Egypt. J. Agric. Res., 76 (2),1998.

SURVEY AND DETERMINATION OF BARLEY DISEASES IN NEW LANDS AND RAINFED AREAS

RIZK A.RIZK[1], F.A. ASAAD[2], AND A.M.M. SALEH[1]

1 Plant Pathology Research Institute, Agric. Res. Centre, Giza, Egypt.

2 Field Crops Research Institute, Agric. Res. Centre, Giza, Egypt.

(Manuscript received 18 March 1997)

Abstract

Survey of barley diseases was carried out under rainfed conditions in the Northwest Coast and North Sinai as well as under sprinkler irrigation in the new lands at Nubaria area. Under rainfed condition, physiologic spotting (boron toxicity) was the major problem which affected barley plants. Nest blotch was recorded in some locations but the severity was somewhat low. Scald, covered smut, and barley stripe were limited to some locations with low severity. Under sprinkler irrigation in the new lands, net blotch was presented as a major disease with high severity and incidence. Two barley genotypes were selected as highly resistant to net blotch under sprinkler irrigation in the new lands. Resistance to powdery mildew was exhibited by 28 barley genotypes out of 302 genotypes evaluated. A total of 391 barley genotypes were tested for tolerance to spotting out of which 15 genotypes were selected as highly tolerant.

INTRODUCTION

Barley (*Hordeum vulgare* L) in contrast to other cereal crops can be grown and give production under several stress conditions. In spite of the adverse conditions in which barley is grown, diseases can still be an important factor reducing barley production. Diseases of barley in Egypt are numberous and cause substantial reduction in yield. These diseases are powdery mildew (*Erysiphe graminis f. sp. hordei*), leaf rust (*Puccinia hordei*), net blotch (Helmint hosporium teres), leaf stripe (H.graminium), covered smut (Ustilago hordei), and loose smut (*U.nuda*) (Abdel-Hak and Ghobrial, 1977). Scald caused by Rhynchosporium secalis was recorded by Rizk and El-Sayed (1993) as a new barley disease in the North Western Coast (NWC) of Egypt. Dry land (Common) root rot caused by Fusarium gramenearum. and H.sativum was recorded as one of the major diseases

in the NWC by Rizk et al. (1994). Physiologic spotting is one of the most important problems on barley especially under rainfed conditions in the NWC and North Sinai (Rizk et al., 1993 and 1994).

The best method for controlling these diseases are by using resistant genotypes which exhibit a high level of resistance under adverse climatic conditions. Screening for barley resistant genotypes was carried out in Egypt by many workers; Ghobrial et al. (1976, 1977, 1984 and 1990), Rizk et al. (1984 and 1993), and El-Sayed et al. (1991).

The main objectives of this research were to identify major disease problems through qualitative and quantitative field survey and selecting suitable barley genotypes which can be used in barley breeding program.

MATERIALS AND METHODS

I- Survey of barley diseases

Disease survey of the common barley diseases was carried out in growers' fields under rainfed conditions (NWC and N. Sinai) as well as under sprinkler irrigation (new reclaimed lands). The sampling unit was 100 plants checked in each field. Those tested plants were taken from 10 different spots taken at random on two diagonals of each field. The diseases were diagnosed in the field and representative specimens of diseases which were taken for isolation of the causal fungi and identilication for confirmation.

Barley diseases were assessed three times in the season, at the 3-4 leaf stage, at tillering stage, and at the ripening stage when 2 to 3 leaves were still green. Field reaction for net blotch and scald was recorded on percentage disease and 0-9 double digit disease rating at least 3 times in the season (Saari adn Prescott, 1975). Leaf stripe and smut diseases were recorded as percentage. Dry land (common) root rot was recorded as percentage also, while leaf spotting was recorded using 0-3 simple scale as follows: 0 = no visible symptoms, 1= symptoms cover less than 25% of the leaf area, 2 = 25-60% of the leaf area is affected, and 3 = more than 60% of the leaf area covered with spotting symptoms.

