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GENETIC ANALYSIS FOR GRAIN YIELD, DOWNY MILDEW, LATE WILT AND KERNEL ROT DISEASES ON MAIZE.

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ABSTRACT

Nine white inbred lines of maize were crossed in a diallel crosses system in 2000 growing season. Inbred lines and F_1s single crosses, which evaluated in three experiments at Sahka location in 2001 growing season .The first experiment was carried out under normal condition for grain yield and late wilt disease. The second experiment was under artificial infections for downy mildew disease .The third experiment was in laboratory to determine the presence of kernel rot caused by *Fusarium moniliforme* and *Penicillium spp*. Data were genetically analyzed by the procedures developed by Griffing (1956). Genotypes and their arthognals, parents (p), crosses (c) and P vs c mean squares reached the significant level of probability for all studied traits. except kernel rot diseases which caused by *Fusarium moniliforme* and *Penicillium spp.*for parents and crosses and kernels miosture for p vs c. The mean squares associated with general GCA and specific SCA combining abilities were significant for all studied traits except GCA for *Fusarium moniliforme* and *Penicillium spp. diseases*.

The ratio σ^2A / σ^2D showed greater important of dominance gene action in the inheritance of grain yield, silking date, *Fusarium moniliforme* and *Penicillium spp*. While additive gene action showed great importance in the inheritance of kernels moisture, downy mildew and late wilt resistance.

The estimates of average degree of dominance indicated over dominance in all studied traits except kernels moisture and downy mildew resistance, which was partially dominant. The broad sense heritability estimates were high for all studied traits except kernel rot diseases.

Grain yield was negatively correlated with silking date and infection by *Fusarium moniliforme* and *Penicillium spp.*, while positively correlated with late wilt resistance.

The parental lines SK-4054, SD62/E, SD34/E and SK6056 were the best general combiners for grain yield, resistance of some maize diseases and earliness. The four crosses, i.e. SD7/E *x* SD34/E, SD34/E *x* SK-4054, SD34/E *x* SK-6056and SD62/E x SK4054 had superiority in most studied traits. The above new hybrids could be use to improved the yielding ability and early maturity in maize breeding programs.

INTRODUCTION

Breeding for high yield of maize hybrids, early maturity and high resistance to diseases, downy mildew *(Perenosclcrospora sorghi)*. late wilt (*Cephalsprium maydis*), and kernel rot diseases. (*Fusarium moniliforme* and *Penicillium spp.*) are considered among the main objectives of national maize research program to reduce feed and food crisis. Pajic (1986), and Gonzalez (1988) found that dominance variance was larger than additive variance for grain yield. Shafey (1993) reported that the non-additive variance was more important than additive variance for number of days to 50% silking date. El-Shenawy (1995), El-Zeir and Amer (1999) and El-Zeir *et al.*, (2001) indicated

that the additive genetic variance is more important than those non-additive genetics variance for inheritance of the resistance to downy mildew and late wilt diseases. Correlation coefficient between grain yield and silking date was negatively significant, while positively significant between grain yield and resistance to late wilt disease. Galdwell *et al.*, (1981) suggested that *Fusarium moniliforme* was a better competitor in preharvested maize than *Penicillium spp.* However, from 15 species of Penicillium test in the field only there were Penicillium funiculosum and P. oxalicum able to colonize perharvested ears and infect kernels. King and Scot (1981) showed that infection of inbred lines and of their hybrids by *Fusarium moniliforme* was 19-79% and 5-60% ,respectively. Crosses between two resistant (R) parents had 11% average of infection compared with 55% for crosses between two susceptible (S) parents, while(R x S) crosses infection average was 33%. Cosmin *et al.*, (1988) found that hybrids resulting from a diallel crosses involving seven early inbred lines that resistance to *F. moniliforme* was controlled by dominant genes.

