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ASSESSMENT OF ETHIOPIAN ADVANCED BREAD WHEAT GENOTYPES AND VARIETIES TO SEPTORIA TRITICI LEAF BLOTCH

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ABSTRACT
Wheat production and productivity is significantly constrained by multiple pathogens of which *Septoria tritici* blotch is an economically important foliar disease in the major wheat-growing areas of the world including Ethiopia. Host plant resistance rests the first mark of protection to mitigate this foliar disease, principally in developing countries for economically humble farmers and the most eco-friendly and lucrative strategy for profitable farmers. Thus, the present experiment was executed with the aim of screening of wheat genotypes against septoria leaf blotch. A total of 451 wheat genotypes comprising 436 advanced bread wheat genotypes and 15 commercial released varieties were incorporated in the study. The study shown that none of the genotypes were displayed immune reaction. Close to half (47.1%) of examined wheat genotypes showed good tolerance to the diseases, while the remaining, exceeding half of test genotypes displayed moderately susceptible to susceptible reaction. Therefore, those genotypes which express highly to moderately resistant reaction to septoria tritici could have an imperative role in resistance breeding to septoria leaf blotch which intern play key role for maximizing yield and reduce hunger.

KEY WORDS
Advanced wheat genotypes, commercial, wheat, varieties, septoria tritici blotch.

Wheat stands the utmost key food security grain crop with a production of 778.6 million tons (MT) on about 220 million hectares (Mha) worldwide in 2021. Africa contributes more than 3.4% of the entire wheat production globally while, sub-Sahara Africa (SSA) produced a total of 7.5 MT on a total area of 2.9 Mha accounting for 40 and 1.4 per cent of the wheat production in Africa and at global levels, respectively (FAO, 2021). In Ethiopia, wheat production is increased year after year dramatically for instance it boosts from 429 thousand tons in 1977 to 5,100 thousand tons in 2020(World Data Atlas Ethiopia Tropics Agriculture Crops Production)

Unlike the increments both in area coverage and yield, productivity of wheat in Ethiopia is far less than the global average. This low yield is attributed to multi-faced abiotic and biotic factors such as shortage of upgraded varieties, low and uneven distribution of rainfall, deprived agronomic practices, insect pests and diseases (Dereje and Yaynu, 2000). Of the biotic yield restraining factors, diseases like Septoria leaf blotch (Septiria tritici), Rusts (Puccinia spp), Fusarium head blight (Fusarium gramnearum), Leaf spot (Helminthosporium spp) and Tan spots (Helminthosporium tritici-repentis) exists the foremost diseases (Ayele and Temesgen, 2008).

Among the biotic restraints, Septoria tritici blotch appears around the world in countries as diverse as Argentina, Ethiopia, Iran, the United States, the Netherlands, Russia, New Zealand, and Australia. It is an enormous tricky on durum wheat in Iran, Tunisia and Morocco. Epiphytotic can be particularly overwhelming in rising countries, like those in East Africa. High comparative humidity, regular rains, and modest temperatures are critical for disease development. Moreover, constant wheat cropping, high seeding rates, primary planting and extreme use of nitrogen fertilizers enhanced septoria leaf blotch proliferation (Fernandez *et al*., 1998; Simon *et al*., 2003; Ansar *et al*., 2010).

Under severe epidemics of septoria tritici (STB) can decrease wheat harvests by 35 to 50%. In the United States, STB is second next to wheat rust in terms of importance, and it is the primary disease of wheat in Russia and many countries of Western Europe. The price of fungicides to control the disease can be high, and fungicide treatments may not be cost-effective liable on the price of grain. About 70% of the projected volume of fungicide used on cereals in Europe is used to control STB. In Europe, annual losses from STB are projected to be $400 million dollars, and similar loss estimates for the United States are more than $275 million dollars per year (Ponomarenko A. *et al.,* 2011). In Ethiopia, *septoria tritici* is one of the major constraints of wheat in all wheat-growing areas, causing 82% (Mengistu *et al.,* 1991), 42% (Abera *et al.,* 2015), 30% to 39% (Yitagesu *et al*., 2020), crop economic loss annually.

