RESULTS AND DISCUSSION

A- Genotypic variation

This study included six varieties ,15 F1 and 15 F2 obtained from a half diallel crosses between theses parents .These variable genotypes were planted at the three locations Ismailia, Nobaria, and Gemmeiza locations in 1990. Therefore the determination of variability among these genotype became necessary to investigate the nature of these variations .The significance of the mean squares of genotypes would indicate the presence of genetic variation between them .Analysis of variance for yield and yield components characters in F1 and F2 are found in tables (8 and 9). Tests of significance indicated that the mean squares of genotypes were highly significant for all traits in all three locations and also from the combined analysis .The presence of such significance for genotypes made them possible to perform the comparisons planned in this study .The significance of the mean squares indicated the presence of true differences among these genotypes .The genotypes by environments interaction were also highly significant indicating the presence of certain correlation between genotype and environment .The presence of these significant interactions between genotypes and environments, were expected since most of the varieties and therefore, their crosses were derived from different origins .The presence of significant differences between genotypes would indicate the presence of genotypic variation .These genotypic variation would insure the validity of the comparisons between the means of these genotypes .

Table (8).Analysis of variance for yield and yield components in F1.

Source of variation	Locations	D.F	Plant height	Spike length	No.of spikes/ plant	No.of spikelets spike	No.of grains/ spike	Plant weight	Grain yield plant	100-grain weight	Stem rust reaction
	E1	2	0.132	0.178	0.604	0.136	31.842	1.353	0.011	0.005	6.657
Replication	E2	2	2.161	0.473*	0.295	1.486**	5.781	23.254	0.362	0.069	1.701
	E3	2	2.624	0.108	0.039	0.350	1.028	9.885	0.050	0.019	112.819
	E1	20	60.030**	3.271**	0.683**	2.546**	120.058**	46.373**	12.269**	0.825**	476.456**
Genotype	E2	20	24.243**	1.436**	2.382**	3.619**	65.411**	199.170**	23.123**	0.938**	414.037**
	E3	20	73.643**	1.375**	9.075**	1.689**	91.384**	359.209**	68.021**	2.259**	392.481**
	E1	40	0.414	0.213	0.231	0.187	20.061	7.331	3.424	0.051	51.745
Error	E2	40	1.259	0.100	0.226	0.142	11.936	10.924	2.169	0.074	55.519
	E3	40	1.508	0.168	0.137	0.153	14.978	8.032	3.158	0.071	81.893
Locations		2	39374.919**	307.085**	1884.767**	1739.202**	3216.608**	80161.017**	7636.579**	32.612**	2098.451**
Rep./Loc.		6	1.690*	0.352	0.330	0.659**	12.942	11.527	0.722	0.073	33.685
Genotype		20	72.571**	2.748**	4.033**	4.243**	120.421**	307.694**	51.168**	1.780**	614.964**
Loc.xgeno.		40	42.680**	1.705**	3.953**	1.795**	78.046**	148.565**	27.339**	1.000**	130.185**
Error		120	1.057	0.198	0.188	0.159	15.689	8.786	3.083	0.084	30.748

Whereas: E1=Ismailia

E2=Nobaria

E3=Gemmeiza

Table (9).Analysis of variance for yield and yield components in F2.

Source of variation	Locations	D.F	Plant height	Spike length	No.of spikes/ plant	No.of spikelets spike	No.of grains/ spike	Plant weight	Grain yield plant	100-grain weight	Stem rust reaction
	E1	2	92.687**	8.669**	0.028	2.234*	60.719	13.034	0.104	0.916	94.831**
Replication	E2	2	23.442*	0.183	6.900**	2.199*	23.792	2054.156**	94.939**	0.256	3.833
	E3	2	22.665	0.381	1.062	0.319	12.052	64.960	7.133	0.481	73.879
	E1	20	93.935**	2.134**	3.215**	3.681**	92.791**	436.521**	15.269**	0.866**	374.406**
Genotype	E2	20	47.709**	2.759**	4.340**	1.855**	46.603**	253.480**	25.533**	0.794**	256.413**
	E3	20	222.464**	1.245**	16.433**	1.369**	202.388**	359.712**	70.329**	0.785**	411.047**
	E1	40	16.232	0.479	1.235	0.564	26.158	88.709	5.521	0.319	87.989
Error	E2	40	5.966	0.366	1.320	0.511	19.315	104.257	8.182	0.276	58.316
	E3	40	15.024	0.479	1.985	0.557	26.350	79.169	7.522	0.223	65.511
Locations		2	42261.832**	244.741**	1502.640**	1511.545**	1857.913**	32597.897**	3848.433**	40.903**	6237.681**
Rep./Loc.		6	46.318**	3.734**	2.670	1.585**	32.184	710.699**	34.058**	0.552*	30.861
Genotype		20	254.844**	2.893**	7.908**	4.316**	218.671**	296.439**	40.214**	0.857**	416.434**
Loc.xgeno.		40	54.639**	2.452**	8.041**	1.294**	61.554**	376.656**	35.459**	0.793**	111.278**
Error		120	12.404	0.931	1.512	0.544	23.941	90.712	7.075	0.275	37.844

Whereas: E1=Ismailia

E2=Nobaria

E3=Gemmeiza

B- Analysis of variance :

The analysis of variance of different locations for yield and yield components in F1 are found in table (10) .Most of variations in different locations and their combined data ,were significant or highly significant for general combining ability effects (G.C.A.) and specific combining ability effects (S.C.A.) in F1 in all locations except number of spikes/plant and grain yield/plant at Ismailia for general combining ability effects (G.C.A.) .

The analysis of variance of different locations for yield and yield components in F2 are presented in table (11) .Plant height ;100- grain weight; and the stem rust recation showed mostly highly significant values of G.C.A. and S.C.A. in the three locations ,.Number of spikelets/spike and number of grains/spike exhibited highly significant values for G.C.A. in all locations .Meanwhile plant weight and grain yield/plant showed highly significant values at Nobaria and Gemmeiza locations, and for S.C.A. effects at Ismailia and Gemmeiza locations .Number of spikes/plant gave highly significant value of S.C.A. effects in the three locations, and at Gemmeiza loocation,only for G.C.A. effects. Most of obtained values after combined analysis were highly significant for G.C.A.and S.C.A.effects .

Concept of the significance of any sources of variation such as entries and different studied traits and their interaction with locations means that the behaviour of that sources of variation will be different from location to another .

Table (10). Analysis of variance of general combining ability (G.C.A.) and specific combining ability (S.C.A.) in F1 for yield and yield components .

Source of variation	Locations	D.F	Plant height	Spike length	No.of spikes/ plant	No.of spikelets spike	No.of grains/ spike	Plant weight	Grain yield plant	100-grain weight	Stem rust reaction
	E1		164.642**	7.724**	0.392**	7.025**	268.232**	25.940*	9.578**	1.184**	1393.511**
G.C.A.	E2	2	29.204**	1.305**	2.646**	5.503**	92.880**	389.630**	66.511**	0.249*	1373.636**
	E3	2	41.802**	2.062**	31.457**	2.594**	171.171**	1002.240**	161.430**	3.650**	711.539**
	E1	20	25.158**	1.831**	0.720**	1.053**	70.667**	53.184**	13.166**	0.706**	170.771**
S.C.A.	E2	20	22.605**	1.479**	2.302**	2.992**	56.209**	135.688**	8.661**	1.168**	94.170**
	E3	20	84.264**	1.146**	1.614**	1.386**	64.629**	144.880	36.883**	1.795**	286.129**
	E1	40	0.138	0.059	0.072	0.062	6.687	2.444	1.141	0.017	17.248
Error	E2	40	0.417	0.033	0.074	0.047	3.977	3.641	0.723	0.025	18.506
	E.3	40	0.502	0.056	0.046	0.051	5.012	2.676	1.053	0.024	27.298
G.C.A.		2	95.987**	5.362**	13.334**	10.456**	269.287**	905.972**	108.753**	1.502*	2196.48**
S.C.A.		6	64.766**	1.877**	0.932**	2.172**	70.799**	108.268**	31.973**	1.873**	87.79**
Loc.xg.c.a		20	69.838**	2.737**	10.455**	2.318**	131.391**	255.867**	64.362**	1.378**	130.74**
Loc.xs.c.a		40	33.628**	1.362**	1.620**	1.620**	60.264**	112.797**	14.999**	0.874**	130.00**
Error		120	1.057	0.198	0.159	0.159	15.689	8.786	3.083	0.084	30.75

Whereas: E1=Ismailia

E2=Nobaria

E3=Gemmeiza

Table (11).Analysis of variance of general combining ability (G.C.A.)and specific combining ability (S.C.A.)in F2 for yield and yield components .

Source of variation	Locations	D.F	Plant height	Spike length	No.of spikes/ plant	No.of spikelets spike	No.of grains/ spike	Plant weight	Grain yield plant	100-grain weight	Stem rust reaction
G.C.A.	E1	5	109.467**	6.467**	1.741	6.780**	260.704**	13.481	1.946	1.291**	1257.23[illegible]**
	E2	5	32.650**	1.633	1.0611	4.868**	95.767**	419.592**	56.290**	0.816*	565.58[illegible]**
	E3	5	124.217**	3.160**	10.535**	3.839**	477.900**	535.825**	118.383**	1.024**	260.448**
S.C.A.	E1	15	88.760**	0.689	3.706**	2.648**	36.819	577.593**	19.711**	0.722**	80.055**
	E2	15	52.725**	5.349**	5.436**	0.851	30.214	198.109	15.281	0.787**	153.357**
	E3	15	255.211**	0.607	18.399**	0.545	110.549**	301.010**	54.311**	0.705**	461.248**
Error	E1	40	5.410	0.159	0.412	0.188	8.719	29.569	1.840	0.107	29.316
	E2	40	1.989	0.122	0.439	0.170	6.438	34.752	2.727	0.092	19.439
	E3	40	5.008	0.159	0.662	0.186	8.783	26.390	2.507	0.074	21.837
G.C.A.		5	78.165**	3.476**	1.593	10.051**	643.012**	601.108**	93.988**	0.440*	1158.47**
S.C.A.		15	313.738**	2.699**	10.013**	2.405**	77.224**	194.883**	22.290**	0.996**	169.09**
Loc.xg.c.a.		10	94.142**	3.892**	5.872**	2.718**	95.676**	183.874**	41.315**	1.345**	87.79**
Loc.xs.c.a.		30	41.472**	1.973**	8.765**	0.819**	50.181**	440.918**	33.507**	0.609**	119.11**
Error		40	12.404	0.931	1.512	0.544	23.941	90.712	7.075	0.273	37.84

Whereas: E1=Ismailia

E2=Nobaria

E3=Gemmeiza

C - General combining ability effects

Estimates of general combining ability effect in F1 diallel cross mating design for yield and yield components are presented in tables (12 to 15).

Plant height :

The parental variety Agent and Baart at Ismailia location; Sakha 69 and Giza 157 at Nobaria location;Sakha 69 at Gemmeiza location;Sakha 69 and Agent in combined data showed positive and highly significant and most desirable values of G.C.A. effects.

Spike length

The parental variety Agent,Sakha 92 and Baart at Ismailia location;Giza 157 at Nobaria location;Agent at Gemmeiza location, and Giza 157 and Agent in combined data, exhibited positive and highly significant and most desirable values of G.C.A. effects.

Number of spikes /plant:

The prantal variety Agent at Nobaria location;Sakha 69 and Giza 157 at Gemmeiza location;and Sakha 69,Giza 157 and Agent in combined data showed postive and highly significant and most desirable values of G.C.A.effects.

Number of spikelets/spike:

The parental variety Agent and Baart at Ismailia and Nobaria locations; Sakha 69 and Agent at Gemmeiza location; and Agent and Baart in combined data exhibited positive and highly significant and most desirable values of G.C.A. effects.

Table (12).General combining ability effects in the F1 of wheat yield and yield companents at Ismailia location.

Characters / Parents		Plant height	Spike length	No.of spikes/ plant	No.of spikelets spike	No.of grains/ spike	Plant weight	Grain yield/ plant	100-grain weight	Stem rust reaction
Sakha 69		-0.083**	** -0.298	0.045	0.113**	* -2.164 *	0.720*	-0.058	** 0.295 **	* -3.182
Giza 157		-0.633**	-0.070**	0.123	-0.253**	-2.195**	1.320	-0.504	-0.248**	-2.531**
Giza 160		-3.747**	-0.952**	0.131	-0.945**	-3.460	-0.587**	0.110	0.214	10.401**
Agent		4.419**	0.401**	0.003*	0.440	-0.294**	-1.458	-0.372**	0.049**	-6.370**
Sakha 92		-0.385**	0.346**	-0.181	0.107**	4.898**	-0.578	1.202	-0.124**	-6.059**
Baart		0.428	0.573	-0.121	0.537	3.215	0.583	-0.379	-0.186	7.741
L.S.D.gi	5%	0.242	0.158	0.176	0.163	1.686	1.019	0.775	0.085	3.053
	1%	0.324	0.212	0.235	0.218	2.256	1.364	1.037	0.114	4.725
L.S.D.gi-gj	5%	0.375	0.245	0.272	0.252	2.613	1.595	1.079	0.131	5.471
	1%	0.502	0.329	0.363	0.337	3.496	2.113	1.444	0.176	7.320

Table (13). General combining ability effects in the F1 Of wheat for yield and yield components at Nobaria location .

NO.	Characters / Parents		Plant height	Spike length	NO.of spikes/ plant	NO.of spikelets/ spike	NO.of grains/ spike	Plant weight	Grain yield / plant	100-grains weight	Stem rust reaction
1	Sakha 69		1.735**	0.030	-0.253**	-0.165*	1.377*	0.765	-0.056	0.076	-3.231*
2	Giza 157		0.639**	0.369**	0.036	0.061	2.326**	6.513**	0.428	0.096	-0.942
3	Giza 160		-1.442**	-0.213**	-0.199**	-0.520**	-3.287**	-4.218**	-2.363**	0.075	7.179**
4	Agent		-0.518*	-0.279**	0.641**	0.811**	-0.159	2.155**	2.067**	-0.082	-4.335**
5	Sakha 92		0.133	-0.014	-0.040	-0.386**	0.639	1.573**	-1.419**	-0.156**	-3.536*
6	Baart		-0.547*	0.107	-0.185*	0.199**	-0.896	-3.641**	1.342**	-0.009	4.865**
	L.S.D gi	5%	0.421	0.119	0.177	0.142	1.301	0.766	0.554	0.103	2.875
		1%	0.563	0.159	0.237	0.189	1.740	1.025	0.741	0.137	3.847
	L.S.D.gi-gj	5%	0.562	0.184	0.275	0.219	2.015	3.856	0.859	0.159	4.455
		1%	0.873	0.247	0.368	0.293	2.696	5.159	1.149	0.212	5.960

Table (14). General combining ability effects in the F_1 of wheat for yield and yield components at Gemmeiza location .

NO.	Characters / Parents		Plant height	Spike length	NO.of spikes/ plant	NO.of spikelets/ spike	NO.of grains/ spike	Plant weight	Grain yield / plant	100-grain weight	Stem rust reaction
1	Sakha 69		1.909**	-0.037	0.836**	0.334**	1.982*	2.247**	1.862*	-0.075**	-0.537
2	Giza 157		-0.274	0.028**	1.727	0.111**	-1.877**	11.615**	-0.808**	-0.637	-0.412**
3	Giza 160		0.184	-0.251**	-0.049*	-0.467**	-4.060**	-5.391**	-3.646**	-0.075**	5.358**
4	Agent		0.195	0.560**	-0.167**	0.320	2.553	-4.874	3.352**	0.460**	-4.822
5	Sakha 92		0.197**	-0.205	-0.962**	0.011**	-0.754**	0.332**	1.153**	0.362	-0.729
6	Baart		-2.210	-0.094	1.385	-0.309	2.156	-3.967	-1.912	-0.036	1.142
	L.S.D gi	5%	0.462	0.146	0.139	0.147	1.460	1.066	0.669	0.100	3.048
		1%	0.618	0.195	0.187	0.197	1.954	1.427	0.895	0.134	4.078
	L.S.D.gi-gj	5%	0.715	0.239	0.216	0.228	2.262	3.305	1.036	0.491	4.722
		1%	0.957	0.320	0.289	0.305	3.026	4.423	1.387	0.654	6.317

Number of grains/spike

The parental variety Sakaha 92 and Baart at Ismailia location; Giza 157 and Sakha 69 at Nobaria location ;at Nobaria location;Agent, Baart and Sakha 69 at Gemmeiza location; and Sakha 92 and Baart in combined data exhibited positive and highly significant and most desirable values of G.C.A. effects.

Plant weight :

The parental variety Giza 157 at Ismailia location; Giza 157 and Agent at Nobaria location; Sakha 69 and Giza 157 at Gemmeiza location; and in the combined data ,showed positive and significant or highly significant and most desirable values of G.C.A. effects.

Grain yield/plant:

The parental variety Sakha 92 at Ismailia location; Agent and Baart at Nobaria location; Sakha 69, Agent and Sakha 92 at Gemmeiza location,and Sakha 69 and Agent in combined data, showed positive and highly significant and most desirable values of G.C.A.effects.

100- grains weight:

The parental variety Sakha 69 and Giza 160 at Ismailia location; and Sakha 92 at Nobaria location; and Sakha 69 , Giza 160 and Agent in combined data, showed positive and highly significant and most desirable values of G.C.A. effects.

Stem rust reaction:

The parental variety Baart and Giza 160 at Ismailia and Nobaria locations; Giza 160, and Sakha 69 at Gemmeiza location; and Giza 160 and Baart in combined data, exhibited positive and highly significant and most desirable values of G.C.A.effects. Similar results were obtained by Ranvir et.al.(1983),Qari et.al. (1984),Noor et.al.(1985), Silis and Shmakova (1986), Yadav et.al.(1987), Atale and Vitkare (1990), Salem and Hassan (1991) and Khan et.al.(1992)

Estimates of general combining ability effects determined from F2 in diallel cross mating design for yield and yield components are presented in tables (16 to 19).

Plant height:

The parental variety Agent at Ismailia location; Giza 160 and Sakha 69 at Gemmeiza location; and Agent in combined data, exhibited positive and highly significant and most desirable values of G.C.A. effects.

Spike length:

The parental variety Sakha 92 and Agent at Ismailia location; Giza 160 at Nobaria location; Agent and Giza 157 at Gemmeiza location; and in combined data, exhibited positive and highly significant and most desirable values of G.C.A. effects.

Number of spikes/plant:

The parental variety Giza 157 at Gemmeiza location; revealed

Table (16). General combining ability effects in the F2 of wheat for yield and yield components at Ismilia location.

NO.	Characters / Parents		Plant height	Spike length	NO.of spikes/ plant	NO.of spikelets/ spike	NO.of grains/ spike	Plant weight	Grain yield / plant	100-grains weight	Stem rust reaction
1	Sakha 69		-0.930	-0.138	-0.191	-0.157	-1.468	0.052	0.075	-0.148	-6.494**
2	Giza 157		-1.356**	0.257**	-0.349	0.082	1.108**	-0.178	-0.207	-0.179**	-0.797**
3	Giza 160		-2.522**	-0.996*	-0.127	-0.981	-4.814	-1.000	-0.114	0.380	8.979**
4	Agent		3.500	0.330**	0.062	0.204*	-1.573**	-0.231	-0.313	-0.077	-8.534
5	Sakha 92		1.219	0.351	0.278	0.345**	4.496*	0.047	0.491	0.192	-2.520**
6	Baart		0.089	0.196	0.327	0.508	2.252	1.311	0.069	-0.167	9.365
	L.S.D gi	5%	1.517	0.260	0.418	0.282	1.926	3.546	0.884	0.213	2.708
		1%	2.029	0.348	0.560	0.378	2.576	4.745	1.183	0.285	3.624
	L.S.D.gi-gj	5%	2.350	0.403	0.648	0.438	2.983	5.494	1.370	0.330	4.196
		1%	3.144	0.540	0.867	0.586	3.992	7.351	1.834	0.441	5.515

Table (17). General combining ability effects in the F2 of wheat for yield and yield components at Nobaria location.

NO.	Characters / Parents		Plant height	Spike length	NO.of spikes/ plant	NO.of spikelets/ spike	NO.of grains/ spike	Plant weight	Grain yield / plant	100-grain weight	Stem rust reaction
1	Sakha 69		0.836	-0.332*	0.037	-0.145**	1.681*	3.831**	0.932	0.123	-7.266**
2	Giza 157		0.684	-0.054**	0.019	0.533*	1.373**	6.190*	0.688**	0.193*	-0.297**
3	Giza 160		-0.814	0.436	-0.283	-0.316**	-3.831	-4.096	-2.516	-0.255	11.002**
4	Agent		0.383	-0.016	-0.156	0.374**	0.084	-0.804*	0.738*	-0.189	-8.661
5	Sakha 92		0.911**	-0.150	0.047	-0.653	-0.051	-3.954	-1.243*	0.003	-0.823**
6	Baart		-2.001	0.117	0.336	0.208	0.745	-1.167	1.402	0.128	6.045
	L.S.D gi	5%	0.919	0.228	0.432	0.269	1.655	3.845	1.077	0.197	2.806
		1%	1.231	0.305	0.578	0.359	2.214	5.144	1.441	0.264	3.754
	L.S.D.gi-gj	5%	1.425	0.353	0.669	0.416	2.564	5.957	1.668	0.306	4.347
		1%	1.906	0.472	0.895	0.557	3.430	7.970	2.232	0.410	5.615

Table (18). General combining ability effects in the F2 of wheat for yield and yield components at Gemmeiza location.

NO.	Characters / Parents		Plant height	Spike length	NO.of spikes/ plant	NO.of spikelets/ spike	NO.of grains/ spike	Plant weight	Grain yield / plant	100-grain weight	Stem rust reaction
1	Sakha 69		1.763*	0.185*	0.472**	0.314**	1.094	4.119**	1.859**	0.107	1.796
2	Giza 157		0.402*	0.341**	0.983	0.415**	0.056**	7.099**	0.303**	0.010	-2.307**
3	Giza 160		2.192	-0.586*	0.222*	-0.674	-8.229	-4.653*	-4.155**	-0.163*	8.403**
4	Agent		1.231*	0.344	-0.549	0.164	0.033	-3.673	1.245*	0.203	-7.493
5	Sakha 92		-3.381*	-0.195	-0.466*	-0.216	1.820**	0.126	1.380	0.168**	-2.726
6	Baart		-2.207	-0.089	-0.662	-0.004	5.227	-3.018	-0.632	-0.325	2.332
	L.S.D gi	5%	1.459	0.260	0.530	0.281	1.933	3.350	1.032	0.177	3.407
		1%	3.947	0.348	0.709	0.376	2.596	4.483	1.381	0.237	4.559
	L.S.D.gi-gj	5%	2.261	0.403	0.821	0.435	2.994	5.191	1.600	0.275	5.279
		1%	3.025	0.540	1.099	0.583	4.006	6.945	2.140	0.368	7.063

Table (19). General combining ability effects in the F2 of wheat for yield and yield components in the combined data .

NO.	Characters / Parents		Plant height	Spike length	NO.of spikes/ plant	NO.of spikelets/ spike	NO.of grains/ spike	Plant weight	Grain yield / plant	100-grain weight	Stem rust reaction
1	Sakha 69		0.557	-0.095*	0.106	0.004**	0.436	2.667**	0.955**	0.027	-2.872**
2	Giza 157		-0.090	0.181**	0.218	0.343**	0.845**	4.370**	0.261**	0.008	-0.154**
3	Giza 160		-0.381**	-0.382**	-0.063	-0.657**	-5.625	-3.250	-2.262	-0.013	7.578**
4	Agent		1.705	0.219	-0.214	0.247*	-0.486**	-1.569	0.556	-0.021*	-7.903
5	Sakha 92		-0.417*	0.002	-0.047	-0.175**	2.088**	-1.260	0.209	0.120*	-1.387**
6	Baart		-1.373	0.075	0.002	0.237	2.741	-0.958	0.280	-0.121	4.738
	L.S.D gi	5%	0.744	0.144	0.266	0.160	1.061	2.067	0.576	0.113	1.717
		1%	1.387	0.193	0.355	0.214	1.421	2.766	0.771	0.151	2.297
	L.S.D.gi-gj	5%	1.163	0.223	0.412	0.248	1.644	3.203	0.893	0.175	2.660
		1%	1.556	0.299	0.551	0.332	2.199	4.285	1.194	0.235	3.521

positive and highly significant and most desirable values of G.C.A. effects.

Number of spikelets/spike:

The parental variety Baart and Sakha 92 at Ismailia location; Giza 157, Agent at Nobaria location; Giza 157 and Sakha 69 at Gemmeiza location; and Giza 157, Agent and Baart in combined data, exhibited positive and highly significant and most desirable values of G.C.A. effects.

Number of grains/spike:

The parental variety Sakha 92 and Baart at Ismailia location; Sakha 69 at Nobaria location; Baart at Gemmeiza location; and Baart and Sakha 92 in combined data, exhibited positive and highly significant and most desirable values of G.C.A.effects.

Plant weight:

The parental variety Giza 157 at Nobaria location;Giza 157 and Sakha 69; and in combined data, exhibited positive and highly significant and most desirable values of G.C.A.effects.

Grain yield/plant:

The parental variety Baart at Nobaria location;Sakha 69,Sakha 92 and Agent at Gemmeiza location; and Sakha 69 in combined data, exhibited positive and highly significant and most desirable values of G.C.A. effects.

100- grain weight:

The parental variety Giza 160 at Ismailia location; Agent at Gemmeiza location; and Sakha 92 in combined data, exhibited positive and highly significant and most desirable values of G.C.A.effects.

Stem rust reaction:

The parental variety Geiza 160 and Baart at Ismailia and Nobaria locations; Giza 160 at Gemmeiza location; and Giza 160 and Baart in combined data, exhibited positive and highly significant and most desirable values of G.C.A.effects.These findings were in agreement with those reached by Saakyan et.al.(1983), Noor et.al.(1985),Bashir et.al.(1986),Yadav and Singh (1987),Kasim and Mubarak (1989), Ikram and Tanach (1991),Lazarevich (1991), and Khan et.al. (1992).

D- Specific combining ability effects:

Values of specific combining ability effects (S.C.A.)for yield and yield Components from F1 are presented in tables (20 to 23).

Plant height:

At Ismailia location; the crosses (7,3,15,11,6,12 and 2)gave positive and highly significant values of specific combining ability effects. Whereas,five crosses (10,13,9,4, and 1)indicated negative and highly significant values of specific combining ability effects. At Nobaria location; nine crosses of F1(1,8,14, 5,7,6,13,11, and 2) showed positive and significant or highly significant values of specific combining ebility effect. Whereas the three crosses(10,4,and 9)revealed negative highly significant values of specific combining ability effects.At Gemmeiza location; for this trait in the F1 five crosses (11,4,2,18, and 10) gave positive and highly significant values of S.C.A. effects, while the two crosses (Sakha 69x Agent) and (Giza 157xBaart) showed negative and highly significant values of S.C.A. effects. For the combined data of plant height in the F1 eleven crosses(5,14,4,12, 6,15,8,1,2,7and 11)exhibited positive and significant or highly significant values of S.C.A.effects.The two crosses (Giza 160x Agent and Giza 157xBaart) gave negative and highly significant values of S.C.A. effects.

Generally from the previous results for plant height in the F1 hybrids the crosses (7,3,15,11,6,12 and 2)at Ismailia location; (2,11,13,6,7,5,14,8 and 1)at Nobaria location;(11,4,1,8 and 10)at

Table(20).Specific combining ability effects in the F1 of wheat for yield and yield components at Ismailia location.

NO.	Characters / Crosses		Plant height	Spike length	NO.of spikes/ plant	NO.of spikelets/ spike	NO.of grains/ spike	Plant weight	Grain yield / plant	100-grains weight	Stem rust reaction
1	Sakha 69 x Giza 157		-0.887**	0.103	0.880**	-0.297	-3.404	3.325**	-0.411	0.425**	-2.237**
2	Sakha 69 x Giza 160		1.621**	-0.005	-0.028	0.339	-1.798**	7.572	-0.831	0.208**	-8.609
3	Sakha 69 x Agent		3.922**	0.128*	-0.176	0.014	-6.600**	-1.420	-0.450**	0.608**	5.140
4	Sakha 69 x Sakha 92		-1.275	0.454	0.224	0.310**	-5.464	-1.641*	4.383	0.726**	2.905**
5	Sakha 69 x Baart		-0.181**	0.023**	-0.005	0.993	7.305	-2.911**	-0.581	0.274*	-9.794
6	Giza 157 x Giza 160		1.934**	-1.683**	-0.126	-0.289**	1.979	-3.468*	-0.780	-0.206**	-5.146
7	Giza 157 x Agent		5.422	0.743	-0.075	0.616	-0.425	-3.078**	-0.139	-0.268	-0.326*
8	Giza 157 x Sakha 92		-0.291**	0.076	0.363	-0.201	-0.225*	8.046**	-0.895**	0.100*	6.438
9	Giza 157 x Baart		-1.504**	0.278	0.120**	0.292	-3.718	5.146	2.583	0.246*	-1.204**
10	Giza 160 x Agent		-5.221**	-0.294**	0.827	0.148*	4.782	-0.736	-0.323**	-0.224**	-11.628*
11	Giza 160 x Sakha 92		2.556**	1.095**	-0.002	0.471**	-2.013*	2.030	4.711	-0.496	-6.276
12	Giza 160 x Baart		1.853**	0.937**	0.098**	0.958	-2.009**	0.703	-0.641	-0.158**	4.955
13	Agent x Sakha 92		-2.676	-1.232	-0.997	-0.157	-4.348	-0.149*	-1.164*	0.468**	2.705
14	Agent x Baart		-0.476**	0.177**	-0.157	-0.267**	-5.521	2.801*	1.984*	0.289	-5.644
15	Sakha 92 x Baart		3.444	0.554	0.254	-0.760	-0.368	-2.541	-1.672	0.001	-5.770
	L.S.D.Sij	5%	0.544	0.360	0.398	0.369	3.825	2.312	1.580	0.193	6.143
		1%	0.735	0.481	0.532	0.493	5.117	3.093	2.114	0.258	8.219
	L.S.D.Sij-Sik	5%	0.993	0.650	0.719	0.667	6.913	4.179	2.856	0.349	11.103
		1%	1.329	0.870	0.962	0.892	9.249	5.591	3.821	0.467	14.855

Table (21). Specific combining ability effects in the F1 of wheat for yield and yield components at Nobaria location.

NO.	Characters / Crosses		Plant height	Spike length	NO. of spikes/ plant	NO. of spikelets/ spike	NO. of grains/ spike	Plant weight	Grain yield / plant	100-grains weight	Stem rust reaction
1	Sakha 69 x Giza 157		1.077**	1.303	0.901	0.936	8.192	7.191**	0.639**	1.516**	-2.882
2	Sakha 69 x Giza 160		3.796	0.240	-0.189	-0.160	-0.377	-5.933	-2.652	-0.367**	-3.962
3	Sakha 69 x Agent		-0.861**	-0.202**	-0.028	-0.084**	0.527	-0.307	-0.203	0.489	4.736
4	Sakha 69 x Sakha 92		-2.778**	-0.737**	0.061**	0.731**	-2.370	-2.246	0.124**	0.109**	-0.523**
5	Sakha 69 x Baart		2.023**	-0.510	-0.938	0.458**	-2.059	-1.454*	1.700**	-0.633	-9.515
6	Giza 157 x Giza 160		2.342**	-0.034	0.217	1.036**	2.251	-2.787	-2.756	-0.086*	-0.224
7	Giza 157 x Agent		2.168**	-0.049**	0.142	-0.650	-0.189	0.451**	-0.789	-0.252	-3.567
8	Giza 157 x Sakha 92		1.691**	-0.513**	-0.342**	0.002**	-2.419	-5.798*	0.227	-0.079**	5.961
9	Giza 157 x Baart		-2.337**	1.274	-0.632**	-0.805	-2.628	3.590	0.680	-0.419	-2.890
10	Giza 160 x Agent		-5.681**	0.175**	-0.824**	-0.136**	-0.008	0.428**	0.891**	-0.093	0.366
11	Giza 160 x Sakha 92		2.665	0.818	1.399**	-0.148**	-1.039	15.736**	3.787**	-0.204**	4.521
12	Giza 160 x Baart		-0.385**	-0.014	1.082**	0.562**	-1.278	5.923**	1.939**	1.375	-2.440
13	Agent x Sakha 92		2.541**	0.109**	1.293	2.188	-1.501	6.697**	-2.036	0.035	-2.168*
14	Agent x Baart		1.954	-0.678**	0.219	0.145**	-1.366**	-10.239	0.718**	0.006	-6.560
15	Sakha 92 x Baart		-0.831	0.365	0.386	0.933	12.403	-2.173	-3.428	0.044	6.502
	L.S.D.Sij	5%	0.954	0.270	0.403	0.320	2.949	2.822	1.257	0.232	6.363
		1%	1.277	0.361	0.539	0.429	3.946	3.776	1.682	0.311	8.513
	L.S.D.Sij-Sik	5%	1.726	0.488	0.728	2.150	5.331	5.101	2.272	0.421	11.501
		1%	2.709	0.653	0.974	2.877	7.133	6.825	3.040	0.563	15.388

Table (22).Specific combining ability effects in the F1 of wheat for yield and yield components at Gemmeiza location.

