYMV with redgram YMD in Andhra Pradesh (Chaitanya *et al.* 2021). YMD is a severe disease in summer and late rabi seasons that affect pulse crops caused by whitefly transmitted begomoviruses belonging to the Geminiviridae family. Recently new species of begomovirus named as *Cajanus scarabaeoides* YMV (CsYMV) was reported with wild relative of pigeonpea (*C. scarabaeoides*) from Chhattisgarh state (Dokka *et al.*, 2023).

The majority of begomoviruses are icosahedral twin virion particles with a bipartite genome made up of circular, covalently closed single strand DNA molecules (DNA-A and DNA-B) that are each typically 2.6–2.8kb (Harrison *et al.* 1977). Symptoms consisting of yellow mosaic, mottling, shortening of leaves and stunting occur in most pigeon pea growing areas at a low incidence.

These begomoviruses have a bipartite genome and contain two single stranded covalently closed circular DNA as their genetic material. These are named as DNA-A and DNA-B, each of approximately 2.7Kb in

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size. DNA-A encodes six open reading frames (ORFs), AC1(Replication protein), AC2(Transcriptional activator protein), AC3 (Replication enhancer Protein), AC4(May determine Symptom expression) and AV1(Coat Protein), AV2(Pre coat protein) involved in replication, transcription and packaging, whereas DNA-B encodes two protein ORFs, BC1(movement protein) and BV1(nuclear shuttle protein) involved in viral movement.

Recently high incidence of yellow mosaic and severe stunting of Pigeon pea plants were observed at KVK farm, Reddipalli and other places in Anantapur district during Kharif-2021. The reasons for sudden outbreak of yellow mosaic disease of Pigeon pea in isolated patches in Anantapur district of Andhra Pradesh during Kharif 2021 was not known.

MATERIAL AND METHODS

Roving survey was conducted to record the incidence of yellow mosaic disease in major pigeon pea

growing areas of Andhra Pradesh during December-2022 to January -2023. The districts covered under this study are Anantapur, Kadapa, Guntur and Prakasam from Andhra Pradesh.

I. Symptoms

In order to study the symptoms of the disease, healthy plants and yellow mosaic disease infected plants of Pigeon pea are compared during roving survey from different locations. The symptoms exhibited by the diseased plants.

II. Per cent disease incidence (PDI)

The incidence of the disease was recorded during the survey on naturally infected plants by using following equation as suggested by Wheeler (1969). The zigzag pattern is followed to collect required data in which randomly selected plants were evaluated at each location.

Table 1. Survey details of yellow mosaic disease of pigeon pea in Andhra Pradesh

District	Village	Mandal	Total Number of plants	Number of Infected plants	Percentage of disease incidence
Anantapur	Kadiri	Kadiri	74	12	16
	Motukupalli	Kadiri	43	4	9
	Nallamada	Nallamada	61	5	8
	Kurumala	Nallamada	72	8	11
	Malakavaripalli	Obuladevarecheruvu	97	11	11
Kadapa	Thollaganganapalle	Vallur	78	15	19
	Nallaguttapalle	Ramapuram	41	9	21
	Chitluru	Ramapuram	86	11	12
	Kothagaripalle	Pendlimarri	55	13	23
	Rachapalle	Ramapuram	84	6	7
	Jammalpalle	Chinthakomma dinne	64	6	9
	Ganganapalle	Pendlimarri	89	13	14
	Unaguravaya palem	Buchannapalem	51	3	5
	Annavaram	Podili	63	4	6
Guntur	Chandavanam	Nadendla	68	2	2
	Narasaropeta	Narasaraopet	89	3	3
	Satuluru	Nadendla	57	2	3
	Narnepadu	Muppalla	48	4	8

$$\text{PDI} = \frac{\text{Total number of plants infected}}{\text{Total number of plants observed}} \times 100$$

RESULTS AND DISCUSSION

i. Symptomatology

The typical symptoms of YMD observed are mottle mosaic which are small, irregular greenish yellow patches intermixed with green patches. Due to severe infection, there is a stunted in plant growth and reduction in leaf size and internodal length (Fig. 1).

ii. Incidence of yellow mosaic disease

The disease incidence recorded in four districts of Andhra Pradesh is presented in Table 1. The disease incidence in five mandals in Anantapur district ranged from 8-16%, 7-23 % in seven mandals of YSR Kadapa district, 5-6% in two mandals of Prakasam district and 2-8% in four mandals of Guntur district of Andhra Pradesh. The overall incidence of YMD of pigeon pea was very low as compared to YMV on other pulses like urdbean and mungbean where the incidence goes upto

100%. Though enough population of whiteflies were observed in the fields and source of inoculums was present on weeds and other pulses grown at RARS, Tirupati and elsewhere, still the incidence of disease on pigeon pea was very low. It is worth to study the factors like weather, vector, seasons, genotype characters etc., that are responsible for low incidence in several districts surveyed in Andhra Pradesh. Dokka *et al.* (2023) observed upto 46% disease incidence in *Cajanus scarabeeoides*- a wild relative of pigeon pea present on bunds of urdbean, munbean and pigeonpea fields in 22 districts of Chattisgarh state during survey carried out from 2017 to 2019.

Based on the above data, it was found that several pigeon pea fields, the plants displayed moderate to low level of incidence showing yellow mosaic symptoms across the fields during survey. The range of disease incidence is observed upto 2-23% in different locations of Andhra Pradesh. The overall incidence of YMD of Pigeon pea was very low as compared to YMV on other pulses like urdbean and mungbean where the incidence goes upto 100%. Though enough population of whiteflies were observed in the fields and source of inoculums was present on weeds and other pulses grown.



Fig. 1. Typical symptoms of pigeon pea yellow mosaic disease



Fig. 2. Healthy plant

Because of this reason, further investigation is need to study the factors like weather, vector, seasons, genotype characters etc., that are responsible for low incidence in several districts surveyed in Andhra Pradesh.

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