RESULTS

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The present investigation was carried out through five successive seasons of 1986, 1987, 1988, 1989 and 1990. The data were obtained on two back-crosses (BC_3) i.e ((Giza 157 x Petka) x Giza 157) and ((Sakha 8 x Petka) x Sakha 8). Data were recorded on the individual plant basis in case of the agronomic characters within each of the four replicates of a given genotype. The protein identification obtained through using the method of Bushuk and Zillman (1978) modified by Courvoisier (1984) on vertical gel. The cytological studies were carried out on the meiotic and mitotic cells of the individual plants of each genotype.

Accordingly, data will be classified into three parts as follows, In the first part, data were obtained by estimating the standard deviation and the coefficient of variation for the observed means of each back-cross plant.

In the second part, proteins of the individual plants of the two back-crosses were identified as it is suggested by Payne and Lawrence (1983).

In the thrid part,cytological studies were carried out on the meiotic and mitotic cells of the individual plants for parents, F_1's and both of the two back-crosses. In meiosis, data were recorded on number of univalents,ring and rod bivalents at diakinesis stage. The laggards were counted at metaphase 1, anaphase 1 and anaphase 11. Micronuclei were counted at tetrad phase. In mitosis,it was studied in root tips of parents, F_1's and the back-crosses by using lacto-

propionic orcien beside the C-banding technique for rye chromosomes.

1. Genetic evaluation of characters:-

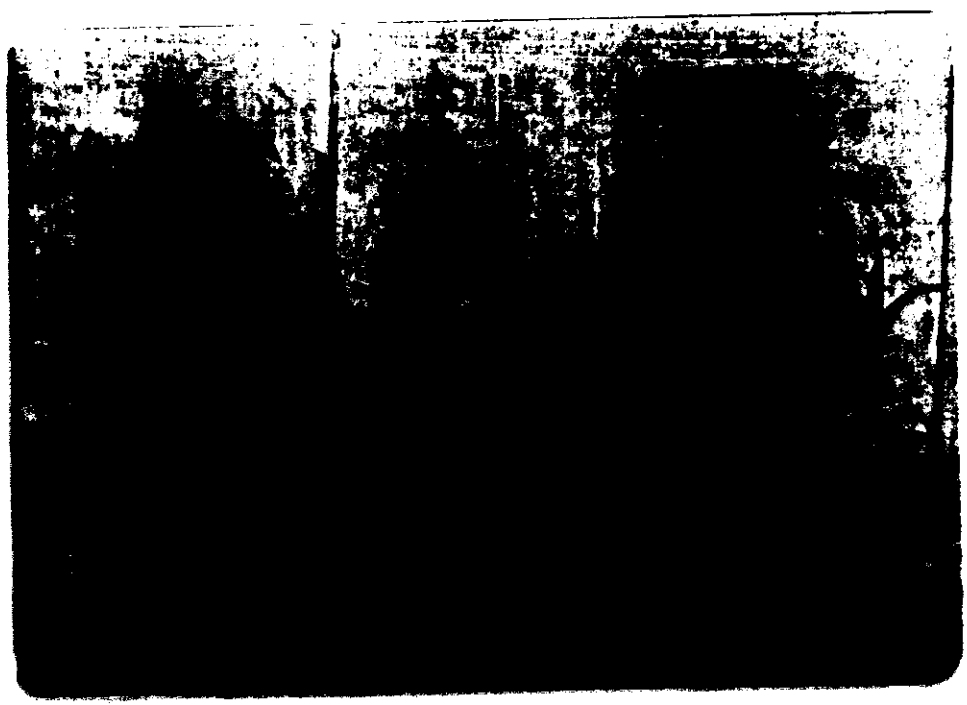
The observed means, standard errors and coefficients of variation were estimated for some agronomic characters for wheat parents, Giza 157, Sakha 8 and for rye parent Petka. Moreover, These characters were also evaluated in two F_1's and two back-crosses The evaluated characters were plant height ,spike length ,internode length, number of tillers, stem waxiness, number of kernels per spike, number of spikelets per ear, 100 kernel weight per plant, number of kernels per spikelets and grain yield per spike.

1.1. Plant height:

Data presented in table (2) showed that the observed means, standard error and coefficient of variation for the plant height character in parents and F_1's.

a. The observed means of plant height in parents, Giza 157,Sakha 8 and Petka were 98.65, 106.06 and 156.05 respectively. Significant differences are excested between them. The coefficient of variation of parents, Giza 157, Sakha 8 and Petka were 2.33 %, 1.85 % and 1.70 %,respectively, indicating that the differences between the individuals within each parent due to the environmental conditions.

b. The observed means of the two F_1's were 120.20 and 125.06, while the coefficient of variability were 1.84 % and 1.36 %,respectively,showing that little differences within each F_1 which may resulted from the effect of environmental conditions. Fig. (1).



Fig(1): Left P[illegible]a diploid rye, middle the hybrid F_1, Giza 157 hexaploi[illegible] wheat plants. The F_1 2N= 28.

The plants of the two back-crosses (BC_3) were flactuated between the dwarf wheat parents and the tall rye parent. In some cases transgressive segregation was observed toward the dwarf parents. Table (3) gives the estimates of observed means, standard error and the coefficient of variation for the plants of the two back-crosses.

c. The back-cross (BC_3) plants ((Giza 157 x Petka) x Giza 157) number 4 and 22 showed non-significant differences as compared to the observed mean (98.65) of the wheat parent, Giza 157.

The plants number 11, 28, 32, 34 and 40 showed significant differences from the wheat parent, Giza 157. These plants were found to contain observed means with slight increase or decrease from the wheat parent, Giza 157.

The plants number 3, 5, 8, 10, 12, 13, 14, 15, 16, 18, 21 and 31 were found to be significantly decreased from the observed mean of the wheat parent, Giza 157 showing transgressive segregation.

The plants number 1, 2, 7, 9, 17, 20, 23, 24, 26, 27, 29, 33, 35, 38, and 39 were found to be significantly increased as compared to the observed mean of the wheat parent, Giza 157. Figs (2,3,4).

The coefficient of variation is higher than those of parents and F_1 and ranged from 2.67 % (for plant number 1) to 7.10 % (for plant number 12).

d. The back-cross (BC_3) plants ((Sakha 8 x Petka) x Sakha 8) number 19, 25, 30 and 37 were shown to be significantly decreased from the wheat parent, Sakha 8 (106.06).

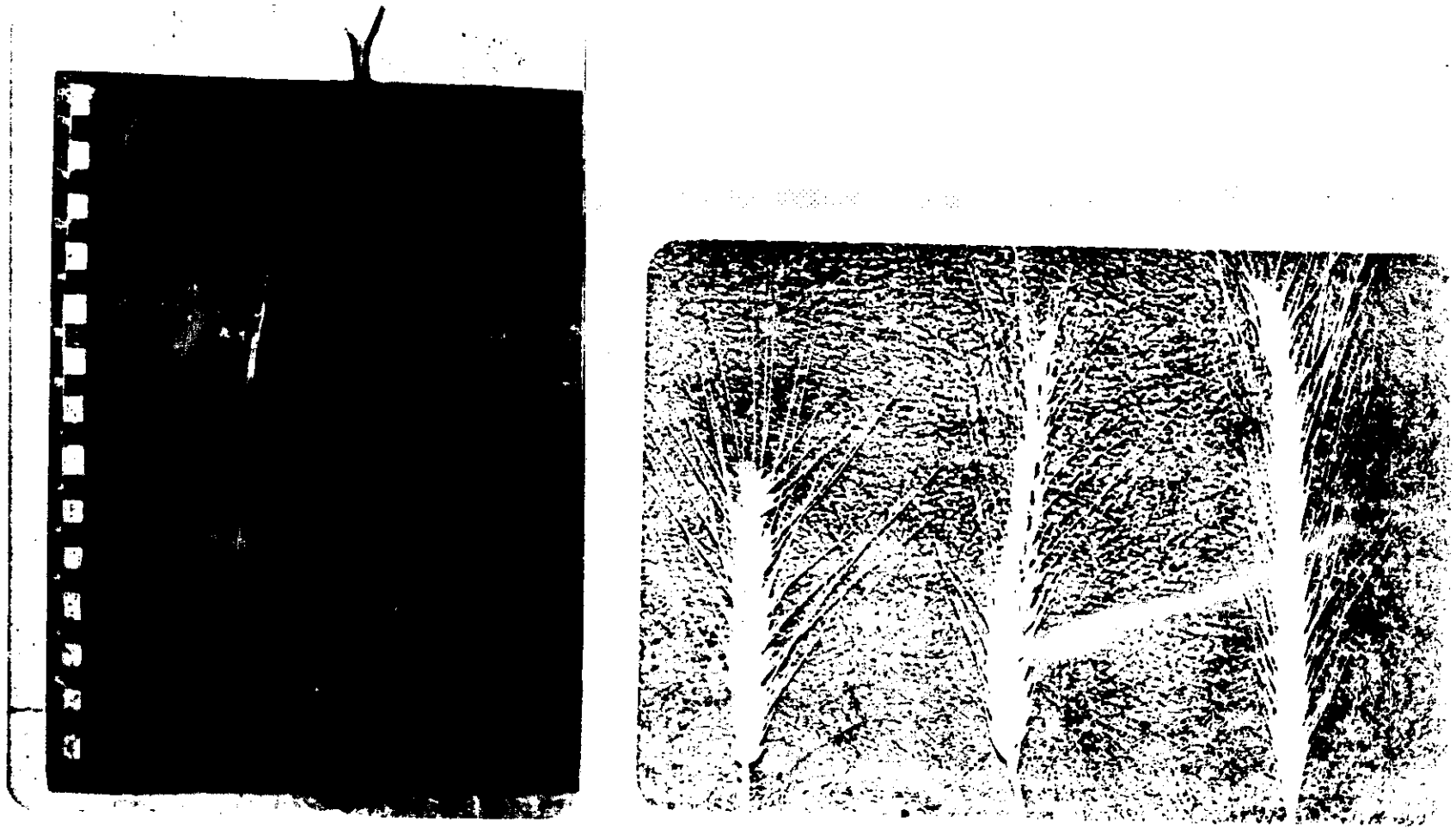


Fig.(2): Plants of Giza 157, Back-cross three plant No. 1 and Petka parent, (a).

The ear length and shape of Giza 157 parent, Back-cross three plant No. 1 and Petka parent, (b).

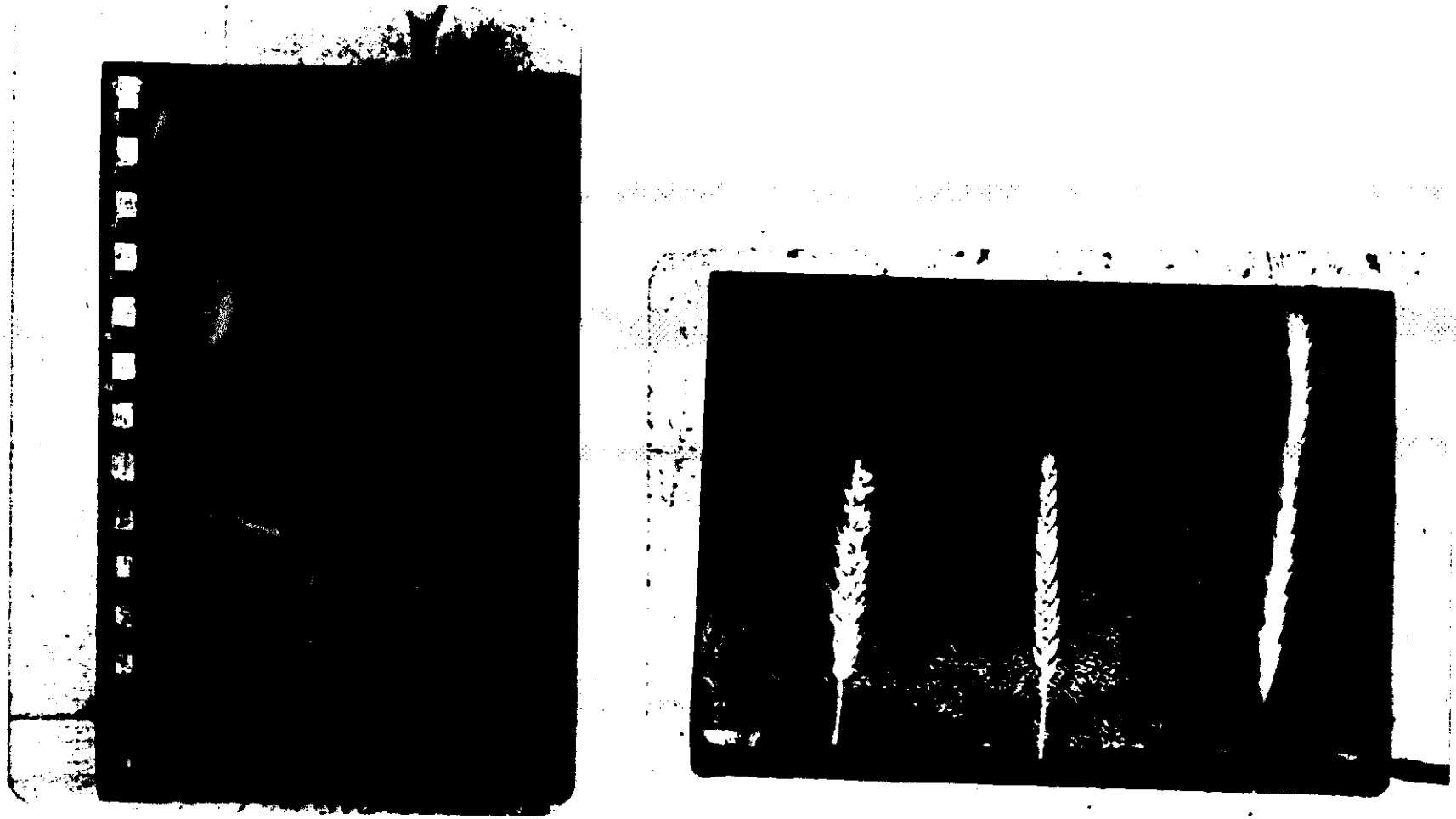


Fig.(3):a. Plants of Giza 157, Back-cross three plant No. 2 and Petka parent.

.b. The ear length and shape of Giza 157, Back-cross three plant No. 2 and Petka parent.

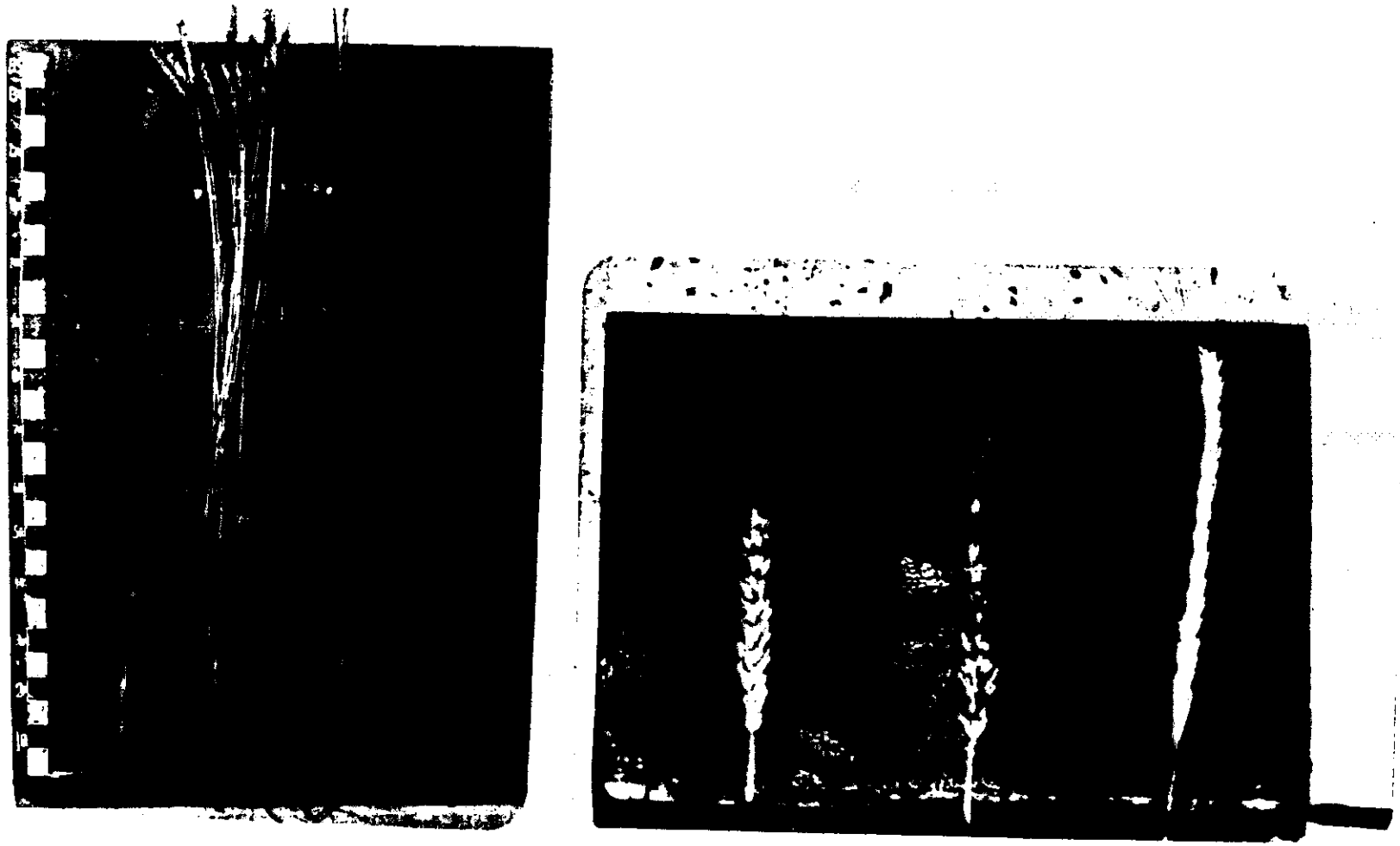


Fig.(4): a Plants of Giza 157,Back-cross three plant No. 3 and Petka parent.

b. The ear length and shape of Giza 157,Back-cross three plant No. 3 and Petka parent.

The plant number 6 showed little significant differences from the wheat parental mean.

The plant number 41 found to be highly significant from the wheat parental mean.

The coefficient of variation ranged from 2.81 % for plant number 6 to 5.35 % for plant number 37 indicating that the variability was higher in the BC_3 plants than the parents and the F_1.

1.2. Spike length:

the observed mean, standard error and variances for the spike length in parents and F_1's are given in table (2).

a. observed means of the spike length in parents,Giza 157,Sakha 8 and Petka were 12.41, 13.12 and 19.45,respectively. Significant differences are excested between them. The coefficient of variations were 8.30 %, 7.92 % and 6.34 % for Giza 157, Sakha 8 and Petka,respectively,indicating low variability between the parental individuals.

b. The observed means between the two F_1's, (Giza 157 x Petka) and (Sakha 8 x Petka) were 13.95 and 14.02 showing significant increasing as compared to the wheat parental means. The two F_1's showed lower variability within the individuals since the coefficient of variations were 8.01 % and 8.56 % respectively. figs(5,6,7).

c. The back-cross (BC_3) plants ((Giza 157 x Petka) x Giza 157) number 4 and 22 showed non-significant differences from the wheat parental mean (12.41) of Giza 157.Fig.(8).

Plants number 7, 9, 10, 11, 14, 23, 26, 28, 34, 36, 39 and 40 showed significant differences from the wheat parent Giza 157. These

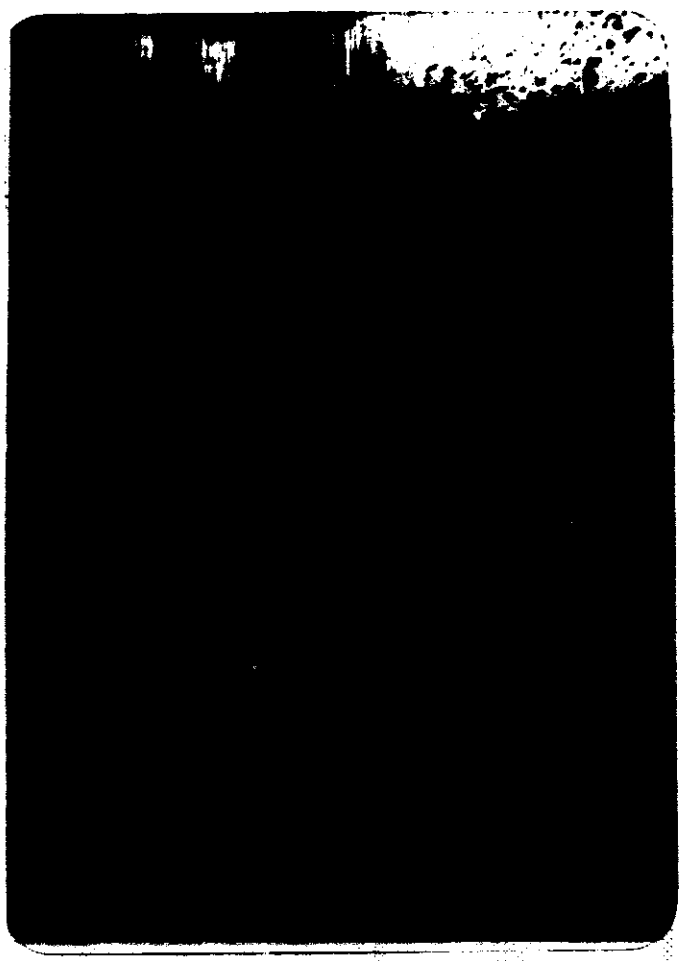


Fig.(5): Some of the F_1 plants showed more than one spike on the main stem (Sakha 3 x Petka).

Fig.(6):a,b Some of the F_1 plants showed abnormal ears on the matn stem (Sakha 8 x Petka) with 2n= 56.

