



## Occurrence and incidence of foot rot disease on fenugreek caused by *Fusarium moniliforme* in Rohilkhand region of Uttar Pradesh, India

Chandra Pal Singh\*, U.S. Mishra and U.C. Pandey

Phytopathology Lab, Department of Botany, Bareilly College, Bareilly-U.P.243001 INDIA

### ARTICLE INFO

Received: 01 Jun 2014

Revised : 21 Nov 2014

Accepted: 10 Dec 2014

### Key words:

Fenugreek, *Fusarium moniliforme*, seedling, foot rot, disease incidence

### ABSTRACT

Pathological studies were carried out in Rohilkhand region during the crop season 2013-14 to assess the pathogenic disease incidence of foot rot of fenugreek (*Trigonella foenum-graecum* Linn.) caused by *Fusarium moniliforme*. A total of 75 fields were surveyed during the crop period at monthly interval during germination, vegetative, flowering and fruiting stages in five different localities of Rohilkhand region. The foot-rot disease of fenugreek was found in all fields (Bareilly, Baheri, Pilibhit, Budaun and MeerGANJ) selected for the study. Monthly occurrence of disease incidence of foot rot ranged from 44-58%. Maximum disease incidence was recorded in the month of Oct. (58%) followed by September (57%) and November (56%). January exhibited the lowest incidence (45%) of pathogenic disease. However, foot rot symptoms developed at early stage of plant growth and persisted up to the end of the crop.

### 1) INTRODUCTION

Fenugreek (*Trigonella foenum-graecum* Linn. Family: Fabaceae, Vern. name: Methi) is grown chiefly as a green leafy vegetable. Almost every parts of Fenugreek are edible as vegetable. The seeds are most commonly used as spices, condiments and medicines. Fenugreek seeds are good sources of protein, fat, minerals and dietary fibres [1]. The chief nutrients of fenugreek leaf and seeds are tabulated as under:

Nutrients	Percent of nutrients	
	Leaf	Seed
Protein	4.4%	9.5%
Carbohydrate	6.0%	42.3%
Fat	0.9%	10.0%
Fibres	1.1%	18.5%
Minerals	1.5%	3.6%
Gum	-	6.0%
Mucilage	-	8.0%
Vitamins	-	Rich in Vit. A, C & K
Moisture content	86.1 %	6.3%

It is native to the Mediterranean region or south East Asia [2]. Rohilkhand is one of the chief production centre of this crop in U.P., facilitating the bulk supply to nearby states. Fenugreek requires a relatively cool climate for its propagation and is highly susceptible to foot rot disease caused by *Fusarium moniliforme* [3]. Foot rot disease poses major threat to the cultivation of fenugreek in Rohilkhand region. The fungus

inflicts heavy damage to the leafy vegetable in crop and reduces the yield to a considerable extent. Rohilkhand possess unique agro-climatic condition and unpredictable erratic weather with intermittent winter rains, foggy cover and usual frosts make this crop more vulnerable to the fungal infection.

It causes pre and post emergence rots of seedling at the time of germination in all growing areas of Rohilkhand region. The main diseases that affect fenugreek are foot-rot and damping-off disease in India [4]. There is no systematic study to find out the extent of this pathogenic disease incidence of fenugreek in Rohilkhand region. In order to establish the benchmark for the prevalence of this problem, current study was initiated in Rohilkhand.

