

## EVALUATION OF PHYSIOLOGIC RACES AND VIRULENCE OF *Puccinia striiformis* ON HOST DIFFERENTIAL GENOTYPES, SOME NEAR ISOGENIC LINES AND COMMERCIAL CVs., AT SEEDLING AND ADULT STAGES IN EGYPT

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### ABSTRACT

Twelve pathotypes of *Puccinia striiformis* from rusted samples collected during 2004/2005. These races were designated as 2 E0, 2E22, 6E0, 6E18, 150E82, 198E150, 198E156, 6E148, 6E150, 38E134, 230E134 and 229E223. Races 2E0, 6E0 and 2E22 were the most frequency ones. Most of the races exhibited high level of virulence on the local cultivars at seedling stage. The isogenic lines carrying Yr 6, Yr 7, Yr 8, Yr 9, Yr 12, Yr 18 and Yr A are considered to be susceptible at both seedling and adult stages. On the other hand, the isogenic lines carrying Yr 1, Yr 5, Yr 15, Yr 17, Yr 27 and Yr sp exhibited high level of resistance at both seedling and adult stages with the exception of Sids-7 and Sids-9 cultivars most of the Egyptian cultivars are considered to be resistant at adult stage. The resistant line can be used as sources of resistance in the breeding program to yellow rust in Egypt.

### INTRODUCTION

Stripe rust caused by *Puccinia striiformis* F. sp. tritici is one of the most important diseases of wheat in the world. In Egypt the first yellow rust epidemic was recorded in 1967. However, during 1990's three major epidemics were recorded in 1995, 1997 and 1999. Sporadic infections were observed during the other years (Abdel - Hak *et al.*, 1972 and Abu El-Naga, *et al.*, 1999). The most important stripe rust epidemic occurred in 1995 particularly in the Northern and Southern Delta areas, yield of most of popular cultivars (Sakha 8, Sakha 69, Giza 163, 164, Gemmeiza-1, -3 and Sids-7, -9) were significantly reduced due to yellow rust infection.

Seedling resistance is usually race specific and can be recognized by its characteristic resistance type at all plant stages (Hong and Singh, 1996). Adult resistance can be either race specific or race non-specific and is usually better recognized after the seedling stage (Johnson, 1988).

Several high yielding spring wheat varieties possess adult plant resistance (Singh, 1992 & Singh and Rajaram, 1994). Hence the objective of this study was to assess physiologic races of the wheat yellow rust pathogen and the effectiveness of the resistance gene and to study the reactions of commonly grown cultivars.

## MATERIALS AND METHODS

Virulence/avirulence survey of cereal rust fungi have traditionally used differential host genotypes that express resistance or susceptible in susceptibility the seedling stage (Kolme, 1997).

In this experiment stripe rust populations were clarified for their virulence pathotypes and pathogenic variations using two methods.

The first method was the evaluation of seedling of differential genotypes. A set of the World and European wheat yellow rust differentials as proposed by ( Johnson *et al.*, 1972 ). (Table 1) was used for this experiment, some commercial local wheat cultivars and some isogenic lines Yr's. The second method was evaluation of differential genotypes, monogenic lines and local wheat cultivars at adult stage (booting). Evaluation of seedling stages collections of 180 samples (leaves and spikes) were obtained at heading stage from differential cultivars in the yellow rust from commercial fields in Egypt during the growing season of 2003/2004 and 2004/2005 from different locations i.e. (Kafr El-Sheikh, Gharbyia, Dakahlyia and Damietta). The collected samples were purified and multiplied on susceptible wheat cv. Giza-160. Urediniospores were used to inoculate 7-10 days-old seedlings of the yellow rust differential genotypes and commercial cvs. (Table 1). Inoculated plants were placed for 24 h in a dew chamber at 10°C, then they were transferred to a growth chamber at 15-17°C with 16 h/8 h day/night light intensity was estimated by 7500 lux. Infection types were assessed 17-20 days after inoculation using the 0 to 9 scale (McNeal *et al.*, 1971).

