Academic Journal of Life Sciences
ISSN(e): 2415-2137, ISSN(p): 2415-5217
Vol. 1, Issue. 3, pp: 15-17, 2018
URL: http://arpgweb.com/?ic=journal&journal=18&info=aims

Academic Research Publishing Group

Original Research Open Access

Screening of Sesame Germplasms Against Bacterial Blight (*Xanthomonas campestris pv. sesami*) at Metema Ethiopia

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Abstract

Bacterial blight is one of the major diseases which inflect heavy losses in sesame production. This experiment was initiated to screen sesame germplasms against bacterial blight under field condition. The experiment has been conducted at Metema station on 2015 and 2016 cropping seasons. A total of 70 genotypes were evaluated and simple plot in one replication in a plot size of 5m length and with a recommended spacing of 10 cm x 40 cm between plant and row respectively were used. Diseases and agronomic data were collected and subjected to descriptive statistical analysis using SAS software. In both seasons genotype WARC-063, WARC-082, WARC-073, WARC-074, WARC-076 and Abasena were moderately resistant and high yielders. These genotypes seem to have some significant stability for resistance of infection with X. campistris pv sesame. Breeders should consider them as a source of resistance in breeding programme.

Keywords: Sesame; Bacterial blight; Severity and metema.

1. Introduction

In Ethiopia, sesame is used as cash crop, export commodity, raw material for industries and as source of employment opportunity. A considerable proportion of the population generate income from oilseed farming, trade and processing. The meal or oilcake remaining after oil extraction can be used as an animal feed [1] however sesame production challenged by biotic and abiotic factors. The major reasons are lack of knowledge and skill in land preparation, agronomic practices, weather uncertainties, weeds, insects and diseases outbreaks [2].

Sesame is known to be a susceptible crop for a number of diseases. In Ethiopia the most wide spread diseases include bacterial blight, phyllody, powdery mildew, wilt, leaf curl and viral diseases [3, 4]. Bacterial diseases are concerned, leaf spot or blight caused by *Pseudomonas syringae* van Hall. pv. *sesami* and *Xanthomonas campestris* (Pammel) Dawson pv. *sesami* is most common, wide spread and inflict heavy losses in sesame production.

The disease mainly develops in the rainy season or with high relative humidity, at night. The disease affects the plant at any age and under severe conditions, producing extensive blight of the foliage, invading petioles, flowers and stems, and causing defoliation and sterility. It is a destructive disease and reported to cause complete loss of crop particularly under rain fed conditions in Sudan [5]. Vijayat and Chakravarti [6] reported 60 % loss in the capsules due to blight under field conditions in Turkey while through artificial inoculation in the field, the disease caused 21-27% loss of yield in India. Approximately 20% loss in yield has been reported from Jalapur area in Madhya Pradesh by Shukla, *et al.* [7]. Complete yield loss under rainy and humid areas of the Sudan and Ethiopia [8, 9]. Use of genetic resistance is the most effective, economic and environmentally-friendly way to control bacterial blight. Therefore this experiment was initiated to screen sesame germplasms against *Xanthomonas campestris* (Pammel) Dawson pv. *sesami* under field condition.

2. Materials and Methods

Field experiment has been conducted at Metema in Gondar agricultural research center station on 2015 and 2016 cropping seasons. A total of 70 genotypes sesame were evaluated in hot spot area at Metema station with simple plot in one replication in a plot size of 5m length and with a recommended spacing of 10 cm x 40 cm between plant and row respectively. All agronomic practices were applied following the recommendations in the location. Disease severity data were collected according to Sarwar and Haq [10] scale where 0= 0% , 1 = 0.1-5% , 2 = 5.1-

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10% , 3 = 10.1-20% , 4 = 20.1-50% , 5 = 50.1-70%, 6 = > 70 % with a response of immune, highly resistant, resistant, moderately resistant, moderately susceptible, susceptible and highly susceptible respectively. Agronomic data on Stand count at emergence and harvest, days to flowering (50%), days of maturity, plant height (cm), number of capsules/plant, thousand seed weight and seed yield. The data collected were subjected to descriptive statistical analysis using SAS software.