Taking into account the difficulty of the disease, an integrated approach that incorporates crop rotation, variety selection, stubble management and fungicides (if required) can provide effective suppression of STB where advancement of resistant wheat varieties is the most effective, economic and environmentally-safe strategy to control this disease (Eyal and Ziv 1974; Eyal 1999). CIMMYT's wheat wide crosses program has produced a broad range of resistant germplasm from D genome synthetics and their synthetic derivatives (Mujeeb-Kazi *et al*., 1996; 1998; 1999). These materials express high levels of resistance to several leaf pathogens, including Bipolaris sorokiniana, Pyrenophora triticir'epentis, and S. tritici.

Therefore, genetic diversity is a vital source for selecting various disease resistance and high yielding genes. The dissimilar genetic sources deliver required allelic variation in parental lines to produce new genetic combinations (Tar'an *et al*., 2005). Thus, the objective of this study was to determine the level of resistance in 453 bread wheat germplasms comprising 436 advanced lines and 17 commercial varieties to S. tritici in the field, at different growth stages and under natural environment conditions.

MATERIALS AND METHODS OF RESEARCH

The experiment was conducted at Bekoji district, experimental station and main hotspot area for septoria disease Kulumsa agricultural research center southeast, Ethiopia in 2020 main cropping season. The site is located at latitude 07^0 32' 37'' N and longitude 39^0 15' 21'' E with an altitude of 2780 meter above sea level. The maximum and minimum temperature was 3.8 and 20.4 ^{0}C respectively with annual rain fall 939 mm.

In the nurseries, a total of 436 advanced spring wheat lines and 15 varieties which were obtained from Kulumsa Agricultural Research center (Ethiopian national bread wheat regional center of Excellency) were included. The test experimental spring wheat lines were arranged in augmented design with standard susceptible check Danda'a. Each test entry was planted in a plot consisting of two rows of 1 m long spaced at 20 cm between rows. A seed rate of 150 kg ha-^{1} and fertilizer rates of 64 and 46 kg ha-^{1} N and P2O5, respectively, were applied on experiment.

Disease assessment was executed on plot wise plants to double digit scale (00- 99) described by Eyel *et al.* (1983). The first digit (D1) shows vertical disease progress on the plant and the second digit (D2) states to severity measured as diseased leaf area. Percent disease severity is projected relay on the formula: % severity = ((D1/Y1) x (D2/Y2) x 100), where D1 and D2 denote the score recorded (00-99 scale) and Y1 and Y2 denote the maximum score on the scale (9 and 9) (Sharma and Duveiller, 2007). Then, genotypes were classified in seven categories; immune (00), highly resistant (1-14), resistant (15-34), moderately resistant (35-44), moderately susceptible (45-64), susceptible (65-84) and highly susceptible (85-99) (Eyal *et al*., 1987).

RESULTS AND DISCUSSION

It is obvious that a wide range of wheat diseases management options are available of which use of resistant variety is the best and fundamental diseases control strategy in general and *Septoria tritici* blotch in particular for resource poor farmers in developing countries and the most environmentally friendly and cost-effective scheme for commercial farmers. According to van Ginkel *et al*., (1999), in most wheat production environments, although not in all, genetic resistance is the most economical method to control fungal diseases besides to cultural and chemical that may be utilized. Thus, this experiment was executed aiming at selection of wheat genotypes including bread wheat lines, candidate and commercial wheat types for Septoria tritici blotch resistance and/or tolerance.

Thus, a total of 451 bread wheat germplasms comprising 436 advanced lines and 15 commercial varieties were screened during the year 2020 cropping season at Bekoji, main hotspot area to *Septoria tritici.* There were differences among test advanced bread wheat lines and varieties to the disease. However, amazingly, this study confirmed that neither the varieties nor the advanced lines were completely resistance or immune to *Septoria tritici* blotch (Tables 1, and Figure1). For this reason, where resistance is not operative, tolerance can be pursued according to McKendry and Henke, (1994). Out of 15 bread wheat varieties, only one variety was exhibited highly resistant to the pathogen. Among 436 advanced bread wheat lines tested; 3.4%,26.8%, 16.9% and 38.9% were found highly resistant, resistant, moderately resistant and moderately susceptible infection types against the disease, respectively (Table 1). Conversely, 13.5% and 0.23% showed susceptible and highly susceptible infection types in there order. These few genotypes with tolerance attributes could contribute in breeding program and key component in integrated management of *Septoria tritici* blotch in the region.

