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Prevalence of *Alternaria* leaf spot disease of Blond psyllium (*Plantago ovata*) and its control by chemicals

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Abstract

The study was carried out to know the prevalence of *Alternaria* leaf spot of isabgol (*Plantago ovata* Forssk.) in Zone III-B of Rajasthan caused by *Alternaria alternata* and its management through chemicals. The disease intensity was maximum (36.00%) at village Bhadwa in Parbatsar and minimum (16.00%) in Dhankoli Village of Moulasar Tehsil in Nagaur during Rabi, 2016-17. Among five chemicals tested in vitro and in vivo, propiconazole gave cent per cent inhibition of mycelial growth at 300 ppm concentration. Two sprays of propiconazole (0.1%) at 7 days interval from disease initiation was found most promising in reducing the disease intensity (68.17%) followed by azoxystrobin (66.24%).

Keywords: Prevalence, *Alternaria*, psyllium, *Plantago ovata*

Introduction

Blond psyllium (*Plantago ovata* Forssk.) commonly known as “Isabgol”, is an annual herb with narrow linear rosette like leaves belonging to the family *Plantaginaceae*. Among 200 species of blond psyllium, *Plantago ovata* Forssk is known for superior quality of husk. Isabgol seeds and husk is used in medicines especially for relieving constipation. Isabgol is an important cash crop cultivated for its export and being of important medicinal value is reported to have larger demands and is traded in major medicinal drug markets of the world. India commands nearly monopoly in the production and export of the seed and husk to the world market. India is earning about Rs. 1600 million as foreign exchange from the export of blond psyllium products to countries like USA, Germany, France, England, Spain and Belgium (Maiti, 2000) ^[4]. In India, the isabgol crop is mainly grown as commercial crop in Gujarat, Rajasthan and Madhya Pradesh. However, the crop is spreading to other non-traditional parts of the country such as Haryana, Uttar Pradesh and Karnataka. In Rajasthan, it is being cultivated in 304430 hectare area with a total production of 144177 tonnes of seeds with an average productivity of 474 kg/ha (Anonymous, 2015-16) ^[2]. In Rajasthan, isabgol mainly cultivated in Barmer, Jalore, Nagaur, Jodhpur, Pali, Sirohi, Chittorgarh, Udaipur and Jaisalmer districts. In recent years the area of the crops spreading in Nagaur district. *Alternaria* leaf spot of isabgol (*Plantago ovata* Forssk.) caused by *Alternaria alternata*, has become a severe problem in Isabgol growing areas of Rajasthan. Sharma and Pandey (2013) ^[9] have been carried out field survey of the major cumin diseases in Ajmer, Nagaur, Barmer, Jalore, Jodhpur, Jaisalmer and Pali districts of Rajasthan and reported disease intensity up to 80.00%. Meena and Maharishi (2013) ^[6] tested six fungicides to control leaf blight of isabgol caused by *Alternaria alternata* and observed that Bavistin and Topsin M gave effective control of the disease. Several factors limiting the productivity of this crop and lack of knowledge of disease management is the major constraints to its productivity. Therefore, it is imperative to know the status of *Alternaria* leaf spot of isabgol (*Plantago ovata* Forssk.) in Zone III-B of Rajasthan and its management through fungicides.

Material and Method

Survey

Survey was conducted to assess the intensity of *Alternaria* leaf spot of isabgol in Zone III-B of Rajasthan. The fields were visited in major isabgol growing areas which includes villages in Parbatsar; Kuchaman, Makrana, Moulasar tehsils of Nagaur district of Rajasthan.

To assess the intensity of disease two fields randomly selected and 10 square meter area marked in each field in each village and per cent disease intensity was observed at 60 days after sowing. Observations on per cent disease intensity (PDI) was recorded by using 0-5 disease rating scale of Rathore and Pathak (2001) where, 0 = plant completely free from disease symptoms; 1=20% leaf area of a plant covered with leaf spot; 2=21-40% leaf area of a plant covered with leaf spot; 3=41-60% leaf area of a plant covered with leaf spot; 4=61-80% leaf area of a plant covered with leaf spot; 5=More than 80% leaf area of a plant covered with leaf spot and per cent disease intensity (PDI) was calculated as per formula given by McKinney (1923) as follows:

$$\text{Per cent disease intensity} = \frac{\text{Sum of all individual ratings}}{\text{Number of leaves observed X Maximum disease rating}} \times 100$$

Efficacy of fungicides (*in vitro*)

To test the efficacy of fungicides, the test fungus was grown on PDA in which the desired quantity of fungicides was incorporated to obtain three different concentrations viz., 100, 300 and 500 ppm. Desired quantity of chemical was mixed thoroughly in 100 ml of PDA, just before pouring in sterilized Petri plates and allowed to solidify. A mycelial disc of 2 mm diameter of the pathogen was taken from a 10 days old culture with the help of sterilized cork borer and then placed at the center of the Petri plate. The inoculated Petri dishes were incubated at 25 ± 1 °C in BOD. The experiment was conducted following Completely Randomized Design (CRD) with four replications. Mycelial growth was measured diagonally after 7 days of inoculation. Per cent growth inhibition was calculated as per formula of Vincent (1947)^[11]:

$$\text{Per cent growth inhibition} = \frac{C-T}{C} \times 100$$

Where,

C = Diameter of the colony in check (average of both diagonals)

T = Diameter of the colony in treatment (average of both diagonals)

Efficacy of fungicides (*in vivo*)

An experiment was conducted during *rabi* 2016-17 with local susceptible cultivar of isabgol with four replications. Artificial inoculation was done with spore suspension (1×10^5 spore/ml) of *Alternaria alternata* and after four days of inoculation of the culture, each fungicide was sprayed and repeated after seven days of first spray. The observations on disease intensity were recorded after 10 days of last spray.

