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Survey of dry root rot incidence in mungbean caused by *Macrophomina phaseolina* across major growing areas of Junagadh district, Gujarat

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Abstract

A roving survey was conducted during the summer seasons of 2024-25 and 2025-26 to assess the incidence of dry root rot of mungbean caused by *Macrophomina phaseolina* in farmers' fields of Junagadh district, Gujarat. The survey covered 25 villages across five talukas: Junagadh, Vantali, Mendarda, Bhesan, and Manavadar. Dry root rot was recorded in all surveyed villages, indicating the widespread occurrence of the pathogen. Disease incidence ranged from 16.00 to 43.00%, with an overall district mean of 29.84%. The highest mean incidence was observed in Mendarda and Manavadar talukas (32.20%), while the lowest was recorded in Bhesan (26.00%). Greater disease incidence was associated with high temperature, low soil moisture, and drought stress, which favor pathogen development. The findings identify dry root rot as a major constraint to mungbean cultivation and emphasize the need for effective integrated disease management practices.

Keywords: Mungbean, *Macrophomina phaseolina*, Dry root rot, disease incidence, survey

1. Introduction

Pulses are a vital component of the daily diet for most Indians when consumed with cereals, provide a balanced source of high-quality vegetarian protein (Ali and Sen Gupta., 2012; Ramya *et al.*, 2026; Venu *et al.*, 2024) ^[1, 19, 23]. Recognizing their importance for human health and agricultural sustainability, the United Nations General Assembly designated 2016 as the "International Year of Pulses" (Khan, 2016; Calles *et al.*, 2019) ^[6, 3].

Mungbean [*Vigna radiata* (L.) Wilczek] is a major grain legume in Asian agriculture - particularly in India, Southeast Asia and East Asia (Lambrides and Godwin, 2017) ^[11]. Belonging to the family Leguminosae, it is popularly known as green gram and often referred to as the "golden gram" due to its high nutritional value. The crop is believed to have originated in the Indian subcontinent, with domestication traced back to around 1500 BC (Vavilov, 1926) ^[22]. Mungbean is a short-duration crop with low input requirements, well adapted to tropical and subtropical environments (Lawn, 1983). Although it responds to short-day photoperiods, it can be cultivated across a wide range of latitudes where temperatures remain above 15 °C (Imrie *et al.*, 1981) ^[5]. Biotic stresses, including insect pests, pathogens and weeds, also substantially reduce mungbean productivity. The crop is highly vulnerable to several viral diseases such as Mungbean Yellow Vein Mosaic (MYVM), fungal diseases like Cercospora leaf spot (CLS), powdery mildew, dry root rot, web blight and anthracnose as well as bacterial blight (Khattak *et al.*, 2000; Lal, 1987; Pandey *et al.*, 2018; Roy *et al.*, 2023) ^[8, 10, 16, 20]. The impact of mungbean diseases on global production is substantial. Dry root rot, in particular, has been documented as a major cause of yield loss in several mungbean-growing countries including India, Pakistan, Uganda, China and regions of South and North America (Allen *et al.*, 2017) ^[2].

Dry root rot (DRR), caused by *Macrophomina phaseolina* (Tassi) Goid, is among the most widespread and destructive diseases of mungbean (Pandey *et al.*, 2020) ^[15]. This necrotrophic pathogen has the capacity to persist in soil for several years and can infect plants at any phenological stage (Pandey *et al.*, 2021) ^[17]. The disease is characterized by black discoloration and rotting of roots, leading to plant wilting at later stages and ultimately plant mortality

(Khan *et al.*, 2017)^[7]. Disease development is greatly favored by high temperatures coupled with reduced soil moisture (Saleh *et al.*, 2010). Secondary spread occurs through soil from infected to healthy neighboring plants and systemic movement within the plant via the vascular tissue has also been documented (Gupta *et al.*, 2012)^[4].

