**Screening of niger cultivars/genotypes for resistance to leaf spot disease under natural conditions**

# ABSTRACT

Niger (Guizotia abyssinica L.) is a traditional minor oilseed crop of significant economic and nutritional value, especially in tribal and marginal farming regions of India. However, its productivity is adversely affected by biotic stresses, particularly leaf spot disease caused by Alternaria alternata, which leads to considerable yield and oil quality losses. In the present study, 21 cultivars/genotypes of niger were screened under natural epiphytotic conditions during *kharif* 2024 to identify sources of resistance to this disease. Observations on disease incidence were recorded using a 0–9 disease rating scale and per cent disease intensity (PDI) was calculated. Based on the disease intensity, genotypes were categorized into different resistance groups. Among the screened cultivars, GNNIG-3 (8.22%), CTPN-1 (4.44%), and ONS-188 (5.76%) were found resistant. Seven genotypes were moderately resistant, nine were moderately susceptible, and two were found susceptible. None of the cultivars exhibited highly resistant or highly susceptible reactions. The findings suggest that the resistant genotypes identified in this study can be utilized in future breeding programs and serve as promising candidates for sustainable disease management strategies in niger cultivation.

**Key words:** Guizotia abyssinica*,* Alternaria alternata*, leaf spot disease, genotypes*

## INTRODUCTION

Niger (*G. abyssinica* L.), a traditional minor oilseed crop cultivated in India, it belongs to family Compositae with the chromosome number of 2n = 30. In various regions of the nation, it is referred to by various names, including ramtil, jagni, or jatangi in Hindi, ramtal or kharsani in Gujarati, karale or khurasani in Marathi, uhechellu in Kannada, payellu in Tamil, verrinuvvulu in Telugu, alashi in Oriya, sarguza in Bengali, ramtil in Punjab, and sorguja in Assamese (Ranganatha, 2013). Along with other crops like finger millet, it is thought to have been brought to India by Ethiopian immigrants sometime in the third millennium BC (Dogget, 1987).

 Despite being classified as a minor oilseed, niger is important since it contains 18–24% protein and 32–40% high-quality oil (Ranganatha, 2013). The niger oil contains essential amino acids among these are leucine, lysine, isoleucine, threonine, and tryptophan are used in cooking, painting, anointing, and lubricating equipment (Patil and Patil, 1981). Niger seeds can be dried and used with flour to form delectable cakes, or they can be eaten fried and used as a condiment. The oil tastes like desi ghee and free from any toxins. Additionally, niger seed oil is used to treat scabies and burns. The seeds contain nearly 40% oil, rich in fatty acids such as linoleic acid (45.4 to 65.8%), oleic acid (13.4 to 39.3%), palmitic acid (8.2 to 9.4%), and stearic acid (5.0 to 7.5%). After oil extraction, the oil cake consists of approximately 24% protein and 24% crude fibres. Worldwide, niger is grown to a limited extent in Ethiopia, South Africa, East Africa, Zimbabwe, India, and the West Indies. In India, niger is mostly grown in the tribal regions of Madhya Pradesh, Odisha, Bihar, Karnataka, Maharashtra, Gujarat and Andhra Pradesh.

In India, niger is mainly grown by marginal, small and medium farmers for home consumption as well as serve as source of income. But the production and productivity of niger is affected by many factors which are responsible for low crop yield, of which biotic factor is major one. Among the biotic agents, leaf spot/blight caused by *A. alternata* is a major devastating disease to the niger in India and also reduce the yield and oil quality (Nagaraja and Krishnappa 2016). This diseases cause heavy damage up to 35-40 per cent to this crop and reduce its seed yields up to 20-30 per cent.

