Impact of Sclerotinia stem rot on quality of *Brassica juncea*

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ABSTRACT

Sclerotinia stem-rot incited by *Sclerotinia sclerotiorum* (Lib.) De Bary is proving a bottleneck to the cultivation of *Brassica juncea*. This disease also causes qualitative deterioration of seeds in partially infected plants. Present study revealed that test weight, oil content and total protein content decreased drastically upto 66.37%, 34.70% and 38.95%, respectively at early seed development stage of infection. Fatty acid composition was also adversely affected by it. Oleic acid and erucic acid reduced by 17.46% and 18.12%, respectively,whereas, palmitic acid, stearic acid, linoleic acid linolenic acid and eicosenoic acid increased by 63.05%, 23.07%, 48.55%, 23.25% and 14.24%, respectively depending upon stage of infection**.**

Key words: *Sclerotinia sclerotiorum* - *Brassica juncea* - Quality- Sclerotinia stem-rot.

INTRODUCTION

Indian mustard *(Brassica juncea)* is predominant oilseed brassica crop plays pivotal role in agricultural economy of country. Even then, India is spending large amount of its foreign exchange to import additional oil to meet its requirement. The crop suffers from biotic and abiotic stresses. The destructive disease of oilseed brassica includes those caused by fungi, bacteria and viruses. Among them, Sclerotinia stem-rot incited by *Sclerotinia sclerotiorum* (Lib.) De Bary is the most serious fungal disease and causes maximum damage at various crop growth and seed development stages. The disease incidence has been recorded upto 80% in the Punjab and Haryana (Kang and Chahal, 2000). In Australia, Kirkegaard et al. (2006) found that disease caused yield loss ranging from 0.39 tonnes/ha to 1.5 tonnes/ha. Besides yield loss, the pathogen causes considerable qualitative deterioration in seeds of partially infected plants. Therefore, present investigation was worked out to determine quantitative and qualitative changes in seeds of infected plants at farmer's field of south west districts of Haryana state of India.

MATERIALS AND METHODS

The present study was carried out by selecting farmer's field of Bhiwani (12 fields), Fatehabad (8 fields), Hisar (15 fields) and Sirsa (9 fields) districts of Haryana with history of Sclerotinia stem-rot which commonly occurred. The Indian mustard (var. RH 30 and Laxmi) was sown from 16 October to 25 October by farmers during 2008-09 crop season in choosen fields. Fifteen plants of each field of every district were tagged on 15th January (early infection stage), 25th January (mid infection stage) and 4th February (late infection stage), 2009 when symptoms became just visible on collar region through systemic infection by myceliogenic germination of sclerotia under natural field condition. Infection usually occurs after 10 January because of prevailing conducive environmental condition. After harvest, average test weight (1000 seeds) of all seed samples was taken to find out comparison between weight of healthy and diseased plant seeds. Seed samples from all fields were used for estimation of oil content by Nuclear Magnetic Resonance (Medsen, 1976), protein content (McKenzie and Wallace, 1954) and fatty acid composition with the help of Gas Liquid Chromatography after preparing the methyl esters of fatty acids (Luddy et al., 1968**).**

RESULTS

It is clearly evident from data of Table 1 that there was significant decline in test weight from 4.13 g to 1.92 g i.e. 27.67 to 66.37% reduction when compared with healthy plant seed at late

(4th February) to early seed development stage of infection (15th January), respectively. Seeds collected from infected plants showed that there was significant reduction in oil content from 34.7 to 25.4% per cent at late infection stage to early infection stage, respectively. Total protein content also decreased significantly from 23.3 to 16.3 per cent at late infection stage to early infection stage, respectively. The fatty acid composition analysis revealed that oleic acid and erucic acid significantly decreased from 11.83% to 10.11% and 44.57% to 38.16%, in late infection and early infection stage, respectively,whereas, palmitic acid (2.61 to 3.31%), stearic acid (0.94 to 1.12%), linoleic acid (19.27 to 26.71%), linolenic acid (13.92 to 16.42%) and eicosenoic acid (6.37 to 7.14%) increased significantly when the crop was infected at late and early stage, respectively.

Table 1. Impact of Sclerotinia stem-rot on quality of *Brassica juncea.*

Traits	Healthy plants	Diseased plants			CD at 5%
		15th January (early infection)	25th January (Mid infection)	4th February (late infection)	
Test weight (g)	5.71	1.92(-66.37)*	3.25(-43.08)	4.13(-27.67)	0.84
Oil content (%)	38.9	25.4(-34.70)	28.1(-27.76)	34.7(-10.79)	2.91
Total protein (%)	26.7	16.3(-38.95)	21.1(-20.97)	23.3(-12.73)	2.57
Fatty Acid Composition					
Palmitic acid (%)	2.03	3.31(+63.05)	2.92(+43.84)	2.61(+28.57)	0.28
Stearic acid (%)	0.91	1.12(+23.07)	1.06(+16.48)	0.94(+3.91)	0.04
Oleic acid (%)	12.25	10.11(-17.46)	10.96(-10.53)	11.83(-3.42)	0.71
Linoleic acid (%)	17.98	26.71(+48.55)	23.33(+29.75)	19.27(+7.17)	2.18
Linolenic acid (%)	13.33	16.43(+23.25)	15.52(+16.42)	13.92(+4.42)	0.91
Eicosenoic acid (%)	6.25	7.14(+14.24)	6.83(+9.28)	6.37(+1.92)	0.23
Erucic acid (%)	46.61	38.16(-18.12)	41.29(-11.41)	44.57(-4.37)	2.96

*Figure in parentheses indicate that per cent increase (+) or decrease (-) in quality and quantity parameters.

DISCUSSION

Based on infected seeds sample analysis, there is significant affect of this disease on quantitative and qualitative characters depending on crop stage infection at farmers fields. As there was 27.67 %(late infection) to 66.37% (early infection) loss in test weight in infected seed samples, hence, it has direct affect on crop yield. The loss in oil content also increased from 10.79 % (late infection) to 34.70 per cent (early infection) which ultimately affected the quality of oil content and oil yield. Total protein content of infected seed also adversely affected by disease, as percent loss increased from 12.73 (late infection) to 38.95% (early infection) which may be attributed due to hydrolysis or inhibition in synthesis of proteins. Fatty acid composition of seeds from infected plant indicated that there was drastic reduction in oleic acid (3.42 to 17.46%) and erucic acid (4.37 to 18.12%) at late infection stage to early infection stage, respectively. In contrary to it, palmitic acid (28.57 to 63.05%), stearic acid (3.91 to 23.07%) linoleic acid (7.17 to 48.55%), linolenic acid (4.42 to 23.35%) and eicosenoic acid (1.92 to 14.24%) increased depending on late infection to early infection stage, respectively. Normally, erucic acid is synthesized from oleoyl COA by a set of reductase in two consecutive steps of chain elongation (Aggarwal and Stumpf, 1985), while Oleoyl COA is needed for synthesis of linoleic acid by enzyme oleoyl desaturase (Stumpf, 1989). Since linoleic acid is a cell membrane component, it might be possible that synthesis of linoleic acid is enhanced in response to infection to maintain integrity of membrane. This may be a reason for the increased linoleic acid in initial stages of infection.

CONCLUSION

Present investigation expresses that Sclerotinia stem-rot has direct affect on quality and quantity or on crop yield in *Brassica juncea*. Test weight, oil content, total protein content and fatty acid composition of seed was adversely affected by Sclerotinia stem-rot.

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