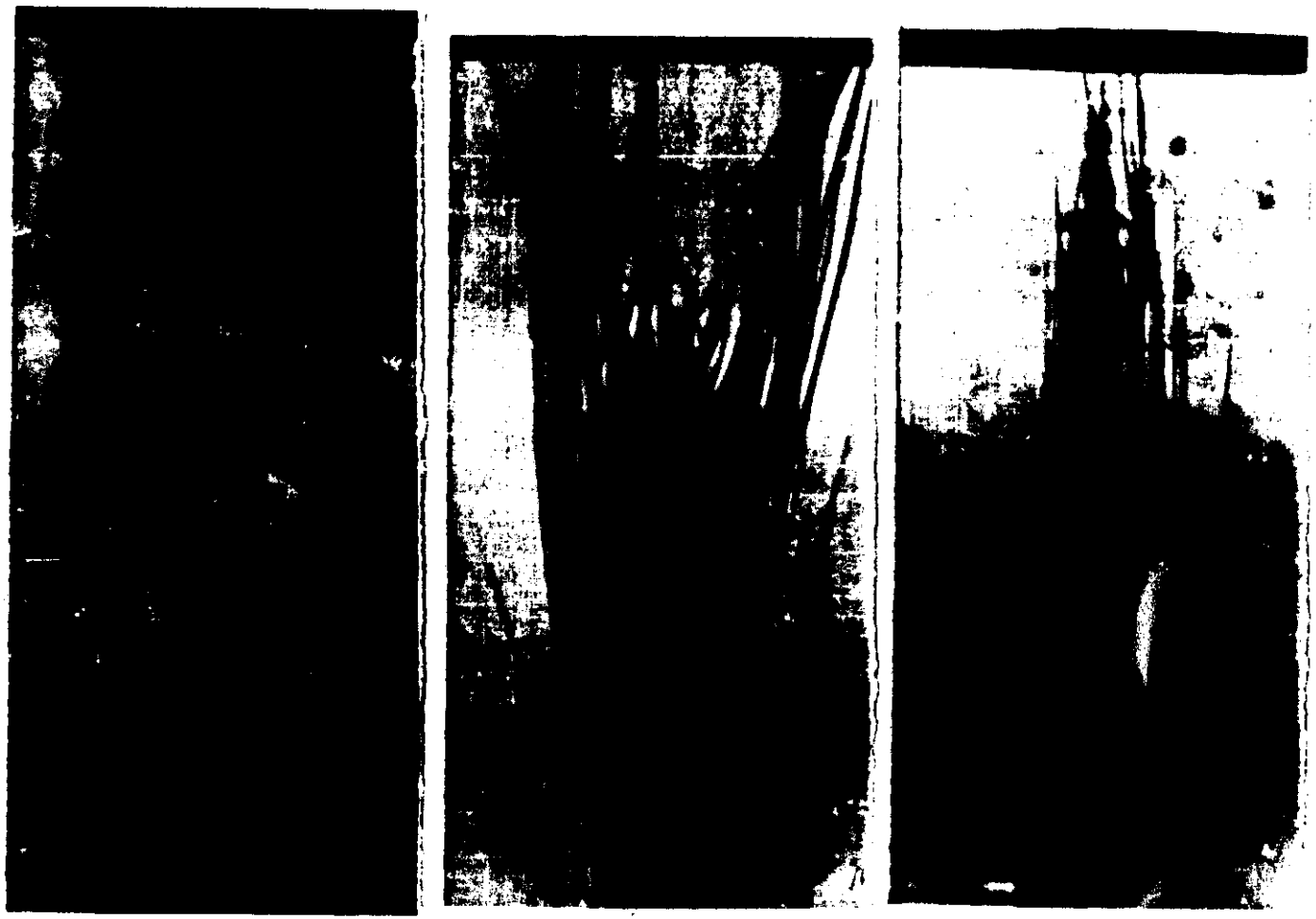


Fig.(7): Left Giza 157 wheat hexaploid parent,middle-the hybrid F_1 Ear,right the Petka diploid parent,where the F_1 2N= 28

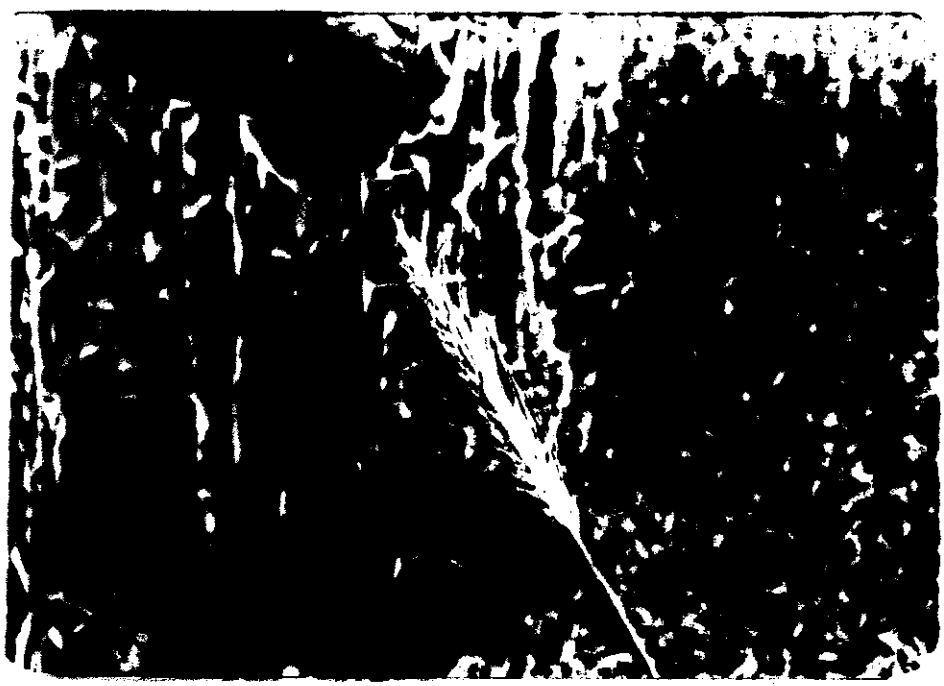


Fig.(8): Plants of the back-cross three ((Giza 157 x Petka) x Giza 157) carrying spikes with a waxy layer.

plants were found to be the nearest to the wheat parent, Giza 157.

Plants number 1, 2, 3, 5, 8, 12, 13, 16, 17, 20, 24, 27, [illegible], 32 and 38 showed significant differences as compared to the [illegible] parent, fig.(8), as it increased over the observed mean.

Plants number 15, 18, 21, 29 and 33 exhibited significant decreasing from the wheat parental mean s owing transgressive segregation. Higher variability were found between individuals of the BC_3 of Giza 157. The coefficient of variations ranged from 7.37 % of the plant number 3 to 10.58 % of the plant number 15.

d. Back-cross (BC_3) plants ((Sakha 8 x Petka) x Sakha 8) number 6, 19, 25, 37 and 41 were found to be significantly decreased from the observed mean of wheat parent, Sakha 8 (13.12) suggesting transgressive segregation in one direction.

Plant number 30 was found to be significantly increased from the observed mean of the wheat parent, Sakha 8.

The estimated coefficient of variations showed that the range of variability within the back-crossed plants was 7.37 % to 9.97 % which higher than the parents and F_1's.

1.3. Internode length:

Table (2 gives the estimates of observed means, standard errors and coefficients of variability for the internode length or peduncle length in parents and F_1's.

a. The observed mean of internode length in parents, Giza 157, Sakha 8 and Petka were 34. 5, 31.39 and 46.55 showing higher signi-

ficant differences among them. The coefficients of variation were 12.33 %, 12.43 % and 12.01 % for Giza 157, Sakha 8 and Petka respectively. The lower variability within the parents were resulted from the effect of the environmental conditions.

b. The observed means of the peduncle length in the two F_1's were 32.21 and 35.86, in which all the F_1's plants appeared with short peduncles. The estimated coefficients of variation were 14.27 % and 14.28 % for both of the F_1's, Giza 157 x Petka and Sakha 8 x Petka indicating low variation within their individuals.

c. The back-cross (BC_3) plants of ((Giza 157 x Petka) x Giza 157) were flactuated between the short to long peduncle plants. Where 4 plants showed insignificant differences, 8 plants were significantly decreased and 23 plants were significantly increased and had long peduncle than that of the wheat parent, Giza 157.

Plants number 8, 10, 12, 13, 15, 16, 24 and 34 were found to possess significantly shorter peduncle than that of the wheat parent, suggesting transgressive segregations toward shorter peduncle.

Plants number 2, 9, 14 and 29 were found to possess peduncle length similar to the wheat parent, Giza 157.

Plants number 1, 3, 4, 5, 7, 11, 17, 18, 20, 21, 22, 23, 26, 27, 28, 31, 32, 33, 35, 36, 38, 39 and 40 were significantly increased from the wheat parent, Giza 157.

The estimated coefficients of variation for the back-crossed

plants showed a range of 12.72 % to 18.78 % for the plants number 3 and 12, respectively.

d. The back-cross (BC_3) plants ((Sakha 8 x Petka) x Sakha 8) number 6, 19, 25, 30, 37 and 41 showed longer peduncle than that of the wheat parent, Sakha 8, Table (3).

The coefficient of variations ranged from 11.66 % to 17.06 % for plants number 6 and 41. The variability was nearly the same for plants 6, 19, 25, 30 and 37 as the F_1 plants and higher for the plant number 41 than the wheat parent, Sakha 8 and F_1.

1.4. Number of Tillers:

The observed means, standard errors and coefficients of variation of the tillering ability per plant for parents and F_1's are given in table (2). Table (3) showed the estimates of the same parameter for the two back-crosses.

a. The observed means of the parents, Giza 157, Sakha 8 and Petka were 21.34, 24.35 and 34.19, respectively, Fig. (9). The coefficients of variation were 24.19 %, 18.90 % and 28.70 % for Giza 157, Sakha 8 and Petka, respectively.

b. The observed means of the two F_1's were 14.23 and 10.81. The coefficients of variation were 3.30 % and 4.90 %, respectively. Where, the variations between the individuals within each of the two F_1's caused by the environmental conditions.

c. The back-cross (BC_3) plants ((Giza 157 x Petka) x Giza 157)

Fig.(9): The Petka diploid rye plants showed a high tillering ability.

number 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 20, 21, 22, 23, 24, 26, 27, 28, 29, 31, 32, 34, 35, 36, 38, 39 and 40 had lower tillering mean as compared with the wheat parental mean (21.34) showing less tillering ability in such back-cross rather than the wheat parent.

The plant number 17 was found to have higher number of tillers than that of the wheat parent, Giza 157.

The coefficients of variation ranged from 18.10 % to 56.81 % showing wide range of variability which may be due to genetic segregation and effect of the environmental conditions.

d. The back-cross (BC_3) plants ((Sakha 8 x Petka) x Sakha 8) number 6, 19, 25, 30, 37 and 41 were found to have less number of tillers per plant than that of the wheat parent, Sakha 8 (24.35). The back-cross plants which showed significantly decreased means from the wheat parent may be due to transgressive segregation toward the direction of wheat parent, Sakha 8.

The variability was higher between the plants of this back-cross since the range of coefficient of variation was 22.76 % to 56.81 %.

1.5. Stem waxiness:

Data presented in table (2) showed that the number of plants which had waxy stem in parents, Giza 157, Sakha 8 and Petka beside the two F_1's, Giza 157 x Petka and Sakha 8 x Petka.

a. The parents, Giza 157 and Sakha 8 are characterized by non-waxy

stem while the petka variety is characterized by waxy stem. The stem waxiness character was qualitative character and it can be used as a marker for the transmission of rye genome to the wheat genomes.

b. All the plants of the two F_1's, Giza 157 x Petka and Sakha 8 x Petka were found to had waxy stem showing complete dominance for waxiness character of the rye parent, Petka over the non-waxiness of the wheat parents, Giza 157 and Sakha 8.

c. Plants of back-cross ((Giza 157 x Petka) x Giza 157) number 1, 3, 7, 8, 9, 10, 13, 14, 16, 17, 18, 20, 22, 24, 31, 32 and 35 showed waxy stem. The number of waxy stem individuals within the back-crossed plants ranged from 3 to 124 showing genetic segregation for such character.

Plants number 2, 4, 5, 11, 12, 15, 21, 23, 26, 27, 28, 29, 33, 34, 36, 38, 39 and 40 found to had non-waxy stem individuals.

d. Plants of back-cross ((Sakha 8 x Petka) x Sakha 8) number 6 and 41 showed waxy stem individuals and the range of waxy stem was 11 to 29 plants, respectively

Plants number 19, 25 and were found to be free from wax on stem for all the individuals.

1.6. Kernels per ear:

Data in table (4) showed the observed mean, standard error and coefficient of variation for the kernels per ear character in parents and F_1's.

a. The observed means of number of the kernels per ear in parents

Giza 157, Sakha 8 and Petka were 79.13±00.13, 82.28± 00.18 and 122.60± 00.26,respectively. Significant differences were present among these parents. The coefficients of variation were 2.94 %,4.09 % and 1.12 %, respectively.

b. A significant reduction was noticed in the number of kernels per ear for both of two F_1's. The observed means of the two F_1's were 62.24±00.30 and 60.53±00.18,respectively.

The coefficients of variation were 4.76 % and 3.44 %,respectively,indicating low variation between the individuals of each one of the two F_1's crosses.

c. Plants of back-cross ((Giza 157 x Petka) x Giza 157) number 1, 2, 3, 4, 5, 7, 8, 9, 10, 13, 14, 15, 21, 22, 23, 24, 26, 27, 28, 29, 31, 32, 34, 35, 36, 38, 39 and 40 showed low number of grains per ear than that of the wheat parent, Giza 157 (79.13). The reduction in the number of kernels per ear may be due to genetic segregation in the direction of wheat parent.

Plants number 11, 12, 16, 17, 18, 20 and 33 showed highly significant differences as compared to the wheat parent, Giza 157.

The coefficients of variation ranged from 2.17 % for plant number 1 to 8.91 % for the plant number 23 showing higher variability except the plant number 1 which had nearly the same as the parents and the F_1.

d. Plants of back-cross ((Sakha 8 x Petka) x Sakha 8) number 6, 19, 25, 30, 37 and 41 showed lower number of kernels per ear than

the observed mean of the wheat parent, Sakha 8 showing transgressive segregation.

The coefficient of variation were found in a range of 5.14 % for plant number 41 to 8.00 % for plant number 30 and this was high as compared with that of the wheat parent and F_1.

1.7. Spikelets per ear (spike):

Data presented in table (4) showed the means, standard errors and coefficients of variation for parents, Giza 157, Sakha 8 and Petka as well as for the two F_1's, Giza 157 x Petka and Sakha 8 x Petka.

a. Spikelets number per ear was lower in the wheat parents, Giza 157 and Sakha 8 than that of the rye parent, Petka. The differences between the parental cultivars were highly significant. The observed means of parents were 21.72±00.05, 23.28±00.05 and 56.85±00.19, respectively. This could suggest that genetic differences is probable among the parents.

The coefficients of variation were 4.65 %, 3.98 % and 3.94 % for Giza 157, Sakha 8 and Petka, respectively. This could indicate that variation was low within each one of the three parents and this low variability is due to the effect of environmental conditions.

b. The observed means of the two F_1's, Giza 157 x Petka and Sakha 8 x Petka was showed significantly low in the number of spikelets per ear as compared to the wheat parents, Giza 157 and Sakha 8. The observed means of the two F_1's were 20.53±00.12 and 21.74±00.09, respectively.

The coefficients of variation for the two F_1's were 6.01,% and 5.18 % which considered low among individuals within each one of the two F_1's.

c. The plant number 21 of back-cross ((Giza 157 x Petka) x Giza 157) showed mean of 21.83 which is insignificantly differed from the wheat parental mean,21.72.

The number of spikelets per ear in plants number 12, 17, 32, 36,and 40 was significantly reduced which may resulted from genetic segregation.

Higher number of spikelets per ear was noticed in the plants number 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 13, 14, 15, 16, 18, 20, 22, 23, 24, 26, 27, 28, 29, 31, 33, 34, 35, 38 and 39 as compared to the wheat parent, Giza 157.

The coefficients of variation ranged from 4.45 % to 10.24 % which reflect high variability between the back-cross individuals.

d. The back-cross (BC_3) plants ((Sakha 8 x Petka) x Sakha 8) number 25 and 37 were found to be insignificantly differed from the wheat parent, Sakha 8 (23.28).

The number of spikelets was reduced in plants number 6 and 19 as compared with the wheat parent, Sakha 8.

The higher number of spikelets per ear was shown in plants number 30 and 41, Fig.(10).

The coefficents of variation ranged from 5.57 % for plant number 19 to 7.65 % for the plant number 6, suggesting presence of

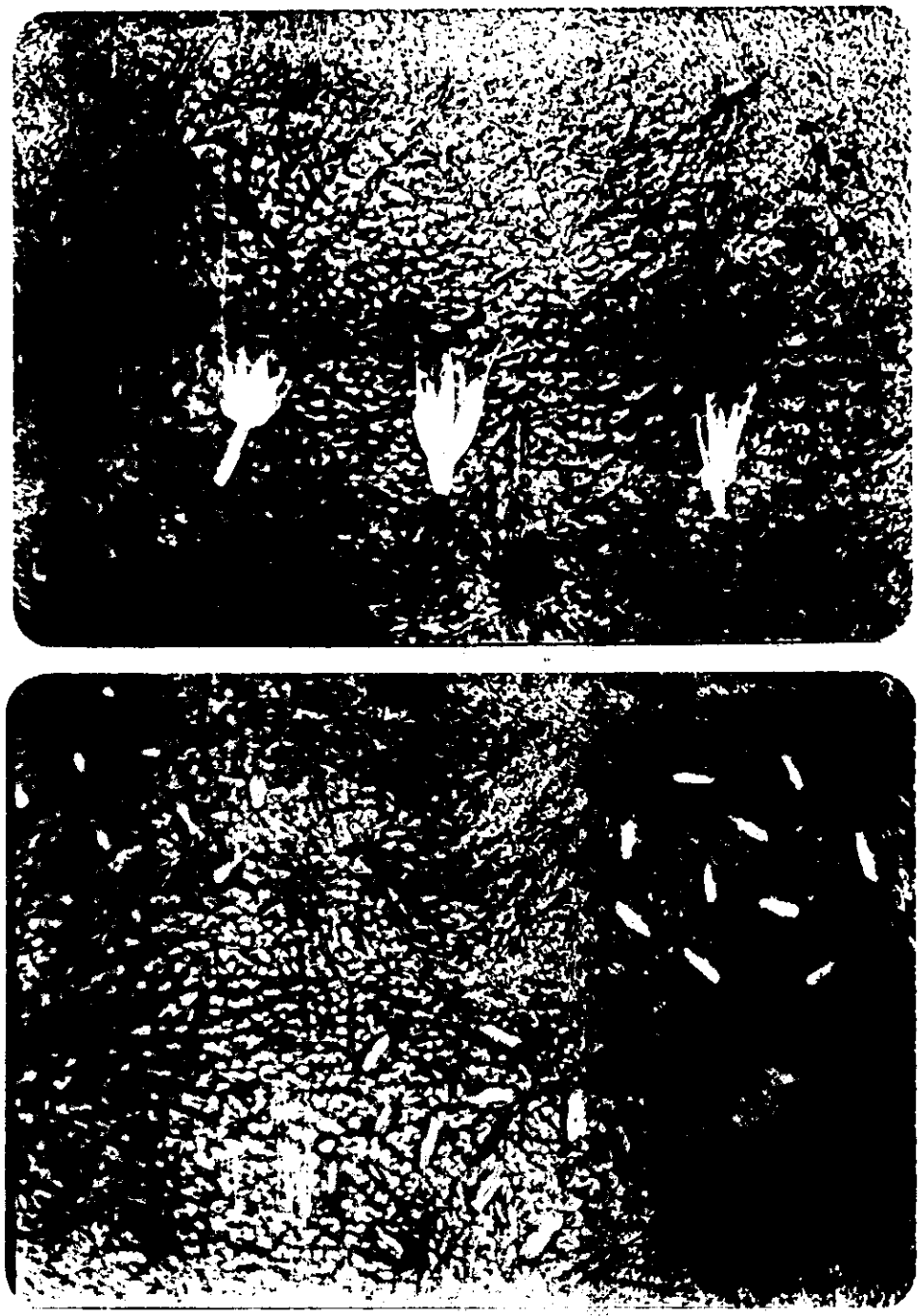


Fig.(10):a, Spikelets of Giza 157 wheat,back-cross three plant No. 1 and Petka variety of rye.

b. Grain shape of the two parents Giza 157 and Petka with the back-cross three plant No. 1.

higher variation within the back-cross plants.

1.8. 100 Kernel weight:

Means, S.E. and coefficients of variation for the 100-kernel weight in parents and F_1's are given in table (4).

a. 100-kernel weight per plant was higher in wheat parents than in rye parent. The observed means of the parents were 4.82, 4.92 and 3.68 gram for Giza 157, Sakha 8 and Petka, respectively. The highly significant differences between wheat parents and rye parent suggested that genetic differences is probable among these genotypes.

The coefficients of variation were 5.87 %, 7.83 % and 14.38 % Giza 157, Sakha 8 and Petka, respectively. These low variations within the parents could be as a result of the environmental conditions.

b. The observed means of the two F_1's were 3.80 and 3.71 grams. Kernel weight is reduced in the F_1 plants as compared by wheat parents, Giza 157 and Sakha 8.

Lower variability was found between the individuals of the two F_1's, Giza 157 x Petka and Sakha 8 x Petka. The coefficients of variation were 8.32 % and 11.11 % for the two F_1's, respectively.

c. All the plants of the back-cross ((Giza 157 x Petka) x Giza 157) showed significant reduction in 100-kernel weight as compared to wheat parent, Giza 157 indicating a continuous of genetic segregation toward the wheat parent.

Wide range of variability was recorded between the individuals of the back-cross (BC_3) plants as it ranged from 4.98 % to 21.52 %.

The higher variability between the individuals of the back-cross plants revealed that segregations were occured beside the environmental effects.

d. Significant reduction was found in plants of the back-cross ((Sakha 8 x Petka) x Sakha 8) which may caused by segregation toward the wheat parent, Sakha 8, Table (5).

Higher range of variability was found between the individuals of the back-cross (BC_3) plants as it ranged from 11.01 % to 17.73 %.

1.9. Kernels per spikelets:

Means, S.E.,and coefficients of variation for kernel number per spikelets of the parents and the F_1's are given in Table (4).

a. The number of kernels per spikelets was higher in the wheat parents than in the rye parent suggesting that the genetic differences is probable. The observed means of the parents were 2.88,2.79 and 2.18 kernels per spikelets for Giza 157, Sakha 8 and Petka, respectively.

