

Evaluation of pumpkin cultivars against cucumber mosaic virus disease under field condition

ABSTRACT

The family Cucurbitaceae includes pumpkin (*Cucurbita moschata* Duch.), one of the most significant vegetable crops cultivated both in India and overseas. Various biotic and abiotic factors affect pumpkin production, and one of the biggest threats to its cultivation is the cucumber mosaic virus disease. An experiment was conducted in the experimental field of the Department of Plant Pathology, Biswanath College of Agriculture, Assam Agricultural University, Assam during 2022–2023 with the aim of screening out various varieties of pumpkin and identifying the one that was most resistant to cucumber mosaic virus in view of the disease's significance. Out of eighteen pumpkin cultivars evaluated against cucumber mosaic virus disease, six were moderately susceptible, eleven were susceptible and one cultivar was observed to be highly resistant against the disease.

Keywords: Pumpkin, cucumber mosaic virus, screening, moderately resistant, susceptible, highly resistance

1. INTRODUCTION

Pumpkin (*Cucurbita moschata* Duch) is one of the important vegetables in Indian cuisine and belongs to the family Cucurbitaceae. Pumpkin fruit is rich in vitamins and minerals but low in calories. Pumpkin is loaded with a wide range of biological and medicinal values such as anti-inflammatory, anti-oxidant, anti-cancer, anti-angiogenesis, and anti-diabetic activities (...). Most often it is used as a functional food and herbal medicine. Besides fruits, all other parts of plants, i.e., seeds, fruits, and stems contain broad nutritional and medicinal values such as high amounts of β -carotene, and moderate amounts of carbohydrates, vitamins, and minerals (Rakcejeva *et al.*, 2011).

Pumpkin crop suffer from a number of biotic and abiotic stresses. A number of insect pests and diseases attack pumpkin crop causing heavy losses in yield. Among various diseases attacking the crop cucumber mosaic virus disease caused by Cucumber Mosaic Virus (CMV) is becoming the most serious disease in pumpkins in recent years. CMV possesses quite distinctive polyhedral particles with a hollow core that are generally 30 nm in size (Zitikaitee *et al.*, 2011). The three plus sense single-stranded RNAs that are bundled in distinct particles constitute the genome. CMV particles contain about 18% RNA. There are four RNAs in the RNA. To be infectious, only the biggest RNA3 is necessary.

Cucumber Mosaic Virus infects over 1000 susceptible plant species including monocots, dicots, herbaceous plants, shrubs, and trees. CMV is efficiently transmitted by several aphid species in a non-persistent manner. The most important aphid species are the *Aphis gossypii* and *Myzuspersicae*. It has also been reported that the virus can spread through pumpkin seeds (Ali and Kobayashil, 2010). Sap and dodder can also mechanically convey it.

Instances of the cucumber mosaic virus disease have been documented in various pumpkin-growing regions in India and Assam. In Assam, there is little information available regarding the evaluation of local pumpkin germplasm for viral resistance. The current investigation aimed to test the available pumpkin germplasm for CMV resistance.

2. MATERIAL AND METHODS

2.1 Location of the experiment:

The experiment was conducted in the post-graduate experimental field, Department of Plant Pathology, Biswanath College of Agriculture, Biswanath Chariali, Assam Agricultural University, Assam during 2022-23.

2.2 Collection of pumpkin germplasm:

Seeds of different pumpkin cultivars (local) were collected from six districts of Assam viz., Dima Hasao, Karbi Anglong, Barpeta, Sonitpur, Sivasagar, Kamrup (R), and Shillong of Meghalaya.

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2.3 Layout of the experiment:

The land was prepared by ploughing with a tractor-drawn disc plough. Seeds were sown at a distance of 1m from plant to plant and 2.5m between rows in a Randomized Block Design with 3 replication.

2.4 Disease scoring:

After sowing, each plant was thoroughly examined in order to document the infection of the cucumber mosaic disease in several cultivars. When the first symptoms of the cucumber mosaic disease appeared, its incidence was regularly monitored until the senescence of the crop. Disease scoring was done by the scale following [method by Akbar et al. \(2015\)](#) and the cultivars were categorized based on the reaction against the CMV disease.

Disease rating scale by Akbar et al. (2015):

- 1 = Highly Resistant (no symptoms; 0% - 10% infection);
- 2 = Resistant (vein clearing after some time; 11%-20%);
- 3 = Moderately Resistant (vein clearing and mild mottle; 21% - 30%);
- 4 = Moderately Susceptible (mild mosaic on few leaves; 31% - 40%);
- 5 = Susceptible (mosaic, wrinkling, mottling;>60%).