NO.	Characters / Crosses		Plant height	Spike length	NO.of spikes/ plant	NO.of spikelets/ spike	NO.of grains/ spike	Plant weight	Grain yield / plant	100-grains weight	Stem rust reaction
1	Sakha 69 x Giza 157		5.263**	0.346	-1.087**	0.125	2.148*	-7.829**	3.901**	0.909**	12.670**
2	Sakha 69 x Giza 160		0.321**	-0.100	-0.234**	-0.096	-3.408	2.843**	-2.367	-0.013	9.494*
3	Sakha 69 x Agent		-3.624**	-0.157**	1.063**	-0.136	-0.463	-3.996**	0.519	-0.222	8.016**
4	Sakha 69 x Sakha 92		6.321	-0.862	0.475**	-0.158	-0.475	6.174**	-1.343	-0.018	-10.944
5	Sakha 69 x Baart		-0.068	0.082*	-0.432**	0.279	0.429	-6.987**	-0.621**	-0.223**	-2.815**
6	Giza 157 x Giza 160		-0.612	0.390	1.178**	0.160**	1.846	4.486**	-3.788**	-0.900**	10.929*
7	Giza 157 x Agent		-0.219**	-0.067*	0.453	0.833	1.670**	3.519**	2.241**	0.327**	-8.037*
8	Giza 157 x Sakha 92		3.521**	-0.375**	0.078	-0.159**	-7.821	-8.067**	5.396	-0.441**	-8.875
9	Giza 157 x Baart		-2.058**	-0.668**	0.001**	-1.565**	-2.555	4.872**	1.342**	0.660**	-6.633
10	Giza 160 x Agent		2.752**	-1.080**	-0.378**	-0.899**	0.652**	9.879**	3.077**	0.656**	-1.572
11	Giza 160 x Sakha 92		10.872	0.543**	-1.229	0.826**	5.825	-3.488	2.335**	0.487**	6.865*
12	Giza 160 x Baart		0.B90	0.746**	0.203**	1.013	1.990**	-2.289**	6.687	0.745	-9.489
13	Agent x Sakha 92		0.182	1.018	0.685**	0.252*	-5.341*	4.212**	-0.904*	0.067**	3.913**
14	Agent x Baart		0.519	0.028**	-0.815	-0.401	-3.992**	-8.391**	-1.650	0.391**	16.792
15	Sakha 92 x Baart		0.957	0.950	-0.214	0.302	-6.294	11.592	-0.399	1.227	0.753
	L.S.D.Sij	5%	1.047	0.350	0.316	0.334	3.348	2.419	1.517	0.227	7.728
		1%	1.401	0.468	0.423	0.446	4.479	3.237	2.030	0.304	10.340
	L.S.D.Sij-Sik	5%	1.893	0.632	0.571	0.603	5.985	4.373	2.743	0.411	13.968
		1%	2.533	0.846	0.765	0.807	8.008	5.851	3.670	0.549	18.669

Table (23). Specific combining ability effects in the F1 of wheat for yield and yield components in the combined data.

NO.	Characters / Crosses		Plant height	Spike length	NO.of spikes/ plant	NO.of spikelets/ spike	NO.of grains/ spike	Plant weight	Grain yield / plant	100-grains weight	Stem rust reaction
1	Sakha 69 x Giza 157		1.818**	0.584**	0.232*	0.255*	2.312	0.896*	1.377**	0.949**	0.481
2	Sakha 69 x Giza 160		1.913	0.045	-0.150*	0.027	-1.861*	1.493*	-1.950	-0.057**	-0.725**
3	Sakha 69 x Agent		-0.187**	-0.077**	0.286*	-0.069**	-2.179**	-1.908	-0.045*	0.292**	5.646
4	Sakha 69 x Sakha 92		0.756*	-0.382	0.254**	0.294**	-2.770	0.762**	1.055	0.273**	-2.688**
5	Sakha 69 x Baart		0.591**	-0.135**	-0.458**	0.577**	1.892*	-3.784	0.166**	-0.194**	-6.219
6	Giza 157 x Giza 160		1.221**	-0.442*	0.423	0.302**	2.023	-0.590	-2.441	-0.397	1.437*
7	Giza 157 x Agent		2.457**	0.209**	0.173	0.283	0.352**	0.299*	0.438**	-0.064*	-4.224
8	Giza 157 x Sakha 92		1.640**	-0.271**	0.033	-0.119**	-3.489**	-1.940**	1.576**	-0.140*	1.203
9	Giza 157 x Baart		-1.967**	0.295**	-0.170	-0.692**	-2.967	4.536**	1.535**	0.163	-1.688
10	Giza 160 x Agent		-2.716**	-0.400**	-0.125	-0.296	1.808	3.190**	1.215**	0.113	-1.687
11	Giza 160 x Sakha 92		5.364**	0.818**	0.056**	0.050**	0.924	4.759	3.611**	-0.071**	1.520
12	Giza 160 x Baart		0.786	0.556	0.461**	0.844**	-0.432**	1.446**	2.661**	0.654**	-2.024
13	Agent x Sakha 92		0.016**	-0.035	0.327*	0.761	-3.730**	3.587**	-1.368	0.145**	1.937
14	Agent x Baart		0.666**	-0.158**	-0.251	-0.174	-3.626	-5.275**	0.351**	0.228**	2.623
15	Sakha 92 x Baart		1.603	0.623	0.142	0.158	1.914	2.293	-1.833	0.244	0.379
	L.S.D.Sij	5%	0.491	0.189	0.215	0.197	1.948	1.454	0.838	0.125	3.894
		1%	0.657	0.252	0.288	0.263	2.606	1.944	1.121	0.168	5.210
	L.S.D.Sij-Sik	5%	0.887	0.341	0.388	0.658	3.508	2.628	1.515	0.227	7.032
		1%	1.265	0.456	0.519	0.881	4.694	3.516	2.027	0.304	9.417

Gemmeiza location;were superior for plant height.From the combined data all crosses except (GiZa 160 x Agent and Giza 157 x Baart)had this advantage . These results agree with those found by Saakyan *et. al*.(1983),Zubair *et.al*.(1987), and Cseuz *et.al*.(1990).

Spike length:

At Ismailia location, five crosses (11,12,7,15 and 4),showed positive and highly significant values of specific combining ability effects.Whereas the two crosses (Giza 157x Giza 160 and Agentx Sakha 92) gave negative and highly significant values of S.C.A.effects.At Nobaria location; four crosses (1,9,11 and 15) showed positive and highly significant values of specific combining ability effects whereas the four hybrids (4,14,8 and 5) gave negative and highly significant values of specific combining ability effects.In Gemmeiza location;four crosses(14,15,12 and 11) exhibited positive and highly significant values of specific combining ability effects.Whereas the four crosses (8,9,4 and 10) showed negetive and significant or highly significant values of S.C.A.effects.From the combined data analysis of spike length in F1 the six crosses (7,9,12,1,15 and 11) revealed positive and significant or highly significant values of specific combining ability effect while, four crosses(6,10,4, and 8) showed negative and highly significant values of specific combining ability.

Generally,from the above mentioned results in F1 the crosses (11,12,7,15 and 4)at Ismailia(1,9,11 and 15)at Nobaria and(14,15, 12 and 11)at Gemmeiza,locations were superior for spike length. From the combined data analysis,six crosses had this adveantage, i.e.(11,15,1,12,9 and 7). Similar results were obtained by Ranvir et.al.(1983), Noor et.al. (1985),Alkoddoussi and Hassan (1991), and Salem and Hassan (1991).

Number of spikes/plant:

At Ismailia location; two crosses (Sakha 69xGiza 157 and Giza 160x Agent) revealed positive and highly significant values of specific combining ability effect whereas the cross Agent x Sakha 92 gave negtive and highly significant values of S.C.A. effects.At Nobaria location; four crosses (11,13,12 and 1) showed positive and highly significant values of specific combining ability effect while, three crosses (5,10 and 9) showed negative and highly significant values of S.C.A.effects.At Gemmeiza location; five crosses (6,3,13,4 and 7)indicated positive and highly significant values of specific combining ability effect. Whereas five crosses (11,1,14,5 and 4) showed negtive and highly significant values of S.C.A. effect . From the combined data analysis the six crosses (1,4,3,13,6 and 12) revealed positive and significant or highly significant values of specific combining ability effect. While, two crosses (Agent x Baart and Sakha 69 x Baart) gave negative and significant or highly significant values of S.C.A. effect.

Generally,the above mentioned results revealed that the F1 cross (1 and 10)at Ismailia ; (11,13,12 and 1) at Nobaria ; and (6,3,13,4 and 7)at Gemmeiza locations ; were superior for number of spikes/plant.From the combined data analysis, six crosses had this advanage,i.e.(12,6,13,3,4 and 1). These findings were in agreement line with those reached by Bhowmik and Ali (1989),Cseuz et.al.(1990),and Salem and Hassan (1991).

Number of spikelets/spike:

At Ismailia location; four crosses (11,7,12 and 5)exhibited positive and significant or highly significant values of specifc combining ability effect while one cross (Sakha 92 xBaart)showed negative and highly significant or highly significant values of S.C.A.effects while only one cross (Sakha 92 x Baart) showed negative and highly significant values of S.C.A.effect.At Nobaria location; seven crosses (13,6,1,15,4,12 and 5) revealed positive and highly significant values of specific combining ability effects.At Gemmeiza location;three crosses (21, 7 and 11) showed positive and highly significant values of S.C.A. effects. Wheras three crosses (14,10 and 9) revealed negative and significant or highly significant. From the combined data analysis of number of spikelets/spike in F1 the seven crosses (1,7,4,5,6,13 and 12) revealed positive and significant or highly significant values of S.C.A. effect. Whereas two crosses (Giza 157 x Baart and Giza 160 x Agent) showed negative and highly significant values of S.C.A. effects.

Generally from the previous results for number of spikelets/ spike in F1 the crosses (5,12,7 and 11)at Ismailia; (6,1,15,4,12 and 5)at Nobaria ;and (12,7 and 11)at Gemmeiza locations; were superior for number of spikelts/ spike. From the combined data seven crosses had this advantage,i.e(12, 13,5,6,4,7 and 1). These results are in agreement with findings of Bashir et.al. (1986), Alkoddoussi and Hassan (1991), and Salem and Hassan (1991).

Number of grains/spike:

At Ismailia location;two crosses (Sakha 69 x Baart and Giza 160 x Agent) showed positive and significant highly significant values of specific combining ability effects whereas four crosses (13,4,14 and 3) revealed negative and significant or highly significant values of S.C.A. effects . At Nobaria location; two crosses (Sakha 92 xBaart and Sakha 69 xGiza 157)gave positive and significant values of S.C.A.effects.On the other hand At Gemmeiza location;the cross (Giza 160 x Sakha 92) showed positive and highly significant values of S.C.A. effects whereas five crosses (2,14,13,15, and 8) gave negative and significant or highly significant values of S.C.A.effects.From the combined data analysis of number of grains/spike two crosses ,(Sakha 69 x Giza 157 and Giza 157 x Giza 160) showed positive and significant values of S.C.A. effects,while six crosses (3,4 ,9, 8, 14 and 13)revealed nagative and significant or highly significant values of S.C.A. effects.

Generally,from the previous results the crosses (5 and 10) at Ismailia (15 and 1)at Nobaria; and Giza 160 xSakha 92)at Gemmeiza locations; were superior for this trait. From the combined data two crosses had this advantage,i.e(Sakha x Giza 157 and Giza 157 x Giza 160). These findings were in line with those obtained by Silis and Shmakova (1986), Bhullar et.al. (1988), and Ikram and tanach (1991).

Plant weight:

At Ismailia location; five F1 (14,1,9,2 and 8)showed positive and significant or highly significant values of specific combining ability effects.While the three crosses (7,5 and 15) gave negative and significant values of S.C.A.effects.At Nobaria location;five F1 crosses (9,12,13,1 and 11) revealed positive and significant or highly significant values of S.C.A.effects whereas four crosses (6,8,2 and 14) showed negative and significant or highly significant values of S.C.A.effects.At Gemmeiza location; eight crosses (2,7,13,6, 9,3,10 and 15) showed positive and significan or highly significant values of S.C.A.effects,while six crosses (14, 8,1,5,3 and 11) showed negative and highly significant values of S.C.A. effects . From the combined data analysis of plant weight six crosses (2,15, 10,13,9 and 11) exhibited positive and significant or highly significant values of S.C.A. effects while the four crosses (3,8,5 and 14) revealed negative and significant or highly significant values of S.C.A. effects.

Generally, from the previous results for plant weight in the F1 the crosses (8,2,9,1 and 14) at Ismailia ; (11,1,13 ,12 and 9) at Nobaria ; and (15,10,3,9,6,13,7 and 2) at Gemmeiza locations; were superior for this trait. From the combined data six crosses had this advantage,i.e. (11,9,13,10,15 and 2). Similar results were reported by Zubair et.al.(1987) and Salem and Hassan (1991).

Grain yield/plant:

At Ismailia location; four crosses (14,9,4 and 11) showed positive and significant or highly significant values of specific combining ability effects while one cross (Sakha 92 x Baart) exhibited negative and significant value of S.C.A. effects. At Nobaria location;three crosses (11,12, and 5) showed positive and highly significant values of S.C.A. effects while four crosses (15, 6, 2 and 13) exhibited negative and highly significant values of S.C.A.effects.At Gemmeiza location; six crosses (12,8,1,10,7 and 11) showed positive and highly significant values of S.C.A.effects while three crosses (14, 2 and 6) gave negative and significant or highly significant values of S.C.A.effects.From the combined data analysis of grain yield/ plant seven of the F1 (4,10,1,9,8,12 and 11) revealed positive and significant or highly significant values of S.C.A. effects. Whereas four crosses (6,2,15 and 13) gave negative and highly significant values of S.C.A. effects.

Generally,from the previous results for grain yield/plant in F1 the crosses (11,4,9 and 14)at Ismailia (11,12 and 5) at Nobaria ; and (12,8,1,10,7 and 11) at Gemmeiza locations; were superior for this trait.From combined data seven crosses had this advantage,i.e(11,12,8,9,1,10 and 4).These results are in agreement with those reported by Shri and Singh (1989), Atale and Vitkare (1990),and Ikram and Tanach (1991).

100-grain weight:

At Ismailia location; eight F1 crosses(2,9,5,14,1,13,3 and 4) showed positive and significant or highly significant values of S.C.A. effects while four crosses (7,11,6 and 10) showed negative and significant or highly significant values of S.C.A.effects. At Nobaria location; three F1 crosses (1,12 and 3) revealed positive and highly significant values of S.C.A. effects whereas four crosses(7,2,9 and 5)exhibited negative and significant or highly significant values of S.C.A.effects.At Gemmeiza location;eight F1 crosses (5,1,12,9,11,10,14 and 7) gave positive and highly significant values of S.C.A. effects while two crosses (6 and 8)showed negative and highly significant.From the combined data analysis of 100-grain weight eight F1 crosses(13,9,14,4,3,15,12 and 1) showed positive and significant or highly significant values of S.C.A. effects while the three crosses (8,5 and 6)revealed negative and significant or highly significant values of S.C.A.effects.

Generally,from the previous results for 100-grain weight in the F1 the crosses (4,3,13,1,14,5,9 and 2) at Ismailia ; (1,12 and 3) at Nobaria; and (15,1,12,9,10,11,14 and 7) at Gemmeiza locations; were superior for 100-grain weight. From the combined data eight crosses had this advantage,i.e(1,12,15,3,4,14 and 13). These results are in line with those reported by Noor et.al.(1985).Yadav and Singh (1988),Alkoddoussi and Hassan (1991), and Salem and Hassan (1991)

Stem rust reaction:

At Ismailia location; only one in of F1(Giza 157 x Sakha 92) gave positive and significant value of S.C.A. effects,while four crosses (11,10,5,and 2) showed negative and significant or highly significant values of S.C.A.effects. At Nobaria location;

only the F1 (Sakha 92 x Baart) exhibited positive and significant value of S.C.A. effects, whereas two crosses (Agent x Baart and Sakha 69 x Baart) showed negative and significant or highly significant values of S.C.A.effects. At Gemmeiza location; five F1 (3,2,14,6 and 1) revealed positive and significant or highly significant values of S.C.A.effects, while four crosses (7,8,12 and 4) exhibited negative and significant or highly significant values of S.C.A.effects.From the combined data for this trait only the cross (Sakha 69 x Agenn)gave positive and highly significant values of S.C.A. effects while the two crosses (Giza 157 x Agent and Sakha x Baart) showed negative and significant or highly significant values of S.C.A.effects.

Generally, from the previous results for stem rust recation in the F1 the cross (Giza 157 xSakha 92) at Ismailia location; (Sakha 92 x Baart) at Nobaria location; and (14,1,6,2 and 3) at Gemmeiza location; were superior for stem rust recation.From the combined data only the (Sakha 69 x Agent) had this advantage,i.e These results are in agreement with those reported by Bedo et.al. (1983),Raut et. al.(1984),Randhawa et.al. (1989). and Khan,et.al. (1992)

Values of specific combining ability effects (S.C.A.) for yield and yield components resulted from F2 generation are presented in tables (24 to 27).

Plant height:

At Ismailia location; four F2 crosses(1,8,15 and 10)revealed positive and significant or highly significant values of specific

Table (24). Specific combining ability effects in the F2 of wheat for yield and yield components at Ismailia location.

NO.	Characters / Crosses		Plant height	Spike length	NO.of spikes/ plant	NO.of spikelets/ spike	NO.of grains/ spike	Plant weight	Grain yield / plant	100-grains weight	Stem rust reaction
1	Sakha 69 x Giza 157		3.830	0.269	0.563	0.661	-0.756**	7.074*	2.952*	-0.421**	0.205
2	Sakha 69 x Giza 160		0.109	0.336	0.397	0.046	8.246	8.904	2.799	-0.901	6.118
3	Sakha 69 x Agent		-2.121	0.527	0.282	-0.564	-4.082**	5.672	0.233	0.121**	2.432
4	Sakha 69 x Sakha 92		2.355	0.196	-0.241	0.074**	-5.916	6.628	0.739	0.990	0.388
5	Sakha 69 x Baart		1.168	0.350	-0.210	1.078	2.398	6.324	0.674	0.171	-2.698
6	Giza 157 x Giza 160		-0.856*	0.186	-0.140	-0.452	0.564	6.595	0.660	0.051	-4.186
7	Giza 157 x Agent		-4.472**	-0.079	0.039	0.558*	2.155	6.588*	1.000	0.149	-0.909
8	Giza 157 x Sakha 92		5.342	0.278	-0.305	0.835**	2.916	8.340	1.044	0.459	2.534
9	Giza 157 x Baart		2.464**	0.502	-0.046	0.875**	-1.012	7.736	0.412	-0.088	-1.261
10	Giza 160 x Agent		13.142	-0.541	0.411	1.402	0.010	7.619	0.768	-0.381*	-6.932
11	Giza 160 x Sakha 92		2.716	0.388	-0.109	0.605**	-2.353	7.677	0.951	0.508	-5.898
12	Giza 160 x Baart		-1.940*	-0.164	0.013	0.896	-3.879	6.003	0.652	0.176	-4.325
13	Agent x Sakha 92		-3.525	-0.005	-0.461	-0.060**	-1.262	7.175	0.484	-0.189	7.297
14	Agent x Baart		-1.198**	-0.335	-0.444	-0.910	1.737	7.573**	1.260**	0.339	2.473
15	Sakha 92 x Baart		6.814	0.441	3.639	0.175	-0.340	10.772	3.890	-0.212	-6.718
	L.S.D.Sij	5%	3.440	0.591	0.949	0.641	4.367	8.043	1.468	0.483	8.009
		1%	4.603	0.791	1.270	0.858	5.844	10.761	3.668	0.646	10.715
	L.S.D.Sij-Sik	5%	6.218	3.379	1.715	1.159	7.894	10.989	3.626	0.873	14.475
		1%	8.320	4.521	2.295	1.551	10.562	14.703	4.852	1.168	19.367

Table (25). Specific combining ability effects in the F2 of wheat for yield and yield components at Nobaria location.

NO.	Characters / Crosses	Plant height	Spike length	NO.of spikes/ plant	NO.of spikelets/ spike	NO.of grains/ spike	Plant weight	Grain yield / plant	100-grains weight	Stem rust reaction
1	Sakha 69 x Giza 157	2.053	0.055**	-0.538	0.646	1.455	-3.918	-1.199	1.131**	0 242
2	Sakha 69 x Giza 160	-0.472	0.846**	0.185	0.301**	1.637	-4.756	-1.170	-0.321	-5.706
3	Sakha 69 x Agent	1.659**	1.057	0.515	-1.051	-3.139	3.893	-1.247	0.134	4.267
4	Sakha 69 x Sakha 92	3.156	-0.065	-0.372	0.182*	-3.068**	0.804**	0.544**	0.234	2.834
5	Sakha 69 x Baart	-0.379**	0.274	0.542	0.639	5.818*	14.929	4.571	-0.118	-5.766
6	Giza 157 x Giza 160	4.388	-0.019	0.915	-0.478	-3.844	7.785*	-0.647	-0.011	-5.684
7	Giza 157 x Agent	1.517*	-0.474	-0.534	0.277*	-2.736	-9.772	-1.852	-0.156*	0.369
8	Giza 157 x Sakha 92	2.528	0.279	0.341	0.679	-0.685*	6.350	-0.366	-0.593*	-1.937*
9	Giza 157 x Baart	0.986*	0.138	-0.097	0.040	4.774	2.352**	1.043	0.555	-7.297
10	Giza 160 x Agent	3.871**	-0.142	0.579	-0.133	-0.218	11.700	0.268	-0.359	-3.477**
11	Giza 160 x Sakha 92	6.121*	-0.240	0.006	-0.052	-0.083	4.288	1.511	0.318*	-6.661
12	Giza 160 x Baart	-2.305	0.194	-0.471**	0.085	-2.546	-3.723*	-1.427*	-0.469	-3.627
13	Agent x Sakha 92	0.662*	0.348	-1.318**	-0.164	2.332	-9.961*	-2.971*	-0.250	6.484
14	Agent x Baart	2.373	0.001	-1.761**	-0.459	-0.233	-9.220	-2.996	0.234*	-5.651
15	Sakha 92 x Baart	1.529	-0.166	3.857	-0.221	1.394	2.652	0.266	0.576	-5.402
	L.S.D.Sij 5%	2.086	0.516	0.979	0.610	3.753	8.720	2.442	0.448	6.521
	L.S.D.Sij 1%	2.791	0.692	1.311	0.816	5.021	11.667	3.268	0.600	8.725
	L.S.D.Sij-Sik 5%	3.770	1.068	1.771	1.102	6.783	15.760	4.415	0.811	11.787
	L.S.D.Sij-Sik 1%	5.044	1.429	2.369	1.475	9.076	21.087	5.907	1.085	15.770

Table (26). Specific combining ability effects in the F2 of wheat for yield and yield components at Gemmeiza location.

NO.	Characters / Crosses	Plant height	Spike length	NO.of spikes/ plant	NO.of spikelets/ spike	NO.of grains/ spike	Plant weight	Grain yield / plant	100-grains weight	Stem rust reaction
1	Sakha 69 x Giza 157	6.734**	0.190	-2.493**	0.264*	5.104	-6.820**	0.181**	0.036	6.268**
2	Sakha 69 x Giza 160	2.677	-0.069	-1.450	0.675*	-3.610**	-7.148	-3.407**	-0.103	10.096**
3	Sakha 69 x Agent	0.917*	-0.077	-0.912**	-0.727	-8.731	4.262**	-6.480	0.012	14.224
4	Sakha 69 x Sakha 92	3.467**	-0.209	-1.700	-0.446	2.207**	-7.251**	-2.039	-0.005**	-6.736
5	Sakha 69 x Baart	4.706**	-0.091	-1.047*	0.292	11.431**	-7.621*	-1.071	-0.595	4.510
6	Giza 157 x Giza 160	6.562	-0.470	-1.726**	-0.212	6.650*	-5.392**	1.394	-0.168	-0.407**
7	Giza 157 x Agent	-0.194**	-0.338	-3.192*	-0.054	5.694	-15.248	-1.076	0.239	14.039*
8	Giza 157 x Sakha 92	6.165	0.086**	-0.432	0.232	2.684*	-2.202**	-0.074	-0.329*	8.545
9	Giza 157 x Baart	0.194**	0.793	-0.445	0.554	-5.351*	-13.544	0.295**	0.495**	0.418*
10	Giza 160 x Agent	19.291**	-0.485	-0.319*	-0.383	-4.996	2.992	-6.205	-1.016	8.595
11	Giza 160 x Sakha 92	5.317	0.185	-1.560	0.371	2.216	-0.576	-0.303	0.231	4.906
12	Giza 160 x Baart	-0.731*	-0.457	-0.255	-0.152	1.687	2.383	-0.463**	-0.144**	2.085**
13	Agent x Sakha 92	-4.445	-0.251	-0.103**	0.103	-1.378	-2.924	-3.756	-0.684	10.188
14	Agent x Baart	-0.952**	-0.423	-1.927	0.261	3.638	-1.173	-0.521	0.183	4.042
15	Sakha 92 x Baart	7.897	0.388	-0.626	0.020	2.239	0.429	-0.656	-0.119	4.025
	L.S.D.Sij 5%	3.310	0.590	1.203	0.638	4.383	4.415	2.342	0.403	6.912
	L.S.D.Sij 1%	4.429	0.790	1.609	0.853	5.865	5.907	3.133	0.539	9.248
	L.S.D.Sij-Sik 5%	5.983	1.068	1.643	1.153	7.923	13.734	4.233	0.728	12.493
	L.S.D.Sij-Sik 1%	8.000	1.429	2.199	1.543	10.601	18.375	5.663	0.975	16.715

Table (27). Specific combining ability effects in the F2 of wheat for yield and yield components in the combined data.

NO.	Characters / Crosses		Plant height	Spike length	NO.of spikes/ plant	NO.of spikelets/ spike	NO.of grains/ spike	Plant weight	Grain yield / plant	100-grains weight	Stem rust reaction
1	Sakha 69 x Giza 157		4.206**	0.171**	-0.823**	0.524**	1.934	-1.221	0.645	0.249**	1.117
2	Sakha 69 x Giza 160		0.772	1.371**	-0.289	0.341**	2.091**	-0.999*	-0.593**	-0.442	1.904**
3	Sakha 69 x Agent		0.152**	0.502	-0.039*	-0.780	-5.318	4.609	-2.498	0.089**	6.234
4	Sakha 69 x Sakha 92		2.992*	-0.026	-0.771	-0.064**	-2.259**	0.060*	-0.252*	0.406	-0.772
5	Sakha 69 x Baart		1.831**	0.178	-0.239	0.669*	6.549	4.544	1.391	-0.181	-1.046
6	Giza 157 x Giza 160		3.365	-0.101	-0.317**	-0.381*	1.123	2.996**	0.469	-0.043	-2.569
7	Giza 157 x Agent		-0.716**	-0.297	-1.229	0.260**	1.704	-6.144*	-0.643	0.077	3.680
8	Giza 157 x Sakha 92		4.679	0.214**	-0.132	0.582**	1.638	4.163	0.202	-0.154*	1.163
9	Giza 157 x Baart		1.214**	0.478**	-0.196	0.489	-0.530	-1.152**	0.583*	0.321**	-1.975
10	Giza 160 x Agent		12.101**	-0.389	0.224	0.295	-1.735	7.437	-1.723	-0.585**	1.010
11	Giza 160 x Sakha 92		4.718	0.111	-0.554	0.308	-0.074	3.796	0.720	0.352	-2.080
12	Giza 160 x Baart		-1.659**	-0.142	-0.238*	0.276	-1.579	1.555	-0.413**	-0.146**	-2.207**
13	Agent x Sakha 92		-2.436	-0.201	-0.627**	-0.040*	-0.103	-1.903	-2.081	-0.374	7.795
14	Agent x Baart		0.075**	-0.252	-1.377**	-0.369	1.714	0.940*	-0.752*	0.252	1.489
15	Sakha 92 x Baart		5.414	0.185	2.287	-0.009	1.098	4.618	1.167	0.082	-2.204
	L.S.D.Sij	5%	1.701	0.327	0.603	0.364	2.406	4.076	1.203	0.257	4.126
		1%	2.275	0.437	0.806	0.486	3.219	5.453	1.938	0.343	5.521
	L.S.D.Sij-Sik	5%	3.074	1.061	0.987	0.657	3.195	7.791	2.362	0.464	7.458
		1%	4.112	1.420	1.321	0.879	5.819	10.424	3.161	0.621	9.979

combining ability effects,while,two crosses (13 and7) showed negative and highly significant values of S.C.A.effects.At Nobaria location; six F2 crosses (14,8,4,10,6 and 11) revealed positive and significant values of S.C.A.effects whereas the cross (Giza 160 x Baart) gave negative and significant value of S.C.A. effects.At Gemmeiza location; eight F2 crosses (4,5,11,8,6 ,1,15 and 10)revealed positive and significant or highly significant values S.C.A.effects,while,the cross (Agent x Sakha 92) showed negative and significant values of S.C.A.effects.From the combined data analysis eight F2 crosses,(5,4,6,1,8,11,15 and 10) exhibited positive and significant or highly significant values of S.C.A.effects whereas, the cross (Agent x Sakha 92) showed negative and highly significant value of S.C.A.effects.

Generally,from the previous results for plant height (10,15,8 and 1) at Ismailia; (11,6,10,4,8 and 14) at Nobaria ; and (10,15,1,6,8,11 and 5) at Gemmeiza location,were superior for plant height.From the combined data eight crosses had this advantage,i.e.(10,15,11,8,1,2,4 and 5). These results agree with those found by Saakyan _et_._al_.(1983), and Cseuz _et_._al_.(1990).

Spike length:

At Nobaria location two F2 crosses (Sakha 69 x Giza 160 and Sakha 69 x Agent) exhibited positive and highly significant values specific combining ability effects.At Gemmeiza location; the cross (Giza 157 x Baart) gave positive and highly significant value of S.C.A.effects.From the combined data analysis three F2 crosses (2,3 and 9) showed positive and highly significant values of S.C.A.effects while,the cross (Giza 160 x Agent) revealed negative and significant value of S.C.A.effects.

Generally, from the previous results for spike length the crosses,(Sakha 69 xGiza 160 and Sakha 69 x Agent)at Nobaria, and (Giza 157 x Baart)at Gemmeiza locations; were superior for this trait.From the combined data three crosses had this advantage,i.e (2,3,and 9). Similar results were obtained by Ranvir et.al. (1983), Noor,et.al.(1985) and Cseuz et.al.(1990).

Number of spikes/plant:

At Ismailia and Nobaria locations;the cross (Sakha 92 xBaart) showed positive and highly significant value of specific combining ability effects while,the two crosses (Agent x Baart and Agent x Sakha 92)at Nobaria location,revealed negative and highly significant values of (S.C.A.)effects.At Gemmeiza location;seven crosses (2,11,3,6,14,1 and 7)exhibited negative and significant or highly significant values of (S.C.A.)effects.From the combined data analysis the cross (Sakha 92 xBaart)indicated positive and highly significant value of (S.C.A.)effects,while,five crosses (13,4,1,7 and 14)exhibited negative and significant or highly significant values of (S.C.A.)effects.

