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Appreciation for printing the covers for this issue is expressed to the Industrial Arts Department, Mr. Robert Rathbun, Department Head,   
and Mr. William J.Transue, Principal, of the Chazy Central Rural   
School, Chazy, New York.

RESEARCH NOTES

Lerner, I. Michael and Frank K. Ho. Black mutant of T. confusum.  
(Reference authorized)

In August, 1958, we received a stock originating from a Canadian mill which was  
identified by the sender as T. madens. Its appearance suggested that it may be  
a black body color mutant of T. confusum. Accordingly, a breeding test was carried  
out. The tested beetles crossed readily with T. confusum, the reciprocal F1’s being   
brown in color. 50 single pair F2 cultures were set up (ten from each of five single-  
pair F1 matings) for each of the reciprocal crosses. The observed ratios of adults with   
brown and black pigmentation indicate that the variant is an autosomal recessive   
mutant. The F2 from the cross +/+ x b1/b1 gave a total ratio of 643 brown to 204  
black; the reciprocal cross; 870 brown to 297 black. There is no indication of lower  
viability of the mutant as compared with a synthetic stock (derived from crosses  
between several sources) of the wild T. confusum used in the test. The goodness-  
of-fit tests based on combined F2 counts within each F1 mating were as follows:

x2 d. f. +/+ x b1/b1 b1/b1x+/+  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Total 5 0.662 4.026  
Deviation from 3:1 ratio 1 0.379 0.225  
Heterogeneity 4 0.283 3.701

We shall maintain the mutant stock for the time being. It is available for distribution to those interested.  
  
Department of Genetics, University of California

Lasley, Earl L. Evidence for equality of recombination between split and jet in both sexes of Tribolium castaneum. (Reference authorized)

Preliminary data suggested that split and jet (a mutant made available through the  
courtesy of Dr. Thomas Park of the University of Chicago) are linked autosomally.  
To prove this suggestion the following F2 results were obtained.

Parental Phenotype Recombination  
 gamete Wild Split Jet Split-jet value  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Repulsion 416 158 194 4 0.16 + 0.024  
  
Coupling 652 31 70 146 0.12 + 0.008

Lack of independence of split and jet is clearly evident for both types of parental   
gametes. There is a tendency (not statistically significant) for genetic split to be misclassified as nonsplits. Adjustment for such misclassification reduces the estimated  
recombination value for repulsion gametes less than 0.01and that for coupling gametes  
about 0.03. It is not clear, therefore, that recombination occurs or does not occur with  
equal frequency in both cases.

An attempt was made to estimate recombination in the two sexes by producing four kinds of backcross progeny. The results are presented in the following table where each value is expressed as the average per viable mating. Four cells in which unexpectedly low values were obtained for jet classifications are indicated by enclosing the observed results in parentheses.

Linkage in Hetero- Phenotype Recombination   
heterozygous zygous value  
parent parent Wild Split Jet Split-jet   
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Repulsion male 3.8 55 64 3.5 0.06 + 0.004  
 female 3.1 49 (28) (1.7) 0.06 + 0.006

Coupling male 45 6.5 (3.8) (19) 0.16 + 0.007  
 female 49 7.9 9.1 42 0.17 + 0.006  
  
It appears that two different recombination values are generated depending upon repulsion or coupling association of split and jet in the heterozygous parent. Furthermore, it appears that about 50 per cent of the expected jet individuals are missing from the second and third rows of the table. Neither of these unusual results has a bearing on the interpretation of sex differences in recombination, however. Since the average recombination value for heterozygous male parents is essentially the same as that for heterozygous female parents, it is concluded that equal recombination occurs in this species.

No explanation is offered for the apparent shortage of jet individuals or for the observance of two recombination values. Reciprocal matings (with regard to sex) between repulsion and coupling double heterozygotes may shed some light on the situation, but eventual clarification may require additional marker genes.   
  
