

Riassunto. Gli autori hanno esaminato l'influenza esercitata *in vitro* da parte del siero di ratti portatori di sarcoma Galliera sulla fosforilazione ossidativa in mitocondri di fegato normale. Dagli esperimenti effettuati risulta che il siero di portatore di tumore determina disaccoppiamento delle fosforilazioni dalle ossidazioni nei mitocondri di fegato normale. Gli autori, in riferimento a

precedenti ricerche, discutono le probabili cause di questo fenomeno dovuto ad una sostanza o sostanze liberatesi dal tessuto neoplastico.

G. NANNI and A. CASU

Istituto di Patologia generale, Università di Genova (Italy), May 23, 1961.

Some Components of Adaptive Values of Heterozygous *Drosophila willistoni* from Irradiated Natural Populations

The adaptive value (*w*) is the integrative result of very numerous and complex biological properties contributing toward the genotypes' relative ability to perpetuate themselves throughout the generations.

In this work we attempt to measure some of the most important components of the adaptive values of irradiated *D. willistoni*. Wild individuals have been studied from a sample taken directly from an isolated wood, Capão A, which, in the course of a year, received about 420 000 ($70\,000 \times 6F_1$) descendents of six irradiated samples (3 times 10 000 r + 3 times 5000 r) by Cobalt 60 source of γ -radiation. As non-irradiated control, we used another isolated natural population of the same region (Eldorado, Rio Grande do Sul, Brasil)^{1,2}.

We studied the percentage of hatched eggs according to daily oviposition, the *viability* as the total number of offspring from single couples in randomised culture vials³ as true reproductive potentials of their genotypes; and the sterility as the mean frequencies of sterile matings³. These parameters of fitness were studied within a set of specified environmental conditions, of temperature, food supply⁴ and technical details.

The most significant results can be briefly described as follows:

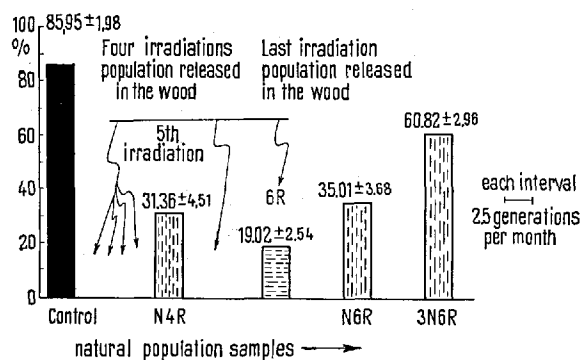
Percentage of hatched eggs was determined by counting the daily oviposition of inseminated females five days old, from the sixth to the tenth day, in all samples. The eggs were maintained at $25 \pm 1^\circ\text{C}$ at 95 to 100% of humidity. The counts of hatched (empty) eggs and the confirmation count of larvae were made 48 h after oviposition.

The first sample examined, N4R₁, was taken from Capão A one month (25 generations) after finishing a period of eight months during which four releases of 70 000 F₁ of irradiated flies (respectively 10 + 10 + 10 + 5 Kr = 35 Kr) were made. In comparison with the control value (85.95 ± 1.98), the percentage of hatched eggs decreased significantly (see Figure). Two more releases of 70 000 F₁ irradiated flies (5 + 5 Kr) were made during the next four months. The last irradiated population released, 6R₁, analysed also exhibited a very low percentage of hatched eggs (Figure). The increase shown after about 3 months (7.5 generations) by the N6R is most significant, however, in the 3N6R sample (3 months later), a significant three-fold increase occurred (Figure). Even this increase did not restore the level of the natural non-irradiated control population.

A total of 3280 eggs were examined in these tests.

Viability was measured by the mean number of offspring produced by fertile simple pairs of flies³. Control and irradiated natural populations, and the last laboratory irradiated sample released, were run in five simultaneous series of experiments:

(6R₁ < Control A), (N6R₁ < Control E₁), (2N6R₁ < Control E₂), (3N6R₁ = Control E₂) (6N6R₁ = Control E₄)



% of hatched eggs of *Drosophila willistoni* control and irradiated natural populations.

as can be seen in the Table. The very significant decrease of viability of the 6R₁ (−17%) was followed by the irradiated natural population samples (N6R₁ 21%; 2N6R₁ −16%) until the recuperation attained by the 3N6R₁ 6 months (15 generations) after the last release; and this was further confirmed by the 6N6R₁ 14 months (approximately 35 generations) after the 6R release.

A total of 36854 among the experimental, and 24183 individuals in the control cultures, has been counted.

The sterility defined as the number of simple pairs of flies that do not produce offspring³ gave the interesting information that in natural population they are eliminated as equivalent of dominant lethals. Only the F₁ of the 6R showed a significantly higher percentage than 37.6%. All samples from nature are around a mean value of 3.5% sterile pairs.

Some irradiated experimental population of *D. melanogaster* increased their fitness in comparison with non-irradiated³ which seems to be dependent on population size and the advantage of induced mutants in heterozygous condition. The irradiated natural populations of *D. ananassae* near the atomic bombed Marshall Islands^{5,6} showed an extreme depression in some biological properties. The flies heavily irradiated by direct and fallout radiations from atomic tests, especially in March 1954 (Bikini islands), showed a greater load of deleterious mutants and low fitness values, expressed in egg development, in comparison with much less irradiated natural

¹ H. WINGE, M. NAPP, C. M. P. MACIEL, and E. K. MARQUES, Exper. 17, (1961).