Drimal and Drimal (1985) stated that the correlation between grain yield and ear rot resistance were high positive. Momchilova and Mitev (1995) obtained negative correlation between resistance to *F.moniliforme* and flowring date EL- Sharkawy *et al.*, (1996) found highly negative significant correlation between the percentage of ear rot and the amount of silk. They also found significant reduction in kernel moisture was found to be due to fungal infection, also the results demonstrated that maize genotypes differed significantly in their disease reaction. Abd-Elaal (1998) reported that the dominance gene action was controlling the inheritance of percentage of rotten ears caused by *F. moniliforme*, grain yield and silking date. He also found that the average degree of dominance exhibited over dominance for three traits. Percentage of rotten ears had significant negative correlation with grain yield and had positive correlation with silking date.

Therefore the present study was conducted to understand the nature and the magnitude of genetic variation governing grain yield, days to 50% silking, kernels moisture, downy mildew, late wilt and kernel rot diseases, also identify superior lines and crosses to resistance diseases, early maturity and high yielding ability.

MATERIALS AND METHODS

The experiments reported herein were carried out at Sakha Research Station. Nine inbred lines, i.e. SD-7/E, SD-34/E, SD-62/E, SK-4051, SK-4054, SK-6050, SK-6054, SK-6055 and SK-6056 were crossed in 2000 growing season in a diallel crossing mating design. Three experiments field were conducted at 2001 growing season. The first experiment was under normal condition in experiments field to study grain yield Ard/fad and resistance to late wilt disease. The second experiment in the late season was performed in disease nursery at Sakha Agric, Res. Station under high level of soil infestation by spores of the fungal pathogen *Prenosclerospora sorghi*, assessment of the disease infection by downy mildew disease was carried out according to Gowda *et al.*, (1989). Third experiment was in laboratory, the

aim of this experiment was to determine the presence of *Fusarium moniliforme* and *Penicillium spp.* in the tested seeds. 100 seeds from sample ears of each plot ,from first experiment after harvesting, were surface sterilized in (0.52%) sodium hypochlorite solution for (10) min , then plated in four Petri-plates (15cm in diam) containing 20ml autoclaved PDA medium. Twenty-five kernel were used for each plot in four replications. The plates were incubated at 25 – 27 C^0 for 6- 8 days. The percentage of infection was estimated according to the visible symptoms and confirmed by microscopic examination according to the method adopted by Daniels (1983).

Randomized Complete Blocks Design with four replications were used in the three experiments. The genotypes were portioned into variation among inbred lines, crosses and inbred lines versus crosses (heterosis) as out lined by Steel and Torrie (1980). The genetic analysis of diallel crosses was computed according to Griffing' s (1956) method – II, model- II.

RESULTS AND DISCUSSION

The mean squares of the seven studied traits are presented in Table (1).The results revealed that genotypes mean squares reached the significance level of probability for all studied traits. Parents and crosses mean squares were significant for all studied traits except kernel rot diseases by fungi *F moniliforme* and *Penicillium spp,* revealing over all differences between these parents and crosses for all traits except infection by kernel rot diseases .Mean squares for parents Vs crosses were significant for all studied traits except kernel moisture, this finding indicated that heterosis were appeared and affected on all traits.

Table (1): mean squares form analysis of variance for seven traits

S.O.V	Gairn yield Ard/fad	Silking date	Kernels moisture %	Downy mildew resistance %	Late wilt resistance %	*Fusarium moniliforme* infection %	*Penicillium sp* infection%
Replication	127.87**	15.91**	154.32**	3823.95**	34.72	429.00	23.10
Genotypes	312.51**	42.10**	24.09**	931.54**	161.25**	252.22*	13.95*
Parents(p)	13.64*	30.86**	36.81**	709.95**	166.19**	202.09	14.46
Crosses (c)	119.43**	15.63**	21.42**	971.905**	147.24**	192.04	12.19
P VS C	9461.27**	1058.47**	15.78	1291.48**	612.08**	2759.56**	71.47**
GCA	62.47**	76.33**	97.46**	3712.32**	512.24**	122.43	8.71
SCA	368.07**	34.49**	7.79*	313.58*	83.25**	281.07*	15.13*
Error	7.36	0.70	5.70	214.42	19.72	149.65	9.73

Table (2):Mean performance of parents and their F1 crosses for seven traits.

