Assessment of Urdbean Disease Incidence in Rice Fallow Systems of Krishna District, Andhra Pradesh

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Abstract— *This study focuses on the surveillance of major diseases affecting urdbean (blackgram) cultivated in rice fallows within the Krishna district of Andhra Pradesh. The research is driven by the significant yield losses caused by major diseases in this region. The primary objective is to assess the impact of these diseases on crop yields to develop effective management strategies. A roving survey was conducted in farmers' fields during the rabi 2022-23 season, with data collected on disease incidence and severity for various pathogens, including Yellow Mosaic Virus (YMV), leaf crinkle, leaf curl, stem canker, leaf spots, and powdery mildew. Results from the Rabi 2022-23 survey revealed varying levels of disease prevalence across different villages and crop stages. The incidence of Mungbean Yellow Mosaic Virus (MYMV), measured on a 1-9 scale, ranged from 1 to 5. The percentage of leaf crinkle incidence varied from 1.63% to 11.54%. Leaf spots were rated on a disease scale of 1-9, with scores ranging from 3 to 6. Powdery mildew severity, assessed on a 0-5 scale, ranged from 2 to 3. The percent incidence of leaf curl was found to be between 0% and 2.81%, while stem canker incidence ranged from 2.18% to 27.73%. The findings of this research indicate that diseases such as powdery mildew, Corynespora leaf spot, leaf crinkle, MYMV, and stem canker are all contributing to yield losses in blackgram.*

Keywords— Blackgram, MYMV, ULCV, leaf curl, powdery mildew, Corynespora leaf spot, and stem canker.

I. INTRODUCTION

Urdbean [*Vigna mungo* (L.) Hepper], also known as blackgram is a short-duration pulse crop often grown in rice-fallow systems in many parts of Asia. Urdbean is suitable for rice fallow situations due to its ability to thrive in residual moisture and its short duration. Specifically, sowing urdbean immediately after rice harvest, potentially with an increased seed rate, can be an effective strategy for maximizing yields and profitability in these systems. Despite immense scope, the extensive use of rice fallows for pulse cultivation is mostly restricted because of several biotic, abiotic and socio-economic constraints (Pande *et al.*, 2000). Among the biotic constraints, several fungal, viral diseases, insect pests and nematodes constraint both cool season and warm season pulses production in rainfed rice fallow lands (Pande *et al.*, 2012).

Krishna district, located in the coastal region of Andhra Pradesh, is recognized for its fertile lands and extensive rice cultivation. Consequently, urdbean is a major *rabi* (post-monsoon) crop in the district, thriving in the black cotton soils that retain moisture effectively. In rice fallow areas urdbean and mungbean are susceptible to *Mungbean Yellow Mosaic Virus* (*MYMV*), besides they are susceptible to powdery mildew, cercospora leaf spot and also to leaf curl virus (Narendra *et.al.*, 2018). An in-depth understanding of disease incidence is critical for enhancing urdbean (*Vigna mungo*) productivity, particularly within the rice fallow pulse systems of Krishna District, Andhra Pradesh. This research helps in reporting the findings of a survey conducted to identify and assess the prevalence and severity of major diseases affecting urdbean cultivated under rice-fallow conditions in Krishna district, Andhra Pradesh during rabi 2022-23.

II. MATERIALS AND METHODS

2.1 Survey Area and Period:

The survey was conducted during the *Rabi* season under rice fallows of Krishna district, Andhra Pradesh during 2022-23.

2.2 Sampling Procedure:

Roving survey was conducted in prominent urdbean growing mandals (administrative divisions) of Krishna district, Andhra Pradesh. The selection of mandals was based on the reported area under urdbean cultivation in rice fallows. The survey was carried out during the rabi season (typically from November to March), when urdbean is predominantly grown as a rice-fallow crop. Multiple visits were made to the selected fields at different crop growth stages (vegetative, flowering, pod formation and pre harvesting) to capture the complete spectrum of disease incidence. Varieties cultivated in farmers' fields, such as LBG 752, LBG 645, LBG 648, LBG-787, TBG-104, PU-31, and Thutakuminumu, were observed. The plants were visually inspected for characteristic symptoms of various diseases.

