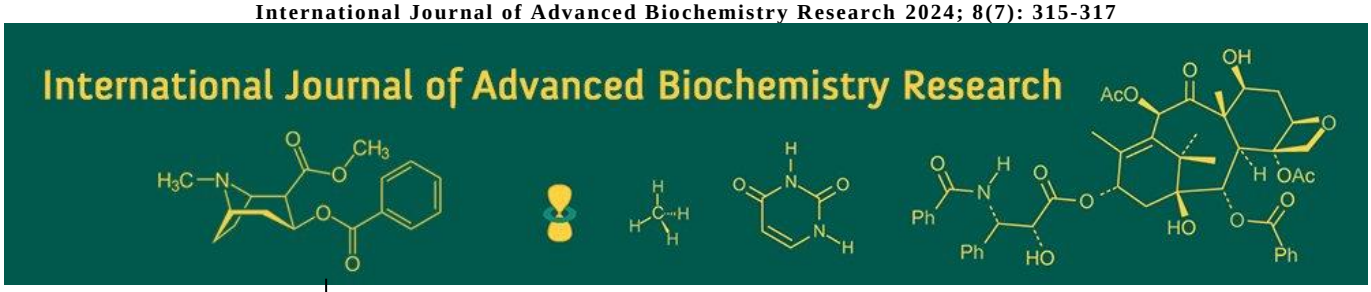

ISSN Print: 2617-4693
ISSN Online: 2617-4707
IJABR 2024; 8(7): 315-317
www.biochemjournal.com
Received: 14-05-2024
Accepted: 20-06-2024

Deepak Upadhyay
Student, M.Sc. Vegetable Science, Department of Horticulture, School of Agriculture ITM University Gwalior, Madhya Pradesh, India

Kunal Adhikary
Assistant professor, Department of Horticulture School of Agriculture ITM University Gwalior, Madhya Pradesh, India

Shipra parmar
Assistant professor, Department of Horticulture, School of Agriculture ITM University Gwalior, Madhya Pradesh, India

Corresponding Author:
Kunal Adhikary
Assistant professor, Department of Horticulture School of Agriculture ITM University Gwalior, Madhya Pradesh, India

Effects of bio-fertilizers on growth and yield attributes of *Mentha*

Deepak Upadhyay, Kunal Adhikary and Shipra Parmar

DOI: https://doi.org/10.33545/26174693.2024.v8.i7d.1518

Abstract
The present investigation entitled "Effects of Bio-fertilizers on Growth and Yield attributes of *Mentha*" conducted at Crop research Centre-3, Department of Horticulture, School of Agriculture, ITM University, Gwalior (M.P.). The experimental material comprised of twelve treatments, during *Rabi* Season of 2023-24. The experiment was laid out in Completely Randomized Design (CRD) with deferent treatments *viz.*, T_0-Control, T_1-RDF (19:19:19) 5gm/liter NPK through Sujala, T_2-Sagarika 5 ml/l, T_3-RDF + Sagarika, T_4-Beej Amrit 5 ml/l, T_5-Jivamrit 10 ml/l, T_6-Beej Amrit 5 ml/l + RDF + Sagarika, T_7-Jivamrit 10 ml/l + RDF (19:19:19), T_8-Sagarika 5 ml/l + Beej Amrit 5 ml/l, T_9-Sagarika 5 ml/l + Jivamrit 10 ml/l, T_{10}-Moringa extract 10 ml/l and T_{11}-Moringa extract 10 ml/l + Beej Amrit 5 ml/l + Jivamrit 10 ml/l. The observed on the growth and yield parameters *viz.*, Plant height (cm), Number of branches per plant, Plant spread, Leaf-to-stem ratio, Total Dry Matter accumulation (g/plant), Number of stolons per plant, Chlorophyll content, Fresh herbage yield per plant (gm) and Shade Dry herbage yield (g/plant).

Keywords: *Mentha*, bio-fertilizers, growth and yield

Introduction
Peppermint, scientifically known as *Mentha* × *piperita*, is a mint hybrid that originated from the crossbreeding of peppermint and spearmint. Originally native to Europe and the Middle East, this plant has now spread and is cultivated in various regions across the globe. In some cases, it can also be found growing in the wild alongside its parent species. Peppermint thrives in moist and shaded areas, and it spreads through underground rhizomes. To propagate, young shoots are taken from mature plants and carefully planted about 0.5 m (1.5 ft) apart in the ground. Given the right conditions, it grows rapidly and forms a dense ground cover. However, to control its growth, many home gardeners prefer to cultivate peppermint in containers. It requires an ample water supply, but it should not be waterlogged. Planting it in areas with partial sun to shade yields the best results. The leaves and flowering tops of peppermint are harvested for various purposes. They are collected when the flowers start to open and can be dried for later use. While the wild variety of peppermint is less suitable for this purpose, cultivated plants have been selectively bred to have higher and better-quality oil content. Before distillation, the harvested leaves and tops can either be allowed to wilt slightly or be taken directly to the distillation process.