Line plus crosses	Grain yield Ard/fad	Silking date	Kernels moisture %	Downy mildew resistance%	Late wilt resistance %	*Fusariue monilliforme* infection %	*Penicillium sp* infection %
SD-7/E	8.98	68.50	35.15	87.50	100	38.05	9.30
SD-34/E	3.95	69.50	28.80	59.60	88.98	38.32	7.90
SD-62/E	7.5	66.75	32.85	100.00	100.00	45.35	11.35
SK-4051	4.65	64.00	25.10	78.65	89.92	42.87	11.40
SK-4054	6.55	68.25	32.60	84.57	90.34	40.00	10.75
SK-6050	4.91	64.00	28.10	97.72	95.11	59.20	12.65
SK-6054	5.76	61.00	28.40	100.00	79.25	43.70	8.525
SK-6055	5.07	67.75	29.80	97.27	95.83	52.77	12.90
SK-6056	8.88	64.75	29.25	95.32	90.62	49.52	12.95
SD-7/EX SD34/E	31.91	62.50	31.55	76.80	98.86	29.300	7.15
X SD-62/E	27.38	61.25	33.35	96.70	100.00	41.50	8.92
XSK-4051	29.31	60.75	29.85	78.37	100.00	27.97	7.50
XSK-4054	12.32	65.50	35.00	92.37	100.00	42.10	11.07
XSK-6050	17.24	63.25	32.70	85.60	100.00	40.82	11.32
XSK-6054	18.70	61.00	28.00	100.00	94.91	45.92	12.82
XSK-6055	22.98	61.25	29.85	89.20	100.00	32.30	8.12
XSK-6056	25.21	60.50	29.45	87.67	96.00	36.05	8.17
SD34/EXSD-62/E	27.10	60.50	29.35	59.55	100.00	25.45	7.17
XSK-4051	9.61	63.25	27.75	54.47	87.02	50.82	13.67
XSK-4054	36.28	61.500	31.45	53.47	100.00	32.60	8.87
XSK-6050	24.03	61.00	31.25	42.26	100.00	32.20	8.72
XSK-6054	21.43	57.75	25.35	90.47	82.83	36.12	9.35
XSK-6055	27.04	60.00	28.50	60.47	97.82	33.10	8.20
XSK-6056	31.43	59.75	28.40	54.4	98.86	27.07	7.25
SD62/EXSK-4051	26.29	59.75	27.10	67.67	99.00	31.60	8.77
XSK-4054	32.29	61.00	30.75	92.97	100.00	36.47	9.27
XSK-6050	27.04	59.00	30.25	88.05	100.00	26.57	8.87
XSK-6054	23.17	56.75	25.65	100.00	96.91	39.85	12.17
XSK-6055	22.76	60.25	29.00	94.67	100.00	27.82	7.82
XSK-6056	17.87	60.5	29.60	99.10	100.00	49.07	11.62
SK-4051XSK-4054	29.38	59.5	31.30	65.10	100.00	40.55	7.57
XSK-6050	18.08	59.75	28.40	82.27	97.82	48.70	11.77
XSK-6054	20.73	56.25	24.65	97.35	70.04	25.30	8.62
XSK-6055	25.14	58.00	27.15	83.80	98.86	31.75	8.07
XSK-6056	26.46	58.25	27.15	86.20	98.61	31.72	8.37
SK-4054XSK-6050	19.39	62.25	28.15	83.10	98.61	39.97	11.77
XSK-6054	22.99	59.75	30.90	97.60	95.91	46.100	10.4
XSK-6055	26.39	60.25	32.30	86.47	99.00	32.15	8.07
XSK-6056	28.15	60.25	31.35	80.60	100.00	36.77	8.95
SK-6050XSK-6054	22.12	58.25	26.15	98.43	90.92	41.12	9.02
XSK-6055	29.81	58.75	29.10	80.92	100.00	32.42	7.32
XSK-6056	26.72	58.25	29.45	73.22	99.00	28.42	8.27
SK-6054XSK-6055	23.27	57.75	27.60	89.77	96.47	36.42	9.57
XSK-6056	22.96	56.5	27.50	98.60	89.83	35.07	11.15
SK-6055XSK-6056	24.49	59.00	28.05	93.75	98.91	35.50	8.25
Check S.C. 10	33.12	67.25	35.25	93.50	100.00	33.70	10.32
L.S.D .0.05	3.75.	1.15	3.38	20.29	6.15	16.95	4.33
0.01	4.94	1.52	4.30	26.71.	8.10	22.31	5.70

Table (3) : Estimates of general combining ability effects for nine inbred lines.