Generally, from the previous results for number of spikes/ plant the cross (Sakha 92 x Baart) at Ismailia and Nobaria locations;and from the combined data was superior for number of spikes/plant.These findings were in line with those reached by Alkoddoussi and Hassan (1991) and Salem and Hassan (1991).

Number of spikelets/spike:

At Ismailia location;five F2 crosses(8,9,12,5 and 10) revealed positive and significant or highly significant values of (S.C A.)effects,while,(Agent x Baart)exhibited negative and highly significant value of (S.C.A.)effects.At Nobaria location;three F2 crosses (8,1 and 5)indicated positive and significant values of (S.C.A.)effects,while,the cross (Sakha 69 xAgent)showed negative and highly significant value of (S.C.A.)effects.At Gemmeiza location;the cross (Sakha 69 x Giza 160)showed positive and significant value of(S.C.A.)effects whereas,the cross(Sakha 69 x Agent)revealed negative and significant value of (S.C.A.)effects. From the combined data analysis four F2 crosses(5,8,1 and 9)exhibited positive and highly significant values of(S.C.A.)effects while three crosses(14,6 and 3)showed negative and significant or highly significant values of(S.C.A.)effects.

Generally, from the previous results for number of spikelets /spike the F2 crosses(10,5,12 and 9)at Ismailia (8,1 and 5)at Nobaria and(Sakha 69 x Giza 160)at Gemmeiza locations;were superior for this trait. From the combined data four crosses had this advantage,i.e.(5,8,1 and 9). These results are in agreement with findings of Bashir et.al. (1986), Alkoddoussi and Hassan (1991), and Salem and Hassan (1991).

Number of grains/spike:

At Ismailia location;the cross(Sakha 69 x Giza 160)indicated positive and highly significant value of(S.C.A.) effects whereas, the cross (Sakha 69 x Sakha 92) revealed negative and highly significant value of (S.C.A.) effects.At Nobaria location,two F2 crosses (Giza 157 x Baart and Sakha 69 x Baart)showed positive and significant or highly significant values of (S.C.A.)effects while,the cross (Giza 157 x Giza 160)revealed negative and significant value of (S.C.A.)effects.At Gemmeiza location,four F2 crosses (1,7,6 and 5)exhibited positive and significant or highly significant values of (S.C.A.)effects whereas,three crosses (10,9 and 5)showed negative and significant or highly significant values of (S.C.A.)effects.From the combined data analysis,F2 cross (Sakha 69 x Baart)gave positive and highly significant value of (S.C.A.)effects,while the cross (Sakha 69 x Agent)revealed negative and highly significant value of (S.C.A.)effects.

Generally,from the previous results for number of grains/ spike the crosses (Sakha 69 x Giza 160) at Ismailia;(Sakha 69 x Baart and Giza 157x Baart)at Nobaria;and (5,6,7 and 1)at Gemmeiza locations;were superior for this trait.From the combined data the cross(Sakha92 x Baart)had this advantage. These findings were in line with those obtained by Silis and Shmakova (1986),Bhullar et.al.(1988), and Ikram and Tanach (1991).

Plant weight:

At Ismailia location;three F2 crosses (8,2 and 15)showed positive and significant or highly significant values of(S.C.A.)effects.At Nobaria location,to F2 crosses (Sakha 69 xBaart and Giza 160 x Agent)exhibited positive and highly significant values of (S.C.A.)effects whereas,three crosses(14,7 and 13)showed negative and significant values of (S.C.A.)effects.At Gemmeiza location, seven F2 crosses (6,1,2,4,5,9 and 7)exhibited negative and significant or highly significant values of (S.C.A.) effects. From the combined data five F2 crosses (8,5,3,15 and 10)gave positive and significant or highly significant values of (S.C.A.)effects,while ,the cross (Giza 157 x Agent)showed negative and highly significant value of (S.C.A.)effects.

Generally,from the previous results for plant weight the crosses (15,2 and 8)at Ismailia,(5 and 10)at Nobaria locations;were superior for this trait.From the combined data five crosses had this advantage,i.e.(10,153,5 and 8).Similar results were reported by Zubair et.al. (1987) and Salem and Hassan (1991).

Grain yield/plant:

At Ismailia location, three F2 crosses (2,1, and 15) indicated positive and significant or highly significant effects At Nobaria location, the cross Sakha 69 x Baart gave positive and highly significant value of S.C.A. effects whereas, two F2 crosses (Agent x Baart and Agent x Sakha 92) exhibited negative and significant values of S.C.A. effects .At Gemmeiza location,four F2 crosses (3,10,13 and 2) revealed negative and highly significant values of S.C.A. effects .From the combined data, two F2 crosses (5 and 15) showed positive and significant values of S.C.A. effects, while, three crosses (10, 13, and 3) gave negative and significant or highly significant values of S.C.A. effects.

Generally, from the previous results for grain yield/plant F2 crosses (15,1, and 2) at Ismailia ;Sakha 69 x Baart at Nobaria locations, were superior for this trait .From the combined data, two crosses had this advantage, i.e. (Sakha x Baart and Sakha 92 x Baart).These results are in line with those reported by Zubair et.al.(1987), Yadav and Singh (1988), Henday, (1989),and Salem and Hassan (1991).

100- grain weight

At Ismailia location, two F2 crosses(11 and 4) revealed positive and significant or highly significant of S.C.A. effects. At Nobaria location, two F2 crosses (15 and 1) showed positive and significant or highly significant values of S.C.A. effects, while two crosses (8 and 12) revealed negative and significant values of S.C.A.effects .At Gemmeiza location, the cross Giza 157 x Baart showed positive and significant value of S.C.A. effects, whereas, three crosses (10,13, and 5) showed negative and highly significant values of S.C.A. effects.From the combined data, three F2 crosses (9, 11 , and 4) exhibited positive and significant or highly significant values of S.C.A. effects,while three crosses (10,2, and 13) showed negative and highly significant values of S.C.A. effects.

Generally, from the previous results for 100- grain weight (4 and 11) at Ismailia ;(1 and 15) at Nobaria and Giza 157 x Baart)at Gemmeiza locations were superior for this trait.From the combined data three crosses had this advantages ,i.e (4,11 and 9). These results are in line with those reported by Yadav and singh

(1988), Atale and Vitkare (1990), and Salem and Hassan (1991),

Stem rust reaction.

At Nobaria location,two F2 crosses (Giza 157 x Baart and Giza 160 x Sakha 92)showed negative and significant or highly significant values of S.C.A. effects .At Gemmeiza location, Six F2 crosses (8,10,2,13,7 and 3) gave positive and significant or highly values of S.C.A. effects. From the combined data, two F2 crosses (13 and 3) showed positive and highly significant values of S.C.A.effects.

Generally,from the previous results for stem rust recation six crosses (3,7,13,2,10 and 8)were superior for this trait.from the combined data,two F2 crosses had this advantage,i.e.(Agentx Sakha 92 and Sakha 69 x Agent). Similar results were reported by Padidan and Knott (1988),Abd-Ellatif (1990), and Khan et.al.(1992)

E- Heterosis:

The mid and better parents heterosis percentages of the F1 hybrids for yield and yield components characters in three locations and combined data are presented in table (28 to 31).

Plant height:

At Ismailia location, heterosis over mid parent ranged from (-7.06%) in the cross (Giza 160 x Agent) to (10.78%) in the cross (Giza 157 x Agent).Comparing with better parent the heterotic effects ranged from (-18.59%)in the cross (Giza x Agent)to (6.96%)in the cross (Sakha 92 x Baart).Most of crosses gave psitive and highly significant values for mid parent.For better parent three crosses (Sakha 69 x Baart,Giza 157 x Giza 160 and Sakha 92 x Baart)exhibited highly significant positive values.Average of mid parent and better parent positive heterosis for plant height were (4.95% and 1.80%),respectively. while the average for negative heterotic effect was (-3.41%, and -4.79%) ,respetively

At Nobaria location;heterosis over mid parent ranged from (-4.87%)in the cross (Giza 160 x Agent)to (5.12%) in the cross (Sakha 69 x Giza 160).comparing with better parent the heterotic effects ranged from (-6.32%)in the cross (Giza 160 x Agent) to (3.53%) in cross (Giza 157 x S akha 92). Most of crosses were positive and significant or highly significant for mid and better parents.Average of mid and better parents positive heterosis for plant height were (3.23% and 2.45%); respectively. while the averag for negative heterotic effect was (-1.59%

Table(28).Expression of heterosis in the F1 of wheat over mid and better parents as percentage for yield and yield at Ismailia location.

Characters	Plant height		Spike length		No.of spikes/ plant		No.of spikelets/ spike		No.of grains/ spike		plant weight		Grain yield/ plant		100-grain weight	
Crosses	M.P	B.P	M.P	B.P	M.P	B.P	M.P	B.P	M.P	B.P	M.P	B.P	M.P	B.P	M.P	B.P	M.P	B.P
Sakha 69xGiza 157	1.85**	0.28	2.05**	-4.44**	32.28**	31.92**	0.51	0.12	-21.52**	-23.91**	41.67**	36.33**	9.58**	7.91**	37.92**	33.19**
Sakha 69xGiza 160	5.57**	-0.75	2.73**	-4.25**	8.77**	5.940**	8.18**	-0.28	-13.01**	-22.94**	64.64**	49.64**	9.89**	1.05	15.48**	-2.51**
Sakha 69xAgent	7.72**	-0.13	2.25**	-8.80**	-2.08**	-8.530**	2.95**	-0.88*	-32.23**	-36.30**	-4.82*	-6.39**	2.07	-14.88**	47.09**	44.54**
Sakha 69xSakha 92	-0.06	-0.16	11.11**	3.38**	9.39**	8.430**	3.82**	0.96**	-25.79**	-37.06**	6.39**	-2.71	239.37**	185.91**	40.70**	37.84**
Sakha 69xBaart	2.35**	1.45**	8.90**	1.64**	6.92**	6.420**	11.03**	7.69**	9.54**	-0.53	-4.92**	-6.52**	16.26**	10.28**	36.02**	30.13**
Giza 157xGiza 160	6.91**	2.01**	-24.71**	-33.95**	6.53**	4.030**	1.12**	-6.45**	2.51	-6.64	3.60	-2.38	-6.64**	-12.91**	-10.17**	-26.29**
Giza 157xAgent	10.78**	1.23*	5.76**	0.36	1.54*	-4.900**	4.93**	0.64	-13.42**	-20.95**	-7.36**	-9.39**	-2.67	-17.82**	0.87**	-4.22**
Giza 157xSakha 92	2.25**	0.57	2.30**	1.59**	21.71**	20.97**	-1.73**	-4.80**	-11.43**	-26.76**	77.70**	68.52**	7.62**	-8.17**	13.68**	12.02**
Giza 157xBaart	0.76	-1.65**	7.83**	7.45**	11.35**	10.54**	4.24**	0.72*	-16.40**	-26.16**	49.00**	41.06**	135.70**	126.90**	18.13**	16.99**
Giza 160xAgent	-7.06**	-18.59**	-5.20**	-20.49**	18.40**	13.43**	4.65**	-6.82**	5.92	-11.10**	0.92	-6.86**	6.60**	-4.30**	-5.87**	-19.37**
Giza 160xSakha 92	6.60**	0.12	18.38**	3.22**	3.36**	1.540**	5.80**	-4.93**	-12.57**	-32.80**	34.48**	33.58**	233.93**	203.23**	-14.76**	-29.23**
Giza 160xBaart	5.91**	-1.25*	19.80**	4.76**	8.36**	5.060**	12.16**	0.54	-8.12*	-25.13**	18.60**	6.16**	-0.88	-4.08*	-6.27**	-23.66**
Agent xSakha 92	-3.10**	-10.08**	-5.10**	-9.34**	-25.28**	29.62**	-1.00**	-2.02**	-23.15**	-31.16**	4.08*	-3.35	4.88**	3.56*	30.71**	25.88**
Agent xBaart	0.85	-5.74**	6.27**	1.19**	-4.78**	-11.43**	0.81*	0.04	-23.16**	-25.94**	16.23**	12.42**	1.68	-11.32**	23.76**	16.44**
Sakha 92xBaart	7.80**	6.96**	15.36**	14.97**	6.74**	5.320**	-3.54**	-3.81**	-9.71**	-16.34**	-1.86	-11.63**	3.20*	-9.01**	13.44**	10.73**
L.S.D. 5%	0.91	1.06	0.60	0.69	0.66	0.760	0.61	0.71	6.40	7.39	3.89	4.49	2.94	3.40	0.23	0.41
L.S.D. 1%	1.22	1.42	0.80	0.93	1.61	1.020	0.82	0.95	8.56	9.88	5.20	6.01	3.93	4.54	0.47	0.55

Table(29)Expression of heterosis in the F1 of wheat over mid and better parents as percentage for yield and yield components at Nobaria location.

Characters	Plant height		Spike length		No.of spikes/ plant		No.of spikelets/ spike		No.of grains/ spike		plant weight		Grain yield/ plant		100-grain weight	
Crosses	M.P	B.P	M.P	B.P	M.P	B.P	M.P	B.P	M.P	B.P	M.P	B.P	M.P	B.P	M.P	B.P
Sakha 69xGiza 157	2.98**	1.51	15.89**	14.97**	9.62**	9.13**	7.0**	4.31**	21.71**	20.15**	8.95**	3.28	0.18	-3.60**	43.55**	40.33**
Sakha 69xGiza 160	5.12**	2.11*	5.07**	0.38	2.04**	-3.73**	1.62**	1.26**	1.11	-6.48*	-4.93*	-16.25	-12.91**	23.79**	1.51**	-0.63**
Sakha 69xAgent	-0.02	-1.39	-2.96**	-3.66**	1.23**	-3.74**	3.35**	-1.39**	1.97	1.80	-2.25	-4.05	-2.73**	-11.49**	18.15**	-16.80**
Sakha 69xSakha 92	-0.80	-2.58**	-6.10**	-6.35**	-3.19**	-8.61**	9.05**	6.83**	-0.26	-2.42	0.17	-7.88**	-1.52	-8.55**	3.64**	2.02**
Sakha 69xBaart	3.11**	1.29	-3.27**	-3.35**	-10.15**	-11.93**	5.72**	3.30**	0.42	-4.99	-4.51	-9.57**	9.05**	6.73**	-5.83**	-7.39**
Giza 157xGiza 160	4.17**	2.63**	6.92**	2.93**	7.84**	1.30**	5.47**	3.18**	7.70**	-1.56	1.71	-14.44**	-14.89**	-27.94**	5.23**	5.08**
Giza 157xAgent	3.32**	3.27**	-0.42	-0.50	4.08**	-0.59	-0.67*	-2.84**	0.99	-0.14	0.46	-3.06	-6.59**	-11.87**	-0.86*	-1.98**
Giza 157xSakha 92	3.94**	3.53**	-0.06	-0.59	4.73**	-1.56**	3.83**	-0.78*	0.32	-3.08	-2.82	-14.88**	-2.88**	-12.96**	1.45*	0.73**
Giza 157xBaart	-0.67	-1.02	16.39**	15.56**	-5.61**	-7.37**	-1.57**	-1.81**	-0.13	-6.64*	4.16	-6.21*	2.53**	0.75	-3.38**	-3.96**
Giza 160xAgent	4.87**	-6.32**	2.83**	-1.08**	-2.12**	-11.92**	1.19**	-3.12**	-1.71	-9.22**	4.45	-9.46**	3.93**	-16.08**	2.31**	1.30**
Giza 160xSakha 92	4.41**	3.27**	10.21**	5.56**	29.71**	29.63**	-1.98**	-4.32**	0.27	-5.33	36.56**	30.25**	21.58**	13.98**	-1.59*	-2.14**
Giza 160xBaart	0.70	-0.44	3.55**	-1.00**	17.26**	12.14**	4.20**	2.14**	-0.30	-2.67	13.06**	4.69	13.60**	-2.41*	35.47**	34.84**
Agent xSakha 92	3.59**	3.14**	-0.37	-0.82**	22.98**	10.73**	14.75**	7.36**	-1.86	-4.13	12.69**	1.89	-12.10**	-25.16**	1.14	0.71**
Agent xBaart	2.33**	1.92*	-6.37**	-6.97**	4.18**	-2.26**	3.63**	1.13**	-1.62	-7.06*	-16.51**	-22.31**	3.12**	-4.29**	3.11	2.57**
Sakha 92xBaart	1.90*	1.87*	4.20**	4.01**	12.54**	7.69**	9.09**	4.48**	33.93**	29.42**	-0.31	-3.37	-0.12	-9.06**	2.47	2.36**
L.S.D. 5%	1.60	1.85	0.52	0.61	0.65	0.75	0.53	0.62	4.93	5.69	4.72	5.45	1.93	2.23	0.38	0.44
L.S.D. 1%	2.14	2.48	0.70	0.82	0.87	1.01	0.71	0.83	6.60	7.62	6.31	7.29	2.59	2.99	2.59	0.59

Table(30) Expression of heterosis in the F1 over mid and better parents as percentage for yield and yield components at Gemmeiza location .

Characters	Plant height		Spike length		No.of spikes/ plant		No.of spikelets/ spike		No.of grains/ spike		plant weight		Grain yield/ plant		100-grain weight	
Crosses	M.P	B.P	M.P	B.P	M.P	B.P	M.P	B.P	M.P	B.P	M.P	B.P	M.P	B.P	M.P	B.P
Sakha 69xGiza 157	8.61**	6.93**	0.64	0.43	-5.45**	8.89**	-0.04	-0.35	1.44	-6.67*	-10.71**	-16.87**	27.60**	4.59**	33.72**	14.03**
Sakha 69xGiza 160	5.90**	2.61*	-1.24**	-5.30**	-2.44**	7.06**	0.65**	-3.49**	-7.23*	26.65**	3.95	-10.20**	-4.20**	-28.59**	8.72**	5.08**
Sakha 69xAgent	-1.60	-2.01	-3.05**	-6.57**	7.84**	-0.28	-0.81**	-1.06**	-6.73*	-11.01**	-6.08**	-16.83**	4.85**	2.33	3.69**	-1.99**
Sakha 69xSakha 92	14.03**	8.40**	-5.99**	-9.71**	2.37**	-8.23**	0.45**	-1.86**	-11.24**	-11.98**	7.16**	-0.71	-0.20	-7.40**	9.43**	6.28**
Sakha 69xBaart	2.01*	-0.08	1.60**	-1.58**	-5.19**	-15.88**	0.76**	-1.40**	-6.31*	-11.27**	-11.19**	-19.01**	3.33**	-15.88**	16.88**	0.83**
Giza 157xGiza 160	4.47**	2.78**	3.52**	-0.93**	7.07**	-1.53**	1.12**	-2.75**	-8.56**	-8.17*	7.32**	-12.68**	-0.18	-11.76**	-15.74**	-26.01**
Giza 157xAgent	1.13	-0.84	-1.73**	-5.11**	5.13**	-6.03**	2.63**	2.05**	-3.64	-15.06**	4.42*	-13.08**	23.05**	-1.03	20.04**	-2.27**
Giza 157xSakha 92	10.78**	6.90**	-4.03**	-8.02**	1.12**	-12.27**	-0.13	-2.12**	-34.52**	-40.22**	-6.47**	-18.85**	44.41**	26.15**	-0.17	-16.90**
Giza 157xBaart	-0.52**	-1.04	-3.94**	-7.14**	-0.98**	-14.94**	-7.23**	-8.94**	-16.53**	-26.91**	4.03	-11.04**	28.55**	27.43**	52.10**	50.03**
Giza 160xAgent	6.15**	2.43*	-8.20**	-15.03**	-1.58**	-4.62**	-2.95**	-7.17**	1.54	-22.42**	19.64**	16.27**	25.50**	-7.92**	28.34**	17.48**
Giza 160xSakha 92	20.85**	18.50**	8.61**	8.43**	-9.46**	-15.08**	5.63**	3.62**	12.84**	-11.33**	2.62	-4.92*	27.61**	0.41	25.64**	18.06**
Giza 160xBaart	4.58**	3.42**	9.99**	8.84**	-1.55**	-8.67**	4.90**	2.75**	3.33	-21.48**	0.36	-5.49*	62.08**	44.37**	50.67**	33.90**
Agent xSakha 92	5.60**	-0.01	10.21**	2.16**	6.20**	2.60**	1.78**	-0.81*	-25.85**	-28.68**	10.48**	5.18*	4.55**	-5.15**	34.19**	30.48**
Agent xBaart	0.47	-1.99	1.98**	-4.69**	6.22**	-10.36**	-2.27**	-4.61**	-19.45**	-20.08**	-9.71**	-12.60**	2.22	-18.33**	36.66**	12.46**
Sakha 92xBaart	6.72**	3.55**	4.78**	3.85**	-4.26**	-5.37**	1.95**	1.79**	-29.68**	-32.86**	17.37**	15.36**	10.88**	-3.85*	61.93**	36.31**
L.S.D. 5%	1.75	2.03	0.75	0.87	0.53	0.61	0.20	0.64	5.54	6.40	4.04	4.67	2.54	2.93	0.48	0.56
L.S.D. 1%	2.34	2.71	1.01	1.16	0.70	0.82	0.56	0.86	7.42	8.57	5.41	6.25	3.39	4.72	0.65	0.76

Table(31)Expression of heterosis in the F1 of wheat over mid and better parents as percentage for yield and yield components in the combined data over all environments.

Characters	Plant height		Spike length		No.of spikes/ plant		No.of spikelets/ spike		No.of grains/ spike		plant weight		Grain yield/ plant		100-grain weight	
Crosses	M.P	B.P	M.P	B.P	M.P	B.P	M.P	B.P	M.P	B.P	M.P	B.P	M.P	B.P	M.P	B.P
Sakha 69xGiza 157	4.89**	3.33**	6.49**	4.97**	4.17**	1.83**	2.59**	1.88**	3.09	-0.06	1.59	-3.87**	13.67**	3.74**	38.93**	31.72**
Sakha 69xGiza 160	5.52**	1.67**	1.99**	-2.96**	0.57**	-3.44**	2.69**	-0.82**	-5.36**	-17.61**	6.24**	-7.04**	-7.38**	-24.53**	-7.38**	2.70**
Sakha 69xAgent	1.20**	-0.27	-1.68**	-5.73**	4.19**	2.65**	1.56**	-1.41**	-11.08**	-14.12**	-4.31**	-9.26**	1.39	-4.86**	1.39**	16.73**
Sakha 69xSakha 92	4.94**	2.22**	-1.77**	-1.95**	5.15**	-2.57**	4.20**	3.21**	-12.11**	-16.62**	4.29**	-3.77**	12.25**	5.59**	19.51**	18.15**
Sakha 69xBaart	2.52**	1.19*	1.62**	1.62**	-5.00**	-11.44**	4.98**	4.27**	1.04	-1.87	-7.85**	-13.76**	6.66**	2.69**	12.28**	6.33**
Giza 157xGiza 160	4.88**	2.55**	-2.04**	-2.03**	7.43**	0.93**	2.72**	-1.45**	6.42**	-4.90*	4.74**	-12.58**	-8.34**	-19.93**	-5.55**	-14.59**
Giza 157xAgent	4.24**	1.21*	1.69**	-1.11**	4.26**	0.45**	1.97**	0.07	-4.72**	-10.58**	1.69	-8.47**	7.13**	-6.85**	6.55**	-1.72**
Giza 157xSakha 92	6.12**	4.93**	0.11	-1.14**	4.11**	-5.54**	0.85**	-0.79**	16.08**	-20.39**	1.98	-10.54**	20.09**	17.47**	8.64**	1.89**
Giza 157xBaart	-0.29	-0.50	6.43**	5.48**	-9.33**	-0.67**	-2.45**	-2.46**	-12.91**	-15.41**	8.21**	-3.80**	20.22**	18.92**	11.55**	11.41**
Giza 160xAgent	-1.15**	-6.09**	-3.58**	-11.85**	1.45**	-1.17**	0.31	-5.62**	1.57	-14.14**	11.09**	1.99	14.15**	11.41**	-2.66**	-4.76**
Giza 160xSakha 92	11.10**	9.86**	11.60**	5.99**	4.59**	0.77**	2.91**	0.32	-6.57**	-17.30**	19.43**	12.60**	39.91**	19.93**	10.51**	6.26**
Giza 160xBaart	3.33**	0.83	10.00**	4.17**	6.00**	2.80**	6.32**	2.00**	-1.70	-16.52**	7.50**	-0.01	33.44**	17.72**	10.37**	-0.34**
Agent xSakha 92	2.72**	-1.35**	0.35	-3.61**	6.65**	0.19	5.64**	1.87**	-16.55**	-18.09**	10.82**	7.66**	-3.24**	-13.73**	22.32**	20.15**
Agent xBaart	1.30**	-1.44**	0.20	-3.46**	-2.28**	-7.61**	0.62**	1.41**	-14.46**	-14.94**	-9.89**	-11.14**	7.27**	-7.59**	19.65**	10.21**
Sakha 92xBaart	5.06**	3.65**	10.55**	10.21**	2.79**	2.39**	3.06**	1.38**	-2.45	-4.79*	8.95**	7.29**	-2.43**	-5.57**	24.88**	16.96**
L.S.D. 5%	0.82	0.94	0.36	0.41	0.35	0.41	0.33	0.38	3.25	3.75	2.43	2.81	1.43	1.64	0.21	0.27
L.S.D. 1%	1.10	1.27	0.48	0.56	0.61	0.54	0.32	0.51	4.34	5.02	3.26	3.76	1.91	2.36	0.31	0.36

and -2.35%), respectively,.

At Gemmeiza location,heterosis over mid parent ranged from (-1.60%)in the cross (Sakha 69 X Agent)to (20.85%)in the cross (Giza 160 x Sakha 92). Comparing with better parent the heterotic effects ranged from (-2.01%)to (18.50%) in the same crosses as for mid parent.Most of crosses exhibited positive and highly significant values for mid parent. For better eight crosses showed significant or highly significant and positive values of heterosis. Average of mid and better parents positive heterosis for this trait were (7.02% and 6.16%),respectively. while the average for negative heterotic effect was(-1.06% and -0.99%),respectively,.

At the combined data,heterosis over mid parent ranged from (-1.15%)in the cross (Giza 160 x Agent)to (11.10%)in the cross (Giza 160 x Sakha 92) . Comparing with better parent the heterotic effects ranged from (-6.09%) to (9.86%) in the same crosses as for mid parent . All crosses were positive and highly significant for mid parent except the two crosses(Giza 157 x Giza 160,and Giza 160 x Agent) which had negative values . For better parent nine crosses exhibited positive heterosis with significant or highly significant values .Average of mid and better parents positive heterosis for plant height were (4.45% and 3.14%),respectively . while the average for negative heterotic effect was(-0.72% ,and -1.93%) ,respectively,. Similar results were obtained by Abromov, (1979), Mitkees (1981),Tamam (1989), Mosaad et.al (1990), and Alkoddussi and Hassan (1991)

Spike length :

At Ismailia location, heterosis over mid parent ranged from (-24.71%) in the cross Giza 157 x Giza 160 to (19.80%) in the cross(Giza 160 x Baart).Comparing with better parent the heterotic effects ranged from (-33.95%)in the cross (Giza 157 x Giza 160)to (14.975)in the cross (Sakha 92 xBaart).Most of crosses were positive,and highly significant for mid parent.For better parent eight crosses showed positive and highly significant values of heterosis.Average of mid and better parents positive heterosis for this trait were (8.56% and 4.28%),respectively.

At Nobaria location,heterosis over mid perants ranged from (-6.37%)in the cross (Agent x Baart)to (16.39%)in the cross (Giza 157 xBaart).Comparing wirh better parent the heteroeic effects ranged from (-6.37%)in the cross(Agent x Baart)to (15.56%)in the cross (Giza 157 x Baart).Most of crosses were positive and highly significant for mid parent.For better parent five crosses showed positive and highly significant values of heterosis.Average of mid and better parents positive heterosis for this trait were (8.13% and 7.24%),respectively.

At Gemmeiza location, heterosis over mid parent ranged from (-5.99%)in the cross (Sakha 69 xSakha 92)to (10.21%)in the cross (Agent xSakha 92).Comparing with better parent the heterotic effects ranged from (-15.03%)in the cross (Giza 160 x Agent) to (8.84%)in the cross(Giza 160 x Baart).Seven crosses were positive and highly significant values for mid parent.For better parent four crosses showed positive and highly significant values of heterosis.Average of mid and better parents positive heterosis for spike length were (5.16% and 4.74%),respectively.

In the combined data,heterosis over mid parent ranged from (-3.58%) in the cross (Giza 160 x Agent) to (11.60%) in the cross (Giza 160 x Sakha 92).Comparing with better the heterotic effects ranged from (-11.85%)in the cross (Giza 160 x Agent)to (10.21%)in the cross (Sakha 92 x Baart).Most of crosses were positive and highly significant for mid parent.For better parent six crosses showed positive and highly significant values of heterosis.Average of mid and better parents positive heterosis for spike length were (4.64%) and 5.41%), respectivly.These results are in agreement with findings of Karra (1980), Mitkeas(1981), Kir'yan(1985),Bajwa et.al (1986), Mosaad et.al. (1990), and Kratochvil and Sammons (1991).

Number of spikes/plant:

At Ismailia location,heterosis over mid and better parents ranged from (-25.28% and -29.62%)in the cross (Agent x Sakha 92) to (32.28% and 31.92%) in the cross (Sakha 69 x Giza 157) ,respectively.Most of crosses were positive and significant or highly significant for mid and better parents.Average of mid and better parents positive heterosis for this trait were (11.28% and 10.33%),respectively.

At Nobaria location,heterosis over mid and better parents ranged from (-10.15% and -11.93%)in the crosses(Sakha 69 x Baart) to (29.71% and 29.63%) in the cross (Giza 160 x Sakha 92), respectively. Most of crosses exhibited positive and highly significant values for mid parent. For better parent six crosses showed positive and highly significant values of heterosis. Average of mid and better parents positive heterosis for this trait were (10.57% and 11.77%), respectively.

At Gemmeiza location, heterosis over mid parent ranged from (-9.46%) in the cross (Giza 160 x Sakha 92) to (7.84%) in the cross (Sakha 92 x Agent). Compering with better parent the heterotic effects ranged from (-15.88%) in the cross (Sakha 69 x Baart) to (2.66%) in the cross (Agent x Sakha 92). Six crosses were positive and highly significant for mid parent. For better parent only one cross (Agent x Sakha 92) exhibited positive and highly significant values. Average of mid and better parents positive heterosis for this trait were (4.96% and 2.66%) respectively.

In the combined data, heterosis over mid parent ranged from (-9.33%) in the cross (Giza 157 x Baart) to (7.43%) in the cross (Giza 157 x Giza 160) while, better parent heterosis ranged from (-11.44%) in the cross (Sakha 69 x Baart) to (2.80%) in the cross (Giza 160 x Baart). Most of crosses were positive and significant or highly significant for mid parent except the three crosses which had negative values. For better parent seven crosses exhibited positive heterosis with highly significant values. Average of mid and better parents positive heterosis for this trait were (4.28% and 1.50%), respectively. Similar results were obtained by Abromov (1979), Mitkeas (1981), Tamam (1989), Alkoddussi and Hassan (1991).

Number of spikelets/spike:

At Ismailia location,heterosis over mid parent ranged from (-3.54%)in the cross (Sakha x Baart)to (12.16%) in the cross (Giza 160 x Baart).Comparing with better parent the heterotic effects ranged from (-6.82%)with better parent the heterotic effects ranged from (-6.82%)in the cross (Giza 160 x Agent) to (7.69%)in the cross (Sakha 69 x Baart). most of crosses exhibited positive and significant or highly significant for mid parent. For better parent three crosses showed postive and significant or highly significant values of heterosis. Average of mid and better parents positive heterosis for this trait were (5.02% and 1.53%),respectively.

At Nobaria location,heterosis over mid and better parents ranged from (-1.98% and -4.32%) in the cross (Giza 160 x Sakha 92) to (14.75% and 7.36%) in the cross (Agent x Sakha 92) ,respectively . Most of crosses were positive and highly significant for mid and better parents.Average of mid and better parents positive heterosis for this trait were (5.74% and 3.78%) ,respectively.

