

Pathological studies of fungal diseases of fenugreek (*Trigonella foenum-graecum* Linn.) in Rohilkhand.

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ABSTRACT

Fenugreek is an important green leafy vegetable and spices crop, is widely cultivated all over India, specially in Rohilkhand region of Uttar Pradesh. Fenugreek crop is affected by many pathogenic fungal diseases in this region. The research was conducted to determine the disease incidence caused by various pathogenic fungi. Survey of fenugreek crop was made in five selected localities during two cropping season of 2019-20 and 2020-21 to record the disease incidence in Rohilkhand region. In each locality 12 to 13 fields were surveyed during the crop period at monthly interval during germination, vegetation, flowering and fruiting stages. A total of five fungal diseases were recorded on the crop of fenugreek. The disease incidence ranged from 5.0-81%. Among the fungal diseases maximum incidence was recorded for foot rot (81%) caused by *Fusarium moniliforme* followed by leaf spot/blight (60%) *Cercospora traversiana*, leaf spot (49%) *Alternaria alternata* and legume spot (29%) *Cercospora* spp. Powdery mildew caused by *Erysiphe polygoni* found the lowest disease incidence (5.0%). Foot rot disease of this crop occurs from one season to other in the form of pathogenic fungal infected seeds. Conidia of the pathogen proliferate extensively in the vascular tissues of host crop.

KEY WORDS: Fenugreek, fungal diseases, disease incidence and pathogenic fungi.

I. INTRODUCTION

Fenugreek (*Trigonella foenum-graecum* Linn. Family: Fabaceae.) is grown chiefly as a green leafy vegetable. The seeds of fenugreek are widely used as spices condiments (Mary, 2009, Kumawat *et al.*, 2017) and also use as a medicinal (Tiran, 2003). It is a gift of nature to the mankind as its regular use keeps the body healthy. Rohilkhand region is one of the chief producing centres of fenugreek in U.P. and is a biggest supplier of this vegetable to Uttaranchal and nearby states. Generally three popular varieties *viz.*, Pusa Early Bunching (PEB), Pusa Kasturi (PK) and Deshi Methi (DM) of fenugreek are preferred by the farmers for cultivation. These varieties are highly vulnerable to the weather and are susceptible to many fungal pathogenic diseases. The most prevalent diseases of fenugreek in the area are foot root caused by *Fusarium moniliforme*, leaf spot/blight caused by *Cercospora traversiana*, leaf spot *Alternaria alternata*, powdery mildew *Erysiphe polygoni* and legume spot caused by *Cercospora* sp.. Foot rot disease caused by *Fusarium moniliforme* was very common, widespread and destructive disease of fenugreek. The characteristic symptoms of the disease appear as yellowing and stunting of the plants followed by wilting and rolling of the leaves and finally the plant dies. Moreover, the pathogenic disease affects the crop production and quality of vegetable. Leaf spot/blight was common disease caused by *Cercospora traversiana* is a seed-borne fungus (Elwakil and Ghoneem, 2002). In order to leaf spot caused by *Alternaria alternata* was found frequently. The symptoms of disease on affected plants with small, circular scattered, dark brown spots on lower leaves and then began developing on the leaf tips and along the margins of the leaf. It gradually progresses continue and finally plants are fall down. In addition to necrotic symptoms on leaves and plants are found. Powdery mildew caused by *Erysiphe polygoni* found as rare disease especially during flowering and pod formation stage of the crop in this region. The disease is characterized by white patches appearing on both sides of leaves, stems and pods. During at the time of pod formation, powdery growth also covers the pods. Therefore the present study is planned to bridge the gap on dearth of literature on this aspect of fenugreek crop production through documenting the incidence and severity of some naturally occurring pathogenic diseases in Rohilkhand region signifies the need and scope of present pathological investigation.

II. MATERIALS AND METHODS

Survey of diseases caused by the fungal pathogens of fenugreek (*Trigonella foenum-graecum* Linn.) crop was made in five localities of different agro-climatic conditions in Rohilkhand region during two cropping seasons to record the occurrence of the disease incidence. In each locality, 12 to 13 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.