2.3 Disease Incidence and Severity Assessment:

Disease severity was assessed using standard disease rating scales specific to each disease.

- Yellow mosaic Disease (YMV): 1-9 scale given by Alice and Nadarajan, (2007)
- Powdery mildew: 0-5 scale
- Leaf spots: 1-9 scale
- Leaf Curl: Percent Disease Incidence
- Leaf crinkle: Percent Disease Incidence
- Stem canker: Percent Disease Incidence

The percent disease incidence was calculated using the formula:

$$\text{Percent Disease Incidence (PDI)} = \frac{\text{Number of infected plants}}{\text{Total number of plants}} X100 \quad (1)$$

2.4 Data Analysis:

The collected data on disease incidence and severity were tabulated and analysed to determine the prevalence of each disease across the surveyed mandals and villages. Mean incidence and severity percentages were calculated for each disease.

III. RESULTS AND DISCUSSION

The survey revealed the presence of several economically important diseases affecting urdbean cultivation under rice-fallow conditions in Krishna district. The major diseases observed were *Mungbean Yellow Mosaic Virus* (*MYMV*), *Urdbean Leaf Crinkle Virus* (*ULCV*), Powdery Mildew, Corynespora Leaf Spot, and Stem Canker. The prevalence and severity of these diseases varied across the surveyed locations and depending on the crop growth stage. The major diseases identified on blackgram during surveys undertaken in rice fallow situation for *Rabi*, 2022-23, in various mandals and villages of Krishna district were presented in Table 1.

3.1 Mungbean Yellow Mosaic Virus (MYMV):

The incidence of *MYMV* ranged from 1 to 5 on a scale of 1-9. As observed in Table 1, *MYMV* incidence was present across all surveyed mandals and villages, with some fields showing higher severity (e.g., Puchagadda, Kodali, Pooshadam, Movva, Ayyanki, Penjendra, Pamarru, Ayyanki in Pamarru). This indicates that *MYMV* is a prevalent disease in urdbean cultivated under rice fallows in Krishna district. This finding aligns with observations in other urdbean-growing regions of Andhra Pradesh, including Guntur district, where *MYMV* is a major constraint (Kasi Rao *et al.*, 2021; Bhaskar *et al.*, 2022). The transmission of *MYMV* by whiteflies (*Bemisia tabaci*) is a major factor contributing to its rapid spread in the field (Prasada

Rao *et al.,* 2003; Biswas *et al.,* 2009). The availability of alternate weed hosts and favorable environmental conditions (temperature and humidity) likely contributed to its high prevalence.

TABLE 1
MAJOR DISEASES IDENTIFIED ON BLACKGRAM DURING SURVEYS UNDERTAKEN IN RICE FALLOW SITUATION FOR RABI, 2022-23 ARE FURNISHED HEREUNDER

Mandal	Village	Variety	Stage of the crop	*MYMV* (1-9 scale)	Leaf Crinkle	Leaf Curl	Stem canker	Corynespora Leaf spots (1-9 scale)	Powdery Mildew (0-5 scale)
					(% Incidence)				
Ghantasala	Ghanatsala	LBG 752	Vegetative Stage	3	11.54	2.16	13.42	5	3
	Puchagadda	LBG 645	Vegetative Stage	5	5.15	1.08	5.12	4	2
	Devarakota	LBG 752	Vegetative Stage	3	3.27	1.73	9.25	4	3
	Kodali	LBG 752	Pod development stage	5	7.21	0.00	3.45	5	3
	Pooshadam	LBG 645	Pod development stage	5	12.34	0.00	12.34	6	2
	Daliparru	Thutikada minumu, LBG 752	Pod development stage	3	4.37	1.24	18.72	6	3
Challapalli	Challapalli	LBG 752	Pod development stage	3	2.71	0.00	15.91	4	2
	Nadakuduru	VBN 8	Pod development stage	1	1.63	0.00	12.42	5	2
	Vakkalagadda	LBG 752	Pod development stage	3	4.16	1.85	5.36	4	2
Movva	Movva	LBG 645	Flowering stage	5	16.24	2.81	7.19	4	2
	Kuchipudi	LBG 752	Flowering stage	3	12.11	1.23	13.45	5	3
	Penumacha	LBG 752	Flowering stage	3	2.19	0.00	12.27	4	1
	Ayyanki	LBG 648	Flowering stage	5	7.84	1.24	10.34	3	2
Gudlavalleru	Gudlavalleru	LBG 752	Flowering stage	3	6.54	1.87	11.36	2	3
	Venuthurumilli	Thutikada minumu	Flowering stage	3	4.36	2.15	27.73	2	3
	Dokiparru	LBG 787	Flowering stage	3	1.45	0.00	14.21	4	3
	Penjendra	LBG 752	Flowering stage	5	9.41	0.00	21.28	3	3
Pedana	Nandigama	PU 31	Flowering stage	1	8.54	0.00	18.75	3	1
	Nadupuru	TBG 104	Flowering stage	1	4.78	0.00	7.32	4	2
Machilipatnam	Arisepalli	LBG 752	Flowering stage	3	3.72	1.26	12.72	5	1
	Patha Majeru	LBG 645	Flowering stage	5	2.51	0.00	19.36	6	1
Pamarru	Pamarru	LBG 648	Pod development stage	5	11.23	0.00	6.24	5	2
	Syamalapuram	VBN 8	Pod development stage	3	7.34	1.56	2.18	5	2
	Ayyanki	LBG 645	Pod development stage	5	8.15	2.36	5.12	6	2
	Ainampudi	LBG 752	Pod development stage	3	7.16	2.09	12.53	4	3