Lines	Grain yield Ard/fad	Silking date	Kernels moisture %	Downy mildew resistance %	Late wilt resistance %	*Fusarium monilliforme* infection %	*Penicillium sp* infection %
SD-7/E	- 0.407	1.904**	2.36**	4.15*	2.781**	-.445	-.206
SD-34/E	0.838*	1.199**	-0.263	-20.448**	-1.436*	-3.063	-0.888*
SD-62/E	1.035**	0.040	0.606	5.699**	3.339**	-0.72	0.126
SK-4051	-1.20**	-0.778**	-1.867**	-5.772**	-2.543**	-.259	0.110
SK-4054	1.164**	1.313**	2.028**	-1.381	1.366*	0.882	0.139
SK-6050	-1.20**	-0.323**	-0.222	-0.610	1.582*	2.875	0.585
SK-6054	-1.871**	-2.369**	-1.954**	12.382**	-7.529**	1.482	0.383
SK-6055	0.411	-0.119	-0.267	3.417	2.142**	-0.909	-0.429
SK-6056	1.231**	-0.869**	-0.422	2.560	0.298	0.157	0.180
LSDgi							
0.05	0.75	0.23	0.68	4.07	1.23	3.4	0.87
0.01	0.99	0.30	0.89	5.36	1.62	4.48	1.14

Table (5): Estimates of genetic variance components and heritability for all studied traits

Traits	σ^2A	σ^2D	σ^2A/σ^2D	Degree of dominance	HBS
Grain yield Ard/fad	-13.89	90.17	0	α	98.0
Silking date	1.901	8.44	0.225	1.37	98.33
Kernels moisture %	4.07	0.457	8.90	0.473	75.23
Downy mildew Res. %	154.48	24.79	6.23	0.566	76.98
Late wilt Res. %	19.49	15.882	1.22	1.276	87.76
F. moniliforme Inf. %	-7.21	32.85	0	α	46.75
Penicillium sp Inf. %	-0.29	1.33	0	α	35.23

Table (6): Correlation coefficients between seven traits.

Traits	Grain yield Ard/fad	Silking date	Kernels moisture	Downy mildew Res.%	Late wilt Res.%	F.monilif orme Inf.%	Penicilli um sp Inf. %
Grain yield Ard/fad	---------	-0.602**	0.066	-0.251	0.434**	-0.682**	-0.596**
Silking date		-------	0.573**	-0.042	0.083	0.413**	0.333*
Kernels moisture %			-----	-0.026	0.523**	0.029	-0.049
Downy mildew Res.%				----	-0.185	0.349**	0.361**
Late wilt Res. %					----	-0.137	-0.168
F. moniliforme Inf. %						------	0.806**
Penicillium sp Inf.%							-----

Table (4): Estimates of specific combining ability effects for the 36 crosses studied.