The coefficients of variation were 3.47 %, 6.21 % and 13.76 % for Giza 157, Sakha 8 and Petka, respectively. The lower variation between the individuals of each one of the parents may resulted from the environmental conditions.

b. The kernel number per spikelets was lower in the two F_1's, Giza 157 x Petka and Sakha 8 x Petka than that of the parents. The

observed means of the two F_1's were 1.85 and 2.04 kernels, respectively. Lower variation was found between the individuals of the two F_1's (15.29 % and 24.51 %) which resulted from the effects of the environmental conditions.

c. Highly significant reduction was found in the back-cross (BC_3) plants of ((Giza 157 x Petka) x Giza 157) for the number of kernels per spikelete. Plants number 1, 3, 4, 5, 7, 8, 9, 10, 13, 14, 15, 20, 21, 22, 33, 24, 26, 27, 28, 29, 31, 32, 33, 34, 35, 36, 38, 39 and 40 showed significant reduction in number of kernels per spikelets as compared to the wheat parental mean (2.88) of Giza 157. Plants number 17 showed insignificant difference from the wheat parental means. Meanwhile, plants number 2, 11, 12 and 18 showed higher increasing in the kernel number of spikelets per plant. Moreover, higher variation was recorded between the individuals of the back-cross (BC_3) plants as it ranged from 23.72 % to 49.17 %.

d. Means of the back-cross (BC_3) plants ((Sakha 8 x Petka) x Sakha 8) for number of kernels per spikelets showed significant reduction i.e plants number 6, 19, 30 and 37.

The observed means of plants number 25 and 41 showed significant increasing over that of the wheat parent, Sakha 8.

The coefficients of variation ranged from 28.05 % to 43.47 % indicating presence of variation than that of the parents and the F_1's

1.10. Grain yield per plant:

Means, S.E. and coefficients of variation of the parents and

the F_1's for the grain yield per plant character are given in Table (4). a. Means of the parents, Giza 157, Sakha 8 and Petka for the grain yield per plant character were 52.16, 71.55 and 94.28 gram, respectively. Highly significant differences were found between the parental means suggesting that the genetic differences is probable in such trait.

Coefficients of variation were 11.41 %, 6.76 % and 9.77 % showing lower variation within their individuals which may be due to the effects of the environmental conditions.

b. The observed means of the two F_1's, Giza 157 x Petka and Sakha 8 x Petka were 26.12 and 19.34 gram indicating severe reduction in weight of grain yield per plant which may be due to the sterility of the upper and lower spikelets and/or the less number of tillers.

Lower variation for grain yield per plant was found between the individuals of each of the two F_1's since the coefficients of variation were 23.68 % and 29.45 %.

c. The observed means of back-cross (BC_3) plants ((Giza 157 x Petka) x Giza 157) showed highly significant reduction in grain yield per plant as compared to the worst parent, Giza 157 (52.16 gram).

The coefficients of variation ranged from 9.53 % to 47.21 % showing higher variation than that of the parents.

d. The observed means of back-cross (BC_3) plants ((Sakha 8 x Petka) x Sakha 8) showed highly significant reduction in grain yield per plant than that of parents and F_1.

The coefficients of variation were found in a range of 12.74 % to 34.91 % which show higher variation than that of the parents and the F_1, Table (5).

Table (2): The mean performance of plant height, spike length, internode length, number of tillers and stem waxiness for parents and F_1's.

Variants	n	plant height	spike length	internode length	number of tillers	stem waxiness
Giza 157	320	98.65±00.13	12.41±00.06	34.15±00.24	21.34±00.29	non
		C.V 2.33 %	8.30 %	12.33%	24.64%	
Sakha 8	342	106.06±00.11	13.12±00.07	31.39±00.21	24.35±00.25	non
		C.V 1.86 %	7.92 %	12.43%	18.9 %	
Petka	336	156.05±00.15	19.45±00.07	46.55±00.31	34.19±00.54	336
		C.V 1.71 %	6.34 %	12.01%	28.70%	
Giza 157 x Petka	94	120.20±00.23	13.95±00.12	32.21±00.47	14.23±00.05	94
		C.V 1.85 %	8.01 %	14.27%	3.30 %	
Sakha 8 x Petka	130	125.06±00.15	14.02±00.11	35.86±00.45	10.81±00.05	130
		C.V 1.36 %	8.56 %	14.29%	4.90 %	

C.V = Coefficient of variability

Table (3): The mean performance of Plant height,spike length,peduncle length,number of tillers and stem waxiness for back-crosses three,plant number 1 to 41.

Cross combination	n	Plant height	Spike length	Internode length	Number of Tillers	Stem Waxiness
BC_3 (No. 1)	136	134.48±00.31 C.V 2.67 %	17.21±00.11 7.86 %	40.23±00.50 14.68%	14.38±00.37 30.57%	45
BC_3 (No. 2)	116	112.27±00.45 C.V 4.41 %	14.87±00.11 8.21 %	34.64±00.50 15.57%	10.01±00.35 38.28%	00
BC_3 (No. 3)	115	86.70±00.53 C.V 6.58 %	14.01±00.09 7.52 %	38.29±00.45 12.72%	17.61±00.44 27.07%	11
BC_3 (No. 4)	126	98.76±00.50 C.V 5.71 %	12.44±00.09 8.51 %	35.08±00.49 5.68 %	18.14±00.41 27.76%	00
BC_3 (No. 5)	146	84.75±00.48 C.V 6.87 %	13.36±00.09 8.47 %	39.12±00,51 15.98%	13.13±00.41 38.44%	00
BC_3 (No. 6)	90	106.74±00.31 C.V 2.81 %	12.22±00.08 8.54 %	41.58±00.51 11.66%	16.62±00.47 27.04%	11
BC_3 (No. 7)	121	114.36±00.33 C.V 3.20 %	12.52±00.10 8.71 %	42.36±00.49 12.76 %	19.37±00.42 24.10 %	77
BC_3 (No. 8)	129	86.10±00.41 C.V 5.44 %	14.21±00.10 8.27 %	31.56±00.47 17.08 %	18.22±00.72 44.89%	31
BC_3 (No. 9)	132	103.18±00.44 C.V 4.98 %	12.15±00.10 9.94 %	33.90±00.38 13.07 %	13.28±00.54 47.19%	29
BC_3 (No.10)	97	88.09±00.38 C.V 4.33 %	12.60±00.11 8.94 %	32.52±00.59 18.02 %	19.68±00.65 32.62%	04

Table(3)con't.

Cross combination	n	Plant height	Spike length	Internode length	Number of Tillers	Stem Waxiness
BC_3 (No.11)	139	97.10±00.47 C.V 5.46 %	12.11±00.10 10.38%	35.30±00.44 14.75%	12.16±00.42 23.70%	00
BC_3 (No.12)	103	85.81±00.60 ..10 %	13.01±00.11 10.38%	32.70±00.60 14.75%	16.36±00.91 30.00%	00
BC_3 (No.	172	86.36±00.37 C.V 5.76 %	13.52±00.08 7.83 %	31.42±00.42 17.53%	13.53±00.45 32.69%	124
F , (No.14)	106	89.24±00.52 C.V 6.04 %	12.21±00.12 10.16%	34.13±00.51 15.56%	09.64±00.53 29.86%	13
BC_3 (No.15)	115	87.41±00.57 C.V 7.05 %	10.74±00.10 10.58%	27.46±00.45 17.71%	06.95±00.53 19.56%	00
BC_3 (No.16)	138	82.83±00.37 C.V 5.32 %	14.53±00.11 9.28 %	31.25±00.45 17.25%	14.92±00.30 53.57%	72
BC_3 (No.17)	125	109.13±00.45 C.V 4.71 %	13.10±00.09 8.50 %	36.23±00.54 16.76%	25.21±00.40 27.50%	8
BC_3 (No.18)	130	89.54±00.46 C.V 5.92 %	11.90±00.10 10.15%	40.22±00.60 16.93%	12.71±00.40 32.96%	12
BC_3 (No.19)	151	96.36±00.35 C.V 4.57 %	12.43±00.09 9.17 %	43.12±00.45 13.08%	13.14±00.45 28.59%	00
BC_3 (No.20)	81	103.73±00.64 C.V 5.63 %	12.89±00.13 9.53%	36.57±00.60 14.67%	13.31±00.60 41.60%	26

Table(3)con't.

Cross combination	n	Plant height	Spike length	Internode length	Number of Tillers	Stem Waxiness
BC_3 (No.21)	170	96.11±00.43 C.V 4.42 %	11.73±00.08 9.57 %	37.09±00.49 17.27%	15.69±00.34 20.27%	00
BC_3 (No.22)	121	98.25±00.47 C.V 5.34 %	12.42±00.12 10.80%	36.32±00.53 16.14%	15.76±00.62 27.63%	03
BC_3 (No.23)	133	105.38±00.52 C.V 5.71 %	12.02±00.09 9.08 %	36.93±00.46 14.81%	16.46±00.48 45.02%	00
BC_3 (No.24)	126	123.19±00.38 C.V 3.50 %	13.21±00.09 8.05 %	33.58±00.53 17.91%	15.07±00.58 27.71%	05
BC_3 (No.25)	163	103.04±00.39 C.V 4.87 %	11.95±00.09 9.97 %	38.65±00.40 13.50%	17.46±00.31 31.13%	00
BC_3 (No.26)	116	108.52±00.52 C.V 5.18 %	12.55±00.10 8.98 %	39.91±00.58 15.78%	17.81±00.56 54.21%	00
BC_3 (No.27)	123	100.21±00.46 C.V 5.11 %	13.65±00.10 8.88 %	35.25±00.45 14.36%	18.54±00.50 40.81%	00
BC_3 (No.28)	96	97.54±00.45 C.V 4.53 %	12.60±00.11 8.69 %	39.83±00.58 14.50 %	14.17±00.47 56.81%	00
BC_3 (No.29)	139	103.20±00.35 C.V 4.04 %	11.65±00.09 9.52 %	34.32±00.48 16.53%	12.76±00.32 43.81%	00
BC_3 (No.30)	122	96.28±00.44 C.V 5.09 %	16.84±00.11 7.37 %	43.13±00.54 13.84%	19.00±00.33 56.75%	00

Table(3)con't.

Cross combination	n	Plant height	Spike length	Internode length	Number of Tillers	Stem Waxiness
BC_3 (No.31)	127	88.41±00.53 C.V 6.82 %	12.98±00.10 8.82 %	39.77±00.54 15.52%	11.28±00.53 39.17%	28
BC_3 (No.32)	150	98.05±00.32 C.V 4.05 %	14.05±00.08 7.67 %	36.65±00.52 17.43%	18.79±00.42 24.39%	65
BC_3 (No.33)	136	106.39±00.45 C.V 5.04 %	11.87±00.10 10.52%	36.03±00.48 15.85%	13.53±00.38 18.10%	00
BC_3 (No.34)	117	99.51±00.44 C.V 4.84 %	12.64±00.10 9.29 %	32.27±00.50 17.02%	17.20±00.45 36.57%	00
BC_3 (No.35)	125	113.54±00.52 C.V 5.17 %	12.93±00.09 8.29 %	39.02±00.58 16.87%	14.09±00.52 42.62%	14
BC_3 (No.36)	121	99.93±00.33 C.V 3.72 %	12.65±00.45 9.45 %	35.62±00.45 15.68%	21.38±00.39 40.74%	00
BC_3 (No.37)	152	89.20±00.38 C.V 5.35 %	11.94±00.08 9.25 %	36.58±00.43 14.42%	16.92±00.37 28.66%	00
BC_3 (No.38)	128	117.15±00.46 C.V 4.50 %	13.10±00.09 8.08 %	41.15±00.51 14.20%	12.38±00.49 43.63%	00
BC_3 (No.39)	121	112.12±00.35 C.V 3.47 %	12.52±00.09 8.38 %	37.12±00.57 16.90%	18.58±00.46 34.15%	00
BC_3 (No.40)	102	97.80±00.57 C.V 5.95 %	12.64±00.10 8.70 %	36.17±00.56 15.60%	16.26±00.50 32.82%	00
BC_3 (NO.41)	97	118.21±00.54 C.V 4.56 %	12.23±00.11 9.47 %	37.54±00.65 17.06%	10.82±00.52 22.76%	29

Table (4): The mean performance of yield and yield components for parents and F_1'S.

Variants	n	Kernels per Ear	Spikelets per Ear	100 kernel Weight	Kernels per Spikelets	Grain yield per plant
Giza 157	320	79.13±00.13	21.72±00.05	04.82±00.02	02.88±00.009	52.16±00.54
		C.V 2.94 %	4.65 %	5.87 %	3.47 %	11.42%
Sakha 8	342	82.28±00.18	23.28±00.05	04.92±00.03	02.79±00.014	71.55±00.40
		C.V 4.09 %	3.98 %	7.33 %	6.21 %	6.76 %
Petka	336	122.60±00.26	56.85±00.19	03.68±00.04	02.18±00.060	94.28±01.62
		C.V 1.12 %	3.94 %	14.38 %	13.76 %	9.77 %
Giza 157 x Petka	94	62.24±00.30	20.53±00.12	03.80±00.03	01.85±00.029	26.12±00.63
		C.V 4.76 %	6.01 %	8.32 %	15.29 %	23.68%
Sakha 8 x Petka	130	60.53±00.18	21.74±00.09	03.71±00.03	02.04±0.043	19.34±00.49
		C.V 3.44 %	5.18 %	11.11 %	24.51 %	29.46%

Table(5)con't

Cross combination	n	kernels per Ear	Spikelets per Ear	100 kernel Weight	Kernels per Spikelets	Grain yield per plant
BC_3 (No.11)	139	83.50±00.41	22.23±00.12	04.49±00.01	03.15±00.08	39.32±00.45
		C.V 5.91 %	6.43 %	4.98 %	31.27%	15.95%
BC_3 (No.12)	103	95.23±00.36	20.04±00.19	03.93±00.02	03.24±00.09	37.38±00.63
		C.V 3.89 %	9.79 %	6.23 %	29.60%	17.15%
BC_3 (No.1[illegible]	172	74.50±00.30	23.31±00.12	03.84±00.02	02.40±00.06	21.64±00.41
		C.V 5.41 %	6.97 %	9.02 %	34.61%	24.92%
BC_3 (No.14)	106	68.52±00.43	25.22±00.20	04.16±00.04	02.19±00.06	18.17±00.49
		C.V 6.59 %	8.17 %	11.53%	30.97%	28.19%
BC (No.15)	115	62.33±00.43	22.59±00.13	04.19±00.07	02.36±00.06	12.20±00.53
		C.V 7.54 %	6.13 %	18.94%	31.42%	47.21%
BC_3 (No.16)	138	88.87±00.32	24.20±00.13	04.05±00.03	03.01±00.07	32.82±00.49
		C.V 4.24 %	6.44 %	10.76%	30.99%	17.79%
BC_3 (No.17)	125	79.80±00.45	20.35±00.20	03.22±00.06	02.88±00.08	36.25±00.39
		C.V 6.38 %	11.00%	21.52%	31.44%	12.25%
BC_3 (No.18)	130	87.13±00.38	24.29±00.15	04.17±00.03	03.11±00.08	26.09±00.36
		C.V 5.09 %	7.33 %	8.31 %	31.01%	15.93%
BC_3 (NO.19)	151	64.37±00.31	20.06±00.09	04.72±00.04	02.71±00.06	31.83±00.40
		C.V 6.05 %	5.57 %	11.21%	29.75%	15.62%
BC_3 (No.20)	81	78.94±00.53	23.24±00.20	03.44±00.06	02.64±00.09	22.20±00.68
		C.V 6.11 %	7.92 %	18.15 %	31.01%	27.91%

Table(5)con't

Cross combination	n	Kernels per Ear	Spikelets per Ear	100 kernel Weight	Kernels per Spikelets	Grain yield per plant
BC_3 (No.21)	170	63.25±00.39	21.83±00.15	03.98±00.03	02.21±00.06	23.91±00.49
		C.V 8.08 %	9.29 %	11.24%	38.66%	26.96%
BC_3 (No.22)	121	[illegible]±00.38	22.20±00.12	03.82±00.03	02.63±00.07	23.75±00.43
		C.V 5.93 %	6.11 %	10.14%	31.35%	20.03%
BC [illegible].23)	133	60.79±00.46	25.37±00.10	04.02±00.02	01.93±00.08	38.43±00.31
		C.V 8.91 %	4.56 %	7.87 %	48.61%	9.53 %
BC_3 (No.24)	126	68.20±00.33	23.06±00.16	03.93±00.03	02.52±00.06	21.52±00.43
		C.V 5.52 %	7.87 %	10.18%	29.96%	22.85%
BC_3 (No.25)	163	72.57±00.38	23.44±00.13	04.12±00.03	02.94±00.07	40.08±00.47
		C.V 6.78 %	7.44 %	11.64%	30.42%	15.07%
BC_3 (No.26)	116	61.41±00.43	24.46±00.16	04.10±00.03	02.28±00.07	34.27±00.49
		C.V 7.57 %	7.32 %	9.45 %	35.90%	15.53%
BC_3 (No.27)	123	60.52±00.43	23.81±00.12	04.08±00.05	02.33±00.07	43.15±00.55
		C.V 7.99 %	5.80 %	13.86%	37.17%	14.33%
BC_3 (No.28)	96	61.11±00.43	22.14±00.23	04.38±00.04	02.51±00.08	28.91±00.59
		C.V 6.98 %	10.24%	9.41 %	32.12%	20.11%
BC_3 (No.29)	139	70.02±00.35	26.25±00.11	04.68±00.02	02.39±00.07	24.62±00.46
		C.V 5.95 %	5.13 %	6.41 %	38.35%	22.35%
BC_3 (No.30)	122	61.57±00.44	24.73±00.13	04.63±00.04	02.17±00.08	42.17±00.48
		C.V 8.00 %	6.04 %	11.01%	43.47%	12.74%

Table(5)con't

Cross combination	n	Kernels per Ear	Spikelets per Ear	100 kernel Weight	Kernels per Spikelets	Grain yield per plant
BC_3 (No.31)	127	64.43±00.45	23.31±00.11	03.77±00.04	02.42±00.07	17.84±00.50
		C.V 7.99 %	5.51 %	12.99%	34.08%	31.82%
BC_3 (No.32)	150	62.74±00.37	20.58±00.09	03.92±00.02	02.43±00.07	29.38±00.44
		C.V 7.35 %	5.91 %	9.20 %	37.04%	18.61%
BC_3 (No.33)	136	8[illegible]±00.45	24.01±00.10	04.06±00.05	02.64±00.07	26.23±00.39
		C.V 6.50 %	5.13 %	14.98%	32.36%	18.61%
BC_3 (No.34)	[illegible]	64.15±00.35	23.62±00.12	04.18±00.03	02.53±00.08	37.89±00.48
		C.V 6.02 %	5.62 %	9.57 %	36.65%	13.88%
BC_3 (No[illegible]	125	68.20±00.43	23.35±00.16	03.81±00.05	02.27±00.07	29.32±00.43
		C.V 7.13 %	7.85 %	15.30%	36.86%	16.52%
BC_3 [illegible] 36)	121	65.91±00.40	21.48±00.12	04.72±00.03	02.62±00.07	43.15±00.40
		C.V 6.68 %	6.32 %	8.99 %	31.47%	10.43%
BC[illegible] (No.37)	152	61.01±00.33	23.10±00.09	04.57±00.04	02.47±00.05	33.67±00.34
		C.V 6.71 %	5.03 %	11.16%	28.05%	12.76%
[illegible]$_3$ (No.38)	128	69.54±00.40	24.34±00.18	04.25±00.03	02.38±00.07	29.32±00.36
		C.V 6.56 %	8.42 %	8.48 %	36.14%	13.95%
BC_3 (No.39)	121	60.74±00.44	24.76±00.13	04.32±00.03	02.42±00.07	42.96±00.50
		C.V 8.10 %	5.95 %	10.09%	34.08%	13.00%
BC_3 (No.40)	102	64.27±00.45	19.65±00.12	04.17±00.04	02.31±00.09	33.07±00.57
		C.V 7.17 %	6.50 %	11.50%	39.44%	17.61%
BC_3 (No.41)	97	81.43±00.42	28.89±00.17	03.43±00.06	03.09±00.09	14.93±00.52
		C.V 5.14 %	6.07 %	17.73%	31.04%	34.91%

2. Protein identification by electrophoresis analysis:

The two storage protein groups, gliadin and glutenin have been recognized in the endosperm (Wall 1979). They are synthesized on the endoplasmic reticulum in the developing endosperm. They are deposited in protein bodies (Shewry and Miflin,1985). The gliadins are considered to have a contribution to viscosity and extensibility of glutin. The glutenins appear to be the major determinants of elasticity (Tatham et al 1985). The SDS-PAGE analysis has shown that higher variability between the electrophoretic bands in the plants of the two back-crosses (BC_3) as compared to the parents, Giza 157, Sakha 8 and Petka. It was found that plants of the back-cross (BC_3) number 1, 5, and 6 showed deficiency in the principle w-gliadin and LMW glutenin components controlled by genes on the short arm of chromosome 1B (1BS) Therefore, it is possible that these plants contain the wheat - rye chromosome translocation. The plants number 1, 11, 21 and 29 of the back-cross three (iza 157 x Petka) x Giza 157) showed that deficient bands of the HMW lutenin subunits as compared to the wheat parent Giza 157. Plants num r 30 and 37 of the back-cross three ((Sakha 8 x Petka) x Sakha 8) s wed more bands in HMW and LMW glutenin subunits as compared to the whe parent, Sakha 8.Fig.(11). The plants number 3, 7, 8, 9, 10, 13, 16, , 22, 24, 27, 31, 32, 35 and 41 showed different bands in the HMW ue, w-gliadine, LMW glutenine and y-gliadine as compared to the wh ents, Giza 157 and Sakha 8. The plants number 2, 4, 12, 14, 15, 17, , 25, 26, 28, 33, 34, 36, 38, 39 and 40 showed insignificant diffe rom the bands of

the wheat parents, Giza 157 and Sakha 8.

It was found that there is no differences between the parents and the two back-crosses plants in the ϱ/B gliadine.

