# PENETRANCE OF GENES ASSOCIATED WITH GENES FOR INCOMPATIBILITY Claude L. Rhyne and Jack C. Carter Geneticist and Emeritus Professor of Biology, Respectively Georgia Southwestern College Americus, GA

#### Abstract

Cultivars cross with incompatible cottons producing hybrid seed that are lethal. Incompatibles have gene  $le_1$  of a wild Ecuadorian and the independently inherited Le2<sup>dav</sup> of wild diploid Gossypium 2D<sub>3</sub>. Even if these genes are extant in Upland background, they carry associated genes of the donor species. Among these are tufting of seed but breeders have selected for  $n_1$  that confers fuzzy seed. The F<sub>1</sub> of a naked seed le<sub>1</sub> N<sub>1</sub> stock x the Stoneville 907 cultivar  $Le_1Le_2$  was challenged by an incompatible yielding viable that were naked seeded except one non-naked. An earlier attempt had yielded one non-naked. Together,  $le_1 n_1$ recombination was 3.8 cM. The recombinant produced seed ranging from a low grade tufted to uniformly fuzzy, indicating a range in expressivity of the  $le_1 n_1 / le_1$  tufting phenotype. Advancing the genotype resulted in  $S_1$  and  $S_2$ that were uniformly fuzzy, nectariless gland-free and pollen fertile. This infrequent event localized recombination rendering the genotype  $gl_2 le_1 n_1 ne_1 Ms_8$ . The genotype was combined with Le2<sup>dav</sup> - Ne2 Ms9. Since Le2<sup>dav</sup> was associated with Ne2 and recombined with ms9 the order of genes is similar to those of the  $le_1 n_1$  recombinant. The gene at the N<sub>2</sub> locus is similar to the gene of fuzzy seeded cultivers. Inheritance and expressivity of genes for tufting was investigated showing a range in fuzz amount and location on seed. Evidence for complementary genes at independent loci and for a gene of variable expression was obtained. Phenotype tufted at the tip deteriorated to bare spots on seed otherwise fuzzy in individual plants, even if the common expression of the heterozygote was a barren seed with a green tuft of fuzz at the small end. Other nonhirsutum genes of the linkage group, Ms<sub>11</sub> le<sub>1</sub> tufting Ne<sub>1</sub> also varied in expressivity.

#### **Introduction**

Conversion of cultivars to incompatible has been complicated by linkage of the  $le_1$  gene with genes having a range in expressivity or in penetrance. Rhyne and Carter (3) indicated unwanted tufting of seed was associated with  $le_1$  that was linked with Ne<sub>1</sub>, also a gene of variable expressivity. Two genes were associated with tufting of seed and one of these linked with Ne<sub>1</sub>. Presumably this tufting allele was at the N<sub>1</sub> locus. The  $le_1$  N<sub>1</sub> linkage has been reported earlier at 5 cM frequency and no recombination of  $le_1 n_1$ , the common gene of fuzzy cultivars, has been reported in the literature (5). They utilized two  $F_1$  hybrids of compatibles crossed with Stoneville 907 cultivar and challenged with incompatible to detect recombinant  $le_1 n_1$ . One non-naked viable indicated a recombinant  $le_1 n_1$  / incompatible. The objective of the present study was to verify the indicated recombinant and repeat the procedure in order to obtain a better estimate of recombination of  $le_1$  with  $n_1$ . Further investigation of genes associated with tufting and  $le_1$  provides information on inheritance, penetrance and expressivity.

These studies were undergirded by the Samora, Stelly, and Kohel formal publication (5) as well as the considerable efforts of numerous researchers on glanding, nectariless, male sterility and incompatibility.

