Journal of Tropical Agriculture 63(4): 292-295, 2025
ISSN 0971-636X (Print), ISSN 0973-5399 (Online)
DOI No.: 10.63599/JTA.2025.1598

Short Communication

# Assessment of biochemical attributes in *Coleus rotundifolius* (Poir.) A. Chev. & Perrot germplasm from Kerala

K. Shafna*[1], P. Athira[2], P. Jaseena[3], K. Musthafa[4], V. Sumbula[5] and P. A. Akhisha[6]

[1]*Dept. of Horticulture, Agricultural Research Station, Anakkayam, Kerala Agricultural University, 676 509, Kerala, India*
[2]*Dept. of Botany,College of Global Studies (Affiliated to University of Calicut), Puthanathani, Malappuram 676 551, Kerala, India*
[3]*Dept. of Horticulture, Agricultural Research Station, Anakkayam, Kerala Agricultural University, 676 509, Kerala, India*
[4]*Agricultural Research Station, Anakkayam, Kerala Agricultural University, 676509, Kerala, India*
[5] *Dept. of Plant Pathology, Agricultural Research Station, Anakkayam, Kerala Agricultural University, 676509 , Kerala, India*
[6] *Vanavarayar Institute of Agriculture, Manakkadavu, Pollachi 642103, Tamil Nadu, India*

Received on 01 July 2025; received in revised form 03 October 2025, accepted 18 October 2025.

**Abstract**

This investigation focused on evaluating the biochemical composition of two released varieties and seven accessions of *Coleus rotundifolius* (Poir.) A. Chev. & Perrot, such as contents of ash, moisture, total sugars, reducing and non-reducing sugars. The experiment was conducted during 2022–2024 at the Agricultural Research Station, Anakkayam, Malappuram district. Among the genotypes, treatment $T_2$ (Sreedhara) recorded the highest total sugar and reducing sugar contents. With respect to non-reducing sugar content, the significantly the highest value is observed in $T_2$(Sreedhara), which was on par with $T_7$(MKD-1). No significant difference was observed with respect to ash content among the treatments. Furthermore, the biochemical evaluation of the collected accessions revealed that comparable levels of essential minerals namely phosphorus, potassium, calcium, and iron in the collected accessions. These findings highlight the nutritional potential of both the existing varieties and selected accessions and support their future use in breeding and genetic improvement programs aimed at enhancing tuber quality and nutritional value.

**Keywords:** *Coleus rotundifolius*, Biochemical attributes, Reducing sugar, Moisture content

Chinese potato (*Coleus rotundifolius* (Poir.) A.Chev. & Perrot) is indeed an underutilised crop. This plant, a member of the Lamiaceae family, is primarily grown for its tuberous roots, which are edible and also rich in essential nutrients. The plant is known for its adaptability in different climates, especially in Southeast Asia and Africa (Hemapriya and Anbuselvi, 2013). Prajapati et al*.,* (2003) reported that it can be grown through vegetative methods, allowing flexibility and ease in cultivation practices.

Duke et al.,(2002) reported that the Coleus plant has exerted multiple physiological and therapeutic effects, including central nervous system suppression, stimulation of glycogen breakdown, and enhancement of gastric activity. He also added its role in blood pressure reduction, promotion of glucose production, suppression of immune responses, fat metabolism enhancement, muscle relaxation, stimulation of nerve activity, increased pancreatic secretion, improvement of cardiac contractility, facilitation of glandular secretions such as saliva, modulation of thyroid function, and vascular dilation.

The analysis results of Gomathy et al. (2020) highlight the untapped potential of this crop in the routine diet, specifically in achieving recommended nutrient intake levels. According to Hempriya and Anbuselvi (2013), the tubers are nutritionally rich, containing significant concentrations of reducing sugars at 26 mg/100 g, proteins ranging from 13.6 to 14.6 per cent, crude fat at 1.2 per cent, and crude fiber at 1.6 per cent were observed. In addition, essential minerals like phosphorus at 36 mg/ 100 g and calcium at 29 mg/100 g were also noted. They also provide vitamins A (13.6 mg/100 g) and C (10.3 mg/100 g), along with beneficial antioxidant compounds

The objective of this study was to assess the variability and to evaluate the biochemical parameters of Coleus(Chinese potato) collected from different parts of Kerala, for the development of high-yielding, nutrient-rich cultivars.