Fenugreek crop showing foot rot, leaf spot/blight, leaf spot, legume spot and Powdery mildew were subjected to isolation trails for the purpose of isolation the causal organisms. The isolated fungi were firstly purified using single spore or hyphal tip techniques (Mundkur 1959) then identified according to the cultural morphological growth characteristic symptoms, mycelium, conidiophores and conidia by Trinocular Research Microscope (Olympus BHTU-312).with the help of Gilman (1957), Barnett and Hunter (1972) and Nelson *et al.* (1983). Disease incidence is a measure of the number of plants which contract a disease during a particular period of time. Percent incidence of each fungal disease on fenugreek was calculated as per the method given by Johnson and Booth (1983) as follows;

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

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.

III. RESULTS AND DISCUSSION

The disease incidence of pathogenic fungal diseases of fenugreek was studied in Rohilkhand region. A total of five fungal diseases were recorded during two cropping seasons of fenugreek. The disease incidence was ranged from 5.0-81% in all surveyed fields. The maximum incidence was recorded for foot rot (81%) caused by *Fusarium moniliforme* followed by leaf spot/blight caused by *Cercospora traversiana* (60%), leaf spot caused by *Alternaria alternate* (49%), legume spot caused by *Cercospora* spp. (29%). and Powdery mildew caused by *Erysiphe polygoni*. exhibited the lowest incidence (5.0%). Most of the diseases of fenugreek were confined to the leaves except foot rot. Foot rot caused by *F. moniliforme* was most damaging soil borne disease of fenugreek. It causes pre and post emergence rots of seedling at the time of germination in all growing crop fields. In contact with the host roots, the conidia of pathogen germinate and penetrate in the vascular tissues. Finally pathogen multiply very rapidly and resulting the vascular tissues of plants are affected then appear as wilting symptoms, rolling of the leaves, and finally the plant dies at initial stage of crop. Leaf spot/blight caused by *Cercospora traversiana* is a seed borne fungus was uniformly distributed in all fenugreek crop fields. The aerial parts of plant were discolored, shrunken or twisted, youngest leaves wilted and died. Severe infection is marked by defoliation along with infected stems and pods. The disease blown by wind and causes infections in fields. The symptoms of disease caused by *C. traversiana* on fenugreek crop were observed similar earlier (Prasad et al 2014; Acharya et al., 2010; Bobev et al., 1999). Leaf spot caused by *Alternaria alternate* (49%) is a common foliar disease occurs in all growing fields of fenugreek crop. The leaf spot symptoms were first occurred on lower leaves of plant. The symptoms were first appeared at margins of the leaves as small brownish spots with concentric rings. As the disease spreads, leaves can develop enough spots that they begin to meld together to create large necrotic areas on leaves. The conidia of the pathogenic fungi can disperse via air currents or by rainfall. When the conidia lands on leaf, they penetrate can either through the stomata or directly through the top of the leaf, using its appressorium. Legume spot caused by *Cercospora* spp. on young pods of fenugreek and are persist up to mature pods as small brownish spots. The infected pods are into black and shrinkage. Conidia of the pathogenic fungi are produced within the spots. The disease causing pathogen is internally seed borne (Khare et al., 1981). *Erysiphe polygoni* caused powdery mildew of fenugreek on the both sides of leaf surface as white powdery patches. This white powdery mass contains a vast number of conidia of pathogen. All the aerial parts of plants exhibit the symptoms. Due to this disease the quality of leafy vegetable are also affected and reduces the yield of crop. The disease recurrence may be through ascospores formed in cleistothecia which are formed on surface of aerial parts of plants towards crop maturity as small black bodies inserted in the mycelium mass.

Table: - Disease incidence of fungal pathogenic diseases on fenugreek (*Trigonella foenum graecum* Linn.) in Rohilkhand.

