TUFTS UNIVERSITY
Medford, Massachusetts

1. Genetics of tillering.

During 1965 crosses not obtained before because of different dates of maturation were made. Parts of two sets of crosses between the 17 translocations and the 7 tillering stocks were planted out; of these no group showed any segregation of tillering related to waxy versus non-waxy seeds. Studies are continuing during 1966.

Norton H. Nickerson

2. Studies involving the gene rootless.

As reported in the 1965 MGCNL, two states of the gene rootless (rt/rt) apparently occur. The first of these, designated "really rootless," forms only 6-8 adventitious roots in its lifetime, grows 2/3 to 7/8 the size of heterozygous sibs, and develops both a tassel and an ear of normal proportions. The second state, designated "regular rootless," forms no true brace roots, grows about 7/8 the size of heterozygous sibs, does develop quantities of fibrous roots just above nodes at those nodes which are below ground in the early stage of plant development. Selfs of both these types were obtained in 1964 and planted out in 1965; results are summarized below.

a. Hilling of partially-mature plants did not alter root development in any way over that in unhilled sibs. The conclusion is that if light has any effect on root development the effect is manifested early in plant ontogeny.

b. A scale of root development from 0 (6-8 adventitious roots totally) to 5 (the normal mass of 60+ adventitious roots at 7 or more nodes) has been developed. A score of 3 means no roots above ground; 4 means some are visible above ground. Typical results for plants of both rootless genotypes are given below. Controls are treated with distilled water, given daily in the same amount (1 ml) as the solutions of the growth substances TIBA (tri-iodo benzoic acid) and IAA (indole acetic acid).

	Numbers of plants in each category					
Scale of root development	0	1	2	3	4	5
Family 65-43 (really rootless)						
H_2O (control)	5	33	13	2		
daily TIBA(250µg)			8	18	7	
daily IAA (500µg)	3	9	6			

cont'd.

	Numbers of plants in each category					
Scale of root development:	0	1	2	3	4	5
Family 65-45 (really rootless)						
H_2O (control)	15	13	1			
daily TIBA (250µg)	3	1	8	12	2	
daily IAA (500µg)	13					
Family 65-47 (regular rootless)						
H_2O (control)	8	11	31	18	2	
daily TIBA (250µg)	4	5	9	5		
daily IAA (500µg)	2	3	4			

These data show that TIBA, which makes normal plants rootless, enhances root development in really rootless plants and has less effect on regular rootless ones. IAA tends to enhance the expression of rootlessness. The conclusion reached is that the gene rootless forms no roots because of an excess production of IAA, rather than because of a dearth of this substance in the nodal meristems of the lower stalk of the plant as was thought heretofore. On this assumption the above data are explainable in terms of known effects of TIBA on IAA concentration and root initiation in normal systems.

c. Differing dates of tassel anthesis in the two types of rootless plants also occur, as summarized in the following table:

Days in August, 1965	10	11	12	13	14	15	16	17	18	19	20
65-43 (really rootless) (H_2O)	15		17	8		2	4		1		
65-47 (regular rootless) (H_2O)						1	13	11	28	3	1

IAA and TIBA, based on limited data, show no clear effects on altering the dates of anthesis of either state of the rootless gene. NAA treatment of 500 µg per day completely

prevents anthesis in the tassels of both types of rootless plants. Studies are continuing.

Norton H. Nickerson

3. Studies involving the gene Knotted.

Development of double-knotted plants Kn/Kn was checked by selfing three suspected plants and at the same time crossing each one to standard L317/W23 female, in 1964. During 1965 these three checks, of 64, 65, and 61 plants, all developed knots. They were not as well expressed in the first group, possibly indicating the presence of modifying genes. Thus the assumption is that double-knotted plants were indeed obtained. These stocks were treated with various growth substances. TIBA had little effect on masking or altering the expression of Kn in either Kn/+ or Kn/Kn plants. NAA does suppress or retard elongation and development of knots; since there is also a slowing down of tissue maturation with this chemical, the "suppression" of Kn may simply mean non-development of knots which ordinarily appear relatively late in ontogeny. IBA and IAA had no demonstrable effects, but the number of plants employed were small. When NAA was administered in a 5% solution of DMSO (Dimethyl sulfoxide), penetration of the NAA was apparently enhanced, as Kn manifestations practically disappeared. A side effect of DMSO at this level was death of areas within the leaves, however. Controls treated with 5% DMSO only showed a slight dwarfing as well as death in leaf areas. The numbers of plants involved in the studies, distributed among 20 seed stocks, are given in the following table:

Substance:	H_2O (control)	TIBA	NAA	IBA	IAA	DMSO	DMSO-NAA
No. of plants treated daily (includes both Kn/+ and Kn/Kn)	227	149	92	23	32	20	46

Anatomical study of knots from Kn/Kn and from Kn/+ leaves shows no vascular proliferation. All cells are essentially the same size as their counterparts in other places of the same leaf. Compared to cells from +/+ sibs, these cells are smaller with thinner walls, but there are many more of them. In knotted plants treated with NAA, there is a progressive lack of development of the transfusion tissue around