*Int.J.Curr.Microbiol.App.Sci* (2020) *9*(4): 416-422

*International Journal of Current Microbiology and Applied Sciences*
***ISSN: 2319-7706*** **Volume 9 Number 4 (2020)**
Journal homepage: http://www.ijcmas.com

**Original Research Article** https://doi.org/10.20546/ijcmas.2020.904.050

# Survey on Incidence of Foot Rot of Wheat in Northern Parts of Karnataka

**M. M. Sindhu*, P. V. Patil and B. M. Kiran**

*Department of Plant Pathology, College of Agriculture, Dharwad*
*University of Agricultural Sciences, Dharwad - 580 005, India*

**Corresponding author*

**Keywords**

Wheat, Foot rot, Survey, Rabi, *Sclerotium rolfsii*

**Article Info**

***Accepted:***
04 March 2020
***Available Online:***
10 April 2020

**A B S T R A C T**

Foot rot of wheat caused by *Sclerotium rolfsii* Sacc. has become a matter of interest to research workers due to variability in causal organism from place to place and it is a serious problem mainly in the rainfed areas. During *rabi* 2017-18, out of 11 villages in Dharwad taluk foot rot incidence was observed in only four villages*viz*., Mangalagatti, Lokur, Bommapur and Kurubagattiwith incidence of 4.17, 3.40, 1.67 and 0.83 per cent respectively. In the same season, Annigeri and ARS, Annigeri of Gadag taluk and six villages *viz.*, Jalikoppa, Nayanagar, ARS, Bailhongal, Murakumbi, Muragod and Ugar Khurd of Belagavi taluk was surveyed but foot rot incidence was not observed in none of the surveyed villages of Gadag and Belagavi taluk. During *rabi* 2018-19, out of eight villages in Dharwad, maximum incidence of foot rot (2.17 %) was recorded in Marewad followed by 1.87 per cent in Rayapur and minimum incidence of 0.89 per cent was recorded in Muragamath.Overall survey results revealed that there was very low incidence of foot rot of wheat among various districts, taluks and villages surveyed in different wheat growing regions of northern Karnataka during *rabi* 2017-18 and 2018 – 19.

## Introduction

Wheat is an important cereal crop and a staple food of vast majority of the human population. Presently in world, wheat is grown over an area of 240.4 m ha with a production of 757.92 mt and a productivity of 3,438 kg $ha^{-1}$. India stands fourth among wheat producing countries both in respect of area and production. In India, it is grown over an area of 30.71 m ha with a production of 101.20 mt and a productivity of 3,295 kg $ha^{-1}$ (Anon., 2019). Karnataka is unique in wheat cultivation where in all three cultivated species, *viz.*, *Triticum aestivum* L., (Bread wheat), *T. durum (macroni* wheat) and *T. dicoccum* (Khapli, Sadaka or Emmer wheat) are grown in tropical climates characterized by the prevalence of high temperature during the crop growth.

In Karnataka, the area under wheat is 1.68 lakh ha with an annual production of 1.72 lakh tonnes and productivity of 1010 kg $ha^{-1}$ (Anon., 2018).

Wheat plays an important role in the cropping programme of Karnataka. It has already been proved to be the best component crop under multiple cropping system of the state. Northern Karnataka being the main wheat belt, accounts to about two - third of the total wheat area.

Wheat in Karnataka is susceptible to foot rot, brown rust and leaf blight. Foot rot of wheatcaused by *Sclerotium rolfsii* Sacc. has become a matter of interest to research workers due to variability in causal organism from place to place and it is a serious problem mainly in the rainfed area.

*Sclerotium rolfsii* Sacc. is a well-known ubiquitous soil inhabiting and most destructive soil borne fungus and it was initially described by Rolfs (1892) on tomato. It is predominantly distributed throughout tropical and subtropical regions where the temperature reaches higher levels during the *rabi* season. *S. rolfsii* having a saprophytic activity in soil and can survive in soil for many years by producing sclerotial bodies (Weber, 1931).