## **Methods and Materials**

The gene le<sub>1</sub> is common to compatible and incompatibles as it is the one that originated in the donor Ecuadorian <u>barbadense</u>. Because of tight linkage, other genes of the donor accompany le<sub>1</sub>. Somora, Stelly, and Kohel (5) proved the gl<sub>2</sub>le<sub>1</sub> centromere order for the long arm of chromosome 11 and Rhyne and Carter (2) placed N<sub>1</sub> Lf Ne<sub>1</sub> proximal the centromere. They (3) infer that a gene for tufted seed is closest to le<sub>1</sub> because they (2) obtained a rare recombination of le<sub>1</sub> N<sub>1</sub>. Our compatibles have genotype gl<sub>2</sub>le<sub>1</sub>? ne<sub>1</sub>ms<sub>8</sub>; gl<sub>3</sub>le<sub>2</sub> - ne<sub>2</sub> ms<sub>9</sub> if pollen sterile. Our incompatible has genotype gl<sub>2</sub> le<sub>1</sub>? Ne<sub>1</sub>Ms<sub>8</sub>; gl<sub>3</sub>Le<sub>2</sub><sup>dav</sup> - Ne<sub>2</sub> Ms<sub>9</sub> and has pollen fertility. The ? indicates an unassigned allele for tufting. Cultivars have Gl<sub>2</sub> Le<sub>1</sub> n<sub>1</sub> ne<sub>1</sub> Ms<sub>8</sub>; Gl<sub>3</sub> Le<sub>2</sub> - ne<sub>2</sub> Ms<sub>9</sub> if nectariless as Stoneville 907 Cv is.

A compatible is crossed with a cultivar and the  $F_1$  challenged by the incompatible. Most plants that live have  $le_1$  in the parental association but some viable have  $le_1$  with a gene of the cultivar. Using two compatible versions of male - sterile that were crossed with 907 Cv, the  $F_1$  was challenged by a common incompatible. Viable with naked seed, or tufted, or fuzzy were observed in the challenge. Exceptional plants were advanced to verify which genes are now associated with  $le_1$ . The  $le_1 n_1$  was sought. Gene expression has varied. Lethality of Le genes (beginning with Lee (1) has been investigated rigorously elsewhere. Tufting of seed, production of leaf nectaries, and pollen fertility are our concerns in this study.

In a progeny critical phenotypes rather than frequencies are reported. Frequencies are reported for significant progenies; all is variable, its significance depends on the number of plants that are needed for recovery of a gene. For example, all have a common phenotype when 1 of 10 would prove the second phenotype in a TC.

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## **Results and Discussion**

Table 1 indicated one exceptional plant on the first line. The testcross was repeated again yielding one exceptional plant. It was easily detected by seed not being naked and lacking fuzz. However, seed in the first boll of the 1995 population were tufted. Later bolls had fuzzy seed; genotype  $le_1 n_1 / le_1$ ? Ne<sub>1</sub> Ms<sub>8</sub> ( $le_2 - ne_2 / Le_2^{dav}Ne_2$ ) had a phenotype ranging from a low grade tufted to uniformly fuzzy. However  $le_1 n_1$  recombination occurred at a low frequency. The expression of the recombinant varied for 1994 and 1995.

This fuzzy-seed plant of 1994 of Table 1 was advanced to  $S_1$ . One portion of ten was observed at the Cotton Winter Nursery and a larger portion in the field in Georgia in 1995. Table 2 shows  $S_1$  plants and four were nectary-free and all seed were fuzzy. Two were nectaried and had low-grade tufted-seed; 56 were nectaried and had fuzzy seed. The expected genotype  $2le_1 n_1 le_2$  was present in the  $S_1$ . The  $S_2$  of the 10  $S_1$  at the winter nursery shows nectary-free plants and this is significant.

A second significant  $S_2$ , being fuzzy but showing a large nectary as an  $S_1$ , contained only fuzzy seed but segregated in the expected ratio 3 nectaried to 1 nectariless. This was the easily detected Ne<sub>2</sub>. Two  $S_2$  were nectaried, the seed were a low grade tufted. Four  $S_2$  yielded nectary-free fuzzy seeded plants. A challenge of such plants indicated all were 2 le<sub>1</sub> le<sub>2</sub>. The significant  $S_2$  having Ne<sub>2</sub> was challenged and all Ne<sub>2</sub>- plants produced lethality. Its genotype must be 2 le<sub>1</sub>n<sub>1</sub>ne<sub>2</sub>; le<sub>2</sub> - ne<sub>2</sub> ms<sub>9</sub> / Le<sub>2</sub><sup>dav</sup> - Ne<sub>2</sub> Ms<sub>9</sub> for the heterozygote. This significant linkage combination is advanced further in a following section.

The  $S_1$  for typical viable having naked seed are also shown in Table 2. The key marker  $N_1$  was present; if not, the plant was either low-grade tufted or normally fuzzy, not  $n_1n_1$ ; if nefree, a plant was generally  $N_1$  and pollen sterile indicative of the compatible (parental) linkage. Malesterile, nectary free, plants were compatible. These associations were used to backcross repeatedly to the 907 cultivar and maintain compatibility.