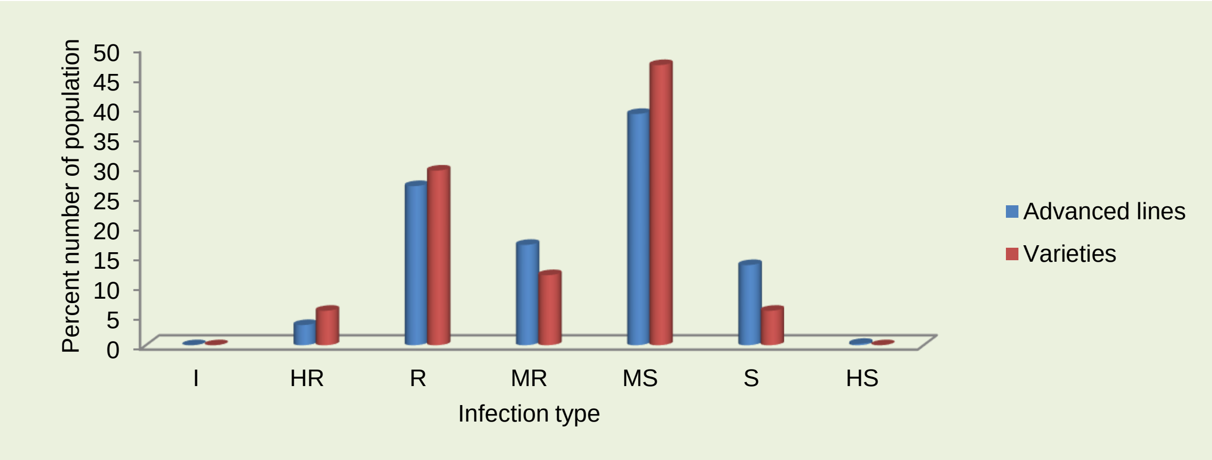

Figure 1 – Response of Advanced bread wheat lines and Varieties to *Septoria tritici* at Bekoji in 2020

Likewise, about 5.8%, 29.4%, 11.76%, 47.1% and 5.8% of the bread wheat varieties expressed highly resistant, resistant, moderately resistant, moderately susceptible and susceptible reaction to the disease correspondingly (Table 1), however none of varieties displayed neither immune or nor highly susceptible infection type. Generally, about 52.63% of advanced lines and 52.9% of varieties were within the range of susceptible to highly susceptible reactions. This revealed that *Septoria tritici* blotch is one of the devastating diseases that limit the production and productivity of wheat globally.

The present study result indicated that there was a wide range of differences among both commercial bread wheat varieties and advanced lines to Septoria leaf blotch; reaction score of resistant to susceptible. This finding is in lined with similar works Teklay *et al* (2015) which states that bread wheat varieties showed different response to Septoria leaf blotch. The widely cultivated mega cultivar in study area viz; Kubsa and Ogolcho were affected by septoria leaf blotch, scored diseases index exceeding 44. Research findings have revealed that S. nodorum resistance in wheat is inherited in an intricate manner containing numerous genes (C.M. Ellerbrook *et al*, 199). In addition to, field trials genetic mapping, identification of resistant genes on for chromosomes 2A, 3D, and 7D is important. Therefore those genotypes that showed resistance under field conditions should be studied on a single chromosome recombination so as to fully cognize their heritability as well as highlighting linked markers.

