

EVALUATION OF FUNGAL DIVERSITY IN CERTAIN LEGUMINOUS CROPS OF CHHATTISGARH

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ABSTRACT

Legumes are a major source of proteins, minerals and vitamins they play a significant role in the enhancement of soil fertility. A periodical survey was conducted during November 2012-March 2013 to collect the infected leaves of 10 leguminous crops viz. *Cajanus cajan* (CC), *Dolichos lab-lab* (DL), *Vigna radiata* (VR), *Vigna mungo* (VM), *Glycine max* (GM), *Lathyrus sativus* (LS), *Pisum sativum* (PS), *Pisum arvense* (PA), *Lens culinaris* (LC), and *Trigonella foenum-graecum* (TFG). The samples were collected from five different locations of Raipur. The sites included Indira Gandhi Krishi Vishvavidyalaya, Raipur, two villages Jora and Bhatagaon, farm house and kitchen garden, Kushalpur. Total 17 pathogens have been isolated from these crops viz. *Cladosporium sphaerospermum*, *Colletotrichum dematium*, *Alternaria chlamydospora*, *Alternaria raphani*, *Alternaria chlamydospora*, *Fusarium semitectum*, *Corynespora cassiicola*, *Glomerella cingulata*, *Alternaria citri*, *Alternaria raphani*, *Alternaria tenuissima*, *Cladosporium sphaerospermum*, *Alternaria alternata*, *Cladosporium sphaerospermum*, *Alternaria raphani*, *Phoma crysanthamicola* and *Alternaria citri*. The symptoms on leaves exhibited dark brown, reddish brown, black dot circular chlorotic or necrotic spots. The results obtained make it clear that, *Alternaria* spp. to be the dominant pathogen as its nine isolates out of seventeen pathogens have been isolated and they colonized 6 out of 10 selected legume hosts. Two isolates of *Alternaria chlamydospora*, three isolates of *Alternaria raphani* two isolates of *Alternaria citri* single isolate of *Alternaria alternata* and *Alternaria tenuissima* have been reported. Three isolates of *Cladosporium sphaerospermum* single isolate of *Colletotrichum dematium*, *Fusarium semitectum*, *Corynespora cassiicola*, *Glomerella cingulata* and *Phoma crysanthamicola* have been isolated from respective crops. Disease severity ranged from moderate to severe.

KEYWORDS: Legume crops, Isolation, Disease severity

The legumes are the large group second only to cereals as a source of human food value, energy, minerals and vitamins in addition to their role in the maintenance of soil fertility. Legumes supply most of the plant proteins which are not only the main but also the cheapest source of dietary proteins. Pulse grains are rich source of protein, dietary fiber, complex carbohydrates, resistant starch and a number of vitamins and minerals viz., folate, potassium, selenium and zinc (Singh and Basu2012). Legumes also provide essential minerals required by human being (Grusak, 2002a) and produce health promoting secondary compounds that can protect against human cancer (Grusak, 2002b; Madar and Stark, 2002) and protect the plant against the onslaught of pathogens and pests (Dixon *et al.*, 2002; Ndakidemi and Dakora, 2003). Fungi are the most important group of pathogens and a very wide range of species are parasites of the legume crops, which reduce the crop yields. Species of *Alternaria*, *Fusarium*, *Trichothecium* and *Cladosporium* were associated with poor emergence of soybean in north western hill of Uttar Pradesh (Sharma, 1987).

A survey was conducted during September 2012 to February 2013 to collect infected leaves of legume crops from five locations of Raipur district viz: Indira Gandhi Krishi Vishvavidyalaya, Raipur, two villages Jora and Bhatagaon, farm house and kitchen garden, Kushalpur, Raipur (C.G).

The present paper deals with the survey, isolation and disease intensity of the pathogen of ten legume crops. viz: *Cajanus cajan* (CC), *Dolichos lab-lab* (DL), *Vigna radiata* (VR), *Vigna mungo* (VM), *Glycine max* (GM), and *Rabi crops Lathyrus sativus* (LS), *Pisum sativum* (PS), *Pisum arvense* (PA), *Lens culinaris* (LC), and *Trigonella foenum-graecum* (TFG). Total 17 pathogens have been isolated from these crops.

MATERIALS AND METHODS

Seventeen fungal pathogens were isolated from infected leaves on Potato Dextrose Agar (PDA) medium (250.0 g Potato, 20.0 g Dextrose, 20.0 g Agar, 1000ml distilled water, pH 4.5). Diseased leaves were collected and brought to the laboratory in polythene bags for the isolation and identification of the causal organisms. Infected portion of leaves were

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cut by means of sterilized razor in small pieces and dipped in 0.01% mercuric chloride solution for 30 seconds. The diseased pieces were then successively washed in sterilized water and transferred to petridishes containing PDA medium. The entire operations were carried out under aseptic conditions. The organisms thus obtained were repeatedly subcultured in order to get pure cultures. Pure cultures were maintained on PDA slants for further studies. Pathogenicity was proved by attached leaf method under natural conditions to ensure Koch's Postulate; pathogenicity was confirmed by attached leaf method under greenhouse conditions. The leaves were pin pricked using sterilized needle and cultures were inoculated on the respective leaves in triplicate under aseptic conditions.