The William H. Miner Agricultural Research Institute

Shrode, R. R. Evidence that mating is random in T. castaneum.  
(Reference authorized)

Since the assumption that mating is random is a basic one in so much population genetics theory, it seemed desirable, if possible, to secure experimental evidence as to the validity of this assumption. The data tabulated herewith are the observed total numbers of copulations engaged in by individual females in ten samples, each consisting of five females randomly taken from a stock culture of Chicago wild type Tribolium castaneum. The members of each sample were marked in the following manner for individual identification. The left antenna was removed from one female, the right antenna from another, half the left antenna from another, half the right antenna from another, and the antennae were left intact on another. These identifications are designated in the table as L, R, HL, HR and I, respectively. One male was placed with each group of five females in a Syracuse watch glass containing a thin layer of flour for five one-hour periods of observation. Copulations engaged in by each female during the hour were recorded.

Females

Sample L R HL HR I X2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
 1 5 4 6 4 3 1.18   
 2 4 5 4 3 4 0.50   
 3 2 5 3 4 3 1.53   
 4 4 2 1 3 3 2.00   
 5 2 3 4 2 2 1.23  
 6 3 5 5 4 3 1.00  
 7 1 4 3 2 3 2.00  
 8 4 5 3 2 4 1.44  
 9 2 1 1 2 3 1.56  
 10 5 4 3 4 2 1.44  
   
 Total X2 = 13.88

The only meaningful chi-squares which can be computed from the data are the individual sample chi-squares, each based on four degrees of freedom, and the total chi-square based on forty degrees of freedom with hypothetical frequencies being one-fifth of the total number of copulations recorded for each sample. The smallest probability of a greater chi-square, considering any of the eleven values computed is about 0.75. These data certainly validate the assumption that mating is random if one is willing to concede that the marked differences between the conditions under which these observations were made and those prevailing in a culture of many males and many females would have no influence on the randomness of mating.  
   
The William H. Miner Agricultural Research Institute

Sokoloff, A., E. L. Lasley, and R. R. Shrode.: A map of the X chromosome in T.castaneum. (Reference authorized)

Five new sex-linked recessive mutations have appeared spontaneously in various laboratory stocks:

1. red ( r.). Lasley. A mutation of excellent viability, variable expressivity, and complete penetrance. Black pigment eliminated from all ommatidia, but retained in ocular diaphragm. Hence, the compound eye appears “spectacled” like pearl. The central facets appear pink to Bordeaux red almost indistinguishable from black. Young beetles’ eyes may not show any pigment, and may be confused with pearl. Pearl is epistatic to red. Found in a stock derived from Chicago wild type and subsequently in a mixed culture containing pearl and wild type.
2. pygmy (py). Lasley. Originally found in a stock derived from Chicago wild type. Later rediscovered in a mating between a heterozygous red, miniature-appendaged paddle (+ r +/pd + ma) female and a red male. Length reduced to about two-thirds the normal. Weight reduced to about one-half. Viability good. Fecundity greatly reduced.

3. miniature-appendaged (ma). Sokoloff. Found in a stock derived from Chicago wild type and subsequently in the progeny of a female heterozygous for pearl. Gene has pleiotropic effect, i.e., body is generally shorter and “stouter”. Elytra and membranous wings reduced to about two-thirds the normal, and podomeres of all legs (except perhaps the coxa) shorter and thicker. Semilethal. A portion of the ma beetles die in the larval stage. The adults may live for two months, but most die when they are a few days old.

4. spotted (sp). Sokoloff. Incompletely recessive. Appeared in a pearl stock. Mutant beetles have a light spot on the elytra. Expressivity variable. The spot may be small and limited to the tips of the elytra, it may extend as more or less symmetrical stripes to the axillary margin of the elytra, or may be absent. Therefore, penetrance is not complete and the gene overlaps wild type. Viability good.

5. truncated elytra (te). Sokoloff. Lethal. Appeared in a red stock. In the pupa the elytra look cut off at various levels. In the adult the terminal portions of the elytra seem truncated or depressed. If viewed from the side, the elytral tips are seen to be folded under the rest of the elytra. May not be possible to maintain as a stock. Linkage studies are under way.

The genetic data giving the distances between the pd, r, ma, py, and sp genes will appear shortly in the Canadian Journal of Genetics and Cytology. The preliminary data indicating that the above-listed genes are sex-linked are given in the following tables.

