J. Hortic. Sci.
Vol. 19(2), 2024

https://doi.org/10.24154/jhs.v19i2.3458

*Short Communication*

# Effect of organic mulches, manure and fertilizers on leaf yield and economics of Eryngo (*Eryngium foetidum* L.)

**Devi P.B.[1,3*], Deb P.[2,3] and Singh H.B.[4]**

[1]Krishi Vigyan Kendra, Utlou - 795 134, Manipur, India
[2]Centre for Biodiversity and Natural Resource Conservation, [3]Department of Ecology and Environmental Science, Assam University, Silchar - 788 011, Assam, India
[4]CSIR-North East Institute of Science & Technology, Branch Laboratory, Lamphelpat - 795 004, Imphal, Manipur, India
Corresponding author Email: bijayakvkbpr@gmail.com

## ABSTRACT

The Eryngo (*Eryngium foetidum* L.) is an important high value indigenous spice crop. An experiment on effect of organic mulches, manure and chemical fertilizers on leaf yield and economics of Eryngo was conducted at Krishi Vigyan Kendra, Utlou, Bishnupur, Manipur. Results revealed that the highest leaf yield (10925 and 12070 kg/ha) was recorded in 2017-18 and 2018-19, respectively, in $T_4$ (vermicompost 2.5 tons/ha + mulching with rice straw 5 tons/ha) followed by $T_5$ (vermicompost 2.5 tons/ha + mulching with rice husk 5 tons/ha) with leaf yield of 9114 kg/ha and 9401 kg/ha in the respective years. The minimum leaf yield (3862 and 4210 kg/ha) was recorded in 2017-18 and 2018-19, respectively, in $T_0$ (control) in which no external input was applied. From the pooled analysis, the highest yield (11,497 kg/ha) and net return (Rs. 526421) with cost benefit ratio (1:5.34) was recorded in $T_4$. Thus, the information generated will help to develop the scientific package of practices for Eryngo cultivation, which in turn will help to improve the economy of small and marginal farmers of Manipur.

**Keywords:** Economics, eryngo, leaf yield, rice husk, rice straw, vermicompost

## INTRODUCTION

The Eryngo (*Eryngium foetidum* L.) belongs to the family Apiaceae is an important high value indigenous annual or biennial spice crop of Manipur. It is believed that the Eryngo is originated from the Caribbean region of the West Indies and popularly known as Eryngo, Culantro, Sea holly, Mexican coriander, Saw-leaf herb, Spirit weed, Burma dhania, Nepali dhania, Naga dhania in different regions. The plant is called Awa-phadigom or Sha-maroi in Manipuri language and cultivated in kitchen gardens in limited quantity (Devi et al., 2019). The leaves are used in many culinary dishes. The Eryngo possesses a wide range of ethno-medicinal uses including treatment for burns, earache, fevers, hypertension, constipation, fits, asthma, stomach ache, worms, infertility complications, snake bites, diarrhoea and malaria (Devi et al., 2021a). The traditional usages are mainly medicinal, which include its leaves and roots decoctions being used for flu, pneumonia, diabetes, epilepsy, constipation, fevers, vomiting and diarrhoea treatment. The crushed leaves are placed in the ear to treat ear-ache and for the topically applied for treatment of arthritic pains. It has also been used as a folk medicine for scorpion sting and stomach pains (Devi et al., 2021b).

In crop production, mulching is very important in preventing of excessive evaporation, soil erosion, regulate surface runoff, enrich the soil and inhibit weed growth (Balsar et al., 2023). Mulching at the soil surface acts as a barrier against moisture loss from the soil and also reduces surface runoff. Despite its wide use, most of the farmers of Manipur are growing Eryngo in a very small scale and without adopting any scientific technology or improved package of practices and so far, the research carried pertaining to scientific cultivation practices of Eryngo for Manipur are very limited (Devi, 2021). Thus, the present investigation was taken up to study the effect of organic mulches, manure and fertilizers on leaf yield of Eryngo and its economic return and also to work out the economics of its cultivation.