2- Screening barley genotypes for resistance

Barley lines and cultivars from local and exotic sources were evaluated in the

new lands under sprinkler irrigation and in the NWC under rainfed condition. Screening for resistance to powdery mildew was carried out at Giza. The barley collections tested in this study were:

A. Local material

1. A-Yield trial, 6-rowed, 64 entries.
2. B-Yield trial, 6-rowed, 32 entries.
3. D-Yield trial, 6-rowed, 16 entries.
4. A-Yield trial, 6-rowed, 64 entries.
5. B-Yield trial, 6-rowed, 32 entries.
6. D-Yield trial, 6-rowed, 16 entries.
7. Local Barley Yield Trial (LBYT), 24 entries.
8. Advanced Barley Yield Trial (ABYT), 8 entries.
9. Egyptian Barley Landraces (EBLR), 16 entries.
10. Barley Screening Nursery (BSN), 50 entries.
11. Demonstration plots, 6-rowed, 10 entries.
12. Demonstration plots, 2-rowed, 10 entries.

B. Exotic material

1. UNRMAG, 1994-95 (269 entries).
2. Barley Yield Trial for Low rainfall (BYT-L), 24 entries.

Field test was carried out under natural infection of barley diseases. Each entry was planted in a single row 1 m long and 20 cm apart. Checks of local and susceptible varieties were included throughout the nurseries and as borders (spreaders) to ensure fungal infection. Disease assessment was carried out at growth stage 10.5 on Feek's scale (Large, 1954).

Area under disease progress curve (AUDPC) was calculated according to Paudy et al. (1989) using the formula:

$AUDPC = D [1/2 (Y1 + Yk) + (Y_2 + Y_3 + ... Y_{k-1})]$ Where:

D = time intervals,

Y1+ Yk = sum of first and last disease scores

Y2 + Y3 + ... Y k-1 = sum of all in - between disease scores.

RESULTS AND DISCUSSION

1. Disease survey

Survey of barley diseases was carried out under rainfed conditions in the NWC and N.sinai as well as under sprinkler irrigation in the new lands at Nubaria area. Data in Table 1 indicated that physiologic spotting was the major problem on barley especially under rainfed conditions in the NWC and N.Sinai. The highest degree of symptoms was noticed on barley plants at Rafah and El-Kharouba in N.Sinai followed by the western parts in the NWC. Net. Net blotch caused by H.ters on the other hand, was present as a major disease especially under sprinkler irrigation at Nubaria in which the average severity of infection on the susceptible cultivars was 7-5, in general. However, North Sinai was free from net blotch. In the NWC net blotch was recorded in some locations and the severity of the disease was somewhat low.

Table 1. Barley diseases in growers' fields expressed as percentage of infected plants and severity at different locations in the rainfed area and the new lands, 1994/95.

Location	Net blotch		Scald		Root-rot	Covered smut	Barley stripe	Phys. spot.	Sev 00-99
	% Inf.*	sev.** 00-99	% Inf.*	sev.** 00-99	% Inf.	%Inf.	%Inf.	% Inf.	
I. Under rainfed									
a. Northwest Coast									
Abo-lahow	10	52	0	0	10	0	0	0	0
El-Halazin	Trace	31	Trace	31	5	0	0	20	2
El-Garrara	30	74	0	0	3.5	0	0	25	2
El-mathani 1	20	64	Trace	31	7	0	0	10	2
El-Mathani 2	0	0	0	0	15	0	0	30	3
El-Negela 1	0	0	0	0	14	Trace	0	60	3
El-Negela 2	330	53	0	0	13.5	0	0	0	0
H. Mubarak	35	42	0	0	16.5	Trace	0	62	2
Sidi Barani 1	25	42	0	0	6	0	0	70	3
Sidi Barani 2	0	0	10	31	0	0	Trace	0	0
b. North Sinai									
El-Arish	0	0	0	0	0	0	0	90	3
Rafah	0	0	0	0	0	0	0	100	3
El-Kharoub	0	0	0	0	0	0	0	100	3
El-Gora	0	0	0	0	10	Trace	Trace	80	3
II. New lands									
El-Nubaria	100	75	0	0	0	0	0	0	0

* % Inf. = Percentage of infected plants in the population.
** Sev. = Average disease severity.

