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## INFLUENCE OF DIFFERENT ORGANIC NUTRIENT SOURCES ON GROWTH PERFORMANCE OF GOKARNA (*Clitoria ternatea* L.)

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### ABSTRACT

The present paper examines the effects of selected organic fertilizers on the growth performance of Gokarna (*Clitoria ternatea* L.). The study was conducted at the College of Forestry, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri, Maharashtra, during 2023-24. The experiment was laid out in a Randomised Block Design. The six treatments used in the experiment were T<sub>1</sub> (Panchgavya), T<sub>2</sub> (Vermicompost), T<sub>3</sub> (Neem cake), T<sub>4</sub> (Amritpani), T<sub>5</sub> (Jeevamrit) and T<sub>6</sub> (Control), with four replications each. Among these treatments, Vermicompost (T<sub>2</sub>) proved superior with respect to various growth and yield-related parameters, including survival percentage, plant height, collar diameter, number of flowers per plant, number of pods per plant, number of seeds per pod, root length, and dry and fresh weights of roots and shoots at 360 DAP.

**Key words :** *Clitoria ternatea*, Gokarna, organic fertilizers, Vermicompost, Growth.

### Introduction

Medicinal plants and herbs are used for health purposes by a significant and growing number of people worldwide (Al-Snafi, 2016). Medicinal plants can be defined as those traditionally used as medicine by a population or community and with the potential to cure a disease (Rabelo and Costa, 2018). According to WWF and IUCN, approximately 50,000 to 80,000 flowering plants are utilized for their medicinal properties (Gusain *et al.*, 2021).

Butterfly pea is currently gaining popularity worldwide for its health benefits. Several pharmacological effects of the plant have been reported, including antioxidant, analgesic, hypolipidaemic, anti-inflammatory, anticancer, antidiabetic, antipyretic, antimicrobial, antiparasitic, and gastrointestinal activities, among others (Al-Snafi, 2016). Butterfly Pea is scientifically known as *Clitoria ternatea* L. and belongs to the family Fabaceae. It is known by several regional names, such as Gokarna, Aparajita, Kokkatan, Gorani, Girikarnu, and many more. Although it originated in tropical Asia, the plant has spread widely across South and Central America, the East and West

Indies, China, and India (Gupta *et al.*, 2010). *C. ternatea* thrives in many soil types, with a pH ranging from 5.5 to 8.9 (Gomez and Kalamani, 2003). The ideal temperature for germination and establishment of *C. ternatea* lies between 24°C and 32°C (Oguis *et al.*, 2019). Although, the plant can tolerate a wide range of temperatures, rainfall, and altitudes, it is vulnerable to frost and struggles to thrive during winter cold spells (Suma *et al.*, 2019).

*Clitoria* is traditionally used to treat jaundice, migraine, throat and eye infections, asthma, skin diseases, swollen joints, urinary tract infections, snake bites, leprosy and central nervous system issues (Gupta *et al.*, 2010). In addition to its medicinal properties, Butterfly pea can be used as livestock feed. It has a high protein content of 14% to 20% and is highly palatable (Umami *et al.*, 2022). After cutting or grazing, *Clitoria* shows excellent regrowth and produces high yields within a short period (Gomez and Kalamani, 2003).

One of the obstacles to the propagation of Gokarna is its low seed germination rate. Freshly harvested seeds fail to imbibe water and germinate (Oguis *et al.*, 2019). The cultivation of Butterfly pea is confined to certain

regions only. Hence, it is necessary to increase the area under this vital crop through good cultivation practices (Suma *et al.*, 2019).

The growth and production of a plant can be increased through the application of fertilizers. A fertilizer fulfils the plant's nutrient needs and supports maximum production. It helps to increase both the quality and quantity of plants. Farmers frequently employ inorganic fertilizers as a temporary fix to boost plant growth, but they can be detrimental over time. The productivity of the land may be lowered by the application of inorganic fertilizers. It damages the physical, chemical and biological balance of the soil. Organic fertilizers improve soil properties (Umami *et al.*, 2022).

Therefore, the present study was undertaken to evaluate the influence of different organic nutrient sources on the growth and yield performance of Gokarna (*Clitoria ternatea* L.).

### Materials and Methods

The field experiment was conducted at the College of Forestry experimental farm, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri, Maharashtra, during August 2023 to August 2024. During the study period, the minimum and maximum temperatures were 18°C and 35.8°C, respectively. The relative humidity ranged from 64% to 90%. The study was conducted in lateritic soil with 6 treatments and 4 replications each, using a Randomised Block Design (RBD). The six treatments were T<sub>1</sub> [Panchgavya (150 mL plant<sup>-1</sup>)], T<sub>2</sub> [Vermicompost (500 g plant<sup>-1</sup>)], T<sub>3</sub> [Neem cake (500 g plant<sup>-1</sup>)], T<sub>4</sub> [Amritpani (150 mL plant<sup>-1</sup>)], T<sub>5</sub> [Jeevamrit (150 mL plant<sup>-1</sup>)] and T<sub>6</sub> [Control (No fertilizer)]. The respective organic nutrient sources were applied monthly around the root zone of the plants. Healthy Gokarna seedlings were collected from the College of Forestry Central Nursery, Dapoli and transplanted at 1 m × 1 m spacing. A total of 24 plants per treatment and 6 plants per replication were planted. Plants were irrigated manually every two days, with irrigation every alternate day during summer. The survival percentage (%) was recorded at the end of the experiment.

