



ISSN NO. 2320-5407

Journal homepage: <http://www.journalijar.com>
Journal DOI: [10.21474/IJAR01](https://doi.org/10.21474/IJAR01)

INTERNATIONAL JOURNAL
OF ADVANCED RESEARCH

RESEARCH ARTICLE

Local land races of linseed from Odisha: their reaction to diseases

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Manuscript Info

Manuscript History:

Received: 14 February 2016
Final Accepted: 13 March 2016
Published Online: April 2016

Key words:

Alternaria blight, linseed, local land races, oil flax, powdery mildew, resistance, wilt.

Abstract

Sixty one local land races (LLRs) of linseed were collected from different parts of Odisha. They were field-screened for resistance to blight (caused by *Alternaria lini* Dey), powdery mildew (caused by *Oidium lini* Skorik) and wilt (caused by *Fusarium oxysporum* f.sp. *lini* (Bolley) Snyder and Hansen). All the LLRs were susceptible to *Alternaria* blight. Six entries, namely, OLC 2, 6, 7, 13, 55 and 57 were resistant to powdery mildew. With regard to wilt, OLC 22 and 37 were immune whereas six entries, namely, OLC 11, 31, 36, 47, 58 and 60 were resistant.

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Introduction

Linseed or oil flax (*Linum usitatissimum* L.) is the second most important *rabi* (winter) oilseed crop and stands next to rapeseed- mustard in area and production in India. It has an important position in Indian economy due to its wide industrial utility. But, the national average productivity of linseed is quite low. As per FAOSTAT (2014), India ranks 4th among world's linseed producing countries. However, in terms of productivity, India (392 kg/ha) is far below than Switzerland (2647 kg/ha), Tunisia (2633 kg/ha), U.K. (2600 kg/ha), France (2121 kg/ha) and New Zealand (1853 kg/ha). In India, during 2013-14 linseed is grown in an area of 292.1 thousand hectares with annual production of 141.2 thousand tonnes and productivity of 484 kg/ha. Out of 15 linseed growing states, the major are Madhya Pradesh (110.4 thousand ha), Maharashtra (31.0 thousand ha), Chhattisgarh (26.2 thousand ha), Uttar Pradesh (26.0 thousand ha), Jharkhand (25.5 thousand ha), Odisha (22.9 thousand ha) and Bihar (18.7 thousand ha). In Odisha, the annual production is 11 thousand tonnes with productivity of 478 kg/ha (Anonymous, 2015a, b).

The North Central Plateau Zone of Odisha comprising the districts of Mayurbhanj and Keonjhar contributes to about 50.6 % of the total linseed area of the state of Odisha (Anonymous, 2015b). However, a significant number of farmers are forced to sow linseed one month late due to excess moisture in the field. Seed setting is highly affected due to higher temperature during later phase of growth decreasing seed yield significantly (Dash *et al.*, 2011). Further, the crop is prone to diseases *viz.* blight (caused by *Alternaria lini* Dey) and powdery mildew (caused by *Oidium lini* Skorik) due to late sowing. Again, when linseed is continuously grown in a field, wilt (caused by *Fusarium oxysporum* f.sp. *lini* (Bolley) Snyder and Hansen) emerges as a malady in this area. So, we need a high yielding linseed variety for late sown conditions with resistance to blight, powdery mildew and wilt. With this objective, field screening of linseed local land races for resistance to *Alternaria* blight, powdery mildew and wilt was initiated.

Material and Methods

Sixty one local land races (LLRs) of linseed were collected from different parts of Odisha in India (Table 1). They were purified for two seasons and sown one month late during November, i.e., on 22.11.2006 and 22.11.2007. Two

field screening trials were laid out in observation strips with two replications each at the Regional Research and Technology Transfer Sub-station of OUAT at Jashipur, Mayurbhanj, Odisha, India (latitude : 21° 57' N, longitude : 86° 06' E, altitude : 400 m above mean sea level, annual rainfall : 1475 mm, soil : red lateritic, sandy loam and acidic). One trial was for screening *Alternaria* blight and powdery mildew, and another for wilt in wilt-sick plot. Each LLR was sown in a single row of 4 m length with a spacing of 25 cm × 5 cm between and within the row, respectively. The sowing depth was 2-3cm. Recommended package of practices was followed to raise a good crop.