2. Materials and Methods

2.1 Assessment of dry root rot incidence in farmer’s fields

A roving survey was undertaken across five major mungbean-growing talukas of Junagadh district (Gujarat) during the Summer seasons of 2024-25 and 2025-26. Disease incidence was periodically recorded in mungbean fields at various survey locations (Table. 1). From each village, five fields were randomly selected and observations were made within a 1 m² area at four corners and the center of each field, with ten plants assessed per site. Field-level information, including village name, latitude, longitude, cropping pattern, variety grown and disease incidence, was systematically documented. Disease incidence (DI) was calculated as the percentage of infected plants relative to the total number of plants examined, following the formula proposed by Wheeler (1969).

Disease incidence(%) = $\frac{\text{Number of infected plants}}{\text{Total no. of plants observed}} \times 100$

2.2 Collection and preservation of diseased mungbean samples

Naturally infected mungbean plants showing typical root rot symptoms were collected from major mungbean-growing regions of Gujarat, as summarized in Table 3.1. Symptomatic root samples were collected in brown paper bags from affected fields during Summer 2024-25, 2025-26 and carried to the laboratory. The samples were pressed between blotting papers using a herbarium press and stored for further examination.

Table 1: Village covered during the survey in Summer 2024-25 and 2025-2026 under farmer’s field

Sr. No.	Taluka	Villages/City	Latitude - Longitude
Junagadh districts			
1	Junagadh	Makhiyala	21. 615981 - 70.447488
2		Navagam	21.422669 - 70.426158
3		Vadal	21.604519 - 70.494662
4		Sukhpur	21.605076 - 70.627331
5		Chokli	21.598760 - 70.524331
Sr. No.	Taluka	Villages/City	Latitude - Longitude
6	Vanthali	Naredi	21.506876 - 70.251780
7		Mahobatpur	21.420445 - 70.412296
8		Luvarsar	21.464972 - 70.398564
9		Selra	21.460108 - 70.411314
10		Sonaradi	22.183364 - 69.483128
11	Mendarda	Mithapur	22.416473 - 68.992899
12		Khadpipli	21.384129 - 70.422789
13		Alidhra	21.359707 - 70.422687
14		Mendarda	21.319880 - 70.436332
15		Manpur	21.286400 - 70.455701
16	Bhesan	Kariya	21.570185 - 70.626290
17		Hadmatiya Vishal	21.609145 - 70.599668
18		Kharchiya	21.659561 - 70.674061
19		Mendapara	21.594855 - 70.606293
20		Ranpur	21.573268 - 70.672688
21	Manavadar	Bantva	21.501829 - 70.130013
22		Galvav	21.490525 - 70.198628
23		Manavadar	21.483417 - 70.146159
24		Marmath	21.584632 - 70.012976
25		Nakra	21.439329 - 70.116065

3. Results and Discussion

3.1 Occurrence and distribution of dry root rot in junagadh district

A roving survey was conducted during the mungbean growing season in different talukas of Junagadh district during the Summer seasons of 2024-25 and 2025-26 to assess the occurrence and severity of dry root rot caused by *Macrophomina phaseolina*. The survey covered 25 villages distributed across five talukas, namely Junagadh, Vanthali, Mendarda, Bhesan and Manavadar. The observations on disease incidence were recorded and the results are presented in Table. 2.

The survey revealed that dry root rot was prevalent in all the surveyed villages of Junagadh district, indicating the widespread distribution of *M. phaseolina* in mungbean-growing areas. The disease incidence varied considerably among locations, ranging from 16.00 to 43.00 per cent. The overall district mean disease incidence was recorded as 29.84 per cent.

3.2 Disease incidence across talukas and villages

Among the talukas surveyed, the highest mean disease incidence was recorded in Mendarda and Manavadar talukas (32.20%), followed by Junagadh taluka (31.60%). Vanthali and Bhesan talukas recorded comparatively lower disease incidence of 27.20 and 26.00 per cent, respectively (Plate 1-5).

At village level, the maximum disease incidence of 43.00 per cent was observed in Nakra village of Manavadar taluka, followed by Navagam and Mendarda villages (42.00% each), Hadmatiya Vishal (41.00%), Mahobatpur (40.00%), Galvav (39.00%), Sukhpur, Selra and Mithapur (38.00% each). On the other hand, the lowest disease incidence was recorded in Makhiyala village (16.00%), followed by Naredi (17.00%), Sonaradi (18.00%) and Mendapara (19.00%).

