

The statistics indicate that there is a significant difference ( $\alpha = 0.05$ ) in the proportion of palmitic acid in both monosome 8 and monosome 10 samples as compared with the control. The data for the other fatty acids indicate no significant difference from the diploid control.

A double monosome plant, involving chromosome 8 and a presently unidentified chromosome, was produced and its fatty acid distribution differs remarkably from its diploid siblings (see MP34-43 in Table 1).

The data indicate that this approach merits further investigation and specific genes involved in fatty acid biosynthesis may be uncovered.

#### References:

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#### 1. Knob constitution and the rate of chromatin loss.

Previous experiments with K3 A Sh/ k3 a Sh plants, in which the knobbed chromosome was marked by A and the knobless by a, indicated that the knobbed chromosome was lost at the second microspore division more often than the knobless chromosome. Loss of the dominant Sh in a spore containing the a chromosome was attributed to a prior crossover between the A locus and the knob and it was concluded that the only chromosomes undergoing loss were K A noncrossovers or K a crossovers.

In order to test the correctness of this interpretation, a second experiment was set up involving a cross of lg k a sh female parents with lg k a Sh/ Lg K A Sh high loss male parents. F<sub>1</sub> kernels of sh phenotype are produced when a sperm deficient for the Sh allele in 3L fertilizes the polar nuclei. In the absence of heterofertilization, the embryos in these kernels arise from the second sperm in the same pollen grain which contains a normal chromosome 3 predicted to carry the knob and the closely linked Lg marker (ca. 5% recombination, Dempsey, unpublished). A total of 524 sh kernels was obtained in a population of 11,200 (families 30131 & 30776). Although germination of sh kernels was poor, 147 Lg and 64 lg plants were obtained. The majority of the plants carried the knob marker as predicted, but the sizeable group of lg plants (presumed to have a knobless chromosome 3) was unexpected. The question arises as to whether the 64 lg plants came from spores with a knobless chromosome 3 which nevertheless underwent chromosome loss or whether they can be accounted for by some other mechanism.

The data may be interpreted in three ways: (1) The knobless homologue undergoes loss approximately half as frequently as does the knobbed chromosome 3. Such a conclusion is at variance with the data from other crosses which indicated that B-chromosome-induced loss of knobless chromosomes rarely occurred. (2) Heterofertilization could account for lg seedlings arising from a sh kernels. On this explanation, the embryo of the exceptional a sh kernel would have a knobless 3. It would be necessary to assume that loss of a knobbed chromosome 3 in one microspore, producing a sperm deficient for the A Sh alleles which fertilized the polar nuclei to form the endosperm, was frequently associated with fertilization of the egg nucleus by a lg k sperm from a second pollen grain. Nothing is known about the frequency of heterofertilization in this experiment although in related tests it was low. (3) It is possible that linkage of the Lg locus with the K3 knob is not as close as previously indicated and that the exceptional a sh kernels giving rise to lg seedlings are the result of loss involving a lg K chromosome coming from crossing over. A limited sample of five lg plants has been examined cytologically; all had a knobbed chromosome 3,

indicating that a crossover lg K chromosome rather than a noncrossover lg k chromosome 3 had fertilized the egg. These cytological data, fragmentary though they be, lend no support to explanation (2) and are in accord with the constitution of the embryo expected on explanation (3).

If loss is restricted to the knobbed 3 and there is no heterofertilization, all of the 147 Lg seedlings from a sh kernels carried a Lg K chromosome 3 and all of the 64 lg plants should possess a crossover lg K chromosome. If all lg plants from the exceptional a sh kernels are the consequence of crossing over between lg and K and if the same proportion of lg K recombinants occurs among the plants from the Sh kernels, the lg and K loci would be independently inherited and recombination would greatly exceed the 5% found by Dempsey. There is no reason to question the validity of her estimate of recombination for this interval and our studies on preferential segregation would also place the lg locus close to the knob. Unlikely though it may seem, we have tentatively concluded that in the high loss strain a crossover between lg and K, occurring in meiotic prophase, predisposes in some unknown manner the crossover chromosome to undergo chromatin loss at the second microspore division.

Although our studies are incomplete we have yet to find an unequivocal instance of B chromosome-induced loss of a knobless chromosome 3 at the second microspore mitosis. If knobless chromosomes are subject to loss at this mitosis it is an infrequent event compared to the rate of loss of knobbed chromosomes.

Data on knob size and the rate of loss came from studies of high loss plants having the following chromosome 9<sup>\*</sup> constitution:  $\underline{K}^L \underline{Yg} \underline{C} / \underline{K}^S \underline{yg} \underline{C}$ . Both knobs terminate the end of the short arm but the  $\underline{K}^L$  knob is much larger than  $\underline{K}^S$ , which is approximately the size of the knob in Kys. The chromosome 9 with the large knob carries the closely linked Yg allele while the homologous chromosome 9 has the small knob and the recessive yg allele. When silks of yg c individuals were pollinated by  $\underline{K}^L \underline{Yg} \underline{C} / \underline{K}^S \underline{yg} \underline{C}$  high loss plants, all of the F<sub>1</sub> kernels would have colored aleurone except in those cases where there was loss of the C allele in the sperm uniting with the polar nuclei. If the colorless kernels arose from loss induced in the  $\underline{K}^L \underline{Yg}$  microspores the embryos of

the exceptional kernels would have the Yg allele contributed by the sister sperm cell and give rise to green seedlings. Loss of the C allele from the chromosome 9 with the small knob would also result in a colorless kernel when the deficient sperm fertilized the polar nuclei but the embryo would produce a yellow green seedling. In short, a green seedling from a colorless kernel denotes loss of the K<sup>L</sup> chromosome while a yellow green plant from a colorless kernel is the consequence of loss of the K<sup>S</sup> chromosome. In a preliminary experiment we obtained 37 green and four yellow green seedlings from colorless kernels. Not unexpectedly, the chromosome with the larger knob is most frequently lost.

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2. Possible causes of variations in the frequency of chromatin loss induced by B chromosomes.

In the 1970 growing season, unusually high rates of endosperm loss of A<sub>1</sub> (around 20%) occurred when a number of high loss plants with 6 or more B's were used as male parents in crosses with several a tester stocks. The high loss plants were derived by self and sib pollinations within a stock which in preceding generations had given uniformly lower rates (about 12%) in crosses with six different female parents. The higher frequencies were attributed to an undefined environmental effect since the segregation of modifying genes or the differential performance on different females appeared unlikely. Moreover, in 1970 two high loss individuals gave both high and low rates of loss when used as the male parent on two a stocks. In both instances, the cross with the late maturing d<sub>1</sub>lg<sub>2</sub>a<sub>1</sub> stock gave a lower rate than did the cross with the earlier a<sub>1</sub>B P<sub>1</sub> stock. Population totals are given in parentheses.

♂ parent	# B's	Endosperm loss of <u>A</u> with ♀ parent:	
		<u>d<sub>1</sub>lg<sub>2</sub>a<sub>1</sub></u>	<u>a<sub>1</sub>B P<sub>1</sub></u>
30785-24	7	12.7 (529)	21.7 (1634)
30785-23	8	8.9 (615)	19.5 (2110)

The different rates of endosperm loss observed in the two crosses could be ascribed to the ability of the female parent to affect the