RESULTS AND DISCUSSION

The legume crops were surveyed periodically in five locations of Raipur districts. Symptoms appeared on the leaves were circular, dot like, brown, reddish brown, black chlorotic or necrotic spots. Collection of the infected leaves for isolation was preferably done during the months having moderate temperature and higher relative humidity conditions. Altogether 17 pathogens were isolated of which viz. two isolates of *Alternaria chlamydospora* (AC) and one isolate of *Alternaria raphani* (AR), have been obtained from *Vigna radiata* (VR) having dark brown, circular, necrotic spots. The degree of infection was found severe and percentage of disease intensities very high. *Alternaria raphani*(AR), *Alternaria citri*(AC) & *Phoma crysanthemicola* (PC) have been obtained from *Trigonella foenum-graecum* (TFG). With dark brown, circular, necrotic spots and black, hard circular necrotic spots. The degree of infection and disease intensities were found to be moderate. *Alternaria teunissima* and *Cladosporium sphaerospermum* were obtained from *Lathyrus sativus* having blight, dark brown necrotic spots were observed in case of *Alternaria teunissima* whereas














black, dot spots were observed on the leaves infected by *Cladosporium sphaerospermum*. Degree of infection and disease intensities were found severe and moderate respectively. Similarly, *Alternaria alternata* and *Cladosporium sphaerospermum* were obtained from *Lens culinaris* with dark brown, circular necrotic spots and black, dot spots in case of *Cladosporium sphaerospermum*. Degree of infection and disease intensities were found to be moderate and mild respectively. *Fusarium semitectum* and *Corynespora cassiicola* were obtained from *Vigna mungo* with reddish brown, circular necrotic spots and severe degree of infection and disease intensities in both species. *Alternaria citri* and *Alternaria raphani* were obtained from *Pisum sativum* and *Pisum arvense* which exhibited symptoms of reddish brown, circular necrotic spots and then degree of infection and disease intensities were found to be severe. *Cladosporium sphaerospermum* was obtained from *Cajanus cajan*. Brown, yellow with chlorotic spots were observed and degree of infection and disease intensities was moderate. *Glomerella cingulata* and *Colletotrichum dematium* showed same symptoms of reddish brown, circular necrotic spots but degree of infection and disease intensities were found severe and moderate respectively. (Table-1)












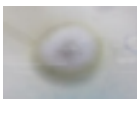


The present work has been associated with survey and screening of the fungal pathogens from highly nutritious legume crops. The degree of infection was found mild to severe. All the isolates were influenced by moderate temperature and high humid conditions.

From the result obtained it is clear that out of seventeen pathogens, *Alternaria spp.* appeared to be the most dominant pathogen. The healthy crops attacked by the pathogens causes retardation of plant growth as well as the gross production of the crops which results in economic loss. Protective measures should be taken in account to overcome the disease severity and loss of the major pulse crops of Chhattisgarh.

Table 1: Survey, Isolation, Disease Intensity and Degree of Infection of different crops

S. No	Crop Host	Pathogen	Isolation Code	% Disease Intensity	Degree of Infection	Symptoms
1	<i>Vigna radiata</i>	<i>Alternaria chlamydospora</i>	AC	80%	Severe	Dark brown circular, necrotic spots
		<i>Alternaria raphani</i>	AR	90%	Severe	
		<i>Alternaria chlamydospora</i>	AC	90%	Severe	
2	<i>Trigonella foenum-graecum</i>	<i>Alternaria raphani</i>	AR	50%	Moderate	Black hard, circular necrotic spots Black, circular, hard spots Dark brown, circular, spots
		<i>Phoma crysanthamicola</i>	PC	60%	Moderate	
		<i>Alternaria citri</i>	AC	60%	Moderate	
3	<i>Lathyrus sativus</i>	<i>Alternaria tuenissima</i>		80%	Severe	Blight, dark brown spots Black, pin head like dot spots
		<i>Cladosporium sphaerospermum</i>		60%	Moderate	
4	<i>Lens culinaris</i>	<i>Alternaria alternata</i>	AA	70%	Moderate	Dark brown circular necrotic spots Black dot spots
		<i>Cladosporium sphaerospermum</i>	CS	20%	Mild	
5	<i>Vigna mungo</i>	<i>Fusarium semitectum</i>	FS	80%	Severe	Reddish brown circular, necrotic spots
		<i>Corynespora cassiicola</i>	CC	80%	Severe	
6	<i>Pisum Sativum</i>	<i>Alternaria citri</i>	AC	80%	Severe	Reddish brown, necrotic spots
7	<i>Pisum arvense</i>	<i>Alternaria raphani</i>	AR	80%	Severe	Reddish brown, necrotic spots
8	<i>Cajanus cajan</i>	<i>Cladosporium sphaerospermum</i>	CS	60%	Moderate	Brown, yellow chlorotic spots
9	<i>Glycine max</i>	<i>Glomerella cingulata</i>	GC	80%	Severe	Reddish brown circular, necrotic spots
10	<i>Dolichos lab-lab</i>	<i>Colletotrichum dematium</i>	CD	60%	Moderate	Reddish brown circular, necrotic spots

