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Evaluation of cucurbit rootstocks and screening of bitter gourd genotypes for resistance to *Fusarium oxysporum* f.sp. *momordicae*

Zong-Ming Sheu*[1], Hsin-Chun Cheng[1], Ming-Sheuh Chiu[1], Chia-Chun Yu[3], Hsiang-Yi Huang[2], Derek W. Barchenger[1], Lawrence Kenyon[1]

[1] World Vegetable Center, Tainan, Republic of China (Taiwan)

[2]Chinan Branch Station, Kaohsiung District Agricultural Research and Extension Station, Kaohsiung 842, Republic of China (Taiwan)

[3]National Chung Hsing University, Taichung, Republic of China (Taiwan)

Corresponding author: zong-ming.sheu@worldveg.org

INTRODUCTION

- Fusarium wilt, caused by *Fusarium oxysporum* f.sp. *momordicae* (FOM), is a major constraints to bitter gourd (*Momordica charantia* L.) cultivation in Taiwan.
- No Fusarium wilt-resistant bitter gourd is commercially available, so far.
- Bitter gourd is commonly grafted to pumpkin or other cucurbit rootstocks in Taiwan. This is becoming less effective as wilting is now observed in grafted plants (Fig. 1).
- FOM is not host specific and there is concern that FOM can be cross-infective to the cucurbit rootstocks.

AIM

1) Assess the disease reaction of bitter gourd cultivars and cucurbits species commonly used for rootstock against a FOM isolate in Taiwan.
2) Screen resistance sources in bitter gourd genotypes including commercial cultivars, germplasm and breeding lines from WorldVeg and Kaohsiung District Agricultural Research and Extension Station (Kaohsiung DARES).

Fig 2. Severe wilting (a) and typical symptoms (b, c) caused by *Fusarium oxysporum* f.sp. *momordicae* on bitter gourd in south Taiwan.

MATERIAL AND METHODS

Plant materials

- Rootstock (6)
- Bitter gourd (93)

Seedling preparation

- Warm water treatment (55˚C, 30 min) to promote germination
- Grow 10 day-old seedlings in greenhouse (25-32˚C) prior to inoculation

Inoculation

- Inoculum: FOM6 (1x10^6 conidia mL^{-1})
- Root pruning for bitter gourd; root-dipping for both bitter gourd and rootstocks
- RCBD with 3 replications, 5 plants each rep

Data collection/analysis

- Disease severity was rated using a 6-point scale at 7, 13, 20 days after inoculation
- AUPDC data compared by LSD ($p<0.05$)
- Fungal colonization (%) assayed at both hypocotyl and epicotyl to evaluate rootstock

RESULTS

1. Six inoculated cucurbit accessions (1 bitter gourd, 2 bottle gourd, 1 fig-leaf gourd and 2 tropical pumpkin) were all infected, but showed differences in disease severity (Tab 1). Tropical pumpkin was the most resistant/tolerant rootstock tested, showing only slight yellowing on cotyledons. Fungal colonization at both hypocotyl and epicotyl parts were observed in all tested rootstocks, even on the most resistant rootstock 'Strong'. Grafting based on current rootstock varieties is not sufficient for disease control.

2. Among the 93 tested accessions of *Momordica* spp., five genotypes were identified as resistant, five as moderately susceptible, and the remaining (included one *M. balsamina* accession) as susceptible (Fig.2). No bitter gourd genotype was completely immune to the disease. However, the resistant accessions VI048307, VI056930 and VI047875 (from WorldVeg genebank) and breeding lines MS-81 and MS-175 (from Kaohsiung DARES) are potential sources for future resistance breeding.

Tab 1. Disease severity and fungal colonization frequency of cucurbit genotypes inoculated with *Fusarium oxysporum* f.sp. *momordica* FOM6

Rootstock cultivar name	Species	Source	Mean DSR [1]	Colonization frequency (%)[2]	
				upper stem	bottom stem
Acherng	*Cucurbita moschata*	Know-You Seed	0.8 e	2.7 d	39.7 c
Strong	*C. moschata*	Know-You Seed	1.3 d	1.0 d	9.0 d
Blackskin	*C. ficifolie*	Know-You Seed	2.1 c	17.0 c	70.2 b
GV9003	*Lagenaria siceraria*	WorldVeg	2.2 bc	51.0 a	75.8 ab
GV9004	*L. siceraria*	WorldVeg	2.8 b	37.3 b	81.2 a
Yeuh-hua	*Momordica charantia*	Know-You Seed	4.8 a	NT[3]	NT

1 DSR (Disease severity rating) were determined by a 6-point rating scale (0-5) at 20 days after inoculation. Mean DSR were based on the averaged data resulting from two inoculation methods (root-dip and root-pruning). Means followed by the same letter are not significantly different by LSD test ($p<0.05$).