The experiment was conducted at the experimental field of Krishi Vigyan Kendra, Utlou, Bishnupur,

Manipur during 2017-18 and 2018-19. The soil of experimental field was clay loam with pH (5.71) and available N, P, K and organic carbon were 412.30 kg/ha,18.20 kg/ha, 312.35 kg/ha and 2.5%, respectively. The treatment comprised of two types of organic mulches *viz.*, rice straw, rice husk, vermicompost and inorganic fertilizer *viz*, urea, single super phosphate and muriate of potash. The experiment was carried out in randomised block design with 6 treatments and 4 replications. Data were compiled, tabulated and subjected to statistical analysis as described by Gomez & Gomez (1984) where the significance of different main effects of the treatments involved were tested with F-test. The critical difference (CD) values at 5% level of significance were collected for the effects which were found significant at least at 5% level.

The different treatments includes control ($T_0$), vermicompost 5 tons/ha ($T_1$), vermicompost 5 tons/ha + NPK 100:70:50 kg/ha ($T_2$), vermicompost 2.5 tons/ha + NPK 50:35:25 kg/ha ($T_3$), vermicompost 2.5 tons/ha + rice straw 5 tons/ha ($T_4$) and vermicompost 2.5 tons/ha + rice husk 5 tons/ha ($T_5$). The different types of organic mulches, manure and fertilizers were applied according to the treatments. The size of each plot was 1 $m^2$ and the spacing maintained was 20 cm x 10 cm. Seedlings were raised by line sowing of seeds on well-prepared raised nursery beds during February of 2017 and 2018. The seedlings (50 days old, 3-leaf stage) were transplanted in April. First harvesting of leaf was done at the end of May and the subsequent harvestings were carried out at an interval of 25 days till February for both the years during the experimental period. The field was irrigated at 7 days interval and earthing up was done after each harvest. Harvesting of leaves was done ten times in a year. The harvested leaves were prepared by making bundles weighing about 40 g per bundle and sold at Rs. 2.5 per bundle at farm.

The data of leaf yield of Eryngo crop for the years 2017-18 and 2018-19 and pooled data are presented in Table 1. It is evident from the findings that the leaf yield of eryngo in all the treatments differed significantly during both the years. In 2017-18, $T_4$ recorded highest average yield of leaf per hectare (10,925 kg), followed by $T_5$ (9,114 kg/ha), while, lowest average leaf yield (3,862 kg) was recorded in $T_0$. Similar trend was observed in 2018-19. The highest leaf yield (12,070 kg/ha) was recorded in $T_4$ followed by $T_5$ (9,401 kg/ha), whereas, lowest average yield (4,210 kg) was obtained in $T_0$. Based on pooled analysis, the highest leaf yield (11497 kg/ha) was in $T_4$ followed by 9,257 kg/ha in $T_5$ and the lowest average yield of leaf (4,036.03 kg/ha) was obtained in $T_0$. In the year 2018-19, the leaf yield/ha was higher in all treatments compared to 2017-18 (Table 1).

The analysis in terms of economic impact of different treatments showed that $T_4$ recorded highest net return (Rs. 5,26,421) with C:B ratio (1:5.34), which was followed by $T_5$ (Rs. 4,10,241/ha) with C:B ratio (1:4.69), whereas, least net return (Rs. 1,68,582) was recorded in $T_0$. Application of vermicompost 2.5 tons/ha and rice straw 5 tons/ha ($T_4$) was found to exhibit highest cost benefit ratio (Table 2).

