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Number 14

March, 1971

FOREWORD

The assistance of Pat Cavataio, Diane Bingham, and Jim Gooch in preparing this issue is gratefully acknowledged.

A. Sokoloff

San Bernardino, California
March, 1971

Stock Lists

BALTIMORE, MARYLAND
THE JOHN HOPKINS UNIVERSITY, DEPARTMENT OF CHEMISTRY

Known to have the following stocks:

I. Wild type strains

Gnathocerus cornutus pearl
Latheticus oryzae +/+
Tribolium anaphe +/+ (Ho)
Tribolium brevicornis +/+
Tribolium destructor +/+
Tribolium madens +/+
Tenebrio molitor +/+

II. Mutant

Tribolium confusum melanotic stink glands (*msg*)

(Ed.)

BERKELEY, CALIFORNIA
UNIVERSITY OF CALIFORNIA, LAWRENCE RADIATION LABORATORY

I. Wild type strains

Tribolium confusum	U. of Calif., Berkeley
Tribolium brevicornis	U. of Calif., Berkeley

II. Mutant

Tribolium confusum - isolated from the wild type stock

(Ed.)

BRIDGEPORT, CONNECTICUT
UNIVERSITY OF BRIDGEPORT, DEPARTMENT OF BIOLOGY

Tribolium confusum

Wild type strains derived from Dr. Fraenkel's laboratory at the University of Illinois.

(Ed.)

BURLINGTON, NORTH CAROLINA
CAROLINA BIOLOGICAL SUPPLY COMPANY

Tribolium castaneum

1. black	Chicago
2. jet	
3. pearl	
4. wild	McGill

Tribolium confusum

1. wild	Carolina

(Ed.)

Stock Lists

CARBONDALE, ILLINOIS
SOUTHERN ILLINOIS UNIVERSITY, DEPARTMENT OF ZOOLOGY

I. Base populations

1. Purdue + foundation
2. Purdue s foundation (sooty)
3. Purdue b foundation (black)

II. Mutant

1. pygmy (py)
2. red (r)
3. pygmy, red (py r)
4. pygmy, paddle, spotted (py pd sp)
5. pearl (p)
6. pegleg (pg)
7. pearl, pegleg (p pg)
8. white (w)
9. bar eye, sooty (Be s)
10. Deformed, sooty (Df s)
11. microcephalic, jet, maroon (mc j m)
12. ruby, light ocular diaphragm (rb lod)
13. Short antenna (Sa)
14. chestnut (c)
15. Short antenna, squint (Sa c)
16. antennapedia (ap)
17. squint (sq)

III. Selected populations

Black: a population subjected to twelve generations of natural selection in very dense larval conditions. Origin from Purdue Black Foundation. Four sublines present.

Early: a population subjected to selection for a short larval period. Origin in Purdue Wild Foundation.

High Chaetae: a population subjected to nine generations of selection for increased pregenital chaetae number. Origin from Purdue Black Foundation.

Late: a population subjected to selection for a long larval period. Origin in Purdue Wild Foundation.

Low Chaetae: a population subjected to nine generations of selection for decreased pregenital chaetae number. Origin from Purdue Black Foundation.

Pearl: a population subjected to twelve generation of natural selection in very dense larval conditions. Origin from Purdue Pearl Foundation. Five sublines present.

Purdue: a population subjected to twelve generations of natural selection in very dense larval conditions. Origin from Purdue Wild Foundation. Five sublines present.

IV. Marker stocks

HBI: derived from crosses between the High Chaetae population and an inbred line. Y chromosome is marked in that it carries a region that produces a higher number of pregenital chaetae than the normal Y chromosome from Purdue Black Foundation.

V. Grossly deformed (gdf/+)

Scute: sct/sct produces reduced size and number of pupal and larval chaetae.

E. L. Lange

CARLISLE, PENNSYLVANIA
DICKINSON COLLEGE, DEPARTMENT OF BIOLOGY

Tribolium confusum

I. Wild type strains

1. Six strains started from females captured in a feed bin in New York City, 1955.

2. Three stains, one each from T. Park, Chicago; J. Stanley, Montreal; S. Smith, Sault Ste. Marie, Canada.

3. One strain consisting of several above strains mixed together about three years ago.

4. One strain started with individuals taken from (1) above, which has been freed of eye mutations.

NOTE: Some of the wild strains listed in (1) and (2) are known to be carrying pearl-like mutations.

II. Mutant

1. Black--Sault Ste. Marie (1956).
2. Ebony--Chicago (1957).
3. Eyespot--sex-linked--from a wild strain in (I.1) above (1959).
4. Rough--from strain (II.1) above (1957).
5. Split--from a wild strain in (I.1) above (1956).
6. Striped--sex-linked--from (II.1) above (1957).
7. One strain each of Striped/black and split/black.

Oryzaephilus surinamensis

One strain started from insects captured in New York City, 1955.

(Ed.)

Stock Lists

CHICAGO, ILLINOIS
UNIVERSITY OF CHICAGO, DEPARTMENT OF ZOOLOGY

Tribolium castaneum

"Chicago"--a wild type strain.
"paddle"--a sex-linked recessive antennal mutant.
"pearl"--an autosomal recessive eye mutant.
"Chicago black"--an autosomal semi-dominant body color mutant.

Tribolium confusum

"Chicago"--a wild type strain.
"ebony"--an autosomal recessive body color mutant.

Latheticus oryzae

"Chicago"--a wild type strain.
"pearl"--an autosomal recessive eye mutant.

(Known to have a number of inbred strains) (Ed.)

COLLEGE PARK, MARYLAND
UNIVERSITY OF MARYLAND, DEPARTMENT OF ZOOLOGY

I. Wild type strains

A. Tribolium castaneum
1. Chicago (via Sokoloff) Berkeley, 1964
2. University del Valle-1 Cali, Colombia, 1964
3. University of Maryland-2*

*Formerly listed as Tribolium confusum in March, 1966, Tribolium Information Bulletin 9 and earlier issues. Whether the error occurred through original misidentification or an originally mixed species culture is not know.

Inbred strains

4. E 2 (originally from Edinburgh, via Boylan) Manitoba, 1964

B. Tribolium confusum
1. So. Illinois University-1 Carbondale, Illinois, 1962

Inbred strains

2. CFI-11 Berkeley, California, 1965

II. Mutant

1. T. confusum Berkeley, California, 1959
2. Ebony ($e^{L\&H}$)

(Ed.)

Stock Lists

CORAL GABLES, FLORIDA
UNIVERSITY OF MIAMI, DEPARTMENT OF BIOLOGY

I. Wild type strains

1.	Tribolium confusum	Chicago
2.	Tribolium castaneum	Chicago

II. Mutant

1.	Tribolium castaneum - "jet"	Chicago
2.	Tribolium castaneum - pearl type, origin in local stocks	
3.	Tribolium castaneum - jet x pearl	
4.	Tribolium confusum - "ebony"	

(Ed.)

CORVALLIS, OREGON
OREGON STATE UNIVERSITY, DEPARTMENT OF ZOOLOGY

I. Wild type strains

A. Tribolium castaneum

1.	Berkeley	Berkeley, 1966
2.	Chicago	Urbana, 1966
3.	del Valle	Maryland, 1966
4.	Oregon	Urbana, 1967
5.	Vivarium	Urbana, 1967

B. Tribolium confusum

1.	Berkeley	Berkeley, 1966
2.	Chicago	Urbana, 1966
3.	Kansas	Kansas, 1966
4.	Oklahoma	Urbana, 1966
5.	Oregon	Urbana, 1967

II. Mutant strains

A. Tribolium castaneum

1.	sa-2 (+/s)	Berkeley, 1966
2.	dve, pd	Berkeley, 1967
3.	fas-3a	Berkeley, 1967
4.	b, mc, p	Berkeley, 1966
5.	bal, c (+/s)	Berkeley, 1966
6.	pd	Urbana, 1966
7.	Be	Berkeley, 1966
8.	mc	Berkeley, 1967
9.	aa (+/p)	Berkeley, 1967
10.	ctp, ju	Berkeley, 1966

11.	Mo	Berkeley, 1966
12.	b	Berkeley, 1966
13.	ap^D, s	Berkeley, 1966
14.	j	Berkeley, 1966
15.	p, s, ap^D	Berkeley, 1966
16.	Fta, c	Berkeley, 1966
17.	ser, py, r	Berkeley, 1967
18.	Spa (+/c)	Berkeley, 1966
19.	r^D, s	Berkeley, 1967
20.	sq	Berkeley, 1967
21.	h	Urbana, 1967
22.	sh^s	Berkeley, 1967
23.	p, lod	Berkeley, 1967
24.	Sa-2, s	Berkeley, 1967
25.	r^u	Urbana, 1968

B. Tribolium confusum

1.	sh, b	Berkeley, 1966
2.	msg^{AS}	Berkeley, 1967
3.	we	Berkeley, 1966
4.	dj, p, lod	Berkeley, 1966
5.	thu^s, e	Berkeley, 1966
6.	dj	Berkeley, 1966
7.	e	Urbana, 1966
8.	thu	Berkeley, 1966
9.	p	Berkeley, 1966
10.	p, lod	Berkeley, 1966
11.	b^u	Urbana, 1967
12.	thu^u	Berkeley, 1966
13.	ble^u	Urbana, 1967
14.	r^u	Urbana, 1968
15.	dep	Urbana, 1969
16.	sh^c	Corvallis, 1970

P. S. Dawson

DAVIS, CALIFORNIA
UNIVERSITY OF CALIFORNIA, DEPARTMENT OF ANIMAL HUSBANDRY

I. Wild type strains (T. castaneum)

BC1	T. castaneum	Berkeley, 1967
DC1	T. castaneum	Davis, 1969

II. Mutant strains

BC2	T. castaneum, sooty	Berkeley, 1967
BCI14	T. castaneum, sooty, inbred from strain 14a	Berkeley, 1967
SCp	T. castaneum, pearl eye	San Bernardino, 1969

III. Selected strains (all derived from BC1)

6-15. BC1-2, lines 1-10, selected for large 21-day pupa for 23 to 36 generations

16-18. BC1-2L, lines 1-3, selected for small 21-day pupa for 30 generations.

IV. Wild type strains (T. confusum)

BF1	T. confusum	Berkeley, 1967
DF1	T. confusum	Davis, 1967
DF3	T. confusum	Davis, 1969

V. Mutant strains

SFp (pearl eye)	San Bernardino, 1969

G. A. E. Gall

EAST LANSING, MICHIGAN
MICHIGAN STATE UNIVERSITY, BIOLOGY RESEARCH CENTER

Tribolium castaneum

I. Wild type strain

1. McGill	Chicago via Berkeley, 1964

II. Mutant strains

1. paddle	Chicago via Berkeley,
2. spotted	Berkeley,

(Ed.)

EAST LANSING MICHIGAN
MICHIGAN STATE UNIVERSITY, DEPARTMENT OF ZOOLOGY

Tribolium confusum

I. Wild type strain

1. Chicago wild, Chi +/+	Berkeley, 1964

II. Mutant strains

1. ruby eyespot (rus)	Berkeley, 1964
2. melanotic stink glands (msg^{Ho})	Berkeley, 1964
3. light ocular diaphragm, pearl (lod p)	Berkeley, 1964
4. black, melanotic stink glands, ruby eyespot (b msg rus)	Berkeley, 1964
5. black, ruby eyespot (b rus)	Berkeley, 1964
6. McGill black, light ocular diaphragm, pearl (McGill b lod p)	Berkeley, 1964

Tribolium castaneum

Wild type strain
black strain

(Ed.)

HAMPTON, IOWA
FARMERS HYBRID COMPANY

I. Wild type strain
1. Chicago — via Berkeley, 1965

II. Mutant strains
1. r py
2. j mc
3. Be/+ — (Ed.)

HUMACAO, PUERTO RICO
UNIVERSITY OF PUERTO RICO, COLLEGE OF HUMACAO
DEPARTMENT OF BIOLOGY

Tribolium castaneum

I. Wild type strain
1. Chicago

II. Mutant strains
1. paddle
2. pearl
3. Microcephalic
4. Bar eye, sooty
5. Short antennae (Sa-2) — (Ed.)

HUNTSVILLE, TEXAS
SAM HOUSTON STATE UNIVERSITY
DEPARTMENT OF BIOLOGY

Tribolium castaneum

I. Wild type strain
Purdue + Foundation

II. Mutant strains
1. light ocular diaphragm lod^D — Carbondale, Illinois
2. maroon M — Purdue + Foundation
3. pearch r^{ph} — Carbondale, Illinois
4. pink p^{pk} — Chazy, New York
5. pink, ivory p^{pk} i — Carbondale, Illinois
6. ruby rb
7. ruby, jet rb j — Carbondale, Illinois
8. ruby, jet, microcephalic rb j mc
9. ruby, maroon rb m
10. ruby, peach rb p^{ph} — A. A. Dewees

IMMACULATA, PENNSYLVANIA
IMMACULATA COLLEGE, CANCER RESEARCH UNIT

I. Wild type strains
1. Alphitobius diaperinus — PIL
2. Alphitobius laevigatus — PIL
3. Gnathocerus cornutus — PIL
4. Gnathocerus maxillosus — PIL

5.	Latheticus oryzae	Berkeley
6.	Tenebrio molitor	PIL
7.	Tenebrio obscurus	PIL
8.	Tribolium anaphae	Berkeley
9.	Tribolium brevicornis	Berkeley
10.	Tribolium castaneum	Berkeley
11.	Tribolium confusum	Berkeley
12.	Tribolium destructor	Berkeley
13.	Tribolium madens	Berkeley

II. Mutant Strain
1. Tribolium confusum melanotic stink glands (msg)

Note: The insect strains formerly maintained by one of us (S.K.L.) at the John Hopkins University, Chemistry Dept., in Baltimore, Md., have been transferred to Immaculata College.

(Ed.)

IRVINE, CALIFORNIA
UNIVERSITY OF CALIFORNIA, DEPARTMENT OF ORGANISMIC BIOLOGY

Tenebrio molitor

(Ed.)

ITHACA, NEW YORK
CORNELL UNIVERSITY, DEPARTMENT OF ANIMAL SCIENCE

Tribolium castaneum

The Purdue Foundation wild type obtained from the Population Genetics Institute in April, 1965.

(Ed.)

ITHACA, NEW YORK
CORNELL UNIVERSITY, DEPARTMENT OF ENTOMOLOGY AND LIMNOLOGY

I. Wild type strains
1. Tribolium confusum from Dr. H. Ducoff, University of Illinois.
2. Tribolium confusum infected with Nosema whitei.

(Dr. L. V. Knutson, same department, is said to have a wild type strain of T. Confusum. Whether this strain is the same as that listed above is not known. Ed.)

JAMAICA, NEW YORK
ST. JOHN'S UNIVERSITY, DEPARTMENT OF BIOLOGY

Tenebrio molitor

(Ed.)

KENT, OHIO
KENT STATE UNIVERSITY, DEPARTMENT OF BIOLOGICAL SCIENCES

I. Wild type strains

A. Tribolium castaneum

Synthetic strain combined from Chicago wild type derived from Dr. Thomas Park and a strain obtained from Dr. Karl Schurr, Department of Biology, Bowling Green State University, Bowling Green, Ohio.

B. Tribolium confusum

Derived from stock maintained by Dr. L. V. Knutson, Department of Entomology, Cornell University, Ithaca, New York.

C. Oryzaephilus surinamensis--from infested flour.

(Ed.)

LAFAYETTE, INDIANA
PURDUE UNIVERSITY, POPULATION GENETICS INSTITUTE

Tribolium castaneum

I. Wild type strains

A. Base populations for quantitative genetics studies:

1. Foundation + - wild type population formed from a broad genetic base and maintained with no artificial selection and minimum of inbreeding.

2. Foundation s - same genetic base as Foundation + but marked with sooty (s).

3. Foundation b - marked with (b) and unrelated to Foundation +, broad genetic base, no selection, minimum inbreeding.

4. Foundation p - marked with pearl (p) and unrelated to Foundation + and b, broad genetic base, no selection, minimum inbreeding.

B. Laboratory stocks:

5.	Arkansas	Fayetteville, 1954
6.	Brazil	Vicosa, 1958
7.	Capetown	South Africa, 1958
8.	Chicago	University of Chicago, 1954
9.	Carbondale	Illinois, 1958
10.	Colombia	South America, 1958
11.	Florida	Gainesville, 1958

12.	Georgia	Tipton, 1954
13.	Japan	Kyoto, 1958
14.	McGill	Montreal, Canada, 1958
15.	Minnesota	Minneapolis, 1958
16.	Texas	College Station, 1954
17.	Virginia	Blacksburg, 1954
18.-30.	Inbred lines with 10-50 generations of full sibbing.	

II. Mutant strains

31.	antennapedia, ap	Purdue Sa Stock, 1962
32.	Bar eye, Be	Berkeley, 1962
33.	black, b^D	Carbondale, Illinois, 1964
34.	chestnut, c	Purdue + Foundation, 1961
35.	cordovan, b^{cd}	Purdue + Foundation, 1962
36.	corn oil sensitive, cos	Purdue + Foundation, 1966
37.	ivory, i	Purdue + Foundation, 1961
38.	jet, j^E	Purdue + Foundation, 1961
39.	light ocular diaphragm, lod^D	Carbondale, Illinois, 1964
40.	maroon m	Purdue + Foundation, 1962
41.	paddle, pd	Chicago, 1955
42.	peach, r^{ph}	Carbondale, Illinois, 1964
43.	pearl, p	Chicago, 1955
44.	pearl, p^M	Malta via Pest Infest. Lab., 1966
45.	pearl, p^S	Fla. Inbred. (Purdue), 1963
46.	pygmy, py	Chazy, New York, 1960
47.	red, r	Chazy, New York, 1960
48.	red, r^s	Purdue + Foundation, 1964
49.	ring, rg	Purdue + Foundation, 1961
50.	rose, rs	Purdue + Foundation,
51.	ruby, rb	Carbondale, Illinois, 1964
52.	Short antenna, Sa	Purdue + Foundation, 1960
53.	short antenna, saz	Purdue + Foundation, 1966
54.	sooty, s	Purdue + Foundation, 1956
55.	squint, sq	Chazy, New York, 1960
56.	wine, r^W	Purdue + Foundation, 1963

(Ed.)

LARMIE, WYOMING
UNIVERSITY OF WYOMING, DEPARTMENT OF ZOOLOGY AND PHYSIOLOGY

Tribolium castaneum

I. Mutant strains

1. Fta c
2. Be s
3. pd py pte
4. sp
5. Spa s eju
6. p b
7. p lod
8. ap sq

(Ed.)

LAURINGBURG, NORTH CAROLINA
ST. ANDREWS COLLEGE

Tribolium confusum

A wild stock that is infected with Nosema whitei.

(Ed.)

LIVERMORE, CALIFORNIA
BIOLOGICAL FRONTIERS INSTITUTE

Only wild type strains of T. confusum and T. castaneum are maintained. We have a number of stocks of these species received from Dr. I. Michael Lerner and described by him in Tribolium Information Bulletin #3 (p.28). In addition we have a number of stocks of both species collected locally.

We have also a wild type strain of the saw-toothed grain beetle, Oryzaephilus surinamensis (L.)

(Ed.)

LORETTO, PENNSYLVANIA
ST. FRANCIS COLLEGE, BIOLOGY DEPARTMENT

I. Wild type strain
1. Tribolium confusum — Chicago via Berkeley
2. Tribolium castaneum — Chicago via Berkeley

(Ed.)

LOS ANGELES, CALIFORNIA
UNIVERSITY OF CALIFORNIA MEDICAL CENTER
DEPARTMENT OF MEDICAL MICROBIOLOGY

I. Wild type strain
1. Tribolium confusum — Chicago via Berkeley

(Ed.)

MANHATTAN, KANSAS
KANSAS STATE UNIVERSITY, DEPARTMENT OF ENTOMOLOGY

I. Stock list

A. Sitotroga cerealella (Oliv.)
1. Angoumois grain moth from Anderson Co., Kansas, about 1960.
2. (Lab strain) AGM from Anderson Co., Kansas, about 1960.
3. (Red-eyed) AGM from Stock cultures, about 1966, K. B.
4. (Field strain) AGM from Riley Co., popcorn, about 1966. RBM.