**Table (1): Yellow rust differential cultivars, used for identification of wheat yellow rust pathotypes (races).**

Differential* cultivars	Decanery value	Yr resistance gene
<b>World set :</b>		
Chinese 166	1 (= 2 <sup>0</sup> )	1
Lee	2 (= 2 <sup>1</sup> )	7
Heines Kolben	4 (= 2 <sup>2</sup> )	6(1)
Vilmorin 23	8 (= 2 <sup>3</sup> )	3V
Moro	16 (= 2 <sup>4</sup> )	10
Strubes Dickkopf	32 (= 2 <sup>5</sup> )	SD
Suwon 92 x Omar	64 (= 2 <sup>6</sup> )	SU
Clement	128 (= 2 <sup>7</sup> )	9, 2+
<i>Triticum spelta</i> f.sp. <i>album</i>	256 (= 2 <sup>8</sup> )	5
<b>European set :</b>		
Hybrid 46	1 (= 2 <sup>0</sup> )	4+
Reichersberg 42	2 (= 2 <sup>1</sup> )	7+
Heines peko	4 (= 2 <sup>2</sup> )	6, 2+
Nord Desprez	8 (= 2 <sup>3</sup> )	ND
Compare	16 (= 2 <sup>4</sup> )	8
Carstens V	32 (= 2 <sup>5</sup> )	CV
Spaldings Prolific	64 (= 2 <sup>6</sup> )	SP
Heines VII	128 (= 2 <sup>7</sup> )	2, 11+

\* Source of seeds R.W. Stubbs, IPO. The Netherlands.

Infection types equal to or higher than 7 were considered susceptible and those less than 7 were considered resistant in turn the aggressive races are considered virulent, avirulent.

Evaluation of differential genotypes, monogenic lines and commercial cvs. against stripe rust infection under field conditions.

Two rows for each of the differential genotype, monogenic liens and commercial cvs. were sown in 2 m long and 30 cm apart. A mixture of highly susceptible wheat cultivars (Giza 160, Giza 163, Sids-7, -9 and Sakha 69) was sown around the experiment to disseminate the urediospores of the pathogen *Puccinia striiformis* inoculation of urediospores was achieved at booting stage on spreader plants around the experiment according to the method of (Tervet and Cassel, 1951). Severity of infection (0 to 100%) and reaction type (R, S) was applied as designated by (Peterson *et al.*, 1948). The experiment was evaluated at all testing sites (Kafr El-Sheikh, and Damietta).

## RESULTS

Identification of physiologic races during the first season 2003/2004. Data presented in Table (2) revealed the presence of 8 physiologic races of *Puccinia striiformis* f. sp. *tritici* West during 2004/2005, these races were identified as 2E0, 2E22, 6E0, 6E18, 150E82, 198E150, 198E156 and 229E223 according to their reactions on both World and European differentials. Data in the same table also revealed that race 2E22 was found only once in Kafr El-Sheikh.

**Table (2): Yellow rust races identified in Egypt and their distribution during 2004/2005 and 2005/2006.**

First season				Second season			
Physiologic races	<sup>a</sup> A	B	C	Physiologic races	A	B	C
2E0	<sup>b</sup> +	+	+	2E0	+	+	+
2E22	+	- <sup>c</sup>	-	6E0	+	+	+
6E0	+	+	+	6E148	+	+	+
6E18	+	+	+	6E150	+	+	+
150E82	+	+	+	38E134	+	+	+
198E150	+	-	+	230E134	+	+	+
198E156	+	+	+				
229E223	+	+	+				

<sup>a</sup> = Kafr El-Sheikh, Dakahlyia and Damietta

<sup>b</sup> = Presence of physiologic races.

<sup>c</sup> = absence of physiologic races.

