

Blight Disease of Linseed with Its Effects on Oil Quality and Chemical Control

Abstract

Linseed crop is common crop of northern Bundelkhand region in Ravi crop, but day by day production rate of linseed and oil quality is decreasing due to some microbial or fungal infection. More than 70% population of this area depend on agriculture and its related job, but due to these infections crop yield is not proper as wanted. Present study have been conducted how *Alternaria lini* effect on oil yield and oil quality. Some chemical methods have been given here to cure the crop. chemical methods have been done by using some chemical like Tilt, Vitavax, Matco, Rovral, Thiram, Captafol, Captan, Ridomil, & Indofil M-45. But out of 9 chemical tested, three fungicides viz., Tilt, Vitavax and Matco proved to be the most effective ones as they inhibited the growth of the pathogen completely.

Keywords: *Alternaria lini*, *Linum usitatissimum*, Chemicals.

Introduction

Linseed or flax (*Linum usitatissimum L.*) is one of the most important oilseed crop of temperate and subtropical regions of world. India ranks second in area (4.37lac/ha) and fourth in production (1.68lac tonnes) after Canada, China and USA. Srivastava R.L. (2010). The major linseed growing states are Uttar Pradesh, Madhya Pradesh, Chattisgarh, Rajasthan, Bihar and Jharkhand. Madhya Pradesh has largest growing area (1.255 lac / ha) and production (0.479 lac tonnes) but maximum yield has been found in Bihar (851kg/ha) Anonymous 2010. Crop has many industrial and medicinal uses in addition to its direct food value . Despite considerable increase in productivity and production a wide gap exists between potential yield and the yield realized at farmer's field which is largely because of a number of biotic and a biotic stresses, to which linseed crop is exposed. Linseed contains 40% oil, 30% dietary fiber, 20% protein, 4% ash & 6% moisture. The crop is affected by some diseases like *Alternaria* blight, powdery mildew, rust and wilt. *Alternaria* blight caused by *Alternaria lini* is one of the major limiting factors of linseed (*Linum usitatissimum L.*) cultivation in Uttar Pradesh. The disease appear on all the aerial parts of the plant, resulting leaf and bud blight and ultimately causes substantial losses in yield from 18 to 43.9%. During the routine field and a near by village's survey, the infection of *Alternaria* blight disease was noticed during flowering stage of linseed plants under field conditions of Hamirpur district. Application of chemical fungicide (carbendazim) against blight of linseed caused by *Alternaria linicola* has been reported from Kanpur. Present experiment was aimed to determine the comparative study of fungicides for the effective management of linseed blight. There are so many drugs have been prepared by *linseed* to cure high blood pressure heart disease and various allergies.

Materials and Methods

Survey and Collection of Samples

A regular and constant survey of linseed crops grown at agriculture fields of Rath (Hamirpur) U.P. was made the diseased leaves and bud of linseed showing the characteristic symptoms of different stages were collected in polythene bags. Sterilized throughly with the help of cotton dipped in alcohol then samples were brought to laboratory for examination and isolation of the pathogen. All the work was done in sterilized and aseptic conditions.

Sterilization of Petri Plates and other Materials

In order to make the experiment free from unwanted microbes sterilization is prerequisite. For the sterilization of glassware, first the petriplates and other glassware were thoroughly washed with detergent, water and then sun dired. After washing, Petri plates were sterilized in the oven at 160-180°C for 4-6 hours.

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Many small instruments like forceps, scalpels, needles, bores etc. were ordinarily sterilized by dipping them in 95% alcohol followed by flaming. These instruments are repeatedly sterilized during the operation to avoid contamination. The mouths of culture vessels were also flamed before pouring or inoculation.

Before inoculation and pouring of the media, hands are repeatedly sterilized with 75% alcohol to avoid contamination.

Laminar Air Flow

Inoculation of fungus into the Petri plates was done under laminar air flow. Before each experiment, ultra violet radiations were given on for 15 minutes to kill the microbes. After switching of U.V. radiations, the inoculation was done.

Isolation and Identification of Fungal Pathogen (*Alternaria lini*)

Pathogen was isolated from infected linseed leaves and buds. The infected leaves were surface sterilized with 0.1 per cent mercuric chloride (HgCl₂) solution, thrice rinsed with sterilized distilled water. Transferred aseptically into petri plates containing melted PDA medium and then small pieces of infected leaf were kept aseptically on media inside petri plates. These petri plates were kept in inverted position for incubated at 25 ± 2°C in incubator. On 2nd day whitish mycelial colony was observed in petri plates and this colony gradually changed into blackish in colour. Some part of colony was taken and slide was prepared by using the method of 1 observed under the microscope Conidiophores were branched, septate, dark in colour and produced mariform conidia.