At Gemmeiza location, over mid and better parents ranged from (-7.23% and -8.94%)in the cross(Giza 157 x Baart)to (5.63% and 3.62%)in the cross (Giza 160 x Sakha 92),respectively.Most of crosses were positive and significant or highly significant for mid parent.For better parent three crosses showed positive and highly significant value of heterosis. Average of mid and better parents positive heterosis for this trait were(2.21% and effects ranged from (-9.22%)in the cross (Giza 160 xAgent)to (29.42%)in the cross(Sakha92 x Baart).Three crosses were positive and highly significant for mid parent.For better parent crosses (Sakha 69 x Giza 157 and Sakha 92 x Baart) exhibited positive heterosis with highly significant values. Average of mid and better parents positive heterosis for this trait were (7.60% and 17.12%),respectively.

At Gemmeiza location, heterosis over mid parent ranged from (-34.52%)in the cross (Giza 157 x Sakha 92)to (12.84%)in the cross (Giza 160 x Sakha 92).Comparing with better parent the heterotic effects ranged from (-40.22%)in the cross (Giza 157 x Sakha 92) to (26.65%) in the cross (Sakha 69 x Giza 160). Two crosses (Giza 157 x Giza 160 and Giza 160 x Sakha 92) which were positive and highly significant for mid parent.For bette parent one cross (Sakha 69 x Giza 160)exhibited positive heterosis with highly significant values.Average of mid and parents positive heterosis for this trait were (5.54% and 26.65%),respectively.

In the combined data,heterosis mid parent ranged from (-16.55%)in the cross (Agent x Sakha 92)to (16.08%)in the cross (Giza 157 x Sakha 92).Comparing with better parent the heterotic effects ranged from (-20.39%)in the cross (Giza 157 x Sakha 92) to (-0.06%)in the cross (Sakha 69 x Giza 157).Two crosses(Giza 157 x Giza 160 and Giza 157 x Sakha 92)showed highly significant values for mid parent.Average of mid parent positive heterosis for this trait which was (5.64%). These results are in line with those reported by Dotlacil (1983),Kir'yan (1985),Palve et.al.(1986),Tamam (1989), and Alkoddussi and Hassan (1991).

Plant weight:

At Ismailia location, heterosis over mid parent ranged from (-7.36%)in the cross (Giza 157 x Agent)to (77.70%) in the cross (Giza 157 x Sakha 92). Comparing with better parent the heterotic effects ranged from (-11.63%)in the cross (Sakha 92 x Baart) to (68.52%) in the cross (Giza 157 x Sakha 92). Nine crosses showed positive and significant or highly significant values for mid parent.For better parent seven crosses exhibited positive heterosis with highly significant values.Average of mid and better parents positive heterosis for this trait were (28.85% and 35.39%),respectively.

At Nobaria location,heterosis over mid and better parents ranged from (-16.51% and -22.31%)in the cross (Agent x Baart) to (36.56% and 30.25%) in the cross (Giza 160 x Sakha 92) ,respectively.Four crosses showed positive and highly significant values for mid parent.For better parent one cross (Giza 160 x Sakha 92) exhibited positive heterosis with highly significant values.Average of mid and better parents positive heterosis for this trait were (9.13% and 10.03%),respectively.

At Gemmeiza location,heterosis over mid and parents ranged from (-11.19% and -19.01%)in the cross (Giza 160 x Agent),respectively.Six crosses and three crosses which were positive and significant or highly significant values for mid and better parents,respectively.Average of mid and better parents positive heterosis for this trait were (7.74% and 12.27%)respectively.

In the combined data,heterosis over mid parent ranged from (-9.89%)in the cross (Agent x Baart)to (19.43%) in the cross (Giza 160 x Sakha 92).Comparing with better parents the heterotic effects ranged from (-13.76%)in the cross (Sakha 69 x Baart)to (12.60%)in the cross (Giza 160 x Sakha 92).Nine crosses showed positive and highly significant values for mid parent heterosis. Comparing with better parent only three crosses exhibited positive and highly significant values.Average of mid and better parents positive heterosis for this trait were (7.21% and 7.39%), respectively. Theses results are in agreement with findings of Mohamed et.al,(1987), and Tamam (1989).

Grain yield/plant:

At Ismailia location,heterosis over mid parent ranged from (-6.64%)in the cross(Giza 157 x Giza 160)to (239.37%)in the cross (Sakha 69 x Sakha 92).Comparing with better parent the heterotic effects ranged from (-17.82%)in the cross (Giza 157 x Agent)to (203.23%)in the cross (Giza 160 x Sakha 92).Most of crosses were positive and significant or highly significant for mid parent.For better parent six crosses showed positive and significant or highly significant values of heterosis.Average of mid and better parents positive heterosis for this trait were(55.89% and 76.98%) ,respectively.

At Nobaria location,heterosis over mid and better parents ranged from (-14.89% and -27.94%)in the cross (Giza 157 x Giza 160)to (21.58% and 13.98%)in the cross (Giza 160 x Sakha 92), respectively. Six crosses showed positive and significant or highly significant values for mid parent heterosis. Comparing with better parent only two crosses(Sakha 69 x Baart and Giza 160 x Sakha 92)exhibited positive and highly significant values. Average of mid and better parents positive heterosis for this trait were (7.71% and 7.15%),respectively

At Gemmeiza location,heterosis over mid and better parents ranged from (-4.20% and -28.59%)in the cross (Sakha 69 x Giza 160)to (62.08% and 4 4.37%) in the cross (Giza 160 x Baart), respectively.Most of crosses were positive and highly significant for mid parent.Comparing with better parent four crosses exhibited positive and significant or highly significant values.Average of mid and better parents positive heterosis for this trait were (22.05% and 17.55%),respectively.

In the combined data,heterosis over mid parent ranged from (-8.34%)in the cross (Giza 157 x Giza 160) to (39.91%) in the cross (Giza 160 x Sakha 92). Comparing with better parent the heterotic effects ranged from (-24.53%)in the cross(Sakha 69 x Giza 160)to (19.93%)in the cross (Giza 160 x Sakha 92). Ten crosses showed positive and highly significant values for mid parent heterosis. Comparing with better parent eight crosses exhibited positive and highly significant values. Average of mid and better parents positive heterosis for this trait were (16.02% and 12.18%),respectively. Similar results were obtained by Mitkees (1981), Bhatti et.al.(1982), Singh et.al. (1984),Palve et.al.(1986),Uppal et.al. (1987),Henday (1989), and Alkoddoussi and Hassan (1991).

100-grain weight:

At Ismailia location,heterosis over mid and better parents ranged from (-14.76% and -29.23%)in the cross (Giza 160 x Sakha 92) to (47.09% and 44.54%) in the cross (Sakha 69 x Agent) ,respectively.Most of crosses were positive and highly significant for mid and better parents.Average of mid and betterparents positive heterosis for this trait were (25.26% and 25.31%), respectively.

At Nobaria location, heterosis over mid and better parents ranged from (-5.83% and -7.39%)in the cross (Sakha 69 x Baart) to (43.55% and 40.33%)in the cross (Sakha 69 x Giza 157),respectively.Most of crosses were positive and significant or highly significant for mid and better parents.Average of mid and better parents positive heterosis for this trait were(10.73% and 10.67%), respectively.

At Gemmeiza location, heterosis over mid parent ranged from (-15.74%)in the cross (Giza 157 x Giza 160) to (61.93%) in the cross(Sakha 92 x Baart).Comparing with better parent the heterotic effects ranged from (-26.015%)in the cross (Giza 157 x Giza 160) to (50.03%)in the cross (Giza 157 x Baart).Most of crosses were positive and highly significant for mid and better parents.Average of mid and better parents positive heterosis for this trait were (29.39% and 20.45%),respectively.

In the combined data,heterosis over mid parent ranged from (-7.38%)in the cross (Sakha 69 x Giza 160)to (38.93%)in the cross (Sakha 69 x Giza 157).Comparing with better parent the heterotic effects ranged from (-14.59%)in the cross (Giza 157 x Giza 160) to (31.72%)in the cross (Sakha 69 x Giza 157). Most of crosses were positive and highly significant for mid and better parents. Average of mid and better parents positive heterosis for this trait were (15.55% and 12.96%),respectively. These results are in line with those reported by Rady et.al.(1981), Dotlacil (1983) ,Gautam and Jain (1985), Bajwa et.al.(1986),Mahdy (1988),Younis et.al.(1988), and Alkoddoussi and Hassan (1991).

Stem rust reaction:

The heterosis percentages of F1 for stem rust in three locations and combined data are presented in table (32). For mid parent heterosis values concerning resistance to stem rust calculated from mid parent at Ismailia location ranged from (-95.73%) in the cross Giza 160 x Agent to (74.30%0 in the cross Giza 157 x Sakha 92 ; at Nobaria location, ranged from (-84.19%) in the cross Sakha 69 x Baart to (86.33%) in the cross Giza 157 x Sakha 92 ; at Gemmeiza location ranged from (-50.46%) in the cross Giza 157 x Sakha 92 to (169.10%) in the cross Sakha 69 x Agent . After combining data analysis ,heterosis estimates ranged from (-55.05%) in the cross Giza 157 x Agent to (188.11%) in the cross Agent x Baart .Two crosses (8 and 13) at Ismailia location; three crosses (8,11 and 15) at Nobaria location ; eight crosses (1,2,3,6,10,11,13 and 14) at Gemmeiza location and five crosses (1,3,8,13 and 14) in the combined data ,showed positive and highly significant values of heterosis .Average of mid parent positive heterosis for this trait were (32.16, 39.12, 72.46 and 51.44) at Ismailia ,Nobaria, Gemmeiza locations, and in the combined data ,respectively,. These findings were in line with those reached by Chovatia et. al.(1992).

Table (32) The mid parent heterosis values for stem rust obtained from the three environments and from combined data over all environments.

Crosses	E1	E2	E3	Comb.
Sakha 69xGiza 157	-70.64**	-67.08**	84.00*	10.280**
Sakha 69xGiza 160	-75.75**	-35.40**	66.25**	-11.388**
Sakha 69xAgent	-16.75**	-3.67	169.10**	106.64**
Sakha 69xSakha 92	-5.21	0.26	-41.08**	-28.98**
Sakha 69xBaart	-82.41**	-84.19**	3.81	-49.94**
Giza 157xGiza 160	-45.24**	-6.04	56.25**	1.24
Giza 157xAgent	-58.00**	-83.19**	-32.23**	-55.05**
Giza 157xSakha 92	74.30**	86.33**	-50.46**	8.90**
Giza 157xBaart	-25.60**	-31.10**	-27.87**	-28.19**
Giza 160xAgent	-95.73**	-10.16	43.56**	-27.02**
Giza 160xSakha 92	-54.72**	36.77**	31.24**	4.88
Giza 160xBaart	-15.21**	-18.86**	-18.25**	-17.31**
Agent xSakha 92	13.33**	-15.53**	56.68**	40.06**
Agent xBaart	-71.53**	-72.36**	141.24**	188.11**
Sakha 92xBaart	8.85	33.13**	-6.25	-8.238*
L.S.D 5%	8.932	10.648	12.932	6.257
1%	11.950	14.246	17.302	8.382

E1=Ismailia

E2=Nobaria

E3=Gemmeiza

From the previous results concerning G.C.A., S.C.A., and heterosis values for all studied charracters,we can admenostrate the best and clear results as follows :

For plant height the parent (Agent) showed the best results for G.C.A. in both F1 and F2.While ,the crosses (Giza 160x Sakha 92 and Giza 157 x Giza 160) showed the best results for S.C.A. in F1 and F2 and also for heterotic effects .

For spike length the parent (Agent) was promising for this trait in F1 and F2 for G.C.A. , For S.C.A. and heterosis the crosses (Giza 160 x Baart ,Giza 160 x Sakha 92 , and Sakha 92 x Baart) showed good results in F1 .

For number of spikes /plant the parent (Giza 157)showed best results for G.C.A. in both F1 nd F2 .While, for S.C.A. effects and heterotic effects the cross (Agent x Sakha 92) was the best one in F1.The cross(Sakha 92 x Baart) showed good results for F2.

For number of spikelets/spike the parents(Agent and Baart) showed best results for G.C.A.effects in both F1 and F2 .While, for S.C.A. effects the cross (Sakha 69 x Baart)was the best combiner for F1, F2 and heterotic effects .

For number of grains/spike the parent (Baart) was promising for this trait in F1 and F2 For G.C.A. effects. For S.C.A. the cross(Sakha 69 x Baart)was the best combiner for F1 and F2,while the cross(Sakha 92xBaart) showed the highest value for heterotic effect .

For plant weight the parent (Giza 157) was promising for this trait in F1 and F2 for G.C.A. effects .While, for S.C.A. effects and heterosis values the crosses (Giza 160 x Sakha 92 and Agent x Sakha 92) showed the highest values in F1 and the cross(Giza 157 x Sakha 92)showed the highest value of S.C.A. effects in F2.

For grain yield/plant the parent (Agent)in F1 and (Sakha 69) in F2 showed the best results ,While ,for S.C.A. effects and heterosis the cross (Giza 160 x Sakha 92) in F1 ,the cross (Sakha 69 x Baart)in F2 showed good combinerresults for S.C.A. .

For 100- grain weight the parent (Agent) was promising for this trait in F1 and F2 for G.C.A. For S.C.A. the cross (Giza 157 x Baart)was the best one for F1 and F2 .

For stem rust reaction the parents (Giza 160 and Agent) were promising for this trait in F1 and F2 for G.C.A. effects. For S.C.A. the cross (Sakha 69 x Agent) showed good results for F1 ,F2 and heterotic effects.

F- Nature of genetic variance components

Estimates of genetic components of varition in a diallel wheat crosses from F1 and F2 for yield and yield components in three locations are presented in tables (33 to 38).

For the plant height the additive component of genetic variance effect (D) was highly significant at Ismailia ,while insignificant at Nobaria and Gemmeiza locations in both F1 and F2 . These.results indicate that the additive gene effects played a major role in the inheritance of plant height. Whereases , the dominance effects (H1) was highly significant in all locations in both F1 and F2.The component of variation due to dominance effects correlated with gene distribution (H2) were significant in all locations in both F1 and F2 and samller than (H1),indicating unequal allele frequency. The overall dominance effects of heterozygous loci(h^2)were significant in all locations in both F1 and F2.Also the covariance of additive and dominance effects (F) were not significant in all locations in both F1 and F2. These results are in line with those reported by Mosaad 1981),Blanco et.al. (1982), and Mosaad et.al. (1990)

The quantities $(H1/D)^{\frac{1}{2}}$ were higher than unity, indicating overdominance in all locations in F1 ;and in F2 at Nobaria and Gemmeiza, and partial dominance (0.889) at Ismailia ,in F1 .The proportion of genes with positive and negative alleles in the parents (H2/4H1) were 0.245,0.240 and 0.178 in F1 and 0.245,0.216 and 0.230 in F2 at Ismailia, Nobaria, and Gemmeiza ,respectively, revealing asymetric distributions of positive and negative alleles

Table (33). Estimates of genetic components of variation in a 6 diallel wheat crosses in F1 for yield and yield components at Ismailia location.

Characters / Components	Plant height	Spike length	No. of spikes/ plant	No. of spikelets/ spike	No. of grains/ spike	Plant weight	Grain yield/ plant	100-grain weight	Stem rust reaction
D	31.13± 4.04**	1.02±0.37**	-0.01±0.13	1.52±0.19**	60.62± 9.53**	0.13±7.33	-0.87±3.14	0.32±0.07**	323.98±12.49**
H1	31.78±10.25**	2.04±0.96**	0.89±0.34**	1.25±0.49**	-69.54±24.20**	63.67±18.61**	15.13±7.99**	1.00±0.18**	184.91±331.7**
H2	31.15± 9.16**	1.70±0.84**	0.74±0.30**	1.02±0.43**	62.09±21.62**	57.51±16.62**	13.64±7.13*	0.61±0.16**	142.61±28.32**
h^2	61.57± 6.16**	2.12±0.57**	1.43±0.20**	4.23±0.29**	428.83±14.55**	167.91±11.19**	21.34±4.80**	3.27±0.11**	878.13±19.06**
F	5.46± 9.87	-0.20±0.92	0.05±0.32	0.67±0.47	30.25±23.29	0.20±17.91	-1.64±7.66	0.47±0.17**	162.30±30.51**
E	0.13± 1.52	0.07±0.14	0.08±0.05	0.06±0.07	6.87± 3.60	2.34± 2.77	1.08±1.18	0.01±0.02	16.53± 4.72
$(H/D)^{1/2}$	1.01	1.41	7.74	0.90	1.07	0.22	4.14	1.74	0.75
(H2/4H1)	0.24	0.20	0.20	0.20	0.22	0.22	0.22	0.15	0.19
KD/KR	1.19	0.87	1.57	1.64	1.60	1.07	0.63	2.41	1.99
$h^2/H2$	1.97	1.25	1.92	4.14	6.90	2.92	1.56	5.33	6.15
h^2(n.s)	62.40	61.29	12.92	63.01	54.78	15.39	19.99	41.75	66.15
r	0.55	-0.29	0.93**	-0.94**	0.77	-0.52	0.03	0.93**	0.96**
r^2	0.30	0.08	0.87	0.89	0.60	0.27	0.01	0.88	0.93

Table (34). Estimates of genetic components of variation in a 6 diallel wheat crosses in F1 for yield and yield components at Nobaria location.

Characters / Components	Plant height	Spike length	No. of spikes/ plant	No. of spikelets/ spike	No. of grains/ spike	Plant weight	Grain yield/ plant	100-grain weight	Stem rust reaction
D	3.44±3.58	0.11±0.26	0.56±0.31	1.05**±0.47	7.18±12.56	97.26**±24.79	12.39**±1.75	-0.01±0.21	225.77**±13.23
H1	27.76**±9.11	2.00**±0.68	2.97**±0.80	3.57**±1.21	65.38**±31.88	182.55**±62.93	10.50**±4.44	1.48**±0.53	98.12**±33.59
H2	26.61**±8.13	1.65**±0.60	2.49**±0.71	3.23**±1.08	62.98**±28.48	157.09**±56.22	9.34**±3.97	1.41**±0.48	62.33**±30.01
h^2	67.18**±5.47	1.88**±0.40	5.41**±0.48	14.71**±0.72	58.22**±19.17	72.72**±37.84	-0.34±2.67	1.70**±0.32	135.29**±20.19
F	-0.81±8.76	0.15±0.65	0.56±0.77	0.47±1.16	-7.34±30.68	64.11±60.56	2.96±4.28	-0.02±0.51	31.45±32.33
E	0.43±1.35	0.03±9.10	0.07±0.11	0.06±0.18	3.18±4.74	3.83± 9.37	0.69±0.66	0.02±0.08	17.65± 5.00
$(H/D)^{\frac{1}{2}}$	2.83	4.16	2.29	1.82	3.01	1.32	0.92	8.81	0.65
(H2/4H1)	0.24	0.20	0.21	0.22	0.24	0.21	0.22	0.23	0.15
KD/KR	0.92	1.36	1.56	1.27	0.71	1.63	1.29	0.88	1.23
h^2/H2	2.52	1.14	2.17	4.54	0.92	0.46	-0.03	1.20	2.17
h^2(n s)	21.04	26.12	25.51	34.49	30.13	40.46	63.61	11.94	77.58
r	-0.64	0.10	-0.51	-0.83*	0.00	0.45	0.49	-0.19	0.40
r^2	0.41	0.01	0.26	0.69	0.00	0.20	0.08	0.03	0.16

Table (35). Estimates of genetic components of variation in a 6 diallel wheat crosses in F1 for yield and yield components at Gemmeiza location.

Characters / Components	Plant height	Spike length	No. of spikes/ plant	No. of spikelets/ spike	No. of grains/ spike	Plant weight	Grain yield/ plant	100-grain weight	Stem rust reaction
D	16.55±13.43	0.55±0.19**	4.28±0.16*	0.70±0.27**	58.56±13.19**	236.08±11.70**	37.05±3.33**	0.46±0.17**	107.94±21.32**
H1	110.95±34.10**	1.45±0.49**	2.17±0.42**	1.81±0.70**	79.04±33.49**	200.17±29.70**	43.08±8.47**	2.13±0.44**	325.84±54.13**
H2	78.86±30.46**	1.33±0.43**	1.91±0.37**	1.62±0.62**	58.33±29.92**	171.34±26.53**	39.72±7.57**	1.80±0.39**	284.37±48.35**
h^2	56.75±20.50	0.12±0.29	0.03±0.25	0.13±0.42	22.21±20.14**	37.16±17.85**	189.42±5.09**	13.11±0.26**	389.04±32.54**
F	37.10±32.81	0.41±0.47	-1.06±0.40**	0.53±0.67	57.93±32.23	115.03±28.58**	16.55±8.15**	0.07±0.42	30.80±52.09
E	0.52± 5.07	0.05±0.07	0.04±0.06	0.05±0.10	4.77± 4.98	2.70± 4.42	1.00±1.26	0.02±0.06	27.78± 8.05
(H/ D)	2.58	1.61	0.71	1.60	1.16	0.92	1.07	2.13	1.73
(H2/4H1)	0.17	0.22	0.22	0.22	0.18	0.21	0.23	0.21	0.21
KD/KR	0.52	1.58	0.40	1.61	2.48	1.72	1.52	1.07	1.17
$h^2/H2$	7.19	0.09	0.01	0.08	3.86	0.21	4.76	7.28	1.36
h^2 (n.s)	22.17	26.16	76.88	28.25	35.53	62.19	52.17	43.46	37.49
r	-0.89*	0.25	-0.39	0.51	-0.61	-0.63	-0.49	-0.53	-0.79
r^2	0.80	0.06	0.15	0.26	0.37	0.40	0.24	0.28	0.63

Table (36). Estimates of genetic components of variation in a 6 diallel wheat crosses in F2 for yield and yield components ata Ismailia location.

Characters Components	Plant height	Spike length	No. of spikes/ plant	No. of spikelets/ spike	No. of grains/ spike	Plant weight	Grain yield/ plant	100-grain weight	Stem-rust reaction
D	24.64** ± 10.61	0.80** ± 0.05	-0.24 ± 1.36	1.36** ± 0.17	53.55** ± 8.83	-25.89 ± 6.93	-1.55 ± 1.07	0.22* ± 0.16	311.08** ± 11.91
H1	113.24** ± 107.83	-1.38** ± 0.55	13.26 ± 13.86	8.14** ± 1.74	48.21 ± 89.67	1322.98** ± 70.39	40.73** ± 10.95	2.23* ± 1.70	-29.54 ± 120.99
H2	304.46** ± 96.33	-1.29** ± 0.49	11.86 ± 12.38	7.86** ± 1.55	59.80** ± 80.10	1426.97** ± 62.88	44.58** ± 9.78	1.80 ± 1.51	-46.89 ± 108.09
h^2	214.92** ± 64.83	16.16** ± 0.33	36.24** ± 8.33	95.99** ± 1.04	-114.56 ± 53.91	41079.50 ± 42.32	1221.29 ± 6.58	0.63 ± 1.02	85.78 ± 72.75
F	29.93 ± 51.88	-0.32 ± 0.26	-0.29 ± 6.67	1.05 ± 0.83	36.49 ± 43.14	-71.47** ± 33.87	-3.81 ± 5.27	0.35 ± 0.81	321.31** ± 58.22
E	6.62 ± 4.01	0.29 ± 0.02	0.39 ± 0.51	0.21 ± 0.06	9.26 ± 3.33	28.36 ± 2.62	1.75 ± 0.40	0.11 ± 0.06	29.43 ± 4.50
$(H/D)^{\frac{1}{2}}$	0.88	0.32	1.85	0.61	0.23	1.78	1.28	0.79	0.07
(H2/4H1)	0.24	0.23	0.22	0.24	0.31	0.27	0.27	0.20	0.39
KD/KR	2.01	0.53	0.71	1.92	6.00	0.44	0.35	3.02	-1.85
$h^2/H2$	7.05	-12.45	3.05	12.20	-1.91	30.89	27.39	0.35	-1.82
h^2 (n.s)	21.60	45.30	0.00	36.60**	63.40	0.00*	0.00	20.90	91.21
r	-0.64	0.11	-0.40	-0.94	0.78	-0.91	-0.70	0.40	0.79
r^2	0.41	0.01	0.16	0.89	0.62	0.83	0.49	0.16	0.63

Table (37). Estimates of genetic components of variation in a 6 diallel wheat crosses in F2 for yield and yield components at Nobaria location.

Characters / Components	Plant height	Spike length	No. of spikes/ plant	No. of spikelets/ spike	No. of grains/ spike	Plant weight	Grain yield/ plant	100-grain weight	Stem rust reaction
D	1.61± 5.77	0.03± 1.09	0.11± 1.73	0.92±0.14**	4.55± 5.49	35.39± 20.18	8.98± 2.61**	-0.08±0.13	224.85± 7.65**
H1	179.06±58.59**	16.30±11.14	22.35±17.59	1.89±1.51	72.09±55.77	-14.43±205.01	19.22±26.55	3.05±1.36**	484.89±77.68**
H2	154.79±52.34**	12.30± 9.95	18.67±15.71	1.11±1.35	50.42±49.82	75.47±183.14	10.52±23.72	2.35±1.22*	297.22±69.40**
h^2	275.21±35.23**	11.51± 6.59	5.42±10.57	-2.32±0.90**	-84.11±33.53**	-223.88±123.26	62.11±15.96	1.75±0.82**	4723.99±46.71**
F	2.28±28.19	0.99± 5.36	1.99± 8.46**	0.89±0.72	-12.53±26.83	-27.23± 98.64	8.61±12.77	-0.19±0.65	446.48±37.38**
E	2.26± 2.18	0.11± 0.41	0.52± 0.65	0.19±0.19	6.51± 2.07	65.70± 7.63	4.10± 0.98	0.09±0.05	18.57± 2.89
$(H/D)^{\frac{1}{2}}$	2.63	5.33	3.55	0.35	0.99	0.16	0.37	1.48	0.36
(H2/4H1)	0.21	0.18	0.20	0.14	0.17	-1.30	0.13	0.19	0.15
KD/KR	1.31	-7.62	-8.46	5.15	0.18	-0.09	4.61	0.45	-6.67
h^2/H2	17.77	0.93	0.29	-2.09	-1.66	-2.96	5.90	0.74	15.89
h^2(n.s)	3.00	0.90	1.60	53.20	8.30	11.50	34.40	0.00	73.93
r	-0.80	-0.71	-0.35	0.42	-0.07	-0.80	0.86*	-0.24	0.95*
r^2	0.64	0.51	0.12	0.17	0.01	0.64	0.75	0.06	0.91

among the parents. The ratio $(4DH1)^{\frac{1}{2}}+F$ $/(4DH1)^{\frac{1}{2}}-F$ was 1.190 ,0.920, and 2.527 in F1 and 2.018, 1.311, and 1.300 in F2 at Ismailia, Nobaria and Gemmeiza, respectively showing that the proportion of dominant alleles are greater in the parents than the recessive ones in all locations,in both F1 and F2 .This conclusion was also supported by the significant (F) values and by the fact that (H2/4H1) was less than (0.25). The estimated values of $(h^2/H2)$, suggested that there were two pairs of genes or more affected the inheritance of this trait in F1 and F2 for all locations . These results, are in accordance with those obtained by Ahmed (1981), and Tamam (1989) and Singh (1990)

Narrow sense heritability in F1 were 62.406%, 21.047% and 22.176% at Ismailia, Nobaria and Gemmeiza locations, while the values in F2 were 21.60%, 3.00 %, and 4.4o% at Ismailia, Nobaria and Gemmeiza locations, respectively.These findings were in line with those reached by Mosaad (1981), Hamada (1988), Tamam (1989) and Hassan and Abd-El-Moniem (1991).

The estimates of correlation coefficients concerning plant height between the parental order of dominance (Wr,Vr)and parental measurements (Yr) table (35), showed significant and negative values for F1 at Gemmeiza and indicating that the dominant genes were operating towards increasing plant height in the above mentioned cases .The insignificant positive or negative correlation coefficient for the remaining cases in F1 and F2 indicated that the dominance was ambidirectional .

The values of (r^2) for plant height were not close to unity in almost cases, suggesting, the possibility of selection among genes showing dominance .Similar results were showed by Tamam (1989) and Mosaad et.al. (1990)

The graphical analysis for plant height for both F1 and F2 are shown in Figures (1 and 2), the regression lines of this trait at Ismailia , (b=0.659 ± 0.218)in F1 intersected Wr axis through of the origin point confirming the complete dominance controlling this trait in this location, Fig (1a). These results agree with those obtained in table (33). The distribution of parental lines along the regression line showed that Sakha 92 at Ismailia, possess an excess of genes behaved as a dominant, while Agent and Giza 157 possess an excess of genes behaved as recessive genes.At Nobaria and Gemmeiza, the regression lines (b= 0.315 ± 0.122) at Nobaria, and (b= 0.260 ± 0.172) at Gemmeiza have fallen downward to the right of the origin denoting over dominance Fig (1b and c). These results agree with thoses obtained in tables (34 and 35).The distribution of parental lines along the regression line showed that Sakha 92 and Sakha 69 at Nobaria,and Baart at Gemmeiza, possess an excess of genes behaved as a dominant ,while Giza 160 at Nobaria ,Sakha 92 at Gemmeiza, possess an excess of genes behaved as a recessive ones.

For F2 data the regression lines (b= 0.655± 0.347) at Ismailia ,intersected (Wr)axis to the left of the origin point indicating partial dominance controlling this trait at Ismailia , Fig (2 c)

PLANT HEIGHT

ISMAILIA

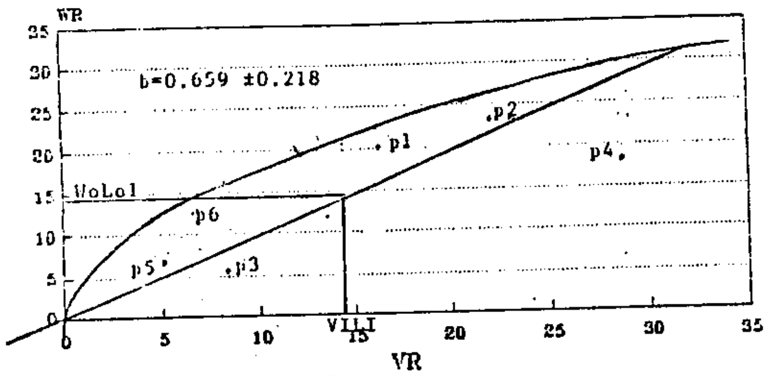

Fig.1 (a).

NOBARIA

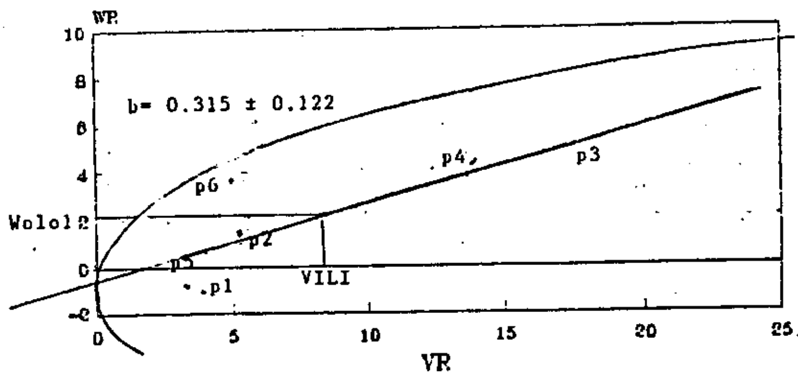

Fig.1 (b).

GEMMEIZA

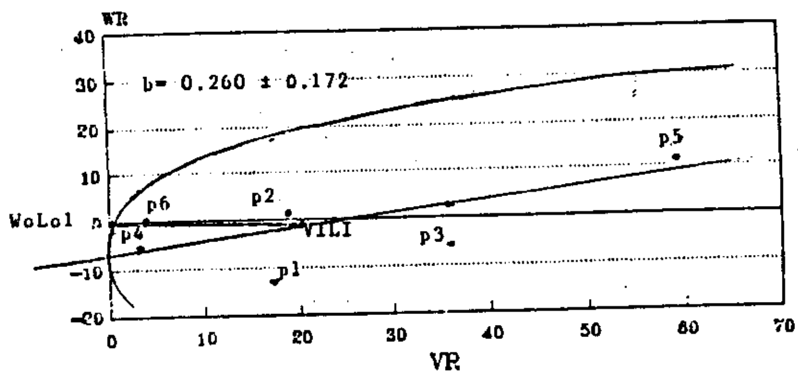

Fig. 1 (c).