Most of these races were virulent to the tested genotypes with the exception of 2E0, 6E0 and to some extent 6E18 and 2E22.

Regarding the second season 2005/2006 data presented in the same table reveal that 60 collected stripe rust samples from different locations in Egypt are identified to six physiologic races named 2E0, 6E0, 6E148, 6E150, 38E134 and 230E134.

**Table (3): Reaction of host differential genotypes, some isogenic lines and some commercial cvs. against stripe rust (*P. striiformis*) under greenhouse conditions at seedling stage.**

		Physiological races reaction at two season													
		First season							Second season						
		Yr	2E0	2E22	6E0	6E18	150E82	198E150	198E156	229E223	2E0	6E0	6E148	6E150	38E134
<b>World differential set :</b>															
Chinese 166	1							S							
Lee	7	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Heines Kolben	6			S	S	S	S	S	S	S	S	S	S	S	S
Vilmorin 23	3V														
Moro	10					S									
Strubes Dikopf	SD								S					S	S
Suwon 92 x Omar	SU						S	S	S						S
Clement	9,2+					S	S	S	S						S
Triticum speleta	5														
<b>European differential Set :</b>															
Hybrid 46	4+								S						
Reichersberg 42	7+		S		S	S	S		S			S	S	S	
Heines Peko	6,2+		S				S	S	S						
Nord Desprez	ND							S	S						
Compare	8		S		S	S	S	S	S			S	S		
Carstens V	CV						S								
Spaldings prolific	SP						S		S						
Heines VII	2+							S	S			S	S	S	S
<b>Supplemental lines :</b>	<b>Isogenic</b>														
Yr 1/*6 Avocet	Yr1	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Yr 5/*6 Avocet	Yr5	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Yr 6/*6 Avocet	Yr6	S	S	S	S	S	S	S	S	S	R	S	S	S	S
Yr 7/*6 Avocet	Yr7	S	S	S	S	S	S	S	S	S	S	S		S	S
Yr 8/*6 Avocet	Yr8	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Yr 9/*6 Avocet	Yr9	S	S	S	S	S	S	S	S	S	S	S	S	S	S

Table (3):Continue.

		Physiological races reaction at two seasons													
		First season								Second season					
	Yr	2E0	2E222	6E0	6E18	150E82	198E150	198E156	229E223	2E0	6E0	6E148	6E150	38E134	230E134
Yr10*6 Avocet	Yr10	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Yr11*3 Avocet	Yr11	R	R	R	R	S	S	S	S	R	R	R	R	S	S
Yr12*6 Avocet	Yr12	R	R	R	R	S	S	S	S	R	R	R	R	S	S
Yr15*6 Avocet	Yr15	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Yr18*3 Avocet	Yr18	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Yr17*4 Avocet	Yr17	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Yr 26*6 Avocet	Yr 26	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Yr 27	Yr 27	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Yr A/ Avocet	Yr A	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Yr SP/Avocet	Yr SP	R	R	R	R	S	R	R	S	R	R	R	R	R	R
Avocet S		S	S	S	S	S	S	S	S	S	S	S	S	S	S
Gobustein		R	R	R	R	R	R	R	R	R	R	R	R	R	R
Bohuth 6		R	R	R	R	R	R	R	R		R	R	R	R	R
Aroonas		S	S	S	S	S	S	S	S	S	S	S	S	S	S
Yr 1/*5 Aroona	Yr1	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Yr 5/*6 Aroona	Yr 5	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Yr 8/*6 Aroona	Yr 8	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Yr15*3 Aroona	Yr15	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Commercial Cvs :															
Sakha 61		S	S	S	S	S	S	S	S	S	S	S	S	S	S
Sakha 69		S	S	S	S	S	S	S	S	S	S	S	S	S	S
Sakha 93		S	S	S	S	S	S	S	S	S	S	S	S	S	S
Sakha 94		S	S	S	S	S	S	S	S	S	S	S	S	S	S
Giza 168		S	S	S	S	S	S	S	S	S	S	S	S	S	S
Gemmeza 9		S	S	S	S	S	S	S	S	S	S	S	S	S	S
Gemmeza 10		S	S	S	S	S	S	S	S	S	S	S	S	S	S
Sids 1		S	S	S	S	S	S	S	S	S	S	S	S	S	S
Sids 7		S	S	S	S	S	S	S	S	S	S	S	S	S	S
Sids 9		S	S	S	S	S	S	S	S	S	S	S	S	S	S

