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Evaluation of Resistance of some Wheat Commercial Cultivars and Elite Lines to Four Pathotypes of *Puccinia striformiss* f. sp. *Tritici*

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ABSTRACT

In this research, resistance of the 45 elite wheat lines and 21 wheat commercial cultivars were studied relative to the 4 wheat yellow rust pathotypes in completely random blocks design in three replications. This study was conducted in seedling stage in 2010-2011. Isolates were collected from Mazandaran, Moghan and Mashhad provinces. In order to determine pathotypes and virulence factors, the isolates of 44 isogenic lines or international lines were used. The result of the study of 4 pathotypes showed that race 166E150A$^+$ (Moghan) has the most pathogenicity and race 134E146A$^+$ (Sari) has the less pathogenicity. In order to determine of resistance, the commercial wheat cultivars and lines were planted in pots in thickness of 12 cm and the seedlings were inoculated with fungi of pathogen in one- two leaves stages. The pots were transferred into greenhouse in temperature of 17-19°C, humidity of 55-65% and 12 h light. The bushes were investigated separately ten days after inoculation. This trend continued 5 days for measuring latent period and finally the infection type was noted based on scale (0-9) in day of 14th after inoculation. After data analysis, the lines and cultivars of C-85D-9, C-85D-13, MV17, C-86-6, M-85-7, C-85-6, C-86-3, C-83-7, C-84-8, S-80-18, C-84D-55, C-85D-8, M-86-9, C-86-5, Dena, Sivand, Pishgam, Parsi, Gaspard, Niknejad and Karkheh were reported resistant against infection type and latent period and lines and cultivars of WS-86-14, S-83-4, WS-85-10, S-85-19, MS-84-16, S-83-3, WS-86-11, MS-85-15, WS-86-13, Alvand, Arg, Bolani and Shahriyar were reported sensitive from infection type and latent period view point.

Keywords: Infection type, Latent period, Seedling resistance, Wheat, Yellow rust.

INTRODUCTION

Wheat yellow rust infected by *Puccinia striiformiss* f. sp. *tritici* is the main wheat disease [3]. The life cycle of *P. striformiss* continues on May apple and this plant plays main role in new composition of disease [8]. This disease needs the lowest heat compared with black rust. The less, optimal and high temperature is 0, 11, and 23°C [7]. The best control method of cereal rusts is using resistant cultivars [11]. For doing so, it is necessary to test the wheat

developed lines before introduction and cultivation and omission of them in vice verse. Thus, the wheat developed lines were tested in seedling and adult stages [11]. Kimberli et al. [10] suggested that increase of resistance against to yellow rust is seen in different areas and the resistance is considerable in North America, south and east Europe and south east of Asia. Few showed that Yr36 is a quantitative gene against to wheat yellow rust discovered in wild races. This gene has (WKS1) protein that coded by two areas: kinase and regulating protein similar to lipid carrier. WSK1 is affected by temperature and the effect of this gene is significant in adult plant relative to shooting stage. Afshari et al. [1] concluded that 52.27% of genotypes show resistant in artificial inoculation of genotype 2154 in stage of formation of claw by pathotype of wheat yellow rust on plant carrying gens *Yr2, Yr6, Yr7, Yr9* and *YrA* in Garakhil region. They can be introduced as new resistance resources [1]. Genetics of the pathogen and resistance of the wheat lines and commercial cultivars in Iran should be studied and the result of these studies should be considered in programs of improvement of production of resistance cultivars. In this investigation, the resistance of some commercial cultivars and lines were evaluated against four pathogens.

MATERIALS AND METHODS

The 44 wheat lines and 21 wheat commercial cultivars were used in this study. These lines were obtained in cereal research center of seed, seed and plant improvement institute and they showed acceptable resistance and products for using in different climates in the country. In order to select the proper pathotypes of pathogen, different samples of yellow rust pathogen fungi were collected from all regions of the country and they were transferred into greenhouse of this center. The samples were multiplied on wheat sensitive cultivars like Bolani. All experiment stages were carried out in greenhouse in proper growth conditions (17-19°C, light 16000 lux by photoperiod of 12 h and relative humidity of 70%). In order to determine the pathotype and pathogens, the isolates of the fungi was inoculated on international cultivars seedlings after purification and multiplication on sensitive cultivars. Each combinatory cultivar involved one or many genes resistant against yellow rust. The infection type was noted 14 days after inoculation based on scale 0-9. The 0-6 was considered as incompatible (resistant and semi resistant) and 7-9 was considered as sensitive [12]. The 4 pathotypes were selected for experiment on cultivars resistance according to isolates pathogenicity. Pathotype 1 was from Ardebil and Mogan and pathotype 2 was from Khorasan and Tortagh region and two other pathotypes were related to Mazandaran and Sari regions. In experiment on wheat lines and cultivars resistance, the seeds of each isolate were cultivated in medium pots in thickness of 12 cm involving pasteurized soil (compost of field soil, leaf manure and sand in ratio of 2:1:1). From each cultivar, three pots by eight seeds in each were cultivated. After growth of the seedlings, the first or second leaves were inoculated by isolates of each pathotype combined with Talk powder. For success of inoculation, the hair was omitted by pulling the leaves between fingers and then inoculation was conducted by sprinkling by using brush in the afternoon for using darkness. All pots inoculated with one pathotype were covered by plastic lids in order to preserve humidity and prevent combination of spores with other pathotypes and they were transferred into 24 hours darkness in temperature of 10°C and humidity of 95-100%. After 24 hours the pots were transferred into greenhouse by 17-19°C and humidity of 70%. For measuring latent period the leaves were experimented from 7^{th} day of inoculation and seedlings with the first pustule were closed by plastic ring for specification. Plastic rings with different colors were used for different days. The number of bushes with pustules was noted everyday for 5 days and in the 5^{th} day the infection type was noted by Mc Neal et al. [12] method as follows: type 0: without infection; type 1: appearance of necrosis spots; type 2: necrosis spots with sporogeny; type 3: necrosis and chlorosis spots and trivial sporogeny; type 4: chlorose and necrosis spots and trivial sporogeny; typ 5: chlorose and necrosis spots and medium sporogeny; type 6: chlorose and necrosis spots and medium sporogeny; type 7: abundant sporogeny with chlorose; type 8: abundant sporogeny with less chlorosis; type 9: abundant sporogeny without chlorosis. According to quantitative nature of infection type, the data were converted and wheat lines and cultivars were grouped based on infection type and latent period traits by using cluster analysis. The experiment was conducted in completely random blocks design by four pathotypes in three replications. The statistical calculations were carried out by SAS software and SPSS software was employed for cluster analysis in Ward method.