3. Cytological studies:

3.a. Cytological behaviour of chromosomes:

Parents and F_1's:

a. Prophase 1:

The observations performed at diakinesis stage for the chromosomal pairing of Giza 157 plants showed that the univalents ranged from 0.0 to 2.0 with an average of 0.083. In PMC's of Sakha 8 plants, it ranged from 0.0 to 2.0 with an average of 0.350, whereas in PMC's of Petka there were no univalentss. The univalent frequency in the F_1 (Giza 157 x Petka) ranged from 12 to 16 with an average of 12.476. While, in the F_1 (Sakha 8 x Petka) univalents ranged from 10 to 18 with an average of 11.061, Table (6a).

The ring bivalents in Giza 157 PMC's ranged from 0.0 to 2.0 with an average of 0.67. Ring bivalents in Sakha 8 PMC's ranged from 0.0 to 3.0 with an average of 0.154. In Petka, it ranged from 0.0 to 7.0 with an average of 0.154. The range of ring bivalents in Giza 157 x Petka was 10 to 13 with an average of 11.532. The range of ring bivalents in Sakha 8 x Petka was 9.0 to 12.0 with an average of 9.904, Table (6a), Fig.(12),( ).

The rod bivalents were ranged from 4.0 to 11.0 and from 4.0 to 10.0 in Giza 157 and Sakha 8, respectively. The range of rod bivalents in Petka was 0.0 to 7.0 with an average of 4.533. The average rod bivalent in Giza 157 and Sakha 8 was 8.330 and 4.286 respectively. The rod bivalents in the Giza 157 x Petka F_1 ranged from 0.0 to 3.0 with an average of 0.524. The range of rod bivalents in the PMC's of

Fig.(12)Pollen mother cells of the diploid rye parent at diakensis stage showed the 7 bivalents chromosomes.

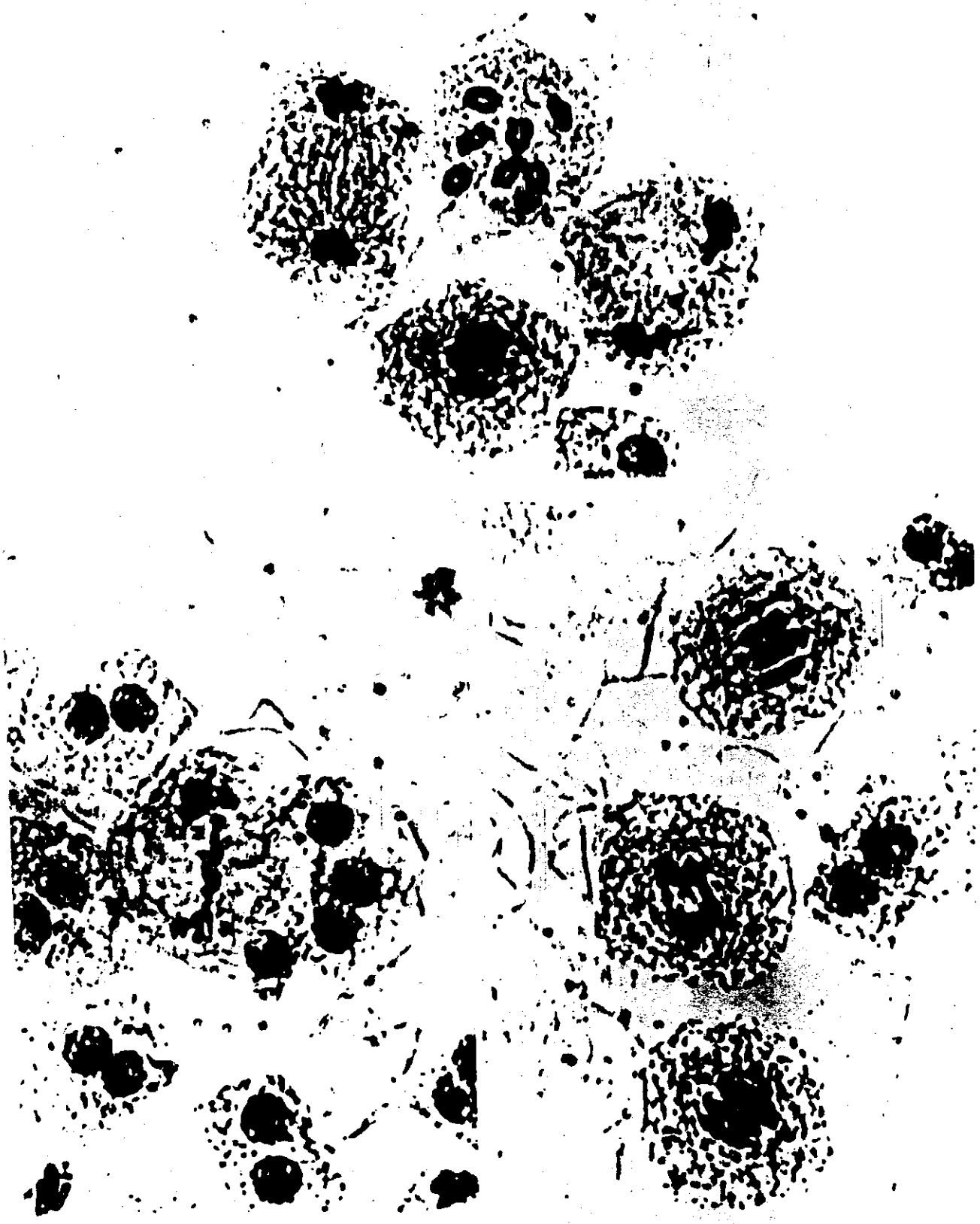


Fig.(13): Pollen mother cells of the diploid rye parent Petka showed natural abnormal single and double bridges with lagging chromosomes.

Sakha 8 x Petka F_1 was 0.0 to 5.0 with an average of 1.077.

Multivalents were found in the Giza 157 x Petka F_1 in a range of 0.0 to 1.0 with an average of 0.097 and in Sakha 8 x Petka F_1 in a range of 0.0 to 3.0 with an average of 0.805.

b. Metaphase 1:

Univalents were found in 14.35 % and in 11.56 % of the PMC's in the two F_1's: Giza 157 x Petka and Sakha 8 x Petka, respectively.

c. Anaphase 1:

Lagging chromosomes were found in 1.44 % of the examined cells of Petka plants. It was shown that 22.51 % of the PMC's of F_1 (Giza 157 x Petka) contained lagging chromosomes in a range of 0.0 to 5.0. The F_1 (Sakha 8 x Petka) was found to contain lagging chromosomes in 20.97 %. They ranged from 0.0 to 7.0 per cell, Table (6b) and Fig.(14)

Chromatid bridges were found in 0.53 % of Giza 157 PMC's and in 1.42 % of Petka PMC's. A range of 0.0 to 2.0, chromatid bridges was found in 4.71 % of the cells of Giza 157 x Petka and in 2.93 % of the cells of Sakha 8 x Petka F_1, Table (6c).

d. Anaphase 11:

Lagging chromosomes were observed in 2.30 % of Giza 157 PMC's, 1.63 % of Sakha 8 PMC's and in 2.07 % of Petka PMC's with a range of 0.0 to 2.0, 0.0 to 1.0 and 0.0 to 3.0, respectively. The lagging chrom chromosomes were found in 42.65 % of the Giza 157 x Petka F_1 with a range of 0.0 to 7.0 and in 24.68 % of the Sakha 8 x Petka F_1 plants

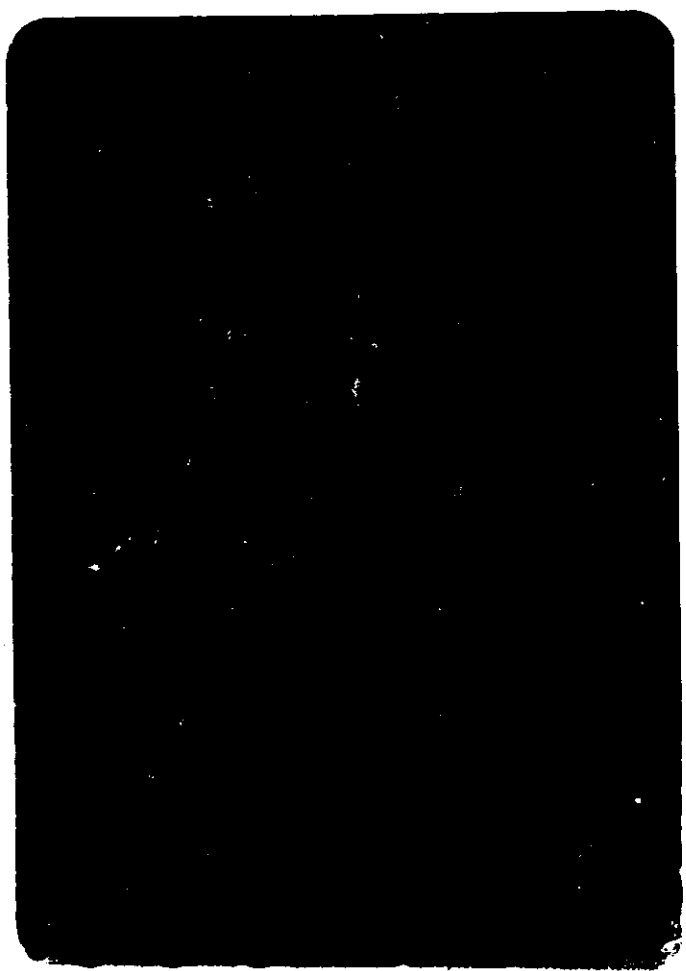


Fig.(14): Pollen mother cell of the F_1 (Sakha 8 x Petka),2n=28 showed lagging chromosomes in anaphase 1.

with a range of 0.0 to 8.0 per cell, Table (6d).

e. Tetrad:

Micronuclei were found in 29.73 % of the PMC's of Giza 157 x Petka F_1 with the range of 0.0 to 6.0. They were found in 20.90 % of the PMC's of Sakha 8 x Petka with the range of 0.0 to 5.0, Table (6e)

Back-cross three (Plant number 1):

a. Prophase 1:

In the analysis of chromosomal pairing at diakinesis stage, it was found that univalents were ranged from 0.0 to 2.0 with an average of 0.548.

The ring bivalents ranged from 0.0 to 6.0 with an average of 1.056. Meanwhile, rod bivalents ranged from 0.0 to 5.0 with an average of 1.167, Table (7-a).

b. Metaphase 1:

The number of the examined PMC's was 80. 9 PMC's showed univalents and the percentage of irregular cells was 11.25 %, Table (7-b) and Fig. (15).

c. Anaphase 1:

PMC's were characterized by the occurance of lagging chromosomes, which ranged from 0.0 to 3.0. There were 30.95 % of the PMC's contained lagging chromosomes. Chromatid bridge beside chromosomal fragments were observed in 21.43 % of the PMC's, Figs (16, 17, 18 and 19)

d. Anaphase 11:

It was found that out of 74 PMC's, 72.97 % showed lagging chromosomes in a range of 1.0 to 8.0 per irregular cell, Table (7-b).

e. Tetrad:

It was found that out of 81 PMC's, 76.54 % showed micronuclei.

Fig.(15): Pollen mother cells of the back-cross ((Giza 157 x Petka) x Giza 157) for plant number 1 showed lagging univalents at metaphase 1.

Fig.(16)Pollen mother cell of the back-cross (Giza 157 x Petka) x Giza 157,showing anaphase 1 with 43 chromosome with two lagging chromatides (bridges), Plant No.1.

Fig.(17) Pollen mother cells of the back-cross (Giza 157 x Petka) x Giza 157, showing anaphase 1 with 43 chromosomes with three chromatid bridges (NO.1).

Fig.(18): Pollen mother cell of the back-cross (Giza 157 x Petka) x Giza 157, showing anaphase 1 and anaphase 11 with lagging chromosomes (No. 1 with 43 chromosomes).

in a range of 1.0 to 5.0. Numerous tetrads with chromatin lines,lays out by cellular walls, were recorded. It was noticed that nuclei often occur with irregular distribution in tetrad, Fig.(20, 21, 22, 23, 24).

Back-cross three (Plant number 2):

a. Prophase 1:

The examined PMC's in the diakinesis stage showed that, the univalents ranged from 6.0 to 10.0 with an average of 6.310. The ring bivalents ranged from 0.0 to 4.0 with an average of o.917. Meanwhile, the range of rod bivalents was 0.0 to 7.0 with an average of 2.668, Table (8-a).

b. Metaphase 1:

There were 2.19 % of the PMC's found to contain univalent chromosomes out of 93 examined cells.

Trivalents were detected in two cells only.

c. Anaphase 1:

The PMC's were found to had only one lagging chromosome in two cells (3.33 %). Therefore, the less number of cells (3.33 %) were found to contain chromatid bridges, Table (8-b).

d. Anaphase 11:

The number of the examined PMC's was 53 cells. Four PMC's showed lagging chromosomes and the percentage of the irregular cells was 7.55 %.

e. Tetrad:

Micronuclei were absent in all of the examined PMC's.

Fig.(21): Pollen mother cells of the back-cross (Giza 157 x Petka) x Giza 157, showing anaphase 11 with lagging chromosomes and metaphase 11(late), (No. 1 with 43 chromosomes).

Fig.(22): Pollen mother cells of the back-cross (Giza 157 x Petka) x Giza 157, showing telophase 1 with three nuclei and lagging chromosome (No. 1).

Fig.(23): Pollen mother cell of the back-cross (Giza 157 x Petka) x Giza 157, showing telophase II with undeveloped cellular wall.

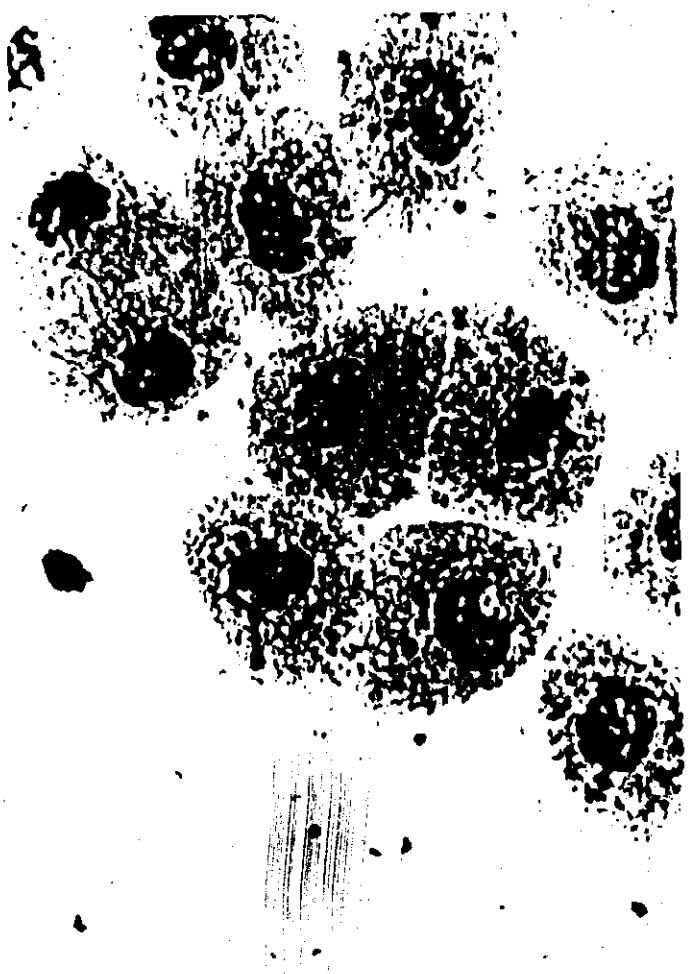


Fig.(24): Pollen mother cells of the back-cross three(Giza 157 x Betka) x Giza 157,showing tetrad with unequally distributed micronuclei.

Back-cross three (Plant number 3):

a. Prophase 1:

The data revealed that univalents were found in a range of 0.0 to 8.0 with an average of 6.128. The ring univalents ranged from 0.0 to 5.0 with an average of 0.672. Meanwhile, rod bivalents ranged from 0.0 to 8.0 with an average of 3.350, Table (9 -a) and Fig. (25).

b. Metaphase 1:

The number of the examined PMC's was 104. Nineteen cells showed univalents with a percentage of 18.27 % of the total cells.

c. Anaphase 1:

The PMC's were found to contain lagging chromosomes in 16.67 % with a range of 1.0 to 5.0. The chromatid bridges were found in 23.33 % of the total examined PMC's.

d. Anaphase 11:

The PMC's were found to had lagging chromosomes in 23.08 % with a range of 1.0 to 6.0.

e. Tetrad:

Micronuclei showed in 14.52 % of the total examined PMC's with a range of 1.0 to 4.0, Table (9 -b).

Back-cross three (Plant number 4):

a. Prophase 1:

The examined PMC's in the diakinesis stage indicated that, the univalents ranged from 0.0 to 8.0 with an average of 5.424. The ring bivalents were ranged from 0.0 to 7.0 with an average of 3.054

Fig.(25): Pollen mother cell of the back-cross (Giza 157 x Petka) x Giza 157, showing ring, rod bivalents and ring quadrivalents (No.3 with 42 chromosomes) at diakinesis stage.

The rod bivalents were found in a range of 0.0 to 7.0 with an average of 3.116, Table (10-a).

b. Metaphase 1:

The total number of the examined PMC's was 101. three PMC's showed univalent chromosomes and the percentage of the irregular cells was 2.97 %, Table (10-b).

c. Anaphase 1:

Lagging chromosomes were shown in four PMC's in a range of 1.0 per each irregular cell. The percentage of the irregular cells was 10.53 %, Table (10-b).

d. Anaphase 11:

The distribution of lagging chromosomes are given in table (10-b). Out of 71 examined PMC's, 7 cells showed lagging chromosomes. Lagging chromosomes in the irregular PMC's ranged from 1.0 to 3.0. The percentage of the irregular PMC's was 9.86 %.

e. Tetrad:

All the examined cells showed as free from micronuclei and all the examined PMC's appeared with normal tetrad formation, table (10-b).

Back-cross three (Plant number 5):

a. Prophase 1:

The examined PMC's in the diakinesis stage indicated that, the univalents ranged from 0.0 to 4.0 with an average of 1.873. The ring bivalents ranged from 0.0 to 4.0 with an average of 1.579.

Meanwhile,rod bivalents ranged from 0.0 to 5.0 with an average of 3.089. Fig. (26) and Table (11-a).

b. Metaphase 1:

The number of examined cells was 83 cells. 3 cells showed univalents and the percentage of irregular cells was 3.61, Table (11-b)

c. Anaphase 1:

The total number of the examined PMC's was 81 and lagging chromosomes ranged from 0.0 to 4.0. Meanwhile, Chromatid bridges were found in 6.17 % of the examined PMC's with an average of 1.0 lagging chromatid per cell.

d. Anaphase 11:

Lagging chromosomes were observed. The distribution of lagging chromosomes are given in table (11-b). Out of 75 examined cells, 11 cells showed lagging chromosomes. Lagging chromosomes in the irregular PMC's ranged from 1.0 to 4.0.

e. Tetrad:

All the examined PMC's were found to be free from micronuclei and the distributiom of the nuclei appeared as normal distribution.

Back-cross three (Plant number 6):

a. Prophase I:

The examined PMC's in the diakinesis stage showed that, the univalents ranged from 0.0 to 10.0 with an average of 7.137. The ring bivalents ranged from 0.0 to 5.0 with an average of 2.687. Meanwhile, The rod bivalents ranged from 0.0 to 8.0 with an average

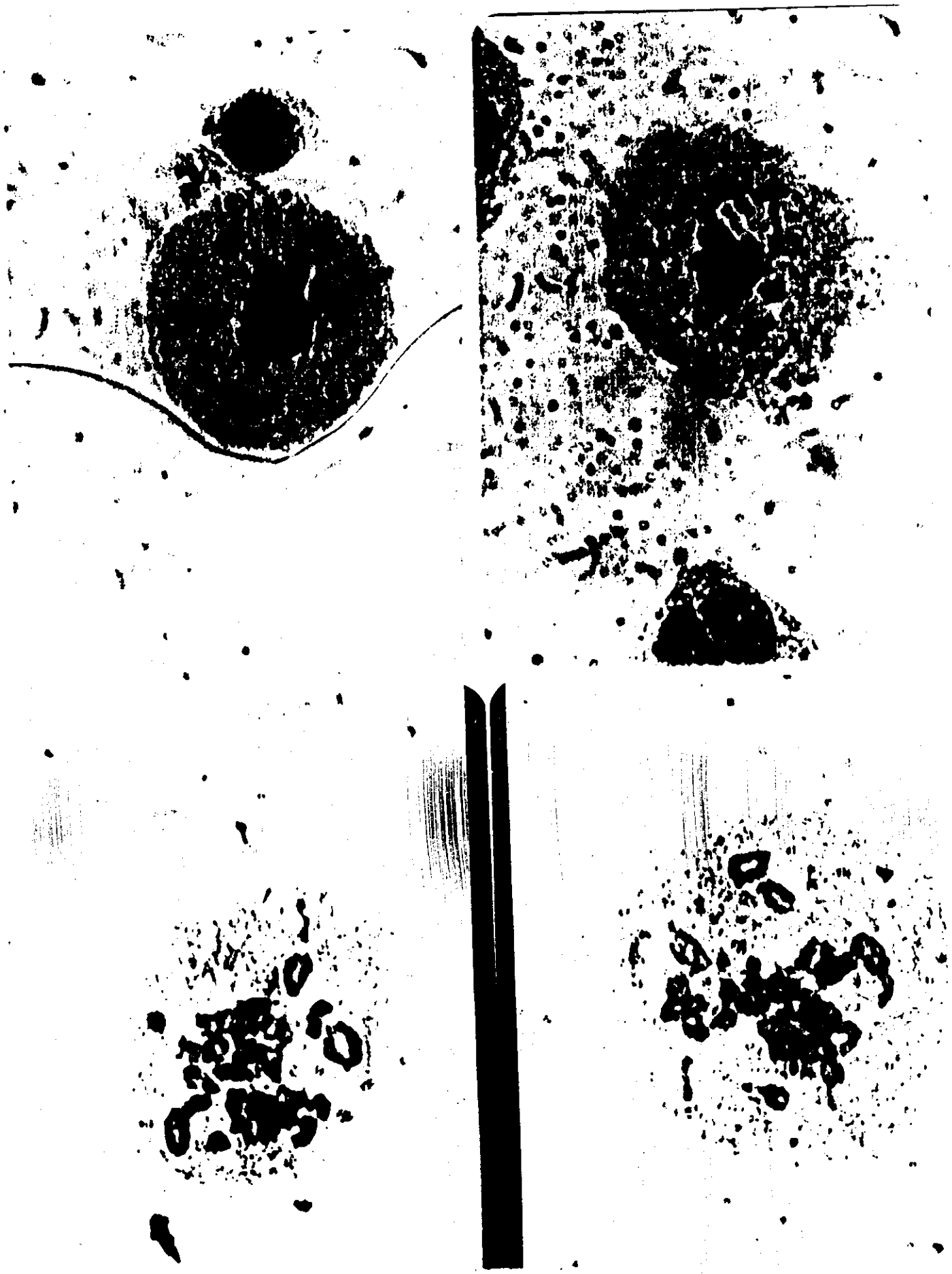


Fig.(26): Pollen mother cells of the back-cross three No. 1 and 5 ((Giza 157 x Petka) x Giza 157) and of the back-cross three plants No. 6 ((Sakha 8 x Petka) x Sakha 8) showed translocation between 1R and 1B chromosomes.

of 4.148. Table (12-a).

b. Metaphase 1:

The total number of the examined PMC's was 83. 7 PMC's showed univalent chromosomes and the percentage of the irregular cells was 8.43 %, Table (12-b).

c. Anaphase 1:

Out of the total 80 PMC's, 19 cell showed lagging chromosomes in a range of 1.0 to 4.0 per irregular cell. The distribution of lagging chromosomes are given in table (12-b).The chromatid bridges were observed in 15.0 % of the total examined cells with frequancy of one per cell,Fig. (27).

d. Anaphase 11:

Lagging chromosomes were recorded in 17.50 % of the total examined PMC's. Lagging chromosomes ranged from 1.0 to 5.0 per irregular cell, Table (12-b).

e. Tetrad:

The percentage of the examined PMC's showed micronuclei was 28.38 %. Micronuclei ranged from 1.0 to 4.0 per irregular cell.