Fig. 1(a,b,and c): Wr Vr graphs of plant height for the F1 of the 6- parents at Ismailia,Nobaria, and Gemmeiza locations.

PLANT HEIGHT

ISMAILIA

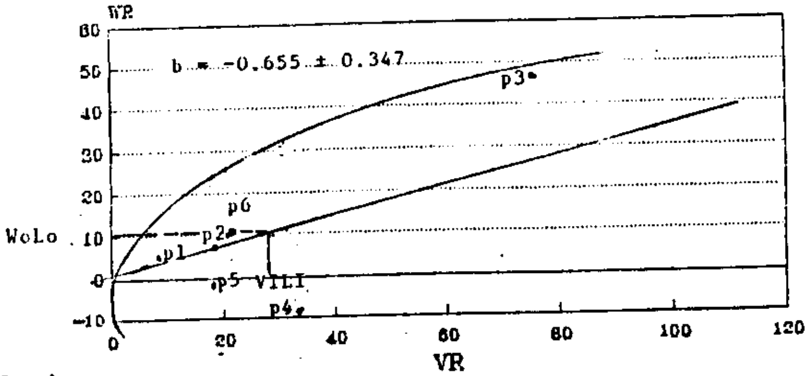

Fig.(2 a)

NOBARIA

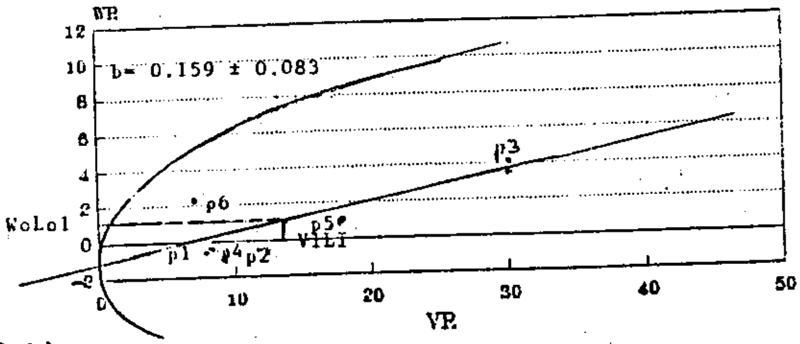

Fig.(2 b)

GEMMEIZA

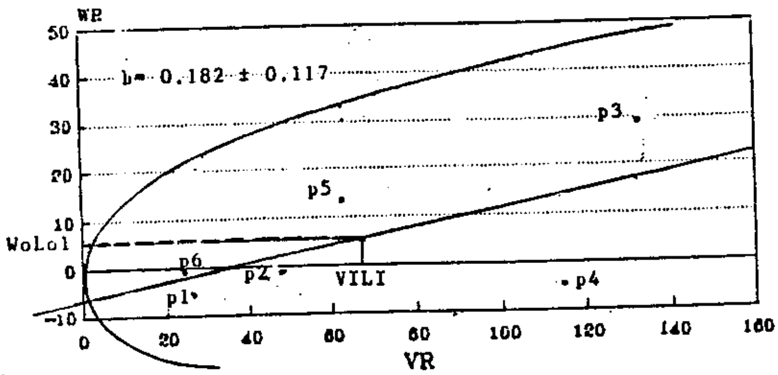

Fig (2 C)

Fig. 2 (a,b,and C) :WrVr graphs of plant height for the F2 of the 6- parents at Ismailia, Nobaria and Gemmeiza locations.

Theses results agree with those obtained in table (36) .The distribution of parental lines along the regression line showed that Sakha 69 and Sakha 92 possess an excess of genes behaved as a dominant, while Giza 160 possess an excess of genes behaved as a recessive.At Nobaria and Gemmeiza,the regression line (b= 0.159 ± 0.083)at Nobaria, and (b=0.182 ±0.117) at Gemmeiza ,intersected (Wr) axis below of the origin point indicating over dominance Fig (2 b and c).These result agree with those obtained in tables (37 and 38).The distribution of parental lines along the regression line showed that Sakha 69 at Nobaria, and Baart and Sakha 69 at Gemmeiza,possess an excess of genes behaved as a dominant, while Giza 160 at Nobaria and Gemmeiza , possess an excess of genes behaved as a reccessive ones. These results are in a good line with those obtained by Ahmed (1981), Mosaad (1981),Lonc (1988), Tamam (1989) and Lonc and Zalewshi (1991).

For spike length the additive gene effect (D) was highly significant in F1 and F2 in all locations except at Nobaria , which was insignificant, whereas the dominance effects (H1) was significant in all locations in F1 and Ismailia in F2 . The component of variation due to dominance effects correlated for gene distribution(H2) was significant in all locations in F1 and Ismailia in F2 and smaller than (H1) ,indicating unequal allele frequency .The overall dominance effects of heterozygous loci(h^2) were significant at Ismailia and Nobaria, in F1 ;and Ismailia and Gemmeiza in F2 . Also the covariance of additive and dominance effects (F) were not significant in all locations in both F1 and

F2 . Similar results were reported by Ahmed (1981), Bhullar et.al. (1985), and Tamam (1989).

The values of $(H1/D)^{\frac{1}{2}}$ were higher than unity ,indicating over dominance in all locations in F1; and in F2 at Nobaria,while, partial dominance at Ismailia (0.889), and Gemmeiza(0.359), in F2 was observed .The proportion of genes with positive and negative alleles in the parents (H2 /4H1) was 0.208, 0.205, and 0.228 in F1; and o.235, 0.189 and 0.099 in F2 at Ismailia, Nobaria, and Gemmeiza ,respectively .These data showed asymetric distributions of positive and negative alleles among the parents .The ratio $(4DH1)^{\frac{1}{2}}-F\ /(4DH1)^{\frac{1}{2}}+F$ was 0.871, 1.369, and 1.588 in F1 and 0.534, 7.624 and 2.324 in F2 at Ismailia, Nobaria, and Gemmeiza, respectively, showing that the proportion of dominant alleles was greater in the parents than the recessive ones at Nobaria and Gemmeiza in both F1 and F2 and recessive genes are in excess in case of Ismailia in both F1 and F2.The estimated values of$(h^2/H2)$,suggested the presence of two pair of genes at Ismailia,and Nobaria, and one pair of genes at Gemmeiza, in F1,while in F2 estimated values of$(h^2/H2)$suggested,one pair of genes or more for the inheritance of this trait at all locations.These results were in line with those found by Bhullar <u>et</u>.<u>al</u>.(1985),Medvedev (1987), and Singh (1990).

Narrow sense heritability was 61.29%, 26.12% and 26.16% at Ismailia,Nobaria and Gemmeiza,respectively,in F1 while in F2 was 45.30 %, 0.90% and 38.20% at Ismailia ,Nobaria, and Gemmeiza, respectively.These results are in a good line with those obtained by Hamada (1988), Tamam (1989), Ikram and Tanach (1991).

The estimates of correlation coefficients concerning spike length between the parental order of dominance (Wr,Vr)and parental measurements (Yr) did not reach the level of significance for both F1 and F2 in all locations except at Gemmeiza location, where significant and positive correlation coefficients were observed indicating that the dominance was ambidirectional .

The values of(r^2) for spike length were less than 1.0 in almost cases,suggesting,the possibility of selection among genes showing dominance . These results agree with those obtained by Tamam (1989) and Mosaad et.al.(1990).

The graphical analysis for spike length for both F1 and F2 are shown in Figures (3 and 4) .The regression lines of spike length (b= 0.469± 0.218)at Ismailia ;(b= 0.083± 0.041)at Nobaria ; and (b= 0.312 ± 0.370) at Gemmeiza ,in F1 intersected Wr, axis below of the origin point indicating the presence of over dominance nature that controlling this trait in all locations Fig (3). These results agree with $(H1 / D)^{\frac{1}{2}}$ 1.411 at Ismailia; 4.16 at Nobaria ; and 1.61 at Gemmeiza .The distribution of parental lines along the regression line showed that Sakha 92 and Baart at Ismailia ; Agent and Sakha 92 at Nobaria ; and Giza 160 and Baart at Gemmeiza possess an excess of genes behaved as a dominant, while Giza 157 at Ismailia and Nobaria ; and Sakha 92 at Gemmeiza , possess an excess of genes behaved as a recessive ones.

SPIKE LENGTH

ISMAILIA

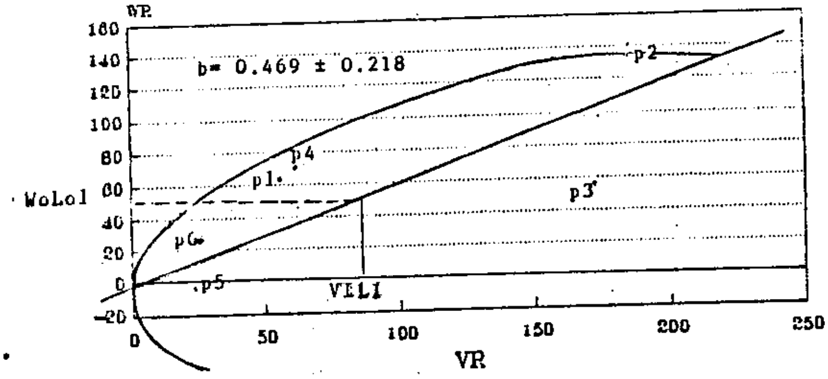

Fig.3 (a).

NOBARIA

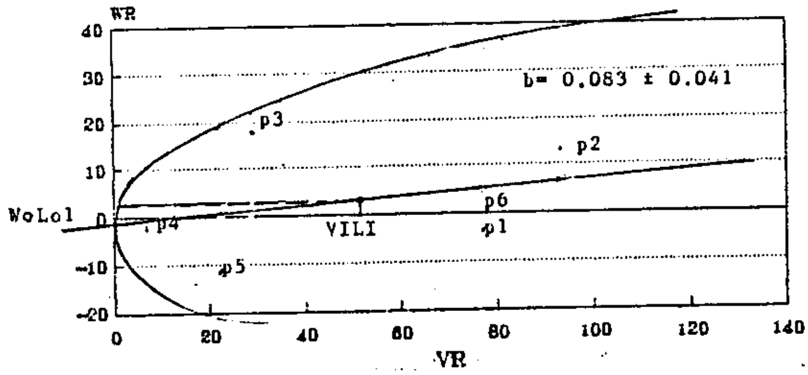

Fig.3 (b).

GEMMEIZA

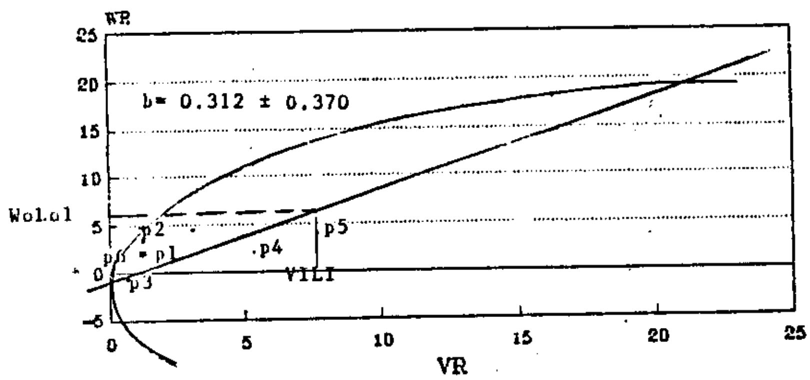

Fig.3 (c).

Fig. 3 (a,b,and c): Wr Vr graphs of spike length for F1 of the 6-parents at Ismailia, Nobaria, and Gemmeiza locations.

SPIKE LENGTH

ISMAILIA

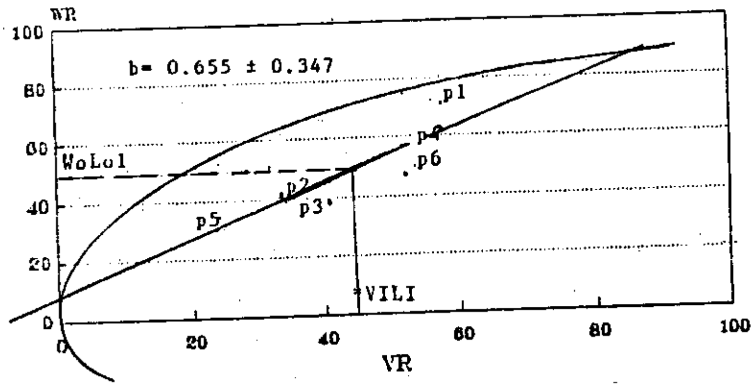

Fig. 4 (a)

NOBARIA

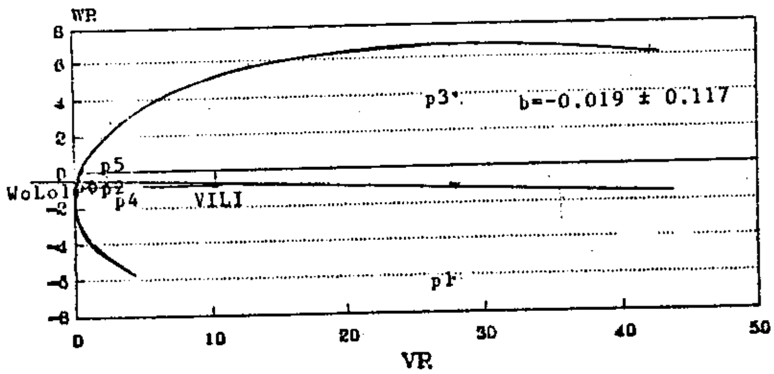

Fig. 4 (b).

GEMMEIZA

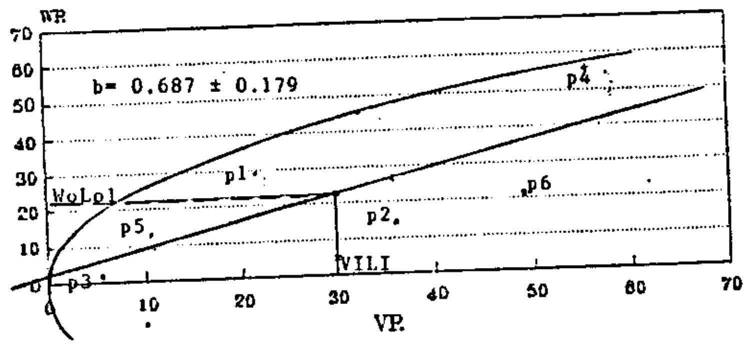

Fig 4 (c).

Fig .4 (a,band c): Wr Vr graphs of spike length for the F2 of the 6- parents at Ismailia,Nobaria, and Gemmeiza locations.

For F2 data the regression line of spike length (b= 0.655 ±0.347)at Ismailia,and(b=0.687±0.179)at Gemmeiza in F2 intersected Wr axis to the left of the origin point confirming the partial dominance controlling this trait in these locations Fig(4 a and c) . These results agree with those obtained in table (36 and 38) . The distributions of parental lines along the regression line showed that Sakha 92 and Giza 157 at Ismailia ; and Giza 160 and Sakha 92 at Gemmeiza,possess an excess of genes behaved as a dominant,while Sakha 69 at Ismailia;and Agent and Baart at Gemmeiza , possess an excess of genes behaved as a recessive ones . At Nobaria the regression lines(b= -0.019± 0.117)in F2 intersected Wr axis below of the origin point indicating that over dominance controlled this trait in this location Fig (4b).This result agree with those obtained in table(37).the distribution of parental lines along the regression line showed that Baart and Sakha 92 possess an excess of genes behaved as a dominant,while Giza 160 and Sakha 69 possess an excess of genes behaved as a recessive ones. These results are in accordance with the finding obtained by Ahmed (1981), Bhullar et.al.(1985), Urazaliv and Shegebaev (1985), Tamam (1989), and Mosaad et.al.(1990).

For number of spikes/plant the additive gene effect (D) was insignificant at Ismailia and Nobaria and significant at Gemmeiza in both F1 and F2 , whereas ,the dominance effects (H1) was significant in all locations in F1 and at Gemmeiza in F2 . The component of variation due to dominance effects correlated for gene distribution (H2) was significant in all locations,in F1 and at Gemmeiza,in F2 and insignificant at Ismailia and Nobaria , in F2,indicating unequal allele frequency .The overall dominance effects of heterozygous loci(h^2) were significant in all locations in both F1 and F2 except at Gemmeiza in F1 and at Nobaria in F2 . Also the (F) values were not significant at Ismailia and Nobaria in F1 and Ismailia and Gemmeiza in F2 ,while significant value was observed at Gemmeiza in F1 and at Nobaria in F2. Theses results are in agreement with the findings of Ahmed(1981) , Hassaballa _et.al_.(1984), and Singh (1990).

The estimates of $(H1/D)^{\frac{1}{2}}$ were higher than unity indicating over dominance at Ismailia and Nobaria in F1 and F2 ,while partial dominance was observed at Gemmeiza in F1 and F2 . The proportion of genes with positive and negative alleles in the parents (H2 /4H1) was 0.209, 0.210, and 0.220 in F1 and 0.224, 0.209 and 0.240 in F2 at Ismailia , Nobaria and Gemmeiza respectively, revealing asymetric distributions of positive and negative alleles among the parents .The ratio $(4DH1)^{\frac{1}{2}} - F / (4DH1)^{\frac{1}{2}} + F$ was 1.573,1.560 and 0.704 in F1 and 0.713, -8.460 and 2.836 in F2 at Ismailia, Nobaria,and Gemmeiza , respectively, showing that the proporation of dominant alleles are greater in the parents than recessive ones at Ismailia and Nobaria in F1; and Nobaria and Gemmeiza,in F2,while recessive genes are in excess in case of F1 at Gemmeiza and F2 at Ismailia,The estimated values of (h^2 /H2),suggested that there were two pairs of genes or more in all locations, affected the inheratince of this trait in F1 and F2 . These results agree with those reported by Hassablla _et.al_. (1984), Abul- Naas _et.al_.(1986), and Lonc and Zalewshi (1991).

Narrow sense heritability in F1 was 12.924% , 25.519% and 76.882% at Ismailia ,Nobaria,and Gemmeiza, while in F2 0.0,1.600%

at Ismailia, Nobaria and Gemmeiza respectively. Similar results were showed by Hamada (1988),Hassan and Abd El-Moniem (1991),and and Ikram and Tanach (1991).

The estimates of correlation coefficient concerning number of spikes/plant between the parental order of dominance Wr,Vr)and parental measurements (Yr) are given in tables (33 and 38).Data showed significant and positive values at Ismailia ,in F1 and at Gemmeiza,in F2 ,indicating that the dominant genes were operating towards increasing number of spikes/plant in the above mentioned cases .The insignificant and positive or negative correlation coefficient for the remaining cases in F1 and F2 indicated that dominance was ambidirectional .

The values of(r^2)for number of spikes/plant were not close to unity in almost cases ,suggesting the possibility limits of selection among genes showing dominance . Similar results were showed by Lonc (1988), and Tamam (1989).

The graphical analysis for number of spikes/plant for both F1 and F2 are shown in Figures (5 and 6).The regression lines of number of spikes/plant at Ismailia,(b=0.0004 ± 0.253)and(b= 0.222 ± 0.281)at Nobaria , in F1 intersected Wr axis below the origin point indicating that over dominance controlling this trait in these locations Fig (5 a aand b).These results agree with those obtained in table (33 and 34).The distribution of parental lines along the regression line showed that Sakha 69 and Giza 157 at Ismailia and Giza 157 at Nobaria ,possess an excess of genes behaved as a dominant, while Agent at Ismailia , and Sakha 92 at

NO.OF SPIKES/PLANT

ISMAILIA

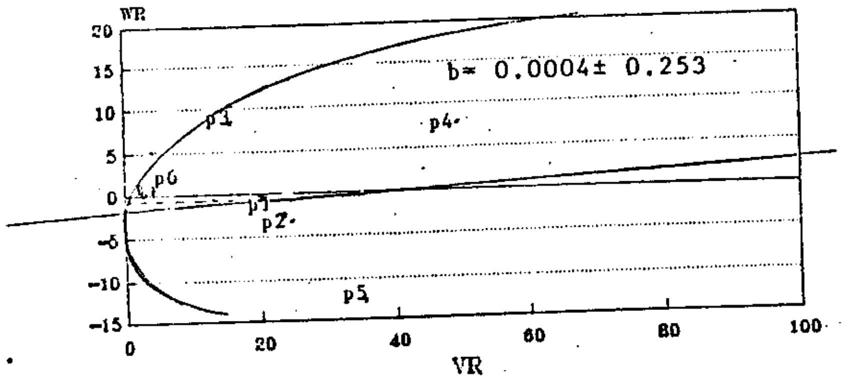

Fig.5 (a).

NOBARIA

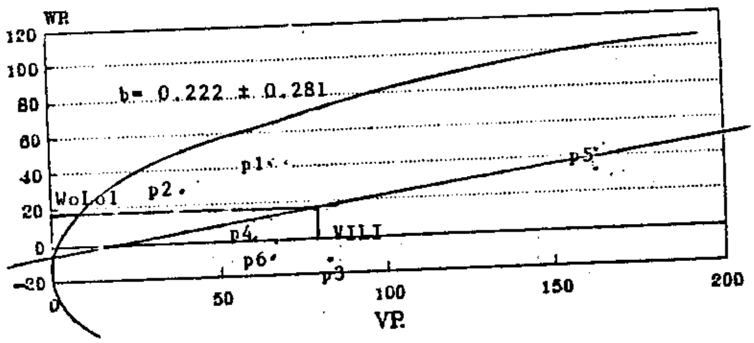

Fig.5 (b)

GEMMEIZA

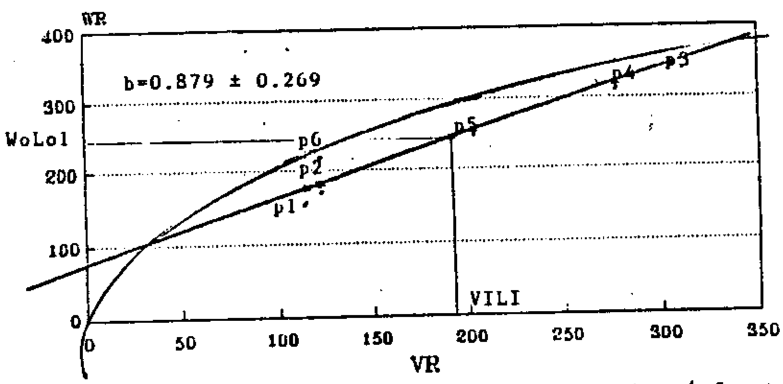

Fig. 5(c)

Fig. 5(a,b, and c) :Wr Vr graphs of number of spikes/plant for the F1 of the 6- parents at Ismailia Nobaria, and Gemmeiza locations.

NO. OF SPIKES/PLANT

ISMAILIA

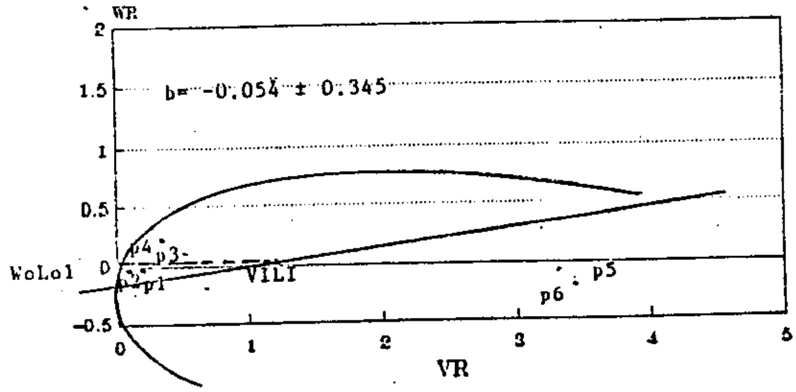

Fig. 6 (a).

NOBARIA

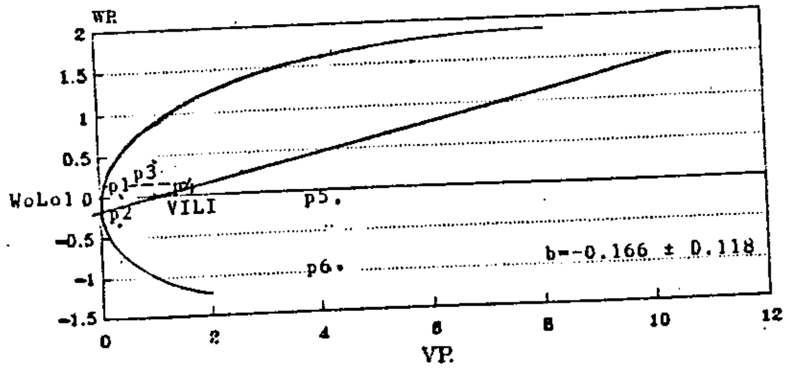

Fig.6 (b).

GEMMEIZA

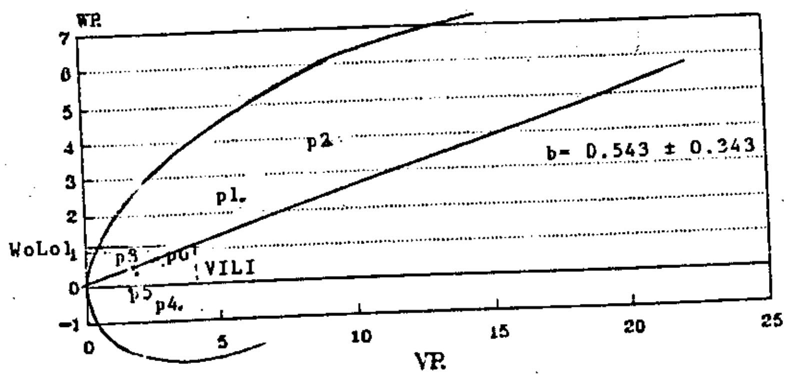

Fig.6 (c).

Fig 6 (a,b, and c): Wr Vr graphs of number of spikes/plant for the F2 of the 6- parents at Ismailia, Nobaria and Gemmeiza locations.

Nobaria , possess an excess of genes behaved as a recessive ones . At Gemmeiza,the regression lines ($b=0.879 \pm 0.269$)in F1 intersected Wr axis to the left of the origin point confirming that partial dominance controlling this trait in this location,Fig (5c).These results agree with those obtained in table (35).The distribution of parental lines along the regression line showed that Sakha 69 and Giza 157 possess an excess of genes behaved as a dominant ,while Giza 160 and Agent possess an excess of genes behaved as a recessive ones .

For F2 data, the regression lines of number of spikes/plant ($b= -0.054 \pm 0.345$)at Ismailia and ($b= -0.166 \pm 0.118$)at Nobaria ,in F2 intersected Wr axis below of the origin point indicating that over dominance controlling this traits in these locations Fig (6 a and b).These results agree with $(H1 /D)^{\frac{1}{2}}$ 1.859, at Ismailia , and 3.550 at NObaria .The distribution of parental lines along the regression line ,showed that Sakha 69 ,Giza 157 at Ismailia and Nobaria ,possess an excess of genes behaved as a dominant , while Sakha 92 and Baart at Ismailia and Nobaria , possess an excess of genes behaved as a recessive .At Gemmeiza the regression lines($b= 0.543 \pm 0.343$) in F2 intersected Wr axis to the left of the origin point confirming that partial dominance controlling this trait in this location Fig (6c) .These results agree with $(H1 /D)^{\frac{1}{2}}$ 0.980 .The distribution of parental lines along the regression line, showed that Sakha 92 and Giza 160 possess an excess of behaved as a dominant genes, while Giza 157 and Sakha 69 possess an excess of genes behaved as a rcessive ones . These findings were in line with those reached by Hassaballa <u>et.al</u> (1984), Abul -Naas <u>et.al</u>. (1986), Mitkees and

El-Rassas (1986), Tamam (1989), and Lonc and Zalewshi (1991).

For number of spikeletes/spike,the additive gene effect(D) was significant in all locations in both F1 and F2.Whereas the dominance effects (H1) was significant in all locations only F1; and at Ismailia in F2 highly significant component of variation due to dominance effects (H2)correlated for gene distribution, was found in all locations in F1; and at Ismailia in F2 indicating the presence of dominance with asymeterical gene distribution.The overall dominance effects of heterozygous loci (h^2) was significant at Ismailia and Nobaria in both F1 and F2, which indicated that the effect of dominance is due to heterozygosity. The covariance of additive and dominance(F) was not significant in all locations in both F1 and F2. Similar results were obtained by Mitkees and El- Rassas (1986) and Tamam (1989).

The values of $(H1/D)^{\frac{1}{2}}$ were higher than unity indicating partial dominance at Ismailia in F1 and in the three locations in F2,while over dominance was observed at Gemmeiza only in F1 The proportion of genes with positive and negative alleles in the parents (H2/4H1) was 0.204, 0.226 and 0.224 in F1 and 0.242 ,0.147 and 0.509 in F2 at Ismailia, Nobaria and Gemmeiza ,respectively,revealing asymetric distributions of positive and negative alleles among the parents.The ratio $(4DH1)^{\frac{1}{2}}+F/(4DH1)^{\frac{1}{2}}-F$ was 1.643,1.277 and 1.617 in F1 and 1.929,5.151 and 4.436 in F2 at Ismailia,Nobaria and Gemmeiza ,respectively,showing that the proportion of dominant alleles are greater in the parents than the recessive ones in all locations in both F1 and F2 generations. The estimated values of $(h^2/H2)$, suggested that their was one pair of genes or more controlled this character of the three locations. These results are in a good line with those obtained by Mitkees and El- Rassas (1986), Medvedev (1987), Tamam (1988), and Lonc and Zalewshi (1991).

Narrow sense heritability was 63.016%, 34.499% and 28.259% at Ismailia, Nobaria and Gemmeiza in F1, while in F2 were 36.6% 53.2% and 45 5% at Ismailia, Nobaria and Gemmeiza, respectively. These results are in a good line with those obtained by Mitkees and El- Rassas (1986), Tamam (1989), and Ikram and Tanach (1991).

The estimates of correlation coefficients(r) concerning number of spikelets/spike between the parental order of dominance (Wr, Vr) and parental measurements(Yr) are given in tables(33 to 38). Data showed significant and negative values for F1 at Ismailia and Nobaria ; and at Ismailia and Gemmeiza in F2 indicating that the dominant genes were operating towards increasing number of spikelets/spike in the above mentioned cases. The significant and positive correlations coefficient for the remaining cases in F1 and F2 indicated that dominance was ambidirectional.

The values of (r^2) for this trait were less than 1.0 in almost cases, suggesting the possibility of selection among genes showing dominance. Similar results were showed by Tamam (1989), and Lonc and Zalewshi (1991).

The graphical analysis for number of spikelets/spike for both F1 and F2 are shown in figures (7 and 8). The regression lines of number of spikelts/spike (b=0.581±0.195)at Nobaria and (b=0.413±0.394)at Gemmeiza in the F1 intersected(Wr)axis below of the origin point indicationg over dominance controlling this trait in these enviroments Fig (7 b and c). These results agree with $(H1/D)^{\frac{1}{2}}$obtained in tables(34 and 35). The distribution of parental lines along the regression line showed that Giza 157 and Baart at Nobaria and Sakha 69 at Gemmeiza , possess an excess of genes behaved as a dominant ,while Sakha 92 at Nobaria and Giza 157 at Gemmeiza possess an excess of genes behaved as a recessive ones . At Ismailia,the regression lines (b=0.992±0.295)in F1 intersected Wr axis to the left of the origin point confirming that partial dominance controlling this trait in this location Fig (7a). These results agree with those obtained in table (33). The distribution of parental lines along the regression line showed that Agent possess an excess of genes behaved as a dominant, whereas Giza 160 possess an excess of genes behaved as a recessive ones

For F2 data the regression lins of number of spikelets/spike (b=1.102 ± 0.172) at Ismailia (b= 0.670 ± 0.337) at Nobaria and (b=1.115±0.246)at Gemmeiza in F2 intersected (Wr)axis to the left of the origin point confirming that partial dominance controlling this trait in all locations Fig(8).These results agree with those obtained in table (36 to 38). The distribution of parental lines along the regression line showed that Agent at Ismailia;Giza 160 and Giza 157 at Nobaria and Sakha 92 at Gemmeiza ,possess an excess of genes behaved as a dominant .while Giza 160 at Ismailia

NO.OF SPIKELETS/SPIKE

ISMAILIA

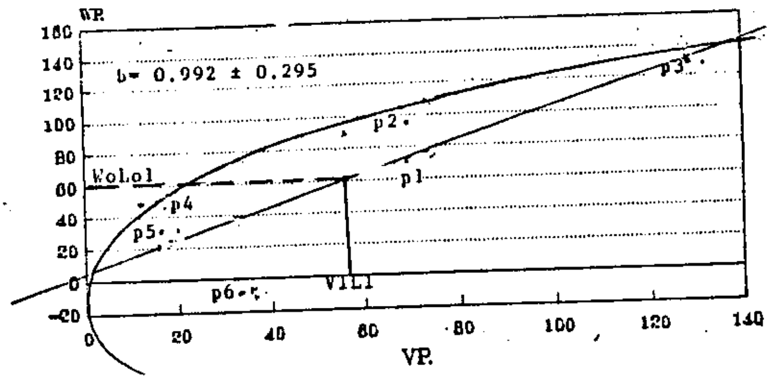

Fig .7 (a).

