INTRODUCTION

The present work comprises three essential parts. The first part is concerned with water content of various avian body tissues, and the second one deals with lipid content of the same tissues. The third group includes studies on some of the metabolites that contribute to liberation of the energy required in body activities, such as the flight process, and on the enzymes of blood and liver-homogenate that are related to production of the suppliers of energy from proteins (by trans-amination). Relatively few researches on birds were undertaken by earlier authors, thus giving an interesting value to the present investigation. Chew (1961) stated that the paucity of information on birds suggests many lines of research.

It was aimed in the present work to study two different kinds of birds. The first kind was chosen to be flightless, the white chicken "Arbor Acre", while the second one is characterized by powerful flight, namely Falco tinnunculus (as described by Parry and Putman, 1979, and Stanely et al., 1980). The present author aimed from this study at revealing to what extent the process of flight exerts its effect on water and lipid contents of various tissues, and on the metabolites and enzymes of blood serum and liver-homogenate of the birds studied.

Water is indispensible for all vital activities of any living organism, and its importance has been taken into consideration in the study

of every physiological phenomenon in any organism (Willoughby, 1966 and 1969). The study of water equilibrium of birds is of intrinsic interest. The avian water balance is particularly critical since birds possess a poorly-developed Henle's loop and are characterized by a very accelerated metabolism due to the high energy expended in flight. However, birds are believed to show certain aspects of physiological superiority over mammals. They have no sweat glands, their body surface is well insulated by a vapour-trapping plumage, and their nitrogen excretion favours the sparingly soluble uric acid instead of urea, thus eliminating relatively small amounts of water and excrete a fairly concentrated urine (Chew, 1961; Bartholomew and Cade, 1963; Cade, 1964 and Schmidt-Nielsen, 1964).

In spite of the importance of avian water economy, a shortage of information on it was noticed. Cade (1964) declared that the researches on water studies in birds had reached a stage calling for more detailed and more precise analytical investigations.

Of course, birds possess lighter bodies than other tetrapodan vertebrates. Many structural modifications were pointed out by earlier authors, indicating the adaptability of such modified structures for the flight nature of birds (Eaton, 1960; Romer, 1962; Young, 1962; Kent, 1973; McFarland et al., 1985 and Jordan and Verma, 1986). Biochemically, the data of some earlier workers have indicated that avian tissues are abruptly less watery than the corresponding ones of Amphibia and Reptilia (the preceeding classes in the series of tetrapods), and of Mammalia (the succeeding most advanced class).

Data of water content were given for amphibian tissues by Smith and Jackson (1931); for tissues of Reptiles by Khalil and Abdel-Messih (1962); for Birds by Hussein et al. (1978) and Khalifa et al. (1986); and for Mammals by Mitchell et al. (1945), Davies et al. (1952) and Akiyoshi (1956). When these data were statistically compared (as tried by Azouz, 1958), significant lowering in water content were noticed characterizing the tissues of (flying) birds, so that they possess the least water contents among all classes of tetrapodan vertebrates.

This suggested a contribution of the less watery tissues of birds (i.e. less laden with water) to the lightness of body so as to ensure successful flight. The present study was undertaken as a program aiming at disclosing the effect of flight on water of tissues in a peculiar way: by comparing the corresponding water contents of tissues of two different birds, which though belong to one tetrapodan class, they greatly differ in the essential feature characterizing birds (flight). One of the birds is characterized with a powerful flight, while the other is a flightless one (i.e, an extraordinary representative of birds, with a terrestrial life as other tetrapods).

To give an additional support for the influence of the process of flight on water content of tissues, a third bird that was previously studied by Azouz et al. (1984) was included in an additional comparative study. This bird was the Palm dove "Streptopelia senegalensis aegyptiaca",

which possesses a different pattern of flight (the flapping type). A comparison was undertaken between the palm dove and the chicken to verify if there exists an effect of the forcible flight of dove on water content of its tissues, or it does not exist. Another interesting comparison was made between the palm dove and the kestrel (both birds are strong fliers-but differ in their patterns of flight) to find out if there is any difference in water content of tissues accompanying the difference in the pattern of flight. The pattern of Falcon's flight is soaring and hovering, while that of the palm dove is flapping. Trials to answer these questions were undertaken in the present investigation.

Lipids of the body are of a great value, because fat is one of the most important components of tissues. Intracellular lipids are used as fuel for contractile activity during exercise. Concerning the flight of birds and other forcible activities, several authors studied the lipid content of various tissues in case of flying birds, and in animals that perform some kind of exercise (Altland and Highman, 1961; Farner et al., 1961; Highman and Altland, 1963; Garbus et al., 1964; Vallyathan et al., 1970 and Pilo and George, 1983). All these authors observed high lipid contents in various tissues of the active animals.

Bird flight is of particular physiological interest because of its high power requirements. According to Lasiewski, 1972; Tucker,