Table 1 – Severity and host response of wheat genotypes against *Septoria tritici*

Number	Genotype	(00-99)	DI	Response	Number	Genotype	Scale (00-99)	DI	Response	Number	Genotype	(00-99)	DI	Response
1	BW120086	85	49	MS	154	BW184123	85	49	MS	307	BWKU13494	87	69	S
2	BW120104	84	39	MR	155	BW184143	72	17	R	308	BWKU13503	87	69	S
3	BW120105	85	49	MS	156	BW184144	73	26	R	309	BWKU13522	86	59	MS
4	BW120106	86	59	MS	157	BW184150	65	37	MR	310	BWKU13536	84	40	MR
5	BW120110	83	30	R	158	BW184152	84	40	MR	311	BWKU13539	85	49	MS
6	BW120111	84	39	MR	159	BW184159	64	30	R	312	BWKU13540	86	59	MS
7	BW120115	83	30	R	160	BW184161	64	30	R	313	BWKU13544	84	40	R
8	BW120118	82	20	R	161	BW184172	65	37	MR	314	BWKU13547	86	59	MS
9	BW120125	84	40	MR	162	BW184174	65	37	MR	315	BWKU13551	85	49	MS
10	BW120135	83	30	R	163	BW184176	65	37	MR	316	BWKU13552	86	59	MS
11	BW120137	85	49	MS	164	BW184177	75	43	MR	317	BWKU13561	84	40	MR
12	BW120152	84	40	MR	165	BW184183	84	40	MR	318	BWKU13575	76	52	MS
13	BW172060	85	49	MS	166	BW184187	83	30	R	319	BWKU13576	76	52	MS
14	BW172600	83	30	R	167	BW184196	85	49	MS	320	BWKU13616	86	59	MS
15	BW172604	83	30	R	168	BW184200	83	30	R	321	BWKU13627	87	69	S
16	BW172608	82	20	R	169	BW184232	86	59	MS	322	BWKU13694	76	52	MS
17	BW172619	81	10	HR	170	BWKU13002	86	59	MS	323	BWKU13695	86	59	MS
18	BW172620	81	10	HR	171	BWKU13025	75	43	MR	324	BWKU13710	87	69	S
19	BW172709	82	20	R	172	BWKU13058	83	30	R	325	EBW192035	87	69	S
20	BW172779	85	49	MS	173	BWKU13072	73	26	R	326	EBW192034	86	59	MS
21	BW172797	84	40	MR	174	BWKU13075	73	26	R	327	EBW192852	87	69	S
22	BW172803	85	49	MS	175	BWKU13105	73	26	R	328	EBW192853	76	52	MS
23	BW172827	83	30	R	176	BWKU13107	76	52	MS	329	EBW192854	76	52	MS
24	BW172828	85	49	MS	177	BWKU13171	85	49	MS	330	EBW192855	86	59	MS
25	BW172831	83	30	R	178	BWKU13206	82	20	R	331	EBW192856	83	30	R
26	BW174302	85	49	MS	179	BWKU13207	81	10	HR	332	EBW192857	76	52	MS
27	BW174334	82	20	R	180	BWKU13208	82	20	R	333	EBW192858	83	30	MR
28	BW174374	83	30	R	181	EBW192945	75	43	MR	334	EBW192859	86	59	MS
29	BW174388	84	40	MR	182	EBW192950	75	43	MR	335	EBW192860	84	40	MR
30	BW174389	83	30	R	183	EBW192954	85	49	MS	336	EBW192861	83	30	R
31	BW174425	81	10	HR	184	EBW192963	76	52	MS	337	EBW192862	88	79	S
32	ETBW9080	87	69	S	185	EBW192973	85	49	MS	338	EBW192863	84	40	R
33	ETBW9172	82	20	R	186	EBW192975	76	52	MS	339	EBW192864	87	69	S
34	ETBW9396	84	40	MR	187	EBW192976	66	44	MR	340	EBW192865	86	59	MS
35	ETBW9452	86	59	MS	188	EBW192977	84	40	MR	341	EBW192866	87	69	S
36	ETBW9578	86	59	MS	189	EBW192986	84	40	MR	342	EBW192867	85	49	MS
37	ETBW9581	85	49	MS	190	EBW192988	75	43	MR	343	EBW192868	86	59	MS
38	BW174413	82	20	R	191	EBW192990	76	52	MS	344	EBW192869	86	59	MS
39	BW174371	84	40	MR	192	EBW192001	83	30	R	345	EBW192870	85	49	MS
40	BW174102	84	40	MR	193	EBW192002	85	49	MS	346	EBW192871	87	69	S
41	BW172771	86	59	MS	194	EBW192003	85	49	MS	347	EBW192872	88	79	S
42	BW172714	83	30	R	195	EBW192005	83	30	R	348	EBW192873	83	30	R
43	BW172713	84	40	MR	196	EBW192015	86	59	MS	349	EBW192874	84	40	MR
44	BW172627	86	59	MS	197	EBW192020	87	69	S	350	EBW192875	86	59	MS
45	BW120149	83	30	R	198	EBW192021	76	52	MS	351	EBW192876	84	40	MR
46	BW120126	85	49	MS	199	EBW192024	76	52	MS	352	EBW192877	84	40	MR
47	BW120116	83	30	R	200	EBW192027	86	59	MS	353	EBW192878	86	59	MS
48	BW120109	65	59	MS	201	EBW192488	85	49	MS	354	EBW192879	85	49	MS
49	BW120101	83	30	R	202	EBW192494	76	52	MS	355	EBW192880	84	40	MR

