The Influence of Glutamic Acid upon the Concentration of the Free Amino Acids of *Drosophila melanogaster*

R. FAHRIG

Genetisches Institut der Justus Liebig-Universität, 63 Gießen (Germany)
Zentrallaboratorium für Mutagenitätsprüfung, 78 Freiburg/Brg. (Germany)

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When *Drosophila* is bred under standard laboratory conditions the internal pool of the free amino acids remains relatively constant. By changing the breeding-conditions, for example by rising the temperature [1, 2] or by adding single amino acids such as glutamic acid [3], the concentrations of many amino acids can be changed.

In earlier experiments glutamic acid attracted our attention as an excessive dietary by-constituent which not only raises the pool of free amino acids [1] but also enlarges the salivary gland chromosomes and the amount of DNA in larvae [3, 4].

The glutamic acid effect is observed only when the concentration of the compound is equal to or greater than 0.5 g pro 100 g media. The maximal influence on amino acid concentrations occurs at 10 g/100 g media and this concentration does not effect the vitality, lifetime or weight of the organism.

Amino acids	Larvae	Pupae	Adults
Histidine	+	+	−
Lysine	+	+	
Arginine	+		+
Ammonia	+	+	+
Aspartic acid	+	+	
Glutamic acid	+	+	+
Threonine			
Serine	+		
Proline	+		+
Glycine	+		
Alanine	−		+
Valine	+	+	
Methionine	+		
Isoleucine			
Leucine			
Tyrosine	−		
Phenylalanine			
β-Alanine	+		−
γ-Aminobutyric acid			
Ornithine			
	14	**6**	**7**

Tab. 1. The increase (+) or decrease (−) of free amino acid concentrations in larvae, pupae, and adults fed with glutamic acid at a breeding temperature of 18 °C.

Up to now only the total amount of amino acids has been measured [3]; exact determinations of the concentrations of single amino acids have not been reported. We determined the concentrations of 19 different amino acids after extraction with trichloroacetic acid by using an automatic amino acid analyser from Beckman. The results are presented in this article.

A general view of the results is given in table 1. It shows the rise (+) or decline (−) of the individual amino acid concentrations. The analytical data are presented in figs. 1 to 3.

Excessive dietary glutamic acid changed the concentrations of 13 (fig. 1) amino acids in larvae (96 h old), of 5 (fig. 2) in pupae (24 h old), and of 6 (fig. 3) in adults (72 h old).

The concentration of ammonia, which was also determined, changed in larvae and pupae as well as in adults.

The feeding of glutamic acid resulted in an increase of the concentrations of all amino acids being

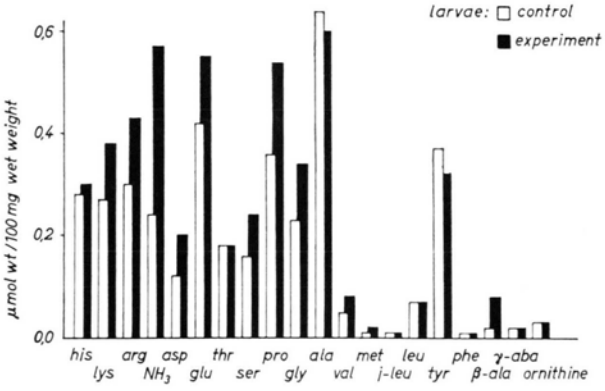

Fig. 1. The free amino acid content in larvae fed with glutamic acid at a breeding temperature of 18 °C.

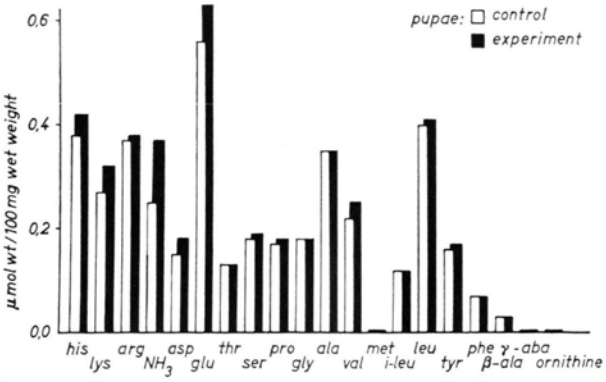

Fig. 2. The free amino acid content in pupae fed with glutamic acid at a breeding temperature of 18 °C.

[1] F. ANDERS, F. DRAWERT, A. ANDERS u. K. H. REUTHER, Z. Naturforsch. **19 b**, 495 [1964].
[2] R. FAHRIG, DIS, in print.
[3] F. DRAWERT, K. H. REUTHER, A. ANDERS u. F. ANDERS, Experientia [Basel] **21**, 618 [1965].
[4] R. FAHRIG, M. SIEGER u. F. ANDERS, Verh. dtsch. zool. Ges., Heidelberg, 565 [1967].

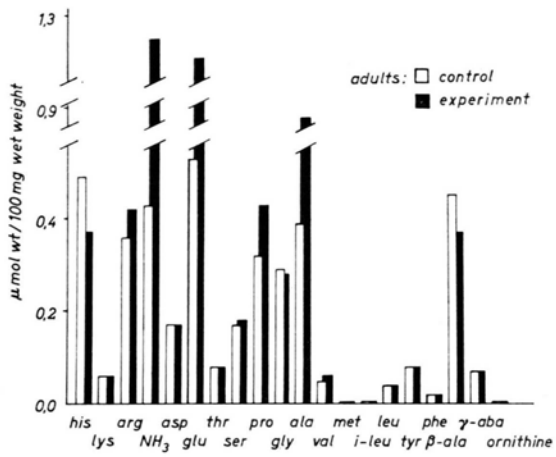

Fig. 3. The free amino acid content in adults fed with glutamic acid at a breeding temperature of 18 °C.

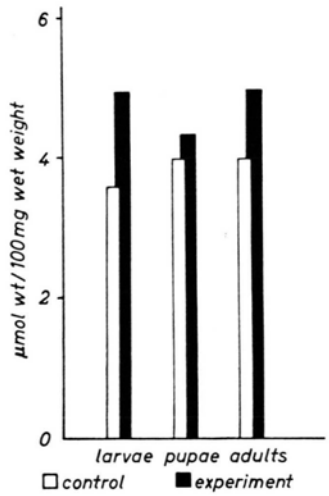

Fig. 4. The total amount of free amino acids in larvae, pupae, and adults fed with glutamic acid at a breeding temperature of 18 °C.

affected in larvae, pupae and adults, except that alanine and tyrosine were not increased in the larvae and histidine and β-alanine were not increased in the adults.

The total amount of all amino acids (fig. 4) showed an increase in larvae of 30%, in adults of 20%, and in pupae of 10 percent. Summarizing we can say that an excessive amount of dietary glutamic acid has a considerable influence on the concentrations of the amino acids in larvae and pupae as well as in adults. Naturally this influence is especially strong in larvae, because they take up large amounts of glutamic acid with their food. Here nearly 3/4 of all amino acids are affected by a change of their concentrations while in pupae and adults in general only ammonia and the acid and basic amino acids are influenced.