Biological Forum – An International Journal **16(7): 256-259(2024)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Panchagavya: An Effective Plant Growth Booster in Leafy Vegetable

Rekha V.R. Nair[1*], Anjitha Das[2], Sreethu V.A.[3] and Raji Swaroop[4]

[1]Assistant Professor, Department of Soil Science and Agricultural Chemistry,
College of Agriculture, Vellayani, Thiruvananthapuram, Kerala Agricultural University (Kerala), India.
[2]Research Scholar, Department of Soil Science and Agricultural Chemistry,
College of Agriculture, Vellayani, Thiruvananthapuram KAU (Kerala), India.
[3]M.Sc. Scholar, Department of Chemistry, Christian
College Kattakada, Thiruvananthapuram, University of Kerala (Kerala), India.
[4]Assistant Professor, Department of Soil Science and Agricultural Chemistry,
College of Agriculture, Vellayani, Thiruvananthapuram, Kerala Agricultural University (Kerala), India.

(Corresponding author: Rekha V.R. Nair)*
(Received: 20 April 2024; Revised: 18 May 2024; Accepted: 17 June 2024; Published: 15 July 2024)
(Published by Research Trend)

ABSTRACT: Amaranthus is a vegetable rich in dietary fibre, protein, minerals, and antioxidants. The heavy demands of nutrients are often met through chemical fertilizers and its prolonged usage can result in nutrient imbalances, soil degradation, and environmental pollution. Application of liquid organic manures like panchagavya, vermiwash, fish amino acid and egg amino acid can enhance productivity without deteriorating soil health. A study was conducted at College of Agriculture Vellayani, Kerala, India, to understand the influence of liquid manures on growth and yield of leafy vegetable amaranthus. These manures were applied 15 days after transplanting and continued till harvesting at weekly intervals. Panchagavya spray at a rate of one per cent at weekly intervals recorded maximum height, number of leaves and girth. The highest fresh weight and dry weight were noticed in panchagavya and vermiwash treated plants. Liquid manures can offer sound and sustainable agricultural practices by reducing the dependence on chemical fertiliser.

Keywords: Nutrient, Amaranthus, Organic manure, Foliar nutrition, Sustainable agriculture.

INTRODUCTION

Amaranthus (*Amaranthus* sp. L.) also called the "poor man's spinach "is considered as an essential leafy vegetable in southern India. It is one of most commercially grown, and reasonably priced leafy vegetable consumed in the states like Kerala, Tamil Nadu, Karnataka, Maharashtra, Andhra Pradesh, and Telangana. Known for having a high nutritional content, it is particularly beneficial in fighting malnourishment and under nutrition with impressive levels of iron, calcium, vitamin A, and vitamin C (Ramesh *et al*., 2020). However, the heavy nutrient demands of vegetables, often met through inorganic fertilizers, pose challenges to soil health, environmental sustainability, and overall ecosystem balance. In response to these challenges, organic farming emerges as a compelling solution, promoting biological activity, biodiversity, and ecological sustainability.

Recently, it has been observed that organic farming uses a variety of native organic preparations, such as vermiwash, fish amino acid (FAA), egg amino acid (EAA) and panchagavya to enhance crop growth and development. The panchagavya is a powerful plant growth promoter that improves crop's biological efficiency. It improves the nutritional value of fruits and vegetables, energizes the soil, and shield plants from disease (Boraiah *et al*., 2017). Vermiwash is a mixture of beneficial microorganisms including fungus and heterotrophic bacteria and nutrients like N, P, K, and Ca. It also contains hormones like auxin and cytokinin. Liquid organic manure fermented from fish excrement is called fish amino acid and is rich in different minerals and amino acids and promote growth of plants and microorganisms.

This study evaluates influence of various organic liquid manures on growth and yield of amaranthus variety Co-1.

MATERIALS AND METHODS

Description of the study area. An experiment was carried out at College of Agriculture Vellayani to study the effect of liquid organic manures on the growth and yield of green amaranthus variety Co-1 during April-May 2023. Transplanting of the seedlings was done after two weeks of growth in nursery. Planting was done in earthen pots filled with potting mixture which was prepared by mixing soil, sand and vermicompost in 1:1:1 ratio. The mixture was slightly acidic in reaction (pH 6.6) with low in available nitrogen (72.13 kgha^{-1}), low in available phosphorous (1.63kg ha^{-1}) and medium in available potassium (99 kgha^{-1}). During the experimental period, mean maximum and minimum

temperature of 28.6°C and 23.8°C and the mean relative humidity of 77 per cent were recorded. An average wind velocity of 4 km/hr and the mean daily evaporation of 3.1mm were recorded. A total rainfall of 69.21 mm was received on six rainy days during the experimental period.

The experiment was laid out in a Completely Randomized Design (CRD) with four replications and number of observational plants per treatment was four. The treatments consist of one per cent foliar spray of panchgavya, vermiwash, fish amino acid, egg amino acid and control spray as water at different growth stages of the crop.

Panchgavya, a phenomenal combination of five "gavya" (five products obtained from cow), enormously helps to boost quality of agricultural products. Cow dung, milk, curd, ghee, and urine are the five items in panchagavya (Dutta *et al*., 2018). Cowdung (7kg) and cow ghee (1kg) were mixed in a clean plastic drum and thoroughly mixed both in morning and evening hours and kept aside for three days. After 3 days cow urine (10 litre) and water (10 litre) were mixed. The mixture was kept for 15 days with regular mixing both in the morning and evening hours. After 15 days, add cow milk (3 litre), cow curd (2 litre), tender coconut water (3 litre), jaggery (3kg) and well ripened bananas (12 numbers). The contents were stirred twice a day, both in morning and evening (KAU, 2017).

