



International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X
© Agronomy
NAAS Rating: 5.20
www.agronomyjournals.com
2025; 8(6): 887-889
Received: 17-03-2025
Accepted: 19-04-2025

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Understanding VBN 11 blackgram [*Vigna mungo* (L.) Hepper] and the epidemic of yellow mosaic virus (YMV): New report

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DOI: <https://www.doi.org/10.33545/2618060X.2025.v8.i6k.3122>

Abstract

Crop protection plays a vital role in achieving sustainable agricultural production. It encompasses a range of progressive approaches, from field selection to dining, including the choice of fields, crops, and varieties, soil nutritional status, agronomic practices, crop protection activities, and pre- and post-harvest attributes. Among these, the selection of resistant cultivars is crucial for successful farming and production. Against this background, a field study was conducted during the Rabi 2023-24 season to evaluate the performance of VBN 11, a variety previously recognized as resistant, against yellow mosaic disease. In this study, VBN 11 exhibited a highly susceptible nature to YMV, with a disease prevalence of 70-77%. This finding provides valuable future insights for breeding programs, emphasizing the need for resistance development through the implementation of climate-smart farming approaches.

Keywords: Blackgram, disease incidence, fabaceae, susceptible, VBN 11

Introduction

Blackgram (*Vigna mungo* L.), a vital pulse crop with 22 chromosomes (2n=22), holds significant importance across tropical and subtropical regions. In the Indian subcontinent, it stands as the third most cultivated pulse, trailing only chickpea and pigeonpea (Nair *et al.*, 2024)^[11]. India is a leading global producer, harvesting 3.06 million tons from 5.60 million hectares. Often hailed as the "king of pulses" for its delicious taste and rich nutritional profile, blackgram is a powerhouse of essential nutrients. It boasts 25-26% protein, 60% carbohydrates, 1.5% fat, and a good array of minerals, amino acids, and vitamins (Kumar *et al.*, 2024)^[8]. A unique advantage of black gram is its ability to perform symbiotic nitrogen fixation, enriching the soil. This versatile crop is typically short-duration, flowering within 30-60 days and maturing within 60-90 days (Pooja *et al.*, 2023)^[12]. However, its productivity is severely hampered by various factors, with Yellow Mosaic Disease (YMD) being the most destructive (Aryal *et al.*, 2022)^[2]. Caused by the Mungbean Yellow Mosaic Virus (MYMV), this disease can lead to devastating yield losses of up to 85-100% in urdbean, depending on the infection's stage and severity (Marabi *et al.*, 2021)^[10]. By the examination of multi-location trials, the culture VBG 12-062 was screened against major diseases from 2017 to 2018 and showed a highly resistant reaction to MYMV disease. Based on the improved performance of VBG 12-062, it was released as VBN 11. Initially, it has documented as resistant nature with high yield profiling with 899kg/ha in all seasons of cultivation in Tamil Nadu (Geetha *et al.*, 2020)^[3]. But later days, it become change as resistant to little by little susceptible one depending upon addressing of mutations, twisting of eco-adaption, emergence of new weeds for alternate host for viral survivor and pest dynamics (Thabrez and Vineeth, 2024)^[14]. Moreover, viral diseases in plants present a real headache for farmers worldwide, wiping out harvests and putting food supplies in disturbed (Varanda *et al.*, 2021)^[16]. To fight back, breeders and scientists create virus-resistant crops using traditional cross-breeding, modern gene editing and handy DNA markers to speed up selection (Hinge *et al.*, 2021)^[4]. Each new line is tuned to shrug off a particular virus, cutting downtime in the field when disease normally strikes. Yet that shield doesn't always last because viruses are quick to change, and resistance among that shield wears thin over time (Vineeth *et al.*, 2023)^[17].

Mutations, constant pressure to survive, and even the climate around them push the virus to find weak spots in the crop (Tsai *et al.*, 2022) ^[15]. When that happens, plants once thought safe start wilting again, and the same viral wave rolls through the field (Jones, 2021) ^[5]. Loss of resistance can happen on its own or be nudged along by lab tricks, RNA knockouts, or simple gene loss in successive generations (Taliany *et al.*, 2021) ^[13]. Pinpointing how these switches occur matters, because it guides a broad toolbox that mixes resistant varieties, rotation, and all-in pest control for longer-lasting protection (Kumar *et al.*, 2024) ^[9]. Studying the initial inner workings of resistance, therefore, remains a must-do task in the race to keep crops healthy by disease prevalence (Kreuze and Valkonen, 2017) ^[7]. Keeping this background the study was carried out for the yellow mosaic virus impact in VBN 11.

Materials and Methods

Seed source

The studying seed material (VBN 11) was obtained from National Pulse Research Centre, Vamban.

Location and season

The field was selected and prepared at the Sugarcane Research

Station at Cuddalore. Seeds are sown at 25×10 cm spacing with 5 cm depth under well-drained black soil. The sowing process takes place in Rabi from 2023 to 24.

Disease assessment

Based on the symptomatology of plants, the incidence of yellow mosaic was recorded in the field at 25 days after sowing. It was calculated by the formula (Kasi Rao *et al.*, 2020) ^[6].

$$\text{Per cent disease Incidence} = \frac{\text{Number of infected plants}}{\text{Total number of plants}} \times 100$$

Results and Discussion

During this study, yellow mosaic disease incidence was recorded from 25 days after sowing (DAS). Field observations revealed a disease incidence of 70-77% in VBN 11 (Fig 1). Previously, VBN 11 had been reported as resistant to yellow mosaic disease by Geetha *et al.* (2020) ^[3]. However, in recent years, a combination of agroclimatic factors, repeated monocropping, and the annual emergence of new weeds have contributed to its increased susceptibility (Anikina *et al.*, 2023) ^[1].



a. Field view- SRS, Cuddalore



b. Typical symptom of YMD

Fig 1: Field study of YMD prevalence in VBN 11 blackgram (*Vigna mungo* L.) at Rabi, 2023-24.

Conclusion

Based on the experiment's results, VBN 11 exhibited a susceptible nature to yellow mosaic disease during the Rabi 2023 season, a shift from its previously resistant status. This transformation likely occurred due to factors such as inadequate monitoring, adaptation to new agroclimatic conditions, climate change, and the emergence of mutated virus strains, new crop varieties, and weeds. Therefore, future breeding programs must focus on developing resistance through multi-potential, climate-smart agricultural approaches.

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