3. Results and Discussion

Table-1. Infection level, scale values and resistance levels of sesame genotypes against bacterial blight in 2015 and 2016

No	Genotypes	Source	2015	2016		Genotypes	Source	2015	2016
			SR	SR	No.			SR	SR
1	WARC -106	Northern Collection	3.6MS	3MR	36	WARC -082	Western Collection	3.2MR	3MR
2	WARC -095	Northern Collection	3.6MS	3MR	37	WARC -083	Western Collection	3.6MS	4MS
3	WARC -092	Northern Collection	3.4MR	4MS	38	WARC -084	Western Collection	3.4MR	3MR
4	WARC -097	Northern Collection	3.8MS	4MS	39	WARC -085	Western Collection	3.2MR	4MS
5	WARC -103	Northern Collection	3MR	5S	40	WARC -086	Western Collection	3.8MS	3MR
6	WARC -094	Northern Collection	3.2MR	5S	41	WARC -087	Western Collection	3.8MS	4MS
7	WARC -104	Northern Collection	3MR	4MS	42	WARC -088	Western Collection	3.2MR	4MS
8	WARC -102	Northern Collection	3.6MS	5S	43	WARC -089	Western Collection	2.4R	3MR
9	WARC -100	Northern Collection	3.4MR	4MS	44	HuARC-2	Pureline	3MR	4MS
10	WARC -091	Northern Collection	3.6MS	5S	45	HuARC-3	Pureline	4MS	4MS
11	WARC -093	Northern Collection	3.6MS	4MS	46	Abusefa	Pureline	3MR	4MS
12	WARC 063	Different Collection	3.4MR	2R	47	Gumero	Pureline	4MS	2R
13	WARC 057	Different Collection	3.4MR	2R	48	o2	Gondar land race	4MS	3MR
14	WARC 059	Different Collection	4MS	3MR	49	o3	Gondar land race	3.6MS	3MR
15	WARC 069	Different Collection	2.6MR	4MS	50	o6	Gondar land race	3.8MS	3MR
16	WARC 061	Different Collection	3.2MR	6HS	51	o7	Gondar land race	3.8MS	4MS
17	WARC 071	Different Collection	3.4MR	4MS	52	o9	Gondar land race	3.6MS	3MR
18	WARC 068	Different Collection	4MS	4MS	53	o10	Gondar land race	4MS	4MS
19	WARC 064	Different Collection	4MS	4MS	54	Adi double	Gondar early	3.8MS	3MR
20	WARC 060	Different Collection	3.4MR	5S	55	NH -0089(1)	Gondar early	4MS	4MS
21	NH -0089(3)	Early Set II -NVT	3.6MS	3MR	56	Acc-00035	Gondar early	3.6MS	3MR
22	Sps –Sik -98	Early Set II -NVT	3.4MR	3MR	57	Acc-00015	Gondar early	3.6MS	4MS
23	Adi	Early Set II -NVT	3.4MR	3MR	58	WARC057	Gondar early	4MS	4MS
24	Clusu -5	Early Set II -NVT	3.8MS	4MS	59	WARC065	Gondar early	4MS	4MS
25	Acc -051 -02-sel -6(2)	Early Set II –NVT	3.6MS	3MR	60	WARC072	Gondar early	3.8MS	4MS
26	acc-051-02-sel-14	Late Set I -NVT	3MR	4MS	61	Abasena	Gondar Late set	2.8MR	2R
27	acc-202-374	Late Set I -NVT	3.4MR	4MS	62	Serkamo white	Gondar Late set	3.5MS	3MR
28	cross22 X t-85(32-3)-sel-4	Late Set I -NVT	3.6MS	3MR	63	WARC068	Gondar Late set	3.8MS	4MS
29	NH-038	Late Set I -NVT	3.4MR	4MS	64	WARC 70	Gondar Late set	3.6MS	4MS
30	Tate	Late Set I -NVT	3MR	4MS	65	WARC 71	Gondar Late set	4MS	4MS
31	WARC-073	Western Collection	2.8MR	3MR	66	Gojam Azene	Gondar Late set	4MS	4MS
32	WARC-074	Western Collection	2.4R	3MR	67	215816	Gondar Late set	3.2MR	3MR
33	WARC -075	Western Collection	2.6MR	3MR	68	Hirhir		3.5MS	3MR
34	WARC -076	Western Collection	3.4MR	3MR	69	Humera-1		4MS	4MS
35	WARC -081	Western Collection	4MS	2R	70	Setit-1		4MS	4MS