B. Plodia interpunctella (Hbn.)
1. Indain Meal moth, from Kansas.

C. Cadra cautella
1. Almond moth from USDA Savannah, Georgia, 1966 RBM.

D. Ephestia elutella, Tobacco moth from USDA Savannah, Georgia, 1966.

E. Sitophilus oryzae (L.), Lesser rice weevil, from Kansas, (old strain) 1955.
1. Lesser rice weevil from Kansas, McLain Co., 1965.
2. Lesser rice weevil from USDA Atlanta, Georgia.

F. Sitophilus zeamais (Mot.) from Stuttgart, Arkansas, 1955.
1. Mexican Larger rice weevil, from Veracruz, Mexico, 1964.

G. Sitophilus granarius (L.), Granary weevil, from Kansas.
H. Oryzaephilus surinamensis (L.), Saw-toothed grain beetle, Kansas.
I. Cryptolestes pusillus (Schonh.), Flat grain beetle, from Kansas.
J. Cryptolestes ferrugineus, Rusty grain beetle, from Kansas.
K. Rhizopertha dominica (F.), Lesser grain borer, from Kansas.
L. Tribolium castaneum (Hbst.), Red flour beetle, from Kansas.
M. Tribolium confusum duVal, Confused flour beetle, Kansas.
N. Oryzaephilus mercator, Merchant beetle, Savannah, Georgia, 1964.
O. Palorus ratzeburgi, Small-eyed flour beetle, Kansas, 1965.
P. Gibbium psylloides (Czemp.), Spider beetle, Flour Mill Chicago, Ill., 1966.
Q. Lasioderma serricorne (F.), Cigarette beetle, Kellogg's All Bran, Manhattan, Kansas, 1966.
R. Trogoderma parabile, Carpet beetle, Kansas.
S. Tenebrio molitor, Yellow mealworm, Kansas.
T. Attagenue piceus (Oliv.), Black carpet beetle, Kansas, recent.

II. New Mutant

A. Sitotrya cerealella
1. red-eyed (bb), from Kansas.

(Ed.)

MIDLAND, MICHIGAN
THE DOW CHEMICAL COMPANY, BIOPRODUCTS DEPARTMENT

Tribolium confusum

Wild strain maintained in laboratory more than 20 years.

(Ed.)

MOSCOW, IDAHO
UNIVERSITY OF IDAHO, DEPARTMENT OF ENTOMOLOGY

A. Tribolium castaneum - large and small selections, sooty marked, obtained from Berkeley last October.

B. Tribolium madens from the Boise Valley area, Idaho, started in November, 1967.

C. Tribolium confusum - probably of local origin, held under weekly subculturing for about three years.

D. Tribolium castaneum - of local origin, subcultured largely at weekly intervals for about five years, started from a very few individuals surviving neglect of cultures previously, somewhat sporadically, maintained for several years in the laboratory.

(Ed.)

MUNCIE, INDIANA
BALL STATE UNIVERSITY, DEPARTMENT OF PHYSIOLOGY AND HEALTH SCIENCE

Tribolium castaneum, large stock, from Purdue University.

Tribolium castaneum, foundation stock, from Purdue University.

(Ed.)

NATICK, MASSACHUSETTS
U.S. ARMY NATICK LABORATORIES, PIONEERING RESEARCH DIVISION

I. Wild type strains

Anagasta kuhniella	USDA Lab., Georgia, 1969
Anthrenus flavipes	USDA Lab., Georgia, 1967
Attagenus megatoma	USDA Lab., Georgia, 1956
Cadre cautella	USDA Lab., Georgia, 1969
Dermestes maculatus	USDA Lab., Georgia, 1968
Lasioderma serricorne	USDA Lab., Georgia, 1968
Oryzaephilus surinamensis	USDA Lab., Georgia, 1968
Plodia interpunctella	USDA Lab., Georgia, 1964
Rhyzopertha dominica	USDA Lab., Georgia, 1969
Sitophilus oryzae	USDA Lab., Georgia, 1968
Sitotroga cerealella	USDA Lab., Georgia, 1969
Tenebroides mauritanicus	USDA Lab., Georgia, 1968
Tribolium castaneum	USDA Lab., Georgia, 1956
Tenebroides molitor	Univ. New Hampshire, Durham, 1965
Tineola bisselliella	Univ. New Hampshire, Durham, 1965
Trogoderma parabile	Natick, 1968

II. Mutant

Tribolium confusum - Ebony strain — A. Sokoloff, 1968

J. J. Pratt, Jr.

NORMAN, OKLAHOMA
UNIVERSITY OF OKLAHOMA, DEPARTMENT OF ZOOLOGY

I. Coleoptera

Tribolium castaneum (Tenebrionidae)
1. wild type Chicago — University of Chicago

(Ed.)

NORTHRIDGE, CALIFORNIA
SAN FERNANDO VALLEY STATE COLLEGE, DEPARTMENT OF BIOLOGY

Tenebrio molitor infested with gregarines.

(Ed.)

NORTRE DAME, INDIANA
UNIVERSITY OF NOTRE DAME, DEPARTMENT OF BIOLOGY

I. Wild type strains
1. CFI-11 — Berkeley, 1965
2. CFI-22 — Berkeley, 1965
3. CFI-11 x CFI-22 — Berkeley, 1965
*4. ND-11 — Park, Univ. of Chicago, 1954

*Since 1956, maintained at the Air Force Weapons Laboratory, Kirtland, A. F. B., New Mexico.

(Ed.)

PITTSBURGH, PENNSYLVANIA
DUQUESNE UNIVERSITY, DEPARTMENT OF BIOLOGICAL SCIENCES

I. Wild type strains
1. Tribolium confusum (Chicago) used as interned host for Hymenolepis diminuta. — Via Sokoloff

(Ed.)

POCATELLO, IDAHO
IDAHO STATE UNIVERSITY, DEPARTMENT OF BIOLOGY

I. Wild type strains

Tribolium castaneum--Synthetic strain marked with sooty from Berkeley.

Tribolium confusum--Synthetic strain from Berkeley.

(Ed.)

RICHLAND, WASHINGTON
BATTELLE-NORTHWEST, BIOLOGY DEPARTMENT

I. Wild type strains
1. Tribolium confusum Duval (Chicago Standard) — Univ. of Chicago
2. Tribolium castaneum Herbst (Brazil cI) — Univ. of Chicago

II. Mutant strain
1. Tribolium castaneum Herbst (Sooty) — Univ. of Calif., Berkeley

(Ed.)

Stock Lists

RIVERSIDE, CALIFORNIA
UNIVERSITY OF CALIFORNIA, DEPARTMENT OF ENTOMOLOGY

A.	*Cryptolestes turcicus*	PIL via Berkeley
B.	*Gnathocerus cornutus*	PIL via Berkeley
C.	*Tribolium anaphe*	PIL via Berkeley
D.	*Tribolium destructor*	PIL via Berkeley
E.	*Tribolium madens*	PIL via Berkeley
F.	*Tribolium brevicornis*	California

(Ed.)

SALT LAKE CITY, UTAH
UNIVERSITY OF UTAH, DEPARTMENT OF ZOOLOGY AND ENTOMOLOGY

I. Wild type strains

1.	*Tribolium confusum*	Park, Chicago, 1962
2.	*Tribolium castaneum*	J. Laurie, Utah, 1962
3.	*Tenebrio molitor*	W. P. Larsen, via S. Muliak, Utah, 1961
4.	*Oryzaephilus* sp.	wild, Utah, 1962

II. Mutant strain

1. melanotic stink glands

(Ed.)

SAN BERNARDINO, CALIFORNIA
CALIFORNIA STATE COLLEGE, NATURAL SCIENCES DIVISION

I. Wild type strains

A. *Tribolium castaneum*

1.	Arkansas	Bell, 1970
2.	Brazil	ex Park via Howard Erdman, 1963
3.	Capetown	Bell, 1970
4.	Chicago	Park, 1955
5.	Columbia	Bell, 1970
6.	Consejo	Spain, 1968
7.	Davis	Davis, Calif., 1961
8.	Georgia	Bell, 1970
9.	Florida	Bell, 1970
10.	Japan	Bell, 1970
11.	McGill	Stanley, 1958
12.	Sacramento	1961
13.	Texas	1958
14.	Veracruz, Mexico	1963
15.	Virginia	1958

B. *Tribolium confusum*

1.	Chicago	Park, 1955
2.	Davis (impure, has pearl)	1961
3.	McGill	Stanley, 1958
4.	New York	1961
5.	Pennsylvania (free of eye color mutants)	McDonald, 1963
6.	Sacramento	1961

Stock Lists

7. San Bernardino 1968

C. Tribolium anaphe
1. PIL Pest Infestation Laboratory, Slough, 1963

D. Tribolium brevicornis
1. Riverside Riverside, California, 1965

E. Tribolium destructor
1. PIL Pest Infestation Laboratory, Slough, 1963

F. Tribolium madens Pest Infestation Laboratory, Slough, 1963

G. Gnathocerus cornutus
1. Berkeley (1) Oakland, Calif., 1959
2. Berkeley (2) Oakland, Calif., 1961
3. PIL Pest Infestation Laboratory, Slough, 1963

H. Latheticus oryzae
1. Kansas 1970
2. Savannah Georgia, 1970
3. Tifton Georgia, 1970

I. Oryzaephilus surinamensis
1. Synthetic from Cold Spring, Harbor, N. Y. and Oakland, Calif. populations
2. San Bernardino 1968

J. Cyrptolestes turcicus
1. PIL Pest Infestation Laboratory, Slough, 1963

K. Stegobium paniceum San Bernardino, 1969

L. Trogoderma inclusum USDA Lab., Fresno, 1968

II. Synthetic strains

A. Tribolium castaneum
1. Berkeley. Synthetic strain from six different laboratory strains marked with sooty. Prepared in 1958.

2. Berkeley. Synthetic strain from seven laboratory strains strains not marked with body color genes. Prepared in 1964.

B. Tribolium confusum
1. Berkeley. Synthetic strain from six wild type laboratory strains not marked with body color genes. Prepared in 1958.

III. Inbred lines

A. Tribolium castaneum
1. Started October, 1958, from the Berkeley synthetic strain (now in 82 generation of brother-sister mating--all marked with sooty.)

a. CSI-3F

2. Started from the Berkeley synthetic strain (now in 87 generation of brother-sister mating--all marked with sooty.)
   a. CSI-5F
3. Started 1971, from synthetic strain now in 3 generation of brother-sister mating--not marked with sooty.)

B. Tribolium confusum

1. Started October 8, 1958, from the Berkeley synthetic strain (now in 87-93 generation of brother-sister mating, not marked with body color genes.
   a. CFI-1
   b. CFI-2
   c. CFI-5
   d. CFI-8
   e. CFI-11
   f. CFI-12
2. Started in 1964 from the Berkeley synthetic strain, (now in 49-53 generation of brother-sister mating, not marked with body color genes.
   a. CFI-13
   b. CFI-14
   c. CFI-15
   d. CFI-23
   e. CFI-24

IV. Mutants

A. Tribolium castaneum

Chromosome I

1.	paddle (pd)	Park, 1955
2.	paddle-1 (pd-1)	Berkeley, 1965
3.	red (r)	Chazy, New York, 1959
4.	red (r^{Ho})	Berkeley, 1962
5.	red (r^{D})	Berkeley, 1963
6.	pygmy (py)	Chazy, New York, 1959
7.	spotted (sp)	Chazy, New York, 1959
8.	divergent elytra (dve)	Chazy, New York, 1959
9.	truncated elytra (te)	Chazy, New York, 1959
10.	platinum eye (pte)	Berkeley, 1965
11.	pokey (pok) (as heterozygotes)	Berkeley, 1962
12.	red modifier (r^{Mr})	Berkeley, 1961
13.	serrate (ser)	Berkeley, 1963
14.	deformed podomeres (dpm)	Berkeley, 1964
15.	pte pd	
16.	py pd	
17.	sp pd	
18.	py r pd	
19.	py r	
20.	r te	
21.	sp r	
22.	r pd	
23.	py r Mr	
24.	pte py pd	

25. r te M^r
26. sp dve py pd
27. ser py r
28. te^{-1}

Chromosome II

29.	pearl (p)	Park, 1955
30.	pink (p^{Pk})	Chazy, New York, 1959
31.	pegleg (pg)	Chazy, New York, 1959
32.	p pg	

Chromosome III

33.	aureate	Berkeley, 1965
34.	McGill black (McGb)	Stanley, 1964
35.	Chicago black (Cb)	Park, 1955
36.	Synthetic (McGb/Cb)	Chazy, New York, 1958
37.	black (b^{S}-1) (Brazil background)	Berkeley, 1963
38.	black (b^{S}) (Chicago background)	Chazy, New York, 1960
39.	light ocular diaphragm (lod) (pearl background)	
40.	light ocular diaphragm (lod^{d})	Dewees, 1971
41.	melanotic stink glands (msg)	Berkeley, 1964
42.	scar (sc)	Purdue, 1964
43.	tawny (b^{t})	PIL, 1965

Chromosome IV

44.	Bar eye (Be)	Chazy, New York, 1959
45.	cut prothorax (ctp)	Berkeley, 1962
46.	elongated juvenile urogomphi (eju)	Berkeley, 1965
47.	fused antennal segments-2 (fas-2)	Berkeley,
48.	incomplete mesosternum (ims)	Berkeley, 1962
49.	juvenile urogomphi (ju)	Berkeley, 1962
50.	reduced juvenile urogomphi (rju)	Berkeley, 1963
51.	Spatulate (Spa)	Berkeley, 1964
52.	deformed legs (dfl)	Chazy, New York, 1959
53.	sternites incomplete (sti)	Berkeley, 1963
54.	Be s	
55.	fas-2s	
56.	mahogany (my)	

Chromosome V

57.	jet (j)	Park, 1955
58.	microcephalic (mc)	Chazy, New York, 1959
59.	fused antennal segments-3 (fas-3) (=agg)	Berkeley, 1961
60.	fused antennal segments-3a (fas-3a)	Berkeley, 1963
61.	j spl mc	
62.	maroon (m)	Eddleman, 1970

Chromosome VI

63.	Microphthalmic (Mo)	Chazy, New York, 1959

Chromosome VII

64. Short antenna (Sa)
65. Short antenna (Sa-1) (=Gn)
66. Short antenna (Sa-2) (=Ds) — Berkeley, 1959
67. Short antenna (Sa-3) (=Cua) — Berkeley, 1962
68. short antenna (sa) (=ca) — Chazy, New York, 1959
69. chestnut (c) (ex Eddleman) — 1961
70. blistered elytra (ble) — Berkeley, 1962
71. short antenna (sa-2) (=vg) — Berkeley, 1962
72. **Fused tarsi and antennae (Fta)** — Berkeley, 1962
73. Fta ble
74. sa c
75. Fta c
76. Sa c
77. Fta ca c
78. ble c

Chromosome VIII

79. antennapedia (ap^D) — Berkeley, 1962
80. antennapedia (ap^S) (=fas-6) — Berkeley, 1963
81. squint (sq) — Chazy, 1959

Chromosome IX

82. missing abdominal sternites (mas) — Berkeley, 1964
83. prothoraxless (ptl) — Chazy, New York, 1959
84. prothoraxless-1 (ptl-1) — Berkeley, 1965
85. partially pointed abdominal sternites (ppas) — Berkeley, 1963

Chromosome X

86. abbreviated appendages (aa) — Cold Spring Harbor, N. Y., 1961
87. abbreviated appendages-1 (aa-1) (=cspl) — Chazy, New York, 1960

Multichromosomal

Note: The Roman numerals indicated the linkage groups involved. The symbol ? means the linkage group for that gene has not been established.

88. py pd; p I, II
89. sp; p I, II
90. py; b I, III
91. py r; lod I, III
92. sp; j I, V
93. pd; Mo I, VI
94. sp; p; j I, II, V
95. p; lod II, III
96. p; b II, III
97. p; b; Mo II, III, VI
98. p; b; mc II, III, V
99. p; mc II, V
100. b; Mo III, VI
101. j; Mo V, VI
102. Be Fta IV, VII
103. Be Sa IV, VII
104. ju ctp c IV, VII
105. Mo; sa VI, VII
106. b (p) apt III, (II), ?
107. mc apt V, ?
108. apt j V, ?
109. Mo (c) mas VI, (VII), IX
110. (p) b mas (II), III ?
111. p Bamp/+ II, III ?
112. Bamp/+ap^D III ?, IX
113. Bamp/+ ptl^{Hoy} III ?, IX
114. b max III, ?
115. j max V, ?
116. au Npp IV, ?
117. ap Npp VIII, ?
118. Be au IV
119. Fta ppas VII, ?

120. mc ppas V, IX
121. fas-3a ptl^{Hoy} III, IX
122. b ap^{s} III, VIII
123. au ctp IV
124. j ppas V, IX
125. p^{pk}; II
126. rb m ?; V

Unassigned (but possibly in II)

127.	creased abdominal sternites (cas)	Berkeley, 1963
128.	abnormal abdominal sternites (aas)	Berkeley, 1965
129.	akimbo (akb)	Berkeley, 1964
130.	alate prothorax (apt)	Berkeley, 1964
131.	antennae and tarsi fused (atf)	Berkeley, 1961
132.	ballooned (bal)	Berkeley, 1963
133.	banjo (bj)	Chazy, New York, 1960
134.	bead (bd)	Bell, 1967
135.	bent tibia (bt)	Berkeley, 1961
136.	Blunt abdominal and metathoracic projections (Bamp) (possibly in III)	Berkeley, 1965
137.	bowed femur (bf)	Berkeley, 1963
138.	bowleg	Bell, 1967
139.	bumpy (by)	Bell, 1966
140.	Charcoal (Chr)	Berkeley, 1966
141.	deflected epimera (dep)	Berkeley, 1964
142.	deformed femur (dff)	Berkeley, 1964
143.	deformed tibia (dft)	Berkeley, 1964
144.	dented	Bell, 1967
145.	diminutive appendages (dim)	Berkeley, 1966
146.	elbowed antennae-1 (elb-1)	Berkeley, 1964
147.	elongated elytra (ele)	Berkeley, 1964
148.	elytra and tarsi affected (eta)	Berkeley, 1963
149.	extra urogomphi (eu) (black)	Chazy, New York, 1960
150.	fused antennal segments-1 (fas-1)	Chazy, New York, 1959
151.	Fused antennal segments-4 (Fas-4)	Berkeley, 1963
152.	Fused antennal segments-5 (Fas-5)	Berkeley, 1963
153.	jagged antecoxal piece (jac)	Berkeley, 1964
154.	knobby prothorax (knp)	Berkeley, 1966
155.	lopped median groove (lmg)	Berkeley, 1964
156.	maxillopedia (max)	Berkeley, 1965
157.	minature appendages (ma^{D} r)	Bell, 1967
158.	Multi-urogomphi (Mu)	Bell, 1966
159.	Nonpunctate prothorax (Npp)	Berkeley, 1965
160.	overhang split (ohs)	Berkeley, 1966
161.	padded prothorax (pdp)	Berkeley, 1965
162.	pectinate antennae (pec)	Berkeley, 1964
163.	reduced gin traps (rgt)	Berkeley, 1965
164.	reduced pleurosternal suture (rps)	Berkeley, 1965
165.	reduced tarsi and antennae (rta)	Berkeley, 1966
166.	rough (ro)	Berkeley, 1964
167.	ruby (rby)	Berkeley, 1962
168.	rugose elytra (rue)	Berkeley, 1966
169.	scalloped prothorax (scp)	Berkeley, 1965
170.	short median abdominal projection (smp)	Berkeley, 1966
171.	short split spinasternum (sss)	Berkeley, 1965

172.	split (sp)	1963
173.	split-back (sb)	Bell, 1966
174.	stumpy (stu)	Berkeley, 1965
175.	Tetra urogomphi (Tu)	Berkeley, 1965
176.	tiny (ti) (=ty)	1962
177.	umbilicus (umb)	Berkeley, 1964

