Int.J.Curr.Microbiol.App.Sci (2020) *9*(2): 1583-1588

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 9 Number 2 (2020)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2020.902.182

Symptom Based Screening of Urdbean Accessions against Leaf Crinkle, Bud Deformation and Yellow Mosaic under Natural Conditions

Abhishek K. Dubey[1], N. K. Gautam[2], Sajad Un Nabi[3], Saurabh K. Dubey[3], Pankhuri Singhal[3], Manoj K. Yadav[3], Saritha R. K.[3] and V. K. Baranwal[3*]

[1]Division of Crop Research, ICAR-Research Complex for Eastern Region, Patna, Bihar-14, India
[2]ICAR-National Bureau of Plant Genetic Resource, New Delhi-12, India
[3]Division of Plant Pathology, ICAR- Indian Agricultural Research Institute, New Delhi-12, India

**Corresponding author*

Keywords

Screening, Symptoms, Urdbean, Accessions, Natural

Article Info

Accepted:
08 January 2020
Available Online:
10 February 2020

A B S T R A C T

Among several factors responsible for low production and productivity, Urdbean leaf crinkle disease (ULCD) and yellow mosaic are considered to be the major threat for urdbean cultivation. The lack of resistance in urdbean against mixed infection of symptoms like crinkling, mosaic and bud deformation is major concern in urdbean productivity. In present study, the symptom based screening in urdbean accessions against leaf crinkle; bud deformation and yellow mosaic under natural conditions were done. The results revealed that all the three symptoms viz., crinkling, mosaic and bud deformation were observed from various accessions. The nature of the symptoms observed varied from severe to mild. All the accessions showed severe (50 -100 % leaf area) or moderate (20-50% leaf area) crinkling exceptKU-321, KU-1408, KU-1375 and KU-1373 which showed mild type of crinkling. The accessions KU-321, KU-1408 and KU-1375 showed only mild symptoms of crinkling, but no mosaic or bud deformation was observed, hence these can be used for cultivation after proper evaluation for yield parameters.

Introduction

Vigna mungo (L.) Hepper, (chromosome no 2n=24) commonly known as urdbean orurad or blackgram or mash, is a leguminous crop and belongs to family *Fabaceae.* It's progenitor is *V. mungo* var. *silvestris* which is native to India, where it has been in cultivation from ancient times (Lukoki *et al.*, 1980). Plants are annual herbaceous, semi erect, erect to spreading or trailing types in habit with 30-100 cm in height. Leave are trifoliate, alternate and sparsely hairy on both the surfaces.

Urdbean is mainly cultivated as *kharif* crop almost in all states in India. In northern plains, it is cultivated during spring as a catch crop and in southern and south-eastern states. It needs relatively heavier, well drained,

moisture retentive, deep loam soils free from excessive soluble salts and sodicity. It is grown as a rainfed crop in the warm plains as well as in the foot-hills and up to an altitude of 2,000m. The 100 grams of urdbean contain water -10.80 g, energy- 341 kcal, protein-25.21 g, total lipid (fat)- 1.64 g carbohydrate-58.99 g, minerals; Calcium (Ca)-138 mg, Iron(Fe)-7.57 mg, Magnesium (Mg)-267 mg, Phosphorus (P)-379 mg, Potassium (K)-983 mg, Sodium (Na)-38 mg, Zinc (Zn)-3.35 mg, Vitamins; Thiamin-0.273 mg, Riboflavin-0.254 mg, Niacin -1.447 mg, Vitamin B6-0.281 mg, Vitamin B12 -0.00 µg, Vitamin A, (RAE)-1 µg and Vitamin A, -23 IU (USDA National Nutrient Database for Standard Reference Report, 2016).

High values of lysine make urdbean an excellent complement to rice in terms of balanced human nutrition. It is good source of phosphorus and known to be having significant hypolipidemic, anticolon-cancer and hypoglycemicaction (Indira and Kurup, 2003). Urdbean contribute about 11% of total pulse production in India.

Despite of advancement in agricultural production technology, due to various factors there is stagnation in urdbean production in country. Crop losses due to emerging plant diseases particularly those of viral origin are of great concern(Anderson *et al.,* 2004). Among the diseases, urdbean leaf crinkle disease (ULCD) and mosaic are most important depending on variety cultivated and season (Reddy *et al.,* 2005, Sharma *et al.,* 2015).