NB. 0=immune (I), 1= Highly Resistant (HR), 2= Resistant (R), 3= Moderately Resistant (MR), 4= Moderately Susceptible (MS), 5= Susceptible and 6= Highly Susceptible (HS), SR= scale and response

Table-2. Mean yield and yield component of the genotypes at Metema in 2015 and 2016 cropping season

	2015			2016					Combine SY		2015			2016					
Genotypes	PH (cm)	PPP	SY (kg/ha)	DM	PH (cm)	SPP	PPP	SY(kg/ha)		Genotypes	PH	PPP	SY (kg/ha)	DM	PH	SPP	PPP	SY (kg/ha)	Combine SY
1	165.2	70.2	685	103	117.8	58.6	96.8	305.0	495.0	36	162.8	123.8	757.5	100	121.6	61.6	72.6	859.2	808.4
2	158.2	56.2	352.5	101	121	61.8	151.4	486.2	419.4	37	173.6	74.8	457.5	107	124	62.4	38.8	398.5	428.0
3	159.6	59	535	103	120.8	66	84.4	648.1	591.5	38	171.6	97.2	315	103	130.2	79.4	49.8	523.2	419.1
4	138.4	29.8	182.5	97	105.2	60.2	37.4	323.9	253.2	39	177.6	43.8	305	104	120.6	66.4	42	604.0	454.5
5	161	48	532.5	101	114.6	55.4	50.6	895.8	714.1	40	163.8	74.4	322.5	76	123	64.8	29.6	482.1	402.3
6	153	42.4	55	102	123.6	63.6	35	665.6	360.3	41	178.2	40.2	545	101	114	62.2	33.2	376.0	460.5
7	173.2	87.8	695	98	125.8	72	54.4	660.0	677.5	42	164.6	30.8	397.5	103	115.8	52.8	31.8	319.4	358.4
8	165.6	67.2	627.5	97	121.8	73.2	35	693.9	660.7	43	179.2	36.8	135	76	139.8	69.8	55	663.7	399.3
9	166.2	79	382.5	97	129	60	37.4	726.8	554.7	44	161.8	54.6	230	103	111.6	57.6	51.8	562.0	396.0
10	162	55	202.5	98	151.2	70.8	66.2	1042.6	622.6	45	143.8	50	302.5	99	127.4	63.6	49.6	439.0	370.8
11	166.4	53.8	392.5	101	137.6	71	31.6	940.6	666.5	46	144.2	76	432.5	102	111.8	67.2	75.4	702.3	567.4
12	191.4	56.8	427.5	103	139.6	64	45.4	1082.0	754.7	47	149.2	48.4	265	97	128	57.2	70.4	734.4	499.7
13	174	41	347.5	103	137.4	73	45.4	753.5	550.5	48	156.6	41	190	98	133	66.6	67	904.1	547.1
14	167.4	54.4	722.5	103	153.6	65	91.8	782.2	752.4	49	171.2	59.4	440	98	145.6	59.2	83.2	813.5	626.8
15	168	56.6	452.5	104	162.6	67.8	86.2	979.3	715.9	50	173.2	53.4	210	101	144.4	57.8	75	984.0	597.0
16	176.4	38.8	432.5	103	137.8	70	43.8	1282.4	857.5	51	165.2	61.4	242.5	103	135.8	64.2	54.2	728.6	485.5
17	157	56.8	602.5	99	137	58.6	56.2	1155.9	879.2	52	156.2	38.8	617.5	104	148.8	69.8	54.6	886.4	751.9
18	164.4	50	405	98	146.6	69.6	54.6	1108.4	756.7	53	165.8	42.2	245	76	156.2	63.4	49.6	632.8	438.9
19	168.2	47.6	215	96	149.8	58.4	73.6	1053.0	634.0	54	158.4	51.4	702.5	107	137.2	78.6	72.8	1216.9	959.7
20	153.4	42.6	407.5	97	143.6	71.6	68.2	534.6	471.0	55	138.4	30.4	275	103	119.6	72.4	41.4	652.0	463.5
21	142.8	38.8	420	103	152.2	76.4	56.8	1065.9	743.0	56	173.4	50.4	550	100	151.8	69.6	49.4	1043.1	796.6
22	171.6	68.6	402.5	103	147.6	60.2	50	885.2	643.9	57	168.4	52.8	417.5	104	142.2	72	41.2	1119.3	768.4
23	188.8	61.6	500	103	144.6	59.2	61.6	900.7	700.4	58	131.2	52.6	360	101	124.4	67	52	857.8	608.9
24	169.6	41	385	104	147.4	67	47.6	839.9	612.5	59	139.4	31.6	390	101	111	79.8	36.2	799.2	594.6
25	196.4	52.6	375	104	160.4	58.2	68	757.6	566.3	60	152.2	55	400	106	131.2	63.6	63.2	946.1	673.0
26	177.8	83.8	422.5	101	145.2	59.2	48.4	804.3	613.4	61	162.6	42.4	382.5	135	127.4	72	69.4	973.0	677.8
27	183.2	51.8	400	101	141.8	78.4	31.8	1125.7	762.8	62	163.4	47.2	537.5	99	120.8	61.4	71.2	346.4	441.9
28	186.2	54	327.5	99	133	60.4	35.6	738.4	532.9	63	172	32.4	382.5	104	116	63.6	70.2	639.4	510.9
29	172.2	69	532.5	97	128.2	66.2	32.4	880.4	706.4	64	171.6	60.4	402.5	103	117.4	68.2	61.6	517.9	460.2
30	167.6	73.2	277.5	99	122	62.4	41.2	792.7	535.1	65	157.4	43.4	425	107	94	51.4	38.2	335.8	380.4
31	170.8	59.4	480	103	136.8	61	46.6	953.8	716.9	66	160.6	56.4	477.5	107	97.2	75.6	49.4	424.5	451.0
32	148	57	440	103	142.4	72.2	100	959.3	699.6	67	166	33.2	427.5	76	101.4	66.6	35.6	571.2	499.3
33	190	77.6	502.5	103	147	59.2	23.8	540.8	521.7	68	153.4	36	372.5	135	101.6	78	45.6	380.3	376.4
34	174.4	120.8	730	103	123.2	67.2	40.2	993.6	861.8	69	163	34	402.5	107	104.6	77.8	33.2	608.0	505.2
35	183.4	118.4	572.5	107	120.2	67.2	37.6	638.8	605.6	70	153.2	44.4	585	107	97.6	59.8	38.4	643.7	614.4