The higher incidence of dry root rot observed in villages such as Nakra, Navagam, Mendarda and Hadmatiya Vishal attributed to the prevalence of high temperature, low soil moisture and moisture stress conditions which are known to favour the development of *M. phaseolina*. The pathogen survives in soil through microsclerotia and becomes highly aggressive under drought conditions resulted in severe root infection and plant mortality. In contrast, villages with comparatively lower disease incidence have experienced favourable soil moisture conditions improved crop management practices and reduced environmental stress on plants.

The occurrence of dry root rot in all surveyed locations indicated that the disease had become an important constraint in mungbean cultivation in Junagadh district. The widespread prevalence of the pathogen was associated with continuous cultivation of susceptible crops, survival of the pathogen in crop residues and soil and the predominance of warm and dry climatic conditions prevailing in the region.

3.3 Comparison with earlier reports

The results of the present experiments are similar to those of various investigators Lakhran *et al.* (2021) conducted a field survey in different districts of Rajasthan and the results illustrate that the disease incidence ranged from (23.84 - 53.72%) in major sesame-growing areas of Rajasthan. The highest incidence of the disease was found in the Jodhpur district (41.14%), followed by Pali (38.71%), Jaipur (35.90%), Nagaur (28.58%) and Tonk district (24.41%). To determine the prevalence of cowpea dry root rot in the Tamil Nadu districts of Cuddalore, Thiruvannamalai and Vellore, (Mohanapriya *et al.*, 2017) carried out a thorough survey. According to the findings, the highest incidence of the disease was recorded in Sukkanampatti (MP10) at 25.84%,

followed by Keelakalpoondi, Keeranur and Sivapuri. In eight of the largest green gram-growing mandals in the Chittoor district Andhra Pradesh, a survey was done to determine the prevalence of dry root rot. The findings showed that between 5.7 and 12 percent of trees experienced dry root rot Mallaiah and Rao (2016).

In the mulberry growing regions of Tamil Nadu, popular mulberry cultivars V1 and MR2 had the highest incidence of dry root rot, with rates of 55.00 and 24.33 percent, respectively Rajeswari and Angappan (2018).

Table 2: Disease incidence of dry root rot in major mungbean growing regions of Gujarat during Summer 2024-25 and 2025-26 on farmers' field

Sr. No.	Taluka	Villages/City	Disease severity (%)
Junagadh districts			
1	Junagadh	Makhiyala	16.00
2		Navagam	42.00
3		Vadal	32.00
4		Sukhpur	38.00
5		Chokli	30.00
Mean			31.60
6	Vanthali	Naredi	17.00
7		Mahobatpur	40.00
8		Luvarsar	23.00
9		Selra	38.00
10		Sonaradi	18.00
Mean			27.20
11	Mendarda	Mithapur	38.00
12		Khadpipli	20.00
13		Alidhra	36.00
14		Mendarda	42.00
15		Manpur	25.00
Mean			32.20
16	Bhesan	Kariya	26.00
17		Hadmatiya Vishal	41.00
18		Kharchiya	23.00
19		Mendapara	19.00
20		Ranpur	21.00
Mean			26.00
21	Manavadar	Bantva	20.00
22		Galvav	39.00
23		Manavadar	31.00
24		Marmath	28.00
25		Nakra	43.00
Mean			32.20
District mean			29.84

