# RESEARCH CONCERNING THE POSSIBILITY OF SPECTROPHOTOMETRIC METHODS FOR DETERMINING THE URIC ACID LEVELS IN BIRD FECAL DISCHARGE

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**Abstract**

*With animals, the nitrogen coming from amino acids is primarily eliminated through one of three ways: free ammonia, urea with animals (ureotelic species), and uric acid with birds (ureotelic species).*

*The urea that is found in urine comes from the breakdown of arginine. In the nutritional design, arginine is indispensable for birds because, unlike mammals, it is not possible for them to regenerate starting from ornithine and carbamoyl phosphate.*

*In bird urine, uric acid represents the primary method for eliminating nitrogen, and the most important constituent (80%) next to ammonium salts, urea, creatine, and free amino acids.*

*Its design is for the purine bases where the molecule's four atoms of nitrogen come from glycine, glutamine, and aspartic acid.*

*In this paper, a spectrophotometer method of determining uric acid from bird fecal discharge is described, adapted from the HEILMAYER spectrophotometer method for uric acid from blood serum.*

**Key words**: uric acid, spectrophotometer, fecal discharge

## INTRODUCTION

The breakdown of purine nitrates, components of nucleic acids, is the metabolic path for forming uric acid in humans, primates, birds and reptiles.

Uric acid is bisynthesized in the liver – this function is called uricopoezing – and is eliminted through the renal system. Other mammals produce allantion with a purine base, with uric acid being an intermediary product.

In the case of birds, uric acid comes from both the breakdown of proteins and also the amonium resulting from the proteic catabolism.

In birds uric acid contains over 80% of urinary nitrogen.

In the case of bird nutrition studies, the necessity of studying the nitrogen balance imposes the need to determine with great precision the exact level of uric acid in fecal discharge.

In the relevant literature a series of methods is presented for determining the uric acid levels from different biological tests:

| TYPES OF TESTS | TYPES OF METHODS |
|---|---|
| BIRD FECAL DISCHARGE | VOLUMETRIC METHOD |
| BLOOD SERUM | SPECTOPHOTOMETRY METHOD |
| MILK, URINE, BLOOD SERUM | ELECTROCHEMICAL METHOD |
| URINE | CHROMATOGRAPHIC METHOD |

Uric acid is not very soluble in water (0.4 mmol/l); the plasmatic concentration in uric acid evolves in function of the nutritional state between 40-100 μg/ml.

The renal excretion must be permanent to avoid endogenous deposits.

Uricemia falls as well as excretion. The urine composition is also modified; amonium salts represent the most important proportion of excreted nitrogen (25%).

## EXPERIMENT

With birds, urine and feces are mixed, so separating them requires chemical methods that allow the scientist to differentiate between fecal and urinary nitrogen.

In order to quantify the fecal nitrogen, indispensible amino acids are primarily in the form of undigestable proteins.

The chemical method begins by separating the uric acid from the excretion using a formaldehyde solution with an acid agent (pH=4.7). The fecal proteins are precipitated with lead acetate or uranyl, before being dosed.

The primary method for this work has at its base the oxidization of uric acid with allantion in an alkaline agent, in the presence of phosphorophramic acid, with the formation of a blue-coloured composition whose intensity is proportional with the uric acid concentration of the test and the spectophotometric determination of 665 mm.

Through the spectrophotometric method the interpretation errors can be avoided that are inherent in volumetric determinization as well as sometimes avoiding the use of formaldehyde and its toxic effects.

The reactions that have been used are: boric acid solution – borax pH=9; sodium carbonate solution 15%; uric acid solution from stock (100 mg/100ml); uric acid solution from work (dilation 1/5 from stock solution). The standard curve is drawn following the concentration of uric acid (mg uric acid /100 ml) and on the obliteration abscissa of 665 mm following table 2.

| Standard uric acid solution (mg/100ml) | Obliteration of 665 mm |
|---|---|
| 0 | 0,001 |
| 5 | 0,094 |
| 10 | 0,175 |
| 15 | 0,259 |
| 20 | 0,429 |

## RESULTS AND DISCUSSION

For this test chicken fecal discharge was used, and the following results were obtained for the determination of uric acid presented in table 3:

| Test Nr. | Uric acid (g%, g dry test), volumetric method | Uric acid (g%, g dry test), spectophotometric method |
|---|---|---|
| 1A | 5,61 | 5,98 |
| 1B | 5,91 | 5.65 |
| 1C | 6.08 | 5.33 |
| 1D | 5.79 | 5.96 |
| 1E | 6.31 | 5.97 |
| 1F | 6.30 | 6.59 |

According to the test t-TEST and the ANOVA text for $p \leq 0.01$ the differences between the array of data obtained from the determination of uric acid from the same test using the volumetric method TREPSTRA and HART and the spectophotometric method are insignificant.

The volumetric methods TREPSTRA and HART for determining uric acid from bird fecal discharge present an increased slope of toxicity, requiring boiling with formaldehyde, but the effective time frame for the work is approximately 26 hours between each test. Because of this it was considered necessary to perfect a new method to determine the uric acid from bird fecal discharge.

## CONCLUSION

The spectrophotometric method for determining uric acid from bird fecal discharge obtains analytical results comparable with those obtained through the volumetric method for determining uric acid from bird fecal discharge.

The spectophotometric method of determining uric acid from bird fecal discharge is faster and uses a descreased number of reactive substances.

The spectophotometric method of determining uric acid from bird fecal discharge is finalized through the instrumental determination that avoids personal interpretation errors such as those found in volumetry.

The spectophotometric method of determining uric acid from bird fecal discharge is much less toxic than the volumetric methods TREPSTRA and HART that use boiling in formaldehyde.

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