Scald caused by Rhynchosporium secalis was recorded as a minor disease in three locations in the NWC only. Covered smut caused by Ustilogo hordei and barley stripe caused by H.gramenium were rarely found in our survey and the percentage of infection was very low.

Concerning dry-land (common) root rot aused by F.gramenearum and H.sativum, data presented in Table 1 showed that the disease is one of the main problems for barley especially under rainfed conditions in the NWC. The percentage of infection ranged from 0% to 16.5% in the locations under study. The highest percentage was recorded at H.Mubarak location, west of Matrouh. Generally, as a result of drought stress, the severity of some diseases such as net blotch and scald was low.

2. Screening for resistance

a. Resistance to ned blotch

Resistance to net blotch was studied in the new lands at Nubaria under sprinkler irrigation. The environmental condition was suitable for disease development. This evaluation was under natural inoculation. The disease score on the susceptible varieties was very high. In this nursery, a total of 10 barley genotypes including some of the commercial varieties and advanced lines from the breeding program were tested for resistance to net blotch. Two barley genotypes were selected as highly resistant according to the Area Under Disease Progress Curve (AUDPC) which have the least value comparing with the other tested varieties (Table 2).

Table 1. Evaluation of some barley cultivars (Demo. 2- rowed) and advanced lines for resistance to net blotch under sprinkler irrigation in the new lands at Nubaria, 1994/95.

Entry No	Name/pedigree	Net blotch severity (00-99)			AUDPC*
		14/3/95	23/3/95	4/4/95	
1	Bweet	0-trace	51	72	57.5
2	Giza 127	75	96	97	150.0
3	Giza 128	Trace	31	61	37.5
4	Sakha 1	41	64	74	90.0
5	Sakha 2	41	53	75	82.5
6	L 2R-93/1	trace	41	41	37.5
7	L 2R-93/2	44	77	88	130.0
8	WI 2291/Harma-03//Harmal ICB-??-0059	76	87	97	147.5
9	(43 MSU/TUNISSIA - 89/90)	0	0	trace	5.0
10	(53 MSU/TUNISSIA-89/90)	0	0	0	0.0

* AUDPC = Aea Under Disease Progress Curve.

Table 3. Selected barley genotypes showing resistance reaction to powdery mildew under natural infection at Giza, 1994/95.