Survival percentage (%) = Number of Surviving Plants / Number of Plants Planted × 100

Plant height was measured with a measuring tape from the base to the highest tip of the shoot. The number of leaves per plant was counted. The collar diameter of the plants was measured using a digital vernier caliper. The number of flowers and pods per plant was counted. Three random plants per replication were selected, and the number of seeds per pod was counted to calculate an

average. Two plants per replication were selected; they were first thoroughly watered to loosen the soil, then carefully uprooted without breaking the roots for growth studies. Fresh and dry shoot and root weights were measured using a digital weighing balance. Soil samples from the field were collected before the onset of the monsoon. To assess the fertility status of the soil, soil pH, Electrical Conductivity, Organic Carbon, available Nitrogen, Phosphorus and Potassium were analyzed at the beginning of the experiment.

Analysis of Variance (ANOVA) was performed using the statistical package OPSTAT (Sheoran *et al.*, 1998).

### Results and Discussion

Data on the influence of different organic nutrient sources on the growth performance of Gokarna (*Clitoria ternatea* L.) are presented in Table 1.

The maximum survival percentage (95.8%) was observed in treatment T<sub>2</sub> (Vermicompost), followed by T<sub>3</sub> (Neem cake), T<sub>5</sub> (Jeevamrit), T<sub>4</sub> (Amritpani), T<sub>1</sub> (Panchgavya) and T<sub>6</sub> (Control), with 91.7%, 91.6%, 87.5%, 83.0% and 70.8%, respectively. Plant height was significantly highest in T<sub>2</sub> (157.72 cm), which was at par with T<sub>5</sub> (148.20 cm) and T<sub>3</sub> (144.02 cm), while the minimum was observed in T<sub>6</sub> (99.55 cm). Collar diameter was significantly highest in T<sub>2</sub> (23.70 mm), which was at par with T<sub>5</sub> (23.17 mm) and T<sub>3</sub> (22.40 mm). The minimum collar diameter was recorded in T<sub>6</sub> (15.37 mm). The number of flowers/plant was also significantly highest in T<sub>2</sub> (2.45 nos.), which was at par with T<sub>5</sub> (1.53 nos.). The significantly highest number of pods/plant (1.91 nos.) was recorded in T<sub>2</sub>. The significantly maximum number of seeds per pod was observed in T<sub>2</sub> (8.83).

The highest root length (38.93 cm) was observed in T<sub>2</sub> (vermicompost), which was on par with T<sub>5</sub> (35 cm). However, T<sub>6</sub> (Control) recorded the lowest root length (23.73 cm), which was on par with T<sub>1</sub> (26.57 cm). The highest fresh (37.87 g) and dry (13.40 g) shoot weights were observed in T<sub>2</sub>. The significantly highest fresh root weight was recorded in T<sub>2</sub> (26.37 g), which was on par with T<sub>5</sub> (26.25 g); however, the minimum fresh root weight was found in T<sub>6</sub> (10.62 g). The dry root weight was significantly highest in T<sub>2</sub> (13.36 g), which was on par with T<sub>5</sub> (13.28 g) and T<sub>4</sub> (10.65 g). The lowest dry root weight was recorded in T<sub>6</sub> (4.82 g). From these observations, T<sub>2</sub> recorded the highest values for most of the growth and yield-related parameters among the six treatments.

The growth and yield of *Clitoria ternatea* L. varied significantly across organic nutrient sources, with

Table 1 : Influence of different organic nutrient sources on growth performance of Gokarna (*Clitoria ternatea* L.).