Back-cross three (Plant number 7):

a. Prophase 1:

The examined PMC's in the diakinesis stage indicated that,the univalents ranged from 0.0 to 10.0 with an average of 7.934.The ring bivalents ranged from 0.0 to 4.0 with an average of 2.023. The rod bivalents ranged from 0.0 to 8.0 with an average of 5.210, Table (13-a).

b. Metaphase 1:

Lagging chromosomes was observed in 5.31 % of the total examined PMC's with a range of 0.0 to 2.0 univalent per cell.

c. Anaphase 1:

Lagging chromosomes was found in 24.44 % of the total examined PMC's in a range of 1.0 to 3.0 per irregular cell. Chromatid bridges were observed in 8.89 % of the total examined PMC's.

d. Anaphase 11:

The total number of the examined PMC's was 45 cells. 28.89 % of the examined PMC's showed lagging chromosomes in a range of 1.0 to 5.0 per irregular PMC's, Table (13-b).

e. Tetrad:

Micronuclei were counted in 8.91 % of the examined PMC's, in a range of 1.0 to 5.0 per irregular tetrad cell. Numerous tetrad cells showed chromatin lines.

Back-cross three (Plant number [illegible])

a. Prophase 1:

In analysis of chromosomal pairing at diakinesis stage, it was found that univalents ranged from 6.0 to 8.0 per irregular cell with an average of 7.374. The ring bivalents ranged from 0.0 to 6.0 with an average of 2.908. Meanwhile, the rod bivalents ranged from 0.0 to 6.0 with an average of 3.711, Table (14-a).

b. Metaphase 1:

Univalent chromosomes were shown in 2.73 % of the total examined PMC's, Table (14-b).

c. Anaphase 1:

The number of the examined PMC's was 64. Two PMC's showed univalent chromosomes and the percentage of the irregular cells was 3.13 %. Univalents ranged from 0.0 to 1.0 per cell. Chromatid bridge was observed in 1.56 % of the examined PMC's.

d. Anaphase 11:

Lagging chromosomes were recorded in 20.97 % of the total PMC's with a range of 1.0 to 6.0 per irregular cell.Table (14-b).

e. Tetrad:

Micronuclei were found in 20.97 % of the total examined PMC's in a range of 1.0 to 6.0 per irregular cell. Meanwhile,two cells showed chromatin lines cut by cellular walls.

Back-cross three (Plant number 9):

a. Prophase 1:

In analysis of chromosomal pairing at diakinesis stage,the univalents ranged from 4.0 to 6.0 per irregular cell with an average of 4.089. The ring bivalents ranged from 0.0 to 6.0 with an average of 4.203. Meanwhile, the rod bivalents ranged from 0.0 to 8.0 with an average of 5.432, Table (15-b).

b. Metaphase 1:

Univalent chromosomes were recorded in 6.43 % of the total examined PMC's with a range of 1.0 to 3.0. Multivalents were shown in a range of 0.0 to 3.0 with an average of 0.086.

c. Anaphase 1:

The number of the total examined PMC's was 74. Nine PMC's showed lagging chromosomes in a range of 1.0 to 6.0 per irregular cell. The percentage of the irregular PMC's was 12.16 %. Chromatid bridges were observed in 5.41 % of the total examined PMC's with a range of 1.0 to 2.0 per irregular cell.

d. Anaphase 11:

The number of the examined PMC's was 82. 46 PMC's showed lagging chromosomes in a range of 1.0 to 5.0 per irregular cell. The percentage of the irregular PMC's was 54.10 %, Table (15-b).

e. Tetrad:

The number of the micronuclei ranged from 2.0 to 5.0 per irregular cell and the percentage of the irregular PMC's was 35.71 %,

Back-cross three (Plant number 10):

a. Prophase 1:

In analysis of the PMC's for chromosomal pairing at diakinesis stage, the univalent chromosomes ranged from 4.0 to 10.0 per irregular cell with an average of 6.244. The ring bivalents ranged from 0.0 to 4.0 with an average of 2.700. Meanwhile, the rod bivalents ranged from 0.0 to 8.0 with an average of 5.175, Table (16-a).

b. Metaphase 1:

The number of the total examined PMC's was 101. Five PMC's showed univalent chromosomes and the percentage of the irregular PMC's was 4.95 %.

c. Anaphase 1:

The distribution of lagging chromosomes are given in Table (16-b). Out of 79 examined PMC's, 9 cells showed lagging chromosomes. Lagging chromosomes in the irregular PMC's ranged from 1.0 to 3.0. The percentage of the irregular PMC's was 11.39 %. Chromatid fragments ranged from 1.0 to 2.0 per irregular cell and the percentage of the irregular PMC's was 8.86 %.

d. Anaphase 11:

Out of 74 examined PMC's, 8 cells showed lagging chromosomes. Lagging chromosomes in the irregular PMC's ranged from 1.0 to 4.0. The irregular PMC's constituted 10.81 % of the total examined PMC's.

e. Tetrad:

The total number of the examined PMC's was 131. Three PMC's showed lagging micronuclei in a range of 1.0 to 4.0 per irregular PMC's. The percetage of the irregular PMC's was 02.29 %,Table (16-b).

Back-cross three (Plant number 11

a. Prophase 1:

The examined PMC's in the diakinesis stage indicated that,the univalents ranged from 0.0 to 8.0 with an average of 5.241. The ring bivalents ranged from 1.0 to 6.0 per irregular PMC's with an average of 3.26. Meanwhile, the rod bivalents ranged from 0.0 to 5.0 with an average of 2.44, Table (17-a).

b. Metaphase 1:

Univalent chromosomes were not recorded in all of the examined PMC's.

c. Anaphase 1:

The total number of the examined PMC's was 82 and lagging chromosomes ranged of 1.0. Meanwhile,Chromatid bridges were 2.43 % of the total PMC's with an average of 1.0 lagging chromatid per cell.

d. Anaphase 11:

The distribution of lagging chromosomes are given in table (18-b). Out of 85 examined PMC's, three PMC's showed lagging chromosomes in a percentage of 3.53 %. Lagging chromosomes in the irregular PMC's ranged from 1.0 to 3.0.

e. Tetrad:

The distribution of the micronuclei are given in table (18-b). All of the examined PMC's showed normal distribution of the nuclei in the tetrad cells.

Back-cross three (Plant number 13):

a. Prophase 1:

The examined PMC's in the diakinesis stage indicated that,the univalents ranged from 0.0 to 8.0 with an average of 3.454. The ring bivalents ranged from 0.0 to 4.0 with an average of 3.297. The rod bivalents ranged from 0.0 to 6.0 with an average of 2.867,Table (19-a).

b. Metaphase 1:

The distribution of the lagging chromosomes are given in table (19-b). The number of the examined PMC's was 104; 17 PMC's showed univalent chromosomes in a percentage of 16.35 %. One PMC showed

Trivalent chromosomes in a range of 1.0 per irregular cell.

c. Anaphase 1:

Lagging chromosomes were observed. The distribution of lagging chromosomes are given in table (19-b). Out of 114 examined PMC's, 9 PMC's showed lagging chromosomes. Lagging chromosomes in the irregular PMC's ranged from 1.0 to 3.0. Meanwhile,Chromatid bridges were 8.77 % with an average of 1.0 per irregular cell.

d. Anaphase 11:

The total number of the examined PMC's was 65. 50.77 % of the examined PMC's showed lagging chromosomes. Lagging chromosomes in the irregular cells ranged from 1.0 to 5.0.

e. Tetrad:

Out of 121 examined PMC's, 23 PMC's showed micronuclei in a range of 1.0 to 5.0 per irregular cell. The percetage of the irregular cells was 19.01 %,Table (19-b).

Back-cross three (Plant number 14):

a. Prophase 1:

The examined PMC's in the diakinesis stage indicated that,the univalents ranged from 0.0 to 6.0 with an average of 3.678. The ring bivalents ranged from 0.0 to 6.0 with an average of 4.735. Meanwhile, the rod bivalents ranged from 0.0 to 4.0 with an average of 2.012, Table (20-a).

b. Metaphase 1:

The number of the examined PMC's was 198. 26 examined PMC's

showed univalent chromosomes in a range of 1.0 to 6.0 per irregular cell. The percentage of the irregular cells was 13.13 %, Table (20-b). One PMC's showed trivalents in a range of one per irregular cell.

c. Anaphase 1:

Out of 86 PMC's, 43 PMC's showed lagging chromosomes with a range of 1.0 to 8.0 per irregular PMC's. Meanwhile, Chromatid bridges were 5.81 % of the examined PMC's with an average of 1.0 per irregular PMC's.

d. Anaphase 11:

The number of the examined PMC's was 100. 25 PMC's showed lagging chromosomes in a range of 0.0 to 3.0. The percentage of the irregular PMC's was 25 %.

e. Tetrad:

The total number of the examined PMC's was 104. Three PMC's showed micronuclei with an average of 2.0 per irregular PMC's. The percetage of the irregular PMC's was 2.88 %.

Back-cross three (Plant number 15):

a. Prophase 1:

The examined PMC's in the diakinesis stage indicated that, the univalents ranged from 6.0 to 10.0 per irregular PMC's with an average of 7.159. The ring bivalents ranged from 0.0 to 4.0 with an average of 3.083. Meanwhile, the rod bivalents ranged from 1.0 to 6.0 with an average of 3.875, Table (21-a).

b. Metaphase 1:

The total number of the examined PMC's was 79. Four PMC's showed univalent chromosomes in a range of 1.0 per irregular PMC. The percentage of the irregular PMC's was 5.06 %, Table (21-b).

c. Anaphase 1:

Out of 56 examined PMC's, 10 PMC's showed lagging chromosomes in a range of 1.0 to 2.0 per irregular PMC. The distribution of the lagging chromosomes are given in Table (21-b). The percetage of the irregular PMC's was 4.29 %. Meanwhile,Chromatid bridges ranged from 1.0 to 5.0 per irregular PMC and the percetage of the irregular PMC's was 20.0 %.

d. Anaphase 11:

The number of the examined PMC's was 40. Eight PMC's showed lagging chromosomes in a range of 1.0 per irregular PMC. The percentage of the irregular PMC's was 8.93 %.

e. Tetrad:

Micronuclei were absent in all of the examined PMC's indicating normal distribution of the nuclei in tetrad stage.

Back-cross three (Plant number 16):

a. Prephase 1:

The examined PMC's in the diakinesis stage indicated that,the univalents ranged from 6.0 to 10.0 per irregular PMC. The ring bivalents ranged from 0.0 to 6.0 with an average of 3.654. Meanwhile, the rod bivalents ranged from 0.0 to 4.0 with an average of 2.815.

b. Metaphase 1:

The number of the examined PMC's was 89. Three PMC's showed univalents with an average of 1.0 per irregular PMC. The percentage of the irregular PMC's was 3.37 %, Table (22-b).

c. Anaphase 1:

The total examined PMC's was 64. 13 PMC's showed lagging chromosomes and lagging chromosomes ranged from 1.0 to 8.0. The percetage of the irregular PMC's was 20.31 %. Meanwhile,lagging chromatids were found in 20.31 % of the PMC's.

d. Anaphase 11:

The distribution of lagging chromosomes are given in table (22-b). Out of 75, 14 PMC's showed lagging chromosomes in a range of 1.0 to 5.0 per irregular PMC. The percentage of the irregular PMC's was 18.67 %, Table (22-b).

e. Tetrad:

The number of the examined PMC's was 112. 18 PMC's showed micronuclei in a range of 1.0 to 4.0 per irregular PMC. The percetage of irregular PMC's was 16.07 %.

Back-cross three (Plant number 17):

a. Prophase 1:

In analysis of chromosomal pairing at diakinesis stage,univalents ranged from 4.0 to 8.0 per irregular PMC with an average of 4.832. The ring bivalents ranged from 2.0 to 6.0 per irregular PMC with an average of 3.246. Meanwhile,the rod bivalents ranged from 0.0 to 6.0 with an average of 2.983, Table (23-a).

b. Metaphase 1:

The number of the examined PMC's was 74. 21 PMC's showed univalents in a range of 1.0 to 2.0 per irregular PMC's. The percentage of the irregular PMC's was 25.68 %.

c. Anaphase 1:

The distribution of the lagging chromosomes are given in Table (23-b). Out of 80 PMC's, 26 PMC's showed lagging chromosomes in a range of 1.0 to 4.0. The percentage of the irregular PMC's was 32.5%. Meanwhile, the chromatid bridges were found in 8,75 % of the examined PMC's, Table (23-b).

d. Anaphase 11:

The total number of the examined PMC's was 83. 14 PMC's showed lagging chromosomes in a range of 1.0 to 5.0. The percentage of the irregular PMC's was 16.87 %.

e. Tetrad:

The number of the examined PMC's was 86. Two PMC's showed micronuclei in a range of 1.0 to 2.0 per irregular PMC. The percentage of the irregular PMC's was 2.33 %, Table (23-b).

Back-cross three (Plant number 18):

a. Prophase 1:

In analysis of chromosomal pairing at diakinesis stage, univalents ranged from 2.0 to 10.0 with an average of 5.710. The ring bivalents ranged from 0.0 to 4.0 with an average of 1.823. Meanwhile, the rod bivalents ranged from 2.0 to 8.0 with an average of 5.243, Table (24-a).

b. Metaphase 1:

The number of the examined PMC's was 90. 25 PMC's showed univalents in a range of 1.0 to 3.0 per irregular PMC's. The percentage of the irregular PMC's was 27.78 %, Table (24-b).

c. Anaphase 1:

Out of 73 PMC's, 26 PMC's showed lagging chromosomes in a rang of 1.0 to 8.0. The percentage of the irregular PMC's was 35.62 %. Meanwhile, chromatid bridges showed in 12.33 % of the examined PMC's.

d. Anaphase 11:

The distribution of the lagging chromosomes are given in Table (24-b). The total number of the examined PMC's was 70. 12 PMC's showed lagging chromosomes in a range of 1.0 to 3.0 per irregular PMC's, Table (24-b).

e. Tetrad:

14.67 % of the exa .med PMC's showed micronuclei in a range of 1.0 to 5.0, Table (24-b).

Back-cross three (Plant number 19):

a. Prophase 1:

At diakinesis stage, the analysis of chromosomal pairing revealed that univalents ranged from 0.0 to 6.0 with an average of 3.563. The ring bivalents ranged from 0.0 to 6.0 with an average of 4.178. The red bivale ts ranged from 0.0 to 8.0 with an average of 4.205, Table (25-a).

b. Metaphase 1:

Fig.(28): Pollen mother cells of the Back-cross three plants No. 19 ((Sakha 8 x Petka) x Sakha 8) showed 2 lagging chromosomes in anaphase 1.

The distribution of the univalent chromosomes are given in Table (25-b). Out of 68 examined PMC's, two PMC's showed univalent chromosomes in a range of 1.0. The percentage of the irregular PMC's was 2.94 %.

c. Anaphase 1:

The number of the examined PMC's was 50. 7 PMC's showed lagging chromosomes in a range of 1.0 to 4.0 per irregular PMC's. The percentage of the irregular PMC's was 14.00 %. Out of 50 PMC's, Five PMC's showed lagging chromatides, Fig. (28).

d. Anaphase 11:

The total number of the examined PMC's was 53. Three cells showed lagging chromosomes in a range of 1.0 per irregular PMC. The percentage of the irregular PMC's was 5.66 %.

e. Tetrad:

The number of the examined PMC's was 50. One PMC showed micronuclei in a range of 1.0 per irregular PMC. The percentage of the irregular PMC was 2.0 %, Table (25-b).

Back-cross three (Plant number 20):

a. Prophase 1:

The examined PMC's in the diakinesis stage indicated that, the univalents ranged from 6.0 to 10.0 with an average of 7.352. The ring bivalents ranged from 0.0 to 6.0 with an average of 4.116. The rod bivalents ranged from 0.0 to 8.0 with an average of 4.203, Table (26-a).

b. Metaphase 1:

The number of the examined PMC's was 156. 42 PMC's showed univalents in a range of 1.0 to 3.0. The percentage of the examined irregular PMC's was 26.92 %, Table (26-b).

c. Anaphase 1:

The total number of the examined PMC's was 67. 20 PMC's showed lagging chromosomes in a range of 1.0 to 5.0 per irregular PMC. The percentage of the irregular PMC's was 29.85 %. Meanwhile, Chromatid bridges were detected in 17.91 % of the examined PMC's with an average of 1.0 per irregular cell. The distribution of the lagging chromosomes and chromatid bridges are given in table (26-b).

d. Anaphase 11:

Lagging chromosomes were observed in some of the examined PMC's Out of 144 examined PMC's, 12 PMC's showed lagging chromosomes in a range of 1.0 to 3.0 per irregular PMC. The percentage of the irregular PMC's was 8.33 %

e. Tetrad:

The number of the examined PMC's was 90. 22 PMC's showed micronuclei in a range of 1.0 to 4.0 per irregular PMC. The percentage of the irregular PMC's was 24.44 %, table (26-b).

Back-cross three (Plant number 21):

a. Prophase 1:

In analysis of chromosome pairing at diakinesis stage, univalents ranged from 0.0 to 4.0 with an average of 2.540. The ring biva-

lents ranged from 0.0 to 6.0 with an average of 2.267. Meanwhile,the rod bivalents ranged from 0.0 to 8.0 with an average of 3.742,table (27-a).

b. Metaphase 1:

The total number of the examined PMC's are 103. 6 PMC's showed univalent chromosomes in a range of 1.0 to 2.0 per irregular PMC. The percentage of the irregular PMC's was 5.83 %.

c. Anaphase 1:

The distribution of the lagging chromosomes are given in table (27-b). Out of 82 PMC's, 6 PMC's showed lagging chromosomes in a range of 1.0 to 2.0 per irregular PMC. The percentage of the irregular MC's was 7.32 %. Chromatid bridges showed in 6.10 % of the examined PMC's with an average of 1.0 lagging chromatid per irregular cell, Table (27-b).

d. Anaphase 11:

The number of the examined PMC's was 83. 6 irregular cells showed lagging chromosomes with an average of 1.0 per irregular cell. The percentage of the irregular cells was 7.23 %.

e. Tetrad:

Out of 90 examined PMC's, One PMC showed micromuclei with an average of 1.0 per irregul r cell, table (27-b).

Back-cross three (Plant n ber 22):

a. Prophase 1:

The examined PMC's n the diakinesis stage indicated that,the

univalents ranged from 6.0 to 12.0 with an average of 7.313. The ring bivalents ranged from 0.0 to 4.0 with an average of 1.983. The rod bivalents ranged from 0.0 to 4.0 with an average of 2.760, table (28-a).

b. Metaphase 1:

The total number of the examined PMC's was 105. 40 irregular cells showed univalent chromosomes in a range of 1.0 to 3.0 per irregular cell. The percentage of the irregular PMC's was 38.09 %.

c. Anaphase 1:

Table (28-b) gives the distribution of the lagging chromosomes and chromatid bridges. Out of 70 PMC's, 23 irregular cells showed lagging chromosomes in a range of 1.0 to 5.0 per irregular cell. The percentage of th irregular PMC's was 32.86 %. Meanwhile, the chromatid bridges d ected in 20.0 % of the examined PMC's with an average of 1.0 per regular cell.

d. Anaphase 11:

The number of he examined PMC's was 42. 9 irregular cells showed lagging chrom omes in a range of 1.0 to 5.0 per irregular PMC. The percentage o the irregular cells was 21.43 %, Table (28-b)

e. Tetrad:

The number of the ex PMC's was 70. 23 irregular PMC's showed micronuclei in a range to 5.0 per irregular cell. The percentage of the irregular cells .86 %, Table (28-b).

Back-cross three (Plant number 23):

a. Prophase 1:

The examined PMC's at the diakinesis stage showed that, the univalent chromosomes ranged from 2.0 to 10.0 with an average of 4.865. The ring bivalents ranged from 2.0 to 6.0 with an average of 3.464. Meanwhile, the rod bivalents ranged from 0.0 to 4.0 with an average of 2.876, table (29-a).

b. Metaphase 1:

The total number of the examined PMC's was 119. Five irregular cells showed univalent chromosomes in a range of 1.0. The percentage of the irregular PMC's was 4.20 %.

c. Anaphase 1:

Lagging chromosomes were observed. Out of 80 PMC's, 6 PMC's showed lagging chromosomes in a range of 1.0 to 2.0. The percentage of the irregular cells was 7.50 %. Chromatid bridges were detected in 6.25 % of the examined PMC's with an average of 1.0 per irregular cell, table (29-b).

d. Anaphase 11:

The distribution of the lagging chromosomes are given in table (29-b). Out of 73 PMC's, Four irregular cells showed lagging chromosomes in a range of 1.0 to 3.0 per irregular PMC. The percentage of the irregular cells was 4.20 %.

e. Tetrad:

The number of the examined PMC's was 80. Two PMC's showed micronuclei in a range of 1.0. The percentage of the irregular cells was 2.50 %, Table (29-b).

