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# Prevalence of seedling diseases of chilli in North-Eastern Karnataka

**K. S[1]. KEERTHANA, A. S[1]. SAVITHA, K[2]. AJITHKUMAR, D. S[1]. ASWATHANARAYANA, AND SANGEETHA, I MACHA[1]**

[1]College of Agriculture, Raichur, University of Agricultural Sciences, Raichur
2 Main Agricultural Research Station, Raichur, University of Agricultural Sciences, Raichur.

***E-mail:** savitha.path@gmail.com

**ABSTRACT:** Chilli is an important commercial crop affected by many pathogens causing pre-emergence and post-emergence damping-off, die-back and wilt to an extent of 62 per cent in seedling stage. Survey was conducted in North-Eastern Karnataka to assess the incidence and severity of seedling diseases of chilli and the results revealed that the maximum incidence was noticed in Ballari district with 32.07 per cent and during the survey the major diseases such as damping-off caused by *Fusarium oxysporum* and die-back caused by *Colletotrichum capsici* were noticed.

**Keywords:** Chilli, damping-off, dieback, seedling diseases.

## INTRODUCTION

Chilli is one of the important commercial and universal crops cultivated in different parts of the world for both green and red chillies. The largest producer of chilli in the world is India, accounts an area of 802 m. ha., with the production and productivity of 1836 m. t. and 2.1 m. t/ha, respectively. India also stands second among world's chilli export contributing for improving Indian economy. The major chilli growing states in India are Tamil Nadu, Maharashtra, Karnataka, Nagaland, Telangana, Andhra Pradesh, West Bengal and parts of Madhya Pradesh contributing 86 per cent of total chilli cultivating area in the country and 90 per cent of the total Indian produce (Anon., 2023). In both nurseries and fields chilli seedlings are affected by many soil borne and seed borne fungal pathogens, killing 62 per cent of seedlings and accounting 90 per cent of plant deaths. The amount of damage caused to seedlings depends on the associated fungi, soil moisture and soil temperature and other factors rather than the particular species of plant concerned. Normally, however, cool wet soils favour the development of the disease. The disease is responsible for poor germination as well as poor stand of seedling in the nursery bed and often the infected seedlings carry the pathogen to the main field where transplanting is done (Pagoch *et al*., 2015). A successful survey will helps to know the severity and incidence of seedling diseases of chilli. Also it enables us to locate the endemic regions of the disease and provides an idea for establishing disease free seedlings to develop area wise integrated management and regulatory measures. Hence survey was conducted to assess the incidence and prevalence of seedling diseases of chilli.

## MATERIALS AND METHODS

### Survey

An intensive random roving survey was carried out to assess the severity and present status of seedling diseases of chilli under both nursery and field conditions in different chilli growing districts of North Eastern Karnataka *viz*., Raichur, Ballari and Koppal during 2022-23. The chilli fields and nurseries were randomly selected and in each district two-three taluks and in each taluk two-three villages were covered and in each village farmer fields and nurseries were selected. In each field and nurseries, observations were made randomly on the seedling diseases of chilli *viz*., damping-off, die-back and wilt based on the symptoms. Samples were collected, properly labelled and stored for further studies. Disease severity was assessed based on the severity rating scale given for damping-off (0- healthy plant, 1- root tip necrosis, 2- softening of stem, 3- dead seedling and 4- dead seed, given by Saba *et al.* (2022) ) and die-back ( 0- 0 %, 1- <5 %, 2- 6-10 %, 3- 11-25 %, 4- 26-40 %, 5- 41-60 % and 6- >60 % area infected, given by Kwee *et al*. (1987)).

Per cent disease incidence was calculated using the formula given by Wheeler (1969).

$$\text{Per cent disease incidence} = \frac{\text{Number of seedlings infected}}{\text{Total number of seedlings observed}} \times 100$$

Per cent disease index (PDI) was calculated by using the formula given by Wheeler (1969).

$$\text{Per cent disease index (PDI)} = \frac{\text{Sum of numerical ratings}}{\text{Total number of plants scored} \times \text{Maximum scale}} \times 100$$

The symptomatic chilli seedlings showing wire stem, damping-off, die-back and necrosis symptoms were collected from surveyed districts of North-Eastern Karnataka and the causal agents were isolated from these infected parts by standard tissue isolation technique and the dominant pathogens associated with damping-off were *Fusarium oxysporum* and *Macrophomina phaseolina* whereae chilli die-back associated with *Colletotrichum capsici*.