2 Colony frequency (%) were determined by calculating the recovery of *Fusarium oxysporum* from the inoculated plants by acidified potato dextrose agar plates. Two sections were respectively sampled at 1 cm above (upper stem) and 1 cm below (bottom stem) the cotyledons. Mean frequencies followed by the same letter are not significantly different by LSD test ($p<0.05$).

3 NT = not tested; the bitter gourd plants were shriveled and dry and almost dead.

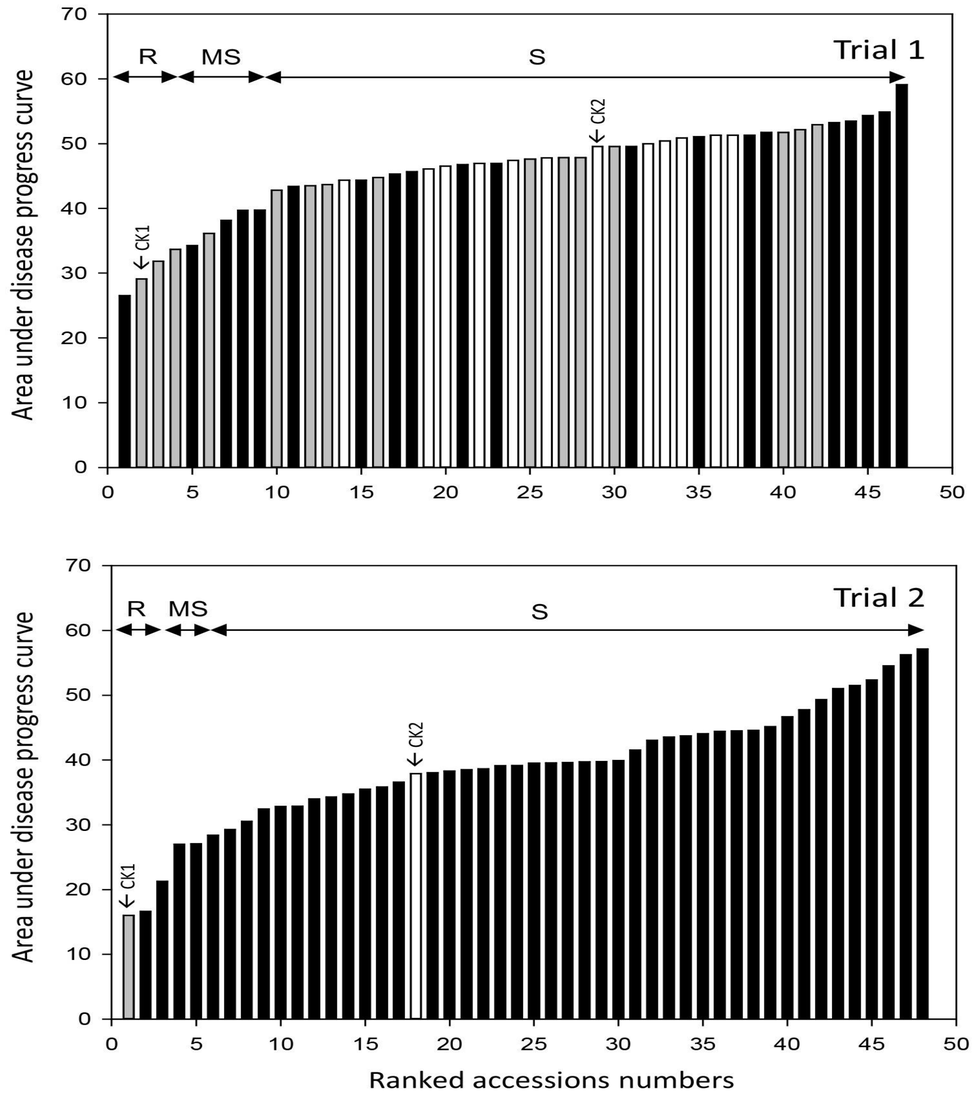

Fig 2. Resistance evaluation of ninety-three accessions of *Momordica* spp., including 66 germplasm (■),15 breeding lines (■) and 12 cultivar(□) to *Fusarium oxysporum* f.sp. *momordica* FOM6. Two screening trials were conducted by root-prune inoculation in summer 2017. Two accessions, cv. Yeuhua (CK2) and 45R1S1 (CK1) were repeated as susceptible and resistant check, respectively. Disease reaction of each accession was categorized into susceptible (S), moderately susceptible (MS) and resistant (R) by comparing the AUDPC (area under disease progress curve) data collected at 7, 13 and 20 days after inoculation.

CONCLUSION

FOM can infect a range of cucurbit species used as rootstocks and is a potential risk for bitter gourd production as the currently available rootstocks alone may not provide sufficient protection against Fusarium wilt in Taiwan. The five bitter gourd genotypes identified as highly tolerant or resistant by the root-pruning inoculation method used in this study are potentially useful resources for breeding to develop FOM-resistant cultivars.

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國立中興大學 National Chung Hsing University