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DISEASE SCREENING IN LINSEED (*LINUM USITATISSIMUM* L.) GENOTYPES FOR RESISTANCE TO WILT AND POWDERY MILDEW

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ABSTRACT

The recent experiment on "Line × Tester analysis for seed yield & its components in linseed (*Linum usitatissimum* L.)" during *Rabi* Year I, 2021-2022, was carried out. These F1's, along with their parents, including check, RLC- 148, were planted in a randomized block design during Year II, Rabi 2022-2023, at the Department of Genetics and Plant Breeding Research-cum Instructional Farm at the College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh. The screening for wilt, powdery mildew under natural field conditions was found to be recorded as resistant for IC-0564661, IC-0564654, IC-0498589×RLC-92,IC-0564661×RLC-92,IC-0564654×RLC-92,IC-0564661×RLC-133,IC-0076542×RLC-148,IC-0564661×RLC-148,IC-0525968×RLC-153. Resistant to wilt check variety is RLC- 92 and susceptible to wilt is RLC-133.
Keywords **:** Resistant, Screening, Wilt, Powdery mildew.

Introduction

Wilt caused by *Fusarium oxysporum* f.sp. lini (Bolley) Snyder &Hansen is one of the most serious diseases of linseed. The disease was first reported by Luggar (1890) from Minnesota, USA. He found that the disease was transmitted by water or old straw from infested to the noninfested fields. Bolley (1901) isolated the pathogen and proved pathogenicity. In India it was first reported from Central Province (Pearl, 1924; Mc Rae, 1926), Maharashtra (Verma, 1945) and Rajasthan (Sharma *et al*., 1971). The disease is now reported from all linseed growing areas of the country.

The pathogen may attack plants at any stage from seedling to maturity. The young seedlings are affected almost three weeks after sowing when atmospheric temperature is generally high. The cotyledons of the affected seedlings turn dull coloured and the edges roll inward. The base of hypocotyl shows a constricted appearance. The young seedlings collapse from this point and ultimately die-off. In the older plants the disease appears as small ill-defined dark green patches on the leaves. Later the leaves shrivel, branches droop and ultimately the plants die-off, although they remain standing.

Materials and Methods

The research work was carried out at the Research-cum-Instructional Farm of the Department of Genetics and Plant Breeding, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh during the *Rabi* 2021-22 & 2022-23 season. The experimental material comprises six lines (IC-0076542, IC-0498589, IC-0525968, IC-0526026, IC-0564661, IC-0564654) and four testers (RLC-92, RLC-133, RLC-148 ©, RLC-153) including one check variety i.e RLC-148 were crossed in line × tester fashion during *rabi* 2022-23 and during *rabi* 2023-24 , 24 F_1's produced which were planted.

Table 1 : List of genotypes

IC-0564661×RLC-92	IC-0564654×RLC-148
IC-0525968×RLC-92	IC-0564661×RLC-148
IC-0564654×RLC-92	IC-0525968×RLC-148
IC-0498589×RLC-92	IC-0498589×RLC-148
IC-0564661×RLC-133	IC-0564654×RLC-153
IC-0564654×RLC-133	IC-0525968×RLC-153

IC-0525968×RLC-133	IC-0498589×RLC-153
IC-0525969×RLC-133	IC-0564661×RLC-153
IC-0564661×RLC-92	IC-0564654×RLC-148
IC-0525968×RLC-92	IC-0564661×RLC-148
IC-0564654×RLC-92	IC-0525968×RLC-148
IC-0498589×RLC-92	IC-0498589×RLC-148
IC-0564661×RLC-133	IC-0564654×RLC-153
IC-0564654×RLC-133	IC-0525968×RLC-153
IC-0525968×RLC-133	IC-0498589×RLC-153
IC-0525969×RLC-133	IC-0564661×RLC-153

Results and Discussion

Field screening of powdery mildew under natural field condition revealed that highly resistant can be utilized in future breeding program to develop wilt resistant high yielding varieties. The resistant ones for powdery mildew are IC-0564661, IC-0564654, IC-0498589×RLC-92, IC-0564661×RLC-92, IC- 0564654 ×RLC-92, IC-0564661×RLC-133, IC-0076542 ×RLC-148, IC-0564661×RLC-148,IC-0525968×RLC-153. The resistant ones for wilt were recorded for IC-0525968, IC-0498589, IC-0076542, IC-0526026,IC-0076542×RLC-92,IC-0564654×RLC-92,IC-0076542 ×RLC-133,IC-0076542×RLC-148,IC-0498589×RLC-148.