I. Males Females   
Mating type Wild Red Wild Red N  
\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_  
  
+/+ x r/ 123 0 138 0 7  
r/r x +/ 0 475 463 0 21  
+/r x +/ 492 491 994 0 30  
+/r x r/ 385 383 388 371 25

II. Males Females  
Mating type Wild pygmy Wild pygmy N  
\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_  
  
+/+ x py/ 69 0 62 0 6  
py/py x +/ 0 235 233 0 9  
+/py x +/ 217 218 437 0 7  
+/py x py/ 264 241 250 218 7  
  
  
  
III.  
Mating type Wild spotted Wild spotted   
\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_  
  
+/+ x sp/ 445 2 453 0 13  
sp/sp x +/ 93 329 381 4 9  
+/sp x +/ 27 18 43 0 1  
+/sp x sp/ 26 25 27 31 2  
  
  
  
IV.  
Mating type Wild min. app. Wild min. app.  
\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_

+/+ x ma/ 88 0 90 0 2  
ma/ma x +/ 0 3 3 0 1  
+/ma x +/ 977 381 2396 0 25  
+/ma x ma/ 32 26 19 14 1

The linkage relationships of the above genes and pd is as in the following diagram.



pd - r about one crossover unit  
pd - ma about 12 crossover units  
ma - py about 2 crossover units  
pd - sp about 50 crossover units

(The position of sp is uncertain because of its overlap with wild type in expression.)

The William H. Miner Agricultural Research Institute

Sokoloff, A. and R. R. Shrode. Techniques for handling beetles for space flight.  
(Reference authorized)  
  
On December 4, 1959, some 11,000 T. castaneum beetles of all stages of the life cycle were included in the biopack carried by the NASA’s Little Joe rocket 55 miles out into space. Because of the ability of these beetles to withstand high and low temperatures and prolonged periods of starvation, they appear to be ideal organisms for such an experiment. The following techniques may help other investigators in setting up similar experiments.

Among the beetles sent on the flight were 400 male and 400 female adults, 400 pupae of each sex, 100 larvae approaching the pupal stage, 400 large active larvae, and 400 small larvae. The last two types of larvae were included (along with one-half sheet of toilet tissue rolled into a loose wad to increase the surface) in one-dram vials, closed with a plastic cap with a small hole for ventilation. The other stages were enclosed in plastic containers which are commonly used to contain jelly dispensed in restaurants. These containers have a flange which is very useful if the container has to be taped in place. A single sheet of tissue was rolled into a loose wad and introduced with the beetles. The plastic cover was resealed with scotch tape, and the sides of the container were punctured with a sewing needle to permit free exchange of gases.

At the suggestion of Major Cloid Green, School of Aviation Medicine, Brooks Air Force Base, Texas, a number of eggs were affixed to two 2” x 3” pieces of graph paper (200 squares to the square inch) which were subsequently taped down on a track plate. The graph paper was covered with double gummed scotch tape, and one-quarter inch of the margin covered with masking tape to provide a lip by which the track plate could be taped to a metal bracket affixed to a rectangular plate firmly screwed to the outside of the container carrying the monkey. The eggs were sprinkled on the sticky scotch tape left exposed by the masking tape. After all the eggs were sprinkled on the two plates, the plates were tapped on the edges to dislodge any eggs loosely glued to the sticky tape. The eggs were again sprinkled, and the process repeated over and over until all the eggs remained attached after three taps. Of the 8,000+ eggs about 2,000 were lost through jarring of the capsule in flight or as it plunged into the ocean. Some eggs were lost through squashing. Of the remaining eggs, larvae emerged from more than 90 per cent. After the track plate was recovered, the graph paper was cut into squares ½ inch to the side. Each square was placed in a vial, making sure that the sticky surface between the eggs became covered with flour. Because of this precaution very few larvae died as a result of becoming stuck to the paper.

The track plates played a dual function, i.e., they recorded any hits of primary or secondary cosmic particles and also gave indication as to which eggs might possibly have been hit. Also, the plates were suspended over the plastic containers holding the adults, pupae and large larvae. Thus, if any of these stages were in the path of a cosmic particle, the track plate would record the fact, and breeding efforts could be concentrated on that group.