## RESULTS AND DISCUSSION

The maximum disease incidence and severity was recorded in Ballari district, where the per cent disease incidence and severity were ranged from 14.08 to 61.00 per cent and 33.16 to 53.33 per cent, respectively with mean per cent disease incidence of 32.07 per cent and severity of 40.99 per cent followed by Raichur district with incidence and severity ranging from 3.67 to 54.00 per cent and 28.82 to 56.66 per cent with an average incidence and severity of 29.70 and 40.97 per cent, respectively. In Koppal district, the per cent incidence and severity were ranged from 9.80 to 38 per cent and 23.02 to 43.33 per cent with an average of 21.77 per cent and 35.46 per cent, respectively. In Koppal, the maximum incidence and severity of 38 and 43.33 per cent was recorded in Hatti village and minimum was recorded in Kadur village. In Ballari district, the maximum incidence (61 %) and severity (53.33 %) of die-back was recorded in Siruguppa village, whereas minimum was noticed in Ballari (14.08 and 33.16 %). However in Raichur district, the maximum die-back incidence and severity (54.00 & 56.66 %) was noticed in Hunsihalhuda village, whereas damping-off incidence was maximum in Navilgudda village (30.00 %) and severity was maximum in Chandrabanda (41.26 %) (Table 1).

The survey results evidenced that the occurrence of seedling diseases of chilli differs significantly from one location to another. This variation might be attributed to the diverse interplay of weather parameters, including temperature, relative humidity and rainfall as well as the specific cultivars cultivated and type of soil in each area.

**Table 1. Status of seedling diseases of chilli across major districts of North-Eastern Karnataka**

| District | Taluk | Village | Field/ Nursery | Variety | Method of sowing | Crop stage (days) | Diseases noticed | Disease incidence (%) | Disease severitynm (%) |
|---|---|---|---|---|---|---|---|---|---|
| Raichur | Raichur | Hosur | Field | Old 50 | Direct seeded | 35 | Die-back | 48.00 | 40.66 |
| | | Gonhal | Field | Super 10 | Direct seeded | 20 | Die-back | 38.00 | 40.00 |
| | | Hunsihalhuda | Field | Old 50 | Direct seeded | 17 | Die-back | 54.00 | 56.66 |
| | | Marchathal | Field | Byadagi | Direct seeded | 30 | Die-back | 46.00 | 47.33 |
| | | Chandrabanda | Nursery | HPH 2043 | Raised in protrays | 28 | Damping-off | 17.43 | 41.26 |
| | | Kalmala | Field | Super 10 | Direct seeded | 22 | Die-back | 33.00 | 36.66 |
| | | **Taluk mean** | | | | | | **39.41** | **43.76** |
| | Devadurga | Gabbur | Nursery | HPH 2043 | Raised in protrays | 36 | Damping-off | 4.89 | 30.01 |
| | | | Nursery | HPH 2043 | Raised in protrays | 39 | Damping-off | 19.40 | 31.54 |
| | | Navilgudda | Field | 1080 | Direct seeded | 25 | Damping-off | 30.00 | 35.55 |
| | | | | | | | Die-back | 42.00 | 65.00 |
| | | Devadurga | Nursery | HPH 5531 | Raised in protrays | 38 | Damping-off | 3.67 | 28.82 |
| | | **Taluk mean** | | | | | | **19.99** | **38.18** |
| | | **District mean** | | | | | | **29.70** | **40.97** |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Gangavathi | Budugumpa | Nursery | Sukhino | Raised in protrays | 30 | Damping-off | 18.37 | 25.48 |
| | | Kadur | Nursery | HPH 5531 | Raised in protrays | 30 | Damping-off | 9.80 | 23.02 |
| | | | | **Taluk mean** | | | | **14.08** | **24.25** |
| | Kanakagiri | Kanakagiri | Nursery | VNR145 | Raised in protrays | 27 | Damping-off | 16.12 | 38.87 |
| | | Gouripura | Nursery | BASF 1080 | Raised in protrays | 30 | Damping-off | 12.85 | 37.63 |
| Koppal | | | | **Taluk mean** | | | | **14.49** | **38.25** |
| | Kushtagi | Gunnal | Field | Avenger plus | Transplanted | 42 | Damping-off | 20.00 | 32.50 |
| | | Kushtagi | Nursery | Saritha 074 | Raised in protrays | 25 | Damping-off | 21.02 | 39.54 |
| | | | | **Taluk mean** | | | | **20.51** | **36.02** |
| | Koppal | Hatti | Field | VNR145 | Direct seeded | 50 | Damping-off | 38.00 | 43.33 |
| | | | | **Taluk mean** | | | | **38.00** | **43.33** |
| | | | | **District mean** | | | | **21.77** | **35.46** |
| | Ballari | Ulavathi | Field | Avenger plus | Transplanted | 28 | Damping-off | 40.00 | 45.00 |
| | | Ballari | Nursery | Avenger plus | Raised in protrays | 24 | Damping-off | 14.08 | 33.16 |
| | | | | **Taluk mean** | | | | **27.04** | **39.08** |
| Ballari | Siruguppa | Bagwadi | Nursery | Old 50 | Raised in protrays | 25 | Damping-off | 17.34 | 41.83 |
| | | Devalapura | Field | RJ33 | Transplanted | 34 | Damping-off | 40.00 | 34.50 |
| | | | | | | | Die-back | 30.00 | 40.00 |
| | | Siruguppa | Field | Old 50 | Direct seeded | 40 | Die-back | 61.00 | 53.33 |
| | | | | **Taluk mean** | | | | **37.09** | **42.92** |
| | | | | **District mean** | | | | **32.07** | **40.99** |