Back-cross three (Plant number 24):

a. Prophase 1:

The examined PMC's at diakinesis stage indicated that, the univalents ranged from 4.0 to 8.0 with an average of 5.876. The ring bivalents ranged from 0.0 to 6.0 with an average of 2.175. The rod bivalents ranged from 0.0 to 4.0 with an average of 2.622, Table (30-a).

b. Metaphase 1:

The number of the examined PMC's was 93. Three PMC's showed univalent chromosomes in a range of 1.0 to 2.0 per irregular cell. The percentage of the examined PMC's was 3.22 %, Table (30-b).

c. Anaphase 1:

The total number of the examined PMC's was 84. Four irregular cells showed lagging chromosomes in a range of 1.0 to 2.0. The percentage of the irregular PMC's was 4.76 %. Out of 84 PMC's, Four irregular cells showed chromatid bridges in a range of 1.0. The percentage of the irregular PMC's was 4.76 %.

d. Anaphase 11:

The number of the examined PMC's was 87. Eight irregular cells showed lagging chromosomes in a range of 1.0 to 4.0. The percentage of the irregular PMC's was 9.19 %, Table (30-b).

e. Tetrad:

The number of the examined PMC's was 96. 10 irregular cells showed micronuclei in a range of 1.0 to 5.0. The percentage of the

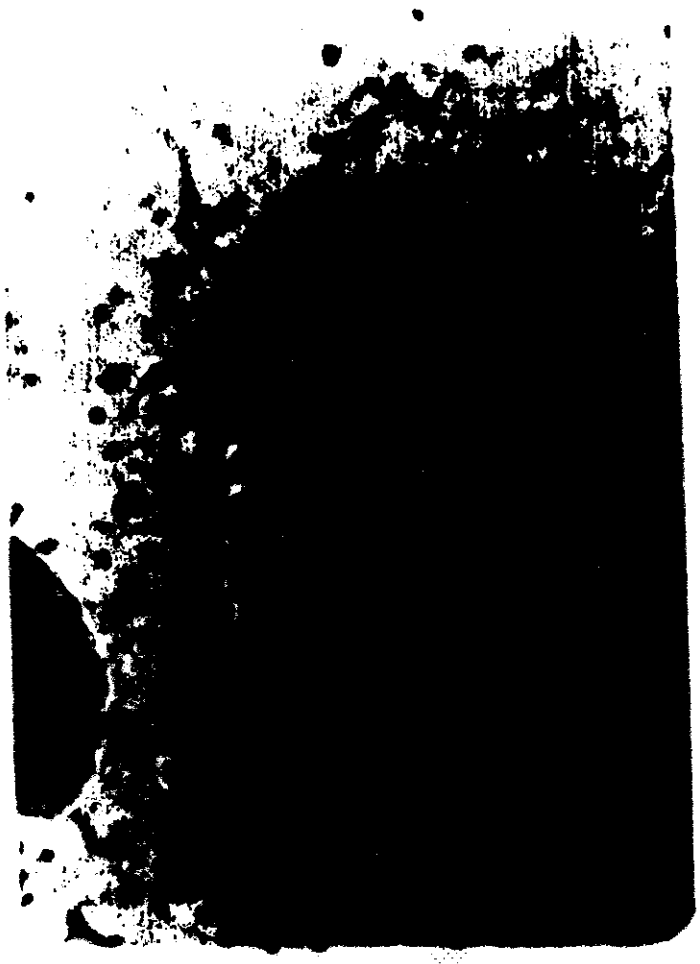


Fig.(29): Pollen mother cell of the back-cross three plants No. 25 ((Sakha 8 x Petka) x Giza 157). It showed multivalents at diakinesis stage.

irregular cells was 8.33 %, Table (30-b).

Back-cross three (Plant number 25):

a. Prophase 1:

In analysis of chromosomal pairing at diakinesis stage, univalents ranged from 2.0 to 8.0 with an average of 3.601. The ring bivalents ranged from 2.0 to 4.0 with an average of 3.820. The rod bivalents ranged from 0.0 to 6.0 with an average of 3.019, Table (31-a).

b. Metaphase 1:

The number of the examined PMC's was 134. Two PMC's showed univalent chromosomes in a range of 1.0. The percentage of the irregular cells was 1.49 %.Fig. (25).

c. Anaphase 1:

The total number of the examined PMC's was 80. 7 PMC's showed lagging chromosomes in a range of 1.0. The percentage of the irregular cells was 8.75 %, Table (31-b). Meanwhile, chromatid bridges were found in 7.50 % of the examined PMC's with an average of 1.0 lagging chromatid per irregular cell.

d. Anaphase 11:

The distribution of lagging chromosomes are given in table(31-b). Out of 157 examined P 's, 47 irregular cells showed lagging chromosomes in a range of 1.(to 4.0 per irregular cell. The percentage of the irregular PMC's wa 29.94 %, Table (31-b).

e. Tetrad:

All of the examined PMC's showed the absence of micronuclei in such stage, Table (31-b).

Back-cross three (Plant number 26):

a. Prophase 1:

In analysis of the chromosomal pairing at diakinesis stage, the univalents ranged from 0.0 to 6.0 with an average of 2.753. The ring bivalents ranged from 0.0 to 6.0 with an average of 3.414. Meanwhile, the rod bivalents ranged from 0.0 to 8.0 with an average of 3.887, Table (32-a).

b. Metaphase 1:

The number of the examined PMC's was 77. Three PMC's showed univalent chromosomes in a range of 1.0 per irregular cell and the percentage of the irregular cells was 4.05 %, Table(32-b).

c. Anaphase 1:

The total number of the examined PMC's was 55. 7 PMC's showed lagging chromosomes in a range of 1.0 to 3.0. The percentage of the irregular PMC's was 12.73 %. Lagging chromatides were detected in 5 PMC's with an average of 1.0 lagging chromatid per irregular cell. The percentage of the irregular PMC's was 9.09 %, Table (32-b).

d. Anaphase 11:

The number of the examined PMC's was 56. 7 irregular cells showed lagging chromosomes in a range of 1.0 to 4.0. The percentage of the irregular cells was 2.50 %, Table (32-b).

e. Tetrad:

Out of 70 examined PMC s, One cell showed micronuclei in a range of 1.0 per irregular ce l.

Back-cross three (Plant number 27):

a. Prophase 1:

The total number of the examined PMC's was 126. At diakinesis stage,univalents ranged from 4.0 to 10.0 per irregular cell with an average of 6.427. The ring bivalents ranged from 0.0 to 6.0 with an average of 2.683. The rod bivalents ranged from 0.0 to 5.0 per irregular PMC with an average of 3.190, Table (33-a).

b. Metaphase 1:

The number of the examined PMC's was 96.and lagging univalents ranged from 1.0 to 3.0 per irregular cell. The percentage of the irregular PMC's was 21.87 %, Table (33-b).

c. Anaphase 1:

The total number of the examined PMC's was 102. 23 PMC's showed lagging chromosomes. Lagging chromosomes in the irregular cells ranged from 1.0 to 6.0 and the percentage of irregular cells was 22.55 %. The number of the examined PMC's was 102. Chromatid bridges were detected in 12.75 % with an average of 1.0 per irregular cell, Table (33-b).

d. Anaphase 11:

The distribution of e lagging chromosomes in irregular cells is given in table (33-b). (t of 110 PMC's,21 PMC's showed lagging chromosomes in a range of 1) to 5.0. The percentage of the irregular PMC's was 19.09 %.

e. Tetrad:

Micronuclei showed in 1 .11 % of the total examined PMC's with a range of 2.0 to 4.0 per irre ular cell, Table (33-b).

Back-cross three (Plant number 28):

a. Prophase 1:

The examined PMC's in the diakinesis stage indicated that, the univalents ranged from 2.0 to 8.0 with an average of 4.127. The ring bivalents ranged from 0.0 to 5.0 with an average of 1.386. The rod bivalents showed an average of 3.572 and ranged from 0.0 to 7.0,Table (34-a).

b. Metaphase 1:

The total number of the examined PMC's was 82. Four irregular PMC's showed univalents in a range of 1.0. The percentage of the irregular PMC's was 4.87 %, Table (34-b).

c. Anaphase 1:

The distribution of the lagging chromosomes in the examined PMC's is given in table (34-b). Out of 74 examined PMC's, 7 irregular cells showed lagging chromosomes in a range of 1.0 to 2.0. The percentage of the irregular cells was 9.46 %. Meanwhile, 5 irregular cells showed lagging chromatides with an average of 1.0 lagging chromatid per irregular cell. The percentage of the irregular cells was 6.76 %.

d. Anaphase 11:

The number of the examined PMC's was 81. 9 irregular cells showed lagging chromosomes. The lagging chromosomes ranged from 1.0 to 4.0 per irregular cell and the percentage of the irregular cells was 11.11 %, Table (34-b).

e. Tetrad:

Table (34-b) gives the distribution of the micronuclei. The total number of the examined PMC's was 82. All of the examined PMC's showed that the micronuclei were not detected.

Back-cross three (Plant number 29):

a. Prophase 1:

The examined PMC's at the diakinesis stage showed that, the univalents ranged from 2.0 to 10.0 with an average of 3.581. The ring bivalents ranged from 0.0 to 6.0 with an average of 2.935. Meanwhile, the rod bivalents ranged from 0.0 to 6.0 with an average of 2.123, Table (35-a).

b. Metaphase 1:

The number of the examined PMC's was 202. 8 PMC's showed univalent chromosomes. Univalents ranged of 1.0 per irregular cell and the percentage of the irregular cells was 3.96 %, Table (35-b).

c. Anaphase 1:

The total number of the examined PMC's was 70. 12 irregular cells showed lagging chromosomes. Lagging chromosomes in the irregular PMC's ranged from 1.0 to 3.0 and the percentage of the irregular cells was 17.14 %. 8 PMC's showed lagging chromatides with an average of 1.0 per irregular cell. The percentage of the irregular cells was 11.43 %.

d. Anaphase 11:

The number of the examined PMC's was 74. 5 PMC's showed lagging chromosomes in a range of 1.0 per irregular cell. The percentage of the irregular cells was 6.76 %, Table (35-b).

e. Tetrad:

The examined PMC's showed the absence of micronuclei,Table (35-b).

Back-cross three (Plant number 30):

a. Prophase 1:

At diakinesis stage,the number of the examined PMC's was 52. The univalents ranged from 2.0 to 6.0 with an average of 4.083. The ring bivalents ranged from 0.0 to 6.0 with an average of 2.640, Table (36-a). Meanwhile, the rod bivalents ranged from 0.0 to 8.0 with an average of 3.189.

b. Metaphase 1:

The distribution of the univalents is given in table (36-b). Out of 170 PMC's, 7 irregular PMC's showed univalents in a range of 1.0 per irregular cell. The percentage of the irregular PMC's was 4.12 %, Tabl

c. Anaphase 1:

The total number of the examined PMC's was 125. Four PMC's showed univalent chromosomes. Univalent chromosomes in the irregular cells ranged from 1.0 to 2.0 and the percentage of the irregular cells was 3.20 %. Out of 125 PMC's, Two irregular cells showed chromatid bridges. Chromatid bridges ranged of 1.0 per irregular cell and the percentage of the irregular cells was 1.60 %, Table (36-b).

d. Anaphase 11:

The number of the examined PMC's was 140. Four irregular cells

showed that lagging chromosomes ranged from 1.0 to 3.0 per irregular cell. The percentage of irregular cells was 2.86 %, Table (36-b).

e. Tetrad:

The total examined PMC's was 134. All the examined PMC's showed normal distribution of the four nuclei with missing of the micronuclei Table (36-b).

Back-cross three (Plant number 31):

a. Prophase 1:

At diakinesis stage, the number of the examined PMC's was 68. The univalents ranged from 4.0 to 8.0 with an average of 5.284. The ring bivalents ranged from 0.0 to 6.0 with an average of 2.284. The rod bivalents ranged from 0.0 to 6.0 with an average of 3.674, Table (37-a).

b. Metaphase 1:

The distribution of the univalent chromosomes in irregular cells is given in table (37-b). Out of 158 PMC's, 28 irregular PMC's showed univalent chromosomes in a range of 1.0 to 3.0 per irregular cell. The percentage of the irregular cells was 17.72 %.

c. Anaphase 1:

The number of the examined PMC's was 52. 8 PMC's showed lagging chromosomes in a range of 1.0 to 6.0 per irregular cell. The percentage of the irregular PMC's was 15.38 %. 7 PMC's showed lagging chromatides in a range of 1.0 per irregular cell. The percentage of the irregular PMC's was 13.46 %.

d. Anaphase 11:

The number of the examined PMC's was 137. 12 irregular cells showed lagging chromosomes in a range of 1.0 to 5.0 per irregular cell. The percentage of the irregular cells was 8.76 %, Table (37-b).

e. Tetrad:

The number of the examined PMC's was 60. 5 irregular cells showed micronuclei in a range of 1.0 to 4.0 per irregular cell. The percentage of the irregular PMC's was 8.33 %, Table (37-b).

Back-cross three (Plant number 32):

a. Prophase 1:

At diakinesis stage, the total number of the examined PMC's was 115. The univalent chromosomes ranged from 6.0 to 12.0 with an average of 8.215. The ring bivalents ranged from 0.0 to 4.0 with an average of 1.863. The rod bivalents ranged from 0.0 to 6.0 with an average of 3.003, Table (38-a).

b. Metaphase 1:

The total number of the examined PMC's was 115. 17 PMC's showed univalent chromosomes in a range of 1.0 to 2.0 per irregular cell. The percentage of the irregular PMC's was 14.78 %, Table (38-b).

c. Anaphase 1:

The number of the examined PMC's was 84. 5 irregular cells showed lagging chromosomes in a range of 1.0 to 3.0 per irregular cell ,Table (38-b). 4 irregular cells showed chromatid bridges in a range of 1.0 per irregular cell. The percentage of the irregular cells was 4.76 %.

d. Anaphase 11:

The total number of the examined PMC's was 50. 12 irregular PMC's showed lagging chromosomes in a range of 1.0 to 4.0 per irregular cell. The percentage of the examined PMC's was 24.00 %, Table (38-b).

e. Tetrad:

The distribution of the micronuclei in PMC's is given in table (38-b). 8 irregular cells showed micronuclei in a range of 2.0 to 5.0.

Back-cross three (Plant number 33):

a. Prophase 1:

The total number of the examined PMC's was 105. The univalents ranged from 4.0 to 10.0 with an average of 4.508. The ring bivalents ranged from 0.0 to 6.0 with an average of 3.255. Meanwhile,the rod bivalents ranged from 0.0 to 6.0 with an average of 3.982, Table(39-a).

b. Metaphase 1:

The distribution of the univalents in the examined PMC's is given in table (39-b). Out of 175 examined PMC's, 10 irregular PMC's showed univalents in a range of 1.0 to 2.0 per irregular cell.

c. Anaphase 1:

The number of the examined PMC's was 160. 9 irregular cells showed lagging chromosomes. Lagging chromosomes in the irregular cells ranged from 1.0 to 4.0 and the percentage of the irregular cells was 5.63 %, table (39-b). Out of 160 PMC's, 5 irregular cells showed chromatid bridges in a range of 1.0 per irregular cell. The percentage

of the irregular cells was 3.13 %.

d. Anaphase 11:

The number of the examined PMC's was 154. 4 irregular cells showed lagging chromosomes in a range of 1.0 to 5.0 per irregular cell. The percentage of the irregular cells was 2.60 %, Table (39-b).

e. Tetrad:

The total number of the examined PMC's was 142. All the examined PMC's showed normal distribution of the nuclei, Table (39-b).

Back-cross three (Plant number 34):

a. Prophase 1:

At diakinesis stage, the number of the examined PMC's was 139. The univalents ranged from 2.0 to 8.0 with an average of 4.435. The ring bivalents ranged from 0.0 to 6.0 with an average of 2.674. The rod bivalents ranged from 0.0 to 4.0 with an average of 1.873, Table (40-a).

b. Metaphase 1:

The number of the examined PMC's was 126. 13 PMC's showed univalents in a range of 1.0 to 2.0. The perecntage of the irregular PMC's was 10.32 %, Table (-b).

c. Anaphase 1:

Out of 91 PMC's, 11 PMC's showed lagging chromosomes in a range of 1.0 to 4.0. The percentage of the irregular cells was 9.89 %,Table (40-b). The number of the irregular PMC's showed chromatid bridges was two. The percentage of the irregular cells was 2.20 %.

d. Anaphase 11:

The total number of the examined PMC's was 60. One irregular PMC showed lagging chromosomes in a range of 1.0 per irregular cell. The percentage of the irregular cells was 1.67 %, Table (40-b).

e. Tetrad:

The number of the examined PMC's was 60. Four irregular cells showed micronuclei in a range of 3.0 to 4.0. The percentage of the irregular cells was 6.67 %.

Back-cross three (Plant number 35):

a. Prophase 1:

At diakinesis stage, the number of the examined PMC's was 184. The univalents showed a range of 4.0 to 10.0 with an average of 6.707. The ring bivalents ranged from 0.0 to 4.0 with an average of 2.135.The rod bivalents ranged from 0.0 to 6.0 with an average of 2.862, Table (41-a).

b. Metaphase 1:

The number of the examined PMC's was 129. 55 PMC's showed univalents in a range of 1.0 to 3.0. The percentage of the irregular PMC's was 42.64 %.

c. Anaphase 1:

The number of the examined PMC's was 50. 8 PMC's showed lagging chromosomes in a range of 1.0 to 8.0 per irregular cell. The percentage of the irregular cells was 16.00 %. The number of the irregular cells showed lagging chromatides was 3. The percentage of the irregular cells was 6.00 %, Table (41-b).

d. Anaphase 11:

The total number of the examined PMC's was 86. 7 PMC's showed lagging chromosomes in a range of 1.0 to 4.0. The percentage of the irregular cells was 8.14 %, Table (41-b).

e. Tetrad:

The distribution of the micronuclei is given in table (41-b). Out of 56 PMC's, 16 irregular cells showed micronuclei in a range of 1.0 to 4.0. The percentage of the irregular cells was 28.57 %.

Back-cross three (Plant number three 36):

a. Prophase 1:

At diakinesis stage, the number of the examined PMC's was 80. The univalents ranged from 4.0 to 8.0 per PMC with an average of 5.634. The ring bivalents ranged from 0.0 t 4.0 per PMC with an average of 2.205. Meanwhile, the rod bivalents ranged from 0.0 to 4.0 with an average of 2.374, Table (42-a).

b. Metaphase 1:

The number of the examined PMC' was 84. One irregular cell showed lagging chromosomes in a rang of 1.0. The percentage of the irregular cells was 1.19 %, Table (4 b).

c. Anaphase 1:

The total number of the examined PMC's was 54. 8 irregular cells showed lagging chromosomes in a range o 1.0 to 5.0.per irregular cell. The percentage of the irregular cells was 4.81 %. One irregular cell showed lagging chromatid in a range of 1.0. The percentage of the irregular cells was 1.89 %, Table (42-b).

d. Anaphase 11:

The distribution of the lagging chromosomes in the irregular PMC's is given in table (42-b). Out of 92 PMC's, 9 irregular cells showed lagging chromosomes in a range of 1.0 to 2.0 per irregular cell. The percentage of the irregular cells was 9.78 %.

e. Tetrad:

The number of the examined PMC's was 50. All the examined cells showed normal appearance, Table (42-b).

Back-cross three (Plant number 37):

a. Prophase 1:

At diakinesis stage, the examined PMC's indicated that, the univalents ranged from 0.0 to 4.0 per PMC with an average of 1.754. The ring bivalents ranged from 2.0 to 6.0 with an average of 3.254. Meanwhile, the rod bivalents ranged from 2.0 to 6.0 with an average of 3.487, Table (43-a).

b. Metaphase 1:

The number of the examined PMC's was 202. Five irregular cells showed univalent chromosomes in a range of 1.0. The percentage of the irregular cells was 2.47 %.

c. Anaphase 1:

The total number of the examined PMC's was 80 and the lagging chromosomes ranged from 1.0 to 4.0 per irregular cell. Meanwhile, the chromatid bridges were detected in 2.50 % of the PMC's with an average of 1.0 chromatid bridge per PMC, Table (43-b).

d. Anaphase 11:

Lagging chromosomes were observed. Out of 80 PMC's, three cells showed lagging chromosomes. Lagging chromosomes in the irregular cells ranged from 1.0 to 3.0.

e. Tetrad:

The total number of the examined PMC's was 84. All the cells showed normal distribution of the nuclei, Table (43-b).

Back-cross three (Plant number 38):

a. Prophase 1:

The examined PMC's in the diakinesis stage indicated that, the univalents ranged from 0.0 to 4.0 with an average of 1.866. The ring bivalents ranged from 0.0 to 5.0 with an average of 2.406. Meanwhile, the rod bivalents ranged from 0.0 to 7.0 with an average of 3.700, Table (44-a).

b. Metaphase 1:

The number of the examined PMC's was 120, 14 PMC's showed univalent chromosomes in a range of 1.0 to 3.0 per irregular cell. The percentage of the irregular cells was 11.67 %, Table (44-b).

c. Anaphase 1:

The total number of the examined PMC's was 91. 23 PMC's showed lagging chromosomes in a range of 1.0 to 8.0. The percentage of the irregular cells was 25.27 %. Meanwhile, lagging chromatides were detected in 6.59 % of the PMC's with an average of 1.0 to 2.0 per irregular cell, Table (44-b).

d. Anaphase II:

Lagging chromosomes were observed. The distribution of the lagging chromosomes is given in table (44-b). Out of 94 PMC's, 15 PMC's showed lagging chromosomes in a range of 1.0 to 4.0 per irregular cell. The percentage of the irregular cells was 14.89 %.

e. Tetrad:

The number of the examined PMC's was 100. Three irregular cells showed micronuclei in a range of 1.0 to 4.0 per irregular cell. The percentage of the irregular cells was 3.00 %, Table (44-b).