B. Tribolium confusum

Chromosome I

1.	Striped (St)	McDonald, 1961
2.	eyespot (es)	McDonald, 1961
3.	light eyespot (es^{lt})	Berkeley, 1963
4.	red (r)	Berkeley, 1962
5.	antennae and elytra reduced (aer)	Berkeley, 1962
6.	labiopedia (lp)	Berkeley, 1962
7.	pointed abdominal segments (pas)	Berkeley, 1963
8.	thickened elytral tips (tet)	Berkeley, 1963
9.	lethal-1 (l_1) (in heterozygotes)	Berkeley, 1962
10.	crumpled (cru)	Berkeley, 1964
11.	prothoraxless-like (ptll)	Berkeley, 1964
12.	St es	
13.	es lp	
14.	es lp (synthetic background)	
15.	es^{lt} lp	
16.	St es lp	
17.	alate prothorax (apt)	Berkeley, 1965

Chromosome II

18.	pearl (p)	PIL, via Stanley, 1960
19.	pearl (p^S)	Berkeley, 1962
20.	ebony-2 (e_2)	PIL, via Stanley, 1960
21.	creased abdominal sternites (cas)	Berkeley, 1963
22.	dirty pearl eye (dpe) (=fro)	Berkeley, 1963
23.	e_2p	PIL, via Stanley, 1960
24.	p cas	

Chromosome III

25.	Yugoslavian black (=b^z)	Yugoslavia, 1969
26.	McGill black (McGb) (=b^{Ho})	Stanley, 1960
27.	black-3 (b-3)	Berkeley, 1964
28.	ruby spot (rus)	Chazy, New York, 1960
29.	melanotic stink glands (msg)	Berkeley, 1962
30.	rus msg	
31.	b rus	
32.	b msg	

Chromosome IV

33.	thumbed (thu)	Berkeley, 1963
34.	$thumbed^s$ (thu^s) (=$rsp^{P.\ S.\ D.}$)	Berkeley, 1963

Chromosome V

35.	ebony (e)	Park, via Stanley, 1960

36.	ebony ($e^{L\&H}$)	Berkeley, 1959
37.	synthetic ($e/e^{L\&H}$)	Berkeley, 1961
38.	blistered elytra (ble)	Chazy, New York, 1960
39.	e ble	

Chromosome VI

40.	disjoined (dj)	Berkeley, 1963

Unassigned (but possibly in III)

41.	light ocular diaphragm (lod) (pearl)	Berkeley, 1961

Multichromosomal

42.	p; lod	
43.	p; rus	
44.	b; sp	
45.	rus; sp	
46.	rus; ble	
47.	b (;) lod; p	
48.	b twa	
49.	ems dt msg	
50.	jac dt b	
51.	McGill b p	
52.	bent femur (btf)	Berkeley, 1964
53.	bent tibia (btt)	Berkeley, 1962
54.	black-3 (b-3)	Berkeley, 1964
55.	crumpled elytra (cru)	Berkeley, 1964
56.	creased abdominal sternites (cas-1)	1963
57.	deflected epimera (dep)	Berkeley, 1964
58.	deformed legs (dfl)	Berkeley, 1965
59.	elongated elytra (ele)	Berkeley, 1963
60.	fused antennal segments-1 (fas-1)	Berkeley, 1962
61.	fused antennal segments-2 (fas-2)	Berkeley, 1963
62.	incomplete meso-metathoracic suture (ims)	Berkeley, 1965
63.	imcomplete metathoracic projections (imp)	Berkeley, 1964
64.	knobby prothorax (knp)	Berkeley, 1964
65.	legless (lgl)	Berkeley, 1966
66.	medial abdominal groove (mag)	Berkeley, 1964
67.	nude (nd)	Berkeley, 1964
68.	pockets (poc)	Berkeley, 1965
69.	prosternumless (psl)	Berkeley, 1966
70.	Reduced eye (Re)	Berkeley, 1965
71.	rough (ro) (black)	McDonald, 1960
72.	ruby (rby)	Berkeley, 1962
73.	scar (sc) (=engraved metasternum)	Berkeley, 1962
74.	separated epimera (sep)	Berkeley, 1964
75.	short elytra (sh)	Berkeley, 1961
76.	split (sp)	Berkeley, 1961
77.	sternites incomplete (sti)	Berkeley, 1963
78.	stilted legs (stl)	Berkeley, 1962
79.	stunted (stt)	Berkeley, 1966
80.	tiny (ty)	Berkeley, 1961
81.	twisted abdomen (twa)	Berkeley, 1965
82.	umbilicus (umb) (=dent)	Berkeley, 1962

83. warped elytra (we) Berkeley, 1962
84. wingless (wgl) Berkeley, 1965

C. Tribolium anaphe

1. sternites incomplete (sti) Berkeley, 1964
2. creased abdominal sternites (cas) Berkeley, 1965

D. Tribolium brevicornis

1. creased abdominal sternites (cas)
2. split (spl)
3. fused antennal segments (fas)

E. Tribolium destructor

1. bent tibia (btt)
2. creased abdominal sternites (cas) Berkeley, 1964
3. split (spl) Berkeley, 1964

F. Tribolium madens

1. fused antennal segments-1 (fas-1) Berkeley, 1964
2. creased abdominal sternites (cas) Berkeley, 1964
3. split (spl) Berkeley, 1964
4. bent tibia (btt) Berkeley, 1964

G. Gnathocerus cornutus

1. pearl-1 (p-1) PIL, 1964
2. pearl-2 (p-2) Berkeley, 1962

Unassigned

3. light ocular diaphragm (lod) (pearl) Berkeley, 1962

H. Latheticus oryzae

Chromosome I

1. red-1 (r-1) from PIL +/+ stock, 1963

Chromosome II

2. creased abdominal sternites (cas) Berkeley, 1963
3. p cas
4. p

Unassigned

5. droppy elytra (dre) Chazy, New York, 1960
6. fused antennal segments-1 (fas-1) Berkeley, 1963

I. Oryzaephilus surinamensis

None

J. *Cryptolestes turcicus*

Chromosome 1

1. red (r) — PIL, 1963

Unassigned

2. crooked antennae (cka) — Berkeley, 1964
3. runty (rty) — Berkeley, 1964
4. pink
5. tiny

M. *Palorus ratzeburgi*

None

N. *Stegobium paniceum*

None

O. *Tenebroides mauritanicus* — San Bernardino, 1971

A. Sokoloff

SANTA FE, NEW MEXICO
SANTA FE PREPARATORY SCHOOL

I. Wild type strain

A. *Tribolium castaneum* — Chicago via Berkeley

B. *Tribolium confusum* — McGill via Berkeley

(Ed.)

SAVANNAH, GEORGIA
STORED PRODUCT INSECTS RESEARCH AND DEVELOPMENT LABORATORY

I. Wild type strains

A. Lepidoptera
1. *Cadra cautella* — USDA, Tifton, Ga., 1964
2. *Ephestia elutella* — Richmond, Virginia,
3. *Plodia interpunctella*
4. *Sitotroga cerealla* — Tifton, Georgia, 1962
5. *Tineola bisselliella* — Savannah, Georgia, 1962

B. Coleoptera

1. *Anthrenus flavipes*
2. *Attagenus megatoma*
3. *Cryptolestes pusillus* — Madison, Wisconsin, 1967
4. *Dermestes maculatus*
5. *Lasioderma serricorne*
6. *Oryzaephilus mercator*

7.	Oryzaephilus surinamensis	Manhattan, Kansas, 1964
8.	Rhyzopertha dominica	Manhattan, Kansas, 1966
9.	Sitophilus granarius	
10.	Sitophilus oryzae	Estill, S. C., 1961
11.	Sitophilus zea mais	Canada, 1960
12.	Tenebriodes mauritanicus	
13.	Tenebrio molitor	
14.	Tribolium castaneum	Manhattan, Kansas, 1960
15.	Tribolium confusum	Madison, Wisconsin, 1967
16.	Trogoderma glabrum	Madison, Wisconsin, 1967
17.	Trogoderma inclusum	

II. Mutant strain

A. Tribolium confusum-black — Savannah, Georgia, 1967

(Ed.)

SOUTH LANCASTER, MASSACHUSETTS
ATLANTIC UNION COLLEGE, BIOLOGY DEPARTMENT

Tribolium castaneum

I. Wild type strains
1. Brazil (C-1)
2. Chicago
3. McGill
4. Sacramento
5. Texas
6. Veracruz, Mexico
7. Virginia

II. Mutant strains
1. red (r^D)
2. red (r)
3. red (r^{Ho})
4. red modifier (M^r)
5. McGill black ($McGb$)
6. Chicago black (Cb)
7. black (B^S-1), Brazil black
8. sooty (s)
9. jet (j)
10. chestnut (c^S)

(Ed.)

SOUTH ORANGE, NEW JERSEY
SETON HALL UNIVERSITY, DEPARTMENT OF BIOLOGY

I. Wild type strains

A. Laboratory strains
1. Tribolium castaneum - McGill — Montreal, Canada via University of California

2. Tribolium castaneum - Seton Hall — South Orange, New Jersey
3. Tribolium confusum — Fordham University

B. Base Populations for quantitative studies (Tribolium castaneum)
1. Foundation b - marked with black (b) body color - obtained via Purdue University, Lafayette, Indiana.
2. Foundation p - marked with pearl (p) eye color - obtained via Purdue University, Lafayette, Indiana.

II. Mutant strains

A. Tribolium castaneum
1. McGill black — via University of California
2. pearl — via University of California
3. pygmy — via University of California
4. Short antennael (Sa) — Purdue + Foundation, 1960

R. F. Costantino

STATE COLLEGE, MISSISSIPPI
USDA, ARS, BOLL WEEVIL RESEARCH LABORATORY

Anthonomus grandis

A. Wild type strains
1. A & M — College Station, Texas
2. Oktibbeha — State College, Miss.
3. Thurberia — Tucson, Ariz.
4. Iguala — Iguala, Mex.

B. Mutant strains
1. yellow (y) — A & M strain
2. slate (s) — Acala, Mexico
3. ebony (e) — A & M strain
4. pearl (p) — A & M strain

C. Insecticide resistant
1. Endrin Resistant ca. 20 g/weevil — Auburn University

W. Ivey
(Ed.)

ST. BERNARD, ALABAMA
ST. BERNARD ABBEY

I. Wild type strains

A. Tribolium castaneum
1. Chicago — via San Bernardino

B. Tribolium confusum
1. New York — via San Bernardino

II. Mutant strains

A. Tribolium castaneum
1. McGill black — via San Bernardino
2. jet — via San Bernardino

3. Sooty	via San Bernardino
4. Chicago black	via San Bernardino
B. Tribolium confusum	
1. pearl	via San Bernardino
2. McGill black	via San Bernardino
3. Ebony (Smith)	via San Bernardino
	Michael Morgan

STONY BROOK, NEW YORK
STATE UNIVERSITY OF NEW YORK, DEPARTMENT OF BIOLOGICAL SCIENCES

Tribolium castaneum

I. Wild type	
1. UPF Foundation	Purdue University
2. CS-4	University of California
3. Chicago	University of California
II. Mutants	
1. sooty (s)	Purdue
2. paddle (pd)	University of Chicago
3. pearl (p)	University of Chicago
4. McGill black (McGb) - University of Chicago stock	University of California
5. McGill black (McGb) with UPF genetic background obtained by backcrossing to UPF for nine generations	University of Kansas

Tribolium confusum

I. Wild type	
1. Chicago (Sonleitner)	University of Chicago
2. New York	University of Chicago
	Robert Sokal

ST. PAUL, MINNESOTA
UNIVERSITY OF MINNESOTA, DEPARTMENT OF ENTOMOLOGY, FISHERIES AND WILDLIFE

Tribolium confusum	St. Paul, Minn.,
Tribolium castaneum	Berkeley, Calif., 1963
Sitophilus oryzae (large strain)	Manhattan, 1960
Sitophilus granarius	St. Paul, Minn.,
Oryzaephilus surinamensis	Savannah, 1963
Trogoderma parabile	St. Paul, Minn., 1965
Gibbum psylloides	St. Paul, Minn., 1965
Rhysopertha dominica	Manhattan, 1963
Plodia interpunctella	St. Paul, Minn., 1963

(Ed.)

Stock Lists

ST. PAUL, MINNESOTA
UNIVERSITY OF MINNESOTA

Tribolium castaneum

A. Inbreds
1. CSI-5 — Univ. of Calif., Berkeley, 1963
2. CSI-10 — Univ. of Calif., Berkeley, 1963

B. Segregating populations (marked with sooty)
1. Random bred (no selection) since 1963 from a single cross.
2. Random bred with selection for pupa weight.

(Ed.)

ST. PAUL, MINNESOTA
UNIVERSITY OF MINNESOTA, DEPARTMENT OF ANIMAL SCIENCE

A. Inbreds
1. CSI-10 — University of California, Berkeley
2. E 1 — Institute of Animal Genetics, Edinburgh
3. E 2 — Institute,of Animal Genetics, Edinburgh

B. Purdue Foundation, p

C. Segregating population selected for pupa weight, synthesized by crossing CSI-10 and E 2 lines.

(Ed.)

SYCAMORE, ILLINOIS
DE KALB AGRICULTURAL ASSOCIATION, INC.

Dr. R. R. Shrode has moved to the University of Tennessee; fate of the Tribolium stocks is not known.

(Ed.)

TIFTON, GEORGIA
ABRAHAM BALDWIN AGRICULTURAL COLLEGE

Tribolium castaneum

A. Wild type strain
1. Chicago

B. Mutant strains
1. black
2. squint

(All derived from stocks maintained at Berkeley. Ed.)

Stock Lists

URBANA, ILLINOIS
UNIVERSITY OF ILLINOIS, DEPARTMENT OF ZOOLOGY

I. Wild type strains

A. Tribolium castaneum

1. Berkeley	Berkeley, 1966
2. Chicago	Urbana, 1966
3. Carbondale	Maryland, 1966
4. del Valle	Maryland, 1966
5. Kansas	Kansas, 1966

B. Tribolium confusum

1. Berkeley	Berkeley, 1966
2. Chicago	Urbana, 1966
3. Kansas	Kansas, 1966
4. Maryland	Maryland, 1966
5. Minnesota	Minnesota, 1966
6. Oklahoma	Urbana, 1966

II. Inbred lines

A. Tribolium castaneum

1. CSI-2	Berkeley, 1966
2. CSI-3	Berkeley, 1966
3. CSI-5	Berkeley, 1966
4. CSI-10	Berkeley, 1966
5. CSI-12	Berkeley, 1966
6. CSI-14	Berkeley, 1966
7. CSI-15	Berkeley, 1966
8. CSI-16	Berkeley, 1966
9. CSI-22	Berkeley, 1966

B. Tribolium confusum

1. CFI-1	Berkeley, 1966
2. CFI-2	Berkeley, 1966
3. CFI-3	Berkeley, 1966
4. CFI-5	Berkeley, 1966
5. CFI-7	Berkeley, 1966
6. CFI-8	Berkeley, 1966
7. CFI-11	Berkeley, 1966
8. CFI-12	Berkeley, 1966
9. CFI-13	Berkeley, 1966
10. CFI-14	Berkeley, 1966
11. CFI-15	Berkeley, 1966
12. CFI-16	Berkeley, 1966
13. CFI-18	Berkeley, 1966
14. CFI-19	Berkeley, 1966
15. CFI-20	Berkeley, 1966
16. CFI-21	Berkeley, 1966
17. CFI-22	Berkeley, 1966
18. CFI-23	Berkeley, 1966
19. CFI-24	Berkeley, 1966

III. Mutant strains

A. Tribolium castaneum

1.	sa-2 (+/s)	Berkeley, 1966
2.	i	Purdue, 1967
3.	w	Purdue, 1967
4.	b, mc, p	Berkeley, 1966
5.	bal, s	Berkeley, 1966
6.	pd	Urbana, 1966
7.	Be	Berkeley, 1966
8.	mc	Berkeley, 1967
9.	aa (+/p)	Berkeley, 1967
10.	r^{Ho}	Berkeley, 1966
11.	Mo	Berkeley, 1966
12.	b	Berkeley, 1966
13.	ap^{D}, s	Berkeley, 1966
14.	j	Berkeley, 1966
15.	r (+/py)	Berkeley, 1966
16.	Fta/+, c	Berkeley, 1966
17.	c	Berkeley, 1966
18.	Spa/+, +/c	Berkeley, 1966
19.	p	Berkeley, 1967
20.	sq	Berkeley, 1967
21.	msg	Berkeley, 1967
22.	sh^{s}	Berkeley, 1967
23.	p, lod	Berkeley, 1967
24.	Sa-2, s	Berkeley, 1967
25.	rg	Berkeley, 1967
26.	fas-3a	Berkeley, 1967
27.	r^{D}, s	Berkeley, 1967
28.	dve, pd	Berkeley, 1967
29.	h	Urbana, 1967
30.	rs	Purdue, 1967
31.	rb	Purdue, 1967
32.	j, m	Purdue, 1967
33.	ctp, ju	Berkeley, 1967

(Ed.)

URBANA, ILLINOIS
UNIVERSITY OF ILLINOIS, DEPARTMENT OF PHYSIOLOGY AND BIOLPHYSICS

Tribolium confusum

A.	Wild type	G. Fraendel, 1960
B.	McGill black	A. Sokoloff, 1966

Also available:

Nemeritis canescens (Ichneumon.)

From University of Cambridge Zoology Department. Carried on Anagasta kuehniella.

(Ed.)

WASHIGTON, D. C.
THE CATHOLIC UNIVERSITY OF AMERICA, DEPARTMENT OF BIOLOGY

R. H. Arnett moved to Purdue University; fate of Tribolium stocks at

the above institution is not known. (Ed.)

AUSTRALIA

BRISBANE, QUEENSLAND
DEPARTMENT OF PRIMARY INDUSTRIES, ENTOMOLOGY LABORATORY

COLEOTERA

A. Tribolium castaneum
   1. Wild type strains
   2. Black mutant (reoccurrence of b)
   3. Lindane resistant

B. Sitophilus oryzae
   1. Wild type strains
   2. DDT resistant (single semi-dominant sex-linked factor)
   3. Lindane and dieldrin resistant (single and multi-factor strains.)
   4. Black strain

C. Sitophilus zeamais--wild type

D. Sitophilus granarius--wild type

E. Oryzaephilus surinamensis
   1. Wild type strains
   2. Lindane resistant strains (impure)

F. Lasioderma serricorne--wild type

G. Rhizopertha dominica--wild type

H. Mezium americanum--wild type

LEPIDOPTERA

A. Cadra cautella--wild type

B. Phthorimaea operculella
   1. DDT-endrin resistant
   2. Red-eyed mutant (single autosomal recessive)

HYMENOPTERA

A. Microchelomus sp.--wild type

(Ed.)

Stock Lists

BELGIUM

GEMBLOUX
INSTITUT AGRONOMIQUE DE L'ETAT, ZOOLOGIE GENERALE

Tenebrio molitor

F strain--selected for small weight since 1950.
G strain--selected for large weight since 1950.

(Ed.)

LOUVAIN
F. A. JANSSENS MEMORIAL LABORATORY FOR GENETICS
AGRICULTURAL INSTITUTE OF THE UNIVERSITY

Tenebrio molitor

Wild type — Belgium

Tribolium confusum

Two inbred and a wild type — Berkeley, 1965

(Ed.)

BRAZIL

CAMPINAS, SÃO PAULO
INSTITUTE AGRONOMICO, SECAO DE ENTOMOLOGIA

Anobiidae

Lasioderma serricorne (F)--Campinas, SP--wild type.

Bostrichidae

Rhizopertha dominica (F)--Campinas, SP--wild type.

Bruchidae

Acanthoscelides obsoletus (Say)--Campinas, SP--wild type.

Curculionidae

Sitophilus oryzae (L.)--Campinas, SP--wild type

Silvanidae (Cucujidae)

Oryzaephilus surinamensis (L.)--Campinas, SP--wild type.

Tenebrionidae

Tribolium castaneum (Herbst.)--Campinas, SP--wild type.

(Ed.)