Multiple viral symptoms with mixed infection of different viruses in open field conditions cause severe yield losses in pulses in India (Biswa s*et al.,* 2015). The mixed infection in urdbean shows various symptoms like bud deformation, yellow mosaic and leaf crinkle (Biswas *et al.,* 2009).

Disease symptoms and vector population is significantly influenced by weather factors like temperature and humidity. Temperature range of 30-35˚C is reported to be most conducive for disease development of ULCD (Dubey *et al.,* 2019).

There are several reports on screening for ULCD and mosaic resistance in *Vigna* species (Binyamin *et al.,* 2011 and Biswas *et al.,* 2017). We also devised a study to screen the various accessions of urdbean against urdbean leaf crinkle, bud deformation and mosaic under field conditions.

Materials and Methods

Seed collection and raising of plants

During the year2013-14 and 2014-15 (*Kharif*), 53 urdbean accessions (Table 1) were collected from ICAR-NBPGR, New Delhi. The seeds were sown in experimental field of ICAR-NBPGR, (28.6377° N and 77.1571° E) in 20×25 m^2 area in three replications. Timely watering and fertilizer application as per standard agronomic package were done for proper growth of plants.

Disease Incidence and severity

The disease intensity was calculated after 40 and 60 days after sowing. The severity was calculated based on symptoms present on each accession. For ULCD, 50 -100 % crinkled leaves were considered severe,20-50% leaf area moderate and 1-20% as mild.

For bud deformation, 50- 100% deformed floral buds were considered severe, 20-50% as moderate and 1-20% as mild. Observations on mosaic were recorded by using a 1 to 9 point rating scale with slight modification as shown below (Singh *et al.,* 1992).

Scale	Percentage foliage affected	Severity
1	No visible symptoms or minute yellow specks covering 0.1-5% leaf area	Mild
3	Mottling of leaves covering 5.1-15% leaf area	
5	Yellow mottling and discoloration of 15.1-30% leaf area	Moderate
7	Pronounced yellow mottling and discoloration of leaves, pods, reducing in leaf size, stunting of plants, 30.1-75% foliage affected	
9	Severe yellow mottling and discoloration of leaves, stunting of plants, failure of flowering and fruit setting 75.1-100% foliar affected	Severe

Results and Discussion

The 53 accessions from ICAR-NBPGR grown at experimental field of ICAR-NBPGR were constantly observed for various symptoms at 40 and 60 DAS. The symptoms observed were of different types and nature. Three types of symptoms were observed; leaf crinkling, yellow mosaic and bud deformation (Fig 1a and Fig 1b). The nature of the symptoms observed varied from severe to mild in all three types of symptoms.

Most of the urdbean accessions showed severe crinkling (50-100%), the accessions KU-820, KU-1401, KU-1412, KU-1400, KU-3727, KU-1424, IC-251387, IC-1572, SU-12-116, SU-12-123 and SU-12-99 showed moderate crinkling (20-50%) however KU-321, KU-1408, KU-1375, and KU-1373 showed mild (1 to 20 %) type of crinkling. Yellow mosaic varied from mild to severe in urdbean accessions however various accessions KU-1164, KU-1355, KU-321, KU-820, KU-1386, KU-1367, KU-1408, KU-1375, KU-1396, KU-1411, KU-1393, KU1388, KU-1412, KU-1421,KU-1400,KU-3727,KU-1424,KU-1390,KU-1423, IC-251387, IC-539797, IC-1572, IC-485638, SU-12-116, SU-12-123, SU-12-99, TU-77-44, WBU-108 and Azad 2 did not show any yellow mosaic symptom. Bud deformation again varied from mild to severe however three accessions viz., KU-321, KU-1408 and KU-1375 did not exhibit any bud deformation. The result revealed that KU-321, KU-1408 and KU-1375 also did not show either mosaic and bud deformation however, mild crinkling was observed. The overall symptom based screening observed on all accessions and varieties are shown in table 1.