### 2) MATERIALS AND METHODS

Pathogenic disease of foot rot caused by *Fusarium moniliforme* of fenugreek was carried out both in Phytopathology lab and fields. All the field experiments were conducted in five localities Viz., Bareilly, Baheri, Pilibhit, Budaun and MeerGANJ representing of different agro climatic conditions in Rohilkhand region during crop season of 2013-14 to record the incidence of foot rot disease. In each locality, 15 fields were surveyed during the crop period at monthly interval during germination, vegetative, flowering and fruiting stages. Diseased parts of plants *i.e.* root, leaves, legumes and seeds were collected from surveyed fields and packed in polythene bags. Foot rot disease of fenugreek was subjected to

\* Corresponding Author: Dr. Chandra Pal Singh

Email address: [singh.chandra18@gmail.com](mailto:singh.chandra18@gmail.com)

isolation trails for the purpose of isolation of the causal organism. The isolated fungus was identified according to the cultural morphological growth characteristic, symptoms, mycelium, conidiophores and conidia with the help of Gilman [5], Barnett and Hunter [6], Mundkur, [7] and Nelson et al., [8] by the Trinocular Research Microscope (Olympus BHTU-312).

The foot rot disease incidence present in each field was recorded. Percent incidence of foot rot disease on fenugreek was calculated as under:

$$\text{Percent incidence} = \frac{\text{No. of fields showing presence of disease}}{\text{Total no. of field surveyed}} \times 100$$

The disease recorded was divided in the following groups on the basis of their incidence. **Rare- 1-20%, Occasional- 21-40%, Frequent- 41-60%, Common- 61-80%, Very common- 81-100%**. Overall disease incidence (%) was calculated by averaging the disease incidence obtaining from each field. Disease incidence of foot rot was measured by counting the number of affected plants and healthy plants in a definite area at different places in the field. Quadrate of 1m x 1m size was used for this purpose.

### 3) RESULTS AND DISCUSSION

An intensive monthly field survey was done to record the incidence of foot rot disease of fenugreek (*Trigonella foenum-graecum* Linn.) during the crop season 2013-14 in the vicinity of Rohilkhand. A total of 75 fields survey were carried out at monthly interval in each season during germination, vegetative, flowering and fruiting stages. The localities wise prevalence of pathogenic disease incidence on fenugreek was presented in **table 1**.

**Table: 1- Average disease incidence of foot rot caused by *Fusarium moniliforme* of fenugreek in Rohilkhand during 2013-14.**

	DISEASE INCIDENCE IN DIFFERENT LOCALITIES (%)					Mean
	Bareilly	Baheri	Pilibhit	Budaun	Merganj	
Sept.	59.00	54.00	63.00	52.00	59.00	57.00
Oct.	64.00	56.00	65.00	50.00	56.00	58.00
Nov.	57.00	56.00	61.00	48.00	56.00	56.00
Dec.	48.00	49.00	49.00	40.00	50.00	47.00
Jan.	43.00	42.00	49.00	41.00	46.00	44.00
Feb.	45.00	43.00	51.00	46.00	41.00	45.00
Mar.	48.00	45.00	51.00	46.00	43.00	47.00
S.Em ±	0.84	0.68	0.92	0.38	0.52	-
C.D. at 5%	2.32	2.05	3.24	1.68	1.89	-
F. value	*	*	*	*	*	

The occurrence of disease incidence of foot rot was recorded in varied ranged from 44-58%. Maximum disease incidence was recorded in the month of Oct. (58%) followed by September (57%), November (56%) and January exhibited the lowest incidence (44%). Comparatively, the maximum percent of foot rot disease severity were observed in Pilibhit localities and minimum in Badaun localities (**Table 1**). This variation in the severity of pathogenic disease may be due to factors like agro climatic locations, higher humidity, low temperature and management of fields including cultural practices, which are favourable for well established growth and development of the