Stock Lists

CANADA

EDMONTON, ALBERTA
UNIVERSITY OF ALBERTA, DEPARTMENT OF ANIMAL SCIENCE

A.	Brazil	Purdue, 1965
B.	Capetown	Purdue, 1965
C.	Chicago	Chicago, 1965
D.	Consejo	Madrid, 1965
E.	Japan	Kyoto and Purdue, 1965
F.	Kano	Scotland, 1965
G.	Kenya	Scotland, 1965
H.	Kingston	Scotland, 1965
I.	Lisbon	Portugal, 1965
J.	Purdue Foundation +	Manitoba, 1963
K.	Scotland	Edinburgh, 1965
L.	Seychelles	Scotland, 1965
M.	Surrey	England, 1965
N.	Veracruz	Berkeley, 1965

(Ed.)

GUELPH, ONTARIO
UNIVERSITY OF GUELPH, DEPARTMENT OF POULTRY SCIENCE

Tribolium castaneum

A. 1. Purdue Foundation (+)

2. Purdue Foundation S

3. Purdue Foundation b

4. Purdue Foundation P

5. Purdue McNary Small

6. Purdue PL - 1

7. Purdue Burris I and II.

B. Selected lines from Purdue Foundation (+) stock.

1. Four lines with different degrees of inbreeding selected for high pupa weight for six generations in a high humidity environment.

2. Four lines with different degrees of inbreeding selected for low pupa weight for six generations in a high humidity environment.

3. Four lines with different degrees of inbreeding selected for high pupa weight for six generations in a low humidity environment.

4. Four lines with different degrees of inbreeding selected for low pupa weight for six generations in a low humidity environment.

(Ed.)

Stock Lists

GUELPH, ONTARIO
UNIVERSITY OF GUELPH, DEPARTMENT OF ZOOLOGY

A. Sitophilus granarius (L)
   1. GG strain, dark, heavy and symbiotic
   2. MW strain, paler, lighter and aposymbiotic
   3. Two new strains as yet unclassified

B. Sitophilus oryzae (L.)--small rice weevil

C. Sitophilus zea-mais (Mots.)--large rice weevil

(Ed.)

MONTREAL, P. Q.
MCGILL UNIVERSITY, DEPARTMENT OF GENETICS

Tribolium castaneum

1.	Berkeley CS-synthetic	Berkeley, 1967
	Berkeley CSI-3, 5, 10, 14, 16	Berkeley, 1967
	Berkeley CS-pygmy	Berkeley, 1967
2.	Chicago wild	via D. Bray, 1966
3.	Purdue Foundation via E. Scheinberg	Ottawa, 1967
4.	Several strains selected for high pupal weight	via D. Bray, 1966

(Ed.)

OTTAWA, ONTARIO
ANIMAL GENETICS SECTION, ANIMAL RESEARCH INSTITUTE
CENTRAL EXPERIMENTAL FARM

Tribolium castaneum

Purdue Foundation

RSILW - A population selected for high larval weight for 10 generations restricting developmental time and pupal weight (derived from Purdue Foundation).

RSIDT - A population selected for short developmental time for 10 generations restricting larval weight and pupal weight (derived from Purdue Foundation).

RSIPW - A population selected for short developmental time for 10 generations restricting larval weight and developmental time (derived from Purdue Foundation).

TSLW - A populations selected for high larval weight for 10 generations (derived from Purdue Foundation).

TSDT - A population selected for short developmental time for 10 generations (derived from Purdue Foundation).

TSPW - A population selected for high pupal weight for 10 generations (derived from Purdue Foundation).

(Ed.)

QUEBEC, P. Q.
UNIVERSITE LAVAL, DEPARTMENT OF BIOCHEMISTRY

Tribolium confusum Duval

Strain: Laval
Origin: Quebec City

(Ed.)

QUEBEC, P. Q.
UNIVERSITE LAVAL, DEPARTMENT OF BIOLOGY

Tribolium confusum Duval

Strain: Laval
Origin: Quebec City

(Ed.)

VANCOUVER, B. C.
UNIVERSITY OF BRITISH COLUMBIA, DEPARTMENT OF POULTRY SCIENCE

I. Wild type strains

A. Tribolium confusum inbred lines

1. CFI-2a — Berkeley, 1965
2. CFI-3 — Berkeley, 1965
3. CFI-5 — Berkeley, 1965
4. CFI-7 — Berkeley, 1965
5. CFI-8b — Berkeley, 1965

II. Mutant strains

A. Tribolium confusum

1. eyespot (es); chromosome I — Berkeley, 1965
2. red (r); chromosome I — Berkeley, 1965
3. dirty pearl eye (dpe); chromosome IV — Berkeley, 1965
4. ebony-2 (e_2); chromosome II — Berkeley, 1965
5. pearl riboflavinless (p^r); chromosome II — Berkeley, 1965
6. pearl slough (p); chromosome II — Berkeley, 1965
7. ruby spot (rus); chromosome III — Berkeley, 1965
8. light ocular diaphragm (lod); chromosome III — Berkeley, 1965
9. p; dre; cas; multichromosomal — Berkeley, 1965
10. r s; b; multichromosomal — Berkeley, 1965
11. St; b; multichromosomal — Berkeley, 1965

B. Tribolium castaneum

1. red (r); chromosome I — Berkeley, 1965

Stock Lists

Attagenus alfieri
Attagenus piceus
Dermestes frichii
Hylotrupes bajulus
Lasioderma serricorne
Oryzaephilus mercator
Oryzaephilus surinamensis
Rhizopertha dominica
Sitophilus granarius
Sitophilus oryzae
Stegobium (Sitodrepa) paniceum
Tenebrio molitor
Tenebrioides mauritanicus
Thylodrias contractus
Tribolium confusum
Tribolium destructor
Trogoderma granarium

F. S. Andersen

EASTERN NIGERIA

PORT HARCOURT
THE NIGERIAN STORED PRODUCTS RESEARCH INSTITUTE

I. Wild type strains

1.	Dermestes maculatus De Geer	Port Harcourt Strain, 1966
2.	Oryzaephilus mercator Fauv.	Port Harcourt Strain, 1966
3.	Sitophilus zea-mais Motschulsky	Kano Strain, 1965 (Ex Kano Lab. Stock) November, 1965
4.	Tribolium castaneum Hbst.	Kano Strain, 1965 (Ex Kano Lab. Stock) October, 1965
5.	Tribolium confusum DuVal.	Kano Strain, 1965 (Ex Kano Lab. Stock) December, 1965
6.	Trogoderma granarium Everts	Kano Strain, 1965 (Ex Kano Lab. Stock) November, 1965

(Ed.)

GIZA
PLANT PROTECTION DEPARTMENT, MINISTRY OF AGRICULTURE

I. Wild type strains

1.	Bruchus rufimanus	Egypt, U.A.R.
2.	Corcyra cephalonica	Egypt, U.A.R.
3.	Ephestia kühniella	Egypt, U.A.R.
4.	Latheticus oryzae	Egypt, U.A.R.
5.	Rhizopertha dominica	Egypt, U.A.R.
6.	Silvanus surinamensis	Egypt, U.A.R.
7.	Sitophilus granarius	Egypt, U.A.R.
8.	Sitophilus oryzae	Egypt, U.A.R.
9.	Tribolium castaneum	Egypt, U.A.R.
10.	Tribolium confusum	Egypt, U.A.R.

Stock Lists

Note: Dr. M. A. Hafeez is at present in London. Fate of above stocks is unknown.

(Ed.)

FRANCE

LYON, RHÔNE
LABORATORIRE DE ZOOLOGIE GÉNÉRALE, FACULTÉ DES SCIENCES

Tribolium castaneum

Wild type strain from Alès, France.

(Ed.)

VILLEURBANNE (LYON) RHÔNE
INSTITUT NATIONAL DES SCIENCES APPLIQUÉES, LABORATOIRE DE BIOLOGIE

A.	Acanthoscelides obsoletus--wild type	France
B.	Blabera fusca	
C.	Clitumnus extradentatus	
D.	Galleria mellonella	Saint Cyr au Mont d'Or
E.	Oryzaephilus surinamensis--from imported dried apricots	
F.	Periplaneta americana	
G.	Pseudococcus citri	Antibes
H.	Sitophilus granarius	Infestation Control Laboratory, Surbiton
I.	Sitophilus oryzae	P.I.L., Slough
J.	Sitophilus sasakii--wild type	Lyon
K.	Stegobium paniceum	P.I.L., Slough
L.	Tenebrio molitor	
M.	Tenebrio obscurus	P.I.L., Slough
N.	Tribolium castaneum--wild type	Alès

(Ed.)

GERMANY

MUNICH
BAYER, LANDESANSTALT FÜR BODENKULTUR
PFLANZENBAU U. PFLANZENSCHUTZ

Coleoptera

Cucjidae

Cryptolestes turcicus (Grouv.) Munich, 1966

Stock Lists

Curculionidae

Sitophilus granarius (L.)	Munich, 1966
Sitophilus zea-mais (Motsch.)	1966

Ptinidae

Gibbium psylloides (Czemp.)	Regensburg, 1960

Silvanidae

Oryzaephilus mercator (Fauv.)	Munich, 1966
Oryzaephilus surinamensis (L.)	Munich, 1959

Tenebrionidae

Gnathocerus cornutus (F.)	Munich, 1966
Tribolium confusum (Duv.)	Munich, 1960
Tribolium destructor (Uyttenb.)	Munich, 1957

Lepidoptera

Phyticidae

Anagasta Kuehniella (Zell.)	Munich, 1966

(Ed.)

GREAT BRITAIN

BIRMINGHAM, ENGLAND
THE UNIVERSITY OF BIRMINGHAM
DEPARTMENT OF ZOOLOGY AND COMPARATIVE PHYSIOLOGY

Tenebrio molitor
Tenebrio obscurus
Blaps sp.
Tribolium sp.

(Ed.)

DUNDEE, ANGUS
UNIVERSITY OF DUNDEE, DEPARTMENT OF NATURAL HISTORY

Only the stock unique to this laboratory is listed.

Wild stock

1. Tribolium castaneum - Kenya. Collected in December, 1967, from stored maize in the Nairobi district.

(Ed.)

Stock Lists

DUNDEE, ANGUS
UNIVERSITY OF ST. ANDREWS, QUEEN'S COLLEGE
NATURAL HISTORY DEPARTMENT

Only those stocks unique to this laboratory are described. The unlisted stocks are all derived from cultures at the Pest Infestation Laboratory.

A. Wild stocks

1. Tribolium anaphe

2. Tribolium castaneum--Kenya. Collected in 1964 from stored maize in the Machakos district.

3. Tribolium castaneum--Kingston (Jamaica). Collected in 1964 from maize entering central storage.

4. Tribolium castaneum--Kano (Nigeria). Collected in 1964 from cassava flour in Northern Nigeria.

5. Tribolium castaneum--Umuahia (Nigeria). Collected in 1964 from cocoa beans in Eastern Nigeria.

6. Tribolium castaneum--Ibadan (Nigeria). Collected in 1963 from maize silos in Western Nigeria.

7. Tribolium castaneum--Tokyo (Japan). Obtained in 1965.

8. Tribolium castaneum--Rangoon (Burma). Obtained in 1965.

9. Tribolium confusum--Kenya. Collected in 1964 from stored maize in Machakos district.

10. Tribolium destructor

11. Tribolium madens

12. Cathartus quadricollis--Nigeria. Collected in 1961.

B. Mutant stocks

13. Tribolium castaneum--pearl (p). Isolated from P.I.L. stocks.
14. Tribolium castaneum--mahogany. Isolated from P.I.L. stocks.
15. Tribolium castaneum--black (Kingston). Isolated from (4).

(Ed).

EDINBURGH
UNIVERSITY OF ENDINBURGH, INSTITUTE OF ANIMAL GENETICS

Tribolium castaneum

A. Wild type strain

1. Chicago wild type

Stock Lists

B. Mutant strains

1. Microphthalmic (Mo)
2. microcephalic, pearl (mc, p)
3. Bar eye, sooty (Be s/+s)
4. squint (sq)

Stocks obtained from Berkeley, California.

(Ed.)

EDINBURGH, SCOTLAND
DEPARTMENT OF AGRICULTURE AND FISHERIES FOR SCOTLAND
AGRICULTURAL SCIENTIFIC SERVICES, EAST CRAIGS

Tribolium castaneum Herbst.

Wild type strain of unknown origin, collected from imported foodstuffs.

Tribolium confusum J. duV.

Wild type strain of unknown origin, collected from imported foodstuffs.

(Ed.)

LONDON
QUEEN ELIZABETH COLLEGE, DEPARTMENT OF BIOLOGY

Bruchus pectinicornis
Latheticus oryzae
Sitophilus granarius
Tenebrio molitor
Tribolium anaphe
Tribolium castaneum
Tribolium madens
Trogoderma

All insects are derived from the Pest Infestation Laboratory, Slough, Bucks.

(Ed.)

NEWCASTLE UPON TYNE
THE UNIVERSITY OF NEWCASTLE UPON TYNE, SCHOOL OF AGRICULTURE

Tribolium castaneum

A. Wild type

1. pearl (p)
2. black (b), tawny (b^t)
3. antennapedia (ap)
4. paddle (pd)
5. red (r)

Tribolium confusum

A. Wild type

1. ebony (e^2)
2. pearl (p)

All stocks derived from cultures at Pest Infestation Laboratory, Slough, Bucks.

(Ed.)

SLOUGH, BUCKS
MINISTRY OF AGRICULTURE, FISHERIES & FOOD
PEST INFESTATION CONTROL

I. Wild type strains

ORDER Family (-subfamily) Genus (sub genus), species.	COMMON NAME	COUNTRY OF ORIGIN OF STOCK	CULTURE MEDIUM	REARING TEMPERATURE °C.
DICTYOPTERA				
Blattidae				
Blatta orientalis L.	Oriental cockraoch		18a	27
Blattella germanica (L.)	German cockroach		18a	27
Periplaneta americana (L.)	American cockroach		18a	27
Periplaneta australasiae (F.)	Australian cockroach		18a	27
Blaberus craniifer (Burm.)			36+37+38a	25
Henschoutedenia flexivilta			36a	30
Leucophora maderae			36a	30
DIPTERA				
Calliphoridae				
Calliphora erythrocephala (meigen)	Blowfly	Britain	30	27
Muscidae				
Musca domestica L.	Housefly	Britain	25	27
Musca vicina Macquart		Egypt	25	27
HYMENOPTERA				
Formicidae				
Monomorium pharaonis (L.)	Pharaoh's ant	Britain	33	27
Braconidae				
Bracon hebetor Say		America	31	25

Stock Lists

ORDER Family (-subfamily) Genus (sub genus), species.	COMMON NAME	COUNTRY OF ORIGIN OF STOCK	CULTURE MEDIUM	REARING TEMPERATURE °C
LEPIDOPTERA				
Pyralidae - Pyralinae				
Pyralis farinalis (L.)	Meal Moth		5	25
Pyralidae - Phycitinae				
Ephestia (Anagasta) Kuehniella (Zell.)	Mediterranean flour moth	Britain Britain	8a 8a	25 25
Ephestia (Cadra) cautella (Walk.)	Tropical warehouse moth	(S. Africa)	8a	25
Ephestia (Ephestia) elutella (Hubn.)	Warehouse moth	Britain	8a	25
Ephestia (Cadra) calidella (Guen.)		Cyprus	34a	30
Ephestia (Cadra) figulilella Gregs.		Cyprus	34a	30
Plodia interpunctella (Hubn.)	Indian meal moth	Britain	8a	25
Pyralidae - Galleriae				
Achroia grisella (F.)	Lesser wax moth		16a	25
Galleria mellonella (L.)	Honeycomb moth		16a	25
Paralipsa gularis (Zell.)			26	25
Gelechiidae				
Sitotroga cerealella (Oliv.)	Angoumois grain moth		1	25
Tineidae				
Tinea columberiella Wocke	Case bearing clothes moth		20	25
Tinea flavescentella Haworth		Britain	20	25
Tineola bisselliella (Humm.)	Common clothes moth		20	25
Tenea Pellionella (L.)			20	25
COLEOPTERA				
Anobiidae				
Lasioderma serricorne (F.)	Cigarette beetle		6	25
Stegobium paniceum (L.)	Biscuit beetle		6	25
Antribidae				
Araecerus fasciculatus (Deg.)			39	25

Stock Lists

ORDER Family (-subfamily) Genus (sub genus), species.	COMMON NAME	COUNTRY OF ORIGIN OF STOCK	CULTURE MEDIUM	REARING TEMPERATURE °C
Bostrichidae				
Rhyzopertha dominica (F.)	Lesser grain borer		1	30
Bruchidae				
Acanthoscelides obtectus (Say)	Dried Bean beetle	W. Africa	27	30
Callosobruchus analis (F.)			29	30
Callosobruchus chinensis (L.)	Cowpea weevil		29	25
Callosobruchus chinensis (Strain 'A')				
Callosobruchus maculatus (F.)		Sierra Leone	29	30
Callosobruchus rhodesianus (Pic)			29	30
Caryedon serratus (Oliv.) (=gonagra (F.))	Groundnut seed beetle		26a	30
Zabrotes subfasciatus (Boh.)			28	30
Cerylonidae				
Murmidius ovalis (Beck)		Ceylon	13	25
Cleridae				
Necrobia rufipes (Deg.)	Copra beetle		22	30
Necrobia ruficollis (F.)			40	25
Cucujidae				
Cryptolestes capenis (Waltl)			10	25
Cryptolestes ferrugineus (Steph.)	Rust-red grain beetle		10	30
Cryptolestes pusilloides (Steel & Howe)		(Canada)	10	25
Cryptolestes pusillus (Schon.)	Flat grain beetle		10	25
Cryptolestes turcicus (Grouv.)			10	25
Cryptolestes ugandae (Steel & Howe)		(E. Africa)	10	25
Curculionidae				
Sitophilus granarius (L.)	Grain weevil	(Russia)	1	25
Sitophilus oryzae (L.)	Rice weevil	Britain	1	25
Sitophilus zeamais Motsch.	Maize weevil		1	25
Dermestidae				
Anthrenocerus australis (Hope)	Australian carpet beetle	(Britain)	20	25

Stock Lists

Anthrenus (Anthrenus) flavipes LeC. (=vorax Waterh.)	Furniture carpet beetle		20	30
Anthrenus (Nathrenus) verbasci (L.)	Varied carpet beetle	Britain	20	20
Anthrenus (Anthrenodes) sarnicus Mroczkowski			35	20
Anthrenus (Florilinus) olgae Kalik			20	20
Attagenus sp? (alfieri of Hinton 1945)		Kenya	17	25
Attagenus fasciatus (Thunberg) (=gloriosae (Fabrioius)		Botswana	18	25
Attagenus unicolor Brahm (=megatoma (F.) & piceus (Ol.) nec. Thb.)	Black carpet beetle		20	30
Attagenus pellio (L.)	Fur beetle	Britain	20	20
Dermestes ater Deg.	Black larder beetle	Britain	21a	25
Dermestes frischii Kug.	Hide beetle	(Nigeria)	21a	25
Dermestes haemorrhoidalis Kuster		Britain	21a	25
Dermestes lardarius L.	Bacon beetle	Britain	21a	25
Dermestes maculatus Deg.	Leather beetle		21a	25
Dermestes peruvianus Castelnau		Britain	21a	25
Trogoderma anthrenoides (Sharp)		U.S.A.	2	30
Trogoderma glabrum (Herbst)		U.S.A.	2	30
Trogoderma granarium Everts	Khapra beetle	(Britain)	2	30
Trogoderma grassmanii Beal		U.S.A.	18	30
Trogoderma inclusum LeC.	Larger cabinet beetle		10	25
Trogoderma irroratum Reitt.		Egypt	2	30
Trogoderma variabile Ballion (=parabile Beal)		U.S.A.	2	30
Trogoderma simplex Jayne		U.S.A.	18	30
Trogoderma sternale plagifer Casey		New Mexico	32	30
Mycetophagidae				
Typhaea stercorea (L.)	Hairy grain beetle	Nigeria	4	25
Nitidulidae				
Carpophilus dimidiatus (F.)	Corn-sap beetle		14	25
Carpophilus hemipterus (L.)	Dried fruit beetle		15	25
Carpophilus marginellus			23a	25
Trogossitidae				
Lophocateres pusillus (Klug.)	Siamese grain beetle		11	30
Tenebroides mauritanicus (L.)	The Cadelle	Pakistan	12	30
Ptinidae				
Gibbium psylloides (Czemp)	Hump spider beetle	Britain	17a	20
Mezium affine Boield.		Britain	17a	20
Mezium americanum Lap.	American spider beetle		17a	20
Niptus hololeucus (Fald.)	Golden spider beetle	Britain	17a	20
Pseudeurostus hilleri (Reitt.)		Britain	17a	20
Ptinus clavipes Panz.	Brown spider beetle	Britain	17a	20
Ptinus pusillus Sturm.			17a	20
Ptinus sexpunctatus Panz.			17a	20

Coleoptera (Contd)

Ptinidae				
Ptinus tectus Boield	Australian spider beetle		19a	25
Stethomezium squamosum Hint.	African spider beetle	Britain	17a	20
Tipnus unicolor (P. & M.)		Kenya	17a	20
Trigonogenius globulus Sol.	Globular spider beetle	Ireland	17a	20
Trigonogenius particularis Pic		Kenya	18a	25
Silvanidae				
Ahasveras advena (Waltl)	Foreign grain beetle	(West Africa)	10	25
Cathartus quadricollis (Guer.)	Square-necked grain beetle	W. Africa	10	25
Oryzaephilus mercator (Fauv.)	Merchant grain beetle		10	25
Oryzaephilus surinamemsis	Saw-toothed grain beetle		10	25
Tenebrionidae				
Alphitobius diaperinus (Panz.)	Lesser mealworm		7	25
Alphitobius laeviagatus (F.)	Black fungus beetle		7	25
Alphitobius viator Muls. & God.		Sierra Leone	7	25
Alphitophagus bifasciatus (Say)	Two-banded fungus beetle	Britain	5	25
Gnathocerus cornutus (F.)	Broad-horned flour beetle		17	25
Gnathocerus maxillosus (F.)	Slender horned flour beetle		6	25
Latheticus oryzae Waterh.	Long headed flour beetle		6	30
Palorus laesicollis (Fairm.)		Kenya	24	25
Palorus ratzeburgii (Wissm.)	Small-eyed flour beetle		6	25
Palorus subdepressus (Woll.)	Depressed flour beetle	Turkey	7	25
Tenebrio molitor L.	Yellow mealworm		10a	25
Tenebrio obscurus F.	Dark mealworm		10a	25
Tribolium anaphe Hint.		Nigeria	17	25
Tribolium brevicornis LeC.		U.S.A.	23	25
Tribolium castaneum (Herbst)	Rust-red flour beetle	Britain	23	25
Tribolium confusum Duv.	Confused flour beetle		23	25
Tribolium destructor Uytt.	Dark flour beetle	(Holland)	17	25
Tribolium madens (Charp.)	Black Flour beetle	(Yugoslavia)	17	25
Languriidae				
Pharaxonotha kirschi (Reitt.)			6a	25

The letter "a" after a number indicates that drinking water is added to the culture either in the form of damp blotting paper or as a corked tube of water containing a wick of blotting paper.

