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## EVALUATION OF DIFFERENT PLANT EXTRACTS IN REDUCING *BEMISIA TABACI* AND URDBEAN LEAF CRINKLE VIRUS (ULCV) DISEASE INCIDENCE ON GREENGRAM

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### ABSTRACT

ULCVD is the most prevailing threat to mungbean and urdbean worldwide. ULCV is a seed born virus and also transmit through insect vectors. Among all vectors, whitefly (*Bemisia tabaci*) is the most devastating vector in causing this disease. Different mungbean genotypes were sown under natural conditions. The efficacy of different plant extracts (garlic, bougainvillea, onion) against whitefly population and ULCV was determined. Results showed that plant extracts can be useful to manage the disease and vector populations. Garlic extract was found effective and minimum disease severity of 10.48% with least whitefly population 1.27, was seen on plants that were sprayed with garlic extract followed by bougainvillea and onion.

**Keywords:** ULCVD, Mungbean, Whitefly, Plant extracts.

### INTRODUCTION

Greengram or mungbean (*Vigna radiata* L.) belongs to family Fabaceae, native to India. Being a rich source of protein, it is an important short duration crop in humid and sub-humid regions of the world (Akhtar and Haq, 2003). Anjum *et al.* (2006) predicted that mungbean needs less water as compared to summer crops. In Pakistan mungbean is cultivated over an area of 137 thousand hectares and annual production is 77.1 thousand metric tons (GOP, 2011). Under field conditions, eight viruses attack on mungbean (Nene, 1972). Several biotic and abiotic factors are responsible for the less yield of the crop. When mungbean is grown under field conditions, it is prone to numerous viral diseases; the most important are urdbean leaf crinkle virus (ULCV) and bean yellow mosaic virus (BYMV) (Bashir *et al.*, 2006).

Urdbean leaf crinkle disease is a devastating disease of greengram (*Vigna radiata*) and blackgram (*Vigna mungo*)

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Hepper) caused by urdbean leaf crinkle virus (ULCV) (Bashir & Malik, 1988). ULCV is known to spread through seeds and insects (Nene, 1972; Kadian, 1980). Whitefly is also a major vector of ULCV (Binyamin *et al.*, 2011). Out of 254 lines, 247 lines were recorded as highly susceptible mungbean lines against MYMV as a result of whitefly attack (Nadeem *et al.*, 2006). Primary infection occurs through seed (Beniwal *et al.*, 1980). With the time and space vector movement also varies accordingly (Taylor, 1984). Virus causes heavy losses at an early stage of the plant according to research done by Bashir *et al.* (1991). In Pakistan, ULCVD has been a devastating disease because of its high incidence from 40 to 100% recorded in the field and yield losses have been recorded up to 70% (Zeeshan *et al.*, 2014)). The first 3-4 weeks are important in spread of leaf crinkle disease (Ashfaq *et al.*, 2008).

Various approaches have been done in reducing the disease and vector population. But, plant extracts are mainly effective because of eco-friendly nature. Leaf extracts have some inhibitory role against the disease. This study was conducted to evaluate various plant extracts for the management of ULCVD and whitefly population.

## MATERIALS AND METHODS

Mungbean varieties/lines were sown in the Research Area of Plant Pathology, University of Agriculture, Faisalabad on 15<sup>th</sup> March, 2017. Seeds were planted on the ridges, plant to plant and row to row spacing 15 cm and 30 cm, respectively in RCBD. The crop was irrigated at 15 days interval. All the conventional agronomic practices were followed to keep the crop in a good growing condition except spraying of any pesticides. Insect traps consisting of plastics cards (1×1.5 feet) impregnated with Vaseline fastened with a hanger were placed in the field at four sides. Data of vector population were taken by counting the number of whiteflies on yellow boards and on the leaves of the plants. Yellow water traps consisting of yellow iron trays (1×2.5 feet) were also placed at two sites of mungbean field and number of whiteflies trapped in these trays was recorded on weekly basis.

The disease incidence of ULCV infected plants showing extreme crinkling were evaluated by visual inspection at every line in every plot (Zeshan *et al.*, 2014). The disease incidence and whitefly population were recorded. Monitoring of infected plants was executed on weekly basis starting from emergence date till the end of the season. ULCV was confirmed by the method of sap inoculation as described by (Phullaiah *et al.*, 1998). Data of diseased plants were recorded after 7 days of sap ULCV.

For management of mungbean varieties/lines against ULCV disease, plant extracts of *Bougainvillea spectabilis*, *Allium cepa* (onion) and *Allium sativum* (garlic) @2% concentration, were used. 2g extracts was dissolved in 1000ml distilled water to prepare stock solution. Material was then shaken in an orbital shaker for 6h at 25°C. After that, for 2%, 2ml was taken from stock solution and dissolved in 98ml distilled water. Plant extracts were sprayed thrice on greengram sown under natural conditions. The experiment was conducted in an area of Plant Pathology, University of Agriculture Faisalabad in Randomized Complete Block

Design (RCBD). Progression of ULCV was recorded at weekly basis; disease incidence was calculated by counting the total number of healthy and diseased plants and taken their percent. Whitefly population was calculated by calculating no. of whiteflies in upper, middle and lower layer before and after 48h when plant extracts were applied. The extent of ULCV disease in all mungbean accessions was noted at one week interval for five weeks.

The data was analyzed statistically by ANOVA. Least Significant Difference (LSD) test was used for statistical comparison among treatments (Steel *et al.*, 1997).