Result and Discussion

During the survey, discussions were held with the farmers concerned, regarding occurrence and intensity of the disease. As a result of this discussion, it is apparent from the data depicted in (Table-1) that *Alternaria* leaf spot intensity was more severe in Isabgol growing districts of Rajasthan. The disease intensity of *Alternaria* leaf spot of Isabgol was recorded from 16.00 to 36.00 per cent in surveyed areas of Rajasthan. The maximum intensity 36.00 per cent was noted

in Bhadwa village of Parbatsar tehsil of Nagaur district followed by Saranwada (31.00%) in Makrana tehsil of Nagaur and it was minimum in Dhankoli (16.00%) village in Moulasar tehsil of Nagaur. Survey for occurrence and distribution of disease was necessary because there are no reports and records on this disease. However, Sharma and Pandey (2013)^[9] have been carried out field survey of cumin diseases in Ajmer, Nagaur, Barmer, Jalore, Jodhpur, Jaisalmer and Pali districts of Rajasthan and reported disease intensity up to 80.00%.

Among five fungicides tested *in vitro* (Table 2), propiconazole gave cent per cent inhibition of mycelial growth of *Alternaria alternata* at 300 ppm concentration followed by azoxystrobin at 500 ppm while least effective was mancozeb. It has been observed that propiconazole is one of the most suitable and safer fungicide for foliar diseases like *Alternaria* blight. Our results are in accordance with the findings of Akbari and Parakhia (2007)^[11], Singh and Rai (2003)^[10] and Kumari *et al.* (2006).

Results of two foliar sprays of fungicides at a 7 days interval (Table 3) revealed that minimum disease intensity (19.80%) was recorded with propiconazole (0.1%) and it was significantly superior over control followed by azoxystrobin (21.00%). The least effective fungicide was mancozeb (36.30%) followed by carbendazim + mancozeb (34.00%). Present results are well supported by the findings of several workers like Singh and Rai (2003)^[10], Patel and Patel (2008)^[7] and Meena and Maharishi (2013)^[6] in controlling *Alternaria* leaf blight of various crops including isabgol.

Table 1: Survey of leaf blight in isabgol growing areas in Nagaur district of Rajasthan

S. No	Teshil	Name of village	Per cent disease intensity (60 days after sowing)
1	Prabatsar	Bhadwa	36.00
		Naniya	29.00
2	Kuchaman	Chavandiya	24.00
		Kukanwali	27.00
3	Makrana	Saranwada	31.00
		Ranigaon	26.00
4	Moulasar	Sudarsan	23.00
		Dhankoli	16.00

Table 2: Efficacy of fungicides on mycelial growth inhibition of *Alternaria alternata* after 7 days of incubation at 25 ± 1 °C

Treatment	Mycelial growth inhibition			Mean
	100 ppm	300 ppm	500 ppm	
Hexaconazole	72.00	78.33	84.44	78.26
	(58.05)	(62.26)	(66.77)	
Mancozeb	54.60	58.35	68.55	60.50
	(47.64)	(49.81)	(55.89)	
Carbendazim + Mancozeb	60.25	70.15	75.20	68.53
	(50.91)	(56.88)	(60.13)	
Propiconazole	75.00	100.00	100.00	91.67
	(60.00)	(90.00)	(90.00)	
Azoxystrobin	68.00	90.11	100.00	86.04
	(55.55)	(71.67)	(90.00)	
Control	0.00	0.00	0.00	-
	S.Em+	CD (P= 0.05%)		
F	1.17	3.23		
C	1.65	4.57		
F x C	2.86	7.91		

*Average of four replications

Figures given in parentheses are angular transformed values

Table 3: Efficacy of fungicides against *Alternaria alternata* of is abgol

S. No.	Fungicides	Dose g/l	Per cent disease intensity	Per cent disease reduction over control
1	Hexaconazole	1.0	30.80 (33.71)	50.48
2	Mancozeb	2.5	36.30 (37.05)	41.64
3	Carbendazim+ Mancozeb	2.0	34.00 (35.67)	45.34
4	Propiconazole	1.0	19.80 (26.42)	68.17
5	Azoxystrobin	1.0	21.00 (27.27)	66.24
6	Control	0.00	62.20 (52.06)	0.00
	S.Em+		0.76	
	CD =0.05)		2.33	

* Average of four replication

Figures given in parenthesis are angular transformed value

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