**Table 1 : Effect of nutrients and mulches on leaf yield of Eryngo**

| Treatment | Leaf yield (kg/ha) | | |
|---|---|---|---|
| | 2017-18 | 2018-19 | Pooled |
| $T_0$: Control (untreated) | 3,861.98 | 4,210.08 | 4,036.03 |
| $T_1$: Vermicompost (5.0 tons/ha) | 5,971.45 | 6,317.83 | 6,144.64 |
| $T_2$: Vermicompost (5.0 tons/ha) and NPK (100:70:50 kg/ha) | 7,531.50 | 8,249.18 | 7,890.34 |
| $T_3$: Vermicompost (2.5 tons/ha) and NPK (50:35:25 kg/ha) | 6,824.13 | 7,407.70 | 7,115.91 |
| $T_4$: Vermicompost (2.5 tons/ha) and rice straw (5.0 ton/ha) | 10,924.53 | 12,069.55 | 11,497.04 |
| $T_5$: Vermicompost (2.5 tons/ha) and rice husk (5.0 ton/ha) | 9,113.70 | 9,401.00 | 9,257.35 |
| SE(m) | 151.64 | 193.87 | 135.37 |
| C.D. at 5% | 443.63 | 567.17 | 396.02 |
| C.V. (%) | 4.11 | 4.88 | 3.54 |

**Table 2 : Economics of Eryngo cultivation for 1 hectare area**

| Treatment | Total cost of cultivation (Rs.) | Gross return (Rs.) | Net return (Rs.) | Cost benefit ratio |
|---|---|---|---|---|
| $T_0$: Control (untreated) | 58,800 | 2,27,381.97 | 1,68,581.97 | 01:03.9 |
| $T_1$: Vermicompost (5 tons/ha) | 1,33,800 | 3,46,176.90 | 2,12,376.90 | 01:02.6 |
| $T_2$: Vermicompost (5 tons/ha) and NPK (100:70:50 kg/ha) | 1,43,423 | 4,44,526.20 | 3,01,103.20 | 01:03.1 |
| $T_3$: Vermicompost (2.5 tons/ha) & NPK (50:35:25 kg/ha) | 1,01,111 | 4,00,896.34 | 2,99,785.34 | 01:04.0 |
| $T_4$: Vermicompost (2.5 tons/ha) and rice straw (5 tons/ha) | 1,21,300 | 6,47,720.56 | 5,26,420.56 | 01:05.3 |
| $T_5$: Vermicompost (2.5 tons/ha) and rice husk (5 tons/ha) | 1,11,300 | 5,21,540.85 | 4,10,240.85 | 01:04.7 |

During both years, the leaf yield obtained in $T_2$ (vermicompost 5.0 tons/ha and NPK 100:70:50 kg/ha), (7,532 kg, 8,249 kg and 7,890 kg, respectively) and $T_3$ (vermicompost 2.5 tons/ha and NPK 50:35:25 kg/ha) (6,824, 7,407 & 7,116 kg, respectively) was significantly high as compared to control $T_0$, but significantly less as compared to treatments $T_4$ and $T_5$, which might probably be due to moisture deficit caused by the absence of mulching. The leaf yield obtained in $T_2$ was significantly higher than $T_3$ because the amount of fertilizer applied in $T_3$was half as compared to $T_2$. The $T_4$ recorded significantly higher leaf yield as compared to $T_5$ treatment because in $T_5$ rice husk was used for mulching and it probably was not as good as paddy straw mulch in terms of water conservation effect. In both the years, in $T_4$ i.e. mulching with rice straw recorded highest leaf yield. The result of the two years and pooled analysis revealed that application of vermicompost ($T_1$: vermicompost and $T_2$: vermicompost and NPK), the leaf yield was significantly higher in $T_2$ in both the years and in pooled data compared to control. The highest leaf yield (10,925 kg/ha, 12,070 kg/ha and 11,497 kg/ha, respectively) was obtained in $T_4$ during both the years and pooled data, which was significantly superior to $T_5$ (9,114, 9,401 and 9,257 kg/ha), however, lowest yield (5,971, 6,318 and 6,145 kg/ha) was recorded in $T_1$.