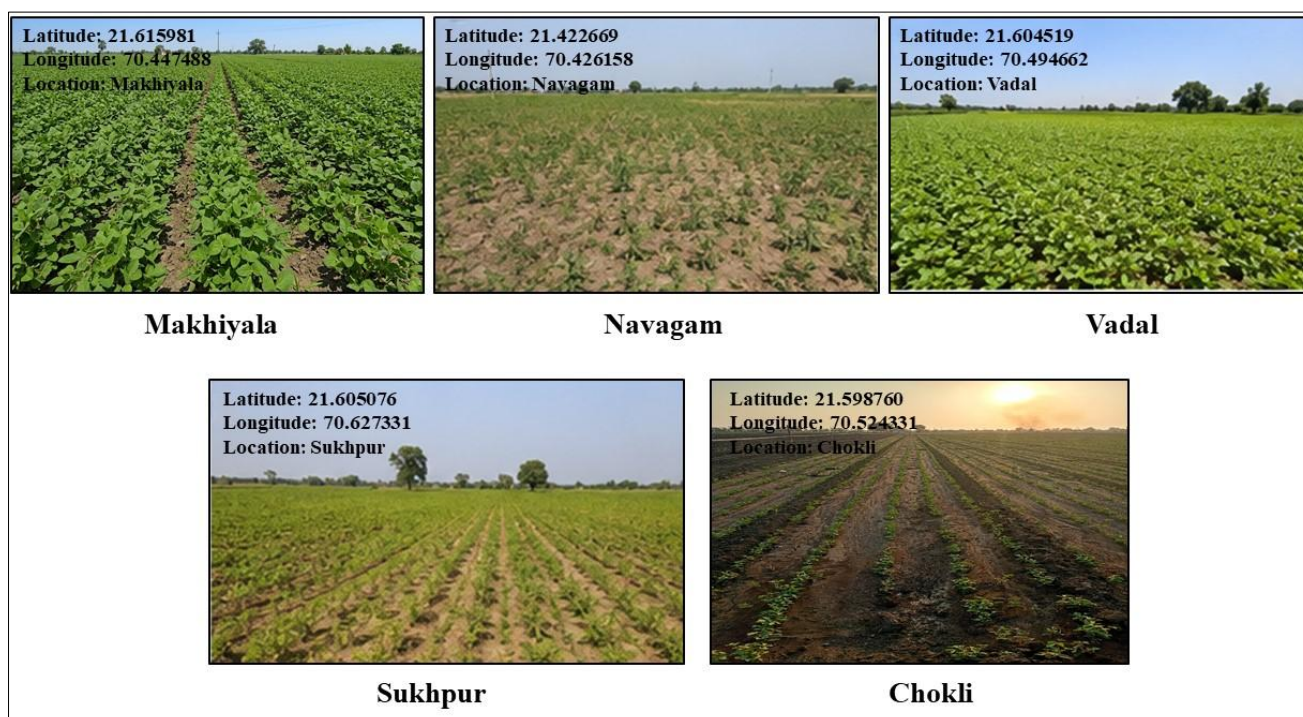


Plate 1: Dry root rot of mungbean severity in different fields of Junagadh region