The recombinant le<sub>1</sub> n<sub>1</sub> is infrequent; it was detected once in each of three populations grown in separate seasons. Each exceptional plant yielded gland-free, nectary-free, fuzzy seed S<sub>1</sub>. The S<sub>1</sub> had pollen fertility. This rare recombinant must be gl<sub>2</sub> le<sub>1</sub>\*n<sub>1</sub>ne<sub>1</sub> Ms<sub>8</sub> (gl<sub>2</sub> le<sub>2</sub> - ne<sub>2</sub> ms<sub>9</sub>). Our estimate is 2 of 53; that is le<sub>1</sub> 3.8 ± 2.4 cM n<sub>1</sub>. Significant contributions of the incompatible were 2gl<sub>2</sub> le<sub>1</sub> tufting Ne<sub>1</sub> Ms<sub>8</sub> and or 2 gl<sub>3</sub>Le<sub>2</sub><sup>dav</sup> - Ne<sub>2</sub> Ms<sub>9</sub> in the S<sub>1</sub> and S<sub>2</sub>.

The infrequency of the  $le_1 n_1$  recombinant and its accompanying associated characters indicates a rare single event that keeps  $n_1 ne_1 Ms_8$  of the 907 intact which renders the previous compatible and incompatible into gland-free

fuzzy versions. The significant double of Samora, Stelly, and Kohel (5),  $Gl_2*le_1*$  centromere occurs more frequently.

The fuzzy seeded plant of the top line Table 1 was crossed by DPL cultivar and 3  $F_1$  advanced to separate  $F_2(S_1)$ . One segregated 15: 1 ne and the population was fuzzy. The challenged nectariless was compatible. This parental  $F_1$ plant had received  $gl_2le_1n_1$  ne<sub>1</sub>Ms<sub>8</sub>;  $gl_3 le_2 - ne_2$ . A second  $S_1$  was homozygous nectary and segregating tufting. It had received  $gl_2le_1$ ? Ne<sub>1</sub> Ms<sub>8</sub>;  $gl_3le_2$  ne<sub>2</sub> with this  $le_1$  associated with tufted and Ne<sub>1</sub> of the incompatible. The third also homozygous nectaried did not segregate tufted. It probably received  $gl_2 le_1n_1^*$  Ne<sub>1</sub>, a recombinant indicated by Samora, Stelly and Kohel (5), and Rhyne, Rhyne, and Menzel (4). Le<sub>2</sub><sup>dav</sup> and Le of DPL cultivar would have produced a nonviable plant and Ne<sub>2</sub> that is linked with Le<sub>2</sub><sup>dav</sup> should be eliminated.

## Glanded, nectary-free, fuzzy compatible

Results of Table 4 were obtained two generations prior to the 1994 detection of a fuzzy viable. Its primary objective was to obtain  $Gl_2 le_1 n_1$ ;  $Gl_2 le_2$ , i.e. to introduce  $le_1$  and  $le_2$ for  $Le_1$  and  $Le_2$  of 907 cv. According to Lee (1) recombinants  $Gl_x le_x$  are frequent but we believed  $le_1 n_1$  was rare, knowing that le<sub>1</sub> N<sub>1</sub> had only 5cM recombination. Believing that  $gl_2$   $le_1*n_1$  ought to be infrequent, and knowing that it could be confused with parental  $gl_2 le_1$ ?  $Ne_1$  of the viable,  $Gl_x$  plants were used for advancement. The exceptional phenotype is focussed on for this report. Recognizing Gl<sub>2</sub>gl<sub>2</sub> Gl<sub>3</sub>gl<sub>3</sub> plants early, we selfed and backcrossed them to 907. Among the exceptional at boll cracking, was the few having seed extremely tufted, all seed were barren except the green fuzz at the small end. This phenotype had less seed cover than compatible and incompatible,  $F_1$ 's and nectaried  $F_1$  of Table 3. It also had been reciprocally backcrossed with 907 and outcrossed to our third gland-free, fuzzy, nectary-free compatible.

Table 5 shows progenies and characters present in each. The S<sub>1</sub> exhibited the tufting at tip T<sup>t</sup> and a low grade tufting of bare spots T and fuzzy Fz that should not be expected since  $n_1$  recombination must be infrequent. Nectary expressions indicated were  $Ne_1ne_1$ ,  $Ne_2ne_2$  and  $Ne_1-Ne_2$ -and homozygous genotypes, pollen fertility  $Ms_x$ - and assorted  $Gl_x$  genotypes. We focussed on  $Ne_2$  even if we expected tufted to be associated with  $Ne_1$ .  $Le_2^{dav}$  was present and readily followed when  $Ne_2$  was recognized and was absent when  $ne_2$  verified.

