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RESEARCH ARTICLE

Field screening of linseed genotypes for resistance to wilt in the north central plateau zone of Odisha

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Abstract

Two hundred ninety two genotypes of linseed including 61 local land races of Odisha and 231 cross-derivatives and selections from different sources within and outside Odisha were field-screened for resistance to wilt caused by *Fusarium oxysporum* f. sp. *lini* (Bolley) Snyder and Hansen. The result revealed 65, 45 and 37 genotypes under immune, resistant and moderately resistant categories, respectively.

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Introduction

Linseed or oil flax (*Linum usitatissimum* L.) is the second most important 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 lower 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, 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 wilt. With this objective, field screening of linseed genotypes for resistance to wilt was initiated.

Material and Methods

Two hundred ninety two genotypes of linseed including 61 local land races of Odisha and 231 cross-derivatives and selections from different sources within and outside Odisha were sown one month late during November, i.e., on 22.11.2006 and 22.11.2007. The local land races were purified during previous two seasons. The field screening trial was laid out in observation strip at the Regional Research and Technology Transfer Sub-station of OUAT at Jashipur, Mayurbhanj, Odisha, India (latitude : 21^{o} 57' N, longitude : 86^{o} 06' E, altitude : 400 m above mean sea level, annual rainfall : 1475 mm, soil : red lateritic, sandy loam and acidic) in wilt-sick plot. Each genotype was

sown in a single row of 3 m length with a spacing of 30 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 genotypes 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% will = Moderately Resistant
11 to 20% wilt = Moderately Susceptible
21 to 50% wilt = Susceptible
Above 50% wilt = Highly Susceptible

Result and Discussion

The disease reactions presented (Table 1) are based on two-year observations (the reaction is not the average). The result revealed 65, 45 and 37 genotypes under immune, resistant and moderately resistant categories, respectively.

The results are based on screening in wilt-sick plot. So, the 65 immune genotypes should be evaluated by embryo root inoculation method in the laboratory (He *et al*., 2008) and scaled before using them in breeding programme.

Table 1: Disease reaction of 292 genotypes of linseed to wilt over two years

Wilt (%)	Category	Genotypes
0	I	OLC 22 and 37; OL 3-1, RL 87, LMH 42, OL 98-8-1, 1216/JRF 5, OL 2-7, MLH 12, OL 98-2-2, LCK 206, P 650, RLC 41, NML 4, LCK 10-10, ACC NO 1396, BAULK 2, LC 1049, OL 98-1-2, JRF 3, NL 9, RLC 6, LCK 3707, OL 98-18-3, PLP 1, OL 93418-1, PCA 18, LW 36-3, PCA 8, RLC 27, OL 98-16-7, LHCK 82, RLA 71, JRF 5, RRL 1, LCK 216, SPS 72-23-10, LCK 241, LIN 12, PCA 89, OL 98-18-5, BAULK 1, LCK 9436, NDL 8804, OL 98-11-2, OL 98-11-2, LMC 926, LMH 78, OL 1-3, Chiplima 6, LMH 43, LCM 1020, NL 97, Chiplima 3, SLS 26, LMH 16-5, OL 98-5-3, EC 1392, PCA 13, T 393, OL 22-1, LCK 37, OL 98-17-4, PCA 16, TBNL 18 (65)
Up to 5	R	OLC 11, 31, 36, 47, 58 and 60; OL 98-2-5, RLC 28, LC 54, OL 4-1, OL 2-4, LMH 16-5, RLC 3, OL 98-3-1, JLT 32, Mayurbhanj Local, OL 98-9-4, RLC 29, LC 1009, LCK 119, CI 1466, OL 2-5, LCK 233-1, RLC 42, LCK 8523, BAU 4708, LHCK 176, OL 98-2-4, LCK 9816, OL 98-5-1, LCK 875, LIN 99289, A 95-13, LS 2323, BAULK 8, Padmini, RLC 2, PCA 12, RLC 33, R 7, LC 18, LMH 91-24, LMH 77, PCA 2, Niali (45)
6 to 10	MR	OLC 5, 8 , 41, 44 and 50; LCK 14, OL 98-18-4, OL 98-8-8, BAUL 4-4, RLC 1, OL 98-2-1, LIN 2, SLS 27, EC 41563, NL 142, PCA 7, OL 98-3-2, OL 3-2, LCK 8132, LMH 90-7, PCA 9, RL 1011, OL 98-10-5, LCK 213, OL 98-4-4, LHCK 144, Neela, LM 898, OL 10-2, OL 18-4, Kiran, Neelum, ML 48, OL 98-4-2, LA 2, OL 98-11-5, EC 41562 (37)
11 to 20	MS	OLC 13, 21, 28, 29 , 30, 52 and 59; OL 98-1-4, 1052/RLC 27, RL 771, LC 1038, RL 17, OL 98-7-5, OL 98-1-4, OL 98-8-3, OL 98-5-3, 1396, OL 98-18-1, OL 9342-1, SPT 5, OL 98-12-3, OL 98-8-4, OL 19-11, LC 1030 (24)
21 to 50	S	OLC 1, 6, 18, 19, 45, 57 and 61; OL 98-12-1, Acc No 442, OL 93418-2-2, OL 98-11-4, LHCK 10, OL 98-2-3, NL 129, GS 234, POLF 19, OL 92-16-3, LCK 9814, LCK 9733, JRF 4, LCK 8901, OL 98-17-6, RLC 44, OL 7-7, OL 98-17-6, OL 98-7-2, KL 49-47, 133, BAU 189-2, OL 98-16-3, OL 98-11-2, JLP 11, OL 98-17-5, OL 98-8-5, OL 92-4-3, OL 98-10-6, OL 98-2-6, OL 98-1-3, 442, OL 9394-2, LMS 5-38, OL 98-5-2, OL 98-8-6, 5160, T 397 (45)
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 and 56; LMS 11-98, PKDL 10, OL 98-3-3,SPS 17-48-544, OL 98-16-2, OL 93414-3, ES 1531, OL 98-16-1, OL 98-9-4, CI 1956, OL 98-12-2, OL 98-15-3, IC 16392, LMS 3-19, LIN 14, LHCK 88062, OL 98-16-4, OL 98-10-1, OL 2-3, OL 98-1-1, OL 98-15-6, OL 98-15-4, NL 105, OL 98-10-3, PCA 11, OL 98-4-5, OL 98-16-2, OL 98-4-1, OL 3-11, JLT 27, OL 98-10-4, OL 98-16-5, OL 98-15-1, O L 98-16-9, OL 98-16-6, RLC 71, OL 93418-2, OL 98-16-8, OL 98-8-2, LCK 9627, OL 98-6-1, LCK 153 (76)

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

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