The peppermint (*Mentha piperita* L.) plant is one of the most important aromatic plants in Egypt. The plant grows in different soils, preferring those deep and fertile. The leaves are used for flavoring purposes. An essential oil, obtained from the leaves, is used in the perfumery and soap-making industry. The oil is also used commercially as a stimulant, carminative, and for sickness and vomiting.

Presently, at least 190 countries commercially produce organic food which is due to the fast-expanding organic agriculture industry. Almost every nation in the world has started organic farming, and its proportion with respect to farms having commercial farming is increasing day by day. *Mentha* (*Mentha arvensis*), a well-known essential oil crop having commercial importance in the food, fragrance, and pharmaceutical industries is a perennial herb of the Lamiaceae family. India is the world's top producer and exporter of *Mentha* oil and its by-products. Brazil and China were the first to cultivate *Mentha*. India recently overtook other countries as the world leader in the cultivation of this essential oil-yielding plant.

In India, Uttar Pradesh provides almost 90% of total *Mentha* production, with the remaining 10% coming from Punjab and Rajasthan. However, in Punjab state, it is grown on a nearly 15,000-hectare area of land. India exports between 25,000 and 30,000 tonnes of menthol in a variety of forms (arvensis oil, decentralized mint oil, menthol crystals, and powder, etc.)

Materials and Methods

The present investigation was carried out at the CRC-3, Department of Horticulture, School of Agriculture, ITM University, Gwalior (M.P.). The experimental material comprised of twelve treatments. The treatments are mentioned in the table 1. The menthe crops were grown in a completely randomized design with three replications. Data were recorded on all treatments from each replication for nine characters *viz*., Plant height (cm), Number of branches per plant, Plant spread, Leaf-to-stem ratio, Total Dry Matter accumulation (g/plant), Number of stolons per plant, Chlorophyll content, Fresh herbage yield per plant (gm) and Shade Dry herbage yield (g/plant).

Table 1: Details of *Mentha* treatments used in the experiment

Treatments symbol	Treatments details
T_0	Control
T_1	RDF (19:19:19) 5gm/liter NPK through Sujala
T_2	Sagarika 5 ml/l
T_3	RDF + Sagarika
T_4	Beej Amrit 5 ml/l
T_5	Jivamrit 10 ml/l
T_6	Beej Amrit 5 ml/l + RDF + Sagarika
T_7	Jivamrit 10 ml/l + RDF (19:19:19)
T_8	Sagarika 5 ml/l + Beej Amrit 5 ml/l
T_9	Sagarika 5 ml/l + Jivamrit 10 ml/l
T_{10}	Moringa extract 10 ml/l
T_{11}	Moringa extract 10 ml/l + Beej Amrit 5 ml/l + Jivamrit 10 ml/l

Result and Discussion

The studies of morphological and growth parameter of *Mentha* was observed that the maximum plant height (73.36 cm) was recorded in T_6-Beej Amrit 5 ml/l + RDF + Sagarika followed by T_7-Jivamrit 10 ml/l + RDF (19:19:19) (71.79 cm) and T_3-RDF + Sagarika (68.03 cm), whereas, minimum plant height was observed in T_0-Control (54.53 cm) (Arafa at al 2017) [1]. The treatments effect was found to be significant critical difference signifying in all treatments have combine effect on the height of *Mentha* with of 1.19 standard error of mean given in table 2.

The maximum Number of branches per plant (39.21) was recorded in T_6-Beej Amrit 5 ml/l + RDF + Sagarika followed by T_7-Jivamrit 10 ml/l + RDF (19:19:19) (37.65) and T_3-RDF + Sagarika (35.69), whereas, minimum number of branches per plant was observed in T_0-Control (29.25) (Shwetha *et al*. 2018; Suresh at al. 2018) [6, 7]. The treatments effect was found to be significant critical difference signifying in all treatments have combine effect on the number of branches per plant of *Mentha* with of 0.76 standard error of mean given in table 2.