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Naylor, Alfred F. Transferring beetles to fresh medium.

Dr. Monte Lloyd has suggested that when transferring to fresh medium, and when seed imagoes in moderate numbers are adequate, quick and dustless transfers are possible. Fold a narrow strip of paper to stiffen and thrust it into the medium. Imagoes will crawl up on the paper from which they can be shaken loose into a fresh stock jar.

The University of Oklahoma

Schlager, G. Efficient, dust-free flour sifter.   
(Reference authorized)

A simple efficient method to sift flour was devised which would be useful for small Tribolium laboratories. It consists of a motor capable of turning at 50 rpm, a three-jaw chuck, a tripod, a 5-cup flour sifter (dime store variety), and a large jar over which the sifter fits fairly snugly. The motor is clamped on the tripod so that the chuck is level with the shaft of the sifter resting on the jar (the turning mechanism of the sifter can be easily modified into a straight shaft). Bolting cloth of the desired size can be stapled to the sieve in the sifter. With this mechanism there is no flour dust problem and approximately 50 pounds of flour are sifted each month by the University of Kansas Tribolium Laboratory.

The University of Kansas

McDonald, Daniel J. A population cage for Tribolium confusum.

Populations of T. confusum have been continuously maintained for over fourteen months in population cages with the following structural characteristics. Each cage consists of a 1-gallon stainless steel tank, 13.0 cm wide, 18.5 cm long, and 18 cm deep, with a 1 cm overhanging rim projecting outward around the top. A strip of ¼-inch foam rubber weather stripping is applied to this rim, and a plywood cover is cut to fit over the top of the tank. A rectangular opening about 5 x 15 cm is cut in the top cover and over this a piece of fine mesh cloth is glued. Holes drilled through the cover and the rim are fitted with bolts and wing nuts for secure fastening. Each cage has eight removable food compartments, 4.5 cm wide, 6.5 cm long and 3.3 cm deep, made of do-it-yourself aluminum sheeting with circular perforations in it. Four hundred grams of flour-yeast medium is placed in the cage, which fills the cage up to the level of the compartment tops. The diagram below shows the arrangement of the compartments and the changing schedule.



Each compartment remains in the cage for six weeks. The beetles can move from compartment to compartment through the holes in the sides. The population reaches a maximum size of eight to ten thousand adults and a minimum of less than a thousand.

Dickinson College, Carlisle, Pa.

Lasley, Earl L. The incompletely recessive effect of the sex-linked gene, pygmy, on pupa weight in Tribolium castaneum. (Reference authorized).

Sokoloff, Lasley and Shrode (Canadian Journal of Genetics and Cytology, 1960) described a sex-linked gene in T. castaneum which reduces pupae weight about one-half. Data available at the time the paper was written pertained only to progeny of heterozygous females mated to pygmy males and are presented as matings one and two in the accompanying table. These results suggest that the presence of one pygmy gene causes some reduction in weight since the average pupa weight of heterozygous females was 0.186 mg less than that of their brothers. This is contrary to the knowledge that wild type female pupae weigh about 0.128 mg more than wild type males. The incompletely recessive effect of the pygmy gene was confirmed by subjecting female progeny of matings 3, 4, 5 and 6 to breeding tests.

Pupa Weight in Milligrams

+/ py/ +/+ +/py py/py  
 Mating No. Wt. No. Wt. No. Wt. No. Wt. No. Wt.  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. +/py x py/ 26 2,732 20 1.326 27 2.510 20 1.362  
2. +/py x py/ 29 2.706 34 1.397 31 2.555 25 1.417  
3. +/py x +/ 21 2.583 19 1.168 13 2.765 17 2.445  
4. +/py x +/ 5 2.742 15 1.357 21 2.824 14 2.524  
5. +/py x +/ 27 2.564 18 1.163 20 2.746 11 2.476  
6. +/py x +/ 16 2.669 25 1.281 16 2.805 15 2.487  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The average difference (unweighted) between +/+ females and +/ males, 0.145 + 0.045 mg, is in good agreement with the sex difference, 0.128, based on weights of thousands of wild type pupae. The average difference between +/+ females and +/py females, 0.302 + 0.043 mg, confirms the suggestion that pupa weight is reduced for carrier females. Some carrier females were probably misclassified as noncarriers owing to the nature of the breeding test even though decisions were based on thirty or more progeny (not classified for sex) in almost all cases. Bias introduced in this way should not seriously affect the basic conclusion that the pygmy gene is incompletely recessive in its effect on pupa weight.