Urdbean (*V. mungo* L. Hepper),an Asiatic species of genus *Vigna* is an important pulse crop of South-East Asia which is widely adapted to both subtropical and semi-arid areas (Ganguly and Bhat, 2012).Among several factors responsible for low production and productivity, Urdbean leaf crinkle disease (ULCD) and mosaic are considered to be the major threat for urdbean cultivation (Reddy *et al.*, 2005). There are several reports on screening for ULCD and mosaic resistance in Vigna species (Binyamin*et al.*, 2011 and Biswas, 2017). Kadian (1980) screened 528 germplasm lines of vigna species by sap inoculation in net house and found only two urd bean and two mungbean varieties resistant/tolerant. Rishi (1990) screened many urdbean germplasm and found PLU-158, PLU-213, 83183-43, UH81-7, UH-82-11, UH82-45, UH83-13, Berisal and Saradomash were resistant to ULCD in a 2-year field experiment under heavy inoculum pressure.

Table.1 Observation of symptoms on different urdbean accessions collected from ICAR-NBPGR, New Delhi

S. No.	Germplasm	Crinkling	Yellow mosaic	Bud deformation
1	Barabanki Local	severe	Mild	severe
2	KU-1164	severe	-	mild
3	KU-1355	severe	-	severe
4	KU-1382	severe	moderate	severe
5	KU-321	mild	-	-
6	KU-820	moderate	-	mild
7	KU-1401	moderate	mild	mild
8	KU-1386	severe	-	severe
9	KU-1364	severe	moderate	severe
10	KU 1426	severe	moderate	severe
11	KU-1367	severe	-	severe
12	KU-1374	severe	moderate	severe
13	KU-1391	severe	severe	severe
14	KU-1363	severe	severe	severe
15	KU-1368	severe	moderate	severe
16	KU-1408	mild	-	-
17	KU-1375	mild	-	-
18	KU-1373	mild	moderate	mild
19	KU-1396	severe	-	severe
20	KU-1411	severe	-	severe
21	KU-1407	severe	severe	severe
22	KU-1393	severe	-	severe
23	KU-1388	severe	-	severe
24	KU-1412	moderate	-	mild
25	KU-1421	severe	-	severe
26	KU-1400	moderate	-	severe
27	KU-1376	severe	mild	severe
28	KU-1427	severe	severe	severe
29	KU-1409	severe	severe	severe
30	KU-3727	moderate	-	mild
31	KU-1424	moderate	-	mild
32	KU-1390	severe	-	severe
33	KU-1423	severe	-	severe
34	KU-1404	severe	moderate	severe
35	IC-485636	severe	severe	severe
36	IC-485638	severe	severe	severe
37	IC-251387	moderate	-	moderate
38	IC-1572	moderate	severe	mild
39	IC-539797	severe	-	severe
40	IC-11613	severe	severe	severe
41	IC-144901	severe	severe	severe
42	IC-1572	severe	-	moderate
43	IC-485638	severe	-	severe

44	SU-12-116	moderate	-	mild
45	SU-12-123	moderate	-	mild
46	SU-12-99	moderate	-	mild
47	TU-77-44	severe	-	moderate
48	IB-233-1	severe	severe	severe
49	IPU-2-43	severe	severe	severe
50	WBU-108	severe	-	moderate
51	Uttara	severe	moderate	severe
52	Azad-2	severe	-	moderate
53	Pant U-40	severe	severe	severe

Fig.1 Plants with leaf crinkle and bud deformation symptom (a) and plants with leaf crinkle, yellow mosaic and bud deformation symptom (b)

a b

Some of urdbean cultivars *viz.,* HpU 27, 102, 164, and 315 have been reported to be resistant to ULCD (Sharma and Dubey, 1984). However 67 black gram germplasm of Indian origin were screened under field conditions by Chaudhry *et al.*, (2007) and none of them were found to be resistant against ULCD. Ashfaq *et al.,* (2007) evaluated 87 urdbean cultivars from Pakistan and found nine genotypes free from disease and categorized as 'highly resistant. The lack of resistance in urdbean against mixed infection of all three symptoms is the major concern to build up adequate viral inoculum pressure (Biswas *et al*., 2015). Therefore, greater attention is needed in searching pathogen derived resistance in exploiting genetic engineering approach, an alternate path for development of resistant cultivars.

References

Anderson PK, Cunningham AA, Patel NG, Morales FJ, Epstein PR and Daszak P (2004). Emerging infectious diseases of plants: pathogen pollution, climate change and agrotechnological drivers. *Trends Ecol. Evol.* 19:535–544.