These sclerotia constitute the primary inoculum of the pathogen and mainly for dispersal and survival of the fungus under adverse environmental conditions. The fungus, *S. rolfsii* having more than 500 host plants which are grown across the semi-arid tropics including Asian countries. It was first reported by Rolfs (1892) as a cause of tomato blight from Florida in U.S.A. Later it was named as *Sclerotium rolfsii* by Saccardo in 1911. In India, Reddy *et al.,* (1971) proved *S. rolfsii* as causal organism of foot rot of wheat in Karnataka.

*Sclerotium* wilt or rot is a disease of tropics and subtropics. It is common where high temperature exists during the rainy season. It is a serious disease on potatoes in certain areas. The pathogen *S. rolfsii* cannot withstand low temperature for long time. Hence, it is not important in the temperate region.

Foot rot is a serious problem mainly in the rainfed area of Madya Pradesh, Gujarat and Karnataka. The pathogen is soil borne and damaging wheat crop by causing pre and post emergence death of the seedlings (Kalappanavar and Patil, 2000). It is evident that information on the crop losses caused by this fungus is adequate.

In Karnataka, much of the wheat area is covered under rainfed conditions. A little work on control of this disease under field conditions has been carried out earlier. It is necessary to undertake survey on foot rot of wheat, so that their distributions can be understood in order to take suitable precautionary measures in endemic areas and also survey of the disease over a period of time gives the intensity with which it affects the yield in addition to the most susceptible stage of the crop. Hence, the survey was conducted in rainfed wheat areas of northern Karnataka to know the incidence and distribution of the disease.

## Materials and Methods

### Survey on incidence of foot rot of wheat in northern parts of Karnataka

Intensive roving survey was conducted in wheat growing areas of Dharwad, Gadag and Belagavi districts of Karnataka, during *rabi* 2017-18 and 2018-19. Detailed information during the survey like District, Taluk, Village, Variety/ species, Crop stage, Crop grown condition and foot rot incidence (%) was recorded.

Wheat fields on the survey route were visited and in each field five spot of2m ×1 m area were selected randomly and observations on foot rot incidence was taken by counting the total number of plants and the number of plants showing *S. rolfsii* infection. Further per cent disease incidence was calculated by using the formula given by Wheeler (1969).

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

During survey, foot rot infected collar/root portion samples were collected and used further for isolation and variability studies. The fungus was identified as *S. rolfsii* based on growth characters and morphology of the fungus as described by Butler and Hunter (1972).

## Results and Discussion

In recent years, foot rot have become more important due to drastic change in climate makes the crop more susceptible to disease (Nikam *et al.*, 2011). By conducting survey, one can find out the occurrence and distribution of wheat diseases and it also helps to assess the levels of resistance and susceptibility of the cultivars grown in farmers' field.

Hence, survey was conducted in wheat growing areas of northern parts of Karnataka to know the incidence and distribution of the disease. During *rabi* 2017-18, Dharwad taluk was surveyed, out of 11 villages *viz.*, Mangalagatti, Kurubagatti, Lokur, Garag, Tadakod, Rayapur, Sainagar, Bommapur, Shiraguppi, Nalawadi and Basapur foot rot incidence was observed in only four villages (Mangalagatti, Lokur, Bommapur and Kurubagatti) with incidence of 4.17, 3.40, 1.67 and 0.83 per cent respectively and it was not observed in rest of the seven villages. In the same season, Annigeri and ARS, Annigeri of Gadag taluk and six villages *viz.*, Jalikoppa, Nayanagar, ARS, Bailhongal, Murakumbi, Muragod and Ugar Khurd of Belagavi taluk was surveyed however foot rot incidence was not observed in none of the surveyed villages of Belagavi taluk (Table 1, Figure 1 and 2).