RESULTS AND DISCUSSION

In this research, the pathotypes of the pathogens or genes were determined after evaluation of infection types of isogenic lines. All pathotypes were pathogenic on genes of *YrA, Yr25, Yr9, Yr8, Yr7, Yr6*, and *Yr2*, but they showed difference in pathogenicity in other gens (Tables 1 and 2). In the study on the wheat lines and commercial cultivars resistance, the infection type and latent period were evaluated. So the infection type is the best factor for measuring

of the resistance in greenhouse. Race specific resistance is controlled by special genes in the host and pathogen and it is a resistance that identifiable from special pathotypes or genes of pathogen.

Table 1: Different lines and their reactions to four pathotypes of *puccinia striiformiss*.

No.	Line name	Resistance genes	Pathotype 1	Pathotype 2	Pathotype 3	Pathotype 4
1	Chinese 166	*Yr1*	*R*	*R*	*R*	*R*
2	Lee	*Yr7*	*S*	*S*	*S*	*S*
3	Heines Kolben	*Yr2*	*S*	*S*	*S*	*S*
4	Vilmorin 23	*Yr3*	*R*	*R*	*R*	*R*
5	Moro	*Yr10*	*R*	*R*	*R*	*R*
6	Strubs Dikkopf	*YrSD*	*S*	*R*	*R*	*S*
7	Suwon 92/Omar	*YrSU*	*R*	*R*	*R*	*R*
8	Clement	*Yr2,Yr9,+*	*S*	*S*	*S*	*S*
9	*Triticum spelta* var. album	*Yr5*	*R*	*R*	*R*	*R*
10	Hybrid 46	*Yr4*	*R*	*R*	*R*	*R*
11	Reichersberg 42	*Yr7+*	*S*	*S*	*S*	*S*
12	Heines Peko	*Yr2,Yr6,+*	*S*	*R*	*S*	*S*
13	Nord Desprez	*YrND*	*R*	*R*	*R*	*S*
14	Compare	*Yr8*	*S*	*S*	*S*	*R*
15	Carstens V	*YrCV*	*R*	*R*	*R*	*R*
16	Spalding Prolific	*YrSP*	*R*	*R*	*R*	*R*
17	Heines VII	*Yr2+*	*S*	*S*	*S*	*R*
18	Avocet ‘R‘	*Unknown*	*S*	*S*	*S*	*S*
19	Kalyansona	*Yr2*	*S*	*S*	*S*	*S*
20	Trident	*Yr17+Sr38*	*S*	*S*	*S*	*R*
21	Yr15/6* Avocet S	*Yr15*	*R*	*R*	*R*	*R*
22	Hugenoot	*Yr25*	*S*	*S*	*S*	*S*
23	Selkirk	*Yr27*	*R*	*R*	*R*	*S*
24	Federation*4/Kavkaz	*Yr9*	*S*	*S*	*S*	*S*
25	Federation	*Unknown*	*S*	*S*	*S*	*S*
26	Yr1/6*Avocet ‘S	*Yr1*	*R*	*R*	*R*	*R*
27	Yr5/6*Avocet ‘S	*Yr5*	*R*	*R*	*R*	*R*
28	Yr6/6*Avocet ‘S	*Yr6*	*S*	*S*	*S*	*S*
29	Yr7/6*Avocet ‘S	*Yr7*	*S*	*S*	*S*	*S*
30	Yr8/6*Avocet ‘S	*Yr8*	*S*	*S*	*S*	*S*
31	Yr9/6*Avocet ‘S	*Yr9*	*S*	*S*	*S*	*S*
32	Yr10/6*Avocet ‘S	*Yr10*	*R*	*R*	*R*	*R*
33	Yr15/6* Avocet ‘S	*Yr15*	*R*	*R*	*R*	*R*
34	Yr17/6* Avocet ‘S	*Yr17*	*S*	*S*	*S*	*R*
35	Yr18/6* Avocet ‘S	*Yr18*	*S*	*R*	*S*	*S*
36	Yr24/6* Avocet ‘S	*Unknown*	*R*	*R*	*R*	*R*
37	Yr26/6* Avocet ‘S	*Unknown*	*R*	*R*	*R*	*R*
38	Yr27/6* Avocet ‘S	*Yr27*	*R*	*R*	*R*	*R*
39	Yr32/6* Avocet ‘S	*Unknown*	*R*	*R*	*R*	*R*
40	YrSP/6* Avocet ‘S	*YrSP*	*R*	*R*	*R*	*R*
41	Jupateco73R	*Unknown*	*S*	*S*	*S*	*S*
42	Jupateco73S	*Unknown*	*S*	*S*	*S*	*S*
43	Avocet ‘R	*YrA*	*S*	*S*	*S*	*S*
44	Avocet ‘S	*Unknown*	*S*	*S*	*S*	*S*

Table 2: Virulence formula of four pathotypes of *Puccinia striformiss*.