The BC f indicated the atypical was used as seed parent when backcrossed to 907. T<sup>t</sup> unexpected showed with Ne<sub>x</sub> and ne<sub>1</sub>ne<sub>1</sub>ne<sub>2</sub>ne<sub>2</sub>. Ne<sub>x</sub> and FZ were together in some plants. Absent was Le<sub>2</sub><sup>dav</sup> and ms, but expected to be absent. The BC m used the exceptional as male parent on 907 with the phenotypes same as those of BC f. The OC f used the exceptional as seed parent and it showed combinations of phenotypes in simpler patterns although the S<sub>1</sub> had similar combinations. We focused on Ne<sub>2</sub>---. Five plants of BC f were carried forward as  $S_1$ . Three were glanded, nectariless and fuzzy and produced S1 with this same phenotype. Two glanded, nectaried and tufted produced typical Ne<sub>1</sub> ne<sub>1</sub> hetrozygotes, e.g. many leaves of an individual had to be searched to detect a small nectary. As Rhyne and Carter (3) reported, Ne<sub>1</sub> was associated with tufting and tufting was exhibited as the ratio 9 T: 7 Fz. Ne<sub>2</sub> was not present in these 5  $S_1$  for  $Le_2^{dav}$  had been eliminated as lethal with Le<sub>x</sub> of the 907 in the backcross. Two of the 3 BC f  $S_1$  were randomly sampled using plants of the original S<sub>1</sub>. Each exhibited only glanded, nectary-free plants and the challengers showed a possible Ne<sub>2</sub> - - genotype. At boll cracking the two Bc f S<sub>1</sub> had only fuzzyseed plants. One challenger had a fuzzy-seed phenotype and was proven to harbor  $Le_2^{dav}$ . The Bc f S<sub>1</sub> advance showed on  $S_2$  having nectariless, glanded, fuzzy plants. The  $S_2$  of the challenger also was fuzzy but segregating  $Le_2^{dav}$ .  $Le_2^{dav}$  was associated with Ne<sub>2</sub> and the S<sub>2</sub> harbored  $Ne_2Ne_2$ :  $Ne_2ne_2$ :  $ne_2ne_2$  ( $ne_1ne_1$ ) phenotypes.

The viable of this challenge of glanded, fuzzy nectariless in Bcf S<sub>1</sub> nectaried exhibited some nectary-free plants with seed having the tufted at tip phenotype. Ne<sub>1</sub> absence was confirmed; however, a few Ne<sub>2</sub> ne<sub>2</sub> ne<sub>1</sub>ne<sub>1</sub> were identified. When the Le<sub>x</sub> ne<sub>x</sub> of the 907 was present it was eliminated if Le<sub>2</sub><sup>dav</sup> Ne<sub>2</sub> was in the zygote. Many nectariless plants were fuzzy seeded since the challenger harbored le<sub>2</sub> - ne<sub>2</sub>, and Le<sub>1</sub> n<sub>1</sub> ne<sub>1</sub> of 907 then would be viable. Nevertheless, each Bc f S<sub>1</sub> produced tufted at tip offspring in the challenger. Instead, Gl<sub>2</sub>\*le<sub>1</sub> tufting \* ne<sub>1</sub> Ms<sub>8</sub> was present and complementary with an unidentified in the 1995 challenge, producing tufting phenotype.

The linkage  $Le_2^{dav}$  -  $Ne_2 Ms_9$  plants of Table 5 show glanded, nectary-free phenotype with tufted or fuzzy seed. BC f and BC m plants were backcrossed with 907 cv, OC f with the compatible. Tufting was associated with the  $le_1$ for the backcross parent contributed  $n_1ne_1$ ; the inheritance of tufting in the three BC similar although variable for phenotypic expression of tufting.  $Gl_2 * le_1 ? * ne_1$  and  $Gl_3$ \*  $le_2 - ne_2$ , present in the tufted at the tip; persisted in the advancement. The tufting had persisted even in the absence of  $Le_2^{dav} - Ne_2 Ms_9$ . To evaluate the contribution of  $Le^{dav} - Ne_2 Ms$  tufting the OC f was backcrossed to its compatible parent.