In the present study, the highest net return and the cost benefit ratio of Eryngo cultivation was obtained with application of vermicompost (2.5 tons/ha) and rice straw (5 tons/ha) ($T_4$), which was closely followed by vermicompost (2.5 tons/ha) and rice husk (5 tons/ha) ($T_5$). In $T_1$, the net return of Rs. 2,12,377/ha was higher compared to Rs. 1,68,582 in $T_0$. However, the C:B ratio of 1:3.87 in $T_0$ control was higher than the C: B of 1:2.59 obtained in $T_1$. This might be because of higher cultivation cost incurred in $T_1$. FYM is economically more viable than vermicompost and the cost of production is low when it is used in place of vermicompost. Eryngo proportionately recorded higher yield at reasonable cost of cultivation leading to higher C:B ratio in the present study. The plant residues are easily available in farms are ready cheap materials that can boost production of agricultural crops. Uses of naturally available mulches are advocated for farmers as the cost of the mulching is economical which could help in the reduction of cost of production. Therefore, application of vermicompost, mulching with rice straw in the prescribed quantity is critically important inputs for the improved yield of Eryngo.

As of now, there is no scientific cultivation of Eryngo in Manipur. The present study will help to provide an insight knowledge and cultivation package to marginal farmers. The potential of this crop in enhancing income for farmers has been highlighted (Devi et al., 2023).

The present study revealed that the application of vermicompost and organic mulches is highly beneficial in terms of yield of Eryngo (*Eryngium foetidum* L.) in the Manipur valley, India. The crop being a potential for high income generation due to its consumption as a local spice and used in traditional healing system, its cultivation with judicious application of organic manure (vermicompost) along with organic mulches in open field condition can be

beneficial for both marginal and sub-marginal farmers. Thus, the use of vermicompost and other organic mulches increases the yield of Eryngo and economy of farmers and also helping in sustainable agriculture.

## ACKNOWLEDGEMENT

Authors are thankful to the Dean and Head of the Department, Assam University, Silchar for providing research facilities.

## REFERENCES

Balsar, K., Doruk, K., & Sindhu, G. P. (2023). Enhancing crop productivity: The art of mulching in agriculture. *Journal of Pharmacognosy & Phytochemistry*, *12*(6), 42-43. https://doi.org/10.2227/phyto.2023.v12.i6a.14766.

Devi, P. B. Deb, P., & Singh H. B. (2023). Promotion, utilization and commercial cultivation of local spices with especial reference to Eryngo (*Eryngium foetidum* L.) as a measure for livelihood improvement towards achieving the goal of sustainable development in the Indo-Burma biodiversity hotspot: A case study from Manipur, Northeast India (*In* Climate Change Adaptation, Risk Management & Sustainable Practices in the Himalaya; Eds. S. Sharma, J. C. Kuniyal, P. Chand & P. Singh). Springer Nature. 12, 253-255. https://doi/10.1007/978-3-031-24659-3_12.

Devi, P. B. (2021). Ecological studies on Eryngo (*Eryngium foetidum* L.) in Manipur valley and development of its agro-techniques. PhD Thesis. Assam University, Silchar, Assam.

Devi, P. B., Deb, P., & Singh, H. B. (2021a). Ethno-medicinal uses of Eryngo (*Eryngium foetidum* L.) by Meitei community of Manipur, Northeast India (2021). *Indian J Traditional Knowledge, 20*(3), 767-774. http://nopr.niscpr.res.in/handle/123456789/57874.

Devi, P. B., Deb, P., & Singh, H. B. (2021b). Study on traditional knowledge of Eryngo (*Eryngium foetidum* L.) in Bishnupur district of Manipur. *Research Journal of Agricultural Sciences*, *12*(2), 693-696.

Devi, P. B., Deb, P., & Singh, H. B. (2019). Traditional method of *ex-situ* cultivation and conservation of Eryngo plant (*Eryngium foetidum* Linn) in Manipur valley. *Souvenir and abstracts on Strengthening of seed system in the North eastern and unreached regions-Problems, prospects and policies*, 214-215.

Gomez, K. A., & Gomez, A. A. (1984). Statistical procedures for agricultural research (2nd ed.). John Wiley & Sons, New York. 680 p.

(***Received : 31.08.2024; Revised : 19.12.2024; Accepted : 22.12.2024)***