No.	Pathotype	Virulence factors on wheat different sets
1	166E150A$^+$	*Yr7, Yr2, YrSD, Yr9, +, Yr7+, Yr6+, Yr8, Yr2+, Yr17+, Yr25, Yr29, Yr6, Yr17, Yr18, YrA*
2	134E150A$^+$	*Yr7, Yr2, Yr9, +, Yr7+, Yr6, Yr8, Yr2+, Yr17, Yr25, Yr18,YrA*
3	134E146A$^+$	*Yr7, Yr2, Yr9, +, Yr7+, Yr8, Yr2+, Yr17+, Yr25, Yr6, Yr17, YrA*
4	166E14A$^+$	*Yr7, Yr2, YrSD, Yr9, +, Yr7+, Yr6, YrND, Yr25, Yr27, Yr8, Yr18, YrA*

Table 3: Means of infection types of wheat commercial cultivars and lines to four pathotypes of *Puccinia striformiss*.

No.	Line/cultivar	Pathotype 1	Pathotype 2	Pathotype 3	Pathotype 4	Ave. 4 pathotypes
1	N-83-3	2.33	1	1.33	7	2.91
2	GASPARD	0	1.33	2	0.66	1.33
3	MV17	0	0	0	0	0
4	ALVAND	7	7	7	7	7
5	DARYA	0	1.33	0.33	7	2.16
6	ARTA	0	0	0.66	7	1.91
7	GASCOGEN	0	0	0.66	2.33	0.74
8	SHIRODI	2.66	0.66	0.66	8	2.99
9	CHAMRAN	3.66	3.33	3	7	4.24
10	TAJAN	7	3.33	7.33	7.66	6.33
11	NICKNEJAD	0	0	2.66	0.66	0.83
12	PARSI	0	0	0	0	0
13	SIVAND	0	0	0	0	0
14	PISHGHAM	0	0	0	0	0
15	PISHTAZ	8	0.66	1.66	8	4.58
16	YAVAROUS	1.33	0	0	1.33	0.66
17	D-79-15	1.33	6.33	3.33	5	3.99
18	DENA	0	0	0	0	0
19	KARKHAH	2.66	1.66	1.33	1.66	1.82
20	SISON	7.66	2.33	1.33	7.66	4.74
21	SHAHRIAR	8	7	7	8	7.5
22	S-80-18	0	0	0	0	0
23	S-83-3	8	7.33	7.66	8	7.74
24	S-83-4	5.33	7	7	7	6.58
25	S-84-14	5.66	2	7	4.33	4.74
26	S-85-10	7	2.33	7.66	8	6.24
27	S-85-19	8	8	7.66	8	7.91
28	C-81-10	6	0.66	1.66	7	3.83
29	C-83-7	0	0	0	0	0
30	C-83-8	0	0	0	2	0.5
31	C-84-8	0	0	0	0	0
32	C-85-3	0	0	0	7.33	1.83
33	C-85-6	0	0	0	0	0
34	C-86-3	2.33	0	0.66	0	0.74
35	C-86-5	0	2	0.66	0	0.66
36	C-86-6	0	0	0	0	0
37	M-85-7	0	0	0	0	0
38	M-85-16	7.33	1.33	7	8	5.91
39	WS-85-10	8	8	7.66	8	7.91
40	WS-85-15	1.33	0.66	0.33	7	2.33
41	N-86-3	2.66	7	3.33	7	4.99
42	M-86-5	0.66	0.66	5	7.33	3.41
43	M-86-7	7.66	7	4	7.33	6.49
44	M-86-9	0	0	0	1.33	0.33
45	WS-86-5	3	2.66	3	7.33	3.99
46	WS-86-8	1.33	0.33	1	7	2.41
47	WS-86-11	7.66	7.33	8	8	7.74
48	WS-86-12	7	3.33	2.66	8	5.24
49	WS-86-13	7.66	7.33	7.33	8	7.58
50	WS-86-14	7.33	7.66	7.33	7	7.33
51	BAHAR	1.33	1.33	0	6	2.16
52	BAAZ	1.66	2	0.66	7.66	2.99
53	C-84D-551	0	0	0	2.66	0.66
54	C-85D-8	0	0	0	2	0.5
55	C-85D-9	0	0	0	0	0
56	C-85D-13	0	0.66	0.66	0	0.33
57	C-85D-7	7.33	7	4	8	6.58
58	MS-85-17	7.33	4	0	7.66	4.74
59	MS-85-15	8	7	7	8	7.5
60	MS-85-12	7.33	2.33	1.66	7	4.58
61	MS-84-13	7.33	1.33	1.33	8	4.49
62	MS-84-16	7	7.66	7.66	8	7.58
63	ARGH	7	7	7	8	7.25
64	DN-7	0	0	1.66	6	1.91
65	DN-10	4.33	2.33	2.66	7	4.08
66	DN-12	3.66	2	1.66	7	3.58
67	Bolani	8	8	8	8	8

Table 4: Means of latent period of wheat commercial cultivars and lines to four pathotypes of *Puccinia striformiss*.