Stock Lists

CULTURE MEDIA

No.	Food	Weight Ratio (Ounces)
1.	Wheat	
2.	Wheat + wheatfeed	7:3
3.	Wheat + wheatfeed + glycerol	7:3:1
4.	Wheat + wheatfeed + glycerol on a damp pad of cotton wool	7:3:1
5.	Wheat + wheatfeed on a damp pad	7:3:1
6.	Wheatfeed + yeast	10:1
7.	Wheatfeed + yeast on a damp pad	10:1
8.	Wheatfeed + yeast + glycerol	10:1:3
9.	Wheatfeed + yeast + glyc rol on a damp pad	10:1:3
10.	Wheatfeed + rolled oats + yeast	5:5:1
11.	Wheatfeed + rolled oats + yeast + groundnuts	5:5:1:1
12.	Wheatfeed + rolled oats + yeast + groundnuts + cork	5:5:1:1
13.	Wheatfeed + rolled oats on a damp pad	2:1
14.	Rolled oats + yeast	10:1
15.	Rolled oats + yeast + dates	6:1:6
16.	Wheatfeed + rolled oats + yeast + glycerine + honey + brood comb	5:5:1:2:2:2
17.	Wheatfeed + fishmeal + yeast	8:4:1
18.	Wheatfeed + rolled oats + fishmeal + yeast	5:5:2:1
19.	Fishmeal + yeast	16:1
20.	Fishmeal + yeast + flannel	16:1
21.	Fishmeal + yeast + bacon ends	16:1
22.	Fishmeal + yeast + bacon ends + cheese	16:1
23.	Wholemeal flour + yeast	12:1
24.	Wheatfeed + rolled oats + flour + yeast	3:3:3:1
25.	Wheatfeed + grassmeal + yeast + shortex	20:10:1:2
26.	Groundnuts	
27.	Haricot beans	
28.	Butter beans	
29.	Cowpeas + dried green peas	1:1
30.	Liver + sugar and water	
31.	Moth culture (Sub-family Phycitinae)	
32.	Fishmeal + Yeast + dried cockroaches	
33.	Liver, swiss roll and honey	
34.	Wheatfeed + glucose + yeast	5:2:1
35.	Wheatfeed + fishmeal + yeast + cholesterol	8:8:1:1
36.	Crushed dog biscuit + yeast	20:1
37.	Bread and butter	
38.	Sweet biscuits	
39.	Maize	
40.	Wood sawdust + bones	

Stock Lists

I. Resistant strains

A. Tribolium castaneum (Tenebrionidae)

1.	DDT resistant	South Africa, 1960
2.	Non-specific resistant	Australia, 1968
3.	Lindane specific resistant	Zambia, 1970
4.	Malathion specific resistant	Nigeria, 1963
5.	Insecticide susceptible	Unknown, 1970

II. Mutants

A. Ahasveras advena (Silvanidae)

1.	black (b)	Soulbury, UK, 1960

B. Callosobruchus maculatus (Bruchidae)

1.	giant	India, 1964

C. Carpophilus dimidiatus (Nitidulidae)

1.	pearl (p)	(from Lab stock of unrecorded origin) 1960

D. Cryptolestes pusillus (Cucujidae)

1.	black (b)	Trinidad, 1960

E. Dermestes maculatus (Dermestidae)

1.	dented pronotum	1965
2.	light wing (l)	Australia, 1964
3.	dark antennae	India, 1964
4.	pearl (p)	(from Lab stock of unrecorded origin) 1960
5.	pink	(from Lab stock of unrecorded origin) 1964
6.	rufous (ru)	Kenya, 1964
7.	rufous (ru)	India, 1964
8.	white tip	Sudan, 1965
9.	fuscous (fu)	Australia, 1964
10.	3y chromosomes	India, 1963

F. Oryzaephilus surinamensis (Silvanidae)

1.	pearl (p)	Australia, 1961
2.	small	Burma, 1964

G. Rhyzopertha dominica (Bostrichidae)

1.	black (b)	(from Lab stock of unrecorded origin) 1964

H. Tribolium castaneum (Tenebrionidae)

Linkage Group I

1.	pygmy, paddle (py, pd)	Sokoloff, 1962

Linkage Group II

2.	pearl (p^m)	Malta, 1959

Linkage Group III

3.	melanotic stink glands (msg)	Sokoloff, 1966
4.	black (b)	Sokoloff, 1962
5.	tawny (b^t)	Australia, 1961

Linkage Group IV
6. sooty (s) — Sokoloff, 1962
7. cut prothorax (ct) — Bell, 1966
8. mahogany (my) — St. Andrews, Scotland, 1965

Linkage Group V
9. maroon (m) — Bell, 1966
10. jet (j) — Sokoloff, 1965
11. microcephalic (mc) — Sokoloff, 1962
12. jet (j^k) — Kingston, Jamaica, 1965

Linkage Group VI — Sokoloff, 1965
13. Microphthalmic (Mo)

Lingage Group VII
14. short antenna (sa) — Sokoloff, 1962
15. chestnut (c) — Sokoloff, 1962

Linkage Group VIII
16. antennapedia (ap^D) — Sokoloff, 1964

Linkage Group X
17. abbreviated appendages (aa) — Sokoloff, 1966

Multichromosomal
18. p; b^t
19. b; c
20. s; p
21. j^k; m
22. mc; ap
23. Mo; i
24. aa; i

Unassigned
25. Long abdomen (la) — St. Andrews, Scotland, 1965
26. aurate (au) — Sokoloff, 1966
27. pectinate (pec) — Sokoloff, 1966
28. ruby (ru) — Sokoloff, 1966
29. ivory (i) — Bell, 1967
30. white (w) — Bell, 1967

I. Tribolium confusum (Tenebrionidae)
Linkage Group II
1. ebony-2, pearl (e^2, p) — UK, 1952, UK, 1959

Linkage Group III
2. Black (b^m) — Sokoloff, 1965

Linkage Group V
3. ebony (e) — Sokoloff, 1965

J. Trogoderma granarium (Dermestidae)
1. pearl (p) — UK, 1958

(Ed.)

Stock Lists

SLOUGH, BUCKS, U.K.
TROPICAL STORED PRODUCTS CENTRE, MINISTRY OF OVERSEAS DEVELOPMENT

I. Wild type strains

COLEOPTERA

Anobiidae

Lasioderma serricorne	Cyprus, 1964

Silvanidae

Oryzaephilus surinamensis	Crete, 1964
Oryzaephilus surinamensis	Cyprus, 1964
Oryzaephilus surinamensis (bicornis)	Crete, 1964
Oryzaephilus surinamensis (Small)	Far East, 1967

LEPIDOPTERA

Phycitidae

Cadra cautella	Cyprus, 1964
Cadra cautella	Rhodesia, 1965
Cadra figulilella	Cyprus, 1967
Plodia interpunctella	South Africa, 1965
Plodia interpunctella	N. Nigeria, 1965

(Ed.)

TOLWORTH, SURBITON, SURREY
MINISTRY OF AGRICULTURE, FISHERIES AND FOOD
INFESTATION CONTROL LABORATORY

Insects in Culture	Culture Medium	Rearing Temp. °C
DICTYOPTERA		
Blattidae		
Blatta orientalis (L.)	7 + 33	25.0
Blattella germanica (L.)	7 + 33	25.0
Blattella germanica (Resistant strain)	7 + 33	25.0
Periplaneta americana (L.)	7 + 33	25.0
Periplaneta australasiae (F.)	7 + 33	25.0
ORTHOPTERA		
Gryllidae		
Achroia domesticus (L.)	7 + 33	25.0

Stock Lists

Insects in Culture	Culture Medium	Rearing Temp. °C
LEPIDOPTERA		
Galleriidae		
Achroia grisella (F.)	31	R
Paralipsa gularis (Zell.)	32	R
Corcyra Cephalonica	18	25.0
Gallaria mellonella (L.)	31	R
Gelechiidae		
Sitotroga cerealella (Oliv.)	10	25.0
Phycitidae		
Ephestia kuhniella (Zell.)	1	R
Ephestia cautella (Walk.)	5	25.0
Ephestia elutella (Huebn.)	5	25.0
Plodia interpunctella (Huebn.)	5	25.0
Tineidae		
Tinea columbariella (Wocke)	25 + 29	25.0
Tinea pellionella (L.)	25 + 29	25.0
Tineola bisselliella (Hum.)	25 + 29	25.0
COLEOPTERA		
Anobiidae		
Lasioderma serricorne (F.)	3 + 19 + 24	25.0
Stegobium paniceum (L.)	3	25.0
Anthribidae		
Araecerus fasciculatus (Deg.)	10 + 11	25.0
Bostrichidae		
Rhyzopertha dominica (F.)	8	25.0
Bruchidae		
Acanthoscelides obtectus (Say.)	15	25.0
Callosobruchus analis (F.)	14	25.0
Callosobruchus chinensis (L.)	14	25.0
Callosobruchus chinensis (Strain 'A')	14	25.0
Callosobruchus maculatus (F.)	14	25.0
Callosobruchus rhodesianus (Pic.)		
Caryedon gonagra (F.)	22	25.0

Stock Lists

Insects in Culture	Culture Medium	Rearing Temp. °C
Cleridae		
Necrobia rufipes (Deg.)	21 + 24	25.0
Necrobia ruficollis (F.)	35 + 39	25.0
Cucjidae		
Cryptolestes ferrugineus (Steph.)	3 + 6	25.0
Cryptolestes pusilloides (Steel & Howe)	3 + 6	25.0
Cryptolestes pusillus (Schon.)	3 + 6	25.0
Cryptolestes turcicus (Grouv.)	3 + 6	25.0
Cryptolestes ugandae (Steel & Howe)	3 + 6	25.0
Curculionidae		
Sitophilus granarius (L.)	8	25.0
Sitophilus zea-mais (Motschulsky)	10	25.0
Sitophilus oryzae (L.)	8	25.0
Dermestidae		
Anthrenocerus australis (Hope)	25 + 29	25.0
Anthrenus verbasci (L.)	25 + 29	R
Anthrenus vorax (Waterh.)	25 + 29	25.0
Anthrenus fuscus (Oliv.)	25 + 29	R
Attagenus pellio (L.)	2 + 25	R
Attagenus piceus (Oliv.)	3 + 29 + 25	25.0
Attagenus alfierii (Pic.)	3 + 25	25.0
Dermestes ater (Deg.)	25	25.0
Dermestes frischii (Kug.)	25	25.0
Dermestes haemorrhoidalis (Kuster)	25	25.0
Dermestes lardarius (L.)	25	25.0
Dermestes maculatus (Deg.)	25	25.0
Dermestes peruvianus (Cast.)	25	25.0
Trogoderma glabrum (Herbst)	3	25.0
Trogoderma granarium (Everts)	13 + 24 + yeast	25.0
Trogoderma inclusum (Le Conte)	2	25.0
Trogoderma granarium (Egyptian Strain)	9 + 12	25.0
Trogoderma sternale (Casey)	28 + 32	25.0
Nitidulidae		
Carpophilus dimidiatus (F.)	16 + 24	25.0
Carpophilus hemipterus	6 + 27	25.0
Ostomatidae		
Lophocateres pusillus (Klug.)	2 + 6 + 33	25.0
Tenebriodes mauritanicus (L.)	6 + 10	

Stock Lists

Insects in Culture	Culture Medium	Rearing Temp. °C
Ptinidae		
Gibbium psylloides (Czemp.)	2	25.0
Mezium affine (Boield)	1	25.0
Mezium americanum (Laporte)	1	25.0
Niptus hololeucus (Fald.)	3 + 25 + 33	R
Ptinus clavipes (Panz)	3 + 25 + 33	R
Ptinus fur (L.)	3 + 25 + 33	R
Ptinus pusillus (Sturm)	1 + 33	UR & R
Ptinus sexpunctatus (Panz.)	3 + 25 + 33	25.0
Ptinus tectus (Boield.)	3 + 25 + 33	R
Stethomezium squamosum (Hinton)	3 + 33	25.0
Trigonogenius particularis (Pic.)	3	25.0
Silvanidae		
Ahasverus advena (Waltl)	3 + 21 + 33	25.0
Cathartus quadricollis (Guer.)	6	25.0
Oryzaephilus mercator (Fauv.)	16 + 24	25.0
Oryzaephilus surinamensis (L.)	6	25.0
Oryzaephilus surinamensis (small strain)	6	25.0
Tenebrionidae		
Alphitobius diaperinus (Panz.)	2 + 6 + 30	25.0
Alphitobius laevigatus (F.)	2 + 6 + 30	25.0
Alphitobius sp.	2 + 6 + 30	25.0
Gnathocerus cornutus (F.)	1	25.0
Gnathocerus maxillosus (F.)	3	25.0
Latheticus oryzae (Waterh.)	1	25.0
Palorus ratzeburgi (Wissm.)	1 + 6	25.0
Palorus subdepressus (Woll.)	2	25.0
Tenebrio obscurus (F.)	1 + 6 + 30	25.0
Tenebrio molitor (L.)	1 + 6 + 30	25.0
Tribolium anaphe (Hinton)	2 + 24 + 25	25.0
Tribolium castaneum (Herbst)	1	25.0
Tribolium confusum (J. du V.)	1	25.0
Tribolium destructor (Uyttenb.)	1	25.0
Tribolium madens (Charp.)	1	25.0
Languriidae		
Pharaxonotha kirschi (Reitt)	3 + 33	25.0

Culture Media
(Proportions by weight)

1. Whole-meal flour (20 pts.) and yeast (1 pt.)

2. Whole-meal flour (10 pts.), fine wheat feed (10 pts.) and yeast (1 pt.)
3. Fine wheat feed (20 pts.) and yeast (1 pt.)
4. Broad bran (dry)
5. Broad Bran (6 pts.) and glycerine (1 pt.)
6. Rolled oats (20 pts.) and yeast (1 pt.)
7. Crushed dog biscuit (20 pts.) and yeast (1 pt.)
8. Wheat
9. Crushed wheat
10. Maize
11. Maize (Kibbled)
12. Crushed Maize
13. Barley
14. Dried peas
15. Haricot beans
16. Dried fruit
17. Cocoa beans
18. Cocoa beans (crushed)
19. Locust beans (Kibbled)
20. Wood
21. Copra
22. Ground-nuts (undecorticated)
23. Decorticated ground-nuts
24. Ground-nuts (decorticated and crushed)
25. Fish meal (20 pts.) and yeast (1 pt.)
26. Bacon
27. Dried figs and yeast
28. Dried insects
29. Woolen cloth
30. Damp cotton-wool pad
31. Honeycomb
32. Sweet almonds
33. Water supply - an inverted beaker over a cotton-wool pad in a petridish, or a 3" x 1" tube of water fitted with a biological stopper or filter paper strip.
34. Grass seed
35. Wood sawdust
36. Bread and butter
37. Sweet biscuits
38. Senna pods
39. Bones

M. G. Lanbourne

INDIA

GORAKHPUR, U. P.
UNIVERSITY OF GORAKHPUR, DEPARTMENT OF ZOOLOGY

Wild type strain

1. Tribolium castaneum from local godowns.

(Ed.)

Stock Lists

HISSAR, HARAYANA
PUNJAB AGRICULTURAL UNIVERSITY, DEPARTMENT OF GENETICS

I. Wild type strains (Tribolium castaneum)

1.	IZT	I	
2.	MAD	I	
3.	PAU	I	
4.	PAU	II	
5.	Chicago wild		via Sokoloff, Berkeley
6.	Brazil		via Sokoloff, Berkeley
7.	Inbred lines in 8th. generation of full sibbing.		

II. Mutant strains (Tribolium castaneum)

S-8	Py	via Sokoloff, Berkeley
S-12	P	via Sokoloff, Berkeley
S-20	Me	via Sokoloff, Berkeley
S-24	Squint	via Sokoloff, Berkeley
S-26	sa	via Sokoloff, Berkeley
S-28	mc	via Sokoloff, Berkeley
S-35	py r	via Sokoloff, Berkeley
S-53	jet	via Sokoloff, Berkeley
S-71	sa	via Sokoloff, Berkeley
S-74	ju	via Sokoloff, Berkeley
S-81	Bes	via Sokoloff, Berkeley
S-90	Py r M^r	via Sokoloff, Berkeley
S-100	b Mo	via Sokoloff, Berkeley
S-154	Be Fta	via Sokoloff, Berkeley
S-248	Fta c ca	via Sokoloff, Berkeley
S-253	lod p	via Sokoloff, Berkeley
S-304	Msg	via Sokoloff, Berkeley
S-313	ser py r	via Sokoloff, Berkeley
S-325	Fta	via Sokoloff, Berkeley
S-333	Spa	via Sokoloff, Berkeley
S-341	r	via Sokoloff, Berkeley
S-346	Fas-3	via Sokoloff, Berkeley
S-483	pd	via Sokoloff, Berkeley

(Ed.)

BAHADU SHAH TAFAR MARJ, NEW DELHI-1
MAULANA AZAD MEDICAL COLLEGE, DEPARTMENT OF BIOCHEMISTRY

T. castaneum

Wild strain of local origin (Ed.)

Stock Lists

JABALPUR, MADHYA PRADESH
J.N. AGRICULTURAL UNIVERSITY
COLLEGE OF VETERINARY SCIENCE & A.H.
DEPARTMENT OF ANIMAL BREEDING & GENETICS

1. Random Stocks: R-1, R-2, R-3, R-4, R-5, R-6, R-7, R-8, R-9, R-10, PAU-1 (HSR-Wild).

2. Inbred Lines: I-1, I-2, I-3, I-4, I-5, I-6, I-7, I-8, I-9, I-10.

These stocks have been inbred for 19 generations.

