

purified material was consistent with this structure. Additional comparisons of the unknown with an authentic sample confirmed the above observations.

The role of betaine in metabolism has been discussed recently by JUKES⁵ who points out that betaine is an important intermediate in one of two mechanisms for contributing the methyl group to the biosynthesis of methionine. Further investigation is required to assess the possibility of any special role of betaine in the metabolism of the new-born infant as compared to the adult and its role in older children with generalized aminoaciduria.

Zusammenfassung. Ein Betain wurde in grösseren Mengen im aufgefangenen Urin gesunder Säuglinge und ebenfalls im Urin einiger älterer Kinder mit allgemeiner Aminoacidurie gefunden. Die Substanz besitzt eine Akti-

vität, welche die Inhibition des *Bacillus subtilis* durch β -2-Thiophenalanin verhindert. Ihre Aktivität gleicht derjenigen des Phenylalanins und der Phenylbrenztraubensäure, unterscheidet sich jedoch von diesen dadurch, dass die β -2-Thiophenalanin-Inhibition verhindert wurde, wenn Sporen des *Bacillus subtilis* als Erreger verwendet wurden.

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⁵ T. H. JUKES, Proc. 6th Internat. Congr. of Hematol. (Grune and Stratton, Boston, Mass. 1956), p. 682.

Determination of Reproductive Categories in the Life Cycle of Aphids

Some species of Aphids show warm climate populations which reproduce constantly by parthenogenesis and populations from temperate regions where amphigony also occurs. Such differences in the reproductive cycles are not to be regarded as merely phenotypic, but seem to depend upon the existence of genetic variability which is maintained even in the so-called clones by a peculiar type of meiosis (endomeiosis)^{1,2}.

Different populations of *Brevicoryne brassicae* were collected from localities having different climates: two zones each of the Appenines (Vaglio, Lama), the Po plain (Modena, Reggio), the Northern Tyrrhenian coast (Leghorn, Sestri), and the Southern Tyrrhenian coast (Naples, Salerno). Fifty parthenogenetic females of each population were isolated on cabbage leaves and kept for two months in the same thermostat which was regulated for obtaining sexuales. Table I shows the offspring of the eight populations that were kept in the thermostat for two months. Selection for parthenogenetic females was carried out and the results are shown in the Figure. The mountain populations showed no parthenogenetic females at either the 5th or 4th generation, despite selection for the parthenogenetic phenotypes. The population of Reggio showed no parthenogenetic females at the 9th generation, while in the population of Modena three parthenogenetic females, which appeared at the 3rd generation, ultimately gave rise to a parthenogenetic line where the percentage of the parthenogenetic females was increased in the next generations. The same process was obtained in previous researches, within the parthenogenetic lines of a strain³. The Mediterranean populations show on the other hand a marked tendency towards parthenogenesis: no male has ever appeared in their cultures. Amphigonic females disappeared in both populations from the Northern Tyrrhenian coast at the 9th generation. The tendency towards parthenogenesis is even more evident in the populations from the Southern Tyrrhenian coast, where conditions favourable for amphigonic reproduction exerted practically no influence at all.

The above experiments show therefore that the populations from regions with different climates are unlike in their genetic composition and form therefore different

sexual races. The environmental factors influence populations where multiple reproductive genotypes can be originated even within single parthenogenetic lines. In the same environmental conditions the individuals of different localities react differently in accordance with the reaction norms of the different sex genotypes which are present in genic pools of the populations. This explains why it is possible to obtain lines reproducing constantly by parthenogenesis from strains where amphigony has occurred.

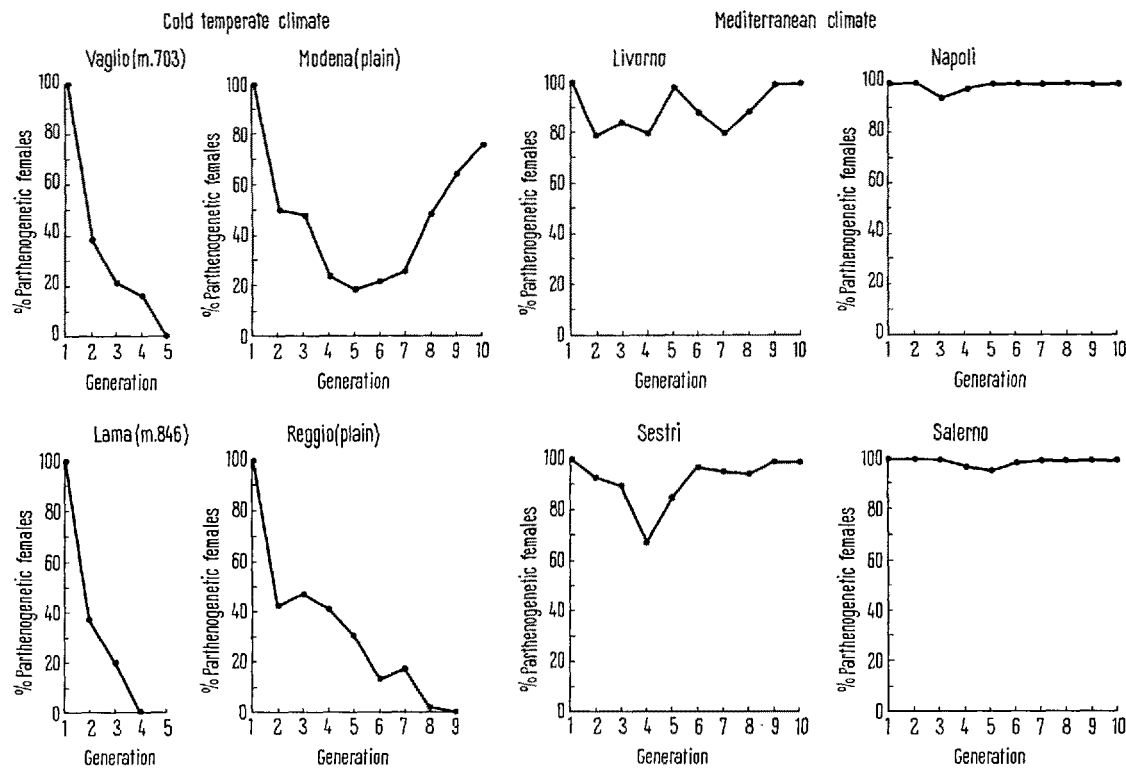
Table I. Offspring of 8 populations of *Brevicoryne brassicae* from different regions, bred for 2 months in thermostat regulated chamber for obtaining sexuales