Pathogenicity Test (Maiti et al., 2007)

The pathogenicity test of the isolated fungus was made on healthy bud/leaves of host plant in order to establish the pathogenic nature of the fungus. The pathogenic nature of the fungus was tested according to Koch's postulates. For pathogenicity test : Plants were grown in sterilized pots by sowing sterilized healthy seeds of linseed variety Chambal.

Chemical Control

In vitro effect of some fungicides was tested in the present study to select the best fungicide which can inhibit the growth of the pathogen to maximum extent. The following 09 fungicides belonging to different groups were tested. This could be achieved by the food poison technique (Schmitz, 1930). The requisite quantity of each fungicide was added in two per cent P.D.A. media thoroughly mixed by shaking prior to pouring in sterilized Petri plates. The media was allowed to solidify and then inoculated with 5 mm disc of inoculums 7 Days old culture of the pathogen. The fungal discs were reversed so that the pathogen could come in contact with the media directly. Three replication were kept for each treatment. The Petri plates were incubated in B.O.D. at temperature (25±2 °C along with one set of control in which the media was not mixed with any fungicides but simply inoculated with pathogen. the radial growth of fungal colony were measured in mm after 24 hours till the fungal colony fully covered that control Petri plates. the per cent inhibition over control was calculated by the following formula (Vincent, 1974).

$$\text{Percent (\%)} \text{ inhibition over control} = \frac{C - T}{C} \times 100$$

Where,

C = Growth of fungus in control

T = Growth of fungus in treatments.

Table - 1
Active Ingredients and Doses of Fungicides Used in Experiment

S. No.	Name of Fungicide	Active Ingredient	Doses (%)
1	Tilt	1-[2-(2,4-dichlorophenyl)- 4-propyl 1, 3 dioxalan- 2yl methyl] – IH -1, 2, 4-triazole	0.2
2	Vitavax	5,6-dihydro-2methyl-1,4-oxathin-3-carboxanilide	0.2
3	Matco	Metalaxyl 8% + Mancozeb 64% WP	0.2
4	Rovral	[3-(3,5 dichlorophenyl)-N-isopropyl 2, 4-dioximidazolidine – 1 carboxamide]	0.2
5	Thiram	80% Tetramethyl thiuram disulphide	0.2
6	Captafol	[N(1,1, 2,2-tetrachloro ethyl sulfenyl), CIS-4 cychohexane -1,2-dicarboximide]	0.2
7	Captan	50% N Trichloromethyl thio-4 cyclohexene – 1,2 dicarboximide	0.2
8	Ridomil	Methyl – DL-N-(2,6-dimethyl phenyl – N) 2 methoxyacetyl – alanate	0.2
9	Indofil M-45	Managanese ethylene bisdithiocarbamate + Zincion	0.2

Results

Alternaria lini cause a brown and black target like lesion on the leaf and buds. Lesions can cover the whole leaf surface and lead to curled and dried of bud of linseed which cause failure of flower to open during the day (Fig. No. 1&2)



Fig. 1 Symptoms on Leaves of Linseed Plants Identification

Identification of the isolated pathogen was done on the basis of morphological characters and the characters were same as reported by Dey, (1933) For *Alternaria lini* the morphological characters of the isolated pathogen are given below (Fig No. 2) :

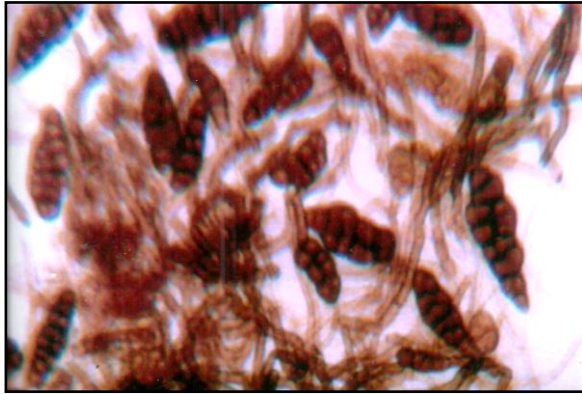


Fig. 2 Conidiophore bearing conidium of *Alternaria lini*

Hyphae

Septate, branched, hyaline later turning to pale then olive grey. The mycelial width was 3.0 – 5.3 µm.

Conidiophores

Septate, erect, branching or non-branching geniculate, olive buff to dark olive buff, 21.5 – 100.5 µm wide.