Ser. No	Entry No	Name/pedigree	Source
1	10	32 MUS (Giza 89/90 season)	Demonstration 6-rowed
2	1	Bweet	Demonstration 2-rowed
3	7	L-2R-93/1	Demonstration 2-rowed
4	7	Roho	D-Trial 6-rowed
5	8	Acsad 1028	" "
6	14	80-5013/5/Cr.115/Pro//Bc/3/Api/GM67/4/ Giza120ICB85-1696-OAP	" "
7	16	Arizona 5908/Aths//Lignee 640	" "
8	3	Giza 128	D-Trial 2-rowed
9	7	L 2R-93/2	" "
10	8	WI2198/Emir/417028/2759/3/69-82//DS/ Apro ICB83-0053-23AP-OTR-OAR	" "
11	12	Aurore/Esp//Alger/Ceres, 372-1-1 LB3A-9L-2AP-OPXSoufara's' Sel. 5AP-OAP.WI	" "
12	13	2291/Bus//H.vulgare/Martonva 34 ICB86-0578-OAP.	" "
13	14	CN42/CI07772//Fun/3/Fun/Tc4/Fun/ Ki/5/ Harmal-01 ICB 87-1456-OAP.	" "
14	16	WI2269/3/Roho//Alger/Ceres, 366-1-1 ICB84-1693-2AP-2AP-OAP	" "
15	19	PI 2325/Maf 102//Cossack/3/TRUMP	B-Trial 6-rowed
16	32	Plaisant	" "
17	14	Lignee 131//CI 08887/CI 05761/3/ER/Apm ICB 82-0458-3AP-1AP-OAP	B-Trial 6-rowed
18	17	Weeahll//WI2291/Bgs ICB83-1826-1AP-2AP-1AP-OAP-OAP.	B-Trial 6-rowed
19	28	Api/CM 67//Mona/3/DI//Asse/CM 65-1W-1B x As 46/Aths*2	" "
20	52	Lignee 527/Aths CYB-3191-OD- 1AP-4AP-01TR-4AP-OTR-OAP	A-Trial 6-rowed
21	8	Mo-B1337/WI2291//Harmal1-02 ICB89-0058	" "
22	60	WI3391/Bus/5/Cq/CM/Apm/3/12410/4/ Giza134-2L-OAPICB85-1428-1428-OAP-	A-Trial 2-rowed
23	64	36APH-OAP Bweet	" "
24	5	PId 10342//Cr. 115/Por/3/Bahtim9/4/DS/ Pro/5/WI2291/6/Badia ICB 86-0545-OAP-3KSR-1KSR-OGZ-OKSR	" " Screening
25	11	Nigrate/5/WI2198/4/Avt/Ki//Avt/Total/3/ B2/Vt ICB86-0329-0329-OAP-2KSR-1GZ-OKSR	" "
26	27	Quinn/Rihane//Quinn/Lignee 640 ICB 83-1134-OAP-OAP-OAP-9AP-OAP Lignee 527/NK1272	" " " "
27	32	L.91-5 Unknown (No. 30, Expt I, Sakha, Strees	
28	42	Prog.)	" "

b. Resistance to powdery mildew

Screening for resistance to powdery mildew caused by Erysiphe grainmis f.sp. hordei was carried out a Giza under natural inoculation. In the disease nursery, a total of 302 barley genotypes including yield trials as well as advanced lines of the breeding program were evaluated for resistance to powdery mildew. Resistance was exhibited by 30 barley genotypes (Table 3).

c. Tolerance to barley spotting (boron toxicity)

Screening barley genotypes for tolerance to barley spotting is a new strategy to select genotypes tolerant to spotting symptoms especially under rainfed conditions. This screening was carried out at El-Kasr location in the NWC in which spotting symptoms were very high especially on sensitive genotypes. A total of 391 barley genotypes were tested, out of these 15 were tolerant (Table 4).

Table 4. Selected barley genotypes (Local and exotic material) showing resistance to physiologic spotting under rainfed condition in the NWC, 1994/95.