The compatible used as female was gland-free, nectary-free, fuzzy, male-sterile and the OC f pollinator was glanded, nectaried, tufted at the tip, pollen fertile. The  $S_1$  of Table 6 shows independence of genes except for genes of the  $Le_2^{dav}$  association. Ne<sub>2</sub> was indicated by the easy finding of a leaf nectary and  $Gl_2Gl_2$  was indicated by its distinct  $Gl_2gl_2$ phenotype. This must be the  $Gl_2$  of 907. Tufting was independent of Ne<sub>2</sub> and  $Gl_2$ . Male fertility was independent of  $Gl_2$ . However a close linkage of Ne<sub>2</sub> and Ms<sub>9</sub> is evident. Summer 1995 was notable for scarcity of bee pollinators. Table 6 shows 23 male-sterile plants. Flowers of these were pollinated with pollen of the cultivar when inspection shown that bees had not pollinated.  $Le_2^{dav}$  was then proven in the two Ne<sub>2</sub>ms and many of the 70 but absent for all 24 ne<sub>2</sub>ne<sub>2</sub> plants. Clearly the gene order must be  $Le_2^{dav} - Ne_2$  ms<sub>9</sub> for these tightly linked gens. Dr. J. A. Lee (personal communications) inferred that a gene for fuzzy seed of <u>G</u>. davidsonnii was present in the original 15-4 that was the donor of  $Le_2^{dav}$ .  $Le_2^{dav} Ne_2$  linkage is tight and so the genes have been coupled and have persisted. The compatible pollen sterile in this S<sub>1</sub> was le<sub>2</sub> ne<sub>2</sub>, representing recombination earlier of le<sub>2</sub> Ne<sub>2</sub> / Le<sub>2</sub> ne<sub>2</sub>.

Our attempts to detect  $Le_2^{dav}$   $ne_2$  recombination were extended to the  $S_2$  family marked with \* in Table 2. Here the  $S_1$  parent had  $Le_2^{dav}$  -  $Ne_2$   $Ms_9$  /  $le_2$  -  $ne_2$   $ms_9$  in a fuzzy-seed  $2le_1n_1$  background. The  $S_2$  was gland-free. All  $ne_2ne_2$  plants were compatible; all sampled  $Ne_2ne_2$  plants produced viable (glanded) and inviable. A glanded  $2Le_1$   $Le_2$  was challenger. This  $S_1$  was larger than the  $S_1$  of Table 6. The  $Le_2^{dav}$   $Ne_2$  linkage is tight, but  $Le_2^{dav}$  - must be tighter, if the order is  $Le_{2dav}$  -  $Ne_2$   $Ms_9$ . Whether the - is an allele of the  $N_2$  locus and differs from that of the 907 and DPL cultivars has not been resolved. The  $le_2$  -  $ne_2ne_1$  has shown no difference from  $Le_2$  - of the cultivars.

# **Tufting variation in S<sub>1</sub>**

Table 7 shows classifications of tufting for Ne<sub>2</sub> and ne<sub>2</sub>ne<sub>2</sub> phenotypes in an S<sub>1</sub>. The "tufted at tip" is barren of fuzz except a green tuft at the small tip and the lint is white. It occurred in both Ne<sub>2</sub> and ne classes and Ne<sub>2</sub> is expected to be 3 to 1. A lesser area of the seed is barren that is called T. Its frequency is similar for Ne<sub>2</sub> and ne classes. Uniformly covered seed was skewed slightly toward the Ne<sub>2</sub>. When tufting is grouped as T, as in Table 5, a single gene is indicated by the 67 to 29 segregation. The suggestion is that T t phenotype, which should be most frequent in the S<sub>1</sub>, is often that of a highly dominant but sometimes a lesser degree of tufting is expressed. Both T<sub>t</sub> and T seed have been observed on a plant, even in an individual boll.

Evidence for two interacting genes for tufting was present in backcrosses of BC f and m to 907 for tufting occurred in 1/4 of the backcross, not in ½. That genotype  $le_1n_1 / le_1$ ? Ne<sub>1</sub>;  $le_2 - ne_2 / Le_2^{dav}$  - Ne<sub>2</sub> varied for tufting has been shown previously.

#### Acknowledgments

The donations of field space, cultivation, spraying by Hodges Brothers Farm made our populations possible. Their patience and interest are gratefully acknowledged. Personal communications of Dr. Joshua Lee were invaluable. The interest and approval of Dr. William Tietjen is much appreciated. Without the help of Pat Embleton this report would not be possible.

