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GENETIC PREDICTION OF STRIPE RUST RESISTANCE THROUGH CROSSING ANZA A$^+$ TO SIX EGYPTIAN WHEAT CULTIVARS

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ABSTRACT

Anza A$^+$ was crossed with 6 Egyptian wheat cultivars (*Triticum aestivum*, L.). These cultivars, F_1, and F_2 were tested under greenhouse conditions at seedling stage against pathotype (race) 230E18 of *Puccinia striiformis*. The cultivars and F_1 possessed a susceptible (S) phenotype. The F_2 populations were segregated into two gene pairs. The dominance tend direction of susceptibility. The resistance genes were recessive. On the other hand, at adult stage under field conditions against races mixture of the pathogen, Anza A$^+$ possessed (R) phenotype, the F_1 showed resistance of each all crosses. The F_2 populations were segregated with 4 crosses (2 and 2) fitted the expected ratios 15 (R): 1(S) and 3 (R): 1(S). The other two crosses *i.e.,* Anza A$^+$ /Giza 168 and Anza A$^+$ / Sakha94 appeared no segregated and dominance of resistance. The cultivars Giza 168 and Sakha94 may have the adult plant resistance gene Yr A$^+$ under filed conditions. These findings confirmed that this gene is an effective under the Egyptian environmental conditions. Results obtained showed that partial stripe rust resistance in the tested wheat cultivars was controlled by one ore two gene pairs in most cases at seedling and adult stages. These results indicated that the selection for partial resistance materials in the early generations was possible while delaying it to late ones is more effective, due to the important role of dominance effect in the expression of this trait.

INTRODUCTION

Stripe or yellow rust caused by *Puccinia striiformis* Westend f. sp. *tritici* lead to yield losses in many of the worlds' important wheat production areas (Zwer and Qualset 1991). The pathogen causes damaging to susceptible autumn-sown spring wheat (*Triticum aestivum*, L.) varieties. In Egypt, a mediterranean-type climate with cool and moisture winter and spring when the crop is in the stem elongation to heading phases and pathogen can likely cause an epiphytotic. Difference in seedling and adult-plant reactions for stripe rust were noted early in some varieties by (Robbelen & Sharp 1978). These varieties were susceptible as seedling and resistant in the adult plant stage. Allan *et al*.,(1966) and Johson & Law (1975) recorded similar phenomena. However, lines and varieties expressing intermediate infection type as seedling were resistant to the same pathogen and isolate in the adult stage. The adult plant resistance to stripe rust is controlled by at least two or more genes (wallwork and Johnson 1984; Bariana and McIntosh 1995; Afshari 2000; Gosal 2000 and singh *et al*., 2000.

MATERIALS AND METHODS

This investigation was carried out in Wheat Disease Research Division under greenhouse and field conditions at Sakha Agricultural Research Station.

Host: six Egyptian wheat cultivars *i.e*., Gemmeiza7, Giza168, Sakha94, Sids1, Sakha8 and Sakha69 exhibited different levels of resistance or susceptibility, there were crossed with variety Anza (YrA^+) exhibited high resistance in its reaction to stripe rust. They were chosen as parental materials in the present work. These parents were sown in 2004/2005 growing season in seven rows each. The crosses among Anza YrA^+ and six wheat cultivars, (Anza (YrA^+ was used as male parent) were carried to produce the hybrid seeds. Any doubtful of F_1 plants were discarded and the others were harvested separately. Part of the F_1 seeds was grown at the following season (2005/2006) in row 3m. long and 30 cm apart and spaced 30 cm., in order to allow the production of F_2 seeds. A comparative experiment was carried out in 2006/2007 growing season in a randomized complete block design with three replicates. Each replicate contained one row for each parent and F_1 as well as 13 rows for each F_2. This performance was conducted to create uniform environmental conditions for disease development. The rows were 2m long, 30 cm apart. Seeds were sown at 10 cm. spacing within rows. Therefore, each row contained 20 plants. A mixture of the highly susceptible wheat cultivars *i.e.,* Morocco, Triticum spelta Saharensis and Little club were sown around the experiment as belt spreader to disseminate the urediniospores of the pathogen. All regular cultural practices of wheat were applied during the three growing seasons.