During *rabi* 2018-19, out of eight villages in Dharwad *viz.*, Rayapur, Amargol, Govanakoppa, Hebballi Agasi, Muragamath (Dharwad), Marewad, Karadigudda and Pudakalkatti maximum incidence of foot rot (2.17 %) was recorded in Marewad followed by 1.87 per cent in Rayapur and minimum incidence of 0.89 per cent was recorded in Muragamath (Dharwad) followed by 0.91 per cent in Amargol and 0.98 per cent in Hebballi Agasi (Table 2). These results are agreement with the findings of Manjappa (1979) and Sulladmath *et al.*, (1977).

Among surveyed areas foot rot incidence was high in rainfed condition compared to irrigated condition. *Sclerotium rolfsii is* an aerobic organism and it needs low moisture (20-25 %) for its growth and infection (Reddy *et al.*, 1971). Maximum saprophytic activity of *S. rolfsii* was found at 30 per cent soil moisture level (Harlapur, 1988).

The activity of fungus reduced under irrigated conditions and still reduced when irrigation was coupled with nitrogenous fertilizer application and it may be due to decreased aeration in soil which deprives the pathogen by inadequate oxygen supply needed for the activity of fungus.

Optimum soil temperature of 30°C for mycelial growth of *S. rolfsii* and 25°C for sclerotial production (Gondo, 1964).

**Table.1** Survey on incidence of foot rot of wheat in northern parts of Karnataka during *rabi* 2017-18

| District | Taluk | Village | Variety/Species | Crop grown condition | Foot rot incidence (%) | Remarks (Other pests/ diseases observed) |
|---|---|---|---|---|---|---|
| **Dharwad** | Dharwad | Mangalagatti | BW | RF | 4.17 | Stem borer |
| | | Kurubagatti | Bijaga yellow (DW) | RF | 0.83 | Leaf blight |
| | | Lokur | DWR 2006 (DW) | RF | 3.40 | Leaf blight |
| | | Lokur | Amruth (DW) | RF | - | Termites |
| | | Lokur | BW | RF | - | Termites |
| | | Garag | DWR 2006 (DW) | RF | - | - |
| | | Tadakod | Amruth (DW) | RF | - | Leaf rust |
| | | Rayapur | Amruth (DW) | RF | - | Termite, Stem borer |
| | | Rayapur | Amruth (DW) | RF | - | - |
| | | Sainagar | Amruth (DW) | RF | - | - |
| | | Bommapur | Amruth (DW) | RF | 1.67 | - |
| | | Shiraguppi | Amruth (DW) | RF | - | - |
| | | Nalawadi | Amruth (DW) | RI | - | Leaf rust |
| | | Basapur | Amruth (DW) | RI | - | Stem borer |
| | Navalgund | Arekurahatti | Amruth (DW) | RI | - | - |
| | Taluk | Village | Variety/Species | Crop grown condition | Foot rot incidence (%) | Remarks (Other pests/ diseases observed) |
| | Belagavi | Jalikoppa | BW | IR | - | Leaf blight |
| | | Nayanagar | BW | IR | - | - |
| | | ARS, Bailhongal | AVT – RI | RI | - | - |
| | | Murakumbi | BW | RF | - | - |
| | | Muragod | BW | RF | - | - |
| | | Maladinni | BW | IR | - | - |
| | | Ugar Khurd | Trials | IR | - | - |
| | Gadag | Annigeri | DW | RF | - | - |
| | | ARS, Annigere | Trials | RF | - | - |

**Table.2** Survey on incidence of foot rot of wheat in northern parts of Karnataka during *rabi* 2018-19

| District | Taluk | Village | Variety/Species | Crop grown condition | Foot rot incidence (%) | Remarks (Other pests/ diseases observed) |
|---|---|---|---|---|---|---|
| **Dharwad** | Dharwad | Rayapur | Amruth | RF | 1.87 | Leaf blight, Termite |
| | | Amargol | Amruth | RF | 0.91 | Leaf blight |
| | | Govanakoppa | DW | RI | - | Leaf blight |
| | | Hebballi Agasi | BW | RI | 0.98 | Leaf blight |
| | | Muragamath (Dharwad) | DW | RF | 0.89 | Leaf blight |
| | | Marewad | BW | RF | 2.17 | Leaf blight |
| | | Karadigudda | BW | RI | 0 | Leaf blight |
| | | Pudakalkatti | DW | RF | 0.83 | - |