## RESULTS AND DISCUSSION

Analysis of variance table showed that there was a significant variation within the varieties and also within the extracts. Two way interactions or treatment and variety showed highly significant results (Table 1). It was indicated that in case of garlic with 2% concentration, disease incidence was 23.8%, 19.86%, 15.01% and 10.48% on 15033, 15405, M-07007 and on M-07002, respectively. Similarly by the extract of bougainvillea at 2% concentration disease incidence was 29.29%, 26.21%, 16.14% and 14.19% on 15033, 15405, M-07007 and on M-07002, respectively. And onion extract showed disease incidence of 33.48%, 29.27%, 25.47% and 20.97% on 15033, 15405, M-07007 and on M-07002, respectively. Moreover, in case of control maximum disease incidence was recorded i.e. 47.19%, 44.2%, 40% and 38% on 15033, 15405, M-07007 and on M-07002, respectively (Table 2).

Control showed maximum disease incidence as reported by various scientists like Reddy *et al.* (2006), Karthikeyan *et al.* (2008) and Thirumalaisamy *et al.* (2003). According to them, anti-viral properties of plant extracts exhibited inhibition in disease incidence of ULCVD.

In case of whitefly, garlic with 2% concentration showed minimum vector population i.e. 3.10, 2.44, 1.85 and 1.27 on 15033, 15405, M-07007 and on M-07002, respectively.

Table 1. Analysis of variance table for plant extracts against ULCV disease incidence

Source of variation	D.F	Sum of squares	Mean squares	F-value
Block	2	3.7	1.87	0.72 <sup>NS</sup>
Treatment	3	13250.4	4416.8	1697.69 <sup>**</sup>
Variety	3	3366.3	1122.1	431.30 <sup>**</sup>
Spray	2	144.9	72.46	27.85 <sup>**</sup>
Treat*Variety	9	218.7	24.3	9.34 <sup>**</sup>
Treat*Spray	6	27.5	4.59	1.76 <sup>NS</sup>
Variety*Spray	6	8.2	1.37	0.53 <sup>NS</sup>
Treat*Variety*Spray	18	29.9	1.66	10.64 <sup>NS</sup>
Error	36	93.7	2.6	
Total	85	17143.3		

Table 2. Treatment x Variety Interaction mean±SE for Disease incidence

Treatments	Varieties				Mean
	15033	15405	M-07007	M-07002	
Garlic	23.81h	19.86i	15.08jk	10.48l	17.31D
<i>Bougainvillea spectabilis</i>	29.29f	26.21g	16.14j	14.19k	21.46C
Onion	33.48e	29.27f	25.47g	20.97i	27.29B
Control	47.19a	44.2b	40.0c	38d	42.35A
Mean	35A	30B	24.17C	20.91C	

Means sharing similar letter in a row or in a column are statistically non-significant ( $P>0.05$ ). Small letters represent comparison among interaction means and capital letters are used for overall mean.

LSD value for interaction (5%) = 1.542

Table 3. Treatment x Variety Interaction mean±SE for whitefly population

Treatments	Varieties				Mean
	15033	15405	M-07007	M-07002	
Garlic	3.11f	2.44gh	1.85ij	1.27k	2.16D
<i>Bougainvillea spectabilis</i>	4.07d	2.67g	2.11hi	1.68j	2.63C
Onion	5.5d	3.51e	2.17hi	1.62j	3.2B
Control	6.53a	5.04c	4.83de	2.28h	4.67A
Mean	4.80A	3.42B	2.74C	1.72D	

LSD value for interaction= 5% = 0.3482

Similarly by the extract of *Bougainvillea* at 2% concentration whitefly population was 4.07, 2.67, 2.11 and 1.68 on 15033, 15405, M-07007 and on M-07002, respectively. In case of onion extract at 2% concentration, the whitefly population was maximum i.e. 5.5, 3.51, 2.17 and 1.62 on 15033, 15405, M-07007 and on M-07002, respectively. Control had maximum whitefly population i.e. 6.53, 5.04, 4.83 and 2.28 on 15033, 15405, M-07007 and on M-07002, respectively. (Table 3).

On M-07002, minimum whitefly population and disease incidence was found i.e. 1.27 and 10.48%, respectively. While, 15033 was found highly susceptible and showed maximum disease incidence as well as vector population. In this study, it was found that plant extracts have a significant role as they reduced the whitefly population and ULCV disease incidence up to significant level. As, garlic have the properties of authorizing immune system anti-tumor and antioxidant effects and its extract is used against viral infections (Goncagul and Ayaz, 2010). Onion shows inhibitory effect on virus because of two most important flavonoids (quercetin and kaempferol) (Duh *et al.*, 2008). Leaves of *bougainvillea* cause stimulation of the assembly of phenolics and as a result the activities of peroxidase, polyphenol oxidase and phenylalanine ammonia-lyase enhanced. (Karthikeyan *et al.*, 2009).

#### CONCLUSION

The low yield potential, susceptibility to diseases, insect

pests attack and sensitivity to environmental fluctuations contribute towards yield instability. Plant extracts are economical and eco-friendly. Among three extracts, garlic extract gave best results for reducing vector population as well as disease incidence. While *bougainvillea* gave good results and onion showed satisfactory results. As ULCVD is a seed born virus so the use of diseased free seeds is a best way to reduce the viral infection, after that, plant extracts are the economical way to control vector population and disease incidence.

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