Vaglio				Reggio			
sex.	$\frac{\sigma\sigma}{\varphi\varphi}$	30 162	} 65%	sex.	$\frac{\sigma\sigma}{\varphi\varphi}$	20 316	} 64%
parth.		98		parth.		192	
tot.		290	35%	tot.		528	36%
Lama				Modena			
sex.	$\frac{\sigma\sigma}{\varphi\varphi}$	28 190	} 59%	sex.	$\frac{\sigma\sigma}{\varphi\varphi}$	20 273	} 50%
parth.		154		parth.		303	
tot.		372	41%	tot.		596	50%
Leghorn				Naples			
sex.	$\frac{\sigma\sigma}{\varphi\varphi}$	- 78	} 12%	sex.	$\frac{\sigma\sigma}{\varphi\varphi}$	- 38	} 6%
parth.		586		parth.		605	
tot.		664	88%	tot.		643	94%
Sestri				Salerno			
sex.	$\frac{\sigma\sigma}{\varphi\varphi}$	- 109	} 16%	sex.	$\frac{\sigma\sigma}{\varphi\varphi}$	- 19	} 3%
parth.		597		parth.		640	
tot.		716	84%	tot.		659	97%

¹ G. COGNETTI, Exper. 17, 168 (1961).
² G. COGNETTI, Boll. Zool. 29, 129 (1962).
³ G. COGNETTI and A. M. PAGLIAI, Arch. Zool. ital. 48, 329 (1963).

Table II. Offspring of a cross between ♀♀ from Sestri with ♂♂ from Reggio, compared with the offspring of a cross between ♀♀ and ♂♂ from Reggio

P		Sestri × Reggio														
F ₁	Fundatrix A				Fundatrix B				Fundatrix C							
	sex.	♂♂ ♀♀	1 130	} 24%	sex.	♂♂ ♀♀	3 155	} 30%	sex.	♂♂ ♀♀	- 139	} 27%				
parth.		416	76%		parth.		368		70%	parth.			376	73%		
	tot.		547		tot.		526		tot.		515					
P		Reggio × Reggio														
F ₁	Fundatrix A				Fundatrix B				Fundatrix C				Fundatrix D			
	sex.	♂♂ ♀♀	12 320	} 66%	sex.	♂♂ ♀♀	8 215	} 61%	sex.	♂♂ ♀♀	6 230	} 59%	sex.	♂♂ ♀♀	19 305	} 71%
parth.		171	34%		parth.		142		39%	parth.			164	41%	parth.	
	tot.		503		tot.		365		tot.		400		tot.		456	



Selection for parthenogenetic females of *B. brassicae*, carried on in eight populations from different regions.

It appears therefore that sex and reproductive variability is realized through a polygenic system. This hypothesis was verified by crossing females from a population showing a marked tendency to parthenogenesis with males from a population showing a low tendency to parthenogenesis. Thus amphigonic females from Sestri were crossed with males from Reggio. All the individuals of course were still bred in the same environmental conditions as their parents. Table II shows that in F₁ the percentage of sexuales is higher than that of the Sestri samples and it is lower than that of the Reggio samples. At the same time controls on the offspring of fertilized eggs from the Reggio populations were carried on, and the percentage of sexuales proved to be very close to the percentage which was previously ascertained in the parental generation.

On the basis of these results, a polygenic determination of the reproductive categories in the life cycles of Aphids

appears to be highly probable. The above experiments indicate that there is a possibility of obtaining through selection constantly amphigonic strains in the same way as constantly parthenogenetic strains were obtained both through natural and through artificial selection.

Riassunto. L'incrocio fra ♂♂ di ceppi di *B. brassicae* con scarsa tendenza alla partenogenesi, con ♀♀ anfigniche di ceppi tendenti alla partenogenesi costante, ha dato alla F₁ percentuali di sessuali intermedie rispetto a quelle dei ceppi usati per l'incrocio. Le categorie riproduttive degli Afidi sembrano quindi determinate da poligeni.

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