A- Seedling stage test (under greenhouse conditions)

Three replicates, each one included one pot for each of the two parents and F_1's as well as 13 pots for F_2's were sown, with 20 seed each. These materials were tested in a room condition in the greenhouse with daylight rhythm of 16/8 hours. Light intensity was approx. 7500 lux and temperature of 10-15 °C. the plants were ready to be inoculated at 8 days of sowing. The plants were inoculated following the method of Tervet and Cassel (1951) and Stakman *et al.,* (1962), in which, plants were dusted with mixture of spores and Talcum powder at the rate 1:20 (w:w) or tightly rubbing method. Inoculated plants were kept in an incubator apparatus for 24 hours at 90% relative humidity and 10 °C and transferred to the growth chamber for 14 days according the method adopted by Stubbr (1985).

Host reaction type: infection type was rated on the scale (0-9) adopted by McNeal *et al*., (1971) as used in the seedling studies, where, 0= immune, 1 to 3 were classified as resistant, 4 to 5 were intermediate and 7 to 9 were susceptible. These infection types were grouped into two classes in the seedling and adult studies: 0 to 6 was considered as resistant and 7 to 9 were susceptible.

B- Adult stage test (under field conditions)

The spreader plants were moistened and dusted using urediniospores and Talcum powder at the rate 1:20 (w:w). all materials were inoculated at booting stage according to the methods adapted by Tervet and

Cassel (1951). Rust severity (%) was recorded on adult plants according to the method adopted by modified Cobb scale (Peterson *et al.,* 1948) and the host response was evaluated following scale described by Roelfs *et al.,* (1992).

Stripe rust uredia first appeared on 25 January 2007. Individual plants were rated before the early-heading stage. Resistant plants were marked with blue tape and susceptible ones by red tape according to disease severity into each class. The number of plants rated ranged from 190 to 260 per F_2 plant populations.

C- Inheritance study

To study the inheritance of stripe rust resistance, the F_2 plant populations were divided into 12 categories depending upon their percentage of rust severity under field conditions. These classes were 0, 0;, 10R, 20R, 20MR, 20MS, 10MS, 10S, 20S, 30S, 40S and 50S. plants of the first four classes were pooled together and considered as the resistant phenotypes. However, plants in the other classes were considered as susceptible ones. Frequency distribution values were recorded for parents, F_1 and F_2 populations in terms of infection type in all the crosses at seedling as well as adult stages.

Qualitative and quantitative analysis regarding to mode of inheritance, goodness of fit to expected ratio of the phenotype classes concerning the stripe rust severity and infection type were determined using X^2 analysis Steel and torrie, (1960). The minimum number of effective genes controlling slow-rusting resistance in each cross was estimated by the formula of Wright (1968). Degree of dominance was calculated according to the method suggested by Romero and Frey (1973). Heritability in its broad-sence was estimated according to Lush (1949).

RESULTS

Stripe rust infection type developed uniformly throughout the experiments and parental varieties exhibited consistent disease reactions each year, for both seedling and adult stages. Genetic behavior of crosses between Anza YrA^+/ 6 commercial wheat cultivars against races 230E18 at seedling stage under greenhouse conditions in 2006/2007 growing season.

Data presented in Table (1) indicated that this group represented by six crosses was susceptible / susceptible. The F_1 plants reaction tend direction susceptible similar to their parental reaction. Regarding F_2 plant population, data indicated that 6 tested crosses, segregated in the direction of susceptibility dominance. However, the number of F_2 resistant plants : susceptible one of these crosses were 82:112, 97:108, 34:114, 40:155, 43:160 and 17:179 goodness of fitted the theoretical expected ratio *i.e.,* 7:9, 7:9, 7:9, 3:13, 3:13 and 1:15 which suggested digenic control with two independent recessive genes conditioning reaction to race 230E18 (Table, 1).

Table (1): Stripe rust Infection Type of 6 crosses between Anza (YrA$^+$) and 6 commercial wheat cultivars against race 230 E18 at seedling stage under greenhouse conditions in 2006/2007 growing season.