Significant changes in race composition were identified using the world and European differential sets Table 3. The composition of physiologic races found in 2005 and 2006 differed greatly on the world and European differential set. With the exception of races 2E0 and 6E0 which were observed during two seasons of the study.

Whereas 229E223 was virulent to Yr<sub>1</sub>, 7, 6-2, SD, SU, 9-2 ; 4+, 7+ 6, 2+, ND, 8, SP and 2+. Race 2E0 and 6E0 was a virulent to most European and all world differential set.

Races identified in two years such as 198E150, 198E156, 229E223 and 230E134, have wider spectra of virulence for yellow rust resistance genes than races 2E0, 6E0 and 6E18. However, the yellow rust population in the country consists of number of pathotypes that differ in their pathogenicity toward the host plant some pathotypes such as 2E0, 6E0 and 6E18 can attack two or three resistance genes in the host plant and some pathotypes such as 198E156, 229E223 and 230E134 can attack 12 identified genes in the host plant.

The relative frequency of yellow rust races and their distribution (Table 4) was determined from the survey samples of 2004-2005 crop season in North Delta. The data reveal that race 2E0 was the most frequent (18.54%) followed by 6E0 (17.08%), 2E22 (14.64%), 6E148 (12.20%) and both 6E18 and 6E150 (7.32%).

**Table (4): Pathotypes of wheat stripe rust (*Puccinia striiformis*), their frequency (%) and distribution in Northern and Southern Delta during 2004/2005 and 2005/2006.**

Pathotypes	Number of samples	Frequency (%)	Distribution
2E0	38	18.54	Sakha, Damietta and Dakahlyia
2E22	30	14.64	Dakahlyia and Sharkyia
6E0	35	17.08	Sakha, Damietta and Dakahlyia
6E18	15	7.32	Dakahlyia
150E82	9	4.39	Sakha
198E150	5	2.43	Sakha
198E156	7	3.42	Sakha
229E223	13	6.63	Sakha
6E148	25	12.20	Sakha, Dakahlyia and Damietta
6E150	15	7.32	Sakha
38E134	5	2.43	Sakha, Damietta and Dakahlyia
230E134	8	3.90	Sakha and Damietta

**Reaction of monogenic lines and commercial cvs. at seedling stage:**

As clearly shown in Table (3), 22 wheat Yr near isogenic lines were evaluated against stripe rust infection when inoculated with pathotypes of *Puccinia striiformis* at seedling stage during two seasons. The data indicated that all races, possessed virulence for near isogenic lines Yr 6, Yr 7, Yr 8, Yr 9, Yr 18 and Yr A. Races 150 E82, was virulent on the near isogenic line Yr 10. Races 198E150, 198E156, 229E223, 38E134 and 230E134 was virulent on the near isogenic lines Yr 11, and 12.

Results in the same table reveal that 11 wheat varieties under artificial inoculation was using same pathotypes which all tested varieties were susceptible and giving reaction ranged from (7-9) s.