Crosses	Grain Yield Ard/fad	Silking date	Kernels moisture%	Downy mildew resistance %	Late wilt resistance %	*Fusariue monilliforme* infection %	*Penicillium sp* infection %
SD-7/EX SD34/E	10.734**	-1.809**	0.044	9.491	1.600	-4.894	-1.353
X SD-62/E	6.001**	-1.900**	0.975	3.244	-2.039	5.013	-0.591
XSK-4051	10.172**	-1.582**	-0.052	-3.61	3.9*	-9.023	-2.00
XSK-4054	-9.185**	1.077**	1.203	5.99	-0.066	3.961	1.545
XSK-6050	-1.900	0.464	1.153	-1.547	-0.282	0.693	1.350
XSK-6054	0.230	0.259	-1.815	-0.139	3.745	7.186	3.052*
XSK-6055	2.222	-1.741**	-1.652	-1.974	-0.842	-4.048	-0.837
XSK-6056	3.632**	-1.741**	-1.897	-2.642	-2.998	-1.364	-1.396
SD34/EXSD-62/E	4.475**	-1.945**	-0.402	-9.305	2.179	-8.469	-1.660
XSK-4051	-10.77**	1.623**	0.471	-2.909	-4.915*	16.445**	4.856**
XSK-4054	13.524**	-2.218**	0.275	-8.30	4.152*	-2.921	0.027
XSK-6050	3.640**	-1.082**	2.325*	-20.383**	3.936*	-5.314	-0.569
XSK-6054	1.710	-2.286**	-1.843	14.937*	-4.120*	0.004	0.259
XSK-6055	5.044**	-2.286**	-0.379	-6.098	1.202	-0.630	-0.080
XSK-6056	8.608**	-1.786**	-0.325	-11.316	4.083*	-7.721	-1.639
SD62/EXSK-4051	5.701**	-0.718	-1.047	-15.856*	2.285	-5.123	-1.057
XSK-4054	9.340**	-1.559**	-1.293	5.053	-0.623	-1.389	-0.587
XSK-6050	6.459**	-1.923**	0.457	-0.642	-0.839	-13.282*	-1.432
XSK-6054	3.258**	-2.127**	-2.411*	-1.684	5.10*	1.386	2.070
XSK-6055	-0.563	-0.877*	-0.747	1.955	-1.399	-8.248	-1.469
XSK-6056	-5.147**	0.123	0.007	7.237	0.444	11.936*	1.722
SK-4051XSK-4054	8.669**	-2.241**	1.730	-11.351	5.258*	2.225	-2.271
XSK-6050	-0.271	-0.355	1.080	5.053	2.868	8.381	1.484
XSK-6054	3.046*	-1.809**	-0.938	7.136	-15.799**	-13.625*	-1.464
XSK-6055	5.180**	-2.309**	-0.125	2.551	3.346	-4.785	-1.203
XSK-6056	5.682**	-1.309**	0.030	5.808	4.937*	-5.875	-1.512
SK-4054XSK-6050	-1.319	0.055	-3.065**	1.487	-0.255	-1.485	1.454
XSK-6054	2.948*	-0.400	1.416	2.995	6.161**	6.034	0.281
XSK-6055	4.070**	-2.150**	1.130	0.835	-0.426	-5.525	-1.232
XSK-6056	5.006**	-1.400**	0.335	-4.183	2.417	-1.966	-0.966
SK-6050XSK-6054	4.470**	-0.264	-1.084	3.062	0.951	-0.935	-1.539
XSK-6055	9.852**	-2.014**	0.180	-5.485	0.358	-7.244	-2.800*
XSK-6056	5.943**	-1.764**	0.685	-12.329	1.201	-12.310*	-2.087
SK-6054XSK-6055	9.976**	-0.968*	0.412	-9.628	5.945**	-1.850	0.025
XSK-6056	2.849*	-1.468**	0.466	0.054	1.145	-4.266	0.990
SK-6055XSK-6056	2.093	-1.218**	-0.670	4.169	0.554	-1.450	-1.098
LSD Sij							
0.05	2.43	0.75	2.18	13.12	3.97	10.96	2.8
0.01	3.20	0.99	2.88	17.27	5.23	14.43	3.69

Means performance of parental lines and their F_1 crosses are presented in Table (2).The Mean values for lines ranged from (3.95 to 8.98 Ard/fad) for grain yield, (61 to 69.5 days) for silking date, (25.1 to 35.15%) for kernels moisture, (59.6 to 100%) for downy mildew resistance, (79.25 to 100%) for late wilt resistance, (38.05 to 59.2%) for infection by *Fusarium moniliforme* and (7.9 to 12.95%) for infection by *Penicillium spp.* The highest yield were obtained for single crosses, SD34/E x SK 4054 (36.28 Ard/fad), SD62/E x SK4054 (32.29 Ard/fad), SD 7/E x SD34/E(31.91 Ard/fad) and SD34/E x SK6056(31.43 Ard /fad) not significant than check S.C.10 (33.12 Ard/fad) for grain yield and resistance of most diseases, while these crosses significant for earliness(61.5, 60.0, 62.5 and59.75 days) , respectively than check(67.25 days),also for kernels moisture (31.45, 30.75, 31.55 and28.4%),respectively than check(35.25%).