No.	Cross name		Infection Type race 230E18											Observed ratios	Expected ratio	X^2	P. values
			0	0;	1	2	3	4	5	6	7	8	9				
	Susceptible X Susceptible																
1	Anza A$^+$/ Gemmeiza7	P_1									2	18					
		P_2										3	17				
		F_1									3	17					
		F_2					3	39	40		41	64	7	82:112	7:9	0.26	0.75-0.50
2	Anza A$^+$/ Giza168	P_1									2	18					
		P_2										2	18				
		F_1									3	17					
		F_2						27	70		51	50	7	97:108	7:9	1.05	0.50-0.25
3	Anza A$^+$/ Sakha 94	P_1									2	18					
		P_2									19	1					
		F_1									17	3					
		F_2						34	50		25	60	29	84:114	7:9	0.14	0.75-0.50
4	Anza A$^+$/ Sids1	P_1									2	18					
		P_2										1	19				
		F_1									17	3					
		F_2						35	5		50	60	45	40:155	3:13	0.387	0.75-0.25
5	Anza A$^+$/ Sakha8	P_1									2	18					
		P_2										1	19				
		F_1									17	3					
		F_2						18	25		30	60	70	43:160	3:13	0.78	0.50-0.25
6	Anza A$^+$/ Sakha69	P_1									2	18					
		P_2										3	17				
		F_1									17	3					
		F_2						5	12		29	90	60	17:179	1:15		

Identification of adult-plant stripe rust resistance gene (YrA$^+$) in some Egyptian commercial wheat cultivars:

To identify Anza (YrA$^+$) governing wheat adult plant resistance to stripe rust, 6 crosses between variety Anza (YrA$^+$) and each of the six commercial wheat cultivars *i.e.,* Gemmeiza7, Giza168, Sakha94, Sids1, Sakha8 and Sakha69 were used. Data presented in Table (2) indicate that 6 crosses could be divided into two categories *i.e.,* resistant/ resistant and resistant/susceptible.

The first category:

This group was represented by 4 crosses indicated that either of the tested parents showed resistance response against races mixture of stripe rust disease. The F_1 tested plants, showed the same trend with their parents (giving resistant reaction). Regarding the F_2 plant populations, two out of four crosses segregated in ratios ranging between resistant and susceptible type *i.e.* Anza A$^+$/Gemmeiza7 and Anza A$^+$/Sids1, which fitted the expected ratio 15L:1H indicating that the cultivars Gemmeiza7 and Sids1 do not have this gene (YrA$^+$) and each of them may carry different minor gene(s) that cause low disease severity. The other two crosses *i.e*., Anza A$^+$/Giza 168 and Anza A$^+$/Sakha94 were resistant and no segregation for susceptibility could be detected, these results proved that, these two cultivars likely carries the stripe rust resistance gene (YrA^+).

Table (2): Stripe rust severity of crosses between Anza A^+ (YrA^+) and 6 commercial wheat cultivars under field conditions in 2006/2007 growing season.

No.	Cross name		Strip rust severity %										Observed Ratios (L:H)	Expe-cted ratio	X^2	P. values
			0	10 R	10M R	20M R	10M S	10 S	20 S	30 S	40 S	50 S				
	Resistant X Resistant															
1	Anza A^+/ Gemmeiza7	P_1	19	1												
		P_2			3	17										
		F_1	2	18												
		F_2	64	75	43		12	7					182:19	15:1	2.37	0.25-0.50
2	Anza A^+/ Giza168	P_1	19													
		P_2		2	18											
		F_1	17	3												
		F_2	142	48	15								205:0	1:0	0	>0.99
3	Anza A^+/ Sakha 94	P_1	19	1												
		P_2	3	17												
		F_1	18	2												
		F_2	150	30	21								201:0	1:0	0	>0.99
4	Anza A^+/ Sids1	P_1	19	1												
		P_2			1	19										
		F_1	2	18												
		F_2	88	62	41		12	4					191:16	15:1	0.74	0.50-0.25
	Resistant X Susceptible															
5	Anza A^+/ Sakha 8	P_1	19	1												
		P_2								3	17					
		F_1		18	2											
		F_2	14	40	49	36	25	19	8	6	4		139:62	3:1	3.63	0.10-0.05
6	Anza A^+/ Sakha 69	P_1	19	1												
		P_2									2	18				
		F_1			18	2										
		F_2	12	35	56	39	25	15	8	5	3	1	142:57	3:1	1.5	0.25-.10

The second group: resistant X susceptible

This group was represented by two crosses *i.e,* Anza A^+/Sakha8 and Anza A^+/Sakha69 the two cultivars *i.e.,* Sakha8 and Sakha69 were susceptible while, Anza A^+ was resistant. The F_1 tested plants showed resistance. The F_2 plants showed segregation to 139L:62H and 131L:69H, respectively., which fitted the expected ratio 3L:1H indicating that these two cultivars do not have this gene (YrA^+) and each of these may carry different minor gene(s) that cause low disease severity.