Race 6E0 was found in Sakha, Dakahlyia and Damietta Table (4) this race isolated in Sakha, Dakahlyia and Damietta from infected leaves of Heins Kolben and from bread wheat cv. Sakha 8. Race 2E0 was isolated from differential genotype Lee in Sakha, Dakahlyia and Damietta. Race 2E22 and 38E134 were isolated from leaf samples of the differential genotype Reichersberg 42 in Sakha, Dakahlyia and Damietta. Three physiologic 198E150, 229E223 and 230E134 were isolated from cv. Giza 163 in Sakha and Damietta. Races were identified using rust samples developed on cultivars that have specific genes or gene combination.

Stripe rust samples were collected during the growing seasons of 2004/2005 and 2005/2006 from different location were made from selected differential genotypes associated with resistance gene. The selected lines were exposed in trap nurseries to natural and some cultivar yellow rust infection Table (5) shows the *P. striiformis* physiological races and the corresponding cultivars from which they were isolated.

**Table (5): Yellow rust physiological races isolated from specific differential lines or wheat cultivars in Egypt.**

Differential genotypes cultivars	Resistance gene	Physiologic races
Heines Kolben, cultivars Sak.69, Sak.8, Sids 9 and 7	Yr 6, -	6E0
Lee	Yr 7,-	2E0
Compare	Yr 8	6E18
Reichersberg 42	Yr 7+	2E22
Cultivars Sakha 69	-	150E82
Jupateco R	Yr 18	198E150
Heines VII	Yr 2	198E156
SupatecoR, cvs.Sak.69,Sak.8,Giza163, Sids7 and 9	Yr 18	229E223
Compare	Yr 8	6E148
Lee	Yr 7-	6E150
Reichersberg 42	Yr 7	38E134
Jupateco R	Yr 18	230E134

**Field observations:**

The results of adult plant stage showed that many of the lines had resistant reaction to yellow rust (Table 6).Of these differentials, Chinese 166, Vilomorin 23, Moro, Strubes Dickkopf, Suwon 92 x Omar, *Triticum spelta* f.sp., album, Carsten V and Spaldings prolific carrying respective Yr resistance factors Yr 1, Yr 3V, Yr 10 Yr SD, Yr Su, Yr 5, Yr CV and Yr SP were resistant through the study between 2004-2006 in two locations (Table 6). The differential Lee, Heines Kolben, Clement, Rechiersberg 42, Heines Peko, Nord Desperz, Compare and Heines VII, carrying Yr 7, Yr 6, Yr 9, Yr 2+, Yr7+, Yr 6, Yr 2+, Yr 8 and Yr 2,11+, respectively were susceptible in two seasons and two locations.The scores were variable between 10MS-90S in two seasons. In contrast to these genotypes some others gave defferent infection type.

At all the testing sites reported in this study the susceptible cultivars Avocets, and Aroonas were in fact the most susceptible cultivars in the field.

The isogenic lines carrying Yr 6, Yr7, Yr 8, Yr 9, Yr 12, Yr 17 and Yr SP gave susceptible reading in two years though the second season severity was low.

**Table (6): Reaction of differential genotypes to yellow rust at different locations throughout two seasons,2004/2005 and 2005/2006.**

Differential Cvs.	Yr gene	First season		Second season	
		A	B	A	B
Chinese 166	1	0	0	0	0
Lee	7	90S	60S	60S	60S
Heines Kolben	6	90S	80S	70S	70S
Vilmorin 23	3V	20R	20R	0	0
Moro	10	0	0	0	0
Strubes Dickkopf	SD	0	0	0	0
Suwon 92 x Omar	SU	0	0	0	0
Clement	9, 2+	60S	40S	50S	50S
<i>Triticum spelta album</i>	5	0	0	0	0
Hybrid46	4+	30MS	20MS	0	0
Reichersberg 42	7+	90S	60S	80S	80S
Heines Peko	6,2+	80S	80S	60S	60S
Nord Desprez	ND	20MS	10MS	5MR	5MR
Compare	8	60S	50S	40S	30S
Carstens V	CV	0	0	0	0
Spaldings prolific	SP	0	0	0	0
Heines VII	2, 11+	80S	80S	60S	40S

A = location Kafr El-Sheikh B = Location Damietta

The susceptible cultivars confirms the presence of yellow rust disease at the testing site. Significant changes were observed in the virulence pattern of Yr populations in 2004/2005.

