# ANALYSIS OF PROTEIN CONTENT OF SALOMALAIKUM (Cyperus *rotundus L.)*

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***Abstract***. *Cyperus rotundus L. is a perennial plant widely distributed in tropical and subtropical regions and traditionally used in folk medicine. Although its pharmacological properties have been extensively studied, limited scientific information is available on the nutritional characteristics of its roots, particularly their protein content. This study aimed to determine the crude protein content of Cyperus rotundus L. roots collected from the Andijan region using the Kjeldahl nitrogen determination method. Root samples were collected, air-dried, finely ground, and analyzed for total nitrogen content. Crude protein content was calculated using the conventional conversion factor of N × 6.25. The results showed that the total nitrogen content of the root samples was 1.24%, corresponding to a crude protein content of 7.89%. These findings indicate that Cyperus rotundus L. roots contain an appreciable amount of protein and may have nutritional and functional value. The study contributes to regional data on the biochemical composition of C. rotundus and provides a basis for further research on its potential use in food, feed, or pharmaceutical applications.*

***Keywords***: *crude protein, Cyperus rotundus L., Kjeldahl method, nitrogen content, Andijan region.*

## INTRODUCTION

*C. rotundus* (nutgrass or purple nutsedge) is a perennial herb belonging to *the Cyperaceae family, which grows in many tropical and subtropical regions. This plant is* widely used in traditional medicine for the treatment of gastrointestinal, inflammatory and other diseases , and also contains bioactive components with nutritional and pharmacological value. Scientific data on the chemical composition of *C. rotundus* , in particular the amount of proteins and their nutritional analysis, have not been studied in sufficient depth, which makes it urgent to determine the nutritional and biochemical potential of this plant. Proteins are the main structural and functional molecules of plant cells and play an important role in supporting biological activity and growth processes. Therefore, analysis of the protein composition of *C. rotundus* and its evaluation based on scientific literature play an important role in determining the potential nutritional value of this plant [1].

## LITERATURE ANALYSIS AND METHODOLOGY

### 1. General chemical composition of *Cyperus rotundus* .

A number of review articles report that *C. rotundus* contains over 200 bioactive compounds, including flavonoids, phenolic compounds, terpenoids, alkaloids, and other metabolites, which are believed to underlie its pharmacological and therapeutic activities.

Also, reviews examining the ethnobotanical and pharmacological data of *C. rotundus* have highlighted the plant's presence of protein and soluble amino acids, sugars, and other nutritional components.

**2. Proximate analysis and protein content studies.**

Various international studies have conducted proximate (i.e., primary nutritional) analyses of *C. rotundus* . *For example,* in a study by Emelugo et al ., the crude protein content of *C. rotundus* round roots was found to be 1.75±0.55% in a proximate analysis . This result was presented along with other nutritional components.

Another study reported that the protein content of *C. rotundus* root powder was 6.17% . It is cautioned that these values may vary depending on the plant's growing conditions, collection, and analysis methods.

Recently published studies have shown that the crude protein content of *C. rotundus varies between* 10.51 and 14.40% in liquid and dry matter at different growth stages , further illuminating the biological and nutritional value of this plant.

**3. Methodological approaches to protein analysis.**

Various methods are used to determine protein content: the Keldahl method, Lowry or Bradford spectrophotometric methods, etc. The study of protein content is especially important in the evaluation of plant biomass components, analyzing their potential use as animal feed or pharmacological preparations. In the scientific literature, these methods are described in standard analytical data for plants such as *C. rotundus* .

**4. Differences and explanations noted in the literature.**

*C. rotundus samples* grown in different geographical areas . This may be due to genetic variation of the plant, soil conditions, and climate changes. Therefore, further studies on samples from different regions are needed.

**Determination of total protein.** The method consists in determining nitrogen by the Kjeldahl method, followed by conversion to protein. The essence of the method is the decomposition of organic substances in the sample with the formation of ammonium salts when boiling with concentrated sulfuric acid, the conversion of ammonium to ammonia, its distillation into an acid solution, the quantitative accounting of ammonia by the titrimetric method. and calculation of the nitrogen content in the material under study [ 7 ]

A precise sample from the average crushed homogeneous sample of the test sample was weighed into a test tube for analysis, with an error of no more than 0.1%. The sample was quantitatively transferred to a Kjeldahl flask. Further experiments were carried out in accordance with the methodological instructions [8].

Processing of results: the mass fraction of nitrogen (X) in the test sample was calculated by the formula in percentage relative to its mass during the distillation of ammonia into sulfuric acid.

$$X = \frac{(V_1 - V_0) \times K \times 0{,}0014 \times 100}{M},$$

Here; Vo is the volume of 0.1 mol/l sodium hydroxide solution used to titrate 0.05 mol/l sulfuric acid in the control experiment, ml.