Table 2 : Scale (0-5) for rating of reaction to powdery mildew and wilt

S.N.	Score	Disease intensity (% area of leaves/plant infected)	Rating	
1	0	Free from disease	Highly resistant	HR
2	1	1 to 10% (R)	Resistant	R
3	2	11 to 25% (MR)	Moderately resistant	MR
4	3	26 to 50% (MS)	Moderately susceptible	MS
5	4	51 to 75% (S)	Susceptible	S
6	5	Above 75% (HS)	Highly susceptible	HS

Thirty four germplasm were screened against powdery mildew, wilt and *Alternaria* blight under natural epiphytotic conditions during *Rabi* 2022-23 under the Research cum Instructional Farm, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh. All entries were assessed visually based on percentage of leaf area affected using 0-5 scale genotypes which were tagged with labels, Each plant was scored visually in the field and plants were rated in 0-5 scale, where, 0-highly resistance,1- resistance, 2- moderately resistance, 3-moderately susceptible, 4- susceptible and 5-highly susceptible .The assessment of the disease per plant was obtained by observing the intensity of lesions present on the leaves. The plants with disease rating except spraying of plant protection chemical to allow maximum inoculation of powdery mildew diseases.

Table 3: Screening of thirty four germplasm for Powdery mildew tolerance during *Rabi* 2022-23 at Raipur, C.G

S. N.	Score	Disease intensity (% area of leaves/plant infected)	Rating	Number of genotypes
1	0	Free from disease (HR)		
2	1	1 to 10% (R)	9	IC-0564661, IC-0564654, IC-0498589×RLC-92,IC-0564661×RLC-92,IC-0564654×RLC-92,IC-0564661×RLC-133,IC-0076542×RLC-148,IC-0564661×RLC-148, IC-0525968×RLC-153.
3	2	11 to 25% (MR)	18	IC-0076542, RLC-92, RLC-133, RLC-148, RLC-153,IC-0076542×RLC-92, IC-0525968×RLC-92,IC-0076542×RLC-133, IC-0525968×RLC-133, IC-0564654×RLC-133, IC-0498589×RLC-148,IC-0525968×RLC-148, IC-0526026×RLC-148,IC-0076542×RLC-153, IC-0564654×RLC-153
4	3	26 to 50% (MS)	22	IC-0525968, IC-0498589, IC-0526026, IC-0526026×RLC-92, IC-0498589×RLC-133, IC-0526026×RLC-133, IC-0564654×RLC-148, IC-0498589×RLC-153, IC-0526026×RLC-153.
5	4	51 to 75% (S)	52	IC-0564661×RLC-153
6	5	Above 75% (HS)		

Table 4: Screening of thirty four germplasm for Wilt tolerance during *Rabi* 2022-23 at Raipur, C.G

S.N.	Grade	Reaction	Number of genotypes	Name of genotypes
1	0	Free from disease		
2	1	1 to 10% (R)	9	IC-0525968,IC-0498589, IC-0076542, IC-0526026, IC-0076542×RLC-92,IC-0564654×RLC-92, IC-0076542×RLC-133,IC-0076542×RLC-148, IC-0498589×RLC-148.
3	2	11 to 25% (MR)	20	IC-0564661,IC-0564654,RLC-92, RLC-133, RLC-148, RLC-153, IC-0498589×RLC-92,IC-0525968×RLC-92, IC-0526026×RLC-92, IC-0564661×RLC-92, IC-0498589×RLC-133, IC-0525968×RLC-133, IC-0526026×RLC-133, IC-0564661×RLC-133, IC-0525968×RLC-148, IC-0526026×RLC-148, IC-0564654×RLC-148, IC-0498589×RLC-153, IC-0564661×RLC-153, IC-0564654×RLC-153
4	3	26 to 50% (MS)	4	IC-0564654×RLC-133,IC-0564661×RLC-148, IC-0076542×RLC-153,IC-0525968×RLC-153.
5	4	51 to 75% (S)	1	IC-0526026×RLC-153.
6	5	Above 75% (HS)		

Fig. 1: Field screening of Wilt:

Fig. 2: Field screening of Powdery mildew

Conclusion

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 stresses, to which linseed crop is exposed. The cost of chemicals farmer rarely practice such control measures and the usage of such fungicide will negatively affect environment and especially human health. Therefore the most effective way to control disease is the use of resistant varieties. Genetic resistance is a priority for flax breeders because fungicides can be hazardous, costly, and associated with environmental concerns. Therefore, there is a need to develop varieties resistant to powdery mildew, wilt to stabilize the yield potentials of linseed varieties. Therefore, this research work helps in developing varieties resistant powdery mildew, wilt. The manipulation of inherent potentials of plants in the form of resistant varieties is a cheap, viable and environment friendly alternative to reduce losses from biotic stress.

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