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Studies on the effect of feather degraded soil on the growth and proximate content of *Centella asiatica* L.

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Abstract
The aim of the present investigation was assessed the influence of these degraded feather (termed as feather protein hydrolysate) on *Centella asiatica* plant growth promotion activity and proximate contents. We raised plants in each of treatments and examined an array of vegetative traits like leaves, leaf length (cm), leaf width (cm), number of branches (ns), shoot length (cm) and root length (cm), proximate contents are like dry matter (%), crude fiber (%), crude protein (%), ash (%), crude fat (%) and carbohydrate (%) were performed respectively. Most of the observed growth traits and proximate were demonstrated significant variation in response to MIRR 3 treatment. The *C. asiatica* plant can maximize growth and proximate in habitat with control, MIRR 1 and MIRR 2 rather than MIRR 3.

Keywords: *Centella asitica*, degraded feather, fertilizer, growth traits, proximate

Introduction

Maintenance of maximum agriculture productivity is a prerequisite to cater the demands of growing population (Perez-Montano *et al.*, 2014) [11]. To increase the productivity of crops, synthetic fertilizers are being used all over the world. Overuse of these fertilizers leads to their gradual entry into water systems through rain water and causes eutrophication. Recently, several biological approaches for improving crop productivity are gaining strong impetus among agronomists and environmentalists (Khushboo *et al.*, 2016) [6].

Preparation of biofertilizers using chicken feather wastes is attracting the focus of many research scientists. Feather meal is a cheap and easily available source of nitrogen (15 % N) and may serve as a potential biofertilizer (Jeong *et al.*, 2010) [5]. Feathers are the major byproducts of poultry industry and considered as waste. Feathers (composed of protein keratin) are metabolized by a number of microorganisms as a source of carbon and nitrogen. Degradation of feathers results in production of amino acids and peptides which can be employed as precursors for plant growth-promoting metabolites.

The plant growth-promoting activity of protein hydrolysates could also be effectively applied in agriculture (Tiwary and Gupta 2010) [14]. Thus, microbial degradation of feather represents an alternative for development of slow-release nitrogen fertilizers. The degraded product of chicken feathers could generate appropriate amount of tryptophan which is the key source of IAA synthesis (Tsavkelova *et al.*, 2012) [15].

Centella asiatica L. (Gotu Kola) Urban (*Syn. Gotu Kola coriacea* Nannfd, *Hydrocotyle asiatica* L., *Hydrocotyle lunata* Lam., and *Trisanthus cochinchinensis* Lour.) is a tropical medicinal plant from Apiaceae family native to Southeast Asian countries such as India, Sri Lanka, China, Indonesia, and Malaysia as well as South Africa and Madagascar. The present study deals with the study of *Centella asiatica* L. plant growth promoting attributes of degraded feather as a biofertilizer.

Materials and Methods

Degraded feather

Degraded feathers (fertilizer) were purchased from Indian Biotrack Research Institute, Thanjavur, Tamil Nadu.

Plantation of *Centella asiatica* (Anjana and Pramod, 2009) [4]

Several plant cuttings of randomly sampled individual plants of *C. asiatica* were collected from Indian Biotrack Research Institute Garden, Karuvakurichi, Mannargudi. The cuttings of plantlets were more or less uniform size containing four leave condition; were planted in earthen shallow pots in greenhouse conditions. Ten plants for each treatment were planted separately for experiment. Planting was done in September 2021 and equal amount of water was provided for irrigation purpose for each treatment. All pots and treatments were rotated each week to counter any positional effects of pots within treatments.

Soil Treatment (Nurfatiha *et al.*, 2018) [9]

The soil was treated by degraded feather with different concentration such as, 25mg, 50mg, 75mg and untreated soil was considered as a control.

Control- Untreated with degraded feather
MIRR 1- degraded feather 25mg
MIRR 2- degraded feather 50mg
MIRR 3- degraded feather 75mg

Growth Measurement (Noor *et al.*, 2018) [8]

Data on yield and morphological traits were recorded in October 2021. replication, selected randomly were used for the observations. The phenotypic characters such as colour of leaves, leaf length (cm), leaf width (cm), number of branches (ns), shoot length (cm) and root length (cm) were measured.

Proximate analysis of *Centella asiatica* (Ajay *et al.*, 2020) [1]

The moisture content was determined by drying at 105°C in an oven until a constant weight reached. For total ash determination, the leaf sample was weighed and converted to dry ash in a muffle furnace at 450°C for incineration. The crude fat content was determined by extraction with n-hexane using a Soxhlet apparatus. All these determinations were carried out according to AOAC (1990). Kjeldahl method was used for crude protein determination. Carbohydrate content was determined by calculating the difference between the sums of all the proximate compositions from 100%.