Quantitative analysis:

To study genetic behavior of infection type and wheat partial stripe rust resistance quantitatively, the two parents, F_1 and F_2 populations for each of the six crosses were tested at seedling and adult stages under greenhouse and field conditions. Population means and variance of the parents, F_1's and F_2's were used to estimate the degree of dominance for $F_1(h_1)$ and $F_2(h_2)$, the heritability in its broad-sense and the number of functioning genes for each cross (Tables 3 and 4).

Under greenhouse conditions: at seedling stage

Data presented in Table (3) proved that the disease severity % to cvs. Anza A+, Gemmeiza7, Giza168, Sakha94, Sids1, Sakha8 and Sakha69 were 7.9, 8.85, 8.9, 7.05, 8.95, 8.95 and 8.85, respectively. The F_1 and F_2 mean values in six crosses appeared values lower than their mid-parent values, revealing the presence of resistance (low infection type).

Table (3): Means of P_1, P_2, F_1, F_2, and MP, degree of dominance of F_1 (h_1) and F_2 (h_2) as well as broad-sense heritability for infection type of 6 wheat crosses inoculated with *P. striiformis* f. sp. tritici at seedling stage under greenhouse conditions in 2006/2007 growing season.

No.	Cross name	Infection type means of					Degree of dominance		Herita-bility	No. of genes
		P_1	P_2	F_1	F_2	MP	h_1	h_2		
	Susceptible X Susceptible									
1	Anza A^+/Gemmeiza7	7.9	8.85	7.85	6.33	8.375	-1.09	-8.56	86.72	0.41
2	Anza A^+/Giza168	7.9	8.9	7.85	6.23	8.4	-1.1	-8.66	72.6	0.56
3	Anza A^+/Sakha 94	7.9	7.05	7.15	6.57	7.47	-0.76	-4.23	97.3	0.03
4	Anza A^+/Sids1	7.9	8.95	7.15	7.2	8.42	-2.428	-4.66	96.97	0.083
5	Anza A^+/Sakha8	7.9	8.95	7.15	7.3	8.42	-2.43	-4.4	96.24	0.062
6	Anza A^+/Sakha69	7.9	8.85	7.15	7.9	8.37	-2.24	-1.63	91.8	0.09

MP= mid parents

Expression of gene actions measured as the degree of dominance h_1 and h_2 has been shown in Table (3). The estimated values of h_1 and h_2 also, demonstrated the significant negative values of h_1 and h_2 (low infection type less than mid-parents) also, suggested the manifestation of resistance for stripe rust resistance.

Under field conditions: at adult stage

The obtained data in Table (4) revealed that the disease severity % were 0.1095, 7.4, 3.8, 1.702, 7.8, 38.5 and 49.0 for the cultivars *i.e.,* Anza A+, Gemmeiza7, Giza168, Sakha94, Sids1, Sakha8 and Sakha69, respectively. The F_1 and F_2 means showed values lower than these calculated for their respective mid-parents, revealing the presence of partial dominance for low- disease severity confirming the results obtained from F_1's (Table, 4).

Expression of gene action measured as the degree of dominance h_1 and h_2 has been shown in the same Table. The estimated values of h_1 and h_2 exhibited negative values in these six crosses suggested the manifestation of partial dominance for stripe rust resistance and supported the F_1 results.

The heritability values for all tested crosses at seedling and adult stages are considered to be high, for the above mentioned six crosses (Tables, 3 and 4).

Number of genes: the minimum number of effective genes controlling the resistance was digenic recessive for each of the six crosses at the seedling stage (Table, 3). On the other hand, in the adult stage, the difference between each two parents is controlled by dominance mono or digenic since the calculated number of genes was recorded in Table (4).

Table (4): Means of P_1, P_2, F_1, F_2, and MP, degree of dominance of F_1 (h_1) and F_2 (h_2) as well as broad-sense heritability for rust severity (%) of 6 wheat crosses inoculated with *P. striiformis* at adult stage under field conditions in 2006/2007 growing season.