The mean squares associated with general and specific combining abilities were significant for all studied traits (Table1) except general combining ability for kernel rot diseases by fungi *Fusarium moniliforme* and *Penicillium spp.* The Estimates of the GCA effects for individual parental lines are illustrated in Table (3). Significant desirable general combining ability effects were obtained for grain yield (Ard/fad) in SK-4054, SK-6056, SD-62/E and SD -34/E, for silking date in SK-6054, SK-6056, SK-4051 and SK-6050, for kernels moisture in SK-6054 and SK-4051, for downy mildew resistance in SK-6054, SD-62/E and SD-7/E, for late wilt resistance in SD-62/E, SD-7/E, SK-6055, SK-6050 and SK-4054 and for kernels rot by fungi *Penicillium spp* in SD34/E.

The estimates of the specific combining ability effects in the 36 crosses for all studied traits are presented in Table (4). Significant desirable specific combining ability effects were obtained for grain yield in twenty five crosses, for earliness in 26 crosses for kernels moisture in two crosses, for downy mildew resistance in one cross, for late wilt resistance in nine crosses, for infection of *Fusarium moniliforme* in three crosses, for infection of *Penicillium spp.* in one cross. Generally the crosses, (SD-7/E x SD-34/E), (SD-7/E xSK-4051), (SD-34/E x SK-4054), (SD-34/Ex SK-6056), (SD-62/E x SK-6050), (SK-4051 x SK-4054),(SK-4051 x SK-6056) and (SK-6050 x SK-6055)had superiority in most traits specially yielding ability and early maturity.

Genetic variance components and heritability values are presented in table (5). The relative magnitudes of additive (σ^2A) and dominance (σ^2D) variances were presented through the (σ^2A/σ^2D) ratio, grain yield, silking date and infection by *Fusarium moniliforme* and *Penicillium spp* had ratio loss than unity. These indicated that the dominance variance played the major role in the inheritance of these traits. It could concluded that these materials were expected to have good combination which should out yield, earliness and resistance to infection by kernel rot disease than the best parents. These results agreed with that obtained by Pajic (1986) Cosmin *et al* (1988), Gonzalez (1988), Shafey (1993), Mostafa *et al.* (1996), Amer. *et al.* (1998) and EL-zeir *et al.* (2001). While, kernels moisture, downy mildew and late wilt resistance had ratio more than unity. These indicated that the additive variance was important in the inheritance of these traits. Hence their improvement could be achieved by selection. Major role additive variance in

the inheritance of these traits were also reported by EL- shenawy (1995), EL zeir and Amer (1999) and EL-zeir *et al.*, (2001) for downy mildew resistance. Galal *et al.*, (1992) and Mosa (2001) for late wilt resistance.

Regarding to Table (5). The estimates of the average degree of dominance exhibited over dominance for all studied traits except kernel moisture and downy mildew resistance, which exhibited partial dominance. These results were harmony with Gardner and lonnquist (1961) and Abd–Elaal (1998). On the other hand estimates of heritability in the broad sense according to Gardner (1963) exhibited high values for silking data, grain yield, late wilt resistance, downy mildew resistance and kernels moisture respectively, while infection by kernel rot *F. moniliforme* and *Penicillium spp* exhibited medium values respectively. These results were agreed with obtained by Abd-Elaal (1998) stated that heritability in the broad senses were high for grain yield and silking date, Nonkam and pataky (1996) indicated that broad sense heritability ranged from 32 to 55% for resistance to *F moniliforme*.