50	EBW192353	63	22	R	203	EBW192897	85	49	MS	356	EBW192886	72	17	R
51	EBW192357	83	30	R	204	EBW192898	85	49	MS	357	EBW192887	85	49	MS
52	EBW192361	84	40	MR	205	EBW192899	76	52	MS	358	EBW192888	87	69	S
53	EBW192363	86	59	MS	206	EBW192900	86	59	MS	359	EBW192889	87	69	S
54	EBW192370	82	20	R	207	EBW192901	86	59	MS	360	EBW192890	86	59	MS
55	EBW192371	85	49	MS	208	EBW192902	86	59	MS	361	EBW192891	84	40	MR
56	EBW192375	85	49	MS	209	EBW192903	82	20	R	362	EBW192892	84	40	MR
57	EBW192377	82	20	R	210	EBW192904	86	59	MS	363	EBW192893	87	69	S
58	EBW192380	84	40	MR	211	EBW192905	87	69	S	364	EBW192489	88	79	S
59	EBW192382	81	10	HR	212	EBW192906	76	52	MS	365	EBW192490	88	79	S
60	BW120002	82	20	R	213	EBW192907	86	59	MS	366	EBW192491	86	59	MS
61	BW120004	83	30	R	214	EBW192908	76	52	MS	367	EBW192508	86	59	MS
62	BW120011	82	20	R	215	EBW192909	85	49	MS	368	EBW192509	88	79	S
63	BW120014	87	69	S	216	EBW192910	76	52	MS	369	EBW192510	86	59	S
64	BW120039	84	40	MR	217	EBW192911	77	60	MS	370	EBW192511	88	79	S
65	BW120041	87	69	S	218	EBW192912	76	52	MS	371	EBW192512	88	79	S
66	BW120042	83	30	R	219	EBW192913	86	59	MS	372	EBW192023	86	59	MS
67	BW120044	82	20	R	220	EBW192914	86	59	MS	373	EBW192010	87	69	S
68	BW120052	85	49	MS	221	EBW192915	88	79	S	374	EBW192022	84	40	MR
69	BW120053	83	30	R	222	EBW192916	75	43	MR	375	EBW192018	87	69	S
70	BW120054	81	10	HR	223	EBW192917	86	59	MS	376	EBW192521	87	69	S
71	BW120056	83	30	R	224	EBW192918	87	69	S	377	EBW192032	85	49	MS
72	BW120060	82	20	R	225	EBW192919	86	59	MS	378	EBW192991	84	40	MR
73	BW120063	83	30	R	226	EBW192920	83	30	R	379	EBW192320	84	40	MR
74	BW172056	85	49	MS	227	EBW192921	76	52	MS	380	EBW192322	85	49	MS
75	BW172082	61	7	HR	228	EBW192922	84	40	MR	381	EBW192330	83	30	MR
76	BW172088	72	17	R	229	EBW192923	86	59	MS	382	EBW192331	82	20	R
77	BW172093	83	30	R	230	EBW192924	85	49	MS	383	EBW192332	85	49	MS
78	BW172105	86	59	MS	231	EBW192925	83	30	R	384	EBW192336	88	79	S
79	BW172319	76	52	MS	232	EBW192926	86	59	MS	385	EBW192337	88	79	S
80	BW172393	83	30	R	233	EBW192927	83	30	R	386	EBW192338	84	40	MR
81	BW172440	83	30	R	234	EBW192928	84	40	MR	387	EBW192339	88	79	S
82	BW172474	72	17	R	235	EBW192929	76	52	MS	388	EBW192340	88	79	S
83	BW172862	73	26	R	236	EBW192930	75	43	MR	389	EBW192341	85	49	MS
84	BW172864	73	26	R	237	EBW192931	84	40	MR	390	EBW192344	86	59	MS
85	BW172872	74	35	MR	238	EBW192932	87	69	S	391	EBW192345	82	20	R
86	BW172936	73	26	R	239	EBW192933	87	69	S	392	EBW192346	81	10	HR
87	BW172996	74	35	MR	240	EBW192934	88	79	S	393	EBW192347	81	10	HR
88	BW173001	64	30	R	241	EBW192935	87	69	S	394	EBW192348	88	79	S
89	BW173004	65	37	MR	242	EBW192936	88	79	S	395	EBW192349	84	40	MR
90	BW173006	65	37	MR	243	EBW192937	76	52	MS	396	EBW192350	83	30	R
91	BW173031	83	30	R	244	EBW192938	84	40	MR	397	EBW192351	83	30	R
92	BW173207	86	59	MS	245	EBW192939	83	30	R	398	EBW192352	83	30	R
93	BW173261	64	30	R	246	EBW192940	76	52	MS	399	EBW192359	86	59	MS
94	BW173263	85	49	MS	247	EBW192941	77	60	MS	400	EBW192360	85	49	MS
95	BW173270	63	22	R	248	EBW192943	87	69	S	401	EBW192362	88	79	S
96	BW173288	85	49	MS	249	EBW192006	84	40	MR	402	EBW192364	87	69	S
97	BW173292	82	20	R	250	EBW192007	87	69	S	403	EBW192366	86	59	MS
98	BW173332	83	30	R	251	EBW192008	85	49	MS	404	EBW192369	84	40	MR
99	BW173353	81	10	HR	252	EBW192009	85	49	MS	405	EBW192386	83	30	R
100	BW173366	83	30	R	253	EBW192011	85	49	MS	406	EBW192387	82	20	R
101	BW173378	81	10	HR	254	EBW192012	86	59	MS	407	EBW192392	85	49	MS