All the LLRs were assessed visually for both *Alternaria* blight and powdery mildew based on percentage of leaf area affected using 0-5 scale (Anonymous, 1991) as detailed below:

0=Free (F)
 1=0.1 to 10% leaf area affected (R)
 2=10.1 to 25 % leaf area affected (MR)
 3=25.1 to 50 % leaf area affected (MS)
 4=50.1 to 75 % leaf area affected (S)
 5=75.1 to 100 % leaf area affected (HS)

In case of wilt, the LLRs were assessed visually based on percentage of infected plants for each entry in wilt-sick plot and categorized into six types (Singh *et al.*, 2010) as detailed below:

No wilt disease = Immune
 Up to 5% wilt = Resistant
 6 to 10% wilt = Moderately Resistant
 11 to 20% wilt = Moderately Susceptible
 21 to 50% wilt = Susceptible
 Above 50% wilt = Highly Susceptible

Result and Discussion

None of the LLRs were free, resistant or moderately resistant to *Alternaria* blight (Table 2). With regard to powdery mildew, none of the LLRs was free; six entries, namely, OLC 2, 6, 7, 13, 55 and 57 were resistant and fifty four were moderately resistant. The results of wilt screening showed that OLC 22 and 37 were immune whereas six entries, namely, OLC 11, 31, 36, 47, 58 and 60 were observed to be resistant (Table 3), and OLC 5, 8, 41, 44 and 50 were moderately resistant.

Table 1: Collection of 61 local land races of linseed in Odisha

| Name of Districts | Name of Blocks | No. of Accessions | Accession No. of Local Land Races |
|-------------------|---|-------------------|-----------------------------------|
| Mayurbhanj | Jashipur, Kusumi, Karanjia, Raruan, Tiring, Bijatala, Bisoi | 47 | OLC 1 to 21, 24 to 27, 40 to 61 |
| Keonjhar | Keonjhar | 02 | OLC 22 to 23 |
| Nuapada | Khariar, Komna | 09 | OLC 28 to 36 |
| Nowrangpur | Umerkote, Jharigaon | 02 | OLC 37 to 38 |
| Nayagarh | Nuagaon | 01 | OLC 39 |
| Total | | 61 | |

Table 2: Reaction of 61 local land races of linseed to *Alternaria* blight and powdery mildew over two years

| Scale (0-5) | Category | Local land races | |
|-------------|----------|---|---|
| | | <i>Alternaria</i> blight | Powdery mildew |
| 0 | F | NIL | NIL |
| 1 | R | NIL | OLC 2, 6, 7, 13, 55, 57 (06) |
| 2 | MR | NIL | OLC 1, 3, 4, 5, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 48, 49, 50, 51, 52, 53, 54, 56, 58, 59, 60, 61 (54) |
| 3 | MS | OLC 3, 4, 6, 9, 36, 37, 38, 41, 53, 57, 59 (11) | OLC 47 (01) |
| 4 | S | OLC 2, 5, 7, 8, 11, 12, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30, 31, 33, 34, 39, 43, 45, 46, 48, 49, 51, 52, 54, 55, 56, 60, 61 (38) | NIL |
| 5 | HS | OLC 1, 10, 18, 29, 32, 35, 40, 42, 44, 47, 50, 58 (12) | NIL |

NB: F = Free; R = Resistant; MR = Moderately Resistant; MS = Moderately Susceptible; S = Susceptible; HS = Highly Susceptible

Table3: Reaction of 61 local land races of linseed to wilt over two years

| Wilt (%) | Category | Local land races |
|----------|----------|--|
| 0 | I | OLC 22, 37 (02) |
| Up to 5 | R | OLC 11, 31, 36, 47, 58, 60 (06) |
| 6 to 10 | MR | OLC 5, 8, 41, 44, 50 (05) |
| 11 to 20 | MS | OLC 13, 21, 28, 29, 30, 52, 59 (07) |
| 21 to 50 | S | OLC, 1, 6, 18, 19, 45, 57, 61 (07) |
| Above 50 | HS | OLC 2, 3, 4, 7, 9, 10, 12, 14, 15, 16, 17, 20, 23, 24, 25, 26, 27, 32, 33, 34, 35, 38, 39, 40, 42, 43, 46, 48, 49, 51, 53, 54, 55, 56 (34) |

NB: I= Immune; R = Resistant; MR = Moderately Resistant; MS = Moderately Susceptible;
S = Susceptible; HS = Highly Susceptible

Conclusions

All the local land races were susceptible to *Alternaria* blight. The resistant lines to powdery mildew, and the immune and resistant ones to wilt should be evaluated under artificial conditions to confirm the resistance before utilizing them in breeding programme.

Acknowledgement

The author thanks Dr. Devraj Lenka, Mr. Rabiratna Patel, Mr. Bishnu Prasad Jena, Mr. Mahendra Mallick, Mr. Chaitan Mohanta and Dr. Pramod Chandra Satapathy for their help in collection of local land races.

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