Conidia

Conidia are formed singly or in branches chain, consisting 02-10 spores, smooth or verruculose, linear to obclavate, dark olive to buff in colour, provided with 1-7 cross and 1-5 longitudinal septa and often with short conical or cylindrical beak, light brown to dark olive buff, measuring 1.5-45.6 x 7.0 – 3.5µm in size, beaks usually light colour measuring 3.5-18.0 x 3.0 – 65. µ m.

Pathogenicity

The pathogenicity test of the purified isolate (Fig. No. 4) was carried out on cotyledon stage at 15 days and 75 days old plants (bearing buds and flowers) of linseed variety chambal. The plants were raised from the surface sterilized seed in pots, filled with autoclaved soil by the technique described under materials and methods. Ten plants per pots were raised and three replications were taken for the study. Some leaves were inoculated by the pathogen by spraying.

The inoculated plant were covered with polythene bags for 24 hours and then placed in laboratory. The leaves and buds were watched daily for the development of disease symptoms. In present study the percentage disease severity was recorded 40-60% in case of leaves after 48 hours of inoculations (Table No. 1)

In case of buds the percentage disease severity was recorded 40%. The symptoms resumed their natural appearance within 48 hours after inoculation (Table No. 2 and fig No.4)

Table - 1

Percentage Disease Severity on Linseed Leaves Inoculated with "*Alternaria lini*"

Treatment	No of leaves inoculated	No. of leaves infected	Disease severity (%)
Upper surface	70	34	48.57 %
Lower surface	70	38	54.28 %
Control	70	Nil	Nil

Table - 2
Percentage Disease Severity on Linseed Buds with "*Alternaria lini*"

Treatment	No of leaves inoculated	No. of leaves infected	Disease severity (%)
Inoculated buds	60	28	46.66 %
Control	60	Nil	Nil



Fig. No. 3 Inoculated Plants with *Alternaria lini*

Discussion

The disease symptoms initially appear as light brown to black dots like spots on stem and leaves. Minute dark brown to black spots appeared near the base of calyx, which enlarged later, differed in colour and spread all over the bud passing in to the pedicle the symptoms were same as reported by Dey. 1933.

The pathogen was isolated and indentified as *Alternaria lini* because, its morphological characters which were closely resembling with the description given by Dey. (1933).

During the pathogenicity test of the leaf spot and black bud disease, pathogen (*Alternaria lini*) has been found to parasitize the leaves, floral organs and buds causing seedling blight leaf spot and black bud. The most common symptoms of this disease were leaf spot and black bud. The affected buds in most of the cases were completely replaced by fungal mycelium and conidia. The affected capsule may contain deformed, discoloured and blighted seeds. Similar type of symptoms were observed by Dey. (1933)

The pathogenic fungus (*Alternaria lini*) was isolated from the affected tissues on potato dextrose agar medium. The isolated pathogen produced a similar cultural character which was similar to the description given by Siddiqui, (1963) and Simmons, (1967).

The disease control through use of chemical is widely practiced. A total of 9 fungicides were evaluated to find their fungi toxicity against *Alternaria lini*, the causal organism of *Alternaria* blight in linseed. All the chemical fungicides tested were effective as fungi toxic. However, Tilt, Vitavax and Matco (64 %) Mancozeb, 8 % Metalaxyl) checked the growth completely.

The other effective fungicides in order of superiority were Rovral, Thiram. Captafal, Captan, Ridomil, Indofil M-45.

Seven fungicides found effective under laboratory tests were further tested in field as spray. (Comstock and Ferreira, 2002).

The superiority in disease control was as follows Tilt > Matco > Rovral > Captafal > Indofil M-45. Tilt or propiconazole was reported to be highly toxic for *Alternaria macrosora*. The findings were similar to our results.

Vitavax was found very effective for control of cotyledons leaf blight (Singh *et al.*, 2001) Matco may be effective because it contains 64 percent Mancozeb and Metalaxyl.

Effectiveness of rural (Iprodione) is in confirmation to the finding of Singh and Singh, (2004). *Alternaria* leaf spot of mustard was controlled by Indofil M-45, which was reported to be effective fungicide by earlier workers (Singh, 2002), was effective in present study most be effective

The systemic fungicides viz., Bavistin, Benlate and rock (thiophanate methyl) were more effective, reducing silt by 82.4, 69.0 and 53.5 % respective order and statistically at par with Thiram, Agrosan G.N. Captan and Vitavax. (Kishore and Singh, 2008).

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