No.	Line/Cultivar	Pathotype 1	Pathotype 2	Pathotype 3	Pathotype 4	Ave. 4 pathotypes
1	N-83-3	14	20	20	11	16.25
2	GASPARD	20	20	20	20	20
3	MV17	20	20	20	20	20
4	ALVAND	11	11	11	11	11
5	DARYA	20	20	20	11	17.75
6	ARTA	20	20	20	11	17.75
7	GASCOGEN	20	20	20	14	18.5
8	SHIRODI	13.33	20	20	10	15.83
9	CHAMRAN	13	14	14	11	13
10	TAJAN	10.33	14	11	10	11.33
11	NICKNEJAD	20	20	14	20	18.5
12	PARSI	20	20	20	20	20
13	SIVAND	20	20	20	20	20
14	PISHGHAM	20	20	20	20	20
15	PISHTAZ	11	20	14	10	13.75
16	YAVAROUS	20	20	20	20	20
17	D-79-15	14	11	14	13	13
18	DENA	20	20	20	20	20
19	KARKHAH	14	20	14	20	17
20	SISON	10	20	14	11	13.75
21	SHAHRIAR	10	11	11	10	10.5
22	S-80-18	20	20	20	20	20
23	S-83-3	10	11	10.33	10	10.33
24	S-83-4	12	11	11	10.66	11.16
25	S-84-14	11	20	11	13	13.75
26	S-85-10	10	20	10.66	10	12.66
27	S-85-19	10.33	10	10.66	10	10.24
28	C-81-10	12.33	20	20	11	15.83
29	C-83-7	20	20	20	20	20
30	C-83-8	20	20	20	14	18.5
31	C-84-8	20	20	20	20	20
32	C-85-3	20	20	20	11	17.75
33	C-85-6	20	20	20	20	20
34	C-86-3	20	20	20	20	20
35	C-86-5	20	20	20	20	20
36	C-86-6	20	20	20	20	20
37	M-85-7	20	20	20	20	20
38	M-85-16	11	20	11	10	13
39	WS-85-10	10	10	10	10.66	10.16
40	WS-85-15	20	20	20	10.66	17.66
41	N-86-3	14	11	13.33	11	12.33
42	M-86-5	20	20	13	11	16
43	M-86-7	10	11	14	10	11.25
44	M-86-9	20	20	20	20	20
45	WS-86-5	14	14	14	10.66	13.16
46	WS-86-8	14	20	20	10.66	16.16
47	WS-86-11	10	11	10	10	10.25
48	WS-86-12	11	14	14	10.33	12.33
49	WS-86-13	10	11	11	10.66	10.66
50	WS-86-14	10.66	11	11	10.33	10.74
51	BAHAR	20	20	20	10.33	17.58
52	BAAZ	20	14	20	10.66	16.16
53	C-84D-551	20	20	20	20	20
54	C-85D-8	20	20	20	20	20
55	C-85D-9	20	20	20	20	20
56	C-85D-13	20	20	20	20	20
57	C-85D-7	11	11	20	10	13
58	MS-85-17	10.33	13	20	10	13.33
59	MS-85-15	10.66	11	11	10	10.66
60	MS-85-12	10.33	20	14	11	13.83
61	MS-84-13	11	20	20	10.33	15.33
62	MS-84-16	10.33	11	10.33	10.66	10.58
63	ARGH	11	11	11	10	10.75
64	DN-7	20	20	14	11	16.25
65	DN-10	10.33	14	14	11	12.33
66	DN-12	13	20	14	10.33	14.33
67	Bolani	10	10	10	10	10