² A. R. CORDEIRO, Exper. 17, (1961).

³ B. WALLACE, The Amer. Nat. 872, 295 (1959).

⁴ E. K. MARQUES and C. M. P. MACIEL, Dros. Inf. Serv. 32, 169 (1958).

⁵ W. S. STONE and F. D. WILSON, Univ. of Texas Publ. 5914, 223 (1959).

⁶ T. G. GREGG, Univ. of Texas Publ. 5914, 207 (1959).

populations, the controls, Majuro Ponape. The return to control values occurred in 1956 and remained in 1957, 1958^{5,6}.

The experiments here reported show that the percentage of hatched eggs remains lower than the control non-irradiated populations even after the frequency of recessive lethal + semi-lethals have returned to the normal values¹.

The mean number of offspring produced by fertile single pairs, after a significant decrease recovered normal values five months after the normalization of lethal + semi-lethal frequencies¹.

The interesting results of genetical analyses, completed with allelism tests on the same populations, shows what

might be an incorporation of newly induced lethals and probably a discharge of the 'wild' lethals.

Would these newly incorporated mutants be responsible for the persistence of the physiological effects observed?⁷

Zusammenfassung. Die Analyse einiger Adaptationskomponenten (Häufigkeit des Schlüpfens aus dem Ei, Viabilität und Sterilität) bei einer isolierten natürlichen Population von *Drosophila willistoni*, zeigte nach Bestrahlung mit Co 60 verminderte Adaptationswerte, während mehrerer Generationen nach Bestrahlung, mit progressiver Angleichung an das Kontrollniveau in den folgenden Generationen. Jedoch erreichte diese Population während 15 Generationen den Grad der Häufigkeit des Schlüpfens von unbehandelten Populationen nicht.

E. K. MARQUES and CLARA M. P. MACIÉL

Departamento de Genética, ICN Universidade do Rio Grande do Sul, Porto Alegre (Brazil), January 30, 1961.

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Chromosomal Polymorphism Decrease due to γ -Radiation on Natural Populations of *Drosophila willistoni*

Studies on genetics¹ and fitness² of isolated natural populations, irradiated for one year and compared with control populations of the same region, accompanied these cytological observations.

A short account is given of the most significant results obtained. Before irradiating the first sample from the chosen 'Capão A', the inversion frequencies of the chromosomes from the salivary glands were determined.

As mentioned in ¹, a total of about 45 kr γ -radiation was delivered in one year throughout the successive releases of F₁ flies from three samples that received 10 kr followed by three samples that received 5 kr (about 70000 individuals in each sample). The population size determined experimentally was 3 to 10 times lower, according to the season. One month after each release the samples: N1R, N2R, N3R, N4R, N5R, and N6R were collected from Capão A simultaneously with the controls (see Tables I and II). The total cytological analysis includes about 3000 individuals. The samples N6R to 6N6R complete this analysis to 14 months after the last release: 6R₁.

For the second chromosome inversions (Table I) and the III chromosome C inversion, the pooled values from the N1R to the N5R show significantly lower frequencies in comparison with Control A, obtained from the same wood before radiation. The III C was below the Control values until the 5N6R and the IIL: D, E, and F until the 6N6R.

The mean number of inversions per individual (only females were considered) after remaining almost unchanged for the long period of seven months, from N1R to N4R, decreased significantly afterwards from the N5R to the 6N6R sample (Table II).

Another result was the detection of two new inversions restricted to the irradiated wood. One is a long sub-distal inversion in the III chromosome, the other is subproximal, short, in the XL Chromosome, called respectively RE1 and IE1. The former (III R·E1) involves the inversion of the sections 92 to the middle of 100, and the latter

Tab. I. Significant differences among various samples of *D. willistoni* natural populations, irradiated and control (X² and P)

Chromosomes and inversion	N1R-N5R	N6R	3N6R	4N6R	5N6R	6N6R
II L-D	28.10 <0.01	14.70 <0.01	15.11 <0.01	44.47 <0.01	6.25 <0.02	28.64 <0.01
II L-E	28.24 <0.01	6.91 <0.01	6.27 <0.02	37.42 <0.01	16.37 <0.01	15.72 <0.01
II L-F	30.38 <0.01	5.77 <0.02	4.63 <0.05	1.75 <0.20	6.54 <0.02	15.29 <0.01
II L-H	12.73 <0.05	7.95 <0.01	—	6.99 <0.01	—	—
III B	—	—	4.73 <0.05	—	—	—
III C	14.06 <0.05	12.43 <0.01	9.43 <0.01	5.30 <0.05	8.49 <0.01	—
III J	—	5.37 <0.02	2.71 <0.10	—	—	—
Number of studied individuals						
Irradiated	568	188	106	199	162	244
Control	133	117	117	214		240

¹ H. WINGE, M. NAPP, C. M. P. MACIÉL, and E. K. MARQUES, Exper. 17, (1961).

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