Back-cross three (Plant number 39):

a. Prophase 1:

At diakinesis stage, the total number of the examined PMC's was 74. The examined PMC's indicated that, the univalents ranged from 2.0 to 8.0 with an average of 4.251. The ring bivalents ranged from 0.0 to 4.0 with an average of 2.108. Meanwhile, the rod bivalents ranged from 0.0 to 6.0 with an average of 3.477, Table (45-a).

b. Metaphase 1:

The number of the examined PMC's was 96. Four irregular cells showed lagging chromosomes in a range of 1.0 per irregular cell. The percentage of the irregular cells was 4.17 %, Table (45-b).

c. Anaphase 1:

The total number of the examined PMC's was 65. 9 PMC's showed lagging chromosomes with a range of 1.0 to 8.0 per irregular cell. Chromatid bridges were found in 6.15 % of the examined PMC's in a range of 1.0 per irregular cell.

d. Anaphase 11:

Lagging chromosomes were detected. The distribution of lagging chromosomes is given in Table (45-b). Out of 74 PMC's, Five irregular cells showed lagging chromosomes in a percentage of 6.76 %. Lagging chromosomes in the irregular cells ranged from 1.0 to 4.0.

e. Tetrad:

The total number of the examined PMC's was 63 cells. All the examined cells showed normal distribution. The abnormal micronuclei disappeared in such stage.

Back-cross three (Plant number 40):

a. Prophase 1:

At diakinesis stage, the total examined PMC's was 87. The examined PMC's showed that theunivalents ranged from 2.0 to 6.0 with an average of 2.892. The ring bivalents ranged from 0.0 to 6.0 with an average of 2.683. Meanwhile, the rod bivalents ranged from 0.0 to 6.0 with an average of 3.155, Table (46-a).

b. Metaphase 1:

The number of the examined PMC's was 167. 24 cells showed univalents and the percentage of the irregular cells was 14.37 %, Table (46-b).

c. Anaphase 1:

The total number of the examined PMC's was 58. 10 examined PMC's showed lagging chromosomes in a range of 1.0 to 7.0 per irregular PMC's. The percentage of the irregular cells was 17.24 %.

Out of 58 PMC's, 7 cells showed lagging chromatides in a range of 1.0 to 2.0 per irregular cell. The percentage of the irregular cells was 12.07 %, Table (46-b).

d. Anaphase II:

The number of the examined PMC's was 132. 6 irregular cells showed lagging chromosomes in a range of 1.0 to 3.0. The percentage of the irregular cells was 4.55 %, Table (46-b).

e. Tetrad:

The distribution of the micronuclei in PMC's is given in Table (46-b). Out of 108 PMC's, two examined PMC's showed micronuclei in a range of 2.0 to 3.0 per irregular cell.

Back-cross three (Plant number 41):

a. Prophase I:

The examined PMC's in diakinesis stage indicated that, the univalents ranged from 4.0 to 8.0 with an average of 5.115. The ring bivalents ranged from 0.0 to 4.0 with an average of 1.487. Meanwhile, the rod bivalents ranged fr 0.0 to 6.0 with an average of 2.054, Table (47-a).

b. Metaphase I:

The number of the exami d PMC's was 264. 94 irregular cells showed univalent chromosomes i a range of 1.0 to 5.0 per irregular cell. The percentage of the irr ular cells was 36.36 %, Table (47-b)

c. Anaphase I:

The total number of the exa ed PMC's was 71 and lagging

chromosomes ranged from 1.0 to 8.0. The percentage of the irregular cells was 29.58 %, Table (47-b). Meanwhile,chromatid bridges were found in a range of 1.0 to 4.0 per irregular cell. The percentage of the irregular cells was 14.08 %.

d. Anaphase 11:

The distribution of the lagging chromosomes in the irregular PMC's is given in Table (47-b). The number of the examined PMC's was 47. 12 PMC's showed lagging chromosomes in a range of 1.0 to 5.0 per irregular cell. The percentage of the irregular cell was 25.53 %, Table (47-b).

e. Tetrad:

The distribution of the micronuclei in the irregular cells is given in Table (47-b). The number of the examined PMC's was 50 cells. 16 irregular cells showed micronuclei in a range of 1.0 to 8.0 per irregular cell. The percentage of the irregular cells was 32.00 %.

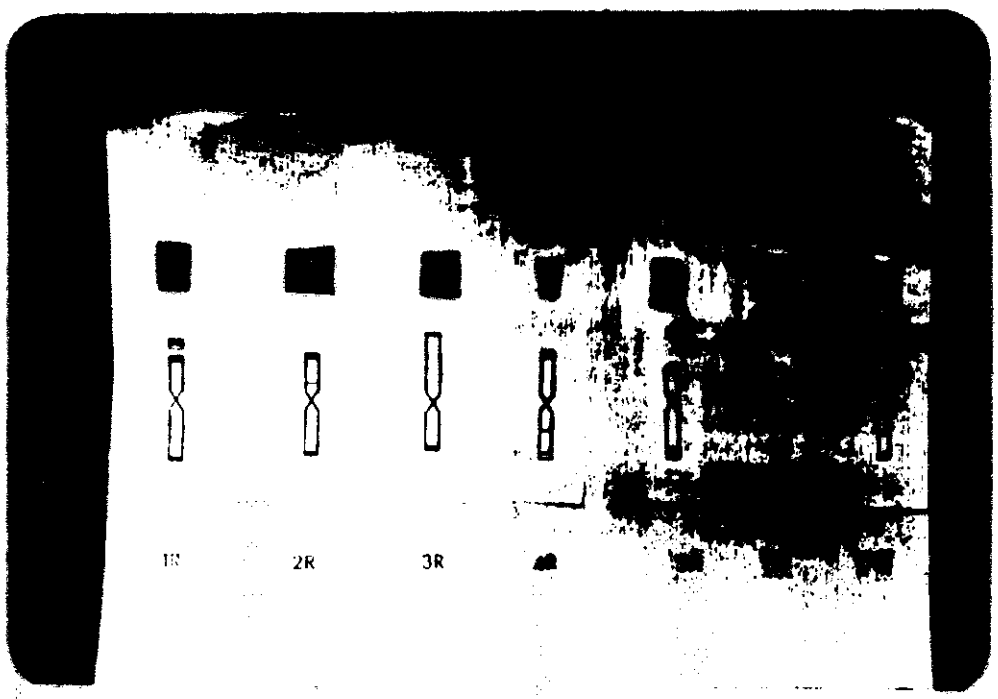


Fig.(30): Giemsa C-banded chromosomes of cv. "Petka".

Fig.(31): Somatic cells of the back-cross ((Giza 157 x Petka) x Giza 157, showed micronucleus beside the main nucleus.

Fig.(32): Somatic cell of the parent, Petka with 7 rye chromosomes using C-banding techniq

Fig.(33):a. Somatic cell of the Giza 157 plants with 2N = 42

b. Somatic cell of Back-cross three ((Giza 157 x Sakha) x Giza 157) plants with 2N = 43.

3.b. C- banding:

Fig. (30) indicates the C- banding karyogram of Petka variety of rye. Every chromosome pair is characterized by a specific banding pattern. Chromosomes are suggested to be designated by 1R to 7R. Some weak bands are not clearly visible on the Figure but can be identified clearly under the microscope. Chromosome 2R showed a small band near the centromere position in the long arm. Chromosome 3R which along with 1R is one of the smallest chromosome showed a band on the short arm that is closer to the centromere than in 2R. Chromosome 6R characterized by the subterminal centromere position showed band in the long arm near the centromere. The unbanded chromosomes are 1R, 4R, 5R and 7R.Fig.(32).

Through using the lacto-propienic orcien,The mitotic cells of the 41 back-cross (BC_3) plants showed that 14 plants were found to contain 42 chromosomes in their cells. Only 5 back-cross plants were found to contain 43 chromosomes. The number of the plants which showed 44 chromosomes was 4. The number of the plants which showed 43 and 44 chromosomes in their mitotic cells was one back-cross plant. The back-cross (BC_3) plants number 3, 9, 11, 13, 16, 18, 22 and 41 showed differences in their chromosome number as it ranged from 35 to 41 chromosomes. The back-cross (BC_3) plant number 5 showed 28 chromosomes The distribution of chromosomes of the mitotic cells is given in Table (48). Fig.(33).

Some mitotic cells of the two back-crosses (BC_3) showed micro-

nuclei beside the main nucleus, Fig. (31). These micenuclei were found in different stage of division i.e interphase and late prophase.

Table (6a):Chromosomal pairing in PMC'S For Parents and F_1'S.

Combination	PMC'S	Univalents	Bivalents			Other pairing	Univalents %
			Ring	Rod	Total		
Giza 157	243	(0-2) 0.083	(0-2) 0.670	(4-11) 8.330	9.003	(0-0) 00.00	01.03 %
Sakha 8	216	(0-2) 0.350	(0-3) 0.154	(4-10) 4.286	4.439	(0-0) 00.00	01.57 %
Rye	145	(0-0) 00.00	(0-7) 0.154	(0-7) 4.286	4.439	(0-0) 00.00	00.00 %
Giza 157 x Rye	106	(12-16) 12.476	(10-13) 11.532	(0-3) 0.524	12.056	(0-1) 0.097	14.35 %
Sakha 8 x Rye	138	(10-18) 11.061	(9-12) 9.904	(0-5) 1.077	10.981	(0-3) 0.805	11.56 %

Table (6b): Frequency Distribution Of Lagging Chromosomes in PMC'S at anaphase I for parents and F_1'S.

Combination	PMC'S	Frequency Distribution of Lagging Chromosomes								% Of Irr. Cells
		0	1	2	3	4	5	6	7	
Giza 157	189	189								00.00%
Sakha 8	201	201								00.00%
Rye	211	208	3							01.44%
Giza 157 x rye	191	148	23	7	7	4	2			22.51%
Sakha 8 x Rye	205	162	15	11	6	3	5	1	2	20.97%

Table (6c) :Frequency Distribution Of Lagging Chromatides in PMC'S At anaphase I for parents and F_1's.

Combination	PMC'S	Frequency Distribution of Lagging Chromosomes									% Of Irr. Cells
		0	1	2	3	4	5	6	7	8	
Giza 157	189	188	1								00.53%
Sakha 8	201	201									00.00%
Rye	211	208	1	2							1.42%
Giza 157 x Rye	191	182	6	3							4.71%
Sakha 8 x Rye	205	199	5	1							2.93%

Table (6d): Frequency Distribution Of the Lagging Chromosomes in PMC'S at anaphase II For Parents and F_1'S.

Combination	PMC'S	Frequency Distribution of Lagging Chromosomes									% Of Irr. Cells
		0	1	2	3	4	5	6	7	8	
Gisa 157	174	170	1	3							02.30%
Sakha 8	184	181	3								01.63%
Rye	193	189	1	1	2						02.07%
Giza 157 x Rye	136	78	15	12	11	10	4	1	5		42.65%
Sakha 8 x Rye	154	116	9	8	13	5			2	1	24.68%

Table (6e):Frequency Distribution Of the Micronuclei in Tetrad cells For Parents and F_1'S.

Combination	PMC'S	Frequency Distribution of Micronuclei								% Of Irr. Cells
		0	1	2	3	4	5	6	7 - 8	
Giza 157	154	154								00.00%
Sakha 8	186	186								00.00%
Rye	167	167								00.00%
Giza 157 x Rye	148	104	5	3	6	24	5	1		29.73%
Sakha 8 x Rye	153	121	4	8	2	15	3			20.92%

Table (7 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 1

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 1)	324	(0 - 2) 0.547	(0 - 6) 1.056	(0 - 5) 1.167	2.223	(0 - 2) 0.236

Table (7 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 1).

Lagging & Micronuclei	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	80	71	6	2	1								11.25 %
Lagging chromosomes in Anaphase 1	42	29	9	1	3								30.95 %
Lagging Chromatid in Anaphase 1	42	33	9										21.43 %
Lagging chromosomes in Anaphase 11	74	20	14	22	2	11	2	2		1			72.97 %
Micronuclei in Tetrad	81	19	20	28	7	6	1						76.54 %

Table (8 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 2).

Combination .	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 2)	87	(6 -10)	(0 - 4)	(0 - 7)		(0 - 1)
		6.310	0.917	2.668	3.585	0.130

Table (8 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 2).

Lagging & Micronuclei .	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	93	91	2										2.20 %
Lagging chromosomes in Anaphase 1	60	58	2										3.33 %
Lagging Chromatid in Anaphase 1	60	58	2										3.33 %
Lagging chromosomes in Anaphase 11	53	49	2	2									7.55 %
Micronuclei in Tetrad	48	48											0.00 %

Table (9 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 3).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 3)		(6 - 8)	(0 - 5)	(0 - 8)		(0 - 0)
		6.128	0.672	3.350	4.022	0.000

Table (9 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 3).

Lagging & Micronuclei	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	104	85	9	4	1	5							18.27 %
Lagging chromosomes in Anaphase 1	60	50	4	2	3		1						16.67 %
Lagging Chromatid in Anaphase 1	60	46	14										23.33 %
Lagging chromosomes in Anaphase 11	39	30	5		1	2		1					23.08 %
Micronuclei in Tetrad	62	52	5	4		1							14.52 %

Table (10 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 4).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 4)	130	(4 - 8)	(0 - 7)	(0 - 7)		(0 - 0)
		5.424	3.054	3.116	6.170	0.000

Table (10 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 4).

Lagging & Micronuclei	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	101	98		2	1								02.97 %
Lagging chromosomes in Anaphase 1	38	34	4										10.53 %
Lagging Chromatid in Anaphase 1	38	36	2										05.26 %
Lagging chromosomes in Anaphase 11	71	64	3	3	1								09.86 %
Micronuclei in Tetrad	29	29											00.00 %

Table (11-a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 5).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 5)	106	(0-4) 1.873	(0-4) 1.579	(0- 5) 3.089	4.668	(0 -0) 0.000

Table (11-b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 5).

Lagging & Micronuclei	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	83	80	3										03.61 %
Lagging chromosomes in Anaphase 1	81	70	8	1	1	1							13.58 %
Lagging Chromatid in Anaphase 1	81	76	5										06.17 %
Lagging chromosomes in Anaphase 11	75	64	3	6	1	1							14.67 %
Micronuclei in Tetrad	40	40											00.00 %

Table (12 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 6).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 6)	128	(6 - 10) 7.137	(0 - 5) 2.687	(0 - 8) 4.148	6.835	(0 - 0) 0.000

Table (12 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 6).

Lagging & Micronuclei	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	83	76	6	1									08.43 %
Lagging chromosomes in Anaphase 1	80	61	11	4	3	1							23.75 %
Lagging Chromatid in Anaphase 1	80	68	10	2									15.00 %
Lagging chromosomes in Anaphase 11	80	66	4	5	2	2	1						17.50 %
Micronuclei in Tetrad	74	53	5	2	6	8							28.38 %

Table (13 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 7).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 7)	83	(6 - 10) 7.934	(0 - 4) 2.053	(0 - 8) 5.210	7.263	(0 - 0) 0.000

Table (13-b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 7).

Lagging & Micronuclei	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	113	107	5	1									05.31 %
Lagging chromosomes in Anaphase 1	90	68	14	5	3								24.44 %
Lagging Chromatid in Anaphase 1	90	82	7	1									08.89 %
Lagging chromosomes in Anaphase 11	45	32	3	4	3	2	1						28.89 %
Micronuclei in Tetrad	101	92	5		2	1	1						08.91 %

Table (14 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 8).

Combination .	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 8)	90	(6 - 8)	(0 - 6)	(0 - 6)		(0 - 0)
		7.354	2.908	3.711	6.619	0.000

Table (14 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 8).

Lagging & Micronuclei .	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	110	107	3										02.73 %
Lagging chromosomes in Anaphase 1	64	62	2										03.13 %
Lagging Chromatid in Anaphase 1	64	63		1									01.56 %
Lagging chromosomes in Anaphase 11	62	49	3	5	3	1		1					20.97 %
Micronuclei in Tetrad	100	94	4	1	1								06.00 %

Table (15 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 9).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 9)	93	(4 - 6)	(0 - 6)	(0 - 8)		(0 - 3)
		4.089	4.203	5.432	9.635	0.086

Table (15 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 9).

Lagging & Micronuclei	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	140	131	4	2	3								06.43 %
Lagging chromosomes in Anaphase 1	74	65	5	2	1		1						12.16 %
Lagging Chromatid in Anaphase 1	74	70	3	1									05.41 %
Lagging chromosomes in Anaphase 11	82	36	16	14	7	8	1						56.10 %
Micronuclei in Tetrad	70	45		4	4	11	6						35.71 %

Table (16-a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No.10).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No.10)	126	(4 - 10)	(0 - 4)	(0 - 8)		(0 - 0)
		6.243	2.700	5.175	7.875	0.000

Table (16-b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 10).

Lagging & Micronuclei	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	101	96	4	1									04.95 %
Lagging chromosomes in Anaphase 1	79	70	8		1								11.39 %
Lagging Chromatid in Anaphase 1	79	72	6	1									08.86 %
Lagging chromosomes in Anaphase 11	74	66	4	2	1	1							10.81 %
Micronuclei in Tetrad	131	128		2		1							02.29 %

Table (17 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 11).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 11)	65	(4 - 8)	(1 - 6)	(0 - 5)		(0 - 0)
		5.241	3.261	2.444	5.705	0.000

Table (17 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 11).

Lagging & Micronuclei	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	58	58											00.00 %
Lagging chromosomes in Anaphase 1	63	60	3										04.76 %
Lagging Chromatid in Anaphase 1	63	61	2										03.17 %
Lagging chromosomes in Anaphase 11	60	54	2	3	1								10.00 %
Micronuclei in Tetrad	154	154											00.00 %

Table (18 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 12).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 12)	71	(2 - 8)	(0 - 6)	(0 - 6)		(0 - 0)
		5.270	3.831	4.311	8.142	0.000

Table (18 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 12).

Lagging & Micronuclei	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	143	142	1										00.70 %
Lagging chromosomes in Anaphase 1	82	80	2										02.44 %
Lagging Chromatid in Anaphase 1	82	80	2										02.44 %
Lagging chromosomes in Anaphase 11	85	82	1		2								03.53 %
Micronuclei in Tetrad	80	80											00.00 %

Table (19 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 13).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 13)	116	(0 - 8) 3.454	(0 - 4) 3.297	(0 - 6) 2.867	6.164	(0 - 1) 0.090

Table (19 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 13).

Lagging & Micronuclei	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	104	87	17										16.35 %
Lagging chromosomes in Anaphase 1	114	105	3	2	4								07.89 %
Lagging Chromatid in Anaphase 1	114	104	8	2									08.77 %
Lagging chromosomes in Anaphase 11	65	32	13	5	7	7	1						50.77 %
Micronuclei in Tetrad	121	98	5	4	3	9	2						19.01 %

Table (20 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 14)

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 14)	103	(0 - 6)	(0 - 6)	(0 - 4)		(0 - 1)
		3.678	4.735	2.012	6.747	0.2000

Table (20 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 14).

Lagging & Micronuclei	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	98	75	19		1	1	1	1					23.47 %
Lagging chromosomes in Anaphase 1	86	43	9	3	4	2	3	11	4	7			50.00 %
Lagging Chromatid in Anaphase 1	86	81	5										05.81 %
Lagging chromosomes in Anaphase 11	100	75	12	3	7								25.00 %
Micronuclei in Tetrad	104	101		3									02.88 %

Table (21 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 15).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3 (Plt. No. 15)	48	(6 - 10)	(0 - 4)	(1 - 6)		(0 - 0)
		7.159	3.083	3.875	6.958	0.000

Table (21 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 15).

Lagging & Micronuclei	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	79	75	4										05.06 %
Lagging chromosomes in Anaphase 1	56	46	6	2									14.29 %
Lagging Chromatid in Anaphase 1	56	51	5										08.93 %
Lagging chromosomes in Anaphase 11	40	32	4	1	1	1	1						20.00 %
Micronuclei in Tetrad	44	44											00.00 %

Table (22 -a): **Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 16).**

Combination .	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 16)	130	(6 - 10)	(0 - 6)	(0 - 4)		(0 - 0)
		7.655	3.654	2.815	6.469	0.000

Table (22 -b): **Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 16).**

Lagging & Micronuclei .	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	89	86	3										03.37 %
Lagging chromosomes in Anaphase 1	64	51	8	1			1	1		2			20.31 %
Lagging Chromatid in Anaphase 1	64	51	13										20.31 %
Lagging chromosomes in Anaphase 11	75	61	4	3	5	1	1						18.67 %
Micronuclei in Tetrad	112	94	6	3	5	4							16.07 %

Table (23 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 17).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 17)	109	(4 - 8) 4.832	(2 - 6) 3.246	(0 - 6) 2.983	6.229	(0 - 0) 0.000

Table (23 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 17).

Lagging & Micronuclei	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	74	53	18	1									25.68 %
Lagging chromosomes in Anaphase 1	80	54	19	5		2							32.50 %
Lagging Chromatid in Anaphase 1	80	73	7										08.75 %
Lagging chromosomes in Anaphase 11	83	69	5	4	3	1	1						16.87 %
Micronuclei in Tetrad	86	84	1	1									02.33 %

Table (24 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 18).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 18)	77	(2 - 10) 5.710	(0 - 4) 1.823	(2 - 8) 5.243	7.066	(0 - 0) 0.000

Table (24 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 18).

Lagging & Micronuclei	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	90	65	10	13	2								27.78 %
Lagging chromosomes in Anaphase 1	73	47	21		1			1		3			35.62 %
Lagging Chromatid in Anaphase 1	73	64	9										12.33 %
Lagging chromosomes in Anaphase 11	70	58	3	5	4								17.14 %
Micronuclei in Tetrad	75	64	4	3	2	1	1						14.67 %

Table (25 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 19).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 19)	57	(0 - 6)	(0 - 6)	(0 - 8)		(0 - 0)
		3.563	4.178	4.205	8.383	0.000

Table (25 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 19).

Lagging & Micronuclei	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	68	66	2										02.94 %
Lagging chromosomes in Anaphase 1	50	43	4	1	1	1							14.00 %
Lagging Chromatid in Anaphase 1	50	45	5										10.00 %
Lagging chromosomes in Anaphase 11	53	50	3										05.66 %
Micronuclei in Tetrad	54	53	1										01.85 %

Table (26 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 20).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3 (Plt. No. 20)	92	(6 - 10)	(0 - 6)	(0 - 8)		(0 - 0)
		7.352	4.116	4.203	8.319	0.000

Table (26 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No.20).