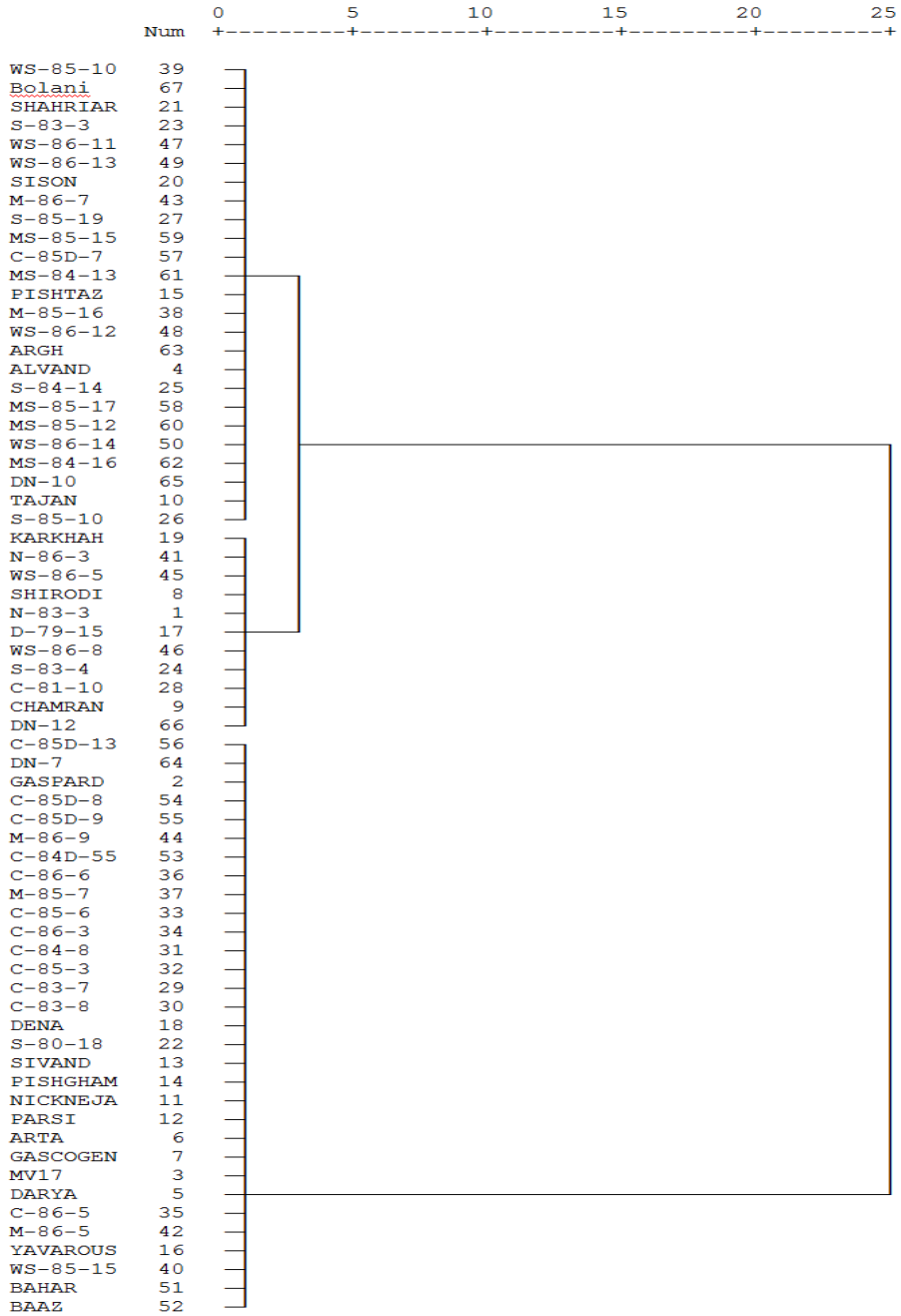

Figure 1: Dendrogram of wheat commercial cultivars and lines based on their resistance to 166E150A$^+$ pathotype of *Puccinia striformiss*.

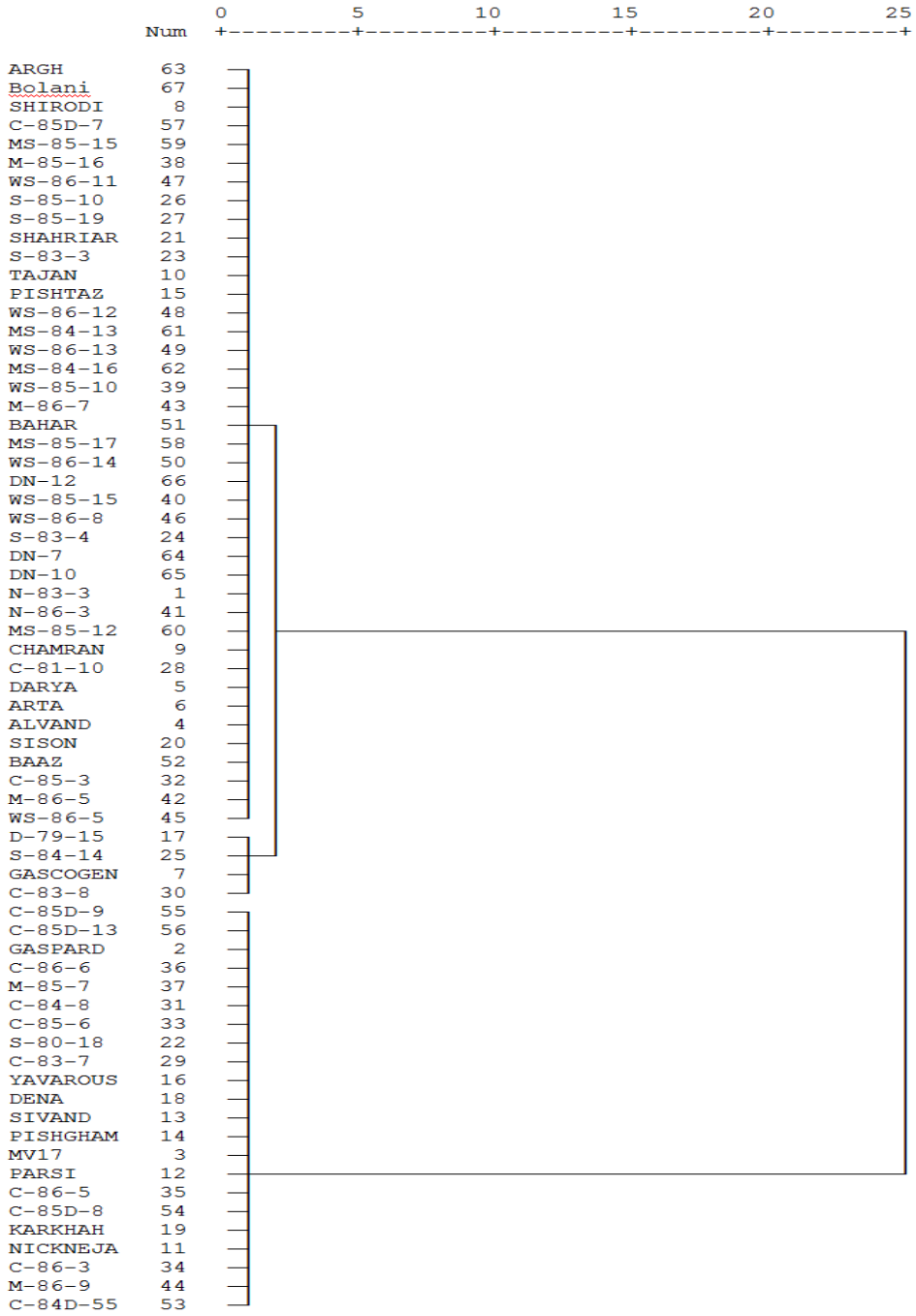

Figure 2: Dendrogram of wheat commercial cultivars and lines based on their resistance to 166E14A^{+} pathotype of *Puccinia striformiss*.