						
<i>Vigna radiata</i>	<i>Vigna radiata</i>	<i>Vigna radiata</i>	<i>Trigonella foenum- graecum</i>		<i>Trigonella foenum- graecum</i>	<i>Lathyrus sativus</i>
						
<i>Alternaria chlamydospora</i>	<i>Alternaria raphani</i>	<i>Alternaria chlamydospora</i>	<i>Alternaria raphani</i>	<i>Alternaria citri</i>	<i>Phoma crysanthamicola</i>	<i>Alternaria. tuenissima</i>

						
<i>Lathyrus sativus</i>	<i>Lens culinaris</i>	<i>Lens culinaris</i>	<i>Vigna mungo</i>	<i>Vigna mungo</i>	<i>Pisum Sativum</i>	<i>Pisum arvense</i>
						
<i>Cladosporium sphaerospermum</i>	<i>Alternaria alternata</i>	<i>Cladosporium sphaerospermum</i>	<i>Fusarium semitectum</i>	<i>Corynespora cassiicola</i>	<i>Alternaria citri</i>	<i>Alternaria raphani</i>







		
<i>Cajanus cajan</i>	<i>Glycine max</i>	<i>Dolichos lab-lab</i>
		
<i>Cladosporium sphaerospermum</i>	<i>Glomerella cingulata</i>	<i>Colletotrichum dematium</i>

Figure: Disease symptoms and isolation of the fungal pathogens from different leguminous crops

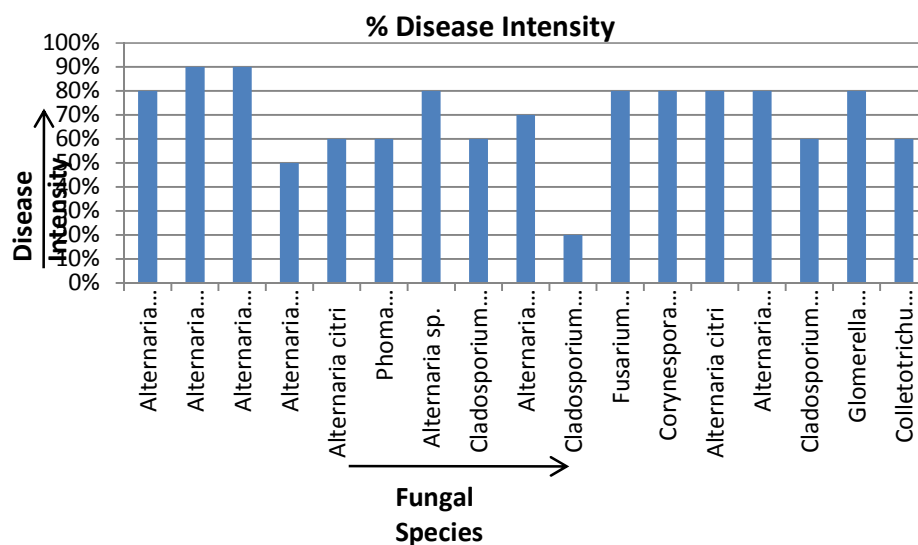


Figure: Disease Intensity of different pathogens

REFERENCES

- Dixon R.A., Achnine L., Kota P., Liu C.J., Reddy M.S.S. and Wang L., 2002. The phenylpropanoid pathway and plant defense: a genomics perspective. *Mol Plant Pathol.*, **3**:371–390.
- Grusak M.A., (2002a). Enhancing mineral content in plant food products. *J. Am. Coll. Nutr.*, **21**: 178–183.
- Grusak M.A., (2002b). Phytochemicals in plants: genomics-assisted plant improvement for nutritional and health benefits. *Curr. Opin. Biotechnol.*, **13**(50):8–511.
- Madar Z. and Stark A.H., 2002. New legume sources as therapeutic agents. *Br. J. Nutr.*, **88**:287–292.
- Ndakidemi P.A. and Dakora F.D., 2003. Review: legume seed flavonoids and nitrogenous metabolites as signals and protectants in early seedling development. *Funct. Plant Biol.*, **30**:729–745
- Sharma A.K., 1987. Seed mycoflora of soybean and its pathology in the north western hills. *Seed Res.*, **15**(1):60-65
- Singh J. and Basu P.S., 2012. Non-nutritive bioactive compounds in pulses and their impact on human health. An overview. *Food and Nutrition Sciences*, **3**:1664-1672.