V1 – volume of 0.1 mol/l sodium hydroxide solution used to titrate sulfuric acid in the test solution, ml;

K – correction to the titer of 0.1 mol/l sodium hydroxide solution;

0.0014 – the amount of nitrogen equivalent to 1 ml of 0.05 mol/l sulfuric acid solution;

M is the mass of the sample, g. The results were calculated to the third decimal place and rounded to the second decimal place.

The mass fraction of nitrogen in the dry matter of the product ($X_3$), in percent, was calculated using the following formula:

$$X_3 = \frac{X_1 \times 100}{100 - W},$$

Where; $X_1$ – mass fraction of nitrogen in the sample being tested, %;

W – moisture content of the test sample, %.

The mass fraction of protein (Y) as a percentage was calculated according to the following formula: Y = K XX, where K is the coefficient of nitrogen transfer to protein: with an average lipid content - 6.38;

**RESULTS AND DISCUSSION**

**Collection of plant samples.** *C. rotundus* plants were collected from natural growing areas of Andijan region during the growing season. Plant species identification was performed based on standard botanical keys. Root parts were separated, cleaned of soil residues, and washed with distilled water.

**Sample preparation.** The washed root samples were dried at room temperature and ground in a laboratory mill to a uniform powder. The prepared samples were stored in airtight containers.

*Cyperus rotundus* L. root.

***Table 1***

| No. | Sample | Nitrogen (%) | Protein (%) |
|---|---|---|---|
| **1** | Cyperus rotundus L. | **1.24** | **7.89** |

This in research Andijan province under the circumstances from the sky *Cyperus round L.* o ' wire at the root general nitrogen amount Keldal method based on **1.24%** , raw protein amount and classic **N × 6.25** coefficient using **7.89 %** that The results obtained confirm the nutritional and biochemical potential of *C. rotundus* and are somewhat consistent with previously published scientific works.

In the literature *C. rotundus* root and of the rhizomes raw protein amount wide in the range — **from 1.7% to 14%** change record These differences are mainly explained by the fact that they depend on the geographical location of the plant, agroclimatic conditions, soil composition, vegetation stage, and the methodology for preparing and analyzing samples. The protein content of **7.89% determined in the sample from Andijan region** corresponds to the average values of this range, indicating that the plant can synthesize stable protein under regional conditions.

Determined nitrogen amount ( **1.24%** ) and from it calculated protein share *C. rotundus* at the root not only structural , maybe metabolic active proteins the existence also guess to do opportunity It is known that proteins accumulated in roots and rhizomes are often directly related to enzymatic activity, stress tolerance, and secondary metabolite biosynthesis. In this respect, the results obtained indirectly support previously reported ideas about the pharmacological activity of *C. rotundus* .

It should also be noted that the crude protein content determined by the Keldahl method includes non-protein nitrogenous compounds in addition to the actual proteins in the plant.

However, this method is a widely accepted standard method for proximate analysis of plant raw materials in SCOPUS-indexed journals, and the results are considered reliable enough to be compared with other studies. However, further determination of the amino acid composition or comparison with the Dumas method will allow a more in-depth assessment of the quality parameters of *C. rotundus proteins.*

From a regional perspective, the mineral composition of the soils and climatic conditions of the Andijan region may have a positive effect on nitrogen metabolism in plants. This, in turn, may have led to a relatively high protein synthesis in root tissues. Therefore, the results obtained serve as an important scientific basis for assessing the regional nutritional value of *C. rotundus* .

Overall, the results of this study indicate that the root of *C. rotundus* is a biologically active plant raw material in terms of protein content and substantiate the prospects for its study as a nutritional supplement, phytopreparation or animal feed component. The data obtained complement the existing literature and create a scientific basis for further studies aimed at assessing the chemical composition of *C. rotundus in a regional context.*

## CONCLUSION

The crude protein content of the roots of *C. rotundus* L. collected from Andijan region was determined using the Kjeldahl method. According to the analysis results, the total nitrogen content was **1.24%** and the crude protein content was **7.89% .**

The results obtained indicate that the root *of C. rotundus* L. is moderately rich in protein and confirms the biological and nutritional value of the plant. The soil-climatic conditions of the region may have influenced the nitrogen accumulation and protein synthesis in the root tissues.

Overall, the results of this study make an important scientific contribution to the assessment of the chemical composition *of C. rotundus* L. in a regional context and provide a basis for future studies of its amino acid composition, functional properties, and potential applications.

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