



## Analysis of Weeds and Derived Composts for Enhancing Growth and Quality of Fenugreek (*Trigonella foenum-graecum* L.)

Shubhangi Chavan<sup>1</sup> S. B. Sanap<sup>2</sup>

<sup>1</sup>Dept of Botany, Sanjeevane Mahavidyalaya Chapoli, Dist. Latur, MS

<sup>2</sup>Dept of Botany, Late Shankarrao Gutte ACS College Dharmapuri, Dist. Beed, MS

Corresponding Author: Shubhangi Chavan

Email: [sanapsb.bot11@gmail.com](mailto:sanapsb.bot11@gmail.com)

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### Abstract:

This study evaluates the impact of different weed composts on the growth and nutrient uptake of fenugreek (*Trigonella foenum-graecum* L.). Composts prepared from weeds such as *Cassia tora*, *Ipomoea muricata*, and *Hyptis suaveolens* were applied to fenugreek crops. The results show significant variations in plant growth parameters, demonstrating the potential of using weed composts as a sustainable agricultural practice.

**Keywords:** Fenugreek, Weed Compost, Sustainable Agriculture, Organic Manure

### Introduction:

Fenugreek (*Trigonella foenum-graecum* L.) is a valuable herb known for its medicinal properties and nutritional value. It has a rich history of use in various cultures and is widely distributed globally (Slinkard, 2006; Rouk & Mangesha, 1963; Rosengarten, 1969; Edison, 1995). This herb is cultivated for both forage and human consumption, particularly in regions where meatless diets are prevalent (Paroda & Karwasra, 1975; Piper, 1947; Duke, 1986; Howard, 1987).

Soil health is crucial for sustainable agriculture, and composting organic materials like weeds can improve soil structure, fertility, and

microbial activity (Epstein, 1997; Poincelot, 1975; Miller, 1993). This study investigates the use of composts prepared from weeds such as *Cassia tora*, *Ipomoea muricata*, and *Hyptis suaveolens* to enhance the growth of fenugreek, focusing on the growth parameters and nutrient uptake of the crop.

### Materials and Methods

#### Field Site and Experimental Design:

The field experiment was conducted at the research farm of the Botanical Garden at Dr. Babasaheb Ambedkar Marathwada University, Chh. Sambhajinagar. A randomized block design (RBD) was used, with six treatments and four replicates.

Block I	II	III	IV
HC	CC	IC	MC
CON	CON	MC	IC
IC	CC	CON	CON
MC	NPK	CC	CC
NPK	HC	NPK	NPK
IC	MC	HC	HC

### Legend:

CC: Cassia compost, IC: Ipomoea compost, HC: Hyptis compost, MC: Mix compost, NPK: Chemical Fertilizer, CON: Control

### Treatments, Composting Process and Plot Size:

Fresh vegetation of *Cassia tora*, *Ipomoea muricata* and *Hyptis suaveolens* was collected and chopped into small pieces (2-3 cm). Equal amounts (13333 kg/ha) of weed vegetation were used for compost preparation in Bangalore pits (105 x 75 x 90 cm). The composts prepared were Cassia compost (CC), Ipomoea compost (IC), Hyptis compost (HC), Mix compost (MC) in equal proportion (1:1:1), recommended dose of fertilizer (NPK), and control (CON).

The composts were incorporated into the topsoil (15-20 cm) of the experimental plots (1.5 x 1.5 m). Fenugreek seeds were sown at a rate of 30 kg/ha.

### Application of Inorganic Fertilizer:

NPK fertilizers were applied at recommended levels (40 N, 30 P, 30 K kg/ha) to the NPK treatment. All plots received irrigation as needed.

### Analysis:

#### Chemical Analysis

Chemical analyses of plant samples were conducted using standard analytical methods:

**Ash Content:** Ash values were obtained by burning moisture-free samples in a muffle furnace at 600°C for 2 hours.

**Calcium (Ca) Content:** Calcium content was analyzed by titrating the acid-soluble ash solution against 0.01 N KMnO<sub>4</sub> solution using methyl red as an indicator (AOAC, 1995).