* RF: Rainfed, IR: Irrigated, RI: Restricted irrigation, BW: Bread wheat, DW: Durum wheat, ARS: Agricultural Research Station

**Figure.1** Mangalagatti (Dharwad tq, Dharwad dist)

**Figure.2** Muragod (Belagavi tq, Belagavi dist.)

Overall survey results revealed that there was very low incidence of foot rot of wheat among various districts, taluks and villages surveyed in different wheat growing regions of northern Karnataka during *rabi* 2017-18 and 2018 - 19.The reason for low incidence of foot rot in different districts surveyed during *rabi* 2017-18 and 2018-19 may be correlated with soil moisture level. Among surveyed area, foot rot incidence was high in rainfed condition compared to irrigated area. Due to availability of good soil moisture level in the soil and this condition may not be congenial for pathogen development and expression of various symptoms of the disease.

## Acknowledgement

The author wishes to thank Professor Dr. Patil, P. V. University of Agricultural Sciences, Dharwad, for his sustained interest in this work and the preparation of this paper.

## References

Anonymous, 2018, Agricultural Statistics at a Glance, Directorate of Economics and Statistics, Department of Agriculture and Co-operation, Ministry of Agriculture, Govt. India. p. 45-65.

Anonymous, 2019, www.indiaagristat.com

Butler, H. L. and Hunter, B. H., 1972, Illustrated genera of imperfect fungi. 3rd Ed. Burgess Publishing Co., Minneapolls, pp. 208-209.

Gondo, M., 1964, Soil ecological studies on the soil pathogens. Effect of various soil factors on the growth of *Corticium rolfsii* Curzi. *Bull. Fac. Agric. Kagoshima Univ*., 10: 23-27.

Harlapur, S. I., 1988, Studies on some aspects of foot rot of wheat caused by *Sclerotium rolfsii* Sacc. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Dharwad.

Kalappanavar, I. K. and Patil, N. K., 2000, Biological control of *Sclerotium rolfsii* Sacc. a causal agent of foot rot of wheat. *Karnataka J. Agric. Sci.*, 13(2): 478-479.

Manjappa, B. H., 1979, Studies on the survival and variation in *Sclerotium rolfsii* Sacc. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Bangalore.

Nikam, P. S., Jagtap G. P. and Sontakke, P. L., 2011, Survey, surveillance and cultural characteristics of chickpea wilt

caused by *Fusarium oxysporium f.* sp. *Ciceri*. *African J. Agric. Res.*, 6 (7): 1913-1917.

Reddy, H. R., Fazalnoor, K. and Hegde, R. K., 1971, Screening of commercial varieties and genetic stocks of wheat against foot rot caused by *Sclerotium rolfsii* Sacc. *Mysore J. Agric. Sci.*, 5: 252-256.

Rolfs, P. H., 1892, Tomato Blight-Some Hints. *Bull. Fla. Agic. Exp. Stn*., p. 18.

Saccardo, P. A., 1911, Notae Mycologieae. *Ann. Mycol*., 9: 249-257.

Sulladmath, V. V., Hiremath, P. C. and Anilkumar, T. B., 1977, Studies on variation in *Sclerotium rolfsii*. *Mysore J. Agric. Sci*., 11: 374-380.

Weber, G. F., 1931, Blights of carrots caused by *Sclerotium rolfsii* with geographic distribution and host range of the fungi. *Phytopath*, 22: 837-845.

Wheeler, B. E. J., 1969, *An Introduction to Plant Disease*, John Wiley and Sons Ltd., London, p. 301.

**How to cite this article:**

Sindhu. M. M., P. V. Patil and Kiran. B. M. 2020. Survey on Incidence of Foot Rot of Wheat in Northern Parts of Karnataka. *Int.J.Curr.Microbiol.App.Sci.* 9(04): 416-422.
doi: https://doi.org/10.20546/ijcmas.2020.904.050