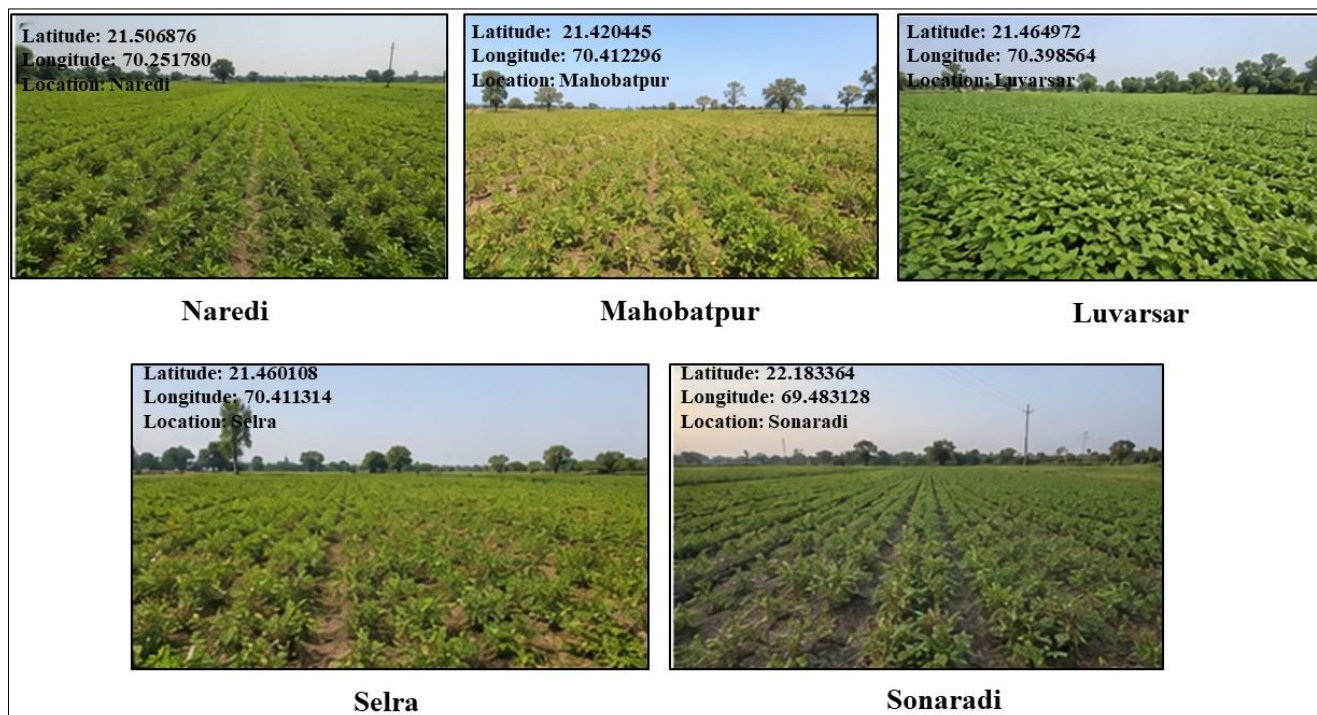


Plate 2: Dry root rot of mungbean severity in different fields of Vanthali region

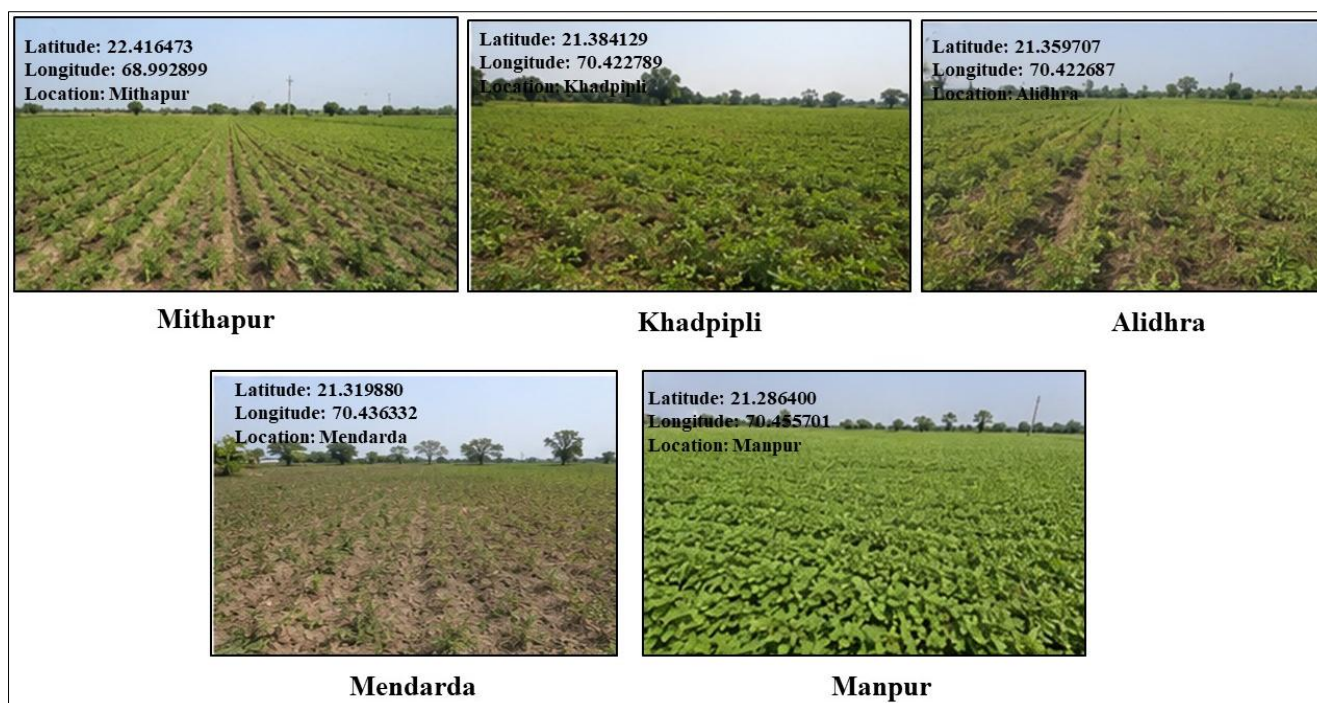


Plate 3: Dry root rot of mungbean severity in different fields of Mendarda region