102	BW173380	85	49	MS	255	EBW192019	87	69	S	408	EBW192394	87	69	S
103	BW174116	82	20	R	256	EBW192028	87	69	S	409	EBW192395	87	69	S
104	BW174170	85	49	MS	257	EBW192031	84	40	MR	410	EBW192396	86	59	MS
105	BW174187	73	26	R	258	BW182002	81	10	HR	411	EBW192397	83	30	R
106	BW174456	85	49	MS	259	BW182005	83	30	R	412	EBW192398	86	59	MS
107	BW182052	84	40	MR	260	BW182021	85	49	MS	413	EBW192401	82	20	R
108	BW182122	73	26	R	261	BW182037	85	49	MS	414	EBW192402	86	59	MS
109	ETBW 9077	83	30	R	262	BW182039	87	69	S	415	EBW192404	87	69	S
110	ETBW 9080	83	30	R	263	BW182254	84	40	MR	416	EBW192407	88	79	S
111	ETBW 9128	64	30	R	264	BW182263	86	59	MS	417	EBW192408	88	79	S
112	ETBW 9136	83	30	R	265	BW182285	86	59	MS	418	EBW192410	88	79	S
113	ETBW 9396	83	30	R	266	BW182297	82	20	R	419	EBW192413	84	40	MR
114	ETBW 9452	86	86	HS	267	BW182442	85	49	MS	420	EBW192414	83	30	R
115	ETBW 9642	86	59	MS	268	BW182761	82	20	R	421	EBW192416	86	59	MS
116	ETBW 9647	85	49	MS	269	BW182767	81	10	HR	422	EBW192417	88	79	S
117	ETBW 9648	86	59	MS	270	BW182834	85	49	MS	423	EBW192123	82	20	R
118	ETBW 9650	82	20	R	271	BW182870	85	49	MS	424	EBW192140	85	49	MS
119	ETBW 9654	73	26	R	272	BW182876	84	40	MR	425	EBW192423	85	49	MS
120	EBW192992	75	43	MR	273	BW182913	85	49	MS	426	EBW192424	86	59	MS
121	EBW192318	65	37	MR	274	BW182922	85	49	MS	427	EBW192430	82	20	R
122	EBW192319	66	44	MR	275	BW182935	85	49	MS	428	EBW192434	83	30	MS
123	EBW192321	84	40	MS	276	BW182977	84	40	MR	429	EBW194092	85	49	MS
124	EBW192323	84	40	MS	277	BW182981	83	30	R	430	EBW194169	86	59	MS
125	EBW192324	73	26	R	278	BW182985	84	40	MR	431	EBW194095	83	30	R
126	EBW192325	73	26	R	279	BW182999	82	20	R	432	EBW194030	88	79	S
127	EBW192326	75	43	MR	280	BW183001	84	40	MR	433	EBW194174	83	30	R
128	EBW192327	83	30	R	281	BW183015	85	49	MS	434	EBW194086	86	59	MS
129	EBW192328	73	26	R	282	BW183074	86	59	MS	435	EBW194158	86	59	MS
130	EBW192333	76	52	MS	283	BW183085	87	69	S	436	EBW194002	86	59	MS
131	EBW192335	66	44	MR	284	BW183100	83	30	R		Varieties			
132	EBW192343	81	10	HR	285	BW183106	85	49	MS		Digelu	81	10	HR