Although data are not presented, it should be pointed out that the standard deviations are proportional to mean weight for each genotype. Transformation to common logarithms is necessary to produce independence of variance and mean. It is concluded that the mode of action of background genes is multiplicative.

The William H. Miner Agricultural Research Institute

NEW MUTANTS

Prothoraxless (ptl). Lasley and Sokoloff. Spontaneous in several strains of T. castaneum derived from Chicago wild type and maintained in isolation. Autosomal, semi-dominant of variable expressivity overlapping wild type, and incomplete penetrance. Lethal in a homozygous state. Identifiable in the earliest larval instars. In the heterozygote the prothoracic segment in the larva or the prothorax in the pupa or adult, or the prothoracic legs may be affected: If only the prothorax is affected, the protergum may exhibit a deep groove at right angles to the midline, or it may have various indentations at one or the other anterior corners. In the extreme cases the protergum is almost completely absent, and only half of the prosternum remains. If the prothorax is not affected, either leg, both legs, or no legs may be affected. If they are affected, the tibia and the femur will be considerably shorter and thicker and sometimes the leg is paralyzed.

The homozygote mutant is more severely and uniformly affected. The prothorax is almost completely gone, leaving the “neck” exposed. Only a small portion of the prosternum remains, and to this is attached a pair of vestigial legs (in the larva, pupa or adult). Most of the homozygous mutant larvae pupate, but many pupae die before becoming imagoes. The adults walk poorly on four legs, the first pair being nonfunctional, and generally they remain on the surface of the flour, attesting to the importance of the first pair of legs in tunneling. The only stock of this mutant established failed after about three months. The stock must be maintained by selecting the heterozygote.

Droopy elytra (dre). Sokoloff and Lasley. Spontaneous in Chicago wild type T. castaneum. Autosomal recessive with poor penetrance overlapping in expression with wild type so that only 10 per cent of F2 progeny exhibit the character. Mutants mated inter se will produce phenotypically wild type progeny. Elytra fail to meet at the midline over the whole length of the abdomen and present a variable degree of droopiness. Beetles may die at an early age because of dehydration.

Fused antennal segments (fas). Sokoloff. Spontaneous in Chicago wild type T. castaneum stock. Autosomal recessive. Penetrance poor. The ninth and tenth distal segments of one or both antennae fused. Frequency in a stock can be increased by selection so nearly all beetles exhibit the character, but on outcrossing the frequency of the mutant drops, in some crosses to a very low level (3-5 per cent).

Microphthalmic (Mo). Sokoloff. Appeared spontaneously in a mixed culture of wild type and pearl T. castaneum. Autosomal dominant. Variable expressivity and incomplete penetrance in the minority of individuals examined, the heterozygous Mo/+ beetles resembling the wild type. Facet size may be reduced if there is no reduction in number, and the eye is displaced ventrally. If the facets are reduced in number, the dorsal facets are most often eliminated. Less often the dorsal and lateral portions of the eye are eliminated, the eye being confined to the ventral surface of the head. In its extreme form the cranium behind the genae is reduced, and the beetle has a microcephalic appearance. In some of these beetles the eye may consist of three or four facets lying on the ventral surface of the head. The head in these beetles is usually retracted into the prothorax up to the level of the eyes. Matings with pearl (to which Mo is not linked) reveal that the ocular diaphragm is present, even when the eye is split into two widely separated components, as it has happened in one case.