3. RESULTS AND DISCUSSION

Table 1: Reaction of pumpkin cultivars against cucumber mosaic virus disease

Sl No.	Cultivars	Symptoms Appearance	Disease Rating	Level of resistance/susceptibility
1	DH-C1	Mosaic,crinklingandmottling	5	Susceptible
2	DH-C3	Mild mosaiconfew leaves	4	Moderately susceptible
3	DH-C4	Mosaic,crinklingandmottling	5	Susceptible
4	DH-C5	Mildmosaiconfew leaves	4	Moderately susceptible
5	DHC6	Mosaic,crinklingandmottling	5	Susceptible
6	DH-C7	Mosaic,crinklingandmottling	5	Susceptible
7	MEGH-C1	No symptoms	1	Highly resistant
8	KA-C2	Mosaic, crinkling andmottling	5	Susceptible
9	KA-C3	Mild mosaiconfew leaves	4	Moderately susceptible
10	BAR-C1	Mosaic,crinklingandmottling	5	Susceptible
11	BIS-C1	Mosaic,crinklingandmottling	5	Susceptible
12	SIV-C1	Mild mosaiconfew leaves	4	Moderately susceptible
13	SIV-C2	Mosaic,crinklingandmottling	5	Susceptible
14	KAM(R)-C1	Mosaic,crinklingandmottling	5	Susceptible
15	KAM(R)-C2	Mosaic,crinklingandmottling	5	Susceptible
16	KAM(R)-C3	Mild mosaiconfew leaves	4	Moderately susceptible

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17	KAM(R)-C4	Mosaic,crinklingandmottling	5	Susceptible
18	KAM(R)-C5	Mild mosaiconfew leaves	4	Moderately susceptible

Pumpkin cultivars collected from different places in Assam and Meghalaya were evaluated for their reaction against cucumber mosaic virus disease and the result is presented in Table 1. From the table, it is evident that most of the cultivars fall in susceptible and moderately susceptible ranges except cultivar MEGH-C1 which was highly resistant to the disease. Cultivar DH-C1, DH-C4, DH-C6, DH-C7, KA-C2, BAR-C1, BIS-C1, SIV-C2, KAM(R)-C1, KAM(R)-C2 and KAM(R)-C4 were categorized as susceptible whereas cultivar DH-C3, DH-C5, KA-C3, SIV-C1, KAM(R)-C3 and KAM(R)-C5 were moderately susceptible against Cucumber Mosaic Virus.

The majority of the pumpkin cultivars evaluated in the current study had susceptible and moderately susceptible reactions to CMV infection, with the exception of the cultivar MEGH-C1, which was proven to be exceptionally resistant to CMV infection based on symptoms. Cultivar DH-C1, DH-C4, DH-C6, DH-C7, KA-C2, BAR-C1, BIS-C1, SIV-C2, KAM(R)-C1, KAM(R)-C2 and KAM(R)-C4 was susceptible whereas cultivar DH-C3, DH-C5, KA-C3, SIV-C1, KAM(R)-C3 and KAM(R)-C5 were observed as moderately susceptible against cucumber mosaic virus disease. In the study of similar kinds by Rahman *et al.* (2009), the incidence of CMV varied between 3.00 and 21.21 percent depending on the variety among the eleven chili cultivars that were examined. CMV incidence varied among cultivars, with the lowest being 3.0% and the greatest being 21.21% Al-Ani *et al.* (2009) reported that among twelve melon cultivars evaluated against CMV, only three cultivars showed resistance against the virus. In the study by Masud *et al.* (2009), forty pumpkin lines showed resistance to CMV, papaya ring spot virus, watermelon mosaic virus, and zucchini yellow mosaic virus evaluated through artificial inoculation in the field. According to the forty test lines visual appearance, two lines were found to be highly resistant to the viruses, one line to be resistant, seventeen to be moderately resistant, eleven to be moderately susceptible, and nine to be susceptible. In the findings of Akbar *et al.* (2015), of the seventeen cucumber germplasm samples, fourteen germinated and displayed the typical CMV symptoms, but none of them displayed virus resistance. There was no evidence of resistance in commercially available germplasm. Pandawani *et al.* (2017) reported that among the four cucurbit varieties tested, no single varieties were resistant to CMV. From the planting time of the crop until the age of 4 weeks after planting, cucumber plants are susceptible to CMV infection.

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4. CONCLUSION

Out of eighteen cultivars of pumpkin evaluated against cucumber mosaic virus disease, cultivar DH-C1, DH-C4, DH-C6, DH-C7, KA-C2, BAR-C1, BIS-C1, SIV-C2, KAM(R)-C1, KAM(R)-C2 and KAM(R)-C4 exhibited susceptible reaction, cultivar DH-C3, DH-C5, KA-C3, SIV-C1, KAM(R)-C3 and KAM(R)-C5 categorized as moderately susceptible, whereas cultivar MEGH-C1 was found to be highly resistant against the disease.

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