Ashfaq M, Khan A, Mughal M, Javed N, Tariq and Bashir M (2007). Evaluation of urdbean germplasm for resistance against urdbean leaf crinkle virus. *Pak. J. Bot.*, 39(6): 2103-2111.

Binyamin R, Khan MA, Ahmad N and Ali S (2011). Relationship of epidemiological factors with urdbean leaf crinkle virus disease and its management using plant extracts. *Int. J. Agric. Biol.* 13, 411–414.

Biswas K K., Biswas K and Tarafdar A. (2015). Multiple and mixed infections with yellow

mosaic, leaf crinkle and bud necrosis disease complex in mungbean: A threat to cultivation of mungbean in India. *Legume Research*. 38(3)2015: 382-388.

Biswas, K. K., Tarafdar, A., Kumar, A., Dikshit, H. K. and Malathi, V. G. (2009) Multiple infection in urdbean (*Vigna mungo*) in natural condition by begomovirus, tospovirus and urdbean leaf crinkle virus complex *Indian Phytopath.* 62 (1): 75-82.

Biswas, K.K., 2017. Plant viruses, diseases and their management. IK International Pvt. Limited.

Chaudhry MA, Ilyas MB and Ghazanfar MU (2007).Screening of urdbean germplasm for the sources of resistance against urdbean leaf crinkle virus.*Mycopathology* 5:1–4.

Dubey, A.K., Sinha, P., Baranwal, V.K., Mishra, S. and Saritha, R.K. (2019).Temperature influence on leaf crinkle disease expression in urdbean (*Vigna mungo* (L.) Hepper) and potential distribution of the disease in India.*Crop Protection* 120: 84–90.

Ganguly PR, Bhat KV (2012).Study of the pattern of variation for microsatellite markers in Black gram (*Vigna mungo* (L.) Hepper) germplasm. Inter J Biomedical Life Sci 3(1):1–6.

Indira M and Kurup PK (2003).Blackgram (*vignamungo*): A hypolipidemic pulse. Natural product radiance, 2 (5): 240-242.

Kadian OP (1980). Studies on leaf crinkle disease of urdbean (*Vignamungo*(L.) Hepper) mungbean (*V. radiata*(L.) Wilczek) and its control, *Ph.D. Thesis,* p: 177. Department of Plant Pathology Haryana Agricultural University, Hisar, India.

Lukoki L, Marechal R and Otoul E (1980).The wild ancestors of the cultivated beans *Vigna radiata* and *Vigna mungo*. *Bull. Jard. Bot. Nat. Belg.* 28:23–30.

Reddy, TonapiCh VA, Varanasiappan S, Navi SS and Jayarajan R (2005). Influence of plant age on infection and symptomatological studies on urdbean leaf crinkle virus in urdbean (*Vigna mungo*). *Int. J. Agri. Sci.* 1:1-6.

Rishi N (1990). Seed and crop improvement of northern Indian pulses (Pisum and Vigna) through control of seed-borne mosaic viruses.inal Technical Report (US-India Fund) Dept. Plant Pathology, CCS Haryana Agric. Univ, Hisar, p 122.

Sharma I, Dubey GS (1984) Control of urdbean leaf crinkle virus through heat treatment, chemotherapy and resistance. Indian Phytopathol 37:26–30

Sharma P N, Sharma A and Singh M. (2015).Effect of leaf crinkle disease on yield and quality of urdbean (*Vigna mungo* L. Hepper) in Himachal Pradesh. *Himachal Journal of Agricultural Research* 41(1): 80-82.

Singh, G., Sharma, Y.R. and Kaur, L. 1992. Method of rating mungbean yellow mosaic virus in mungbean and urdbean. Plant Disease Research. 7: 1-6.

USDA national nutrient database for standard reference report 2016 (https://www.nutrition-and-you.com/black-gram.html)

How to cite this article:

Abhishek K. Dubey, N. K. Gautam, Sajad Un Nabi, Saurabh K. Dubey, Pankhuri Singhal, Manoj K. Yadav, Saritha R. K. and Baranwal, V. K. 2020. Symptom Based Screening of Urdbean Accessions against Leaf Crinkle, Bud Deformation and Yellow Mosaic under Natural Conditions. *Int.J.Curr.Microbiol.App.Sci.* 9(02): 1583-1588.
doi: https://doi.org/10.20546/ijcmas.2020.902.182