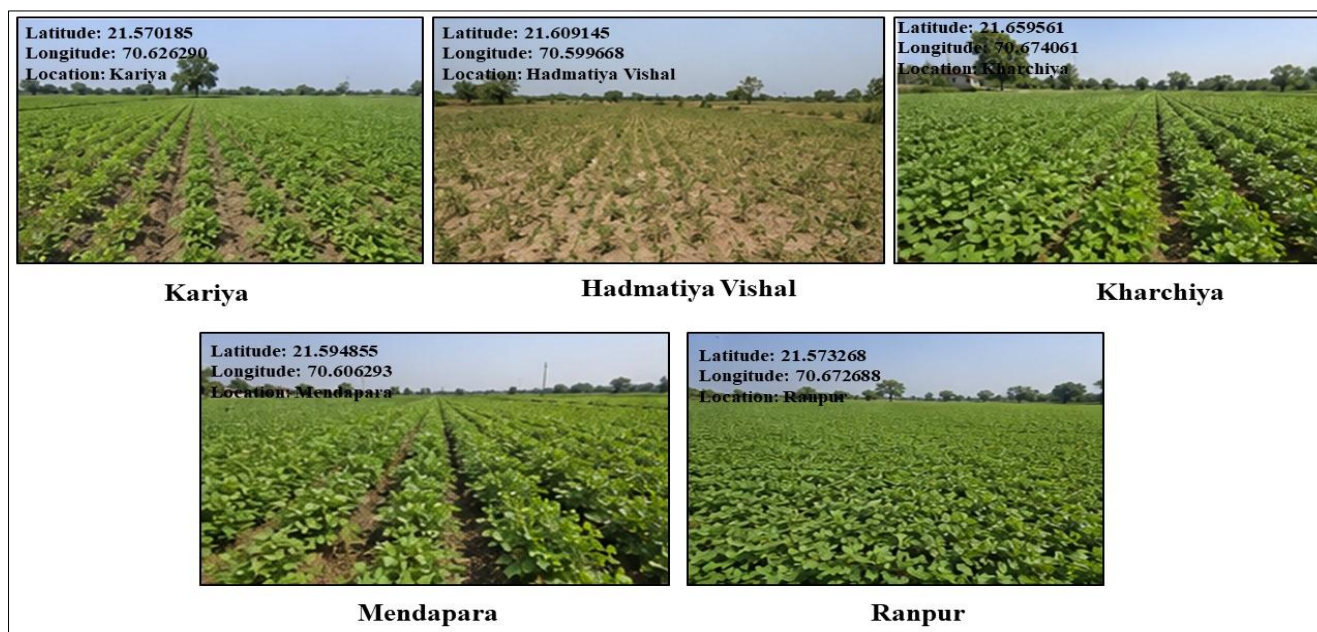


Plate 4: Dry root rot of mungbean severity in different fields of Bhesan region

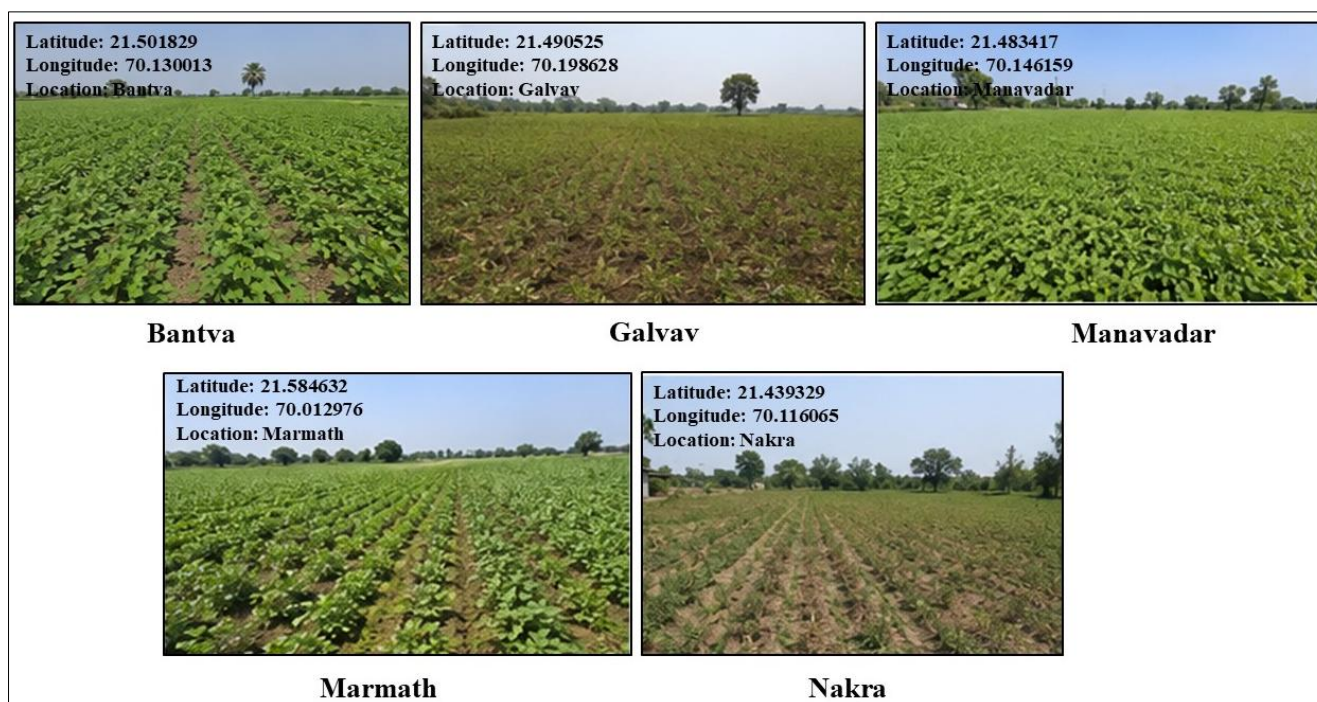


Plate 5: Dry root rot of mungbean severity in different fields of Manavadar region

4. Conclusion

Mungbean is an important pulse crop valued for its nutritional richness, short duration and suitability in multiple cropping systems, but the increasing incidence of dry root rot poses a serious threat to plant stand, vigour, grain yield and grain quality. Dry root rot of mungbean caused by *Macrophomina phaseolina* (Tassi) Goid. has emerged as one of the most destructive soil-borne diseases limiting mungbean production under warm and moisture-stressed conditions. The pathogen survives for long periods in soil and infected crop residues through microsclerotia, and disease development is particularly severe under high temperature and low moisture conditions. In view of the increasing prevalence of this disease in mungbean-growing areas, the present investigation was undertaken to study the occurrence of *M. phaseolina* causing dry root rot of mungbean.

A roving survey was conducted during the summer seasons of 2024-25 and 2025-26 in five talukas of Junagadh district, namely Junagadh, Vanthali, Mendarda, Bhesan and Manavadar, covering 25 villages to assess the prevalence of dry root rot on farmers' fields. The survey clearly established that the disease was present in all surveyed locations, confirming its widespread distribution in the district. Disease incidence ranged from 16.00 to 43.00 per cent, with an overall district mean of 29.84 per cent. Among the talukas surveyed, Mendarda and Manavadar recorded the highest mean disease incidence (32.20%), followed by Junagadh with a mean incidence of 31.60%, whereas Vanthali (27.20%) and Bhesan (26.00%) recorded comparatively lower incidence. At village level, maximum disease incidence was observed in Nakra (43.00%), followed by Navagam and Mendarda (42.00% each) and Hadmatiya Vishal (41.00%), while the minimum incidence

was observed in Makhiyala (16.00%). The widespread occurrence of the disease in all locations indicated that dry root rot has become a major production constraint in the mungbean ecosystem of Junagadh district. Higher disease incidence in some villages was attributed to high temperature, moisture stress and favourable edaphic conditions for survival and aggression of the pathogen.

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