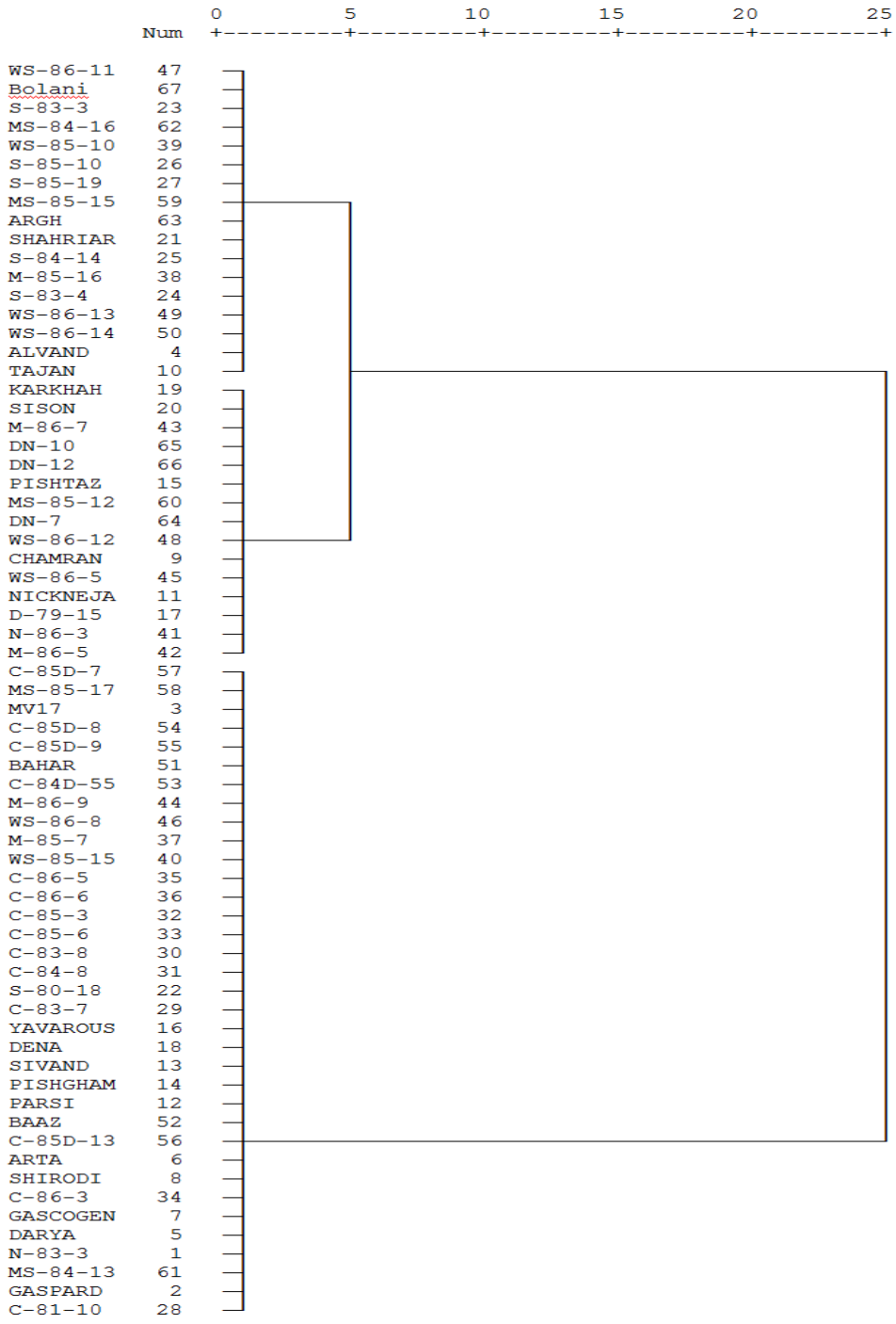

Figure 3: Dendrogram of wheat commercial cultivars and lines based on their resistance to 134E150A$^+$ pathotype of *Puccinia striformiss*.