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Table 1. Segregation of seed-covering in TC compatible x LE Stoneville 907 C challenged with PIC. NT 1 1

Population Leulais	Inaked		гиzzy		
		GHO		GΗΟ	
No nectary	154	2 10 25		1	1/38 is
Naked Seed					2.6 cM

Table 2. Segregation in progenies of TC plants from naked-nectariless F1 Type Character present No. Naked  $N_1$ TF Fz Ne. ms ne

$S_1$	x	х	х	х	x	х	all
Fuzzy							
S <sub>1</sub>			х			х	4
		х			х		2
			х		х		56
S <sub>2</sub>		х			х		2
			х			х	*1
		х	х		х		1
			х		х	х	*1
			х		х		3
			х		х	х	2
*Signific	ant pheno	types					

Table 3	Progeny of	fuzzy	recombinant	in '	Table X DPL ov	,
rable 5.	I TOgenty Of	IULLY	recombinant	111	TAULCA DI LU	/

EXPRESSIONS PRESENT							
	Nex	ne	Le <sub>x</sub>	le	Tf	Fz	
TC	х	х	х	х		х	1
$S_1$	х		х	х	Х	х	1
	х		х	х		х	1

Table 4. Segregation of seed-covering in TC compatible x LE Stoneville 907 C challenged with PIC.

Population	Lethals	Tufted	Fuzzy	
		GΗΟ	GHO	
Nectaried	242	12 26 17	599	is 23/78
Tufted seed				complex inheritance
				and expressivity

Table 5. Segregation in progenies from testcross phenotype "tufted at tip",

backcrossed to 907 cv and outcrossed on fuzzy compatible									
Type Character present in a grogeny									
	т	Т	Fz	Ne	ne	Ms	ms	Gl	g]
S.	x	x	x	x	x	X		X	x
BC f	x	x	x	X	x	x		x	
BC m	х	х	х	х	х	х		х	
OC f	х	х	х	х	х	х		х	х
Table 6. glandless	$S_1 \text{ of }$	BC o	f gland stariless	ed, tuf s, male	ted at steril	tip, nec e, com	ctaried, patible	incompa	tible X
Ne gl	Ne	GI	ne gl	litons	ne Gl	1	exr	pected	
51	22	01	15		9		03	3.1	>0.05
Ne T	Ne	fz	ne T		ne fz		) )	51	20.05
49	23	12	18		6		93	31	>0.05
Ne Ms	Ne	ms	neMs		ne ms		/ 5	51	20.05
70	2	1113	3		21		lin	kage	5 3+2 4cM
ol T	ol 1	fz	GLT		Glfz		1111	nuge	5.5 <u>1</u> 2.1011
42	23		25		6		93	31	>0.05
ol Ms	ol	ms	GI M	2	Gl ms		, ,		2 0100
51	14		22	,	9	,	93	31	>0.05
Male Gl	le. ? 1	ne, m	s.: gl. l	Le <sup>dav</sup> -	Ne <sub>2</sub> N	Ms <sub>o</sub>	10		2 0100
seed ol. le		e, ms	s.: 91, 10	e <sub>o</sub> - neo	ms	-109			
Table 7.	Distri	butic	on of tu	fted ty	pes in	S <sub>1</sub>			
Tuft at tij 51	þ		Ne	$\mathbf{T}^{t}$		37	ne	$\mathbf{T}^{t}$	14
bare spots	8		Ne	Т		12	ne	Т	4
uniformit	У		Ne	Fz		23	ne	Fz	6
fuzzy									
Table 8.	Gene	actio	ns of g	enes pi	oxim	al le <sub>1</sub>			
			Ne <sub>1</sub> Ne	1		Ne <sub>1</sub> ne <sub>1</sub>		ne <sub>1</sub> n	e <sub>1</sub>
Nectary of individ plant	on Lea lual	ſ	all			some		none	e
			$Ms_{11}M$	ls <sub>11</sub>		Ms <sub>11</sub> m	s <sub>11</sub>		$ms_{11}ms_1$
pollen in	flower	r	none		1 <i>E</i>	none		all	
	uai pi	anı	none	more t	nan S	070 FIII	lia	o]]	
			When	more t	han 50	0% hirs	sutum	an	
			ΤТ			Τt		$n_{1}n_{1}$	
Fuzz on a	seed		all			some		all	
plant			bare			bare			