This study was conducted from May 2023 to January 2024 (single season) at the Field, research laboratory, and processing unit located at the Agricultural Research Station,

* Author for Correspondences: Phone :7012550157; Email: shafna.k@kau.in; ORCID ID:0009-0000-1153-150X

located at Anakkayam, Malappuram. Geographically, the location lies 11°00'05.6" north latitude & 76°07'03.0" east longitude, positioned 47 meters above Mean Sea Level.

Propagation materials comprising two varieties and seven accessions were collected from various research institutions and farmers' fields between 2022 and 2023, as detailed. (Table No.1)

*Table 1.* Details of experimental treatments, varieties, and accessions of *Coleus rotundifolius*

| Treatments | Coleus accessions collected |
|---|---|
| $T_1$ | Nidhi (KAU, Pattambi, Palakkad, Kerala) |
| $T_2$ | Sreedhara (CTCRI, Sreekaryam, Trivandrum, Kerala) |
| $T_3$ | Alur collection (Palakkad) |
| $T_4$ | TCM 9 (Palakkad) |
| $T_5$ | M131 (Palakkad) |
| $T_6$ | CP74 (Palakkad) |
| $T_7$ | MKD-1 (Mankada) |
| $T_8$ | PML-1 (Pulamanthole) |
| $T_9$ | TSR-1 (Thrissur) |

The collected accessions and varieties were cultivated in the field according to the Package of Practices of Kerala Agricultural University, Thrissur (KAU,2016). The experiment was laid out in a Randomized Block Design (RBD) with three replications for each treatment. A total of nine treatments (varieties) were evaluated. Single harvesting was carried out once the plants had completely dried, with the process beginning in December 2023. Tubers from each replication of all nine accessions were collected separately. The yield attributing characters were recorded separately. The harvested crop was cleaned and properly prepared for biochemical analysis. The study analysed total and specific sugars (reducing and non-reducing), along with ash and moisture contents.

The Lane and Eynon method, which involves the use of Fehling's solution, was employed to quantify the amount of reducing sugars in the sample. To determine ash content, 5g of the sample were incinerated in a muffle furnace at 550°C for four hours. Moisture content was assessed by drying 5g of the fresh sample in a laboratory oven at 105°C for 16 hours or until a constant weight was reached (Sadasivam and Theymoli, 1987)

In addition, the mineral composition, such as Iron, Potassium, Calcium, and Phosphorus content, was also analysed. Phosphorus is analysed using diacid digestion followed by reading in ICP-OES. Potassium is analysed using diacid digestion followed by reading in a Flame photometer. Calcium and Iron are analysed using diacid digestion followed by reading in an Atomic absorption spectro photometer.

Statistical Analysis of the observed data was carried out using OPSTAT. Analysis of variance was conducted for all parameters observed. When results were significant, the Critical Difference (CD value) was determined at a five percent significance level for comparison of treatment means. Significant variation was observed among the treatments for all the parameters observed, except for ash content. The total sugar content ranged from 4.10 % to 5.53% among the treatments. Significantly, the highest total sugar content was observed in $T_2$ (Sreedhara) and the lowest in $T_4$ (MKD-1). Reducing sugar content varies from 1.26% to 2.56%. Significantly, the highest reducing sugar content was observed in $T_2$ (Sreedhara), and the lowest in $T_6$(CP74)and $T_4$(TCM9). Significantly higher non-reducing sugar content was found in $T_2$(Sreedhara), which was on par with $T_7$(MKD-1). Non-reducing content in $T_2$, Sreedhara is 3.63% and in $T_7$, MKD-1, it is 3.56%. The values of non-reducing content vary from 2.9% to 3.63%. The ash content ranged from 3.06% to 3.30%, with no significant difference among the treatments. Significantly, the highest moisture content was observed in $T_7$, ie, MKD-1. The treatment $T_5$ observed 76.58% moisture content, and on par results were observed in $T_1$ (Nidhi), $T_2$ (Sreedhara), $T_3$ (Allur collection), $T_4$ (TCM-9), and $T_8$ (PML-1). Significantly lower value, with respect to moisture content, was observed in $T_6$ (CP74).