Resistant varieties reduce reliance on chemical fungicides or pesticides, promoting sustainable agriculture. It helps to reduce the disease incidence and severity under field conditions, especially in endemic areas. Considering the increasing importance of resistant varieties and increasing importance of niger, the present studies conducted on “Screening of different cultivars/genotypes *A. alternata* causing leaf spot in niger’’. The main aim of this study is to find out niger cultivars/genotypes that are naturally resistant or tolerant to a leaf spot in niger’’

# MATERIAL AND METHODS

#### **Location**

The present investigation was carried out during *kharif* 2024 at Department of Plant Pathology, College of Agriculture, Dapoli, Dr. B. S. K. K. V., Dapoli.

**Seeds:**

Seeds of niger cultivars/genotypes were obtained from Niger Research Station, Vanarasi, Navsari Agricultural University, Navsari (Gujarat).

**Table 1: List of cultivars/genotypes**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr.no** | **Genotypes/Varieties** | **Sr.no** | **Genotypes/Varieties** |
| 1. | GN-1 | 12. | CTPN-2 |
| 2. | GN-2 | 13. | NRS-2301 |
| 3. | GNNIG-3 | 14. | ONS-189 |
| 4. | GNNIG-4 | 15. | JNS-22-7 |
| 5. | IGPN-2004-01 | 16. | NRS-2302 |
| 6. | JNS -9 | 17. | ONS-188 |
| 7. | JNS-28 | 18. | NRS-2304 |
| 8. | NPR -11 | 19. | NRS-2307 |
| 9. | NPR -13 | 20. | RTNN-2 |
| 10. | NPR -38 | 21. | LOCAL |
| 11. | CTPN-1 |  |  |

Twenty one cultivars/genotypes of niger were screened for their reaction against leaf spot disease under natural epiphytotic conditions. Each test cultivars/genotypes under the investigation were grown in separate plot. This experiment was performed in field condition.

**Observations**

Observations on intensity of disease were recorded at 15 days interval starting first observation at initiation of the disease by randomly selecting fifteen plants from each treatment and was graded as per 0 to 9 rating scale and the per cent disease Intensity (PDI) was calculated by using the formula.

$$Per cent disease Intensity =\frac{Sum of all numerical ratings}{No. of leaves assessed × Maximum disease grade value}×100$$

 **(**Wheeler, 1969)

On the basis of per cent disease intensity the cultivars/genotypes were categorized in different categories as mentioned below.

**Table 2. Disease intensity of cultivars/genotypes**

|  |  |  |
| --- | --- | --- |
| **Rating/ Scale** | **Disease intensity** (%) | **Disease Reactions** |
| 0 | No disease | Highly resistant (HR) |
| 1 | 1 to 10 | Resistant (R) |
| 3 | 11 to 25 | Moderately resistant (MR) |
| 5 | 26 to 50 | Moderately susceptible (MS) |
| 7 | 51 to 75 | Susceptible (S) |
| 9 | 76 to 100 | Highly susceptible (HS) |

(Pandey *et al*., 2003)

**RESULT AND DISCUSSION**

Screening of 21 cultivars/genotypes of niger under natural epiphytotic conditions was carried out to identify resistant sources against leaf spot disease caused by A. alternata. The data presented in Table 3 revealed that, three cultivars/genotypes, namely GNNIG-3 (8.22%), CTPN-1 (4.44%), and ONS-188 (5.76%), were found to be resistant to leaf spot disease. Seven cultivars/genotypes *viz*., ONS-189 (12.22 %), GNNIG-4 (12.42 %), CTPN-2 (15.15 %), IGPN-2004-01 (18.88 %), JNS-28 (21.38 %), JNS -9 (23.22 %) and GN-1 (23.44 %) were found moderately resistant to leaf spot disease. Nine cultivars/genotypes *viz*., GN-2 (27.77 %), NPR -38 (28.88 %), NPR -11 (31.11 %), JNS-22-7 (33.33 %), NPR -13 (35.55 %), RTNN-2 (35.77 %), NRS-2301 (44.22 %), LOCAL (46.66 %) and NRS-2302 (48.88 %) were found moderately susceptible to leaf spot disease and 2 cultivars/genotypes *viz*., NRS-2307 (53.33 %) and NRS-2304 (55.56 %) were found susceptible to leaf spot disease. Among the entries of niger screened for their reaction to the disease, none of the cultivars/genotypes was found highly resistant and highly susceptible to the leaf spot disease of niger incited by *A. alternata.*