Warped elytra (we). Sokoloff. Spontaneous in a fused antennal segments stock of T. castaneum. Autosomal recessive. Poor penetrance. Generally the elytra meet producing a continuous line from the posterior tips to just posterior to the mesonotal scutellum. However, in we the elytra are displaced either to the right or to the left of the dorsal midline of the abdomen, one or both elytra are lifted away from the abdomen, and a shallow wave produced by both elytra may be present. Frequency of beetles expressing the character can be increased by selection, the frequency dropping to a low level on outcrossing. Adult viability reduced, as the dorsal part of the abdomen is exposed permitting evaporation of moisture and accumulation of flour grains.

Deformed legs (dfl). Sokoloff. Autosomal recessive, penetrance poor. Discovered as a female pupa of a Chicago wild type T. castaneum stock which, in the adult, had the following abnormalities: right and left foreleg tibia short and curved outward. Left middle leg normal; right middle leg with short tibia and thin femur. Right hind leg normal; left with tibia curved inwardly or posteriorly. F2 progeny of this female reveal that the expressivity of this gene is quite variable. Any leg may be affected, usually one of a pair only, and the tibia is the podomere most frequently affected.

Split elytra (spl). Lasley. “Split” was isolated from a mass culture of Tribolium castaneum. This mutation is located on the “Jet” chromosome and inherited as an autosomal recessive. The elytra of beetles which are homozygous for “split” are usually separated at the posterior extreme. The femurs are also somewhat shortened and broadened. Phenotypic expression is quite variable and overlaps wild type so that about 80 per cent of genetically split beetles exhibit a recognizable separation of the elytra. In some genic backgrounds, both the elytra and legs may be shortened. A majority of the split pupae can be identified since the elytra tend to separate and curve away from the abdomen. Mortality is high among emerging imagoes and productive life is reduced markedly in the adult female.

Pink (pPk). Lasley. This eye mutation originated in a carefully pedigreed stock of Tribolium castaneum derived from Chicago wild type. Pink is completely recessive to wild type and is allelic to pearl. The pink eye phenotype strongly resembles the pearl eye phenotype; the two are practically indistinguishable in newly emerged imagoes. The center portion of the eye which is devoid of pigment in pearl imagoes develops a pinkish tinge in pink imagoes as they become older. Imagoes which are heterozygous for both pearl and pink also develop the pink phenotype; therefore, pink is dominant to pearl in the allelic series. Fedundity and viability are apparently not affected by the presence of one or two genes causing the pink eye phenotype.

Squint (sq). Bywaters. In examining a mixed culture of T. castaneum and T. confusum, six specimen of T. castaneum, three males and three females, were found in which the eyes appeared to be squinting. Closer examination revealed no facets or ommatidia. The pigmented ocular diaphragm appears broadened and when viewed from the ventral surface appears as a rough triangle with the apex forward. This diaphragm extends around the head, constricting at the side and expanding on the dorsal surface in another rough triangle, smaller than the ventral one. The inner edges of the diaphragm come very close to each other producing the squint appearance.

Beetles possessing this abnormality have difficulty righting themselves when placed on their backs, are much slower in their movements than wild type individuals, and appear to be blind. The condition can be detected in pupae about to emerge by a crescent configuration in the eye area.

Three single pair matings were made from the specimen found, but only one produced offspring. Most were wild type as the female had been mated when found. Several small cultures were set up, and eventually a sizable stock of homozygous squint was developed. Difficulty was experienced in obtaining homozygous squint that would reproduce.

Matings involving wild type and pearl with squint have led to the conclusions that the lowered reproductive performance of squint is due to a marked decrease in production and viability of eggs, the gene is a semi-lethal autosomal recessive which is epistatic to pearl, and that pearl and squint are on separate chromosomes.

Stocks are available to those who wish them.

Red ( r ). Sokoloff. 1 An eye color mutation in Latheticus oryzae similar to that in T. castaneum (q. v.). Appeared in a cross of two pearl heterozygotes. Complete penetrance, although with variable expressivity, since the pigment may darken as the beetle ages. Pearl is epistatic to red.

Truncated elytra (te). Sokoloff. Found as pupae in a wild type stock of Latheticus oryzae. The mutant resembles the truncated elytra condition described for T. castaneum. The data so far are meager, but the mutation is probably, at worst, a semi-lethal, in contrast to the lethal character of this gene in T. castaneum. Matings are under way to determine the crossover values.

24 Black