No.	Cross name	Rust severity means of					Degree of dominance		Heritability	No. of genes
		P_1	P_2	F_1	F_2	MP	h_1	h_2		
	Resistant/ Resistant									
1	Anza A^+/Gemmeiza7	0.109	7.4	1.801	2.43	3.204	-0.534	-0.723	86.35	1.12
2	Anza A^+/Giza168	0.109	3.8	0.31	0.77	1.95	-0.892	-1.3	76.91	1.67
3	Anza A^+/Sakha 94	0.109	1.7	0.21	0.72	0.94	-0.876	-0.457	90.8	0.22
4	Anza A^+/Sids1	0.109	7.8	1.801	2.1	3.95	-0.559	-0.96	92.5	1.358
	Resistant /Susceptible									
5	Anza A^+/Sakha8	0.109	38.5	2.2	7.24	19.3	-0.9	-1.3	92.1	3.3
6	Anza A^+/Sakha69	0.109	49.0	4.4	7.22	24.5	-0.824	-1.42	93.74	5.41

MP= mid parents

DISCUSSION

Seedling reaction of crosses between Anza A^+/Gemmeiza7, Anza A^+/Giza168, Anza A^+/Sakha94, Anza A^+/Sids1, Anza A^+/Sakha8 and Anza A^+/Sakha69 showed segregation patterns of their crosses confirming resistant : susceptible ratios *i.e.,* 7:9, 7:9, 7:9, 3:13, 3:13 and 1:15, respectively, which suggested digenic control with two independent recessive or partial dominant gene conditions with epistasis (Table, 1). These results disagreed with those of Macer (1972) who reported that the line (S) had one gene for seedling resistance (3 resistance/1 susceptible). While, the results in this work were agreed with those of Allan and Purdy (1970) and Griffy and Allan (1988) who suggested that Alba resistance was controlled by one or two genes but varied from that studied by Zadoks (1961) who reported recessive monogenic control. Genetic interpretation of adult plant reaction to the fungus in the field during one season (Anza A^+ / Gemmeiza7 Anza A^+ /sids1) indicated digenic control of resistance and this result is in agreement with these of Allan (1968) and Allan and Purdy (1970),respectively.

However, the latter authors reported monogenic control of seedling resistance in one cross. Anza A^+ / Sakha8 and Anza A^+/ Sakha69 which indicated monogenic control for resistance agreed with Macer (1972). Griffey and Allan (1988) with resistant by susceptible cross, they suggested that one or two genes control seedling and adult plant reactions among most of lines. Singh and Rajaram (1994) showed that adult plant resistance to stripe rust in the ten cultivars was controlled by one to three genes. Broers (1997) pointed to that quantitative resistance in wheat to yellow rust is characterized by susceptible infection type in the seedling stage (but not in the adult plants in the field) and a slow-epidemic development (Park *et al.,* 1988, Park & Rees, 1989 and Broers *et al.,*1996). Several breeding strategies can be incorporated resistance genes into breeding populations (Robbelen & Sharp, 1978; CIMMYT, 1988 and Knott, 1989). The seedling factor in Anza A^+ is only effective at the growth stage in combination with other genes, but another gene YrH gives it the protection in the adult stage. The epistically expressed seedling resistance gene is believed to be YrA^+ by Willing *et al*., (1988). Zwer and Qualset (1994) pointed to that there are two genes in Anza contribute to the durability of "Anza" as resistant variety.

The quantitative analysis in all tested crosses at seedling and adult stages, the F_1 and F_2 population mean values were found to be lower than their respective mid-parents. The estimated values of degrees of dominance (h_1 and h_2) were significant and negative in all six crosses (at seedling and adult sages) under study. These results supported the manifestation of partial resistance according to the method adopted by Millus and Line (1986), Shehab El-Din *et al*. (1991a, 1991b) and Shehab El-Din and Abdel-Latif (1996), Negm (2004) and Shahin (2005).

The high heritability values are indicated for high rate of success in recovering the desired genes in future generations. Also, these high estimates indicate that the selection for this character in early segregations could be possible. While, delaying it would be more effective, these results are in harmony with those af Kuhn *et al.* (1980), Lee and Shamer (1985), Shehab El-Din and Abdel-Latif (1996), Najeeb *et al*.,(2004) and Negm (2004).