Lagging & Micronuclei	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	156	114	34	3	5								26.92 %
Lagging chromosomes in Anaphase 1	67	47	6	4	3	6	1						29.85 %
Lagging Chromatid in Anaphase 1	67	55	12										17.91 %
Lagging chromosomes in Anaphase 11	144	132	4	3	5								08.33 %
Micronuclei in Tetrad	90	68	13	4		5							24.44 %

Table (27 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 21).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3 (Plt. No. 21)	64	(0 - 4)	(0 - 6)	(0 - 8)		(0 - 0)
		2.540	2.267	3.742	6.009	0.000

Table (27 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 21).

Lagging & Micronuclei	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	103	97	4	2									05.83 %
Lagging chromosomes in Anaphase 1	82	76	4	2									07.32 %
Lagging Chromatid in Anaphase 1	82	77	5										06.10 %
Lagging chromosomes in Anaphase 11	83	77	6										07.23 %
Micronuclei in Tetrad	90	89	1										01.11 %

Table (28 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 22).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3 (Plt. No. 22)	58	(6 - 12)	(0 - 4)	(0 - 4)		(0 - 0)
		7.313	1.983	2.760	4.713	0.000

Table (28 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 22).

Lagging & Micronuclei	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	105	65	28	7	5								38.09 %
Lagging chromosomes in Anaphase 1	40	19	8	3	4	2	3	1					52.50 %
Lagging Chromatid in Anaphase 1	40	32	8										20.00 %
Lagging chromosomes in Anaphase 11	42	33	4	3	1		1						21.43 %
Micronuclei in Tetrad	70	47	11	2	2	7	1						32.86 %

Table (29 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 23).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 23)	82	(2 - 10)	(2 - 6)	(0 - 4)		(0 - 0)
		4.865	3.464	2.876	6.330	0.000

Table (29 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 23).

Lagging & Micronuclei	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	119	114	5										04.20 %
Lagging chromosomes in Anaphase 1	80	74	4	2									07.50 %
Lagging Chromatid in Anaphase 1	80	75	5										06.25 %
Lagging chromosomes in Anaphase 11	73	69	1	1	2								05.48 %
Micronuclei in Tetrad	80	78	2										02.50 %

Table (30 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 24

Combination .	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 24)	101	(4 - 8)	(0 - 6)	(0 - 4)		(0 - 0)
		5.876	2.175	2.622	4.797	0.000

Table (30 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 24).

Lagging & Micronuclei .	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	93	90	2	1									03.23 %
Lagging chromosomes in Anaphase 1	84	80	3	1									04.76 %
Lagging Chromatid in Anaphase 1	84	80	4										04.76 %
Lagging chromosomes in Anaphase 11	87	79	5	1	1	1							09.19 %
Micronuclei in Tetrad	96	88	4	2		1	1						08.33 %

Table (31 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 25).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 25)	84	(2 - 8)	(2 - 4)	(0 - 6)		(0 - 1)
		3.601	3.820	3.019	6.839	0.183

Table (31 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 25).

Lagging & Micronuclei	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	134	132	2										01.49 %
Lagging chromosomes in Anaphase 1	80	73	7										08.75 %
Lagging Chromatid in Anaphase 1	80	74	6										07.50 %
Lagging chromosomes in Anaphase 11	157	112	23		13	11							29.94 %
Micronuclei in Tetrad	80	80											00.00 %

Table (32 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 26).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 26)	64	(0 - 6)	(0 - 6)	(0 - 8)		(0 - 0)
		2.753	3.414	3.887	7.301	0.000

Table (32 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 26).

Lagging & Micronuclei	PMC's n	Frequency Distribution										% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	77	74	3										04.05 %
Lagging chromosomes in Anaphase 1	55	48	3	2	2								12.73 %
Lagging Chromatid in Anaphase 1	55	50	5										09.09 %
Lagging chromosomes in Anaphase 11	56	49	3	2		2							12.50 %
Micronuclei in Tetrad	70	69	1										01.43 %

Table (33 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No.27).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 27)	126	(4 - 10)	(0 - 6)	(0 - 5)		(0 - 0)
		6.427	2.683	3.190	5.873	0.000

Table (33 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for back-cross three (Plt. No.27).

Lagging & Micronuclei	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	96	68	21	5	2								21.88 %
Lagging chromosomes in Anaphase 1	102	79	10	3	5	3	1	1					22.55 %
Lagging Chromatid in Anaphase 1	102	89	13										12.75 %
Lagging chromosomes in Anaphase 11	110	89	5	7	6		3						19.09 %
Micronuclei in Tetrad	108	96		3	2	7							11.11 %

Table (34 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 28).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 28)	84	(2 - 8)	(0 - 5)	(0 - 7)		(0 - 0)
		4.127	1.386	3.572	4.958	0.000

Table (34 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for back-cross three (Plt. No. 28).

Lagging & Micronuclei	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	82	78	4										04.87 %
Lagging chromosomes in Anaphase 1	74	67	4	3									09.46 %
Lagging Chromatid in Anaphase 1	74	69	5										06.76 %
Lagging chromosomes in Anaphase 11	81	72	3	2	3	1							11.11 %
Micronuclei in Tetrad	82	82											00.00 %

Table (35 -a): Chromosomal pairing at diakinesis s age in PMC's of back-cross three (Plt. No. 29).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 29)	100	(2 - 10)	(0 - 6)	(0 - 6)		(0 - 0)
		3.581	2.935	2.123	5.058	0.000

Table (35 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 29).

Lagging & Micronuclei	PMC's n	Frequency Distribution										% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10
Lagging chromosomes in Metaphase 1	202	194	8									03.96 %
Lagging chromosomes in Anaphase 1	70	58	7	3	1							17.14 %
Lagging Chromatid in Anaphase 1	70	62	8									11.43 %
Lagging chromosomes in Anaphase 11	74	69	5									06.76 %
Micronuclei in Tetrad	69	69										00.00 %

Table (36 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 30)

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 30)	52	(2 - 6)	(0 - 6)	(0 - 8)		(0 - 0)
		4.083	2.640	3.189	5.829	0.000

Table (36 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 30).

Lagging & Micronuclei	PMC's n	Frequency Distribution										% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	170	163	7										04.12 %
Lagging chromosomes in Anaphase 1	125	121	3	1									03.20 %
Lagging Chromatid in Anaphase 1	125	123	2										01.60 %
Lagging chromosomes in Anaphase 11	140	136	1	2	1								02.86 %
Micronuclei in Tetrad	134	134											00.00 %

Table (37 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 31).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 31)	68	(4 - 8)	(0 - 6)	(0 - 6)		(0 - 0)
		5.284	2.284	3.674	5.958	0.000

Table (37 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for back-cross three (Plt. No. 31).

Lagging & Micronuclei	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	158	130	14	11	3								17.72 %
Lagging chromosomes in Anaphase 1	52	44	3		1	2		1					15.38 %
Lagging Chromatid in Anaphase 1	52	45	7										13.46 %
Lagging chromosomes in Anaphase 11	137	125	4	2	3	1	2						08.76 %
Micronuclei in Tetrad	60	55	2	1	1	1							08.33 %

Table (38 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 32).

Combination .	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 32)	115	(6 -12)	(0 - 4)	(0 - 6)		(0 - 0)
		8.215	1.863	3.003	4.866	0.000

Table (38 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 32).

Lagging & Micronuclei .	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	115	98	16	1									14.78 %
Lagging chromosomes in Anaphase 1	84	79	3		1								05.95 %
Lagging Chromatid in Anaphase 1	84	80	4										04.76 %
Lagging chromosomes in Anaphase 11	50	38	2	5	1	4							24.00 %
Micronuclei in Tetrad	70	62		1		6	1						11.43 %

Table (39 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 33).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3 (Plt. No. 33)	105	(4 -10)	(0 - 6)	(0 - 6)		(0 - 0)
		4.508	3.255	3.982	7.237	0.000

Table (39 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for back-cross three (Plt. No. 33).

Lagging & Micronuclei	PMC's n	Frequency Distribution										% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	175	165	8	2									05.71 %
Lagging chromosomes in Anaphase 1	160	151	[illegible]	[illegible]	1	1							05.63 %
Lagging Chromatid in Anaphase 1	160	155	5										03.13 %
Lagging chromosomes in Anaphase 11	154	150	1		1	1	1						02.60 %
Micronuclei in Tetrad	142	142											00.00 %

Table (40 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No.34).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No.34)	139	(2 - 8)	(0 - 6)	(0 - 4)		(0 - 0)
		4.435	2.674	1.873	4.547	0.000

Table (40 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for back-cross three (Plt. No. 34).

Lagging & Micronuclei	PMC's n	Frequency Distribution										% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	126	113	10	3									10.32 %
Lagging chromosomes in Anaphase 1	91	80	4	3	1	3							09.89 %
Lagging Chromatid in Anaphase 1	91	89	2										02.20 %
Lagging chromosomes in Anaphase 11	60	59	1										01.67 %
Micronuclei in Tetrad	60	56			3	1							06.67 %

Table (41 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 35).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 35)	184	(4 - 10)	(0 - 4)	(0 - 6)		(0 - 0)
		6.707	2.135	2.862	4.997	0.000

Table (41 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for back-cross three (Plt. No. 35).

Lagging & Micronuclei	PMC's n	Frequency Distribution											% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	129	74	41	12	2								42.64 %
Lagging chromosomes in Anaphase 1	50	42	1		1	2	1	1		2			16.00 %
Lagging Chromatid in Anaphase 1	50	47		3									06.00 %
Lagging chromosomes in Anaphase 11	86	79	5			2							08.14 %
Micronuclei in Tetrad	56	40	2	7	4	3							28.57 %

Table (42 -a): Chromoscmal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 36).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 36)	80	(4 - 8) 5.634	(0 - 4) 2.205	(0 - 4) 2.374	4.579	(0 - 0) 0.000

Table (42 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase II and Micronuclei in Tetrad for Back-cross three (Plt. No. 36).

Lagging & Micronuclei	PMC's n	Frequency Distribution										% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	84	83	1										01.19 %
Lagging chromosomes in Anaphase 1	54	46	5	1	1		1						14.81 %
Lagging Chromatid in Anaphase 1	54	53	1										01.89 %
Lagging chromosomes in Anaphase 11	92	83	8	1									09.78 %
Micronuclei in Tetrad	50	50											00.00 %

Table (43 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 37).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3 (Plt. No. 37)	115	(0 - 4)	(2 - 6)	(2 - 6)		(0 - 0)
		1.754	3.254	3.487	6.741	0.000

Table (43 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for back-cross three (Plt. No. 37).

Lagging & Micronuclei	PMC's n	Frequency Distribution										% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	202	197	5										02.47 %
Lagging chromosomes in Anaphase 1	80	71	5		1	2							11.25 %
Lagging Chromatid in Anaphase 1	80	78	2										02.50 %
Lagging chromosomes in Anaphase 11	80	78		1	1								02.50 %
Micronuclei in Tetrad	84	84											00.00 %

Table (44 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 38).

Combination .	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3 (Plt. No. 38)	123	(0 - 4) 1.866	(0 - 5) 2.406	(0 - 7) 3.700	6.106	(0 - 0) 0.000

Table (44 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 38).

Lagging & Micronuclei .	PMC's n	Frequency Distribution										% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	120	106	9	1									11.67 %
Lagging chromosomes in Anaphase 1	91	68	16	2	1		1			1			25.27 %
Lagging Chromatid in Anaphase 1	91	85	4	2									06.59 %
Lagging chromosomes in Anaphase 11	94	79	8	4	2	1							14.89 %
Micronuclei in Tetrad	100	97	2			1							03.00 %

Table (45 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 39).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3 (Plt. No. 39)	74	(2 - 8)	(0 - 4)	(0 - 6)		(0 - 0)
		4.251	2.108	3.477	5.585	0.000

Table (45-b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 39).

Lagging & Micronuclei	PMC's n	Frequency Distribution										% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	96	92	4										04.17 %
Lagging chromosomes in Anaphase 1	65	56	1	3		1		1		1	2		13.85 %
Lagging Chromatid in Anaphase 1	65	61	4										06.15 %
Lagging chromosomes in Anaphase 11	74	69	1	1	2	1							06.76 %
Micronuclei in Tetrad	63	63											00.00 %

Table (46 -a): Chromosomal pairing at diakinesis stage in PMC's of back-cross three (Plt. No. 40).

Combination	PMC's n	Univalents	Bivalents			Multivalents
			Ring	Rod	Total	
BC_3(Plt. No. 40)	87	(2 - 6)	(0 - 6)	(0 - 6)		(0 - 0)
		2.892	2.683	3.155	5.838	0.000

Table (46 -b): Frequency distribution of Laggards in Metaphase 1, Anaphase 1, Anaphase 11 and Micronuclei in Tetrad for Back-cross three (Plt. No. 40).

Lagging & Micronuclei	PMC's n	Frequency Distribution										% of irregular cells
		0	1	2	3	4	5	6	7	8	9	10	
Lagging chromosomes in Metaphase 1	167	143	15	8	2								14.37 %
Lagging chromosomes in Anaphase 1	58	48	3	4		2			1				17.24 %
Lagging Chromatid in Anaphase 1	58	51	6	1									12.07 %
Lagging chromosomes in Anaphase 11	132	126	2	1	3								04.55 %
Micronuclei in Tetrad	108	106		1	1								01.85 %

Table (49): Frequency Distribution of the Chromosomal number in Back-crosses three No. 11,12, 13,14,15,16,17,18,19 and 20.

Crossing	PMC'S n	2n= 42	2n= 35	36	37	38	39	40	41	43	44	45	46	% Of Irr. Cells
BC_3(No.11)	92	81	01	00	01	00	03	05	01	00	00	00	00	11.95 %
BC_3(No.12)	79	72	00	00	00	01	00	02	04	00	00	00	00	08.86 %
BC_3(No.13)	153	122	02	01	06	04	04	09	03	00	02	00	00	20.26 %
BC_3(No.14)	69	64	00	00	00	00	00	04	01	00	00	00	00	07.46 %
BC_3(No.15)	80	80	00	00	00	00	00	00	00	00	00	00	00	00.00 %
BC_3(No.16)	110	94	00	00	00	08	02	03	01	00	02	00	00	14.55 %
BC_3(No.17)	63	62	01	00	00	00	00	00	00	00	00	00	00	01.58 %
BC_3(No.18)	48	39	00	00	01	05	00	07	01	00	00	00	00	18.75 %
BC_3(No.19)	79	47	00	00	00	08	02	03	03	00	16	00	00	40.51 %
BC_3(No.20)	38	31	00	00	00	00	00	00	07	00	00	00	00	18.42 %

Table (50): Frequency Distribution of the Chromosomal number in Back-crosses three No. 21, 22, 23, 24, 25, 26, 27, 28, 29 and 30.

Crossing	PMC'S n	2n= 42	2n= 35	36	37	38	39	40	41	43	44	45	46	% Of Irr. Cells
BC_3(No.21)	82	82	00	00	00	00	00	00	00	00	00	00	00	00.00 %
BC_3(No.22)	46	34	00	00	01	03	01	03	04	00	00	00	00	26.08 %
BC_3(NO.23)	87	85	00	00	00	00	00	02	00	00	00	00	00	02.29 %
BC_3(No.24)	90	86	00	00	00	00	00	01	03	00	00	00	00	04.44 %
BC_3(No.25)	102	102	00	00	00	00	00	00	00	00	00	00	00	00.00 %
BC_3(No.26)	75	75	00	00	00	00	00	00	00	00	00	00	00	00.00 %
BC_3(No.27)	90	62	00	00	00	00	00	08	09	00	11	00	00	31.11 %
BC_3(NO.28)	72	72	00	00	00	00	00	00	00	00	00	00	00	00.00 %
BC_3(No.29)	60	60	00	00	00	00	00	00	00	00	00	00	00	00.00 %
BC_3(NO.30)	63	63	00	00	00	00	00	00	00	00	00	00	00	00.00 %

Table (51): Frequency Distribution of the Chromosomal number in Back-crosses three No. 31,32, 33,34,35,36,37,38,39,40 and 41.

Crossing	PMC'S n	2n= 42	2n= 35	36	37	38	39	40	41	43	44	45	46	% Of Irr. Cells
BC_3(No.31)	70	70	00	00	00	00	00	00	00	00	00	00	00	00.00 %
BC_3(No.32)	51	42	00	00	00	00	02	05	02	00	00	00	00	17.65 %
BC_3(No.33)	86	86	00	00	00	00	00	00	00	00	00	00	00	00.00 %
BC_3(No.34)	88	82	00	00	00	00	00	06	00	00	00	00	00	06.81 %
BC_3(No.35)	61	41	00	00	00	00	00	12	04	04	00	00	00	32.78 %
BC_3(No.36)	73	73	00	00	00	00	00	00	00	00	00	00	00	00.00 %
BC3(No.37)	103	103	00	00	00	00	00	00	00	00	00	00	00	00.00 %
BC_3(No.38)	65	61	00	00	00	00	00	00	04	00	00	00	00	06.15 %
BC_3(No.39)	87	87	00	00	00	00	00	00	00	00	00	00	00	00.00 %
BC_3(No.40)	57	48	00	00	00	00	00	03	00	06	00	00	00	15.79 %
BC_3(No.41)	94	76	00	00	05	02	06	02	03	00	00	00	00	19.14 %

Table (52): Summary of the disorders observed at prophase I(diakinesis stage), Metaphase I, Anaphase I anaphase II and tetrad's in the PMC's of the two back-crosses (BC_3) plants.

Plant n	Diakinesis average of			Metaphase I	Anaphase I		Anaphase II	Tetrad's
	Univ.	Biv	Multiv.	lagging chromosomes	lagging chromosomes	chromatides	lagging chromosomes	Micro-nuclei
1	0.547	2.223	0.236	11.25 %	30.95 %	21.43 %	72.97 %	76.54 %
2	6.310	3.585	0.130	02.20 %	03.33 %	03.33 %	07.55 %	00.00 %
3	6.128	4.022	0.000	18.27 %	16.67 %	23.33 %	23.08 %	14.52 %
4	5.424	6.170	0.000	02.97 %	10.53 %	05.26 %	09.86 %	00.00 %
5	1.873	4.668	0.000	03.61 %	13.58 %	06.17 %	14.67 %	00.00 %
6	7.137	6.835	0.000	08.43 %	23.75 %	15.00 %	17.50 %	28.38 %
7	7.934	7.263	0.000	05.31 %	24.44 %	08.89 %	28.89 %	08.91 %
8	7.354	6.619	0.000	02.72 %	03.13 %	01.56 %	20.97 %	06.00 %
9	4.089	9.635	0.086	06.43 %	12.16 %	05.41 %	56.10 %	35.71 %
10	6.243	7.875	0.000	04.95 %	11.39 %	08.86 %	10.81 %	02.29 %
11	5.241	5.705	0.000	00.00 %	04.76 %	03.17 %	10.00 %	00.00 %
12	5.270	8.142	0.000	00.70 %	02.44 %	02.44 %	03.53 %	00.00 %
13	3.454	6.164	0.090	16.35 %	07.89 %	08.77 %	50.77 %	19.01 %
14	3.678	6.747	0.000	32.47 %	50.00 %	05.81 %	25.00 %	02.88 %
15	7.159	6.958	0.000	05.06 %	14.29 %	20.00 %	08.93 %	00.00 %
16	7.655	6.469	0.000	03.37 %	20.31 %	20.31 %	18.67 %	16.07 %
17	4.832	6.229	0.000	28.38 %	32.50 %	08.75 %	16.87 %	02.33 %
18	5.710	7.066	0.000	27.78 %	35.62 %	12.33 %	17.14 %	14.67 %
19	3.563	8.383	0.000	02.94 %	14.00 %	10.00 %	05.66 %	01.85 %
20	7.352	8.319	0.000	26.92 %	29.85 %	17.91 %	08.33 %	23.44 %
21	2.540	6.009	0.000	05.81 %	07.32 %	06.10 %	07.23 %	01.11 %
22	7.313	4.713	0.000	38.09 %	32.86 %	20.00 %	21.43 %	32.86 %
23	4.865	6.330	0.000	04.20 %	07.50 %	06.25 %	04.20 %	02.50 %
24	5.876	4.797	0.000	03.23 %	04.76 %	04.76 %	09.19 %	08.33 %
25	3.601	6.839	0.183	01.49 %	08.75 %	07.50 %	29.94 %	00.00 %
26	2.753	7.301	0.000	04.05 %	12.73 %	09.09 %	12.50 %	01.43 %
27	6.427	5.871	0.000	21.88 %	22.55 %	12.75 %	19.09 %	11.11 %
28	4.127	4.958	0.000	04.878%	09.46 %	06.76 %	11.11 %	00.00 %
29	3.581	5.058	0.000	03.96 %	17.14 %	11.43 %	06.76 %	00.00 %
30	4.083	5.829	0.000	04.12 %	03.20 %	01.60 %	02.86 %	00.00 %
31	5.284	5.958	0.000	17.72 %	15.38 %	13.46 %	08.76 %	08.33 %
32	8.215	4.866	0.000	14.78 %	05.95 %	04.76 %	24.00 %	11.43 %
33	4.508	7.237	0.000	05.71 %	05.63 %	03.13 %	02.60 %	00.00 %
34	4.435	4.547	0.000	10.32 %	09.89 %	02.20 %	01.67 %	06.67 %
35	6.707	4.997	0.000	42.64 %	16.00 %	06.00 %	08.14 %	28.57 %
36	5.634	4.579	0.000	01.19 %	14.81 %	01.89 %	09.78 %	00.00 %
37	1.754	6.741	0.000	02.47 %	11.25 %	02.50 %	02.50 %	00.00 %
38	1.866	6.106	0.000	11.67 %	25.27 %	06.59 %	14.89 %	03.00 %
39	4.251	5.585	0.000	04.17 %	13.85 %	06.15 %	06.76 %	00.00 %
40	2.892	5.838	0.000	14.37 %	17.24 %	12.07 %	04.55 %	01.85 %
41	5.115	3.541	0.000	36.36 %	29.58 %	14.08 %	25.53 %	32.00 %