The present findings are consistent with Jayakody et al., (2005), who reported a reducing sugar content of 0.32% in Coleus tubers. Among the accessions, $T_2$ (Sreedhara)

*Table 2.* Biochemical parameters of *Coleus rotundifolius* observed under different treatments

| Treatments | Accessions and varieties | Total sugar content (%) | Reducing sugar content (%) | Non-reducing sugar content (%) | Ash content (%) | Moisture content (%) |
|---|---|---|---|---|---|---|
| $T_1$ | Nidhi | $4.700^{b}$ | $1.560^{bc}$ | $3.333^{abc}$ | $3.3093^{a}$ | $75.988^{ab}$ |
| $T_2$ | Sreedhara | $5.533^{a}$ | $2.567^{a}$ | $3.633^{a}$ | $3.2627^{a}$ | $76.559^{ab}$ |
| $T_3$ | Alur collection | $4.400^{de}$ | $1.633^{b}$ | $3.467^{ab}$ | $3.2587^{a}$ | $75.883^{ab}$ |
| $T_4$ | TCM 9 | $4.600^{bcd}$ | $1.300^{e}$ | $3.200^{bcd}$ | $3.2547^{a}$ | $76.257^{ab}$ |
| $T_5$ | M131 | $4.667^{bc}$ | $1.533^{c}$ | $3.100^{cd}$ | $3.2447^{a}$ | $76.586^{ab}$ |
| $T_6$ | CP74 | $4.267^{ef}$ | $1.267^{e}$ | $2.900^{d}$ | $3.0660^{c}$ | $71.432^{c}$ |
| $T_7$ | MKD-1 | $4.100^{f}$ | $1.500^{cd}$ | $3.567^{a}$ | $3.1547^{b}$ | 78.240a |
| $T_8$ | PML-1 | $4.433^{cde}$ | $1.333^{e}$ | $3.100^{cd}$ | $3.2650^{a}$ | $75.876^{ab}$ |
| $T_9$ | TSR-1 | $4.600^{bcd}$ | $1.433^{d}$ | $3.167^{bcd}$ | $3.1257^{bc}$ | $73.423^{bc}$ |
| CD (0.05) | | 0.237 | 0.098 | 0.351 | NS | 3.481 |

Table 3. Variation in Phosphorus, Potassium, Calcium, and Iron content among treatments of *Coleus rotundifolius*

| Treatments | Accessions and varieties | Phosphorus (%) | Potassium (%) | Calcium (%) | Iron (%) |
|---|---|---|---|---|---|
| $T_1$ | Nidhi | 0.225 $^{a}$ | 1.380 $^{b}$ | 0.118 $^{f}$ | 0.056 $^{d}$ |
| $T_2$ | Sreedhara | 0.205 $^{b}$ | 1.329 $^{c}$ | 0.147 $^{c}$ | 0.066 $^{b}$ |
| $T_3$ | Alur collection | 0.144 $^{h}$ | 1.203 $^{g}$ | 0.131 $^{d}$ | 0.049 $^{f}$ |
| $T_4$ | TCM 9 | 0.182$^{f}$ | 1.277 $^{e}$ | 0.132 $^{d}$ | 0.053 $^{e}$ |
| $T_5$ | M131 | 0.157$^{g}$ | 1.226 $^{f}$ | 0.127 $^{e}$ | 0.068 $^{a}$ |
| $T_6$ | CP74 | 0.194$^{e}$ | 1.278 $^{e}$ | 0.115 $^{g}$ | 0.052 $^{a}$ |
| $T_7$ | MKD-1 | 0.197$^{e}$ | 1.314 $^{d}$ | 0.157 $^{b}$ | 0.062 $^{c}$ |
| $T_8$ | PML-1 | 0.196$^{cd}$ | 1.468 $^{a}$ | 0.159 $^{a}$ | 0.052 $^{e}$ |
| $T_9$ | TSR-1 | 0.195 $^{de}$ | 1.190 $^{h}$ | 0.102 $^{h}$ | 0.068 $^{a}$ |
| CD (0.05) | | 0.002 | 0.009 | 0.002 | 0.002 |