pathogen. In some areas, whole of the fenugreek fields were destroyed due to foot rot caused by *Fusarium moniliforme* (**Fig. 1**). Foot rot is one of the most significant disease of fenugreek resulting in heavy loss of the crop in Rohilkhand region. *Fusarium moniliforme* was isolated most frequently from root-rot infected plants in the early stage of plant growth. Uniformly colonies of the pathogen were consistently isolated on selected media. The colonies were white in colour, suppressed and slow growing. The underside of plate was whitish in colour (**Fig. 2**). Foot rot symptoms also developed on fully mature plants and persisted up to the end of the crop. The fungus is a major component of foot-rot disease in crops studied by Hwang and Chakravarty [9] and Sangeetha [4]. *Fusarium* sp. is a soil borne pathogen producing either a toxic metabolic or parasitizing hyphae of pathogenic fungi. The observed suppression of disease symptoms in fenugreek can be attributed to various factors when the soil is poorly drained. A cold variable environmental condition of Rohilkhand accelerates the pathogenic disease at an early stage of the crop causing considerable damage of the crop and severe losses in yield of seeds. It may be attributed to unpredictable erratic weather with intermittent winter rains, foggy cover, higher humidity and low temperature which are favorable for well established growth and development of the pathogen. Similar reports on foot rot were made by Mathur et al., [10]. The present study has helped to identify the major areas affected by foot rot disease in Rohilkhand region which would help to discover a way for formulation of preventive management strategies.

**Fig 1:** Early stage of foot rot disease caused by *Fusarium moniliforme* in fenugreek fields



A- Germination of *Fenugreek* seeds in fields.



B- Infection of *Fusarium moniliforme* causing foot rot disease in fields.



C- Severity of foot disease in fields.



D- Healthy plant and progress symptoms of foot rot disease on *Fenugreek*.

**Fig. 2** Occurrence of foot rot caused by *Fusarium moniliforme* in Rohilkhand region



A- Two Week old culture of *Fusarium moniliforme* on PDA medium



B- Conidia of *Fusarium moniliforme*.

#### Acknowledgement

My sincere thanks to University Grant Commission, New Delhi, for financial assistance grant in the form of post doctoral fellowship and also thanks to the Head, P.G. Department of Botany, Bareilly College, Bareilly-U.P. India, for providing necessary facilities to carry out the research work.

#### REFERENCES

- 1) Kochhar, A. Nagi, M and Sachdeva, R. 2006. Proximate composition, available carbohydrates, dietary fibre and anti nutritional factors of selected traditional medicinal plants. *J Hum Ecol*:195-199.
- 2) Acharya, S.N. Tomas, J.E. and Basu, S.K. 2008. Fenugreek (*Trigonella foenum-graecum* Linn.) an alternative crop for semiarid regions of North America. *Crop Sci.* 48: 841-853.
- 3) Singh, C.P. Mishra, U.S. and Patel, V. V. 2010. Disease management of foot-rot disease of fenugreek caused by through late sowing practice in Bareilly *Fusarium moniliforme* *Asian J. Exp. Biol. Sci.* Spl:174-176.
- 4) Sangeetha, 2010. Activity of superoxide dismutase and catalase in fenugreek (*Trigonella foenum-graecum*) in response to carbendazim. *Indian J. Pharm Sci.* 72:116-118.
- 5) Gilman. J.C. 1957. A manual of soil fungi. Iowa State University Press, Ames, Iowa, U.S.A. pp: 450.
- 6) Barnett, H.L. and Hunter, B.B. 1972. Illustrated genera of imperfect fungi. Burgess Publishing Company. Minneapolis, Minnesota, pp: 241.
- 7) Mundkur, B.B. 1959. Fungi and plant diseases. Macmillan and Co. Ltd, London. pp: 246.
- 8) Nelson, P.E. Toussoun, T.A. and Marasan, W.F.O. 1983. *Fusarium* spp. An illustrated manual for identification. The Pennsylvania Univ. Press, press, park. pp: 218.

- 9) Hwang, S.F. Chakravarty, P. 1993. Root rot disease complex of field pea in central Saskatchewan. Canadian plant disease survey, 73(1): 98-99.
- 10) Mathur, K. Bansal, R.K, and Gurjar, R.B.S. 2006. Organic management of *Fusarium* wilt of fenugreek (*Trigonella foenum- graecum* L.). A seed spices. J. Mycol. and Pl. Pathol. 36(1): 94-95.