The maximum Plant spread (48.01) was recorded in T_6-Beej Amrit 5 ml/l + RDF + Sagarika followed by T_7-Jivamrit 10 ml/l + RDF (19:19:19) (46.45) and T_3-RDF + Sagarika (45.64), whereas, minimum plant spread was observed in T_0-Control (39.04) (Arafa at al 2017) [1]. The treatments effect was found to be significant critical difference signifying in all treatments have combine effect on the plant spread of *Mentha* with of 0.67 standard error of mean given in table 2.

The maximum leaf-to-stem ratio (0.927) was recorded in T_6-Beej Amrit 5 ml/l + RDF + Sagarika followed by T_7-Jivamrit 10 ml/l + RDF (19:19:19) (0.897) and T_3-RDF + Sagarika (0.882), whereas, minimum leaf-to-stem ratio was observed in T_0-Control (0.693) (Vijaya at al. 2008) [8]. The treatments effect was found to be significant critical difference signifying in all treatments have combine effect on the leaf-to-stem ratio of *Mentha* with of 0.017 standard error of mean given in table 2.

The maximum total dry matter accumulation (254.44 g/plant) was recorded in T_6-Beej Amrit 5 ml/l + RDF + Sagarika followed by T_7-Jivamrit 10 ml/l + RDF (19:19:19) (248.87 g/plant) and T_3-RDF + Sagarika (238.93 g/plant), whereas, minimum total dry matter accumulation was observed in T_0-Control (184.91 g/plant) (Shwetha at al. 2018; Suresh at al. 2018) [6, 7]. The treatments effect was found to be significant critical difference signifying in all treatments have combine effect on the total dry matter accumulation of *Mentha* with of 8.65 standard error of mean given in table 2.

The maximum number of stolons per plant (7.63) was recorded in T_6-Beej Amrit 5 ml/l + RDF + Sagarika followed by T_7-Jivamrit 10 ml/l + RDF (19:19:19) (7.30) and T_3-RDF + Sagarika (7.02), whereas, minimum number of stolons per plant was observed in T_0-Control (4.32) (Rahman at al 2014; Rashmi at al 2008) [4, 5]. The treatments effect was found to be significant critical difference signifying in all treatments have combine effect on the number of stolons per plant of *Mentha* with of 0.17 standard error of mean given in table 2.

The maximum chlorophyll content (82.55) was recorded in T_6-Beej Amrit 5 ml/l + RDF + Sagarika followed by T_7-Jivamrit 10 ml/l + RDF (19:19:19) (81.68) and T_3-RDF + Sagarika (80.79), whereas, minimum chlorophyll content was observed in T_0-Control (67.72) (Al-Fraihat at al 2011). The treatments effect was found to be significant critical difference signifying in all treatments have combine effect on the chlorophyll content of *Mentha* with of 1.22 standard error of mean given in table 2.

Table 2: Effect of bio-fertilizers on growth and yield parameters of *Mentha*

Treatments	Plant height (cm)	Number of branches per plant	Plant spread	Leaf-to-stem ratio	Total Dry Matter accumulation (g/plant)	Number of stolons per plant	Chlorophyll content	Fresh herbage yield per plant (gm)	Shade Dry herbage yield (g/plant)
T_0-Control	54.53	29.25	39.04	0.693	184.91	4.32	67.72	161.70	99.77
T_1-RDF (19:19:19) 5gm/liter NPK through Sujala	63.78	33.02	43.21	0.798	217.66	6.47	78.97	285.95	205.02
T_2-Sagarika 5 ml/l	61.59	32.61	41.40	0.747	210.71	5.97	77.13	266.59	184.33
T_3-RDF + Sagarika	68.03	35.69	45.64	0.882	238.93	7.02	80.79	312.02	229.76
T_4-Beej Amrit 5 ml/l	61.46	31.86	40.65	0.729	205.31	5.63	74.57	252.99	170.73
T_5-Jivamrit 10 ml/l	59.03	31.56	40.36	0.714	200.35	5.01	72.53	235.44	153.18
T_6-Beej Amrit 5 ml/l + RDF + Sagarika	73.36	39.21	48.01	0.927	254.44	7.63	82.55	337.99	255.73
T_7-Jivamrit 10 ml/l + RDF (19:19:19)	71.79	37.65	46.45	0.897	248.87	7.30	81.68	329.95	247.69
T_8-Sagarika 5 ml/l + Beej Amrit 5 ml/l	67.35	35.33	44.69	0.851	230.78	6.98	79.41	305.43	223.17
T_9-Sagarika 5 ml/l + Jivamrit 10 ml/l	65.76	34.51	43.84	0.812	227.89	6.56	79.27	290.85	208.59
T_{10}-Moringa extract 10 ml/l	58.16	31.28	39.57	0.704	194.36	4.63	69.83	211.99	129.73
T_{11}-Moringa extract 10 ml/l + Beej Amrit 5 ml/l + Jivamrit 10 ml/l	62.75	32.47	42.47	0.783	214.22	6.20	78.00	279.08	196.82
SE (m)	1.19	0.76	0.67	0.017	8.65	0.17	1.22	11.66	14.94
C.V.	3.22	3.92	2.73	3.80	6.84	5.06	2.77	7.41	13.48
C.D. at 5%	3.47	2.23	1.98	0.051	25.26	0.52	3.58	34.04	43.63