Moreover, the presence of varying pathogenic strains within the fungus also contributes to this observed diversity.

As per the findings of the survey, die-back was noticed only in the field conditions whereas, damping-off was observed in both nursery and field conditions. In nurseries, damping-off was majorly observed and variety Old 50 was found to be more susceptible with maximum severity of 56.66 while minimum severity was observed with HPH 5531 hybrid (23.02 %).

Damping-off disease manifested in the seedlings until 40 days of post sowing, later the incidence reduced as the age advances. In contrast, die-back symptoms were observed even beyond the 40 days old seedling and the disease predominantly thrived in black soil with flooded fields. Die-back was not recorded in Koppal district while damping-off was recorded in severe form and this might be due to improper spacing, watering in nurseries, rainfall, relative humidity might have played the role in causing damping-off.

Mougy *et al.* (2011) revealed that the surveyed nurseries at early stages showed highest records of damping-off in vegetable crops under protected condition. Ali *et al.* (2019) isolated different fungal pathogens from soil collected from infected chilli fields and found that

**Damping-off** **Die-back**

**Fig. 1. Symptoms of damping-off and die-back**

maximum number of pathogens were found in the month of October, later there was a decline in the number of pathogens in the month of March and April. Majeed *et al.* (2018) carried out a survey for assessing the prevalence of damping off disease in chilli and found mean incidence varying between 16.07 and 29.00 per cent, also reported that highest incidence was due to excessive moisture in soil and lesser maintenance of fields. Results were also similar to the findings of Hajong *et al*. (2023), they reported that, Khanapara village had recorded the highest disease incidence at 24.25 percent followed by Pimpari Deshmukh with 23.00 per cent and Selu with 21.25 percent, compared to other localities where they revealed that frequent watering of seedlings or their exposure to waterlogged conditions for extended periods increased the likelihood of damping-off in tomato seedlings and also reported that, disease was caused by the planting of susceptible tomato cultivars in heavy black soil.

## CONCLUSION

Damping-off and die-back of chilli have become major constraints in the nursery as well as in the field conditions. Analysis of survey data revealed that the disease has significantly increased in Northern Karnataka in terms of its distribution and intensity, might be because of continuous cultivation of chilli over the years with susceptible varieties, direct seed sowing without maintaining the proper plant to plant and row to row spacing. The farmers are also practicing the drill sowing method for chilli varieties in the plain land without making any ridges and furrows. This may lead to more plant population, poor light penetration with poor ventilation. During a heavy rainfall situation, the sloppy and undulated fields without ridges and furrows result in water logging conditions and chilli crops become more vulnerable to pathogen infection. Hence, it can be concluded from the present study that crop rotation with non-host crops and maintaining proper plant population with spacing may check the disease intensity.

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