NOBARIA

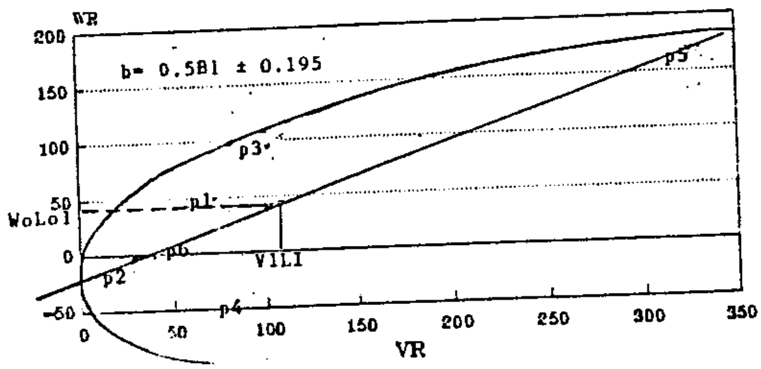

Fig. 7 (b).

GEMMEIZA

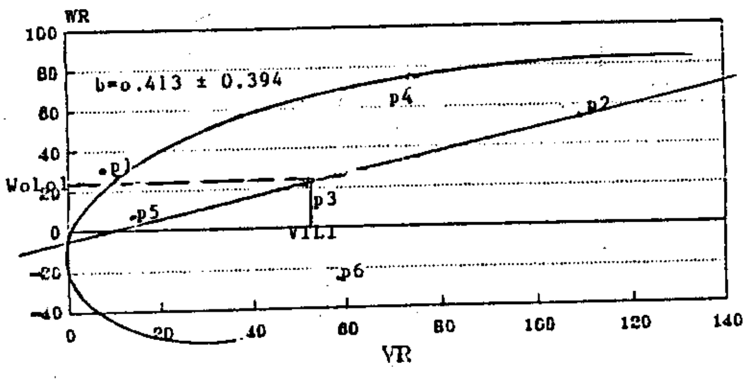

Fig. 7 (c).

Fig. 7 (a,b and c): Wr Vr graphs of number of spikelets/spike for the F1 of the 6- parents at Ismailia, Nobaria and Gemmeiza locations.

NO.OF SPIKELETS/SPIKE
ISMAILIA

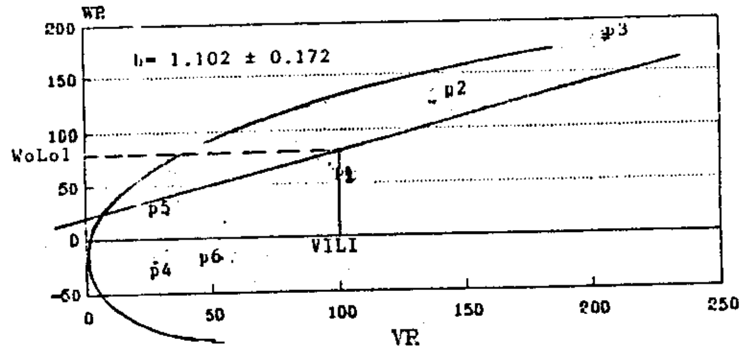

Fig 8 (a).

NO.OF SPIKELETS/SPIKE
NOBARIA

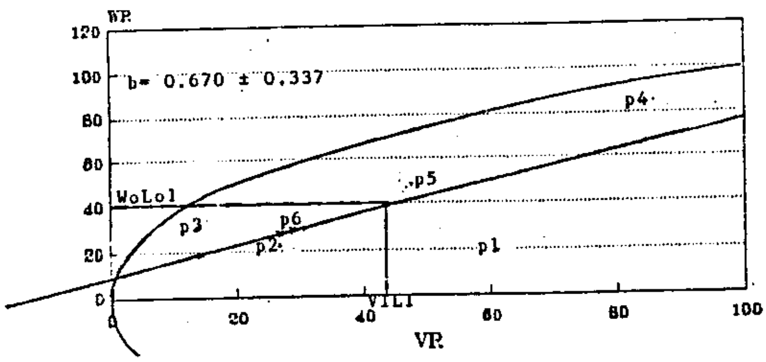

Fig. 8(b).

GEMMEIZA

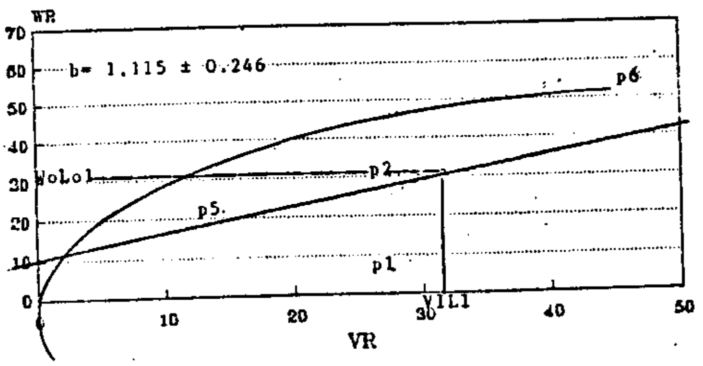

Fig 8 (c).

Fig 8 (a,b, and c): Wr Vr graphs of number of spikelets /spike for the F2 of the 6-parents at Ismailia, Nobaria and Gemmeiza locations.

;Agent at Nobaria ;and Baart at Gemmeiza possess an excess of genes behaved as a recessive ones .These results agree with that mentioned by Mitkees and El- Rassas (1986), Tamam (1989), and Lonc and Zalewshi (1991).

For the number of grains/spike the additive gene affect (D) was significant in Ismailia and Gemmeiza,in F1 and F2 at Nobaria, while dominance effects(H1)was significant in F1 at all locations and in F2 only at Gemmeiza ,indicating unequal allele frequency. The overall dominance effects of heterozygous loci (h^2) were significant in all locations,in F1 and F2.Whereas,the (F) values were not significant in F1 and F2 in all locations. Similar results were obtained by Abul-Naas et.al. (1986) and Abdel Saboor et.al.(1990).

The values of $(H1/D)^{\frac{1}{2}}$ were higher than unity indicating over dominance in all locations, in F1, while partial dominance was observed at three locations in F2.The proportion of genes with positive and negative alleles in the parents (H2/4H)was (0.223,0.241 and 0.185)in F1 and(0.310,0.175 and 0.212)in F2 at Ismailia,Nobaria and Gemmeiza ,respectively,revealing asymetric distributions of positive and negative alleles among the parents. The ratio$(4DH1)^{\frac{1}{2}}+F/(4DH1)^{\frac{1}{2}}-F$ was (1.607,0.710 and 2.483)in F1 and (6.099,0.182 and 0.705)in F2 at Ismailia, Nobaria and Gemmeiza , respectively.These data showed that the proportion of dominant alleles are greater in the parents than the recessive ones at Ismailia and Gemmeiza in F1 and Ismailia ,in F2 and recessive genes are in excess in case of Nobaria in the F1 and Nobaria and Gemmeiza ,in F2. The estimated values of(h^2/H2), suggested that there were more than two pair of genes affected the inheritance of this trait in F1 and F2. These results are in agood line with those obtained by Tamam (1989), and Lonc and Zalewshi (1991).

Narrow sense heritability was (54.784%,30.131% and 35.533%) at Ismailia, Nobaria and Gemmeiza in F1 and (63.400%, 8.300% and 25.30%) at Ismailia, Nobaria and Gemmeiza, in F2 respectively . Similar results were obtained by Hassan and Abd-El Moniem (1991), and Ikram and Tanach (1991).

The estimates of correlations coefficient concerning number of grains/spike between the parental order of dominance(Wr,Vr)and parental measurements (Yr)did not reach the level of significant for F1 and F2 in all locations indicated that the dominance was ambidirectional.

The values of(r^2) for this trait were not close to unity in most of cases, suggesting the possibility of selection among genes showing dominance. These results are in agreement with the findings of Tamam (1989), and AbdEl Saboor et .al.(1990).

The grabhical analysis for number of grains/spike for both F1 and F2 are showen in Fag.(9 and 10).The regression lines of number of grains/ spike (b=0.576±0.330) at Ismailia;(b=-0.121 ± 0.183) at Nobaria;and (b=-1.535±0.879)at Gemmeiza location in F1 intersected Wr axis below of origin point indicating that over dominance controlling this trait in all locations,Fig.(9 a,b, and c).These results agree with $(H1/D)^{\frac{1}{2}}$,1.071,at Ismailia ; 3.017at Nobaria ;and

NO.OF GRAINS/SPIKE

ISMAILIA

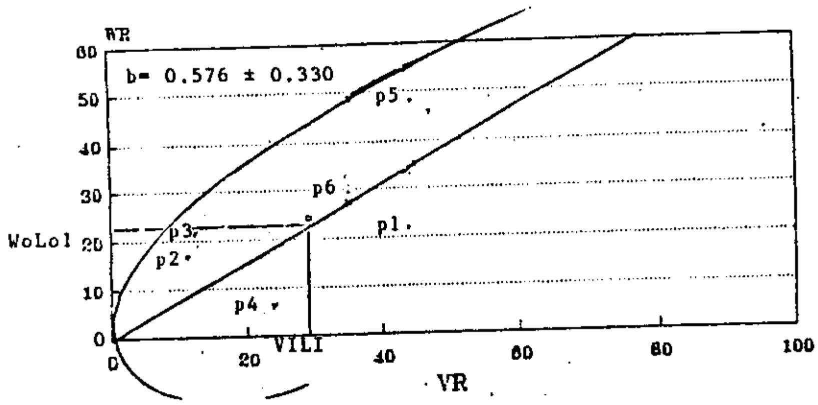

Fig 9 (a).

NOBARIA

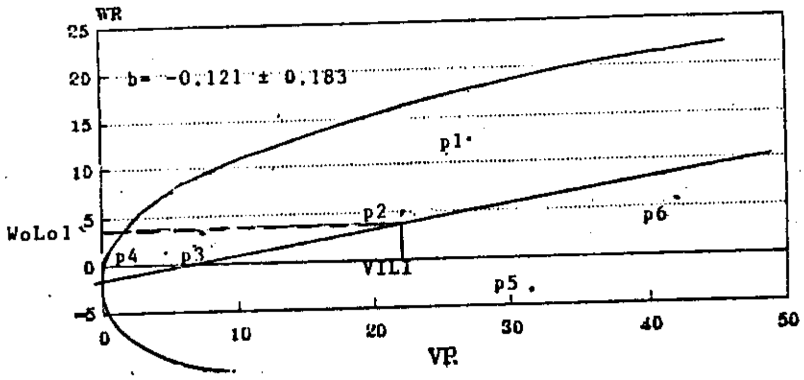

Fig .9 (b).

GEMMEIZA

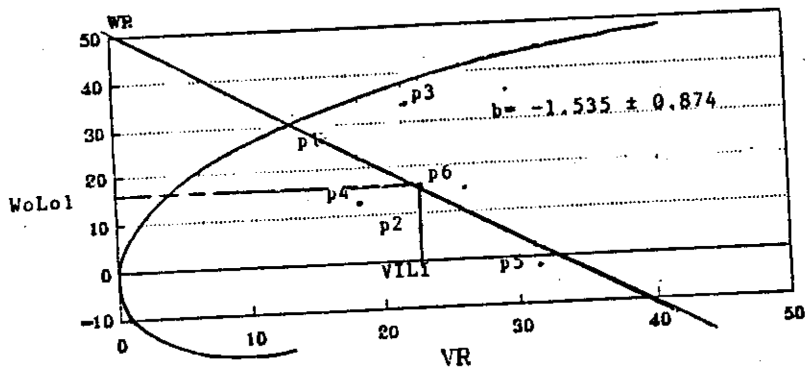

Fig.9 (c).

Fig 9 (a,b, and c): Wr Vr graphs of number of grains/spike for the F1 of the 6- parents at Ismailia, Nobaria and Gemmeiza locations.

NO.OF GRAINS/SPIKE

ISMAILIA

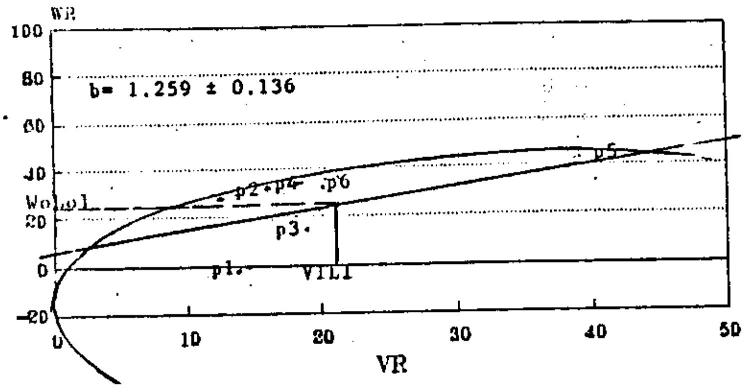

Fig.10 (a).

NOBARIA

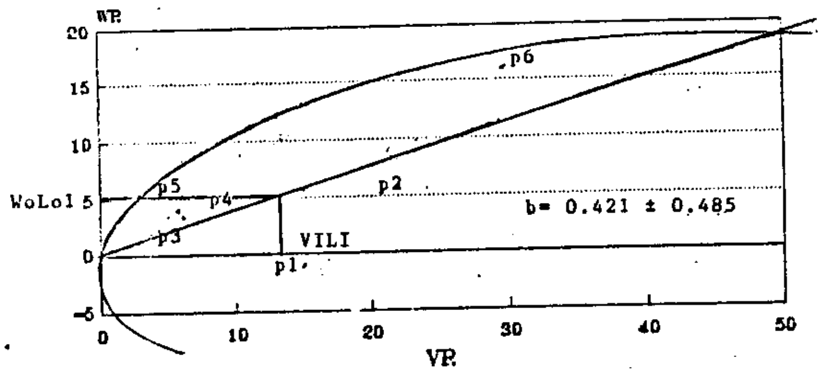

Fig. 10 (b).

GEMMEIZA

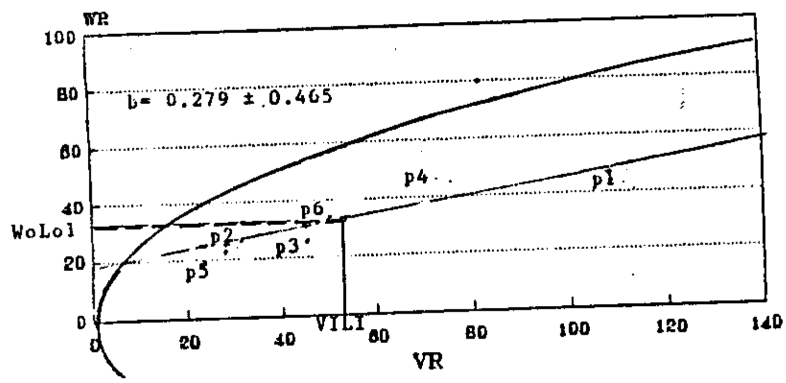

Fig 10 (c).

Fig. 10 (a,b,and c): Wr Vr graphs of number of grains/spike for the F2 of the 6- parents at Ismailia Nobaria, and Gemmeiza locations.

1.161 at Gemmeiza ;the distribution of parental lines along the regression line showed that Giza 157 at Ismailia ;Agent at Nobaria ;and Sakha 92 and Giza 157 at Gemmeiza location;possess an excess of genes behaved as a dominant , while Sakha 92 and Sakha 69 at Ismailia ;Baart and Sakha 92 at Nobaria;and Sakha 69 at Gemmeiza ; possess an excess of genes behaved as a recessive ones.

For F2 data the regression lines of number of grains/spike (b=1.259±0.136)at Ismailia;(b=0.421±0.485)at Nobaria;and (b=0.279 ±0.465)at Gemmeiza,intersected Wr axis to the left of the origin point confirming that partial dominance controlled character this in all locations Fig.(10 a,b,and c)these results agree with$(H1/D)^{\frac{1}{2}}$,0.237,at Ismailia;0.994 at Nobaria ,and 0.719 at Gemmeiza , .The distribution of parental lines along the regression line showed that Giza 157 at Ismailia;Giza 160 at Nobaria ; and Sakha 92 and Giza 157 at Gemmeiza ,possess an excess of genes behaved as a dominant,whereas,Sakha 92 at Ismailia ;Baart at Nobaria;and Sakha 69 at Gemmeiza ,possess an excess of genes behaved as a recessive ones.These findings were in line with those reached by Abul-Naas et.al.(1986), Abdel Saboor et.al.(1990) and Singh (1990).

For plant weight the additive gene effects (D) was significant at Nobaria and Gemmeiza, in F1 and at Gemmeiza only in F2 ,while the dominance effects (H1) was significant in all locations in F1;and in F2 at Ismailia and Gemmeiza , The components of variation due to dominance effects correlated with gene distribution (H2) was significant in all locations for F1 and F2,indicating unequal allel frequency .The overall dominance effects of heterozygous loci(h^2)were significant in all locations in F1 and in Ismailia and Gemmeiza,in F2.Also the (F)values were not significant at Ismailia and Nobaria , in F1 and at Nobaria , in F2 ,while were significant at Gemmeiza in F1; and Ismailia and Gemmeiza ,in F2. These findings were in line with those reached by Mosaad (1981), and Tamam (1989).

The estimates $(H1/D)^{\frac{1}{2}}$were higher than unity,indicating over dominance at Ismailia and Nobaria , in F1 and at Ismailia in F2, while partial dominance at Gemmeiza in F1;and in F2 at Nobaria and Gemmeiza.The proportion of genes with positive and negative allels in the parents (H2/4H1) was 0.226,0.215,and 0.214 in F1 and 0.270,-1.307 and 0.199 in F2 at Ismailia , Nobaria, and Gemmeiza , respectively, revealing asymetric distributions of positive and negative alleles among the parents .The ratio $(4DH1)^{\frac{1}{2}}+F/(4DH1)^{\frac{1}{2}}-F$ was 1.073, 1.634, and 1.720 in F1;and 0.443, -0.093 and 1.181 in F2 for Ismailia ,Nobaria and Gemmeiza; respectivelly, showing that the proportion of dominant alleles are greater in the parents than the recessive ones in all locations in F1 and Gemmeiza,in F2 and recessive genes are in excess in case of Ismailia and Nobaria ,in F2.The estimated values of $(h^2/H2)$,suggested that there were more than two pair of genes affected the inheritance of this trait in F1 and F2 . Similar results were showed by Blanco et.al.(1982) and Tamam (1989).

Narrow sense heritability was 15.39% ,40.46%, and 62.19% at Ismailia, Nobaria, and Gemmeiza , in F1 ,while narrow sense heritability in F2 were 0.0, 11.50% and 64.50% at Ismailia ,Nobaria ,and Gemmeiza , respectively .These results are in agreement with the findings of Hamada (1988), and Tamam (1989).

The estimates of correlation coefficients concerning plant weight between the parental order of dominance (Wr,Vr)and parental measurements (Yr) did not reach the level of significanc for F1 and F2 in all locations, except at Ismailia and Gemmeiza , in F2 indicated that the dominance was ambidirectional .

The values of (r^2) for plant weight were not close to unity in almost cases,suggesting the possibility of selection among genes showing dominance . These findings were in line with those reached by Tamam (1989).

The graphical analysis for plant weight for both F1 and F2 are shown in Figures (11 and 12). The regression lines of plant weight (b= -0.019 ± 0.132)at Ismailia;(b=0.053 ± 1.01)at Nobaria, in F1 intersected Wr axis below of the origin point ,indicating that over dominance controlled this trait in these locations,Fig (11 a and b) .These results agree with those obtained in table (33and34).The distribution of parental lines along the regression line showed that Agent at Ismailia and Baart at Nobaria , possess an excess of genes behaved as a dominant, while Giza 157 at Ismailia , and Giza 160 and Sakha 69 at Nobaria,possess an excess of genes behaved as a recessive ones .At Gemmeiza, the regression line (b=0.785± 0.199) in F1 intersected (Wr) axis to the left of the origin point confirming that partial dominance controlled this trait in this location,Fig (11 c). Theses results agree with

PLANT WEIGHT

ISMAILIA

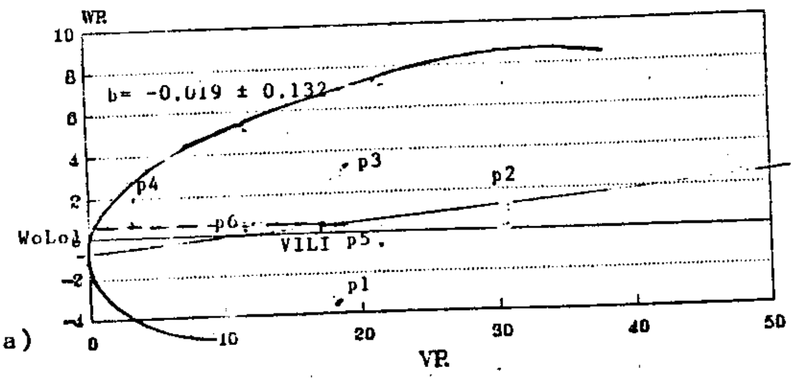

Fig. 11 (a)

NOBARIA

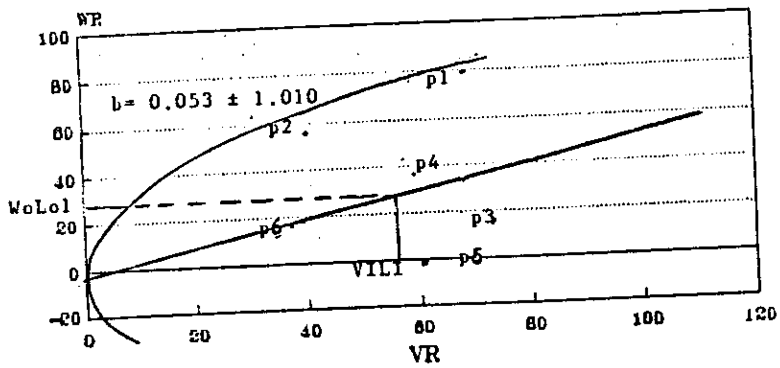

Fig 11 (b).

GEMMEIZA

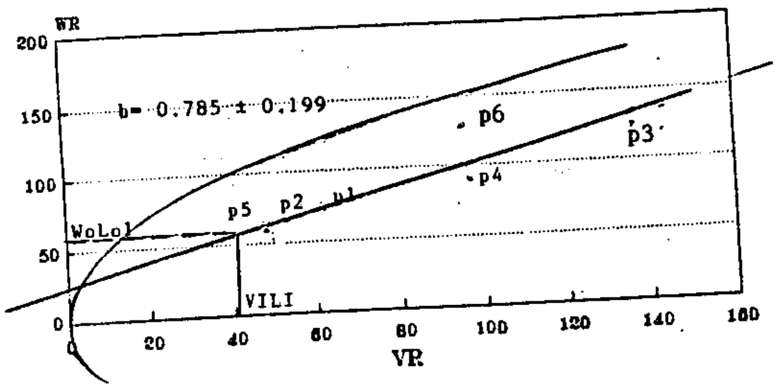

Fig 11 (c).

Fig 11 (a,b and c) Wr Vr graphs of plant weight for the F1 of the 6- parents at Ismailia, Nobaria, and Gemmeiza locations.

PLANT WEIGHT

ISMAILIA

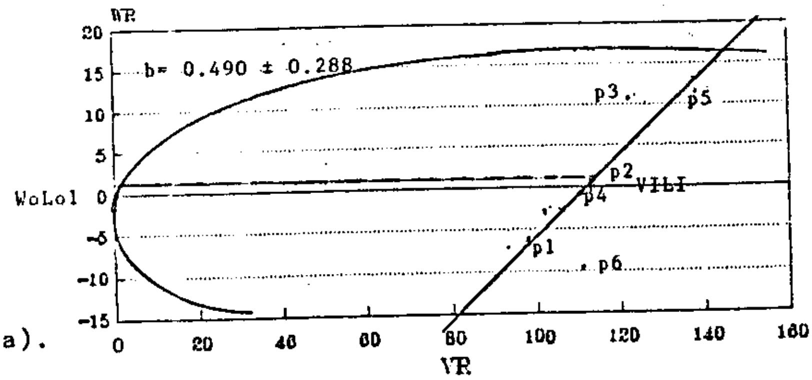

Fig. 12 (a).

NOBARIA

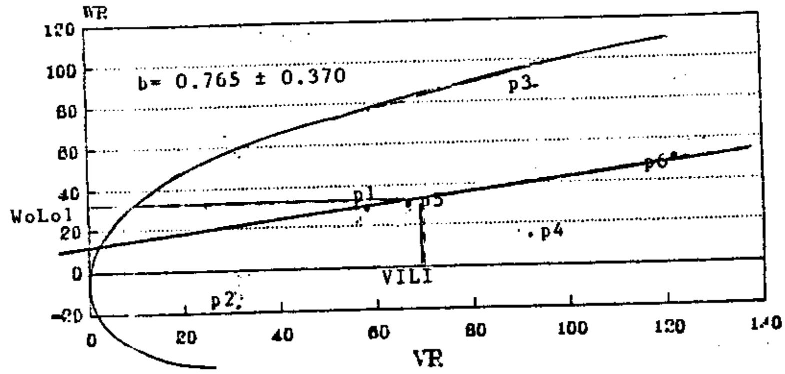

Fig 12 (b).

GEMMEIZA

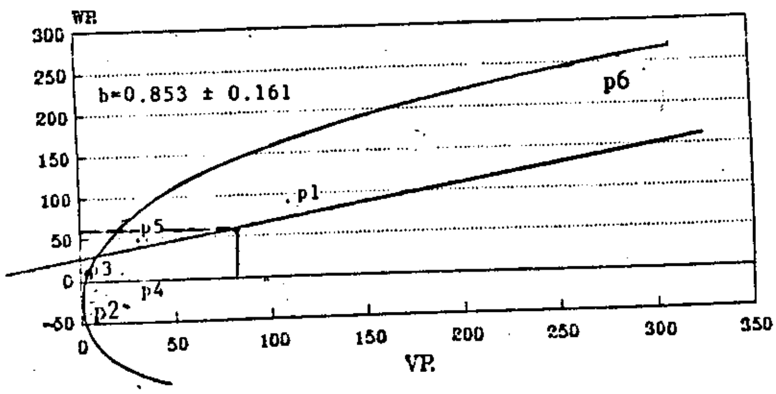

Fig 12 (c).

Fig 12 (a,b and c). Wr Vr graphs of plant weight for the F2 of the 6- parents at Ismailia, Nobaria and Gemmeiza locations.

those obtained in table (35) . The distribution of parental lines along the regression line showed that Sakha 92 possess an excess of genes behaved as a dominant ,while Giza 160 possess an excess of genes behaved as a recessive ones .

For F2 data the regression lines of plant weight (b=0.765± 0.37)at Nobaria ; and (b=0.853 ± 0.161) at Gemmeiza ,in F2 intersected (Wr) axis to the left of the origin point confirming that partial dominance controlling this trait in these location, Fig(12 b and c).these results agree with those obtained in tables (37and 38).The distribution of parental lines along the regression line showed Giza 157 and Sakha 69 at Nobaria ; and Giza 160 at Gemmeiza ,possess an excess of genes behaved as a dominant, while Baart at Nobaria; and at Gemmeiza ,possess an excess of genes behaved as a recessive ones. At Ismailia , the regression line (b=0.490±0.288) in F2 intersected (Wr) axis below of the origin point indicating that over dominance controlling this trait in this location, Fig (12 a). These results agree with $(H1/D)^{\frac{1}{2}}$ 1.787. The distribution of parental lines along the regression line showed that Sakha 69 at Ismailia ; possess an excess of genes behaved as a dominant, while Sakha 92 at Ismailia , possess an excess of genes behaved as a recessive ones. These findings were in line with those reached by Mosaad (1981), Blanco et.al. (1982) and Tamam (1989).

For grain yield/plant the additive gene effect (D) was insignificant at Ismailia in both F1 and F2 ,while significant at Nobaria and Gemmeiza in both F1 and F2 .Also the dominance effects (H1) was significant in all locations in both F1 and F2 except in Nobaria ,in F2 . The components of variation due to dominance effects correlated with gene distribution (H2) was significant in all location, in both F1 and F2 except at Nobaria, in F2 and smaller than (H1),indicating unequal allel frequency. The overall dominance effects of heterzygous loci (h^2) were significant in all locations in both F1 and F2 ,except at Nobaria, in F2 .Also,the values were insignificant in all location except at Gemmeiza ,in F1 . Similar results were showed by Hassaballa et.al.(1984), Mitkees and El-Rassas (1986) and Abdel Saboor et.al. (1990).

The quantities $(H1/D)^{\frac{1}{2}}$ were higher than unity indicating over dominance at Ismaailia and Gemmeiza in F1 and Ismailia,in F2,while partial dominance at Nobaria in F1 ;and Nobaria and Gemmeiza in F2. The proportion of genes with positive and negative alleles in the parents (H2 /4H1) was 0.225, 0.223 and 0.231 in F1 and 0.274 ,0.170 in F2 at Ismailia ,Nobaria and Gemmeiza , respectively revealing asymetric distribution of positive and negative alleles among the paarents. The ratio $(4DH1)^{\frac{1}{2}}$+ F /$(4DH1)^{\frac{1}{2}}$-F was 0.633,1.298, and 1.522 in F1 and 0.351,4.615 and 9.870 in F2 at Ismailia ,Nobaria and Gemmeiza ,respectively, showing that the proportion of dominant alleles are greater in the parents than the recessive ones at Nobaria and Gemmeiza in both F1 and F2 and recessive genes are in excess in case of Ismailia in both F1 and F2 .The estimated values of (h^2 /H2) ,suggested that there were two group of genes controlling grain yield/plant at Ismailia, one pair at Nobaria, and more than two groups of genes at Gemmeiza,in F1,while for F2 more than pairs of genes controlling this character in F2 . These results agree with those reported by Abdel Saboor et.al. (1990), and Singh (1990).

Narrow sense heritability was 19.996%,63.612% and 52.174% at Ismailia,Nobaria,and Gemmeiza,in F1,while narrow sense heritability in F2 were 0.0 ,34.4%,and 54.1% at Ismailia, Nobaria and Gemmeiza ,respectively . Similar results were showed by Hamada (1988), Abdel Saboor et.al. (1990), and Lonc and Zalewshi (1991).

The estimates of correlation coefficients (r) concering grain yield /plant between the parental order of dominance (Wr,Vr)and parental measurements(Yr)are given in tables (33to 38)showed significant and positive values for F2 at Nobaria and Gemmeiza ,indicating that the dominant genes were operating towards increasing grain yield/plant in the above mentioned cases .The insigificant and positive or negative correlation coefficient for the remaining cases in F1 and F2 in all locations ,indicated that the dominance was ambidirectional .The values of (r^2) for this trait were not close to unity in almost cases,suggesting the unlimites of selection among genes showing dominance . These findings were in line with those reached by Medvedev (1987),Lonc (1988), and Abdel Saboor et. al (1990).