The maximum fresh herbage yield per plant (337.99 gm) was recorded in T_6-Beej Amrit 5 ml/l + RDF + Sagarika followed by T_7-Jivamrit 10 ml/l + RDF (19:19:19) (329.95 gm) and T_3-RDF + Sagarika (312.02 gm), whereas, minimum fresh herbage yield per plant was observed in T_0-Control (161.70 gm) (Arafa at al 2017) [1]. The treatments effect was found to be significant critical difference signifying in all treatments have combine effect on the fresh herbage yield per plant of *Mentha* with of 11.66 standard error of mean given in table 2.

The maximum shade dry herbage yield per plant (255.73 gm) was recorded in T_6-Beej Amrit 5 ml/l + RDF + Sagarika followed by T_7-Jivamrit 10 ml/l + RDF (19:19:19) (247.69 gm) and T_3-RDF + Sagarika (229.76 gm), whereas, minimum shade dry herbage yield per plant was observed in T_0-Control (99.77 gm) (Azizi at al 2008) [2]. The treatments effect was found to be significant critical difference signifying in all treatments have combine effect on the shade dry herbage yield per plant of *Mentha* with of 14.94 standard error of mean given in table 2.

Conclusion

Result concluded that the all treatments were significantly influenced the morphological and growth parameters of *Mentha*. The maximum growth parameters were observed in T_6-Beej Amrit 5 ml/l + RDF + Sagarika among all the treatments, while the minimum growth parameters were recorded in T_0-Control for Plant height (cm), Number of branches per plant, Plant spread, Leaf-to-stem ratio, Total Dry Matter accumulation (g/plant), Number of stolons per plant, Chlorophyll content, Fresh herbage yield per plant (gm) and Shade Dry herbage yield (g/plant).

References

1. Arafa AMS, Sarhan AMZ, Mohamed MA, Rabbu HAS. Effect of organic manures with biofertilizers on growth and volatile oil production of *Mentha* longifolia plant. Middle East J Agric Res. 2017;6(3):748-756.
2. Azizi M, Rezwanee F, Hassanzadeh Khayat M, Lackzian A, Neamati H, *et al*. The effect of different levels of vermicompost and irrigation on morphological properties and essential oil content of German chamomile (*Matricaria recutita*) C.V. Goral. Iran J Med Aromat Plants. 2008;24(1):82-93.
3. Al-Fraihat AH, Al-Dalain SYA, Al-Rawashdeh ZB, Abu-Darwish MS, Al-Tabbal JA. Effect of organic and biofertilizers on growth, herb yield and volatile oil of marjoram plant grown in Ajloun region, Jordan. J Med Plants Res. 2011;5:2822-2833.
4. Rahman KM, Sattar MA, Rahman GMM. Effect of fertilizer and manures on growth and yield of Tulsi and Pudina medicinal plant. J Environ Sci Nat Resour. 2014;7(2):13-16.
5. Rashmi KR, Eranna N, Vasundhara M. Influence of biofertilizers on growth, biomass and biochemical constituent of *Ocimum gratissimum*. Biomed. 2008;3(2):123-130.
6. Shwetha D, Pushpa TN, Srikantaprasad D, Kantharaju V, Biradar IB, Shalini RM, *et al*. Effect of dates of planting on growth, yield and quality of menthol mint (*Mentha arvensis* L.) cultivars planted during rabi season. Int J Curr Microbiol Appl Sci. 2018;7(9):2319-7706.
7. Suresh VJ, Preethi F, Saranya V, Sarithra S, Tamilselvan K. Effect of FYM, Coirpith, Vermicompost, Humic acid and Panchagavya on growth and yield of mint (*Mentha arvensis*). Horticult Int J. 2018;2(6):417-419.
8. Vijaya D, Padmadevi SN, Vasandha S, Meerabhai RS, Chellapandi P. Effect of vermicomposted coirpith on the growth of Andrographis paniculata. J Organic Syst. 2008;3(2):51-56.