3. Mutant stocks: S-1 Chi-wild
S-8 py
S-10 p
S-12 Chi b/b, Chi +/b, Chi +/+
S-53 jet
S-100 b Mo
S-248 Fta c Ca
S-304 msg
S-313 ser py r
S-333 Spa
S-341 r

HSR-Black

ISRAEL

TEL AVIV, ISRAEL
TEL AVIV UNIVERSITY, DEPARTMENT OF ZOOLOGY

I. Wild type strains

Tribolium castaneum
++ (Purdue) strain

Tribolium confusum
++ (Chicago) strain

Both obtained from Dr. Robert R. Sokal's laboratory, Stony Brook, N. Y., U.S.A.

II. Mutant strains

Tribolium castaneum
1. Black (bb)
2. Pearl (P)
3. Sooty (ss)

Tribolium confusum
1. (McGill) Black (bb)

All mutants obtained from Dr. Robert R. Sokal's laboratory, Stony Brook, N. Y., U.S.A.

Stock Lists

ITALY

PAVIA
UNIVERSITY PAVIA, CENTRO DE GENETICA

1. Tribolium confusum Duval, wild strain obtained from Professor A. Kock, Biological Institut, Regensburg.

2. id. id., strain of recent colonization from speciments collected in Pavia; small, difficult colony.

(Ed.)

JAPAN

KYOTO
KYOTO UNIVERSITY, FACULTY OF AGRICULTURE

Bruchidae

Callosobruchus chinensis	Kyoto and many other districts in Japan
	Iran
	Thailand
Gallosobruchus maculatus	Louisiana, U.S.A.
	California, U.S.A.
	Fresno Lab., U.S.D.A.
	Burma
	Israel
	Thailand
	Malaya
Zabrotes bifasciatus	Hong Kong

Curculionidae

Sitophilus zeamais	Kyoto
Sitophilus oryzae	Kyoto

Tenebrionidae

Tribolium castaneum	Kyoto

(Ed.)

MIYAZAKI
MIYAZAKI UNIVERSITY, DEPARTMENT OF BIOLOGY

Alphitobius diaperinus--wild type strains
Callosobruchus shinensis--Kyoto strains
Martianus dermestoides--wild type strains
Palorus ratzeburgi--wild type strains
Sitophilus oryzae--wild type strains
Sitophilus zeamais--wild type strains
Tenebrio obscurus--wild type strains
Tribolium castaneum--wild type strains
Tribolium confusum--wild type strains

(Ed.)

Stock Lists

MISIMA, SIZUOKA-KEN
NATIONAL INSTITUTE OF GENETICS

No stock list available (Ed.)

MEXICO

CHAMPINGO
CAMPO EXPERIMENTAL "EL HORNO"

Tribolium castaneum
Tribolium confusum

Both cultures have long been maintained in our rearing chambers. Their source is unknown.

(Ed.)

NEW ZEALAND

NELSON
DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH
ENTOMOLOGY DIVISION

Stegobium paniceum--from infested rat food pellets at Otago University Dunedin
Oryzaephilus surinamensis--from infested rat food pellets at Otago University, Dunedin.
Gnathocerus cornutus--from infested rat food pellets at Otago University, Dunedin
Sitophilus oryzae--from spaghetti in galleys of overseas ships at Port Nelson
Sitophilus zeamais--from rice in galleys of overseas ships at Port Nelson

(Ed.)

PRIVATE BAG, HAMILTON
RUAKURA AGRICULTURAL RESEARCH CENTRE, DEPARTMENT OF AGRICULTURE

Tribolium castaneum

1. Wild type strains derived from imported strain from Edinburgh.
2. Mutant strain carrying the chromosome II mutant pearl (p) and obtained from Tribolium Stock Center, Berkeley, California.

A. R. Quartermain

Stock Lists

PRIVATE BAG, PALMERSTON NORTH
DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH
GRASSLANDS DIVISION

Tribolium castaneum

1. Heavy and light population resulting from 18 generations of selection for increased and decreased pupal weight.

2. Strong, moderate and weak populations resulting from 20 generations of within-familiy selection for increased pupal weight at three selection intensities.

(Ed.)

PORTUGAL

LISBON
LABORATORIO DA DEFESA FITOSSANITARIA DOS PRODUTOS ARMAZENADOS
MINISTERIO DA ECONOMIA

The laboratory maintains the following cultures in the breeding room at 25° - 27° C and 65 - 70% R. H. The origin of the culture, the year of commencement and the culture media are given for each insect species.

Acanthoscelides obtectus (Say)--white bean	Coimbra, 1968
Anagasta kuhniella (Zell.)--bran and glycerine	Carcavelos, 1968
Cadra cautella (Walk.)--decorticated almonds	Algarve, Portugal, 1969
Callosobruchus maculatus (F.)--California black eye	Alcobaca, 1968
Gnathocerus cornutus (F.)--whole-meal flour and yeast	Portugal, 1969
Lasioderma serricorne (F.)--bran and dried yeast	Lisboa, 1964
Oryzaephilus surinamensis (L.)--broken wheat	Portugal, 1960
Plodia interpunctella (Hubn.)--bran and glycerine	Carcavelos, 1968
Rhyzopertha dominica (F.)--wheat	S. Tomé, W. Africa, 1969
Sitophilus granarius (L.)--wheat	Portugal, 1969
Sitophilus oryzae (L.)--wheat	Portugal, 1969
Sitotroga cerealella (Oliv.)--barley	Portugal, 1968
Tenebroides mauritanicus (L.)--broken maize, bran and dried yeast	Portugal, 1967
Tribolium casteneum (Herbst)--flour	Bissau (Guiné), 1957
Zabrotes subfasciatus--white bean	Lisboa, 1968

(Ed.)

Stock Lists

SPAIN

MADRID
INSTITUTO NACIONAL DE INVESTIGACIONES AGRONOMICAS
LABORATORIO DE GENETICA DE POBLACIONES

Tribolium castaneum

A. Wild type strains

1.	Consejo	CSIC, Madrid, Spain, 1964
2.	Purdue	Purdue, USA, 1964
3.	Edinburgh 1	Edinburgh, Scotland, 1970
4.	Edinburgh 2	Edinburgh, Scotland, 1970

B. Mutant type strains

5.	Black Purdue	Purdue, USA, 1964

C. Experimental lines

Originated from the "Consejo" strain and selected for egg laying performance through 35 generations.

		Selected for		Temperature
6.	AN - 1	high performance	at	33° C
7.	AN - II	high performance	at	33° C
8.	AF - I	high performance	at	28° C
9.	AF - II	high performance	at	28° C
10.	AT - 1	high performance	at	38° C
11.	AT - II	high performance	at	38° C
12.	BN - I	low performance	at	33° C
13.	BN - II	low performance	at	33° C
14.	BF - I	low performance	at	28° C
15.	BF - II	low performance	at	28° C
16.	BT - I	low performance	at	38° C
17.	BT - II	low performance	at	38° C
18.	RN - I*	high cross performance	at	33° C
19.	SN - I*	high cross performance	at	33° C
20.	RN - II	high cross performance	at	33° C
21.	SN - II	high cross performance	at	33° C
22.	RF - I	high cross performance	at	28° C
23.	SF - I	high cross performance	at	28° C
24.	RF - II	high cross performance	at	28° C
25.	SF - II	high cross performance	at	28° C
26.	RT - I	high cross performance	at	38° C
27.	ST - I	high cross performance	at	38° C
28.	RT - II	high cross performance	at	38° C
29.	ST - II	high cross performance	at	38° C

* R & S corresponding lines were selected through a reciprocal recurrent selection.

Stock Lists

30 - 62. Inbred lines with 15 generations of full sibbing.

D. Mutants

		Source and date
63.	antennapedia ap, VIII	Purdue 1964 and Sokoloff 1968
64.	Bar eye Be, IV	Purdue 1968
65.	black b, III	Sokoloff 1964
66.	chicago black cb, III	Sokoloff 1968
67.	chesnut c, VII	Purdue 1964
68.	cordoban cd, III	Purdue 1964
69.	Diferencial Df, IV	Purdue 1964
70.	fused antennal segm.-2 fas-2, IV	Sokoloff 1968
71.	ivory i, ?	Purdue 1964
72.	jet j, V	Purdue 1964 and Sokoloff 1968
73.	juvenile urogomphi ju, IV	Purdue 1968
74.	light ocular diaph. lod, III	Purdue 1968
75.	maroon m, V	Purdue 1964
76.	microcephalic mc, V	Purdue 1964
77.	Microphthalmic Mo, VI	Sokoloff 1968
78.	miniature appendaged D. ma^D	Purdue 1968
79.	paddle pd, I	Purdue 1964 and Sokoloff 1968
80.	pearl p, II	Purdue 1964 and Sokoloff 1968
81.	pegleg pg, II	Purdue 1968
82.	pink p^{pk}, II	Purdue 1968
83.	pygmy py, I	Purdue 1964 and Sokoloff 1968
84.	red r, I	Purdue 1964
85.	ring rg, I	Purdue 1964
86.	rose rs, I	Purdue 1964
87.	ruby rb, ?	Purdue 1964
88.	Short antenna Sa, VII	Purdue 1964
89.	short elytra sh, VIII	Purdue 1964
90.	sooty s, IV	Purdue 1964
91.	spotted sp, I	Purdue 1964
92.	squint sq, VIII	Purdue 1964
93.	white w, ?	Purdue 1964
94.	wine r^w, I	Purdue 1968
95.	Eye mutant, ?	Madrid 1967
96.	Elytra mutant, ?	Madrid 1967
97.	Melanotic stink gland-like ?	Madrid 1968

Tribolium confusum

A. Mutants

98.	black b, III	Sokoloff 1968
99.	blistered elytra ble, V	Sokoloff 1968
100.	creased abdominal sterntes cas, II	Sokoloff 1968
101.	ebony e, V	Sokoloff 1968
102.	ebony-2 e_2, II	Sokoloff 1968
103.	red r, I	Sokoloff 1968
104.	ruby spot rus, III	Sokoloff 1968

F. Orozco

Stock Lists

YUGOSLAVIA

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INSTITUTE FOR PLANT PROTECTION
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I. Wild type strain

LEPIDOPTERA

Gelechiidae
Sitotroga cerealella (Oliv.)

Phycitidae
Anagasta kuhniella Zell.

COLEOPTERA

Bostrichidae
Rhizopertha dominica (F.)

Bruchidae
Acanthoscelides obtectus (Say)

Cucujidae
Cryptolestes spp. (Species not yet identified, but ferrugineus and pusillus are present)

Curculionidae
Sitophilus zeamais Motsch.
Sitophilus oryzae (L.)
Sitophilus granarius (L.)

Dermestidae
Attagenus megatoma (F.)
Attagenus piceus (Oliv.)
Trogoderma granarium Everts

Ostomatidae
Tenebrioides mauritanicus (L.)

Ptinidae
Mezium spp. (species not yet identified)

Silvanidae
Oryzaephilus surinamensis (L.)
Oryzaephilus surinamensis (L.) v. bicornis
Oryzaephilus mercator (Fauv.)

Tenebrionidae
Gnathocerus cornutus (F.)
Palorus spp. (species not yet identified but ratzeburgi and subdepressus are present)
Tenebrio molitor L.
Tribolium castaneum (Herbst)
Tribolium confusum Duv.

Stock Lists

All insects are originated from storehouses and mills from Croatia, Yugoslavia. They are reared in a lab under constant circumstances during 3-4 years. Only species Trogoderma granarium is of unknown origin, collected from imported foodstuffs. This species is not found in Yugoslavia yet.

II. Mutants

Tribolium confusum

Chromosome III

Yugoslavian black (=b^z)--Yugoslavia 1969 (report of A. Sokoloff, TIB 13)

Zlatko Korunić

NEW MUTANTS

Dermestes maculatus (Dermestidae)

REPORT OF C. E. DYTE AND T. BINNS

1. platinum (pla) The head, pronotum, and elytra are dark brown and covered with a very dense growth of platinum coloured hair. Penetrance is good. Mode of inheritance not yet established.

2. copper (co) The head, pronotum, and elytra are dark brown and covered with a dense growth of reddish-brown hair. Penetrance is complete. Mode of inheritance not yet established.

3. ridged elytra (re)
A horizontal ridge is present where the dorsal surface of the elytra meet the thorax. The expression varies from a complete prominent ridge to an intermittent barely perceptible ridge. Mode of inheritance not yet established.

NOTES - RESEARCH

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Survey of Continental storage conditions in Portugal and storage conditions in the Portuguese islands (Madeira and Azores)

A. Survey of Continental storage conditions in Portugal

The survey of continental conditions of storage in Portugal effected from 1958 to 1963 was done in the principal types of storage entities on every district of the continent.

Six-hundred and seventy-three (673) warehouses have been visited according to previously collected samples which were distributed by the referred entities in the following way:

1.1 - 170 granaries from "Federação Nacional dos Produtores de Trigo" (National Federation of Wheat Producers) - Corporative Organization to the industry of the wheat produced or imported, and sometimes bread cereals, especially corn and rye.

1.2 - 19 rice granaries from "Comissão Reguladora do Comercio do Arroz" (Rice Trade Committee) and "Grémio de Industriais de Arroz" (Rice Industrials Syndicate) - (Corporative Organization (other then their specific functions) have special warehouses for storage of paddy from small and medium producers.

1.3 - 16 factories of milling rice. Industrial entity that besides the factory section owns warehouses for paddy directly received from the great producers as well as installations for the milled rice and subproducts.

1.4 - 41 mills producing sifted corn and wheat flour (Industrials of great and medium cereals importance). They use those bread cereals which they transform into sift flours ready for bread making or for macaroni industry. Besides the raw materials "cereals" they store sifted flours and subproducts after sifting.

1.5 - 125 mills of whole wheat, corn, and rye flours. Small traders which serve principally rural centers produce whole meal flour that is used for homemade bread -- the cereals which are traditionally consumed in farms and in small villages. They store the so called cereals and respective whole flours.

1.6 - 150 farmers and agricultural cooperatives have warehouses of different sizes and importance according to their locations in the South. There prevails the large propriety belonging to big or medium farmers or in the North where because of irrigation problems and divided propriety are found only small farmers. They store all the available different goods produced as well as the reserves for sowing and goods spent on the farm with the exception of the wheat which has to be delivered to the "National Federation of Wheat Producers". Besides the cereals and vegetables more characteristic of the countries where the stores are placed, they also keep a great variety of various flours or seeds for

pasturages and forests.

1.7 - 43 cereals and leguminous warehouses. Intermediary entity in the commercialization of cereals and legume having in store all these products, saving wheat and rice and sometimes flour for cattle, all kinds of wood tree seeds, vegetables, and forages.

1.8 - 57 grocers' warehouses. The warehouses of this sort have in store all sorts of food which later on are sold in the shops. Generally there are not separate installations for each product, but sometimes they keep in the same room cereals, vegetables, rice, and pastes. In this sort of a warehouse there are usually food provisions and domestic articles in the same installation.

1.9 - 18 factories of forage. Here cereals and other vegetable products are transformed into flour more or less concentrate for animals' forage.
Besides these places are the machinery works and there are warehouses for raw material and others for manufacturing products. Frequently they store also all sorts of cereals, vegetables, oleaginous seeds, residues of food industries, and flours made of fish meat and blood.

1.10 - 16 flour warehouses. Entity which stores and distributes sifted wheat flour to the bread making industrials. Therefore they store only this product.

1.11 - 9 flour packing. Entity specialized in packing selected flours for cooking and baking.
Table I shows the occurrences of Tribolium castaneum and Tribolium confusum in the different types of storages (considering besides the contamination of the product also the collected species inside of warehouses namely on the walls, floors, machines, and residues). And Table II shows the occurrences of the same species collected in the samples of the products collected in the warehouses of various entities.

B. Survey of storage conditions in the Portuguese islands (Madeira and Azores)

The survey of storage conditions in the islands of Azores and Madeira effected in June and August of 1966 was different from the one realized on the continent. So, it was decided not to adopt the same criterion of the continent like the survey of every district because in most of them there was not any storage organization important enough to justify that criterion.

Firstly, it was planned that the division of work be separately divided between the two archipelagos of Madeira and Azores, choosing the islands with greater population and more developed agriculture, therefore having a greater volume and variety of goods in store. However, we maintained the same criterion in the selection of samples for the warehouses with a great number of unities in the country.

The types of entities in storage organization on the two archipelagos

are different from those mentioned for the continent. This happens not only because there are new entities and products, but as well as some of the products already referred are here coordinated and regulated by different entities.

The entities and warehouses visited in each archipelago were the following:

2.1 - AZORES

2.1.1 - 11 farmers (7 in S. Miguel, 2 in Terceira, 1 in S. Jorge and 1 in Faial)

2.1.2 - 18 granaries of Azores Archipelago Cereal Regulating Committee (with similar functions of F.N.P.T. of the continent, with 8 warehouses in S. Miguel, 5 in Terceira 2 in S. Jorge and 3 in Faial).

2.1.3 - 8 warehouses-cereals as well as grocers (3 in S. Miguel, 2 in Terceira, 2 in Faial, and 1 in Flores).

2.1.4 - 2 husbandry societies with storage of products to provide the farmer members of the syndicate namely seeds, flours, "Tourteaux", forages, etc. (1 in S. Miguel and 1 in Faial).

2.1.5 - 8 wholemeal flour mills (3 in S. Miguel, 1 in Terceira, 1 in S. Jorge, 1 in Faial and 2 in Pico).

2.1.6 - 3 white flour mills (1 in each capital of the district).

2.1.7 - 1 factory of macaroni and other pastes with storage of wheat flour (S. Miguel).

2.1.8 - 1 malt and beer factory with storage of malt (barley) and hops (Ponta Delgada in S. Miguel).

2.1.9 - 1 forage factory (in S. Miguel).

2.1.10 - 2 tea factories with storage of tea leaves in different stages of elaboration (S. Miguel).

2.1.11 - 2 tobacco factories with storage of tobacco leaves from regional and exotic production, as well as the product already manufactured (1 in Ponta Delgada - in S. Miguel, another in Angra de Heroismo - Terceira).

2.1.12 - 3 factories of fishing products - having besides the factory section warehouses with fish flours for the manufacturing of forage flours and granulates, they also have the preparation of organic fertilizers and guanos (S. Miguel, Terceira, Faial).

2.1.13 - 2 leather tan factories store furs and leather in different stages of tanning (S. Miguel, Terceira).

NOTES - RESEARCH

2.2 - MADEIRA

2.2.1 - 5 farmers (2 in Madeira, 3 in Porto Santo).

2.2.2 - 7 cereals and grocers' warehouses. One of those was also the owner of a white flour mill which receives and deals with all the wheat consumed in the Archipelago (5 in Madeira, 1 in Porto Santo).

2.2.3 - 1 agricultural cooperative with grinding of cereals (Madeira).

2.2.4 - 3 white flour mills (Madeira).

2.2.5 - 1 macaroni and other pastes factory (Madeira).

2.2.6 - 1 malt and beer factory (Madeira).

2.2.7 - 1 forage factory (Madeira).

2.2.8 - 1 tobacco factory (Madeira)

2.2.9 - 3 factories of fishing products (2 in Madeira, 1 in Porto Santo).

2.2.10 - 2 tanning factories (Madeira).

Similar yet, what was presented for the Portguese continent, Table III, refers the occurrences of Tribolium castaneum and Tribolium confusum in different types of storage entities. Besides species found in contaminated products, collected species found in the different warehouses were also considered (both archipelagos were considered).

Table IV refers the occurrences of the same species in the samples of products collected in the warehouses of the various entities considering together the archipelagos of Azores and Madeira.