NB. PH=Plant Height, PPP=Pod Per Plant, DM=Days to Maturity, SPP=Seed Per Pod and SY=Seed Yield

The development of cultivars with durable resistance to bacterial blight should be an integral component of sesame breeding programs. Tested genotypes did not show total resistance, however, a clear difference in the degree of resistance was noted among the genotypes. On the basis of percent infection values in 2015 none of the genotype was ranked as immune, highly resistant, susceptible and highly susceptible while 2 were resistant, 28 were moderately resistant, and 40 were moderately susceptible genotypes. Genotype 32 and 43 shows a resistant reaction to the disease but result low seed yield than the others. Genotype 36 and 34 show a moderately resistant response and high yield than the other germplasms while genotypes WARC -091, WARC 064 and 06 show a moderately susceptible response and lower yield than the other genotypes. In 2016 cropping season 5 (WARC 063, WARC-057, Gumero, and Abasena) were resistant, 24 moderately resistant, and 34 moderately susceptible, 5 susceptible, 1 highly susceptible genotypes (Table 1). In both seasons genotype WARC-063 (754.7), WARC-082 (808.4), WARC-073 (714.9), WARC-074 (699.6), WARC-076 (861.8) and Abasena (677.8) were moderately resistant and high yielders at Metema (Table 1 and 2).

4. Conclusion and Recommendation

In conclusion, tested genotypes did not show total resistance, however, a clear difference in the degree of resistance was noted among the genotypes. Sources of partial resistance against sesame bacterial blight disease are available in ten genotypes (WARC-063, WARC-082, WARC-073, WARC-074, WARC-075, 215816, WARC-076, WARC-082, WARC-089 and Abasena). These genotypes were resistant to moderately resistant during both years, in the hot spot plots. These genotypes seem to have some significant stability for resistance of infection with *Xanthomanas campistris* pv sesame. Breeders might consider them as a source of resistance in breeding programme or may directly be prompted after confirming their desirable yield trait.

Acknowledgment

Our gratefulness and thanks are going to Sesame Business Network support program (SBN-SP) and Gondar Agricultural Research Center (GARC) for granting us financial support and provision of the necessary materials. Our sincere thanks go also to crop science directorate staff of GARC and Mekdes Abebe for their cooperation and assistance during the research work.

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