The genes controlling seedling and adult plant resistance to stripe rust Pt CDL-6 in resistant variety Anza were YrA^+ at seedling and YrA^+, YrH at adult stages according to Zewer and Qualset (1994). This gene assignment show that each variety has a seedling resistance gene that is also, effective in the adult stage. The analysis also, provided further evidence that Anza has two resistance factors, one that was detectable in the seedling stage only in combination with other resistance genes and the other that was expressed a recessive gene in the adult stage. The first gene they believed was YrA^+ identified by Willing *et al*. (1988) and the other one is designed as YrH. The adult plant resistance to stripe rust is controlled by at least two or more genes (Wallwork and Johnson, 1984; Bariana and McIntosh, 1995; Afshari, 2000; Gosal, 2000 and Singh *et al.,* 2000).

Anza A^+ possessed a susceptible phynotype when inoculated with pathotype (race) 230E18. Also, six cultivars showed susceptibility against this race at seedling stage. The F_1 seedling from these crosses revealed susceptibility. The F_2 population was segregated into two gene pairs. The dominance tend direction of susceptibility. The resistance genes were recessive against the above mentioned race at seedling stage under greenhouse conditions. On the other hand, under field conditions Anza A^+ possessed a resistant (R) phenotype when inoculated with races mixture of *P. striiformis* at adult stage, also, the F_1 from the crosses Anza A^+/6 cultivars showed resistance. The F_2 populations were segregated with 4 crosses fitted the expected ratios 15(R):1(S) and 3(R):1(S). on the other hand, the rest two crosses *i.e.,* Anza A^+/Giza168 and Anza A^+/Sakha 94 showed no segregation and dominance of resistance, indicating that their varieties have the adult plant resistance gene A^+ (Eversmeyer and Kramer, 2000).

These findings showed that this gene is effective under the Egyptian environment and it was included in two of the tested wheat cultivars.

Therefore, it may be transferred to the Egyptian genetic materials as a stripe rust resistance source in breeding program.

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التنبؤ بوراثة مقاومة الصدأ الأصفر من خلال تهجين الصنف $Anza\ A^+$ في ستة أصناف من القمح المصري

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تم تهجين الصنف $Anza\ A^+$ مع ستة أصناف قمح مصرية (*Triticum aestivum*, L.) حيث تم اختبار الأصناف والجيل الأول والثاني في مرحلة البادرة تحت ظروف الصوبة الزجاجية ضد السلالة 230E18 من المسبب المرضي بكسينيا سترايفورمس. أعطى كل من الجيل الأول والأصناف شكلاً مظهرياً قابلاً للإصابة. كما حدث انعزال في الجيل الثاني مع كل الهجن الستة الى زوجين من الجينات حيث كانت المقاومة متنحية في كل الهجن. من جهة أخري في مرحلة النبات البالغ وتحت ظروف الحقل ضد مخلوط من سلالات المسبب المرضى فقد أعطى الصنف $Anza\ A^+$ شكلاً مظهرياً مقاوماً، أيضا F_1 ينتج مقاومة مع كل الهجن. أما الجيل الثاني فقد حدث انعزال في أربعة هجن حيث انه في اثنين منهم تتفق مع النسبة المتوقعة (S) ١ : ١٥(R) واثنين آخرين تتفق مع النسبة (S) ١ : ٣(R). لكن اثنين من الهجن علي سبيل المثال $Anza\ A^+$/Giza168 and $Anza\ A^+$/ Sakha94 لم تنعزل والمقاومة كانت سائدة. الأصناف جيزة١٦٨ وسخا ٩٤ ربما تملك جين المقاومة الجزيئية للصدأ الأصفر في طور النبات البالغ (YrA^+) تحت ظروف الحقل هذا التواجد يؤكد أن هذا الجين مؤثر تحت ظروف البيئة المصرية. النتائج تبين ان المقاومة محكومة بزوج أو زوجين من الجينات السائدة في معظم الحالات في مرحلة النبات البالغ وزوجين من الجينات المتنحية في البادرة. هذه النتائج تدل علي أن الانتخاب من اجل المقاومة في الأجيال المبكرة ممكن لكن التأخير للأجيال المتأخرة تعطى كفاءة عالية وقد ترجع إلي الدور الهام لتأثير السيادة في التعبير عن هذه الصفة.