Table I

FREQUENCY OF OCCURRENCES FROM TRIBOLIUM SPP. IN THE WAREHOUSES VISITED DURING THE SURVEY OF THE PORTUGUESE CONTINENT

TRIBOLIUM CASTANEUM				TRIBOLIUM CONFUSUM			
Types of entities	# of warehouse visited	# of occurrences	% of occurrences	Types of entities	# of warehouse visited	# of occurrences	% of occurrences
Granaries from F.N.P.T.	179	10	5,5%	Granaries from F.N.P.T.	179	32	17,9%
Rice granaries	19	0	-	Rice granaries	19	0	-
Milling rice	16	7	43,8%	Milling rice	16	8	50,0%
White flour mills of wheat or maize	41	10	24,4%	White flour mills of wheat or maize	41	21	32,2%
Whole meal flour mills of wheat, maize or rye	125	23	18,4%	Whole meal flour mills of wheat, maize or rye	125	47	37,5%
Farmers and agricultural co-operatives	150	14	9,3%	Farmers and agricultural co-operatives	150	23	15,3%
Cereals and vegetables warehouses	43	7	16,3%	Cereals and vegetables warehouses	43	12	27,9%
Grocers'warehouses	57	7	12,3%	Grocers'warehouses	57	5	10,5%
Forage factories	18	9	50,0%	Forage factories	18	10	55,6%
Flour warehouses	16	1	6,3%	Flour warehouses	16	0	-
Packing of flour	9	0	-	Packing of flour	9	0	-
TOTAL	673	88	13,0%	TOTAL	673	159	23,5%

Table II

FREQUENCY OF TRIBOLIUM S.P. OCCURRENCES IN SAMPLES OF PRODUCTS DISTRIBUTED BY TYPES OF STORAGE ENTITIES VISITED DURING THE SURVEY OF PORTUGUESE CONTINENT

	Total	TRIBOLIUM CASTANEUM		TRIBOLIUM CONFUSUM	
	Number of Samples	Number of Infested Samples	% of Infested Samples	Number of Infested Samples	% of Infested Samples
WHEAT					
In granaries from F.N.P.T.	111	3	2,7%	16	14,4%
" White flour mills of wheat or corn	23	4	17,4%	5	21,7%
" whole meal flour mills of wheat corn or rye	24	1	4,2%	6	25,0%
" Farmers	31	-	-	2	6,5%
Grocers'warehouses	1	-	-	-	-
" Forage factories	1	-	-	1	-
TOTAL	191	8	4,2%	30	15,7%
GRAIN DUST					
In Granaries from F.N.P.T.	2	-	-	-	-
" Milling rice	6	-	-	-	-
" White flour mills of wheat or corn	19	1	5,3%	1	5,3%
" Whole meal flour mills of wheat corn or rye	17	4	27,0%	7	41,0%
" Farmers	3	-	-	-	-
" Cereals and vegetables warehouses	2	-	-	-	-
" Forage factories	4	-	33,3%	-	-
TOTAL	53	5	9,4%	8	15,0%
OAT					
In Farmers	22	2	9,0%	3	13,6%
" Cereals and leguminous warehouses	3	1	33,0%	1	33,0%
" Grocers warehouses	1	-	-	-	-
" Forage factories	4	3	75,0%	-	-
TOTAL	30	6	20,0%	4	13,3%
BARLEY					
In Granaries from F.N.P.T.	1	-	-	-	-
" Whole meal flour mills of wheat, maize or rye	2	-	-	-	-
" Farmers	19	1	5,2%	2	10,5%
" Cereals and leguminous warehouses	6	1	16,7%	1	17,7%
" Grocers warehouses	1	-	-	-	-
" Forage factories	3	1	33,3%	-	-
TOTAL	32	3	9,4%	3	9,4%
WHEAT FLOUR					
In Granaries from F.N.P.T.	1	-	-	-	-
" White flour mills of wheat or corn	17	-	-	-	-
" Whole meal flour mills of wheat, maize or rye	43	2	46,5%	2	46,5%
" Forage factories	1	-	-	-	-
TOTAL	62	2	3,2%	2	3,2%
MAIZE					
In granaries from F.N.P.T.	33	-	-	-	-
" White flour mills of wheat or maize	6	-	-	1	16,7%
" Wole meal flour mills of wheat, maize or rye	28	1	3,6%	-	-
" Farmers	49	1	2,2%	1	2,0%
Cereals and leguminous warehouses	11	-	-	-	-
" Grocers warehouses	2	-	-	-	-
" Forage factories	6	2	33,3%	-	33,3%
TOTAL	135	4	3,0%	2	1,5%

Table II continued

RYE					
In Granaries from F.N.P.T.	18	-	-	-	-
" Whole meal flour mills of wheat, maize or rye	32	1	3,0%	-	-
" Farmers	22	-	-	1	4,5%
" Cereals warehouses	7	-	-	-	-
" Grocers warehouses	1	-	-	-	-
TOTAL	80	1	1,2%	1	1,2%
PADDY					
In Rice Granaries	15	-	-	-	-
" Milling rice	9	1	11,0%	-	-
" Farmers	19	1	5,3%	-	-
" Grocers warehouses	1	-	-	-	-
TOTAL	44	2	4,5	-	-
MILLED RICE					
In Milling rice	13	1	7,7%	-	-
" Grocers warehouses	10	-	-	-	-
TOTAL	23	1	4,3%	-	-
BRANS					
In Granaries from F.N.P.T.	2	-	-	-	-
" Milling rice	8	-	-	-	-
" White flour mills of wheat or maize	13	-	-	-	-
" Whole meal flour mills of wheat, maize or rye	2	-	-	-	-
" Agricultural co-operatives	2	-	-	-	-
" Cereals and leguminous warehouses	3	1	33,3%	-	-
" Grocers warehouses	3	-	-	-	-
" Forage factories	6	-	-	-	-
TOTAL	39	1	2,6%	-	-
BEAN					
In Farmers	33	1	3,3%	-	-
" Cereals and leguminous warehouses	8	-	-	-	-
" Grocers Warehouses	5	-	-	-	-
" Forage factories	1	-	-	-	-
TOTAL	47	1	2,1%	-	-
BARLEY FLOUR					
In Whole meals flour mills of wheat, maize or rye	2	-	-	-	-
" Cereals and leguminous warehouses	1	1	-	-	-
" Forage factories	1	-	-	-	-
TOTAL	4	1	25,0%	-	-

Table III

FREQUENCY OF TRIBOLIUM SPP. OCCURRENCES IN THE WAREHOUSES VISITED DURING THE SURVEY OF PROTUGUESE ADJACENT ISLANDS

TRIBOLIUM CASTANEUM				TRIBOLIUM CONFUSUM			
Types of entities	# of warehouse visited	# of occurrences	% of occurrences	Types of entities	# of warehouse visited	# of occurrences	% of occurrences
Granaries from Azores Archipelago Regulating commission of Cereals	18	2	11,1%	Granaries from Azores Archipelago Regulating Commission of Cereals	18	0	-
Farmers	16	0	-	Farmers	16	0	-
Warehouses	15	6	40%	Warehouses	15	0	-
Agriculture co-operatives and husbandry societies	3	1	33,3%	Agriculture co-operative and husbandry societies	3	1	33,3%
Whole meal flour mills	12	2	16,7%	Whole meal flour mills	12	2	16,7%
White flour mills	6	3	50,0%	White flour mills	6	6	100,0%
Macaroni and pastes factory	2	2	100,0%	Macaroni and pastes factory	2	2	100,0%
Malt and beer factories	2	1	50,0%	Malt and beer factories	2	0	-
Forage factories	2	2	100,0%	Forage factories	2	1	50,0%
Tea factories	2	0	-	Tea factories	2	0	-
Tobacco factories	3	0	-	Tobacco factories	3	0	-
Fishing products factories	6	1	16,5%	Fishing products factories	6	0	-
Tans factories	4	0	-	Tans factories	4	0	-
TOTAL	91	20	22,0%	TOTAL	91	12	13,2%

Table IV

FREQUENCY OF TRIBOLIUM SPP. OCCURRENCES IN SAMPLES OF PRODUCTS DISTRIBUTED BY THE TYPES OF STORAGE ENTITIES VISITED DURING THE SURVEY OF PORTUGUSE ADJACENT ISLANDS

SORT AND LOCALIZATION OF PRODUCTS	Total Number of Samples	TRIBOLIUM CASTANEUM Number of Infested Samples	TRIBOLIUM CASTANEUM % of Infested Samples	TRIBOLIUM CONFUSUM Number of Infested Samples	TRIBOLIUM CONFUSUM % of Infested Samples
GROUNDNUTS					
In warehouses	4	1	25,0 %	1	25,0%
" Forage factories	1	-	-	1	-
" Agriculture co-operatives and husbandry societies	1	-	-	-	-
TOTAL	6	1	16,7	2	33,3%
MAIZE					
In granaries from Azores Archipelago Regulating Commission of Cereals	4	-	-	-	-
" Farmers	9	-	-	-	-
" Warehouses	9	2	22,0%	-	-
" Agriculture co-operatives and husbandry societies	2	-	-	-	-
" White flour mills	8	-	-	-	-
" Whole meal flour mills	1	1	-	-	-
" Forage factories	2	2	-	-	-
TOTAL	35	5	14,3%	-	-
GRAIN DUST					
In White flour mills	7	1	14,3%	1	14,3%
WHEAT					
In Graneries from Azores Archipelago Regulating Commission of Cereals	8	1	12,5%	-	-
" Farmers	6	-	-	-	-
" Warehouses	2	2	-	-	-
" Whole weal flour mills	3	-	-	-	-
" White flour mills	2	-	-	-	-
TOTAL	21	3	14,3%	-	-
WHEAT FLOUR					
In Whole meal flour mills	2	1	-	-	-
" White flour mills	7	-	-	2	28,5%
" Factories pastes	1	-	-	1	-
TOTAL	10	1	10,0%	3	30,0%
FORAGE FLOURS					
In White flour mills	1	1	-	-	-
" Warehouses	1	-	-	-	-
" Forage factories	2	1	-	-	-
TOTAL	4	2	50,0%	-	-
MALT					
In malt and beer factories	2	1	-	-	-
BRANS					
In Warehouses	2	-	-	-	-
" White flour mills	3	-	-	1	33,0%
" Forage factories	1	-	-	-	-
" Agriculture co-operatives and husbandry societies	1	-	-	-	-
TOTAL	7	-	-	-	14,3%

Table V

Tribolium spp. feeding choice through frequencies registered in Portugal

(Madeira and Azores)

Tribolium castaneum				*Tribolium confusum*			
Infested stored products (descending order of frequency magnitude)	Total number of samples	Number of infested samples	Infested samples(percent of total)	Infested stored products (descending order of frequency magnitude)	Total number of samples	Number of infested samples	Infested samples(percent of total)
Groundnuts	6	1	16,5%	Groundnuts	6	2	33,5%
Maize	35	5	14,5%	Wheat flour	10	3	30,0%
Grain dust	7	1	14,5%	Grain dust	7	1	14,5%
Wheat	21	3	14,0%	Bran	7	1	14,5%
Wheat flour	10	1	10,0%				
Animal-feed flour	4	2	---				
Malt	2	1	---				

NOTES - RESEARCH

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LINKAGE information for the autosomal dominant mutant Reduced eye notch (Ren) in T. castaneum.

Reduced eye notch, Ren, was reported in TIBII to be a dominant mutation in Tribolium castaneum with a recessive lethal effect. The eye notch is reduced similarly to mc, but the eye is unaffected at the leading edge. The reduction in the eye notch is parellel to the longitudinal axis of the beetle.

Subsequent recombination studies places Ren in Linkage Group II with 0.37% recombination with pearl, p, and 31.7% recombination with pegleg, pgl. Since pearl and pegleg show 30% recombination in our laboratory, the suggested linear order for these three mutants is Ren 0.37 p 30.0 pgl, but this was not proven by three point recombination tests.

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Additional information on the sex-linked recessive dwarf mutation in T. castaneum, midget (mi).

A third dwarf type mutation in Tribolium castaneum, midget (mi) was reported in TIB11 to be inherited as a sex-linked recessive gene but non-allelic to pygmy and pokey. Midget has an expression similar to pygmy in being smaller than normal during all stages of development. In addition, we find pupation time to be delayed in comparison to wild-type or normal and the elytra are frequently divergent.

Subsequent studies have revealed that midget is located in Linkage Group I between spotted, sp, and ring, rg, and about 7 recombination units to the left of ring. At the pupal and adult stages, the midget phenotype is somewhat larger than pygmy but considerably smaller that wild-type. For example, under our standard culturing conditions the Purdue "+" Foundations at the pupal stage averages for both sexes about 240 decamicrograms (10 µg), pygmy about 110 dµg, and midget about 150 dµg. Pupation time for midget is about one day longer that pygmy and 3-5 days slower that Purdue "+" Foundation. Larval weight at a fixed age (i.e. 14-day larval weight) finds midget proportionally smaller that either pygmy or the wild type.

NOTES - RESEARCH

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Variations of sex ratios in different family sizes of Tribolium castaneum

Eggs laid by females in single pair matings for a period of forty-eight hours were collected and set into an incubator at 32°C. Pupa emerged between 29 and 26 days and were sexed. A sample survey of 1198 family reveals that the number of males approximately equals the number of females with a total of 14,071 and 14,010 respectively.

If only the frequency of males or females in a family are considered, the distribution deviates from normality. However, if the total number in a family is considered, the distribution becomes very close to normal.

Classifications according to family size and sex ratio - male/(male + female) in a family were tabulated in Table 1. Most of the frequencies were clustered in the middle classes of family size and sex ratio. It is interesting to note that where family size is small there is a tendency for a higher sex ratio or prepondarence of males as denoted by the contrast of sections A and B of the table.

The variance of sex ratio calculated from each family size group is shown in Table 2. In both the small and large families, the frequencies are low. The results are in agreement with our expectations that both high and low family size group have high variance. An experimenter can tend to reduce the variance of sex ratio by using family sizes between 23 and 28 where low frequencies tend to increase variance above and below the limits.

Table 1. Frequency distribution based on the classifications of sex ratio and family size.

		Sex ratio: male/(male + female)											
Family Size		.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	1.0	
1- 2		0	0	0	0	0	3	0	1	0	0	3	
3- 4		0	0	0	1	9	3	0	1	2	0	1	
5- 6	A	0	0	2	1	4	7	3	4	3	1	0	B
7- 8		0	0	1	5	4	3	4	4	2	2	0	
9-10		0	0	1	1	3	37	5	4	4	1	1	
11-12		0	0	1	2	10	31	15	12	3	0	1	
13-14		0	0	1	3	15	19	14	7	2	0	0	
15-16		0	0	0	4	16	24	10	9	2	0	0	
17-18		0	0	0	6	15	22	23	11	3	1	0	
19-20		0	0	1	5	17	22	16	6	7	1	0	
21-22		0	0	1	5	7	23	21	11	4	0	0	
23-24		0	0	0	2	14	33	24	15	1	0	0	

Table I continued

25-26	0	0	0	2	14	26	31	11	2	1	0
27-28	0	0	0	4	6	46	26	9	3	0	0
29-30	0	0	0	1	14	22	27	13	1	0	0
31-32	0	0	0	1	11	24	18	7	0	0	0
33-34	0	0	0	0	3	19	13	9	1	0	0
35-36	0	0	0	1	5	16	22	5	0	0	0
37-38	0	0	0	0	4	19	12	10	0	0	0
39-40	0	0	0	0	4	12	5	2	0	0	0
41-42	0	0	0	0	0	4	10	2	1	0	0
43-44	0	0	0	0	1	6	6	1	1	0	0
45-46	0	0	0	0	0	7	7	1	0	0	0
47-48	0	0	0	0	1	2	1	1	0	0	0
49-50	0	0	0	0	0	1	2	1	0	0	0

Table 2. Variance of sex ratio of different family size groups

Family Size	Variance* of sex ratio
1-2	0.0304
3-4	0.0146
5-6	0.0099
7-8	0.0099
9-10	0.0044
11-12	0.0033
13-14	0.0041
15-16	0.0038
17-18	0.0031
19-20	0.0033
21-22	0.0035
23-24	0.0028
25-26	0.0029
27-28	0.0027
29-30	0.0032
31-32	0.0040
33-34	0.0055
35-36	0.0051
37-38	0.0055
39-40	0.0108
41-42	0.0145
43-44	0.0166
45-46	0.0166
47-48	0.0499
49-50	0.0618

*Var. = pq/n

NOTES - RESEARCH

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*Genetic differences in palatability of pupae and voracity of larvae of Tribolium castaneum

Cannibalism of pupae by larvae was shown to be one of the most important components of selection in hybrid laboratory populations of Tribolium castaneum (Sokal, R. R. and F. J. Sonleitner, 1968).

A preliminary experiment was carried out in order to investigate differences in larval voracity and pupal palatability among strains (UPF and Chicago black) of Tribolium castaneum and their hybrids.

Larval cultures of each strain and their hybrids were set up with larvae 12-13 days old in 6-dram shell vials in 8 g of flour at a density of 100/g. There were three replicates for each genotype with 200 larvae in each replicate. Into each larval culture 50 pupae of the other two genotypes aged $\leq$ 24 hours were introduced in equal proportions (25:25). Each batch of pupae was left in the larval cultures for 24 hours. At the end of this period the remaining pupae were romoved to holding vials and new batches of pupae were introduced into the cultures. This procedure was repeated for five consecutive days. The number and genotype of surviving pupae was determined after eclosion.

Mean percentages of pupae cannibalized by the three types of larvae are shown in Table 1. Because of the rather big variation among replicates and days in percent cannibalized pupae, Wilcoxon's signed rank test was used to test preferential cannibalism (differential palatability) of pupae. The ++ and +b larvae could not be shown to prefer one type of pupa over the other while bb larvae prefer ++ pupae ($p < 0.01$) when they have a choice between ++ and +b pupae. Hybrid larvae seemed more voracious than the two parent strains. A nonparametric simultaneous test procedure (Sokal, R. R. and F. J. Rohlf, 1969, p. 396) confirmed the difference between ++ and +b larvae at $p < 0.01$. But +b and bb, and ++ and bb larvae were not found to be significantly different in voracity.

Further experiments in which larvae have three choices (++, +b, bb pupae) are underway in our laboratory.

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Table 1. Mean proportions of pupae cannibalized (angular transformations; expressed as degrees) by larvae of the two strains and their hybrids.

	Larvae		
	++	+b	bb
Proportion of cannibalized pupae	+b: 41.11±2.877	++: 53.38±3.264	++: 48.78±2.411
	bb: 40.03±3.049	bb: 41.04±2.187	+b: 39.96±2.603

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Colorimetric study of a secretion of Tribolium castaneum.

In the genetic analysis of the fatty acid compostion of an unsaturated fatty acid sensitive mutant (1, 2) in T. castaneum, it was noted that an aqueous extract of the adult mutant showed a pink to red pigmentation.

In the following study, four populations of T. castaneum were examined: Purdue Foundation, Black Foundation, pygmy, and fatty acid sensitive. Initially, crushed T. castaneum were placed in spot plates, the buffer, sodium carbonate was added and a pink color was seen in the spot plates. It was decided, however, to try to find an organic solvent similar in chemical character to sodium carbonate which might allow the extraction of the unknown substance from intact whole animals. It seemed likely that extraneous substrates were present when crushed animals were used. After trying several organic solvents it was discovered that by using diethyl amine, a distinctive red color was observed. Upon evaporation of the diethyl amine, a brown oily residue remained.

When sodium carbonate was added to the filtered residue, the aforementioned pink color was again observed, indicating that the original unknown substrate was present.

When distilled water was added to the brown oily residue, a purple color appeared in the water, as well as a flakey tan precipitate which, when examined under the microscope, was seen to have a crystaline chain structure.

When the live animals were placed in distilled water for five minutes and then removed, the addition of diethyl amine to the water resulted in the same purple color.

If the animals were removed from the diethyl amine after the red color had appeared and the solution were then stopped and allowed to sit in the light at room temperature, the color changed from deep red to brownish orange in an hour to an hour and a half. It was also observed that the flour media had

a pinkish tinge. When this media was placed in diethyl amine, the same brown-orange color was observed. This indicated that what ever was being extracted by the diethyl amine was also being secreted by the animal and either oxidizing or reducing when exposed to light and air at room temperature.

When the diethyl amine was evaporated from the flour media substrate and water was added, the same purple color appeared that had been seen when water was added to the oily residue from the animals, but no precipitate was noted.

When 1.5 normal hydrochloric acid was added to diethyl amine colored red by the T. castaneum, a clear solution with a white precipitate appeared. After filtering out the precipitate, the addition of diethyl amine to the filtrate produced a red color.