3.2 Urdbean Leaf Crinkle Virus (ULCV):

The percent incidence of Leaf Crinkle ranged from 1.45% to 16.24%. The highest incidence was observed in Movva (16.24%) during the flowering stage. This indicates that *ULCV* is a significant viral disease affecting urdbean in the region. Early infection of plants with *ULCV* resulted in more severe symptoms and greater yield losses (Chowdhury and Nath, 1983). The seed-borne nature of *ULCV* (Biswas *et al.,* 2009) and potential mechanical transmission, along with vector transmission, likely contribute to its spread in rice-fallow systems.

3.3 Leaf Curl:

The incidence of leaf curl disease varied from 0% to 2.81% across different locations, with the highest occurrence observed in Movva at 2.81%. Although relatively lower in prevalence compared to other diseases, it is still important to address its presence. This study was supported by Prasada Rao *et al.,* 2003 who reported that the incidence of leaf curl on urdbean was observed to be between 2.92% and 5.73% in rice fallows of Guntur and Krishna districts during rabi 2001-02.

3.4 Stem Canker:

The percent incidence of stem canker ranged from 2.18% to 27.73% in different villages of Krishna district under rice fallow condition. The highest incidence was recorded in Venuthurumilli (27.73%). This indicates that stem canker is a significant factor affecting blackgram yields in the region. According to Jacob, P.S. and Jhansi, K. (2020) 22.32% disease incidence was observed in farmers practice.

3.5 Corynespora leaf Spots (including *Corynespora cassiicola*):

Leaf spots ranged from 2 to 6 on a disease rating scale of 1-9. The highest severity was observed in Pooshadam, Daliparru, Patha Majeru, and Ayyanki (Pamarru). This suggests that leaf spot diseases, including Corynespora leaf spot, are consistently present and can cause considerable damage. Alternaria leaf spot has been reported to cause varying degrees of severity in urdbean in Andhra Pradesh (Ambarish *et al.,* 2021).

3.6 Powdery Mildew (*Erysiphe polygoni*):

Powdery mildew ranged from 1 to 3 on a severity scale of 0-5. While generally not as severe as viral diseases, its consistent presence across different villages indicates its widespread occurrence. Warm and humid conditions typically favour the development of powdery mildew (Prathyusha *et al.,* 2021). The presence of thick crop canopy in well-grown urdbean fields under rice fallows might create a conducive microclimate for the disease.

IV. CONCLUSION

The survey confirms that several major diseases, including *MYMV*, Leaf Crinkle, Powdery Mildew, Leaf Spots, and Stem Canker, significantly affect urdbean yields under rice-fallow conditions in Krishna district. These fungal, bacterial, and viral diseases are considerably contributing to yield reduction. The results suggest that continuous monitoring of these diseases could aid in developing a disease forecasting system that farmers could adopt for timely management of diseases.

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