 The findings of the present investigation are in close consonance with Anonymous (2011), who reported that germplasm lines of niger *viz.,* BMD-112, BMD-124, BMD-131, SD-23, M-79, M-50, and NSKMS-138 found resistance to *Alternaria* leaf spot of niger. Sandipan *et al*. (2014) screened 200 niger germplasm lines to identify resistance to *Alternaria* and *Cercospora* leaf spots. Among the screened germplasm, PCU-197 was the only germplasm line that found resistance against *Alternaria* leaf spot. Similarly, Lokesha *et al*. (2020) screened 189 varieties/ germplasm of niger against *Alternaria* leaf spot disease under natural field condition. Among the 189 lines evaluated, 32 lines namely KEC 6, JN-10, RCR 23, RCR 238, RCR 2090, RCR 328, cherol No.1 etc., were immune. Whereas 100 lines showed resistant reaction with disease (JN 144, JN 132, PHW 5004-2, N-122, JN 94, JN 21, JN 20, BMD 69 etc.). The remaining 57 germplasm lines (COMB 2, UNS 9, BMD 66, No.14-B, PCU 183, JN 107, JN 77, etc.) were moderately resistant to the disease and none of the genotypes were found susceptible. Similarly, Sharma *et al.* (2020) screened ten varieties of niger against *Alternaria* blight disease in a pot under net house conditions with artificial inoculation. Among the ten varieties, Utkal Niger-150, IGPN-2004-1, and Gujarat Niger-1 were found moderately resistant to *Alternaria* blight disease. Seven varieties *viz.,* RCR-18, JNC-1, JNS-9, Gujarat Niger-2, JNC-6, Birsa Niger-2 and the local landrace were found moderately susceptible to the disease. However, none of the varieties were found resistant to the *Alternaria* blight disease.

**Table 3: Disease** **Reaction of different niger cultivars/genotypes against leaf spot disease of niger**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr. No.** | **Genotypes/Varieties** | **Per cent Disease Intensity (PDI)** | **Disease** **Reaction** |
|  | GN-1 | 23.44 | MR |
|  | GN-2 | 27.77 | MS |
|  | GNNIG-3 | 08.22 | R |
|  | GNNIG-4 | 12.42 | MR |
|  | IGPN-2004-01 | 18.88 | MR |
|  | JNS -9 | 23.22 | MR |
|  | JNS-28 | 21.38 | MR |
|  | NPR -11 | 31.11 | MS |
|  | NPR -13 | 35.55 | MS |
|  | NPR -38 | 28.88 | MS |
|  | CTPN-1 | 04.44 | R |
|  | CTPN-2 | 15.15 | MR |
|  | NRS-2301 | 44.22 | MS |
|  | ONS-189 | 12.22 | MR |
|  | JNS-22-7 | 33.33 | MS |
|  | NRS-2302 | 48.88 | MS |
|  | ONS-188 | 05.76 | R |
|  | NRS-2304 | 55.56 | S |
|  | NRS-2307 | 53.33 | S |
|  | RTNN-2 | 35.77 | MS |
|  | LOCAL | 46.66 | MS |

**[Where, I = Immune, R = Resistant, MR = Moderately Resistant, MS = Moderately susceptible, S = Susceptible and HS = Highly susceptible]**

## CONCLUSION

Among 21 niger cultivars/genotypes screened under natural conditions, GNNIG-3, CTPN-1, and ONS-188 were found resistant to leaf spot disease caused by *Alternaria alternata*. These resistant genotypes can be used in breeding programs and offer a sustainable approach to disease management in niger cultivation.

Disclaimer (Artificial intelligence)

I hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT,

COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this

manuscript.

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