133	BW182111	72	17	R	286	BW183108	87	69	S		Kingbird	85	49	MS
134	BW182117	65	37	MR	287	BW183131	85	49	MS		Tesfa	65	59	MS
135	BW182146	76	52	MS	288	BW183160	83	30	R		Atlas	64	29	R
136	BW182463	82	20	R	289	BW183164	86	59	MS		Shorima	83	30	R
137	BW182478	76	52	MS	290	BW184007	86	59	MS		PBW343	85	49	MS
138	BW182491	83	30	R	291	BW184015	76	52	MS		Kakaba	85	49	MS
139	BW182493	85	49	MS	292	BW184019	83	30	R		Ogolcho	85	49	MS
140	BW182508	86	59	MS	293	BW184033	86	59	MS		Lemmu	83	30	R
141	BW182509	75	43	MR	294	BW184039	86	59	MS		Kubsa	76	52	MS
142	BW182536	82	20	R	295	BWKU13258	81	10	HR		Wane	85	49	MS
143	BW182538	82	20	R	296	BWKU13306	87	69	S		Galama	84	40	MR
144	BW182540	83	30	R	297	BWKU13347	84	40	MR		Alidoro	83	30	R
145	BW182549	85	49	MS	298	BWKU13374	85	49	MS		Hidasse	85	49	MS
146	BW182568	86	59	MS	299	BWKU13376	86	59	MS		Danda'a	87	69	S
147	BW182623	75	43	MR	300	BWKU13380	86	59	MS					
148	BW182627	82	20	R	301	BWKU13382	86	59	MS					
149	BW182640	75	43	MR	302	BWKU13383	85	49	MS					
150	BW182706	66	44	MR	303	BWKU13439	86	59	MS					
151	BW182714	73	26	R	304	BWKU13470	86	59	MS					
152	BW184055	73	26	R	305	BWKU13479	85	49	MS					
153	BW184059	86	59	MS	306	BWKU13492	87	69	S					

CONCLUSION

The current investigation showed that the presence of extensive variability among the tested wheat genotypes for *S. tritici* resistance. Therefore, these traits should be taken into account while choosing superior and appropriate plants for further development of yield and *S. tritici* resistance in the development of high yielding and resistant genotype in bread wheat. Thus, those genotypes that displayed lower disease index might be used as integrated disease management options on wheat.

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CONFLICT OF INTERESTS

The author declares no conflict of interests. The funders had no role in the study design; data collection analysis or interpretation; in writing of the manuscript, or in the decision to publish the result.

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