| Treatment                     | Survival (%) | Plant height (cm) | Collar Diameter (mm) | Flowers plant <sup>-1</sup> | Pods plant <sup>-1</sup> | Seeds pod <sup>-1</sup> | Root length (cm) | Fresh shoot weight (g) | Dry shoot weight (g) | Fresh root weight (g) | Dry root weight (g) |
|-------------------------------|--------------|-------------------|----------------------|-----------------------------|--------------------------|-------------------------|------------------|------------------------|----------------------|-----------------------|---------------------|
| T <sub>1</sub> - Panchgavya   | 83.0         | 130.82            | 20.60                | 0.29                        | 0.54                     | 6.25                    | 26.57            | 25.87                  | 10.08                | 18.75                 | 9.50                |
| T <sub>2</sub> - Vermicompost | 95.8         | 157.72            | 23.70                | 2.45                        | 1.91                     | 8.83                    | 38.93            | 37.87                  | 13.40                | 26.37                 | 13.36               |
| T <sub>3</sub> - Neem cake    | 91.7         | 144.02            | 22.40                | 0.62                        | 0.41                     | 7.50                    | 33.00            | 27.12                  | 9.57                 | 17.75                 | 10.08               |
| T <sub>4</sub> - Amritpani    | 87.5         | 130.85            | 21.19                | 0.24                        | 0.29                     | 6.25                    | 31.61            | 26.75                  | 10.29                | 19.00                 | 10.65               |
| T <sub>5</sub> - Jeevamrit    | 91.6         | 148.20            | 23.17                | 1.53                        | 1.33                     | 8.08                    | 35.00            | 33.87                  | 11.07                | 26.25                 | 13.28               |
| T <sub>6</sub> - Control      | 70.8         | 99.55             | 15.37                | 0.00                        | 0.00                     | 0.00                    | 23.73            | 17.12                  | 6.69                 | 10.62                 | 4.82                |
| Mean                          | 86.73        | 135.19            | 21.07                | 0.85                        | 0.74                     | 6.15                    | 31.47            | 28.10                  | 10.18                | 19.79                 | 10.28               |
| SE(m) ±                       | 4.01         | 7.82              | 0.42                 | 0.35                        | 0.17                     | 0.20                    | 1.73             | 5.19                   | 1.50                 | 1.94                  | 0.99                |
| C.D. (5%)                     | 12.19        | 23.78             | 1.30                 | 1.07                        | 0.54                     | 0.61                    | 5.27             | NS                     | NS                   | 5.91                  | 3.03                |

differences in survival, plant height, collar diameter, number of flowers, number of pods per plant, number of seeds per pod, root length and root and shoot weight. These differences indicated variations in nutrient uptake, highlighting the importance of organic nutrient sources for optimal plant development.

The application of vermicompost effectively improved these growth characteristics. The improved growth observed under vermicompost indicates the stimulation of biological activities in the presence of a balanced nutrient supply. Vermicompost enhances plant growth and development because of the humic acid and micro- and macronutrients present in it (Joshi *et al.*, 2015).

Application of vermicompost significantly increased the height of the chamomile plants (Hadi *et al.*, 2011). 5 g of vermicompost recorded the maximum collar diameter in *Juniperus polycarpus* seedlings (Negi *et al.*, 2022). These findings were in line with a study in which stem diameter increased by up to 30% with increasing doses of vermicompost (Caldeira *et al.*, 2005). Improved flowering and heading can be observed after adding vermicompost, due to increased Nitrogen levels and microbial activity, which promote root expansion, nutrient and water uptake, and the rate of photosynthesis (Joshi *et al.*, 2015). Application of 30% vermicompost increased the number of flowers in the *Lilium* plant (Moghadam *et al.*, 2012). Vermicompost improved the physico-chemical characteristics of the soil, resulting in the highest growth and yield (Singh and Chauhan, 2009). These results align with findings in *Arachis hypogaea*, where vermicompost increased shoot length, root length, fresh and dry weight, number of pods/plant, and number of seeds/pod (Lenin *et al.*, 2010).

The hormone-like activity of vermicompost enhances root biomass, root initiation, and overall growth and development (Joshi *et al.*, 2015). Similar findings were reported, with a net production of 4kg of *Amaranthus*/plot (8.25sq.ft./32 days) using vermicompost, compared with only 2.5kg/plot with chemical fertilizer (Uma and Malathi, 2009). By providing a steady nutrient supply, vermicompost supports shoot elongation and helps maintain soil aeration and moisture retention (Aremu *et al.*, 2019). The nutrient availability in vermicompost boosts chlorophyll synthesis and photosynthesis, and increases leaf production (Kumar *et al.*, 2020). Vermicompost has been shown to improve plant growth and biomass accumulation due to its high nutritional content and microbial activity (Ansari and Ismail, 2012).

The study highlights that, vermicompost can significantly enhance the growth and yield characteristics

of *Clitoria ternatea* L. It can also be used to expand the cultivation of this important plant species sustainably.

### Conclusion

Based on the results of this research, it can be concluded that the use of organic nutrient sources can enhance growth and yield. Among the different organic sources tested, Vermicompost significantly increased the growth performance of Gokarna, showing maximum values for survival %, plant height, collar diameter, number of flowers, number of pods/plant, number of seeds/pod, root length, root and shoot weights.

The improved growth under organic nutrient treatments may be associated with enhanced nutrient availability and favourable soil conditions, which can promote root development and nutrient uptake. The study emphasizes the potential of organic nutrient sources as an eco-friendly and sustainable approach to enhance Butterfly pea production.

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