It was then decided to determine from where the secretion was coming. The exoskeleton was removed and immersed in diethyl amine. No color was seen. Next the head was dissected from the abdomen and the two parts put in separate containers of diethyl amine. The secretion appeared to come only from the abdomen.

In egg, larval, and pupal stages, no color (secretion) was noted. The prime age was from the first day of adulthood until three to five months of age, immediate and intense color was seen when the animals were immersed in diethyl amine. With animals older than this prime age, a delay of three to five seconds was noted before the color appeared, and it was brownish orange rather than red. It was also observed that dead or anesthetized animals secreted nothing.

There seems to be an association between the excitement and age with the intensity and time of appearance of the color in diethyl amine.

It can be said that the substance is a secretion originating from the abdomen of the animal. It is secreted in large quantities at times of stress and is apparently also secreted in daily life, as is evidenced by its presence in the nutrient media. It is suggested that this easy laboratory procedure may prove valuable in identifying strains and crosses of T. castaneum by colorimetry.

There is circumstantial evidence that the secretion is a quinone, but as yet we have not developed a method for identifying a quinone from the diethyl amine solution.

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Host sex effects on infection of Tribolium confusum by Hymenolepis diminuta

Introduction

Host sex appear to be an important factor in susceptibility to some parasitic infections. Numerous studies indicate a relationship between host sex and incidence and intensity of parasitic infections. Some studies deal specifically with host sex and incidence of tapeworm larval stages. Campbell (1939) observed that white rats infected with Cysticercus crassicollis had larger numbers of cysts in males than females. Berg and Beck (1968) in their survey of the parasites of cotton-tail rabbits showed a significantly higher incidence of infection with Taenia pisiformis larvae in males. Female mice exhibited remarkable resistance to oral infection with Echinococcus multilocularis (Ohbayashi and Sakamoto, 1966). Kelly et al (1967) reported that old females of the flour beetle Tribolium confusum had a significantly smaller burden of Hymenolepis diminuta cysticercoids than either young females or young or old males. In this report the effect of host sex on the incidence of H. diminuta cysticercoids in Tribolium confusum is reexamined.

Methods and Materials

One hundred and twenty-six-weeks-old flour beetles, Tribolium confusum obtained from the Tribolium Stock Center at C.S.C.S.B. were starved for 4 days prior to the experiment. The beetles were separated into groups of 15 beetles of the same sex and the 4 groups of males and 4 groups of females placed into separate petri dishes.

Hymenolepis diminuta inoculum was obtained by dissecting the tapeworms from a white rat obtained from the laboratory of Dr. Maretta Voge, U.C.L.A. Gravid segments were placed in mammalian Ringer's solution and teased apart to liberate the ova. Ova concentration was determined by direct-count under a dissecting microscope. A suspension of approximately 200-240 ova per drop was used to infect the beetles by placing a drop of the inoculum on an oat-meal flake 3-4 mm in diameter. The inoculum was allowed to be absorbed into the oat-meal flake and 5 such flakes were placed in each of the petri dishes containing the beetles providing approximately 1000-1,2000 ova per dish. The petri dishes were covered and taped to prevent dessication of the ova. Most of the oatmeal was consumed in the first two days and the beetles were fed their regular diet of 95% unbleached wheat flour and 5% brewer's yeast. From the 15th through the 22nd day, all the beetles were dissected under a dissecting scope and the cysticercoids counted.

Discussion

Twenty of the initial 120 beetles used in the experiment died within the first week. Of the remaining 100 beetles that were exposed to ova of H.

diminuta, 30 males and 36 females became infected; an overall infection rate of 66% with 59.2% infected among males and 70.5% infection among females (Table 1.). This higher rate of infection in females contradicts an earlier study (Kelly, et al 1967) in which a higher incidence of infection was reported in males compared to females of the same age group.

Males in our study harbored an average of 2.1 cysticercoids vs. 1.8 cysticercoids/beetle in the females indicating no significant difference between the number of cysticercoids observed in either sex. Host sex apparently has no significant effect on the incidence of H. diminuta cysticercoids in Tribolium confusum.

Table 1. The incidence of H. diminuta cysticercoids in experimentally infected Tribolium confusum

Sex	Mortality	Survivors	Infected beetles	Total cysticercoids	Cysticercoids per beetle
Male	11	49	30	63	2.1
Female	9	51	36	65	1.8

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NOTES - RESEARCH

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Chromosomal evolution and speciation in Timarcha (Coleoptera: Chrysomelidae).

Cytological studies on seventeen morphological species of the apterous beetles Timarcha have been undertaken in relation to spermatogonial mitosis and first meiotic metaphases. The majority of these species are from Spain, two come from southern France and one from Morocco. Ten of the seventeen species were surveyed by measuring the lengths of metaphase chromosomes and fixing the locations of the centromeres.

The following species are morphologically related and have similar karyotypes: T. recticollis Fairm., T. sinuatocollis Fairm., T. cyanescens Fairm., T. monserratensis Bech., T. affinis Laboiss., T. fallax Pérez, T. catalaunensis Fairm., T. maritima Perris, T. perezi Fairm., T. monticola s. lat., and T. geniculata Fairm. The karyotypes of these species have been characterized by the primitive Coleoptera formula: $2n=18^{II}\downarrow Xy_p$. The species show three large autosome pairs, six small autosome pairs (among them the first was an acrocentric and the others were metacentrics), a large X-chromosome and a small metacentric y-chromosome with a low centromere index. There is a marked reduction in the relative length from pair 1 to pair 3 between T. goettingensis L. as studied by DUTRILLAUX and CHEVIN (1969) and T. recticollis, while the other species show a lesser reduction in size. This fact might be explained by a possible reciprocal translocation between pair 1 and pair 3. The remainder of the species as referred above, show no significant differences in karyotypes, although some have small differences in shape of the large autosomes and the X-chromosomes, probably due to pericentric inversions. Furthermore, pericentric inversion polymorphisms were detected in three populations, one population of one species and two populations of another species. Cytological data seems to be in agreement with the gradual variability in some morphological traits as noted in male genitalia. Geographical variation of cline type is assumed to give the best explanation for these allopatric Timarcha, although some of them could have reached the species level as intergroups clines.

There is an increase of symmetry in the karyotypes of the other Timarcha species. Thus, T. intermedia H.-Schäff. shows a karyotype: $2n=18^{II}\downarrow Xy_p$, with a gradual range of chromosome-sizes. T. tenebricosa F. and T. balearica Gory show a karyotype formula: $2n=20^{II}\downarrow Xy_p$, and have similar cytological characteristics. T. espagnoli Bech. and T. tangeriana Bech have a $2n=24^{II}\downarrow Xy_p$ karyotypes formula. Finally, T. strangulata Fairm. shows the highest chromosome number, having a formula $2n=26^{II}\downarrow Xy_p$, among the Timarcha analyzed. The karyotypes and morphological traits of this last group of Timarcha may be assumed to arise from the primitive Timarcha group of 20-chromosomes. The various phylogenetic lineages will not be completely ellucidated without a more extensive species analysis, but pericentric inversions, translocations, and in some cases chromosomal dissociations seem to play the main evolutionary role.

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Resistance of Tribolium brevicornis to starvation and lack of water.

From a wild type strain of T. brevicornis maintained at room temperature in standard medium 100 pupae were isolated on April 8, 1970, and placed in a plastic box without any food or water. The beetles were examined periodically to observe how active the beetles were and how many were still alive. Gradually the beetles emerged from the pupae, and acquired their normal dark coloration. The pupal skins were consumed, and thereafter the only source of food were fecal particles. As the beetles became hungry they became more restless, but this condition was relatively brief (for about a week). Thereafter the beetles became more sluggish, becoming largely quiescent. A few would attempt to climb to the top of the chamber in search of an escape hole. Gradually, more and more specimens began to die, and the dead beetles began to be devoured. Surprisingly, however, not all of these dead beetles were consumed as food. By September 28, when 173 days had elapsed, there were 24 live beetles and 45 largely intact dead ones. There were also some heads and fragments of other parts of the body, but in toto these portions of dead specimens were not enough to account for 27 beetles.

After September 28 the plastic container was examined every 6 or 8 days with the following results:

Date	# Live Adults
Oct. 6	13
Oct. 12	12
Oct. 20	6
Oct. 26	3
Nov. 3	2
Nov. 20	0

Thus, two adults survived at least 209 days without being given any fresh food or water. Of course, it is well known that flour beetles can obtain, by digesting flour, the so-called water of metabolism. Sufficient water is obtainable from carbohydrate digestion to meet the needs of these insects. It is also known that flour will absorb moisture from the air. In a similar fashion, the tissues of dead insects can pick up moisture from the air (recall that to soften a dead, dry insect all one has to do is to introduce it in a relaxing chamber that is air tight where the atmosphere is very moist, for 24-48 hours). Thus, it is possible that the tissues of the dead T. brevicornis

as well as fecal pellets which were probably re-cycled repeatedly as food. Nevertheless, the amount of water absorbed by these dead insects or fecal particles is probably negligible in terms of the water requirements of these beetles. It is possible, of course, that the beetles which survived six months or longer were those beetles which took advantage of necrophaging other, freshly dead insects and thus obtaining a supply of water from them. However, the water in the hemolymph or in the tissues of these insects must have been high already, and unless the living insects can remove the salts from this type of water through the malpighian tubules, this type of water can not be very useful. More useful, perhaps, is the water bound with proteins or fats, which live beetles presumeably could obtain from the dead ones. But it is interesting that the majority of dead beetles remained largely intact. Perhaps by the time the majority of beetles died the others were too weak to expend their energy to break through the exoskeleton to get at the proteinaceous of fatty tissues. Nevertheless, the experiment does provide an idea of the problems economic entomologists are faced with when they try to eradicate flour beetles. If these insects can live for over half a year without food or water, they must be able to live longer under conditions where the insects are free to move from a place short in food to another where some type of food is abundant.

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A comparative study of resistance to starvation in four Tribolium species.

The resistance to starvation of the species. T. brevicornis, T. castaneum, T. confusum, and T. madens was determined by isolating 100 pupae from the stock cultures in empty plastic chambers. At approximately weekly intervals the total number of adults both live and dead was determined. The chambers were maintained at about 25°C and about 60 percent R. H. T. In the following , (at least at room temperature) the last 3 censuses are given. They show the rapidity of deaths, and the longest period the adults survived without food.

a) T. castaneum. Of the hundred pupae isolated, there were 24 live adults and 52 dead adults at the end of 44 days. Nine were alive and 66 were dead at the end of 57 days, and at the end of 63 days all 68 beetles were dead.

b) T. confusum. At the end of 38 days there were 77 beetles alive and 10 dead; but at the end of 51 days 77 beetles were dead and only 10 remained alive. At the end of 57 days only 86 beetles were found, and of these only three were alive. A week later, at the end of 64 days, only one out of 86 beetles was alive and at the end of 66 days all beetles were dead.

c) T. madens. At the end of 50 days we scored 26 live and 48 dead beetles. On the 63rd day there were 8 live and 64 dead. Six days later there were 2 live and 67 dead and a week later, after 76 days had elapsed,

69 were dead.

d) T. brevicornis. This species was the subject of a separate note (see above) which indicated that these beetles can live over 200 days without being provided food or water. The beetles used in this experiment confirm the previously reported conclusions. At the end of 63 days there were 89 live and 3 dead; at 69 days there were 87 live and 2 dead beetles; at 76 days 87 live and two dead; and 90 days 87 live and the two dead beetles had been eaten except for their heads; at 104 days there were 86 live and 3 dead; at 119 days there were still 86 live beetles but only 2 dead beetles, one of which was intact; the other had been almost completely eaten. Only the head remained of this beetle.

It is clear that the readings for T. madens and T. castaneum were a little too late to have an idea where 50% of the beetles had died. By the time T. castaneum was first scored on the 44 day only 24 beetles remained alive, and by the time T. madens was scored on the 50th day, only 26 adults were alive.

The data for T. confusum are much better in this respect. The LD_{50} (where 50 percent of the beetles die) is somewhere between the 38 and 51st day, indicating that T. confusum can survive without any outside source of food or water for about six weeks. T. brevicornis is much more resistant to starvation. Its LD_{50} is between 210 and 217 days. Of course, except for the fact that T. brevicornis and T. confusum belong to the genus Tribolium, there are marked differences in size between the two. T. confusum is rather small, while T. brevicornis is abourt five or six times heavier and therefore larger. (The weights of 10 pupae of each sex weighed in mass for the two species are, respectively, as follows:

10 T. confusum males	.020g	10 T. brevicornis males	.121g.
10 T. confusum females	.028g	10 T. brevicornis females	.104-.112g

At the species level, size may be a factor in resistance to starvation:

The size relationships of these four species from smallest to largest are: T. castaneum < T. confusum < T. madens << T. brevicornis, and judging from the last survivors, the same relationships are obtained for resistance to starvation. The order of longevity of the last survivors is T. castaneum < T. confusum < T. madens << T. brevicornis.

It should be emphasized that the beetles are not completely deprived of food, since any dead or dying beetle could serve as food to the survivors. Indeed, the discrepancy in numbers from one census to the next, expecially among the dead, is due to the complete (or virtually complete), since heads or bits of antennae or tarsi may remain unconsumed, elimination of dead beetles between successive censuses. The remarkable thing , considering the state of starvation of the beetles, is that not more of the dead bodies are consumed as food.

These experiments do not reveal whether a beetle feeding on the carcass of another beetle will die sooner or much later than another beetle which has not partaken of a similar meal. In our opinion, necrophagy is of benefit rather than deleterious to a starving beetle, staving death off to an appreciable degree. We base our conclusions on our observations of the changes

that occur if the medium is not renewed in a culture. In these cultures gradually the flour is used and reused several times, eventually becoming uniform and dark, consisting only of fecal pellets. The ingestion of these fecal pellets (which must contain not only undigested particles but metabolic wastes as well) undoubtedly increases the salt concentration in the animals feeding on these particles. These salts will have to be removed, of course, but this is apparently of no immediate problem to the beetle the first few times they ingest these fecal particles, since they bear a few particles of undigested flour. Probably it is only in the last few rounds of reuse of these particles that a problem may arise since a certain amount of metabolic water would have to be used to remove the extra salts and this water is not available.

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* A review of mating behavior in Tribolium.

The first recorded observations of mating behavior in Tribolium were those of Park (1933) who noted that (1) up to a certain point, fecundity and fertility of the T. confusum females is enhanced by repeated copulation; (2) Tribolium beetles practice copulation frequently; (3) there do not seem to be any particularly elaborate or unvarying behavior reactions associated with the process.

As Park reported, and as numerous investigators have observed, males apparently cannot recognize the other sex readily and will attempt copulation with other males, dead beetles of both sexes, or with any object such as a lump of flour or frass which looks like a beetle. (Nevertheless, in view of Tschinkel's and Wilson's and Bern's recent report on the presence of peromones in Tenebrio molitor, the existence of similar substances in Tribolium cannot be excluded.)

There seems to be no preliminary courtship: a male may meet a female and persist in his attempt to mount her, or give up his attempts to copulate, or a male may meet a female and mount her at once. Park (1934) observed that the mating pair may remain in copula for as long as fifteen minutes or for only two or three minutes. Stanley and Grundmann (1965) recorded that in their studies with T. confusum, mating pairs remained united 30 seconds to as long as 40 minutes with an average of seven minutes. Shrode (1960) noted the T. castaneum Chicago strain mates at random, and that males were capable of copulating from 9 to 22 times an hour, with an average of 15.7 times per hour.

A male may mount and remain grasping the female with all six legs in a normal copulating embrace and yet not copulate. Sex starvation will usually increase the frequency of copulation of isolated beetles.

Females usually remain quiescent, but they can move about with the males on their backs, particularly after long copulations. If the pair should fall

on their backs, the male persistently remains mounted.

During copulation, the legs of the male may grasp the female at any point of her body, but often the forelegs of the male are placed between the prothorax and mesothorax and the tarsi of the middle and hind legs and may clasp the elytral epipleurae. The essential thing appears to be that the male's posterior end comes to lie slightly behind the posterior end of the female, since males selected for low body weight or bearing the sex-linked pygmy gene (and whose weight can be as little as half that of normal males) have no difficulty in copulating (personal observations). The aedeagus is then extended down and forward, aided by the extension of the posterior segments. Intromission is possible only if the female relaxes the seventh sternite. If this does not occur at once, the male "repeatedly extends and withdraws the aedeagus, thus tapping on the tip of the female's abdomen. After a period of time the female usually accomodates him. Sometimes the aedeagus is extended ventral to the seventh sternite of the female. In these cases the aedeagus is moved back and forth laterally with distinct lateral flexion at the articulation." (Stanley and Grundmann, 1965.)

According to Park (1934) when the pair makes contact, "the seminal fluid, a mucous-like slightly milky secretion enters the vagina." On contact with air, however, this secretion from the aedeagus immediately seems to solidify, appearing thread-like at the tip of the aedeagus (Sokoloff, unpublished).

McDonald and Spencer (1963) have compared mating activity in various stocks of T. confusum. They have found pronounced differences in mating activity between mutant strains, and suspect that in some cases the morphological change accompanying the mutation may account for the depression in mating activity. (Frequently this depression is greater in females than in males). They have also noted differences in mutants which do not exhibit obvious morphological abnormalities and an "excited period" when sex-starved males and females are first put together.

The most surprising data on this subject are those of Wool (1967) who scored mating frequencies in a 30-minute period in a dish containing 10% wild type and 90% black T. castaneum. In his experiments "new" beetles were at least four days old but had not previously copulated. The "old" were the beetles introduced into a given container the previous half hour of observation.

Wool noted 30.5% homosexual attempts at matings among the beetles in the wild type (UPF, Purdue University foundation strain) and 34.5% among the blacks, a difference not regarded as significant. He also noted that despite mating, many females had failed to be inseminated.

Taylor and Sokoloff in an attempt to determine the frequency of homogamic and heterogamic as well as homosexual and heterosexual matings in the Berkeley synthetic strains, conducted an experiment wherein the beetles (25 CF ♂♂ and 25 CS ♀♀ marked with sooty 25 CF ♂♂ and 25 CF ♀♀ not marked with body color genes -- all beetles 10-17 days old, sexed as pupae, and kept in isolation until the test) were introduced in a petri dish containing a small amount of flour for a period of an hour. As soon as a beetle was found securely mounted on another these were removed to a vial and their sex and species recorded at the end of the hour. The experiment was run three separate

times in successive days with the results shown in the accompanying table.

Although the data are not extensive, it would appear that:

1. T. confusum males are more likely to engage in heterospecific matings than T. castaneum males.
2. T. confusum is more likely to engage in intraspecies homosexual matings.

There are several observations which can be added:

1. T. castaneum tends to mate first.
2. The "homosexual" matings tend to reduce the male/female ratio.

The drawbacks in the present series of observations are: If mating speed is characteristic of the species, removal of mating paris of the same or different sexes and/or species would tend to bias the results. According to the observations of one of us (C.W.T.) apparently visual and tactual and/or chemical cues are involved in the way Tribolium males identify females. The mating behavior involves the following:

a. male spots another beetle.
b. approaches and touches it.
c. mounts it - at various degrees including orientation.
d. extends his aedeagus.
e. female extends her ovipositor.
f. contact between genitalia.
g. sperm is transferred.

By removing mating "pairs" as they occur, there is a tampering of the measure of isolation:

1. since the sex-species ratio is continuously changing;
2. and since the stage at which "mating" has proceeded cannot be readily and accurately distinguished;

NOTES - RESEARCH

Table 1. Homospecific, heterospecific and homosexual matings in Tribolium castaneum and Tribolium confusum during one hour of exposure.

Homospecffic matings.

CS ♂ x CS ♀ 27

CF ♂ x CF ♀ 18

Heterospecific matings.

CS ♂ x CF ♀ 1

CF ♂ x CS ♀ 7

Intraspecies homosexual matings.

CS ♂ x CS ♂ 5

CF ♂ x CF ♂ 12

CS ♀ X CS ♀ 0

CF ♀ x CF ♀ 1

Interspecies homosexual matings.

CS ♂ x CF ♂ 3

CF ♂ x CS ♂ 0

CS ♀ x CF ♀ 1

CF ♀ x CS ♀ 0

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