The graphical analysis for grain yield/plant for both F1 and F2 are shown in Figures (13 and 14) .The regression lines of grain yield/plant at Ismailia,(b=0.016±0.062);(b=0.854 ±0.370) at Nobaria , and (b=0.841 ±0.142) at Gemmeiza ,in F1 .At Ismailia

GRAIN YIELD /PLANT

ISMAILIA

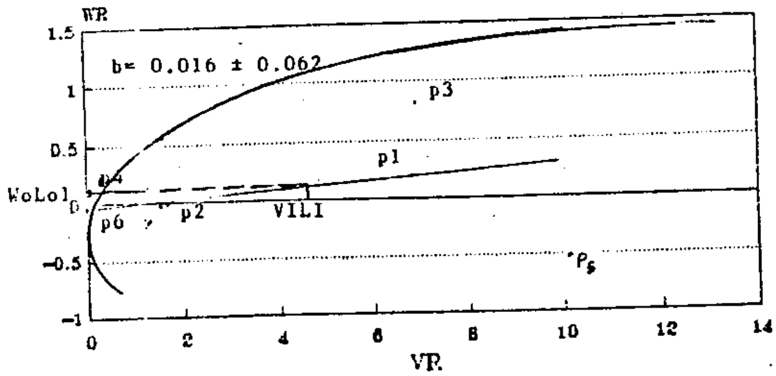

Fig. 13 (a)

NOBARIA

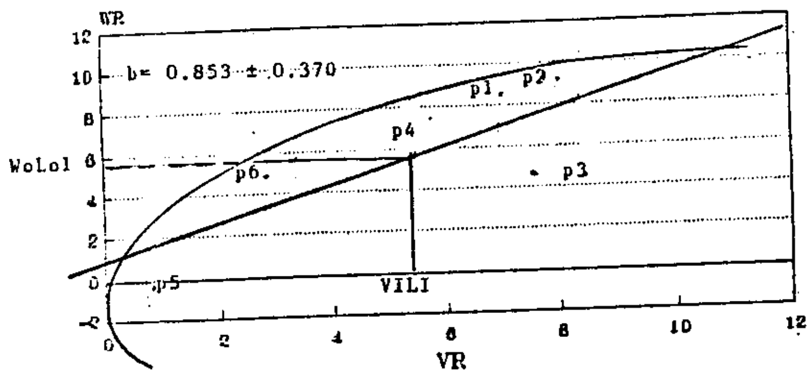

Fig 13 (b)

GEMMEIZA

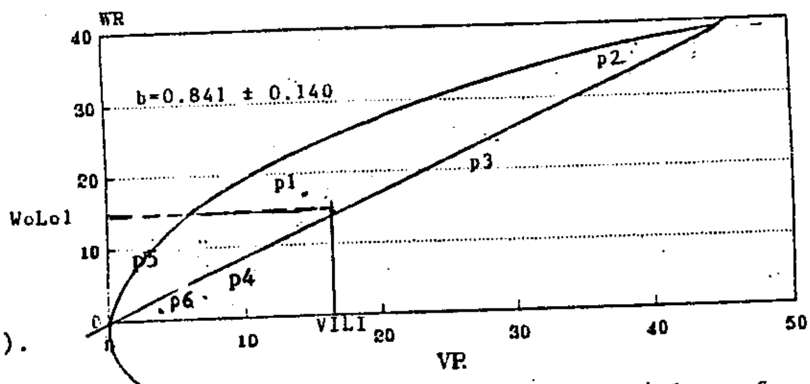

Fig 13 (c).

Fig 13 (a,b and c). Wr Vr graphs of grain yield /plant for the F1 of the 6- parents at Ismailia , Nobaria and Gemmeiza locations.

GRAIN YIELD/PLANT

ISMAILIA

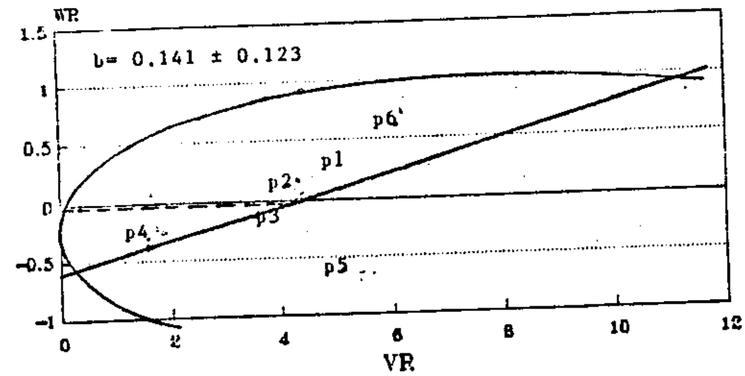

Fig. 14 (a).

NOBARIA

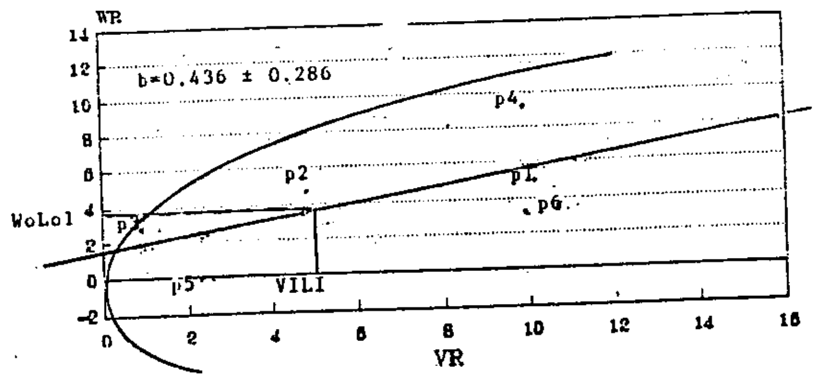

Fig 14 (b).

GEMMEIZA

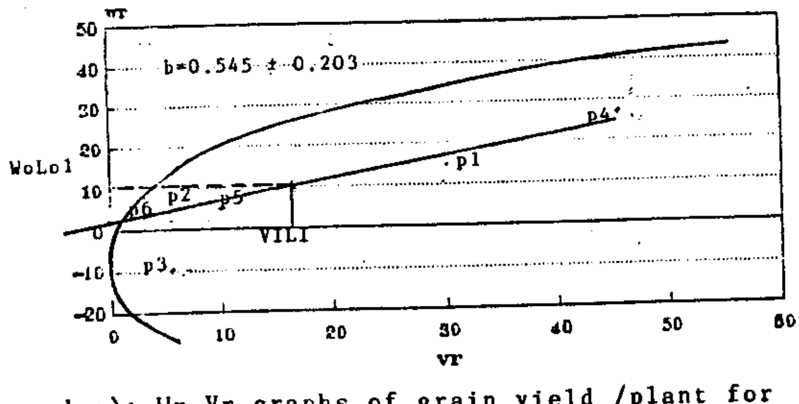

Fig. 14 (c).

Fig. 14 (a,b, and c): Wr Vr graphs of grain yield /plant for the F2 of the 6- parents at Ismailia, Nobaria and Gemmeiza locations.

,the regression lines have fallen downward to the right of the origin point densting over dominance Fig(13a);while the regression lines at Nobaria in F1 intersected (Wr) axis to the left of the origin point confirming that partial dominance controlling this trait and the regression lines at Gemmeiza,in F1 intersected (Wr) axis through the origin point ,indicating that the dominance of genes is complete the line Fig (13 b and c). These results agree with those obtained in table (34 and 35). The distribution of parental lines along the regression line showed that Baart at Ismailia ; Sakha 92 and Baart at Nobaria and Gemmeiza possess an excess of genes behaved as a dominant,while Giza 160 and Sakha 69 at Ismailia; Giza 157 and Giza 160 at Nobaria ;and Giza 157 at Gemmeiza , possess an excess of genes behaved as a recessive ones .

For F2 the regression lines (b=0.141±0.123) at Ismailia , in F2 cuts the (Wr)axis below the origin point,indicating over dominance controlling this trait in this location, Fig (14a) . These results agree with those obtained in table (36). The distribution of parental lines along the regression line showed that Agent and Giza 160 possess an excess of genes behaved as a dominant ,while Baart possess an excess of genes behaved as a recessive ones .At Nobaria and Gemmeiza, the regression lines (b=0.436± 0.286) at Nobaria and (b=0.545 ± 0.203)at Gemmeiza , in F2 intersected (Wr) axis to the left of the origin point confirming that partial dominance controlling this trait in these location Fig (14 b and c). These results agree with those obtained in tables (37 and 38). The distribution of parental lines along the regression line showed that Giza 160 at Nobaria and Gemmeiza , possess an excess of genes behaved as a dominant,while Agent at Nobaria and Gemmeiza ,possess an excess of genes behaved as a recessive ones . These results are in accordance with those obtained by Ahmed (1981), Hassaballa et.al (1984), Abul-Naas et.al.(1986), and Singh (1990).

For 100- grain weight the additive gene effect (D) was significant at Ismailia and Gemmeiza, while insignifican at Nobaria ,in both F1 and F2. Also the dominance effects (H1) was significant in all locations in both F1 and F2.The component of variation due to dominance effects correlated with gene distribution (H2) was significant in all locations in both F1 and F2 except at Ismailia,in F2 and smaller than (H1),indicating unequal allele frequancy. The overall dominance effects of heterozygous loci (h^2) were significant in all locations in F1 and F2 except at Ismailia,in F2. Also the (F) values were not significant in all locations in both F1 and F2 except at Ismailia in F1. These findings were in line with those reached by Hassaballa et.al.(1984), Lonc (1988),Tamam (1989), and Abdel-Saboor et.al.(1990).

The quantites$(H1/D)^{\frac{1}{2}}$were higher than unity indicating over dominance in all locations in F1 and Nobaria in F2,while partial dominance at Ismailia and Gemmeiza in F2.The proportion of genes with positive and negative alleles in the parents (H2/4H1)was 0.202, 0.193 and 0.214 in F2 at Ismailia, Nobaria and Gemmeiza , respectively, revealing asymetric distributions of positive and negative alleles among the parents .The ratio $(4DH1)^{\frac{1}{2}}+F/(4DH1)^{\frac{1}{2}}-F$ was 2.411,0.885 and 1.073 in F1 and 3.029, 0.451 and 4.644

in F2 at Ismailia, Nobaria and Gemmeiza ,respectivelly ,showing that the proportion of dominant alleles are greater in the parents than the recessive ones at Ismailia and Gemmeiza, in F1 and F2 and recessive genes are in excess in case of Nobaria in both F1 and F2.The estimated values of($\hat{h}^2$ /H2),suggested that there was one group of genes controlling the 100-grain weight at Nobaria in F1 and Ismailia and Nobaria ,in F2 ,while ,more than one group of genes seamed to be controlled the inheritance of this character at the other locations in both generations Similar results were showed by Abdel-Saboor et.al. (1990) and Singh (1990).

Narrow sense heritability was: 41.752%, 11.942% and 43.465% at Ismailia, Nobaria and Gemmeiza in F1 ,while narrow sense heritability in F2 were 20.90%, 0.0 and 29.90 % at Ismailia ,Nobaria and Gemmeiza, respectivelly,. These findings were in line with those reached by Hamada (1988), Tamam (1989), and Hassan and Abdel Moniem (1991)

The estimates of correlation coefficient concerning 100-grain weight between the parental order of dominance (Wr,Vr) and parental measurements(Yr)did not reach the level of significance for F1 and F2 in all locations except at Ismailia location,in F1 indicated that the dominance was ambidirectional .

The values of $(r)^2$ for this trait were not close to unity in almost cases, suggesting the possibility limits of selecation among genes showing dominance.These results are in line with those reported by Lonc (1988) and Tamam (1989)

The graphical analysis for 100- grain weight for both F1 and F2 are shown in Figures(15 and 16) . The regression lines of 100- grain weight at Ismailia , (b=0.526 ± 0.764); at Nobaria (b=0.020 ± 0.505) and at Gemmeiza ;(b=0.429 ±0.530) in F1 intersected (Wr) axis below the origin indicating over dominance, controling this trait in these location Fig (15 a,b and c) These results agree with those obtained in tables (33 to 35). The distribution of parental lines along the regression line showed that Baart and Giza 157 at Ismailia ,Sakha 92 and Agent at Nobaria, and Sakha 69 and Agent at Gemmeiza , possess an excess of genes behaved as a dominant ,while Giza 160 at Ismailia ;Sakha 69 at Nobaria ; and Baart and Giza 160 at Gemmeiza possess an excess of genes behaved as a recessive ones .

For F2 data the regression lines at Ismailia,(b=0.061±0.604) intersected Wr axis to the left of the origin indicating partial dominance controlling this trait at Ismailia Fig (16a). These result agree with those obtained in table (36).The distribution of parental lines along the regression line showed that Agent ,possessan excess of genes behaved as a dominant ,while Giza 160 and Sakha 92 possess an excess of genes behaved as a recessive ones. At Nobaria and Gemmeiza ,the regression coefficient lines(b 0.027± 0.511) at Nobaria,and (b= 0.119± 0.217) at Gemmeiza have fallen downward to the right of the origin denoting over dominance Fig (16 b and c). These results agree with those obtained in tables (37and 38).The distribution of parental lines along the regression

100-GRAIN WEIGHT

ISMAILIA

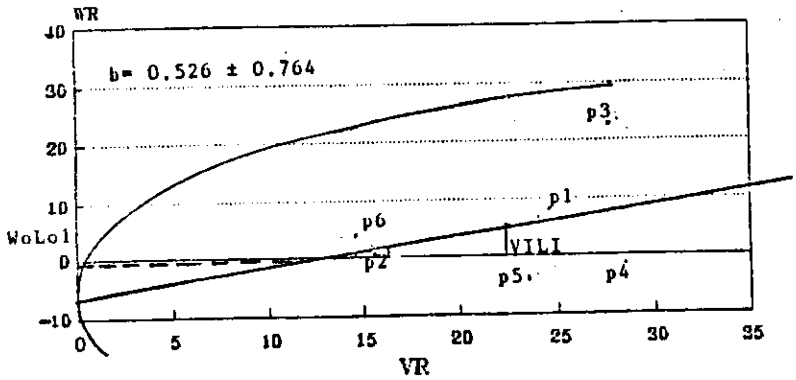

Fig. 15 (a).

NOBARIA

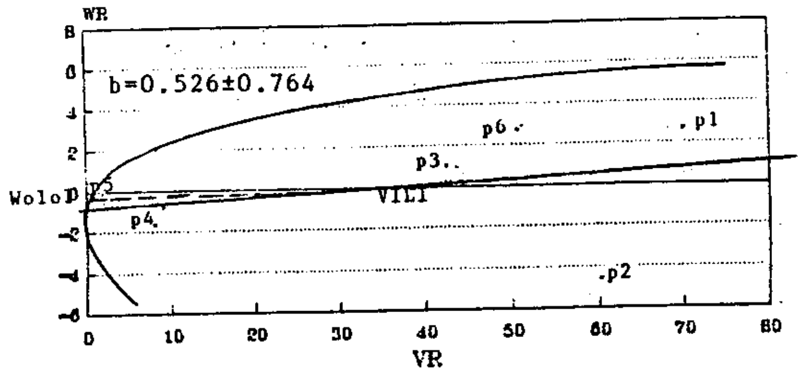

Fig. 15 (b).

GEMMEIZA

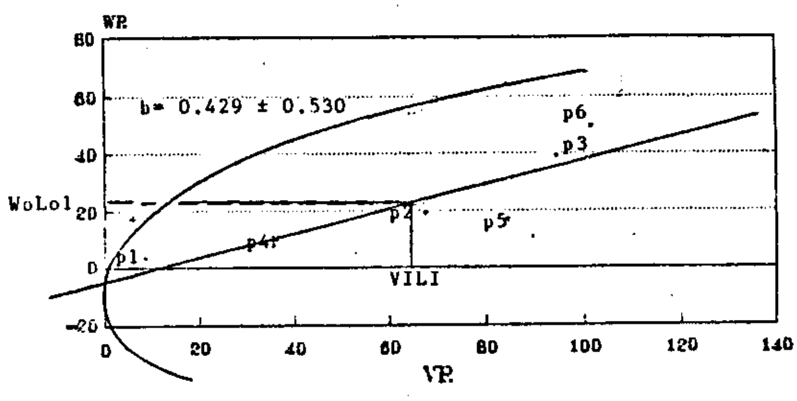

Fig. 15 (c).

Fig .15 (a,b, and c): Wr Vr graphs of 100 -grain weight for the F1 of the 6- parents at Ismailia, Nobaria and Gemmeiza locations.

100-GRAIN WEIGHT

ISMAILIA

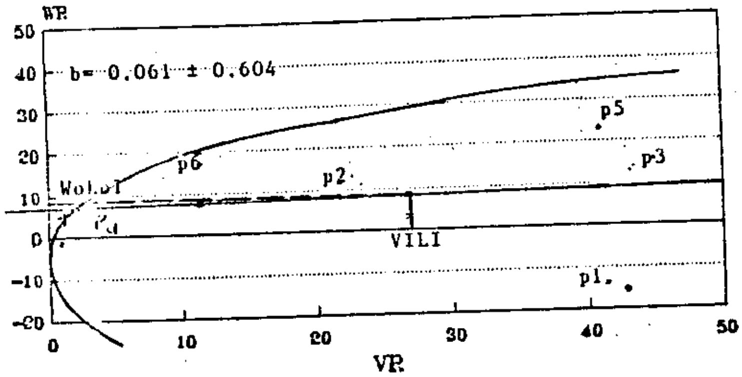

Fig. 16 (a).

NOBARIA

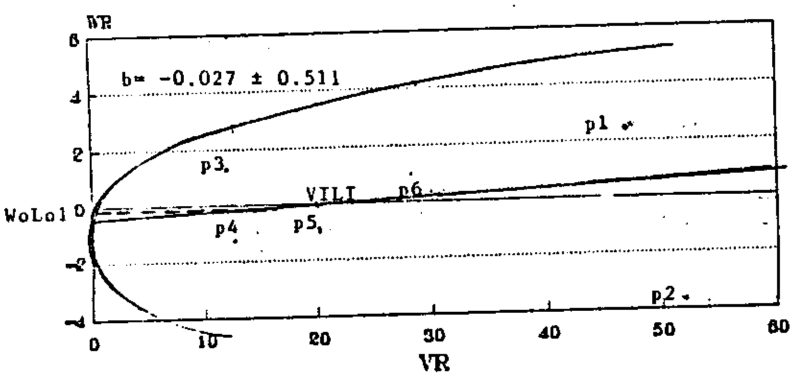

Fig. 16 (b).

GEMMEIZA

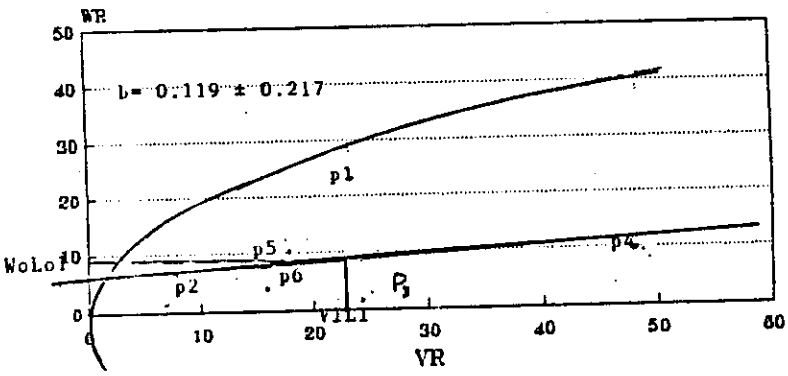

Fig. 16 (c).

Fig 16 (a,b, and c): Wr Vr graphs of 100- grain weight for the F2 of the 6- parents at Ismailia, Nobaria and Gemmeiza locations.

line showed that Agent at Nobaria and Giza 157 and Baart at Gemmeiza, possess an excess of genes behaved as a dominant , while Sakha 69 at Nobaria,and Agent at Gemmeiza , possess an excess of genes behaved as a recessive ones . Similar results were showed by Tamam (1989), Abdel Saboor et.al (1990), and Lonc and Zalewshi (1991).

Data presented in tables(33 to 38)reveal that the additive component of genetic variance (D) for stem rust disease exhibited highly significant values in F1 and F2 at the three different locations.These results indicate that the additve gene effects played a major role in the inhertance of stem rust resistance.Whereas,dominance component of variation (H1),which obtained from the analysis of F1 and F2,exhibited significant values in most of cases indicating that both additive and dominance gene effects are involved in the inheritance of stem rust in wheat with a major contribution of the additive one .

Dominance effects correlated with gene distribution (H2)were not significant at Ismailia,in F2,while the remaining values were significant in both F1 and F2,indicating asymetrical distribution of genes with positive and negative effects.The overall dominance effects of heterozygous loci (h^2) was not significant at Ismailia ,in F2 ,indicating that the effect of dominance was not due to heterozygosity .However,(h^2) exhibited highly significant values in all locations in F1 and Nobaria and Gemmeiza,in F2 confirming that dominance was undirectional .The covariances of additive and dominance effects (F) were significant in all locations ,except at Nobaria and Gemmeiza in F1 and Gemmeiza,in F2 .It could be generally concluded that an excess of recessive alleles was apparent in all cases. These findings were in line with those reached by . Khan et.al. (1992)

The average degree of dominance $(H1/D)^{\frac{1}{2}}$ indicated that partial dominance was apparent in all cases in F1 and F2, except at Gemmeiza , in F1 which appeared to be more than unity (1.737) ,suggesting a kind of over dominance effect in the expresion of stem rust resistance in wheat .The proportion of the genes with positive and negative, effects in the parents (H2 /4H1) was less than 0.23 in most cases except at Ismailia in F2 (0.396), indicating unequal distribution of positive and negative alleles in the parents and ,suggesting more dominant loci contributing these trait .The view was also supported by significant (F) values (The relative frequencies of dominant and recessive alleles in the parents). The ratio $(4DH1)^{\frac{1}{2}} + F/(4DH1)^{\frac{1}{2}} - F$ was greater than the unity (1.992,1.236 and 1.178) in F1 and (-1.850, -6.679 and 5.810) in F2 at Ismailia, Nobaria and Gemmeiza, respectively, showing that the proportion of dominant alleles was greater in the parents than the recessive ones in all locations, in both F1 and F2 .This conclution was also supported by the significant (F) values and by the fact that (H2 /4H1) was less than 0.25 .Number of genes controlling the inheritance of stem rust resistance ,suggested that this character seemed to be polygenic in all locations. It is of importance to mention that wherever gene effects are not equal as indicated by the significancy of the estimated (F) values, the estimates of number of genes may be under estimated. These results agree with in tables (33 to 38) . These results agree with those reported by

Jones et.al. (1983), Raut et.al (1984), and Abd -Ellatif (1990)

Narrow sense heritability for stem rust resistance was relatively high being 66.151%, and 77.588% in F1 as well as 91.214% and 73.979% in F2 at Ismailia and Nobaria .Where at Gemmeiza, narrow sense heritability seemed to be low or moderate values in both F1 and F2 (37.490% and 37.854%). These values of heritability in narrow sense ,suggested that selection would be effective in a chieving resistant progenies to stem rust in bread wheat .Moreover, the square values of this parameters were less than unity ,suggesting that none of parental lines was completly dominant or recessive for genes controlling any of these characters.Similar results were showed by . Higashi et.al. (1983) and Khan et.al (1992) .

The estimates of correlation coefficients between the parental order of dominance (Wr,Vr) and parental measurements (Yr) . are given in tables (33 to 38).The significant correlation coefficients obtained in resistance to stem rust in F1 at Ismailia,and for F2 at Nobaria and Gemmeiza ,indicated that the high resistant parental lines contain most of the dominant genes .While,the insignificant correlation coefficient between the parental means and their corresponding values of(Wr+Vr) in F1 at Nobaria and Gemmeiza. and at Ismailia in F2, indicated that recessive genes insignificantly act towards increasing resistance to stem rust .

The values of $(r)^2$ for stem rust infection ,were close to unity in all studied cases, suggesting the possible limits of selection among genes showing dominance .

The graphical analysis for stem rust reaction for both F1 and F2 are shown in Figures (17 and 18) .The regression coefficients lines of stem rust at Ismailia ,(b=1.025 ±0.071) and at Nobaria , (b=0.384 ±0.147) in F1 intersected (Wr) axis to the left origin point confirming that partial dominance controlling this trait in these location, Fig(17 a and b) .These results agree with those obtained in tables (33 and 34). The distribution of parental lines along the regression line showed that Agent and Sakha 69 at Ismailia and Sakha 69 at Nobaria , possess an excess of genes behaved as a dominant , while Giza 160 at Ismailia and Nobaria , possess an excess of genes behaved as a recessive ones.At Gemmeiza , the regression coefficients lines (b= 0.804 ±0.199) have fallen downward the right of the origin denoting over dominance Fig(17c) . These results agree with those obtained in table (35) . The distribution of parental lines along the regression line showed that Baart.possess an excess of genes behaved as a dominant,while Giza 157 possess an excess of genes behaved as a recessive ones .

For F2 data the regression lines (b=1.043 ±0.264)at Ismailia , (b=1.133 ±0.242) at Nobaria and (b=0.663 ±0.247) at Gemmeiza,intersected Wr axis to the left origin point indicating that partial dominance controlling this trait in three locations Fig(18 a.b and c). These results agree with those obtained in tables (33 to 38).The distribution of parental lines along the

STEM RUST
ISMALIA

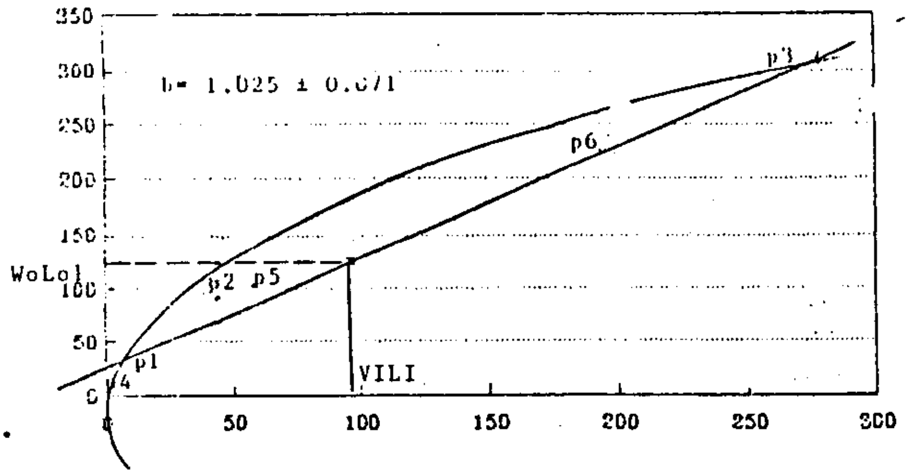

Fig. 17 (a).

NOBARIA

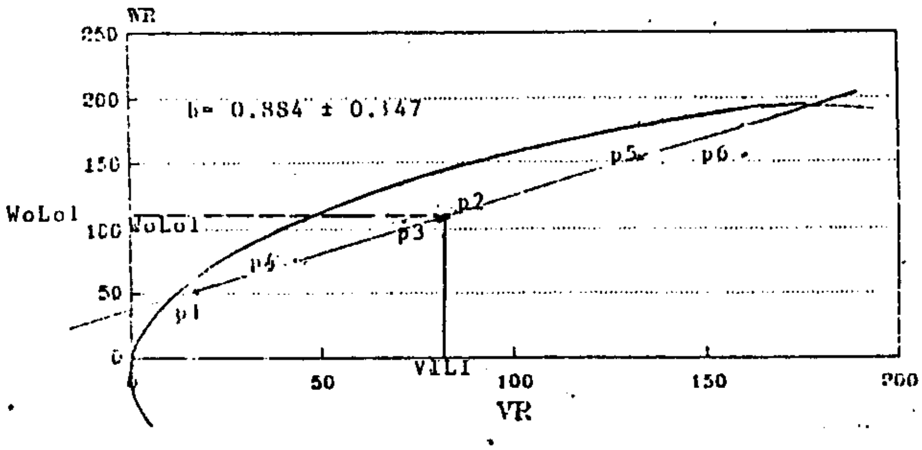

Fig. 17 (b).

GEMMEIZA

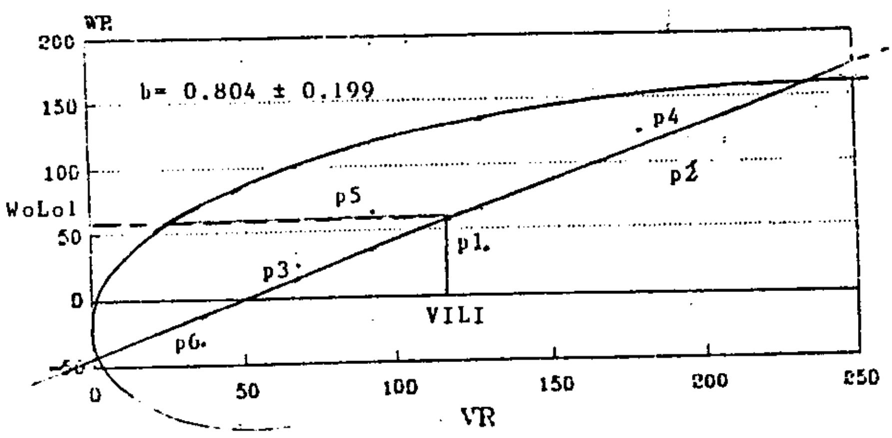

Fig 17 (c).

Fig. 17 (a,b and c): Wr.Vr graphs of stem rust reaction for the F1 of the 6- parents at Ismailia, Nobaria, and Gemmeiza locations.

STEM RUST

ISMAILIA

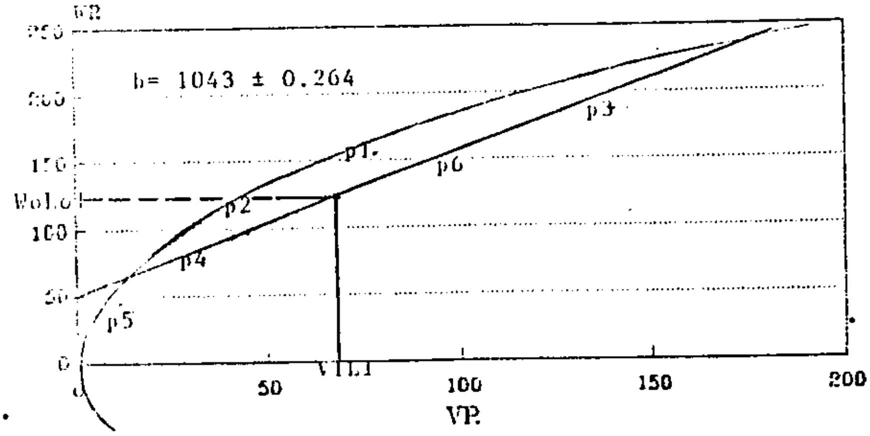

Fig. 18 (a).

NOBARIA

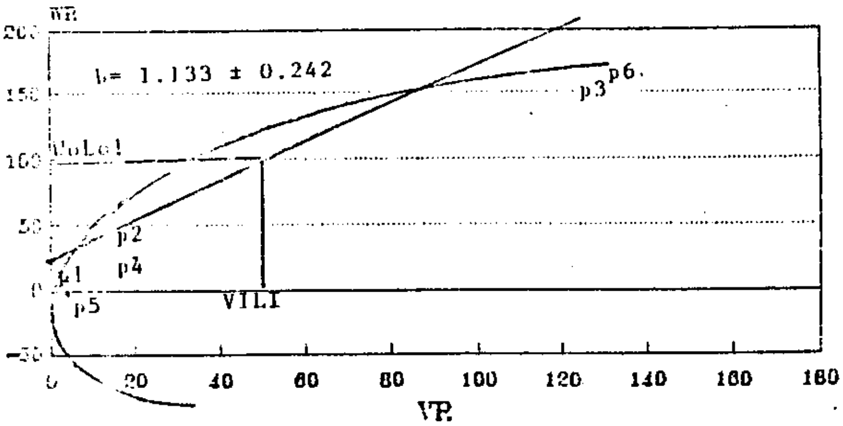

Fig. 18 (b).