Symptoms	Pathogen	Disease incidence (%)		Average disease incidence (%)
		2019-20	2020-21	
Leaf spot	<i>Alternaria alternata</i>	44.23	53.20	49.00
Leaf spot/blight	<i>Cercospora traversiana</i>	66.16	54.03	60.00
Powdery mildew	<i>Erysiphe polygoni</i>	07.00	03.47	05.00
Foot rot	<i>Fusarium moniliforme</i>	78.50	82.75	81.00
Legume spot	<i>Cercospora</i> sp.	27.64	29.53	29.00
S.Em +_		2.35	1.93	-
CD at 5%		7.68	6.32	-
F-value		*	*	-

IV. Conclusion

Pathological study of fenugreek was conducted in Rohilkhand region to find out the disease incidence of pathogenic diseases of fenugreek. This research documented that foot rot (81%) caused by *Fusarium moniliforme* followed by leaf spot/blight (60%) *Cercospora traversiana*, leaf spot (49%) *Alternaria alternata* and legume spot (29%) *Cercospora* spp. Powdery mildew caused by *Erysiphe polygoni* found the lowest disease incidence (5.0%). It indicated that in Rohilkhand, the environment possess unique agro-climatic conditions and unpredictable erratic weather with intermittent winter rains; foggy cover and usual frosts make this crop more vulnerable to the fungal infection. This study could help the fenugreek crop cultivars farmers regarding disease management and use of resistant varieties, improving profitability and achieving healthy crop of leafy vegetable.

REFERENCES

- [1]. Acharya SN, Thomas JE, Prasad R, Basu SK, 2010; Diseases of fenugreek (*Trigonella foenum-graecum* L.) and control measures with special emphasis on fungal diseases. In Arya, A. P. and Perelló, A. E. (ed) Management of fungal pathogens: Current trends and progress. CABI, *Nosworthy Way, Wallingford, Oxon, UK*
- [2]. Aust. J. Crop Sci. 8(6): 822–830
- [3]. Aust. J. Crop Sci. 8(6): 822–830 Barnett, H.L. and B.B. Hunter, 1972. Illustrated genera of imperfect fungi. Burgess Publishing Company. Minneapolis, Minnesota, pp: 241.
- [4]. Bobev SG, Margina AF, Gruytor de J, 1999; First report of *Cercospora traversiana* on *Trigonella caerulea* in Bulgaria. *Plant Dis.* 83:783
- [5]. Elwakil MA, Ghoneem KM, 2002; An improved method of seed health testing for detecting the lurked seed-borne fungi of Fenugreek. *Pakistan J Plant Pathol.* 1:11-13
- [6]. fenugreek accessions and characterization of the pathogen.
- [7]. fenugreek accessions and characterization of the pathogen.
- [8]. Gilman, J.C., 1957; a manual of soil fungi. *Iowa State University Press, Ames, Iowa, U.S.A.* pp: 450.
- [9]. Identification of *Cercospora* leaf spot resistance among
- [10]. Identification of *Cercospora* leaf spot resistance among
- [11]. Johnson, A, Booth C., 1983; Plant Pathologist's Pocket book. *Oxford and IBH Pub. Co. Calcutta.* pp.136.
- [12]. Khare M N, Agarwal S C and Sharma N D, 1981; A seed borne fungus *Trigonella foenum-graecum*. *Indian Phytopath.* 34: 71-77
- [13]. Kumawat, R, Shekhawat, K S and Kumawat, K, (2017) Effect of sowing dates, crop geometry and host range on powdery mildew (*Erysiphe polygoni*) of fenugreek, *Trigonella foenum graecum* L. *Journal of Spices and Aromatic Crops Vol. 26 (2):* 86-90.
- [14]. Mary, J., 2009; Fenugreek Seed Benefits the Digestive System and Lowers Blood Pressure. Available online at <http://EzineArticles.com> (Accessed on April, 2009).
- [15]. Mundkur, B.B., (Ed.), 1959; Fungi and plant diseases. Macmillan and Co. Ltd, London. pp: 246.
- [16]. Nelson, P.E., T.A. Toussoun and W.F.O Marasan, 1983; *Fusarium* spp. An illustrated manual for identification. The Pennsylvania Univ. Press, press, park. pp: 218.
- [17]. Prasad, R., Acharya, S., Erickson, S. and Thomas, J., 2014; Identification of *Cercospora* leaf spot resistance among fenugreek accessions and characterization of the pathogen. *Aust. J. Crop Sci* 8(6): 822-830.
- [18]. Prasad, R., Acharya, S., Erickson, S., and Thomas, J. 2014.
- [19]. Prasad, R., Acharya, S., Erickson, S., and Thomas, J. 2014.
- [20]. Tiran, D., 2003; the use of fenugreek for breast feeding woman. *Comp Ther Nurs Midwifery.* 9(3):155-156.