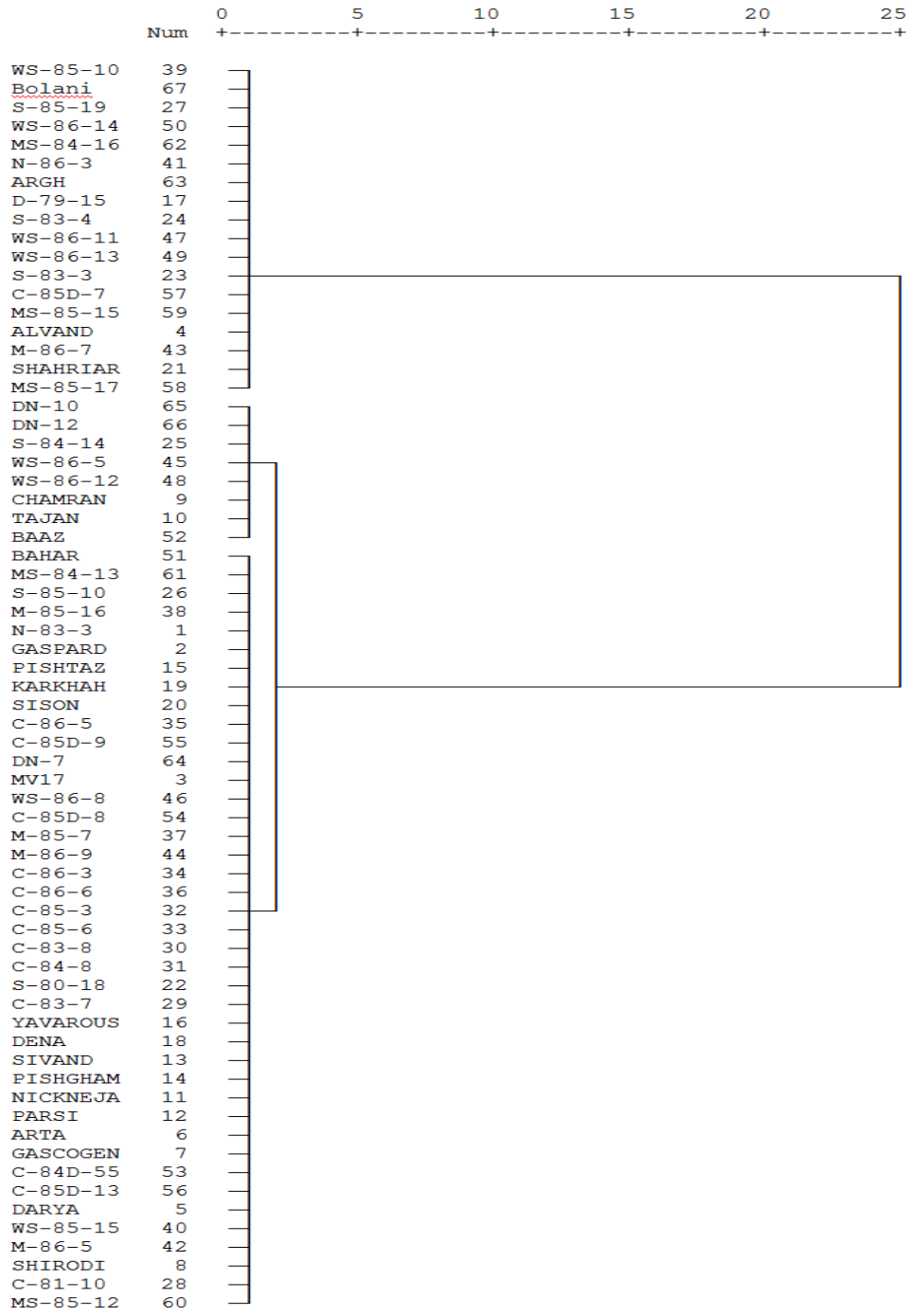

Figure 4: Dendrogram of wheat commercial cultivars and lines based on their resistance to 134E146A$^+$ pathotype of *Puccinia striformiss*.

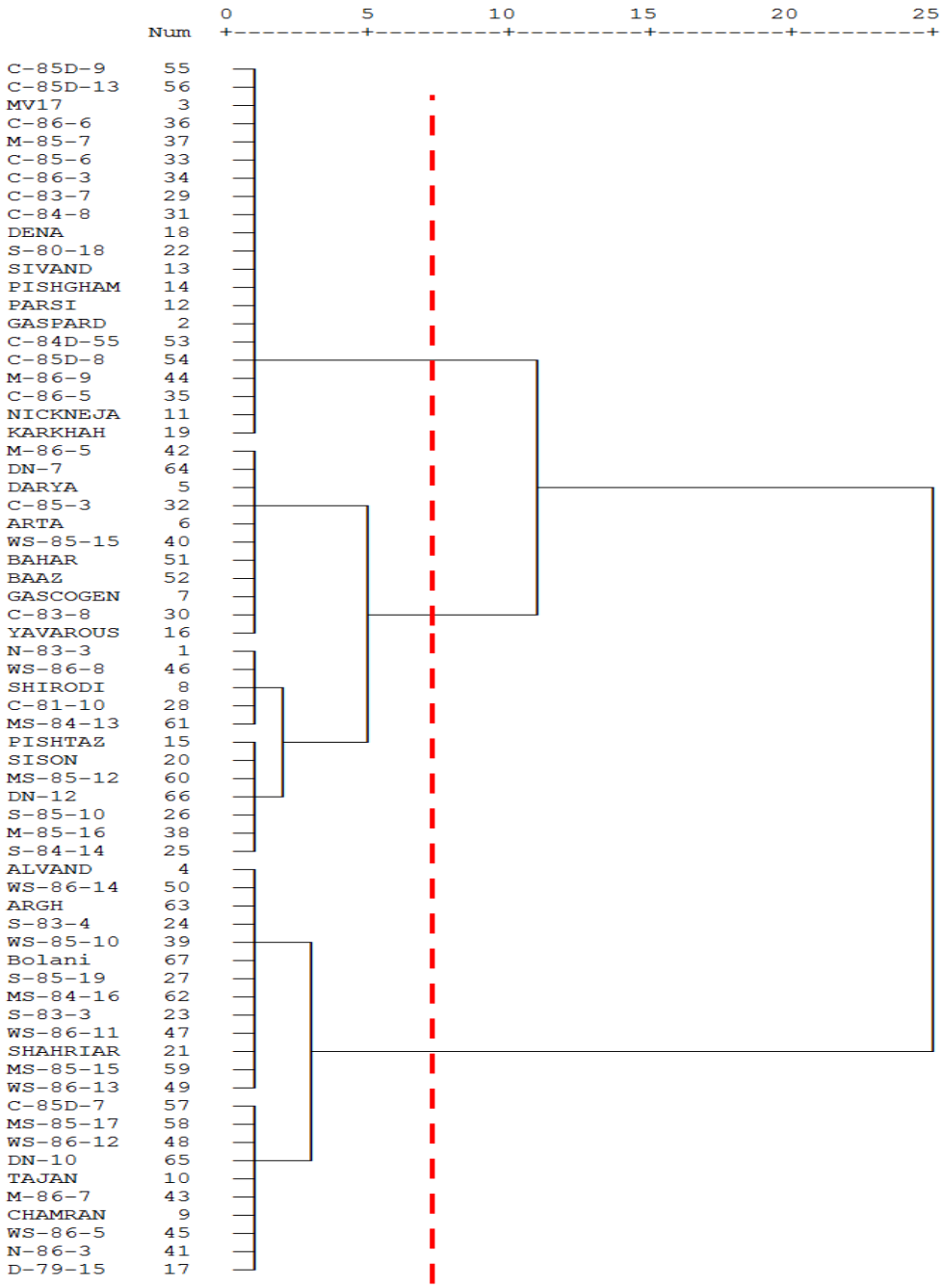

Figure 5: Dendrogram of wheat commercial cultivars and lines based on their resistance to four pathotypes of *Puccinia striformiss*.

