These half-tunicate mutations are being introduced as rapidly as possible into isogenic stocks through repeated backcrossing to the inbred A158. Those originating from the crossover Su gl_3 represent the left hand or l (levo-) component of the compound tunicate locus and those from the crossover su Gl_3, the right hand or d (dextro-) component. If these two components prove to be identical then it is probable that the tunicate locus is one which has originated during domestication and in this case the wild locus probably was tu^h. If the two components prove to be different then the following two possibilities must be considered. (a) The wild locus is Tu since it seems highly improbable that the two components have become differentiated during only a few thousand generations of evolution under domestication. (b) There are two wild loci, tu^h-l and tu^h-d, each characteristic of a distinct wild race of maize. During domestication these two loci have been brought together on the same chromosome to produce the present Tu locus.

In two stocks which are now five eighths A158 the two components are consistently slightly different. The genotype containing the l component having slightly longer, more hairy pistillate glumes than the genotype containing the d component. The differences may, however, be due not to the components themselves but to other genes on the same chromosomes and they may disappear as additional backcrosses make the stocks more nearly isogenic.

In any case it now appears certain that wild corn was a form of pod corn either tunicate or half tunicate. If the latter, it is possible that there were two slightly different forms of half tunicate.

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2. The behavior of pod corn in a simulated wild habitat.

In a recent paper "Reconstructing the Ancestor of Corn" it was shown that by combining the primitive characteristics of pod corn and popcorn it was possible to produce a corn bearing part of its seeds in the tassel and the remainder in one or more small ears arising from the higher nodes of the stalk and having only a few husks which open at maturity allowing the seeds to be dispersed. It was assumed that this corn represented a genetic reconstruction of the ancestral form and an accompanying drawing showed how this ancestral form might have grown in several different environments including a poor site in nature in competition with other vegetation. Under these conditions it was assumed that it would produce no ears but would have an unbranched terminal inflorescence with staminate spikelets borne above and pistillate spikelets below on the same unbranched spike.

When this drawing was made we had not actually produced such plants but on the basis of observations of depauperate plants over a period of years we were reasonably certain that homozygous pod-popcorn plants grown under an unfavorable environment would have the characteristics illustrated. We have now grown the reconstructed ancestral form in a simulated wild habitat and the results are in general agreement with our expectations.

Seedlings of a homozygous pod-popcorn which had been inbred for four generations were started in small pots, eight seeds to a pot. The seedlings, already somewhat stunted by crowding when compared to normal corn seedlings the same age growing in a cultivated field, were transplanted to a fence row consisting of a thick sod made up of various weeds and grasses the principal one of which was the aggressive perennial couch grass, Agropyron repens. The hills were planted two feet apart and were not cultivated. Under these conditions the plants were quite stunted, most of them growing no taller than the couch grass and other grasses with which they were competing, but all produced tassels. The tassels were unbranched or only sparsely branched and bore staminate spikelets above and pistillate spikelets below. In their general botanical characteristics these plants were the exact counterpart of the plant illustrated in the article referred to above except that they were much shorter in stature. Plants of this type have a means of seed dispersal and should be capable of surviving in the wild in a suitable environment.

The second experiment, one which has demonstrated a marked selective advantage of pod corn in a simulated wild habitat, involved the planting in this same fence row of a population consisting of heterozygous tunicate and nontunicate plants in equal numbers. These plants, not being inbred but the product of a backcross, were much more vigorous than the homozygous tunicate plants described above and grew surprisingly well in the limited space available to them and in competition with aggressive weedy grasses. Both tunicate and nontunicate plants reached a height of 3-4 feet and both produced tassels. At this point the selective advantage of the tunicate plants became apparent, for, while the majority of the tassels of the nontunicate plants were sparsely branched and strictly staminate, most of the tassels of the tunicate plants were branched and all bore some pistillate spikelets.

The tunicate plants had an average of 4.0 branches per tassel compared to 1.7 for the nontunicate plants and an average of 77.8 pistillate spikelets compared to an average of 3.6 pistillate spikelets for the nontunicate plants. Since practically all of the pistillate spikelets set seed in both genotypes, the selective advantage of the tunicate over the nontunicate plants in seed production was more than 20 fold. At the time that pollen was being shed no plants of either genotype had ears.

One of the characteristics of pod corn is that it concentrates its energy in the terminal inflorescences at the expense of the lateral ones. The result is that homozygous pod corn grown under cultivation in well-fertilized fields is often quite monstrous. But the very characteristics which make pod corn sometimes monstrous under cultivation are those which provide it with a substantial selective advantage in a simulated wild habitat and which, presumably, would do so in nature. Under these conditions tunicate plants also have a means of dispersal which cultivated corn, its grain-bearing, lateral inflorescence tightly enclosed in husks, lacks. As the seeds ripen the tassel branches become brittle and are easily broken by birds attempting to consume the seeds or by strong winds; the seeds drop to the ground in clusters where, in a situation involving a mild climate with a distinct dry season, they would remain until the beginning of the next rainy season. It is possible that even in this climate some will survive the winter and produce seedlings in the spring. However, not all of this dispersal has occurred at once but has been spread over a period of months. Even as late as December about one third of the seeds still remained on tunicate plants either at the base of branches or the central spike. These too will probably be dispersed as the tassel branches weather, weaken, and break away.

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3. Pointed kernels, a simple Mendelian character.

Among our various stocks of homozygous pod-popcorn some have round and some have pointed kernels. F_1 hybrids usually have kernels more or less intermediate in shape and in F_2 populations both parental types reappear. This suggested that the pointed shaped kernels might be governed by a relatively small number of loci.

During the past season we classified four progenies segregating for kernel shape. In a total of 80 plants, 60 had kernels exhibiting some degree of pointing and 20 had round kernels. Thus the pointed shape seems to be a simple Mendelian character exhibiting incomplete dominance.

Pointed shape appears to be linked with Tu on chromosome 4. In these particular crosses the pointed shape was introduced by a non-tunicate popcorn, Palomero Toluqueño, of Mexico. The distribution of pointed, intermediate, and round seeds in the genotypes, Tu tu and tu tu, is shown below. The Tu Tu plants were usually not classifiable with respect to kernel shape.