**Nitrogen (N) Content:** Nitrogen was estimated using the micro-Kjeldahl method after digesting the sample with concentrated H<sub>2</sub>SO<sub>4</sub> (Bailey, 1967). Crude protein (CP) was calculated by multiplying the nitrogen value by 6.25 (AOAC, 1995).

**Water Soluble Reducing Sugar:** The dry powder of samples was boiled in distilled water, filtered, and the amount of water-soluble reducing sugar in the filtrate was determined using Folin-Wu tubes (Oser, 1979).

**Phosphorus Content:** Phosphorus content was measured following the method of Fiske and Subba Rau (1925) as described by Oser (1979).

**Potassium (K) Content:** Potassium content was determined using a flame photometer (model Mediflame - 127) as suggested by Jackson (1973).

Based on the yield of dry matter and nitrogen content, the total nitrogen accumulated by the aerial biomass was calculated for each treatment. The amount of extra nitrogen accumulated was determined by subtracting the nitrogen accumulated

in the control or untreated samples. Using the extra nitrogen accumulated and the nitrogen supplied with urea or various dry manures, the efficiency of nitrogen use by the plants was calculated.

#### Statistical Analysis:

Data were analysed using analysis of variance (ANOVA) to determine the significance of differences between treatments. The least significant difference (C.D.,  $p = 0.05$ ) was used to compare means where significant differences were found (Mungikar, 1997).

This section provides detailed insights into the methodologies used for growth and chemical analyses of fenugreek plants treated with various weed composts, showcasing the comprehensive nature of the study.

#### Results and Discussion:

##### Analysis of Weeds Used for Compost Preparation:

The analysis of dry matter and nutrient content of the weeds is summarized in Table 1. *Hyptis suaveolens* had the highest dry matter (3176 kg/ha) and nitrogen content (71.0 kg/ha), followed by *Cassia tora* and *Ipomoea muricata*.

Weed Name	Fresh weight (kg/plot)	Fresh weight (kg/ha)	Dry matter (%)	Dry matter (kg/ha)	Nitrogen (%)	Nitrogen (kg/ha)	Nitrogen (kg/ha)	Ash (kg/ha)
<i>Cassia tora</i>	2550	10200	24.20	2468.4	2.38	58.7	8.20	202.4
<i>Ipomoea muricata</i>	2660	10640	22.80	2425.92	2.40	58.2	9.50	230.4
<i>Hyptis suaveolens</i>	2950	11800	26.90	3176.6	2.23	71.0	8.90	281.6

#### Analysis of the Weed Composts:

The fresh weight and nutrient content of the composts prepared from the selected weeds are presented in Table 2. *Hyptis* compost (HC) had the

highest fresh weight (7555 kg/ha) and nitrogen content (42.9 kg/ha), followed by Mix compost (MC), *Cassia* compost (CC), and *Ipomoea* compost (IC).

Compost Name	Fresh weight(kg/ha)	Dry matter (kg/ha)	Organic Carbon (%)	Total Nitrogen (%)	C/N ratio
<i>Cassia</i>	5525	4136.8	11.90	1.19	10.00
<i>Ipomoea</i>	6666	4940.4	15.45	1.41	10.96
<i>Hyptis</i>	7555	5656	19.10	1.28	14.92
Mix	6666	940.4	14.50	1.05	13.81

#### Effect of Composts on Fresh and Dry Weight of *Trigonella*:

The application of weed composts significantly affected the growth parameters of fenugreek. Table 3 presents the fresh and dry weight

of *Trigonella* under different treatments. The highest fresh weight was observed in the IC treatment, while the highest dry weight was found in the CC treatment.

Treatment	Fresh Weight (kg/ha)	Dry Weight (kg/ha)
CC	10444	1522
IC	11111	1472
HC	10000	1434
MC	10666	1490
NPK	10222	1456
CON	9255	1306

**Conclusion:**

The study demonstrates that composts prepared from weeds such as *Hyptis suaveolens*, *Cassia tora*, and *Ipomoea muricata* can significantly improve the growth and nutrient uptake of fenugreek. *Ipomoea* compost showed the highest fresh weight yield, while *Cassia* compost resulted in the highest dry weight, highlighting the potential of using weed composts as an effective and sustainable agricultural practice.

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