

*Food Science Department, Nutrition Institute, Cairo (Egypt)*

## **Studies on some Egyptian foods**

### **Part 2: The effect of protein on blood constituents of rats**

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With 1 table

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This part of study was undertaken to complete a previous study on the biochemical and biological evaluation of some Egyptian foods. Assessment of dietary protein quality can be done by growth experiments. Besides, it can be also evaluated by studying the serum proteins and the changes in the concentration of free serum amino acids of animals.

It is well known that serum albumin is the fraction of serum protein that is reduced by protein depletion. There is no pathological condition in which serum albumin is elevated. On the contrary, serum globulins are above normal in cases of parasitic or bacterial infections despite protein deficiency in the body. They are never reduced below normal even in severe lack of dietary protein. Such changes in serum albumin or globulin reflect consequent changes on total serum proteins. It is popular to describe the state of serum proteins in terms of albumin/globulin ratio. Sometimes determination of serum albumin alone shows protein depletion if it is reduced (1). Changes in the concentrations of free amino acids of serum can also point out to the nutritive value of a dietary protein (2). Concentration of essential amino acids is lowered in case of protein depletion because the body cannot synthesize them. Thus the ratio of nonessential to essential (NEAA/EAA) is always increased.

In this study, the experiments are conducted to investigate the effect of lupinus termis and fenugreek seeds protein intake on the blood serum constituents of rats.

### **Materials and methods**

Experiments were done as described in Part 1 of this study, the number of groups, normal, experimental, and non-protein diet, were the same. After 4 weeks, the rats were killed with chloroform. Blood was taken by cardi-puncture. The total serum protein was determined by usual *Kjeldahl* method (3). The electrophoretic serum-protein pattern was done using *Durrum* method (4) from which albumin/globulin fraction ratios were determined. Determination of free amino acids in blood was done by using the method used by *Abdou and Awadalla* (5).

### Results and discussion

Table 1 shows the total serum protein, albumin/globulin ratio, and NEAA/EAA ratio. Data for total serum protein for animals fed casein are slightly higher than those fed other proteins. The difference is not significant ( $P > 0.05$ ). In the main time, total serum proteins are higher in animals fed lupinus termis, roasted and germinated fenugreek seeds than in those fed raw seeds. The albumin/globulin ratios showed a similar trend. This reflects the better quality of lupinus termis and prepared fenugreek pro-

Table 1. Total serum protein, albumin globulin ratio, and nonessential to essential free blood amino acids of rats fed different protein diets.

Meal	Total serum protein	Albumin-globulin ratio	NEAA-EAA ratio
Casein	7.33	1.48	1.50
Non-protein diet	3.90	0.62	3.24
Lupinus termis Guiza 1	7.00	1.37	1.68
Guiza 2	7.00	1.35	1.69
Balady	6.90	1.39	1.67
Fenugreek seeds raw	6.79	1.32	1.69
roasted	6.97	1.37	1.67
germinated	7.00	1.38	1.66

teins. Changes in the concentrations of free amino acids of serum also reflects the dietary protein quality. The ratio of nonessential to essential free serum amino acids increased in case of rats fed non-protein diet as the body cannot synthesize the essential amino acids. *Whitehead and Dean* (2) found that the ratio of free nonessential to essential amino acids ranged between 3.5 to 8.0 in case of kwashiorkor. The ratio decreased with treatment and clinical improvement approaching the value of 2 and below for the serum of healthy children. In this study, ratio of NEAA/EAA of rats fed casein was 1.5, whereas in ranged between 1.66 to 1.9 for the tested protein. At the maintime, the non-protein diet showed a figure of 3.24.

From this study we can conclude that the lupinus-termis and fenugreek seeds are good sources of protein. Toxic substances in raw fenugreek seeds decreased its nutritive quality. Treatment of seeds either by heat or germination improve the nutritive value of its proteins. This fact can be of value if it is conveyed to the public through the proper channels of nutrition education.

### Summary

This study was undertaken to study the changes of the blood constituents of rats fed different proteins (lupinus termis, Guiza 1, 2 and balady; fenugreek seeds, raw, roasted, and germinated). The total serum protein for animals fed casein was slightly higher than those fed other proteins. Total serum protein of animals fed lupinus termis, roasted and germinated fenugreek was higher than those fed raw seeds. The albumin/globulin ratios showed a similar trend. The ratio of non-essential to essential free serum amino acids of rats fed non-protein diet was higher than those fed protein.

Lupinus termis and fenugreek seeds are good sources of protein. Treatment of seeds either by heat or germination improves the nutritive value of the proteins.

#### *References*

1. Davidson, S., R. Passmore, Human Nutrition and Dietetics. sec. ed. E. & S. Livingstone Ltd. (Edinburgh & London 1963). – 2. Whitehead, R. E. G., R. F. A. Dean, Amer J. Clin. Nutr., **14**, 1964. – 3. AOAC. Association of Official Agricultural Chemist Methods of Analysis. Washington, D.C., 1970. – 4. Durrum, J. A.: J. Amer. Chem. Soc. **72**, 2943 (1950) – 5. Abdou, I., M. Z. Awadalla, J. Egypt. Med. Ass. **55**, 11, (1972)

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