Result and discussion

In the present investigation were analysed with influence on growth and proximate contents of *Centella asiatica* L. growth traits are observed at 30th days such as colour of leaves are dark green, leaf length (2.81±0.05cm), leaf width (3.12±0.11cm), number of branches (6.35±0.00ns), shoot length (12.7±0.08cm) and root length (0.86±0.12cm) are highly observed in the treatment of MIRR 3 (combination). These growth parameters of Control (untreated), MIRR 1 and MIRR 2 treatments were lessthan the MIRR 3 (Table – 1).

Anjana and Pramod, (2009) [4] was reported *Centella asiatica* measured traits of leaves varied significantly with soil type. the leaf traits, the extent of variation was the highest. There was no significant difference in leaf number among the various soil treatments. Growth of root was also affected significantly with soil type.

Noor *et al.*, (2018) [8] studied the plant treated by both NPKOZ Pot (M = 20.00, SE = 2.97) and NPKOZ Verti (M = 21.20, SE = 1.88) exceeded more than 20 leaves.

Patel (2015) was stated the *Centella asiatica* root length 12 – 15 cm, root diameter 1.5 – 2.5 cm, leaf length 1.5 – 2.0 cm and leaf broad 0.5 – 1.0 cm noted from the untreated clay soil.

Ali *et al.*, (2017) was reported the leaf surface area (12.58%), leaf blade width (12.43%), and leaf blade length (10.28%), which were collectively greater than the eigenvectors of the total variation of morphological parameters. Shukurova *et al.*, (2021) [13], stated the *Centella asiatica* leaf size varied from 5.00 to 7.70 cm in length and from 5.30 up to 9.00 cm in width. Leaf area ranged between 27.69 and 79.22 cm^2.

In the present study is takes that the proximate analysis were revealeded the following results such as dry matter (93.8±0.09%), crude fiber (3.24±0.06%), crude protein (12.8±0.55%), ash (3.17±0.05), crude fat (2.76±0.43%) and carbohydrate (78.68±1.71%) are high found to be recorded in MIRR 3. All the proximate content are high quantity when compared with the other treatments like control, MIRR 1, MIRR 2 (Table – 2).

Alagbe (2019), reported the proximate composition of *Centella asiatica* leaf meal (CSP) was presented. Dry matter content of CSP was 90.44% while those of crude protein, crude fibre, ether extract and total ash are 13.06%, 16.14%, 2.01% and 4.07% noted.

Lasaro (2021) [7], was reported the 50% Carbonized Rice Hull + 50% Composted sawdust was got the highest dry matter content, 50% Vermicast + 50% Cocopeat was obtained the ash content of 1.64%, Garden Soil + Vermicast + Cocopeat + Composted Sawdust (25% each) was obtained the highest protein content with 1.42% and 50% Carbonized Rice Hull + 50% Composted Sawdust was obtained the heaviest weight with 1.95 %. Sheetal *et al.*, (2005) was found and stated the *Centella asiatica* ash content of 0.77–3.54 g/100 g reported.

Table 1: Effect of degraded feather on the growth and development of *Centella asiatica*

Phenotypic Characteristics	Control	MIRR 1	MIRR 2	MIRR 3
Colour of Leaves	Flourescent green	Green	Green	Dark green
Leaf Length (cm)	1.73±0.08	1.91±0.11	2.43±0.12	2.81±0.05
Leaf Width (cm)	2.11±0.05	2.75±0.11	2.93±0.08	3.12±0.11
Number of Branches (ns)	3.55±0.33	4.55±0.00	4.33±0.33	6.35±0.00
Shoot Length (cm)	10.6±0.29	11.4±0.17	11.8±0.14	12.7±0.08
Root Length (cm)	0.33±0.03	0.66±0.08	0.43±0.14	0.86±0.12

The values are expressed with mean±standard deviation
MI – M. Indira, RR – R. Rajakumar

Table 2: Proximate analysis of degraded feather treated *Centella asiatica*

Parameters	Percentage (%)			
	Control	MIRR 1	MIRR 2	MIRR 3
Dry matter	91.3±0.05	92.5±0.03	89.7±0.01	93.8±0.09
Crude fiber	2.53±0.07	3.05±0.03	2.87±0.11	3.24±0.06
Crude protein	11.4±0.31	11.8±0.08	12.1±0.29	12.8±0.55
Ash	3.11±0.14	2.84±0.34	2.99±0.87	3.17±0.05
Crude fat	2.34±0.07	2.49±0.02	2.38±0.14	2.76±0.43
Carbohydrate	63.05±1.02	68.73±0.86	73.55±0.97	78.68±1.71

The values are expressed with mean±standard deviation
MI – M. Indira, RR – R. Rajakumar

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