The virulence for the isogenic line Yr 11 and Yr 27 was recorded for the first season in two sites were scored 30 MS-20 MS. However, the two entries in the second season were resistant type reaction was 5MR-10 MR.

Climatic conditions such as temperature, light and humidity may have been playing a role in expression of some genes.

On the other hand, entries in the Ner isogenic lines which was included in the study, the Yr 1, Yr 5, Yr 15, Yr 17, Yr 27, Yr SP and entries Gobustein and Bohuth 6 were resistant in two sites.

The commonly grown wheat cultivars in Egypt varied in their resistance to yellow rust. Table 7 shows the relative reaction of common wheat cultivars to yellow rust at adult stage the results confirmed the resistance of the cultivars Sakha 61, Sakha 93, Sakha 94, Giza 168, Gemmeiza 9, 10 and Sids 1. Sakha 69 and Sids 7, 9 were as expected susceptible and will not be recommended for further cultivation.

The resistance could be useful for breeding for resistance to yellow rust in Egypt.



**Table (7): Infection type and severity of some near isogenic lines and some commercial Cvs. to yellow rust at two different locations.**

isogenic lines :	Yr gene	First season		Second season	
		A	B	A	B
Yr 1/*6 Avocets	Yr 1	0	0	0	0
Yr 5/*6 Avocets	Yr 5	0	0	0	0
Yr 6/*6 Avocets	Yr 6	80S	60S	40S	30S
Yr 7/*6 Avocets	Yr 7	90S	90S	50S	20S
Yr 8/*6 Avocets	Yr 8	80S	80S	40S	20S
Yr 9/*6 Avocets	Yr 9	60S	50S	60S	40S
Yr 10/*6 Avocets	Yr 10	0	0	0	0
Yr 11/*6 Avocets	Yr 11	30 MS	20 MS	10 Mr	5Mr
Yr 12/*6 Avocets	Yr 12	30S	20S	20S	20S
Yr 15/*6 Avocets	Yr 15	0	0	0	0
Yr 18/*6 Avocets	Yr 18	90S	70S	30 MS	30 MS
Yr 17/*6 Avocets	Yr 17	0	0	0	0
Yr 26/*6 Avocets	Yr 26	30 MS	20 MS	10 MR	10 MR
Yr 27/*6 Avocets	Yr 27	0	0	0	0
Yr A /Avocets	Yr A	80S	70S	40S	30S
Yr SP/6 Avocets	Yr SP	0	0	0	0
Avocet S		100S	100S	70S	70S
Gabustein		0	0	0	0
Bohuth 6		0	0	0	0
Aroona (s)		100S	90S	100S	100S
Aroona *5/Yr 1	Yr 1	0	0	0	0
Aroona *6/Yr 5	Yr 5	0	0	0	0
Aroona *6/Yr 8	Yr 8	80S	80S	30S	30S
Aroona *3/Yr 15	Yr 15	0	0	0	0
<b>Commercial Cvs:</b>					
Sakha 61		0	0	0	0
Sakha 69		80S	80S	30S	30S
Sakha 93		0	0	0	0
Sakha 94		0	0	0	0
Giza 168		0	0	0	0
Gemmeiza 9		0	0	0	0
Gemmeiza 10		0	6	0	0
Sids 1		0	0	0	0
Sids 7		90S	90S	90S	90S
Sids 9		90S	90S	90S	90S

A = location Kafr El-Sheikh

B = Location Damietta

## DISCUSSION

Stripe rust of wheat is one of the dangerous wheat diseases all over the world. In Egypt it was claimed that it was a sporadic disease ( Abdel -Hak *et al.*, 1972 ), but starting from 1990's it became a familiar disease causing limited epiphytotics every year ( Abu El Naga *et al.*, 1999 ).