GEMMEIZA

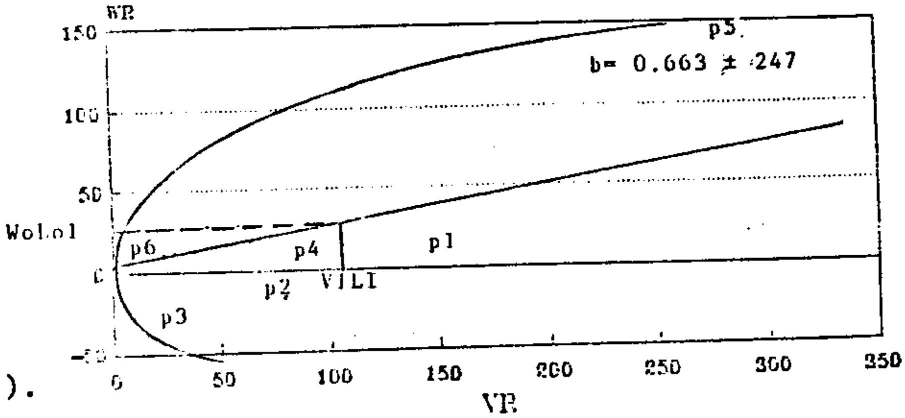

Fig.18 (c).

Fig.18 (a,b and c): Wr Vr graphs of stem rust reaction for the F2 of the 6- parents at Ismailia, Nobaria and Gemmeiza locations.

regression line showed that Sakha 92 at Ismailia and Sakha 69 at Nobaria; and Giza 160 at Gemmeiza, possess an excess of genes behaved as a dominant , while Giza 160 at Ismailia and Baart at Nobaria ; and Sakha 69 at Gemmeiza , possess an excess of genes behaved as a recessive .These results are in accordance with those obtained by Singh and Mcintosh (1987), Abd- Ellatif (1990),and Khan et.al. (1992).

This can be due to the interaction between the genetic constitutions of these varieties and the environmental factors at differant locations.

G- correlation between grain yield and its contributing characters:

Wheat grain yield seems to be rather complex character.The phenotypic and genotypic correlation coefficients between grain yield and its contributing characters provide the breeder with information about the characters which have substantial contribution and that of relatively meagre effect on grain yield. It would be highly helpful for breeding program to distinguish plant characters which strongly correlated with grain yield and proves to be highly heritable under different locations.

Phenotypic and genotypic correlation coefficient between grain yield and its attributes,i.e. plant height, spike length, number of spikes/plant,number of spikelets/spike,number of grains /spike,plant weight and 100-grain weight were calculated for different wheat genotypes and their F1 and F2 grown under three locations,i.e.Ismailia,Nobaria and Gemmeiza.Data of the F1 and F2 presented in tables (39 to 41) showed that grain yield /plant in F1 appeared to be phenotypically and genotypically correlated with each of plant weight(0.375** and 0.187**)at Nobaria location;and number of spikes/plant (0.215** and 0.193**)and 100-grain weight (o.452** and o.213**)at Gemmeiza location; respectively. Comparing with F2 ,it was, phenotypically and genotypically correlated with each of plant height (o.327** and o.228**),number of spike/ plant (o.378** and o.317**), number of spikelets /spike (o.360** and o.427**); plant weihgt (o.701** and 0.494**) at Ismailia location; number of spikes/plant(o.409** and o.343**), plant weight (o.669** and o.7[illegible]**) 100- grain weight (o.347** and o.253**) at Nobaria location;

Table (39).The phenotypic and genotypic correlation between yield and yield components in the F1 of wheat (upper right)and F2 of wheat (lower left)at Ismailia location.

Characters		Plant height	Spike length	No.of spikes/ plant	NO.of spikelets spike	No.of grains/ spike	plant weight	100-grain weight	grain yield/ plant
Plant height	Ph	-	0.576**	-0.092	0.590**	0.064**	-0.091	-0.070	-0.070
	G	-	0.186*	0.048	0.214**	-0.027	0.038	0.025	0.034
Spike length	Ph	0.557**	-	-0.008	0.643**	0.268**	0.153*	0.270**	0.195**
	G	0.316**	-	0.015	0.249**	-0.063	0.031	0.082	0.117
No.of spikes/ plant	Ph	0.349**	0.055	-	-0.104	-0.244**	0.295**	0.109	0.018
	G	0.252**	0.200**	-	0.067	0.161*	0.190**	-0.035	0.189**
No.of spikelets/ spike	Ph	0.558**	0.585**	0.289**	-	0.318**	0.037	-0.143*	0.107
	G	0.302**	0.361**	0.193**	-	0.146*	-0.017	0.065	0.222**
No.of grains/ spike	Ph	0.179*	0.492**	0.107	0.455**	-	-0.213**	-0.465**	-0.056
	G	0.114	0.302**	0.033	0.280**	-	0.108	0.216**	0.034
Plant weight	Ph	0.350**	0.263**	0.269**	0.409**	0.084	-	0.137*	0.049
	G	0.198**	0.003	0.191**	0.222**	0.054	-	0.059	0.029
100 - grain weight	Ph	-0.144*	-0.395**	-0.134	-0.284**	-0.402**	-0.056	-	0.007
	G	-0.104	-0.345**	-0.131	0.470**	-0.335**	-0.042	-	0.189**
Grain yield/	Ph	0.327*	0.145*	0.378**	0.360**	0.023	0.701**	0.014	-
	G	0.228**	0.079	0.317**	0.427**	0.018	0.494**	0.162*	-

Table (40).The phenotypic and genotypic correlation between yield and yield components in the F1 of wheat (upper right)and F2 of wheat (lower left)at Nobaria location.

Characters		Plant height	Spike length	No.of spikes/ plant	NO.of spikelets spike	No.of grains/ spike	plant weight	100-grain weight	grain yield/ plant
Plant height	Ph	-	0.180*	0.279**	0.149*	0.297**	0.213**	0.045	0.008
	G	-	-0.002	-0.112	-0.056	-0.134**	-0.081**	-0.018**	0.002
Spike length	Ph	0.041	-	0.126	-0.089	0.431	0.449	0.260	0.129
	G	0.011	-	-0.029	0.064**	-0.076*	-0.013**	-0.088**	0.022**
No.of spikes/ plant	Ph	0.022	-0.008	-	0.485**	0.147	0.539**	0.279**	0.293
	G	0.014	-0.082	-	-0.189	-0.071**	0.218**	0.218**	0.093**
No.of spikelets/ spike	Ph	-0.123	0.065	** 0.197*	-	0.283	0.183	0.222	0.298
	G	-0.074	0.056	0.149	-	-0.128	0.069**	-0.083**	-0.102
No.of grains/ spike	Ph	-0.067	-0.100*	0.118**	** 0.375**	-	0.293*	0.210	0.030
	G	-0.048	0.139	0.785**	0.328**	-	-0.133	-0.099**	-0.014**
Plant weight	Ph	0.016	-0.009	0.614**	0.395**	** 0.225**	-	0.204	0.375**
	G	-0.009*	-0.116	0.604*	-0.408	-0.275**	-	-0.081	0.187
100 - grain weight	Ph	0.152	-0.120	0.174*	0.051	0.313**	* 0.155*	-	0.073
	G	0.096**	-0.120	-0.337**	-0.023**	-0.295**	0.172**	-	0.114
Grain yield/	Ph	0.225*	-0.105	0.409**	0.472**	0.596**	0.669**	** 0.347**	-
	G	0.153	-0.132	0.343	0.332	-0.593	0.785	0.253	-

Table (41). The phenotypic and genotypic correlation between yield and yield components in the F1 of wheat (upper right) and F2 of wheat (lower left) at Gemmeiza location.

Characters		Plant height	Spike length	No. of spikes/ plant	NO. of spikelets spike	No. of grains/ spike	plant weight	100-grain weight	grain yield/ plant
Plant height	Ph	-	0.118	0.050	** 0.387 *	-0.047	0.082	** 0.290	** 0.395 *
	G	-	0.069	0.017	0.148 **	0.019 **	0.028	-0.101 **	-0.141 **
Spike length	Ph	-0.102 **	-	0.053	0.566 **	0.189	-0.102 **	0.279	0.302
	G	0.282 **	- *	0.019	0.235 **	0.083 *	0.299 **	0.091 **	0.015 **
No. of spikes/ plant	Ph	-0.352 *	0.144	-	0.248	-0.170	0.621 **	-0.510 **	0.215 **
	G	0.149	-0.030 **	-	-0.066	0.071 **	0.212 *	0.177	0.193 **
No. of spikelets/ spike	Ph	0.093	0.413	0.022	-	0.294 *	0.140	0.078	0.472
	G	-0.014	0.146	-0.013 **	- **	0.138	-0.053 *	-0.017	-0.117 **
No. of grains/ spike	Ph	-0.042	0.105 *	-0.376 *	0.315	-	-0.133	-0.085	0.297
	G	0.018 *	0.169 *	0.179 **	-0.054 *	- *	0.056	0.036 **	-0.129
Plant weight	Ph	-0.163	0.145 **	0.748	0.162	-0.138	-	-0.263	0.009
	G	0.079 **	0.275 **	-0.039	-0.025	0.074	-	0.092	0.003 **
100 - grain weight	Ph	-0.383 **	0.450 **	0.091 *	0.103	-0.103	0.076	-	0.452 **
	G	0.207	-0.364 **	-0.165 **	-0.070 **	0.182 **	-0.012 **	- **	0.213
Grain yield/	Ph	-0.388 *	0.443 *	0.412 **	0.361 *	0.413 **	0.383	0.526	-
	G	0.162	-0.177	0.365	-0.137	-0.188	-0.004	-0.098	-

and number of spikes/plant(o.412** and o.365**) at Gemmeiza location; respectively. These results agree with those found by Yu et. al. (1982), Gomaa (1983), Hamada (1988) and Ikram and Tanach (1991).

Grain yield/plant was correlated phenotypically in the F1 with each of spike length (o.195**) at Ismailia location;number ofspikes/ plant (o.293**) and number of spikelets /spike (o.298**) at Nobaria location;and plant height (o.395**), spike length (o.302**), number of spikelets/spike (o.472**) and numbre of grains/spike (o.297**) at Gemmeiza. Comparing with F2 generation, it was phenotypically correlated with spike length (0.145*) at Ismailia location; plant height(-0.225**)number of spikelets/spike(0.472**)and of grains/spike (0.596**),at Nobaria location; plant height(-0.388**),spike length (0.445**),number of spikelets/spike(0.361**),number of grains/ spike (0.413**),plant weight(0.383**)and 100-grain weight(0.526**)at Gemmeiza location.Similar results were obtained by Govindaraj and Mani (1981), Behl et.al. (1983), Bhullar and Nijjar (1984), Hamada (1988), Selim (1989), and Uzik and Sudyova (1992).

Grain yield/ plant in the F1 was correlated genotypically with each of number of spikes/plant (0.189**), number of spikelets/ spike (0.222**)and 100-grain weight (0.189**)at Ismailia location;and plant height (-0.141*) at Gemmeiza location;.Comparing with the F2 it was genotypically correlated with 100- grain weight (0.162*) at Ismailia location;plant height(0.153*),number of spikelets/ spike (-0.332**) and number of grains/spike(-0.593**) at Nobaria location; plant height(0.162*),spike length (-0.177*) and number of grains/ spike(-0.188**)at Gemmeiza location. These findings were in line with those obtained by Li and Yang (1985), Singh et.al.(1985), Kumar and Chowdhury (1986), Hamada (1988), and Kozdoj (1990).

Plant height in the F1 was phenotypically and genotypically correlated with each of spike length (0.576** and 0.186**)at Ismailia location;and number of spikelets/spike (0.387** and 0.148*)at Gemmeiza location;.Plant height was phenotypically correlated with number of spikelets/spike(0.590**)at Ismailia location; spike length (0.180*)number of spikes/plant(0.279**),number of spikelets/ spike(0.149*),number of grains/spike(0.297**)and plant weight(0.213**) at Nobaria location;and 100-grain weight (0.290**)at Gemmeiza location;.On the other hand plant height was genotypically correlated with number of spikelets/spike(-0.214**).Comparing with the F2 generation it was phenotypically and genotypically correlated with each of spike length (0.557** and 0.316**),number of spikes/plant(0.349** and 0.252**),number of spikelets/spike(0.558** and 0.302**)and plant weight(0.350** and 0.198**)at Ismailia location.Plant height was phenotypically correlated with number of grains/ spike (0.179*)and 100-grain weight at Ismailia location;100-grain weight (0.152*)at Nobaria location ; and number of spikes /plant (-0.352**), plant weight (-0.163*)and 100-grain weight(-0.383**)at Gemmeiza location. It was genotypically correlated with each of spike length (0.282**)number of spikes/plant (0.149*)and 100-grain weight (0.207**) at Gemmeiza location. Similar results were reported by Bhullar and Nijjar (1984),Hamada (1988), Selim (1989), Tamam (1989), and Oliveira and Camargo (1991).

Concerning spike / length, it was phenotypically and genotypically correlated with each of was number of spikelets/ spike (0.643** and 0.249) and (0.566** and 0.235)at Ismailia and

Gemmeiza locations, respectively.

Spike length in the F1 was phenotypically correlated with each of number of grains/spike(0.268**), plant weight(0.153*)and 100-grain weight (-0.270**)at Ismailia location;plant weight (0.449**)and 100- grain weight (0.260**)at Nobaria location;and number of grains/spike (0.189**)and 100-grain weight (0.279**)at Gemmeiza location.On the other hand spike length was genotypically correlated with plant weight (0.299**)at Gemmeiza location.Comparing with the F1 it was phenotypically and genotypically correlated with each of number of spikelets / spike (0.585** and 0.361**), number of grains /spike(0.492** and 0.302**) and 100- grain weight (-0.395** and -0.345**) at Ismailia location;and number of spikelets/spike(0.413** and 0.146*) and plant weight(0.145* and 0.275**)at Gemmeiza location. It was also phenotypically correlated with each of number of spikes / plant (0.200**) and plant weight (0.263**) at Ismailia location;and number of spikes/plant(0.144*)and 100-grain weight (0.450**) at Gemmeiza location . On the other hand it was genotypically correlated with number of grains/spike (-0.139*)at Nobaria location;and number of grains/spike (0.169*)and 100-grain weight (-0.364**) at Gemmeiza location. These results are in line with those reported by singh et.al. (1982), Gomaa (1983), Shamsuddin (1987), Hamada (1988),Selim (1989) and Kozdoj (1990).

Concerning number of spikes/plant in the F1,it was phenotypically and genotypically correlated with each of plant weight (0.295** and 0.190**)at Ismailia location ; plant weight (0.539** and 0.218**)and 100- grain weight(0.279** and 0.218**)at Nobaria location; and plant weight (0.621** and 0.212**)at Gemmeiza location.whereas,it was phenotypically correlated with number of grains/spike(-0.244**) at Ismailia location ;number of spikelets/spike(0.485**)and number grains/ spike (o.485** and number of grains/spike (o.147*)at Nobaria location; and number of spikelets /spike (o.248**),numer of grains/ spike(-o.770**) and 100- grain weight (-o.510**) at Gemmaiza location. On the other hand number of spikes / plant was genotypically correlated with number of grains/spike(o.161*)at Ismailia location; number of spikelets/spike (-o.189**)and 100-grain weight at Nobaria location. Comparing with the F2 generation, it was phenotypically and genotypically correlated with number of spikelets/spike (o.289** and o.193**)and plant weight (o.269** and o.191**) at Ismailia location; and plant weight (o.614** and o.604**)at Nobaria location. Whereas, it was phenotypically correlated with number of spikelets/ spike (o.197**) and 100- grain weight (o.174*)at Nobaria location;and number of grains/spike (-o.376**)at Gemmeiza location.It was olsa genotypically correlated with number of spikelets/spike (-0.149*),number of grains/spike (0.179*) and 100- grain weight (-0.337**)at Nobaria location;and number of grains/spike (0.785**)and 100-grain weight (-0.165**)at Gemmeiza location. These result agree with those found by Singh et.al (1985),Kumar and Chowdhury (1986), Hamada (1988), Ikram and Tanach (1991), and Uzik and Sudyova (1992)

Number of spikelets/spike in the F1 was phenotypically and genotypically correlated with each of number of grains/spike (0.385** and 0.148*)and (0.294** and 0.138*) at Ismailia and Gemmeiza locations,respectively.It was phenotypically correlated with each of 100-grain weight(-0.143*)at Ismailia location ;number of grains /spike (0.283**),plant weight (0.183**) and 100- grain weight (0.222**) at Nobaria location;and plant weight(0.140*)at Gemmeiza location. Comparing with the F2 for number of spikelets/spike; it was phenotypically and genotypically correlated with each of number of grains/spike(0.455** and 0.280**)and plant weight(0.409** and 0.222**) at Ismailia location;and number of grains/spike (0.375** and 0.328**) at Nobaria location. It was also phenotypically correlated with 100-grain weight(-0.284**)at Ismailia location;plant weight (0.395**) at Nobaria location; and number of grains/spike (0.315**) and plant weight (0.162*) at Gemmeiza location. It was also genotypically correlated with 100- grain weight (0.470**) at Ismailia locaation; plant weight (-0.408**) at Nobaria location . Similar results were obtained by Li and Yang (1985), Shamsuddin (1987), Selim (1989), and Tamam (1989).

Number of grains/spike in the F1 was phenotypically correlated with each of plant weight (-0.213**) 100- grain weight (-0.465**)at Ismailia location; plant weight (0.293**) and 100- grain weight (0.210**) at Nobaria location; and plant weight (-0.133*) at Gemmeiza location. It was genotypically correlated with 100 - grain weight (0.210**) at Ismailia location; and plant weight (-0.133*) at Nobaria location. Comparing with the F2 for the number of grains/spike , it was phenotypically and genotypically correlated with 100- grain weight (-0.402** and -0.335**)at Ismailia location . It was phenotypically correlated with plant weight (0.225**) and 100- grain weight (0.313**)at Nobaria location;and plant weight (-0.138**) at Gemmeiza location.It was also genotypically correlated with plant weight (-0.275**) and 100-grain weight (-0.295**) at Nobaria location; and 100- grain weight (0.182**) at Gemmeiza location. These results are in agreement with findings of Singh et.al. (1982), Yu et.al.(1983), Bhullar and Nijjar (1984), Hamada (1988), and Kozdoj (1990)

Plant weight was phenotypically correlated with 100- grain weight (0.137^{*}, 0.204^{**}, and -0.263^{**}) at Ismailia ,Nobaria, and Gemmeiza locations,respectively .Comparing with the F2 generatin ,it was phenotypically and genotypically correlated with 100-grain weight (0.155^{*} and 0.172^{*}).at Nobaria location. These findings were in line with those obtained by Gomaa (1983), Hamada (1988), Selim (1989) and Tamam (1989).

H- Stem rust reaction

The mean performance of parents, F1 and F2 at three locations, and from the combined data over all locations for stem rust reaction are presented in table (42).The results showed that stem rust infection for the parents ranged from (0.0 to 43.33) with an average of (16.833) at Ismailia ;(0.067 to 36.667) with an average of 15.90 at Nobaria;(0.067 t0 33.330) with an average of (21.122) at Gemmeiza ; and ranged from (0.044 to 37.778) with an average (17.952) in the combined data .The least infection score was observed in Agent and Sakha 92 at Ismailia and Nobaria ; and Agent and Sakha 69 at Gemmeiza ;and also in the combined data. On the other hand Giza 160 and Baart showed the highest infection score in all locations, and in the combined data .

At Ismailia the mean stem rust infection score for F1 ranged from 0.925 in the cross Giza 160 x Agent to 33.915 in the cross Giza 160 x Baart with an average of 8.785 .At Nobaria the score of infection ranged from 1.267 in the cross Giza 157 x Agent to 28.493 in the cross Giza 160 x Sakha 92 with an average of 12.949 . At Gemmeiza the infection ratio ranged from 6.800 in the cross Giza 157 x Agent to 44.333 in the cross Sakha 69 x Giza 160 with an average of 26.048 .The analysis of combined data gave a score of infection ranging from 3.506 in the cross Giza 157 x Agent to 29.401 in the cross Giza 160 x Baart with an average of 15.927 .The crosses ,(10,3,13, and 7) at Ismailia ;(7,13,and 3) at Nobaria ; (7, 8, and 4)at Gemmeiza ; and (7, 4, 13, and 3)in

Table (42). The mean stem rust infestation scores of parents, F1 and F2 at three environments and from the combined data over all environments.

Crosses + Parents	Parents + F1				Parents + F2			
	E1	E2	E3	Comb.	E1	E2	E3	Comb.
Sakha 69	5.33	5.33	20.00	10.22	5.33	5.33	20.00	10.22
Giza 157	11.667	15.00	20.00	15.55	11.66	15.00	20.00	15.55
Giza 160	43.33	36.66	33.33	37.77	43.33	36.66	33.33	37.77
Agent	0.0	0.06	0.06	0.04	0.0	0.06	0.06	0.04
Sakha 92	4.00	5.00	23.33	10.77	4.00	5.00	23.33	10.77
Baart	36.66	33.33	30.00	33.33	36.66	33.33	30.00	33.33
Sakha 69 x Giza 157 (1)	2.49	3.34	36.80	14.44	9.41	5.80	40.57	18.59
Sakha 69 x Giza 160 (2)	5.90	13.56	44.33	21.26	28.25	7.97	50.17	28.80
Sakha 69 x Agent (3)	2.22	2.60	27.00	10.60	7.79	6.43	44.12	19.45
Sakha 69 x Sakha 92 (4)	4.42	5.18	12.76	7.45	6.06	5.79	27.25	13.03
Sakha 69 x Baart (5)	3.69	3.05	25.95	10.90	16.78	5.59	40.37	20.91
Giza 157 x Giza 160 (6)	15.06	24.27	41.66	27.00	18.60	10.28	39.79	22.89
Giza 157 x Agent (7)	2.45	1.26	6.80	3.50	5.10	4.82	44.06	17.99
Giza 157 x Sakha 92 (8)	13.65	18.63	10.73	14.34	8.86	3.31	42.65	18.27
Giza 157 x Baart (9)	17.98	16.65	18.03	17.55	18.86	6.35	36.40	20.54
Giza 160 x Agent (10)	0.92	16.50	23.97	13.80	12.01	9.09	44.38	21.83
Giza 160 x Sakha 92 (11)	10.71	28.49	37.18	25.46	13.36	6.71	44.79	21.62
Giza 160 x Baart (12)	33.91	28.40	25.88	29.40	28.73	18.14	43.84	30.24
Agent x Sakha 92 (13)	2.26	2.14	18.33	7.57	9.78	8.34	39.98	19.34
Agent x Baart (14)	5.88	4.61	36.26	15.59	18.76	4.61	35.61	19.66
Sakha 92 x Baart (15)	10.20	25.51	25.00	20.23	9.88	5.65	39.69	18.41

Whereas:

E1 : Ismailia

E2 : Nobaria

E3 : Gemmeiza

the combined data , gave the lowest infection rate , while the crosses (12,9 and 6) at Ismailia; (11,12 and 15) at Nobaria ;(2,6, and 11) at Gemmeiza ;and (12, 6, and 11) in the combined data gave the highest one .

In general the crosses which involve Agent or Sakha 69 as common parents exhibited lower infection score than the other crosses .While the crosses which involve Giza 160 and Baart as common parents showed the highest infection score.

The mean stem rust infection score for F2 ranged from 5.109 in the cross Giza 157 x Agent to 28.736 in the cross Giza 160 x Baart with an average of 14.153 at Ismailia .At Nobaria the infection ratio ranged from 3.317 in the cross Giza 157 x Giza 160 to 18.149 in the cross Giza 160 x Baart with an average of 7.264 .At Gemmeiza the infection score ranged from 27.253 in the cross Sakha 69 x Sakha 92 to 50.173 in the cross Sakha 69 x Giza 160 with an average of 40.908 .In the combined data infection score ranged from 13.039 in the cross Sakha 69 x Sakha 92 to 30.242 in the cross Giza 160 x Baart with an average of 20.775 .The crosses (7,4,3, and 8) at Ismailia;(8,14 and 7)at Nobaria ; (4,14 and 9) at Gemmeiza ;and (4,7 and 8)in the combined data, gave the lowest infection score, while the crosses (12,2, and 9) at Ismailia; (12, 6, and 10) at Nobaria ; (2,11, and 3) at Gemmeiza ; and (12,2, and 6) in the combined data gave the highest ones .

In general the crosses involving Agent as common parents exhibited lower infection score than the other crosses .While, the crosses which have Baart and Giza 160 as common parents showed the highest infection score .

The seedling stage test

The inheritance of stem rust resistance to races 11 and 34 at the seedling stage was studied in the some crosses to investigate the field reaction in the adult stage .The results are shown in table (43).

Race 11

Resistance x susceptible

In F2 the seedling test to race 11 of the three crosses involving the resistant variety Agent and each of the three susceptible varieties Giza 157, Giza 160 and Baart ,the Chi-square test for the goodness of fit gave a stisfactory fit to a ratio of 15 resistants : 1 susceptible(P= 0.80 - 0.70) for the first(Agent x Giza 157) cross; 13 resistant : 3 susceptible (p= 0.80 - 0.70) for Agent x Giza 160 ; and 13 resistant : 3 susceptible (p= 0.30 - 0.20) for Agent x Baart . The three crosses involving the resistant Sakha 69 and each of the three susceptible varieties Giza 160, Giza 157, and Baart ,the Chi-square test for the goodness of fit gave a satisfactory fit to a ratio of 13 resistant : 3 susceptible (p= 0.10- 0.05) for the first cross; 15 resistant : 1 susceptibles (p= 0.95 -0.90) for the second cross and 9 resistant : 7 susceptible (p= 0.20- 0.10) for the thrid cross. Similar results showed by Bartos et.al. (1983), Kosner and Bartos (1983) and Abd Ellatif (1990).

Table (43). Observed and expected ratios in F2 of diallel crosses at the seedling stage to predominant races,11 and 34 under the Egyption condition.

Crosses	Resistance	Susceptible	Ratio	Chi square	P.value
		Race 11			
Resistance x Susceptible					
Agent x Giza 157	161	12	15:1	0.139	0.80-0.70
Agent x Giza 160	98	21	13:3	0.093	0.80-0.70
Agent x Baart	123	21	13:3	1.640	0.30-0.20
Sakha 69 x Giza 157	93	6	15:1	0.005	0.95-0.90
Sakha 69 x Giza 160	93	12	13:3	3.693	0.10-0.05
Sakha 69 x Baart	99	61	9:7	2.057	0.20-0.10
Moderate resistance x Susceptible					
Sakha 92 x Giza 157	175	6	15:1	2.66	0.20-0.10
Sakha 92 x Giza 160	125	18	13:3	3.564	0.10-0.05
Sakha 92 x Baart	164	6	15:1	2.152	0.20-0.10
Moderate resistance x Resistance					
Sakha 92 x Agent	112	17	13:3	2.627	0.20-0.10
Sakha 92 x Sakha 69	163	15	15:1	1.439	0.30-0.20
Resistance xResistance					
Agent x Sakha 69	86	12	13:3	2.721	0.10-0.05
		Race 34			
Resistance x Susceptible					
Agent x Giza 157	122	50	3:1	1.518	0.30-0.20
Agent x Giza 160	126	13	15:1	2.283	0.20-0.10
Agent x Baart	94	14	13:3	2.374	0.10-0.05
Sakha 69 x Giza 157	118	7	15:1	0.090	0.80-0.70
Sakha 69 x Giza 160	104	10	15:1	1.237	0.30-0.20
Sakha 69 x Baart	132	6	15:1	0.852	0.50-0.30
Moderate resistance x Susceptible					
Sakha 92 x Giza 157	126	3	15:1	2.283	0.20-0.10
Sakha 92 x Giza 160	70	7	15:1	1.061	0.50-0.30
Sakha 92 x Baart	148	4	15:1	3.392	0.10-0.05
Moderate resistance x Resistance					
Sakha 92 x Agent	82	64	9:7	0.001	0.99-0.98
Sakha 92 x Sakha 69	108	6	15:1	0.189	0.70-0.50
Resistance x Resistance					
Agent x Sakha 69	120	6	15:1	0.476	0.50-0.30

Moderate resistance x susceptible

The crosses involve moderate resistant Sakha 92 and each of the three susceptible varieties Giza 157, Giza 160 and Baart ,the Chi-square test for the goodness of fit gave a satisfactory fit to a ratio of 15 resistant : 1 susceptible (p = 0.20 - 0.10) for Sakha x Giza 157 and Sakha 92 x Baart , and 13 resistant : 3 susceptible (p= 0.10 -0.05) for the Sakha 92 x Giza 160 . These findings were in line with those reached by Abdel Hak et.al.(1985), and Abd-Ellatif (1990).

Moderate resistance x resistance

The moderate resistant Sakha 92 and each of the two resistant varieties Agent and Sakha 69 ,the Chi-square test for the goodness of fit gave a satisfactory fit to a ratio of 13 resistant : 3 susceptible (p= 0.20- 0.10) for the Sakha 92 x Agent and 15 resistants : 1 susceptible (p=0.30 - 0.20) for Sakha 69 x Sakha 92 . Similar results were reported by Jain and Ghandi (1983), and Abdel Hak et.al. (1985).

Resistance x resistance :

Chi- square test of the cross involves the two resistant varieties Agent and Sakha 69 gave a satisfactory fit to a ratio of 13 resistant : 3 susceptibles (p=0.10 - 0.05).These findings were in line with those reached by Sawhney et.al. (1981), Bartos et.al.(1983),and Randhawa et.al(1989).

The above mentioned results showed that resistance to stem rust race 11 is dominant and that two pairs of genes govern resistance, one of them has an epistatic effect or both genes act in a complementary manner .

Race 34

Resistance x susceptible

In the F2 segregating the seedling test to race 34 of the three crosses involving the resistant variety Agent and each of the three susceptible varieties Giza 157, Giza 160, and Baart,the Chi-square test for the goodness of fit gave a satisfactory fit to a ratio of 3 resistant : 1 susceptible (p=0.30- 0.20) for the Agent x Giza 157; 15 resistant : 1 susceptible (p= 0.20- 0.10) for the Agent x Giza 160 and 13 resistant : 3 susceptible (p=0.10 - 0.05) for the Agent x Baart.The three crosses involving the resistant Sakha 69 and each of the three susceptible varieties Giza 157, Giza 160, and Baart ,the Chi- square test for the goodness of fit gave a satisfactory fit to a ratio of 15 resistant : 1 susceptible (p= 0.80- 0.70)for Sakha 69 x Giza 157; Sakha 69 x Giza 160 (p= 0.30 - 0.20) and Sakha 69 x Baart (p= 0.50- 0.30). These results are in a good line with those obtained by Jones et.al. (1983), and Abd-Ellatif (1990).

Moderate resistance x susceptible :

In F2 of the three crosses involving the moderate resistant Sakha 92 and each of the three susceptible varieties Giza 157, Giza 160 and Baart , the Chi-square test for the goodness of fit gave a satisfactory fit to a ratio of 15 resistant : 1 susceptible for the three crosses with p values,(p =0.20- 0.10); (p=0.50- 0.30) and (p= 0.10- 0.05) for Sakha 92 xGiza 157; Sakha 92 x Giza 160 and Sakha 92 x Baart ,respectively . These findings were in line with those reached by Bartos et.al.(1982),Bartos, et.al.(1983), Bedo et.al.(1983) and Abd Ellatif (1990)

Moderate resitance x resistance

The moderate resistant Sakha 92 and each of the two resistant varieties Agent and Sakha 69, the Chi-square test for the goodness of fit gave a satisfactory fit to a ratio of 9 resistant : 7 susceptible (p=0.99- 0.98)for Sakha 92 x Agent and 15 resistantant : 1susceptible (p=0.70- 0.50) for Sakha 92 x Sakha 69 . Bartos and Tersova (1983), Abdel Hak et.al.(1985),and Randhawa et.al.(1989).

Resistance x resistance

The chi-square test of the cross involving the two resistant varieties Agent x Sakha 69 resulted in the ratio 15 resistant : 1 susceptible (p=0.50- 0.30). Similar results were reported by Abdel Hak et.al. (1985) and Abd Ellatif (1990).

Therefore, it was , concluded that the seedling reaction to races 11 and 34 ,showed either one or two pair of genes controlling the genetic behaviour of resistance to the stem rust in resistant and susceptible varieties concerning resistance to race 34 and that resistance was dominant over susceptible. In the presence of two genes; they interact in a complementary manner giving different segregating ratios .