recorded significantly the highest specific sugar values, while $T_5$ (M131) recorded the third significantly highest total sugar content. $T_7$ (MKD-1) exhibited higher non-reducing sugar levels, desirable for starch and flour production, whereas $T_3$ (Allur collection) had the significantly second highest reducing sugar content. A related investigation on *Solenostemon rotundifolius* by Kwazo et al., (2021) reported comparable results, with reducing, total, and non-reducing sugar contents of 0.31%, 4.5%, and 3.8%, respectively, highlighting the nutritional potential of these underutilised tubers. Such variation in sugar composition across accessions and species reflects differences in processing suitability, storage stability, and nutritional quality, underscoring their scope for targeted utilisation and crop improvement.

The moisture content of coleus tubers in the present study ranged from 71.4% to 76.58%. Gomathy et al., (2020) reported a moisture content of 78.14 ± 0.84% in black potato, while Hemapriya and Anbuselvi (2013) found a relatively lower value of 61% in tuber pulp. Similarly, Anbuselvi and Balamurugan (2013), in their study on the nutritional and antinutritional properties of *Plectranthus rotundifolius* using standard analytical methodologies, reported a moisture content of 62% in the tubers, which is slightly lower than the values obtained in the present study. In addition, Jayakody et al., (2005), while studying tuber and root starches and their physicochemical properties in Sri Lanka, recorded a moisture content of 77.2% in coleus tubers. In addition,

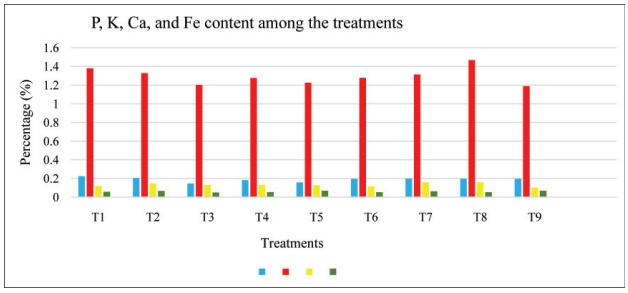


Figure 1. Graphical representation of Phosphorus (P), Potassium (K), Calcium (Ca) and Iron (Fe) content among the treatments

Leung et al., (2009), in the *Food Composition Table for Use in Africa,* reported a moisture content of 78.6%.Such variations in reported moisture levels may be attributed to differences in analytical techniques, varietal diversity, agro-climatic conditions, and post-harvest handling. The relatively high moisture content observed in coleus tubers indicates their perishable nature, emphasizing the need for appropriate storage and processing measures to enhance shelf life and maintain quality.

The ash content of the coleus tubers in this study ranged from 3.06% to 3.30%, with no significant differences observed among the accessions. These values are comparable to the findings of Gomathy et al., (2020), who reported an ash content of 3.26 ± 0.60% in black potato, and Hemapriya and Anbuselvi (2013), who documented 3.6% ash in tuber pulp. Jayakody et al., (2005) also reported an ash content of 3.15% in coleus tubers grown in Sri Lanka, while Leung et al., (2009) documented 3.16% in the *Food Composition Table for Use in Africa.* Ash content is an indicator of the total mineral composition of a food material, reflecting its nutritional value.

Significant difference was observed with respect to Phosphorus, Potassium, Calcium, and Iron content among the treatments. Significantly higher Phosphorus content was observed in treatment $T_1$ (Nidhi), followed by $T_2$ (Sreedhara). But with respect to Potassium content, the significantly highest value was observed in $T_8$ (PML-1), followed by $T_1$ (Nidhi) and $T_2$ (Sreedhara). Significantly higher Calcium content was found in $T_8$ (PML-1), followed by $T_7$ (MKD-1). The treatment $T_5$ (M131) reported the significantly highest value with respect to Iron content, which is on par with $T_9$ (TSR-1).

The tubers of the Chinese potato are a good source of several minor nutrients and vitamins that support proper body functioning. They are also rich in energy, with carbohydrate content comparable to that of potatoes. In addition, the tubers have been reported to contain essential amino acids along with minerals like calcium and iron (Mohan et al., 2024).