The resistance of the resistance entries could be attributed to the presence of resistance genes that have the same or similar reaction as Yr 1, Yr 5, Yr 15, Yr 17 and Yr A. This suggestion is based on the observation that none of the physiologic races tested in Egypt could attack the genes. Similar results were reported by Abu El-Naga *et al.* (1997, 1998, 1999), Hakim and Ahmed (1998), Hovmoller (1993). However, their resistance could be based on other genes or combination genes.

The obtained results gave evidence to the presence of 6 and 8 physiologic races of *Puccinia striiformis* West. The causal agent of wheat stripe rust. These races were identified as 2E0, 2 E22, 6E0, 6E18, 150 E82, 198 E150, 198E156 and 229E223 during 2004/2005 in 3 locations; 2E0, 6E0, 6E148, 6E150, 38E134 and 230E134 during 2005/2006. Similar results were recorded by Ashmawy (2005) in Egypt, Yahyaoui,(2000) and Yahyaoui *et al.* (2002) in other countries.

It could be concluded from these results that high variability in the genetic materials from which the inoculum was obtained reflected the variation within physiological races. Since the high virulent races were correlated with the inoculum from Yr 18 and 2, however less virulence correlated with Yr 7 and Yr 6.

At seedling stage, Yr's , 1, 3 V, 10, SD, 5, 4<sup>+</sup>, Cv., SP proved to be effective against the previously mentioned physiologic races. The same fact was noticed within the Avocet and Aroona crossed materials i.e. Yr's 10, 15, 17, 26, 27, SP ( Gabustein and Buhuth 6 ), Aroona Yr's 1, 5, 15.

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تقييم عدوانية سلالات الصدا الاصفر على الاصناف المفارقة وبعض الاصناف الاحادية الجين (Yr 's) والاصناف التجارية في طور البادرة والبلوغ تحت الظروف المصرية

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كان هدف هذه الدراسة هو التعرف على السلالات السائدة للصدأ الاصفر في مصر واختبار الاصناف الحاملة لجينات المقاومة والاصناف التجارية في موقعين مختلفين سخا والسرو للصدأ الاصفر.

وقد اوضحت النتائج الاتي:

تم تعريف 12 سلالة للصدأ الاصفر خلال موسمين من العينات المتحصل عليها عرفت

كالتالي :

**2E0,2E22,6E0,6E18,150E82,198E150,198E156,6E148,6E150,38E13  
4,230E134, 229E223.**

وقد كانت السلالة 2E0 الاعلى تكرارا وانتشارا متبوعة بالسلالة 6E0 والسلالة 2E22 كما كان معظم السلالات اكثر عدوانية على الاصناف التجارية في طور البادرة. كما اظهرت الدراسة سبعة سلالات من القمح الاحادى الذى يحمل جين Yr قابليتها للاصابة الشديدة بالصدأ الاصفر في طور البادرة والبلوغ وهي Yr A, Yr 18, Yr 12, Yr 9, Yr 8, Yr 7, Yr 6, Yr. بينما اظهرت ستة سلالات من القمح الاحادى الذى يحمل جين المقاومة Yr مقاومة شديدة للصدأ الاصفر في طور البادرة والبلوغ وهي Yr 27, Yr 17, Yr 15, Yr 5, Yr 1, Yr sp, Yr. كما اظهرت الدراسة ان معظم الاصناف المصرية مقاومة للصدأ الاصفر في طور البلوغ باستثناء سدس 7 وسدس 9 ، وعلى ضوء هذه النتائج يمكن الاستعانة ببعض الاصناف معلومة جين المقاومة في برامج التربية المقاومة للصدأ كما يكون الاختبار الفعلى (الحقيقى) للاصناف التجارية يكون تحت ظروف العدوى في طور البلوغ.