All possible simple correlation coefficients among seven studied traits were calculated in Table (6). Grain yield was negatively correlated with silking date, infection by *F. moniliforme* and P*enicillium spp,* while it was positively correlated with resistance of late wilt. These results indicated that when the grain yield increased silking date and infection by kernel rot tended to decrease while resistant to late wilt tended to increase. The significant positive association silking date and kernels moisture and infection by *F. moniliforme* and *Penicillium spp.* These indicated that increased number of days to 50% silking date led to increased kernels moisture and infection by kernel rot disease. Significant positive relationship between kernels moisture and resistance of late wilt diseases, also significant positive correlation between resistance of downy mildew and infection by kernel rot diseases as well as between infection by *F. moniliforme* and *Penicillium spp.* The obtained results were agreement with Drimal and Drimal (1985), monchilova and Mitev (1995), El-zeir *et al.*, (2001) and Abd- Elaal (1998).

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التحليل الوراثى لصفة المحصول وامراض البياض الزغبـــى والذبـــول المتـــأخر واعفان الحبة على الذرة الشامية

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تم أجراء التهجين بين ٩ سلالات بيضاء من الذرة الشـــامية بنظـــام الـــتزاوج الدائري فى عام ٢٠٠٠ ثم قيمت الأباء والهجن الفردية الناتجة فى ثلاث تجارب فى محطـــة البحـــوث الزراعية بسخا عام ٢٠٠١ .

التجربة الأولى تحت الظروف الطبيعية وذلك لدراسة صفة المحصول والمقاومة لمرض الذبول المتـــأخر .

التجربة الثانية فى حقل العدوى الصناعى بالبياض الزغبى لدراسة صفة المقاومة لمرض البياض الزغبـــى بينما التجربة الثالثة فى المعمل لدراسة وجود أعفان الحبة . ويمكن تلخيص أهم النتائج فى

١ – يوجد اختلافات معنوية بين جميع التراكيب الوراثية فى جميع الصفات ماعدا عفـــن الحبـــة الـــوردى (*F.monilliforme*) والعفن الأخضر (*Penicillium spp.*) للأباء والهجن ,و قوة الهجين لرطوبـــة الحبوب

٢ – أظهر أن كل من التباين الراجع للتأثير الإضافي والتباين الراجع للتأثير السيادى له دور فى توريث كـــل الصفات ما عدا التأثير الإضافى للعفن الوردى والأخضر حيث لم يكن لة دور فى توريثـــهما وتبيـــن أن التباين الراجع للتأثير السيادى له الدور الرئيسى فى توريث الصفات التالية (محصول الحبوب – تـــاريخ تزهير ٥٠% حريرة – عفن الحبة الوردى و الأخضر) بينما التباين الراجع للتأثير الإضافى له الـــدور الرئيسى فى توريث صفات (رطوبة الحبوب – المقاومة لمرض البياض الزغبى و الذبول المتأخر).

٣ – درجة السيادة تشير ان طبيعة السيادة فى هذه الصفات سيادة فائقة ما عدا رطوبة الحبـــوب والمقاومـــة للبياض الزغبى سيادة غير تامة. ومعامل التوريث بمعناه الواسع عاليا فى جميع الصفات ما عـــدا أعفـــان الحبة .

٤ –التلازم بين محصول الحبوب وكل من , تاريخ التزهير ٥٠ %حريرة و الاصابة باعفان الحبة ساليا بينمـــا كان موجبا مع المقاومة لمرض الذبول المتاخر.

٥– أظهرت السلالات سخا- ٤٠٥٤ ، سدس -٦٢/م ، وسدس- ٣٤/م ، وسخا -٦٠٥٦ افضلية فى تألفـــهما العام للمحصول والمقاومة لبعض امراض الذرة والتبكير .

٦ – كانت الهجن التالية :(سدس -٧/م × سدس- ٣٤/م),(سدس- ٣٤/م × سخا -٤٠٥٤),(ســـدس-٣٤/م × سخا- ٦٠٥٦-) و(سدس- ٦٢/م × سخا- ٤٠٥٤) متفوقة فى معظم الصفـــات المدروســـة خاصـــة للمحصول والنضج المبكر لذلك يمكن استخدامها كهجن جيدة فى برنامج الذرة الشامية.