Ser No	Entry No	Name/pedigree	Source
1	5	Aths/Rihane-01 ICB84-0213-1AP-3AP-OTR-1AP-OTR	ABYT
2	2	Giza 126	LBYT
3	6	Lignee 640/CC 29//Hem/Bc-9L/5/Lignee 527// BCO. Mr/Gva/4/7028/2759/3/69-82//DS/Apro ICB 83-1066-3AP-OAP	" "
4	17	Pld 10342//Cr. 115/Pro/3/Bahtim 9/4/ Ds. Apro/5/WI2291/Bdia (Sel. 1.2.1) ICB 86-0545-OAP (23 F5 Giza, 91/92)	" "
5	7	Pld 10342//Cr.115/Por/3/Bahtim 9/4/ DS/Pro/5/WI2291/6/Badia ICB86-0545-OAP-3KSR 3KSR-OGZ-OLSR	Screening
6	20	Giza 121/CI 06248/4/Apm. IB 65//11012-2/3/Api/CM67// Ds/Apro/5/Aths ICB 85-0177-2AP-4AP-3TR-2AP-OTR-OAP	
7	32	Lignee 527/NK1272	" "
8	33	Chaaran-01/3/Arizona 5908/Aths//Bgs ICB 79-1328-OSH-2AP-2AP-3AP	" "
9	3	Arar/PI 386540	" "
10	3	Roho/Arabi Abiad//6250/1161/3/Harmal	BYT-L
11	5	Giza 121/CI 06248/4/Apm/IB65//11012-2/3/ Api/CM 67//DS/Apro/5/M5/Galt//As46	NURMAG " "
12	26	Aths/Lignee 686/4/Rihane-03/3/BC/ Rihane//Ky63-1294	" "
13	34	Arar/Rihane-03	" "
14	52	Emier/Nacta//Ast 907//3/Avt	" "
15	197	DL 534/DL 529	" "

On the other hand, 12 barley genotypes were selected as highly sensitive (Table 5). These genotypes will be used for further studies in the near future.

Table 5. Selected barley genotypes sensitive to spotting under rainfed canditions in the NWC, 1994/95.

Ser No	Entry No	Name/pedigree	Source
1	7	Lignee 640/Bgs//Cel. ICB82-0440-2AP-OAP	ABYT
2	11	Nigrate/5/WI2198/4/Avt/Ki//Avt/Toll/3/B2/Vt ICB86-0329-OAP-2KSR-1GZ-OKSR	Screening
3	25	Lignee 640/Bgs//Cel ICB82-0440-2AP-OAP-19AP-OTR	" "
4	36	7-INC-TH90	" "
5	40	Rihane//BC/Coho ICB83-1488-2AP-OAP-1AP-1APH	" "
6	16	Moroc 9-75 (Improved 2-R check)	BYT-L
7	21	Rihane 03 (Improved 6-R check)	" "
8	51	DMR 27/WI2197/3/Np Barley/6307//Ch-Du	NURMAG " "
9	54	Cr. 115/Pro//Bc/3Api/CM67/4/G.120/5/Satter 2/Numar	" "
10	228	WI2197/Mazurka/3/Deir Alla 106//DL 71/Strain 205	" "
11	229	Mari/Aths*2//M-att-73-337-1/3/Arimar/Aths	" "
12	269	ER/Apm	

REFERENCES

1. Abdel-Hak, T., and E. Ghobrial. 1977. Barley diseases situation in the Near East with special reference to sources of resistance. Proceedings of the Forth Regional Witer Cereal Workshop-Amman, Jordon, Barley, Vol. 2:311-319.

2. El-Sayed, A.A., Faten El-Nashar, Massarat El-Ghamry, E.E. Mostafa, and R.A. Rizk. 1991. Disease resistance of barley genotypes under the conditions of Northwestern Coast of Egypt. Assiut J. of Agric. Sci., Vol. 22: 127-142 .

3. Ghobrial, E., A.A. El-Sayed, M.M. Noaman, R.A. Rizk, and Ikhlas Shefik. 1990. Barley varieties of multiple disease resistance under Egyptian conditions. Proc. of the Sixth Cong. of Phytopathology, Cairo, Egypt, Part I. 283-293.

4. Ghobrial, E., E. Ghanem, A.A. Bassioni, A. Gouda, M.S. Saleh, and E.E. Mostafa. 1984. Sources of resistance to powdery mildew of barley (Erysiphe graminis hordei Em. Marchal). Proceedings of EMCIP Symposium, Giza, Egypt, Vol. 2: 189-203 .

5. Ghobrial, E., Ikhlas Shafik, and A.M. Hammouda. 1982. Sources of resistance to barley Helminthosporiosis. Barley Newsletter 25: 64-67 .