Tutu et al. 2024 reported considerable variation in the mineral composition of coleus tubers. The iron content was found to range from 6.50 ± 0.89 to 8.70 ± 0.08 mg/100 g, while calcium content varied between 58.84 ± 0.02 and 234.41 ± 0.10 mg/100 g. In addition, the phosphorus content range, from 451.90 to 343.34 ± 0.71 mg/100 g.These results indicate that, although iron is present only in trace amounts, coleus tubers can serve as a significant source of calcium and certain macronutrients.

When combined with the findings of the present study, it becomes evident that coleus tubers represent a valuable source of calcium, potassium, and phosphorus, in addition to providing iron in comparatively lower concentrations. This suggests that coleus has potential nutritional importance, particularly in contributing to dietary mineral intake. Moreover, the accessions evaluated in these studies exhibit promising mineral content, indicating their potential for further detailed investigations in future research to enhance nutritional profiling and utilization.

## Acknowledgement

The authors express their gratitude to Kerala Agricultural University, Thrissur, Kerala, for offering the essential infrastructure and technical support.

## References

Anbuselvi, S., and Balamurugan, T. 2013. Nutritional and Anti-nutritional constituents of Manihot esculentus and *Plectranthus rotundifolius*, *International Research Journal of Pharmacy*, 4(9):97p. doi:10.7897/2230-8407.04919

Duke, J. A., Godwin, M. J., Cellier, D. U. J., and Duke, P. A. K. 2002. *Hand book of Medicinal Herbs*. CRC Press, USA, pp. 210-215. Available:https://doi.org/10.1201/9781420040463

Gomathy, S., Nizar, N.M., Muhamad, F.N., Syaherah, T.A., Suhairi, T.M., Jahanshiri, E., Gregory, P.J., and Azam-Ali, S. 2020. Nutritional composition of black potato (*Plectranthus rotundifolius* Poir. Spreng.) (synonym: *Solenostemon rotundifolius). International Journal of Scientific & Engineering Research,* 11(10):1120–1128.

Hemapriya, M. and Anbuselvi, S. 2013. Nutritional and anti-nutritional constituents of *Plectranthus rotundifolius*. *International journal of Pharmaceutical sciences Review and Research,* 22(1):213-215.

Jayakody, L., Hoover, R., Liu, Q., and Weber, E. 2005. Studies on tuber and root starches: Structure and physicochemical properties of innala (*Solenostemon rotundifolius*) starches grown in Sri Lanka. *Food Research International,* 38(6):615–629. doi:10.1016/j.foodres.2004.11.015

KAU (Kerala Agricultural University) 2016. Package of Practices Recommendations: Crops (15th Ed.). Kerala Agricultural University, Thrissur, 360p

Kwazo, H. A., Swaiman, A. U., Abdulmumin, U., Muhammed, M. U., and Muhammed, S. 2021. Comparative Assessment of Chemical Composition and Anti-Nutrient Components of *Solenostemon rotundifolius* tuber pulp and peel, *African Journal of Food Science and Technology*.12(4):01-06. doi:10.14303/ajfst.2021.021

Leung, T.W., Busson, F., and Jardin, C. 2009. *Food Composition Table for Use in Africa.* Food and Agriculture Organization, United Nations, pp.92-93.

Mohan C., Senthilkumar, K. M., Krishnakumar, T., and Chauhan, V. B. S. 2024. Tropical Tuber Crops: A potential crop for food, nutritional, and energy security. *Tuber Crops Manual*. ICAR-CTCRI, pp.01-15.

Prajapati, N. D., Purohit. S. S., Sharma, A. K., and Kumar, T. 2003. *A Handbook of Medicinal Plants*, Agrobios Publishers, India, 162p.

Sadasivam, S., and Theymoli, B.1987. *Practical manual in Bio-Chemistry*, Tamil Nadu Agricultural University, Coimbatore, pp.11-13.

Tutu, C.O., Amissah, J.G.N., Amissah, J.N., Akonor, P.T., Budu, A.S., and Saalia, F.K. 2024. Physical, chemical, and rheological properties of flour from accessions of Frafra potato (*Solenostemon rotundifolius*). *Journal of Agriculture and Food Research*, 15:1-11. doi:10.1080/10942912.2023.2228513