Seedling resistance is complete and monogenic and it continued from seedling to maturity. The seedling resistance of wheat lines and commercial cultivars was determined based on infection type and latent period in this research. Reaction of 65 wheat lines and commercial cultivars by Bolani cultivar as control has been shown in Table 3 separately relative to four pathotypes of fungi. The latent period of these cultivars and lines are shown in Table 4. The results show that lines and cultivars of C-85D-9, C-85D-13, MV17, C-86-6, M-85-7, C-85-6, C-86-3, C-83-7, C-84-8, S-80-18, C-84D-551, C-85D-8, M-86-9, C-86-5, C-83-8, Dena, Sivand, Pishgam, Parsi, Niknejad, Gaspard and Karkheh had the longest latent period and resistance (Figure 5). It can be inference that these lines and

cultivars have probably one resistance gene in seedling stage. Afshari [2] suggested one resistance gene in cultivar Niknejad by using 110E134A$^+$ race. Lines and cultivars of M-86-5,‹DN-7, C-85-3, WS-85-15, C-83-8, N-83-3, WS-86-8, C-81-10, MS-84-13, MS-85-12, DN-12, S-85-10, M-85-16, S-84-14, Siyson, Pishtaz, Shirodi, Yavaros, Gasgogen, Baz, Bahar, Arta and Darya showed optimal resistance against yellow rust. Lines and cultivars of WS-86-14, S-83-4, WS-85-10, S-85-19, MS-84-16, S-83-3, WS-86-11, MS-85-15, WS-86-13, Alvand, Arg, Shahriyar and Bolani were sensitive control cultivars by the short latent period relative to four wheat yellow rust pathogen pathotypes. Sensitiveness of these cultivars and lines indicates that they do not posse resistance gene or they have less effective gene.

Lines and cultivars WS-85-10, S-83-4, S-85-19, MS-84-16, WS-86-13, MS-85-15, WS-86-11, WS-86-14, S-83-3, Arg, Alvand and Shahriyar were in one cluster (Figure 5) and they showed significant infection type by short latent period. According to this fact that all pathotypes are common in pathogenic formula for gens of *YrA, Yr25, Yr9, Yr8, Yr7, Yr6 and Yr2, so* it is probable that there are genes similar to gens pathogenesis composition in these lines and cultivars. Badebo et al. [4] determined shooting stage gens of *Yr1, Yr2, Yr3v, Yr4, Yr6* and *Yr17* in 11 developed lines on research on 21 Ethiopia cultivars by using 9 races of wheat yellow rust collected from different regions of the Ethiopia. He showed that 5 wheat commercial cultivars have gens *Yr9* and *Yr7*. Khodarami et al. [9] in survey on 90 developed commercial lines and cultivars by origin of Simit with 4 isolates suggested that these genotypes are divided into two groups: group one involves 24 genotypes by medium resistance against four races, group two consists of 66 genotypes that they were resistant against one race. According to the continues changes in pathogenesis factor and probability of appearance of new races, it is necessary to follow changes in population of a pathogen in order to use resistance cultivars before domination of the new race or use genetic resources for transfer of them.

Chamran cultivar showed resistance against races of 134E150A$^+$, 134E146A$^+$ and 166E150A$^+$ and it was sensitive against races of 166E14A$^+$, *Yr27*. It is probable that there are other genes except *YrA, Yr9, Yr7, Yr25, Yr2,* Yr6 and *Yr8*. The main cultivation regions of this cultivar are Khozestan province, some parts of Fars, Khorasan, Kermanshah, Boshehr and Kerman provinces. This cultivar was resistant against most of the yellow rust isolates in greenhouse that indicates attendance of one seedling gene. According to host reaction in these experiments, it seems that seedling gene of *Yr27* in Chamran cultivar is effective in its resistance. In this experiment race of 166E14A$^+$ on gene *Yr27* showed pathogencity. It is probable that shooting resistance of Chamran cultivar is related to three races of this gene. Most lines and cultivars showed resistance against races of 134E146A$^+$ and 134E150A$^+$.

According to this fact that less standard cultivars had pathogencity, races of 166E150A$^+$ and 166E14A$^+$ that had the highest pathogencity on standard cultivars were sensitive, probably in result of genes of *Yr7, Yr2, YrSD, Yr9+, Yr7+, Yr6+, Yr8, Yr2+, Yr17+, Yr25, Yr29, Yr6, Yr17, Yr18 , YrA, Yr6, YrND,* and *Yr27*. Emad et al. [6] studied 778 lines introduced by CIMMYT in competition with local cultivars in research station of Twaitha and Latifia in Bagdad and they observed that, germplasms under artificial inoculation against brown and yellow rust for three continues generations led to identification of 251 resistance and semi resistance lines. More than 11 resistant genotypes were identified in new cultivar (Farris). Farris showed yield more than 14-30% relative to Tamuz 2 and Maxipak [6]. Observation of changes in yellow rust pathogenesis based on time and place for evaluation of the effect of resistance genes is significant. Different resistant isogenetics wheat lines and cultivars were identified in five regions of Morocco during 4 years. The coefficient infection was more than 80% for yellow rust except for Annoceur and Meknes in 2007-2008, where CI was not more than 30-60%. In cultivation season of 2007-2008, yellow rust was not seen in Allal Tazi except for some pustules in some lines. In Marchouch, most of the sensitive lines showed CI of 15 [13].

CONCLUSION

It was observed that most of the commercial cultivars and lines are sensitive to wheat yellow rust pathogen. According to outbreak of this disease in recent years, finding resistance resources or production of resistance cultivars is necessary. The first step is evaluation commercial lines and cultivars by proper pathotypes by high pathogenic power in cultivars.

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