6. Ghobrial, E., A.M. Hamouda, R. Abdel-Khalek, and E.E. Mostafa. 1977. Studies on the control of powdery mildew of barley in ARE. Agric. Res. Rev. Vol. 55 (2) : 31-38.

7. Ghobrial, E., L.R. Morsi, and T. Sabet. 1976. Sources of resistance to leaf rust of barley (Puccinia hordei Otth) in ARE. Proc. 2nd Conf. Phytopath. 671-682 .

8. Large, E.C. 1954. Growth stages of cereals. Plant Pathology. 3: 129-130 .

9. Paudy, H.N., T.C.M. Menon, and M.V. Rao. 1989. Simple formula for calculating area under disease progress curve. Rachis 8 (2) : 38-39.

10. Rizk, R.A., A.A. El-Sayed, J.Van Leur, and E.E. Mostafa. 1994. Survey of dry-land (common) root rot of barley in Egypt. Symposium of 5th Arab Congress of Plant Protection, Fes, Morocco. (Abstract).

11. Rizk, R.A., A.A. El-Sayed. 1993. Scald, a new barley disease in Egypt. Symposium of International Workshop of Barley Leaf Blights. Aleppo, Syria (Abstract).

12. Rizk, R.A., E.E. Mostafa, F.A. Asaad, and M.M. Noaman. 1994. Survey and determination of barley diseases in barley production areas of Egypt. NVRP Annual Meeting, 11-15 Sep., 1994.

13. Rizk, R.A., M.M. Noaman, E.E. Mostafa, and A. Orabi. 1993. Screening barley genotypes for resistance to major diseases and boron toxicity. (Unpublished data).

14. Saari, E.E., and J.M. Prescott. 1975. A scale for appraising the foliar intensity of wheat diseases. Pl. Dis. Rept. 59, 377-380.

حصر وتقدير أمراض البياض الدقيقى فى الأراضى الجديدة وتحت ظروف الرى بالمطر

رزق عبد الخالق [١]، فريد عازر أسعد [٢]، على محمد محمد صالح [١]

١ معهد بحوث أمراض النبات – مركز البحوث الزراعية – الجيزة – مصر .

٢ معهد بحوث المحاصيل الحقليه – مركز البحوث الزراعية – الجيزة – مصر .

اجريت حصر لأراضى الشعير بالساحل الشمالى الغربى وسيناء الشمالية تحت ظروف الرى بالمطر وكذلك فى الأراضى المستصلحة حديثا بالنوبارية تحت ظروف الرى بالرش.

وقد أظهرت النتائج المتحصل عليها الآتى :-

- تحت ظروف الرى بالمطر بالساحل الشمالى وسيناء وجد أن التبقع الفسيولوجى المتسبب عن زيادة تركيز عنصر البورون كانت المشكلة الرئيسية التى تواجه زراعة الشعير فى هذه المناطق. مرض التبقع الشبكى سجل فى بعض المناطق ولكن تختلف درجة الأصابة ، كذلك مرض اللسعة والتفحم المغطى والتخطيط سجلت في بعض المناطق بدرجة أصابة منخفضة.
- فى الأراضى المستصلحة حديثا تحت ظروف الرى بالرش وجد درجه إصابه عاليه بالتبقع الشبكي.
- تم كذلك فى هذه الدراسة انتخاب صنفين مقاومين لمرض التبقع الشبكى بهم درجة إصابه عالية جدا تحت ظروف الرى بالرش فى الأراضى الجديدة.
- تم كذلك تقييم ٣٠٢ صنفا وسلالة لمقاومة مرض البياض الدقيقى وتم أنتخاب ٢٨ صنفا مقاومة بدرجة عالية.
- تم تقييم ٣٩١ صنفا وسلالة لدراسة مدى حساسيتها للتبقع الفسيولوجى وتم أنتخاب ١٥ صنفا وسلالة تتحمل الأصابة بالبقع الفسيولوجية بدرجة عالية.