A liquid known as "vermiwash" is obtained by passing water through a worm-action column. It consists of a combination of earthworm mucus secretion and excretory materials, along with micronutrients derived from organic compounds. Vermiwashis also rich in microbes like *Azotobacter, Agrobacterium, Rhizobium,* and some phosphate solublizing bacteria (Kaur *et al*., 2015). For the preparation of vermiwash, a cement tank with a side tap was constructed, and a 5 cm thick layer of small brick pieces or gravel was placed at the bottom of the tank. Above it, a layer of coconut fibre of 3-4cm thickness was placed. A definite quantity of biowaste (4kg) was added to the system along with 2kg of earthworms. After two weeks, the entire mass of biowaste was converted to brownish black compost. Then sprinkle two litre of water to the tank containing earthworms and freshly formed vermicompost. Vermiwash was collected through the side tap after 24 hours (KAU, 2017).

Sardine fish (*Sardina pilchardus*)and jaggery in the ratio of 1:1 was used to prepare fish amino acid, which is a good source of nutrients (KAU, 2017). Fish was cut into small pieces and added to sliced jaggery in a ratio of 1:1 in a plastic bucket, layer by layer, and stored in a cool place under anaerobic conditions. Keep it away from direct sunlight for 40-45 days. The end product was filtered and diluted for application.

Egg amino acid prepared from eggs, lemon juice, and jaggery is also popular liquid manure rich in nutrients and minerals. Seven chicken eggs were placed in a jar and pour lemon juice into it until the eggs were completely immersed and kept airtight for two weeks. After two weeks, smash the eggs and prepare the solution. Put 250gm of boiled cooled jaggery into this and mix well. Again, keep it airtight for another week. The solution can be filtered and diluted, and it can be used for spraying on the foliage (KAU, 2017).

The nutrient content of liquid organic emulsions is presented in Table 1. Total nitrogen content was analysed by microkjeldahl digestion and distillation. Total phosphorus content was done by diacid digestion (HNO_3: $HClO_4$ in the ratio 9:4) and estimation using a spectrophotometer. Total potassium content was analysed by diacid digestion (HNO_3: $HClO_4$ in the ratio 9:4) and estimation using a flame photometer (Jackson, 1973).

Table 1: Nutrient content of liquid organic manure.

Liquid organic manure	Nitrogen (%)	Phosphorus(%)	Potassium (%)
Egg aminoacid	0.87	0.72	0.62
Fish aminoacid	0.95	0.98	1.05
Panchagavya	0.77	0.86	0.50
Vermiwash	0.23	0.42	0.68

Organic liquid manures were applied to the crop as foliar spray after 15 days of transplanting in pots at one per cent level. Up to harvesting, a total of five sprays were given at weekly intervals. The plants were harvested after 50 days of transplanting. Observations on plant height, number of leaves, girth and yield were recorded and statistical analysis using WASP- Web Agri Stat Package 2.0 (Jangam and Thali 2004).

RESULTS AND DISCUSSION

Morphological parameters. After the application of organic manures, there was improvement in growth parameters like plant height, number of leaves and girth for all treatments over water spray. The highest plant height of70.50 cm at harvesting was recorded in the plants sprayed with one per cent concentration of panchagavya (Table 2). The per cent leaf area increase over the control treatment was also highest in the same treatment. Plants sprayed with panchagavya invariably produced bigger leaves and developed denser canopy (Tharmaraj *et al*., 2011). The highest leaf area helped in intercepting more solar radiation, which increased photosynthesis and improved all growth indices. The improved availability of nutrients from organic foliar sources and the efficient conversion of nutrients at the site of photosynthesis may cause enhanced growth characteristics (Somasundaram *et al*., 2007). Composition of panchagavya namely protein, fat, carbohydrates, amino acid and calcium derived from the ingredients used for its preparation also accelerated growth in crops (Muthuvel, 2002). By the application of panchagavya it was observed on the 60^{th} and 90^{th} day number of leaves, root length, root volume, fresh weight and dry weight respectively were improved in cluster bean. It might be due to the supply of major and micronutrients and growth hormones like IAA and gibberellic acid in panchagavya (Saritha *et al*., 2013).

Table 2: Effect of liquid organic manure on morphological characters at different growth stages of amaranthus.

Treatment	Height 30DAT*(cm)	Height 50 DAT(cm)	Number of leaves 30 DAT	Number of leaves 50 DAT	Girth 30 DAT(cm)	Girth 50 DAT(cm)
Egg aminoacid	36.80(15^{+})**	61.53^{ab}(9.52^{+})	18.00^{a}(50^{+})	21.50^{b}(28.38^{+})	4.48(16.97^{+})	4.68(5.07^{-})
Fish aminoacid	34.38(7.43^{+})	62.93^{ab}(10.72^{+})	18.00^{a}(50^{+})	22.50^{ab}(34.32^{+})	3.78(1.30^{-})	5.05(2.43^{+})
Panchagavya	36.60(14.37^{+})	70.50^{a}(25.48^{+})	20.75^{a}(72.9^{+})	28.75^{a}(71.64^{+})	4.75(24.02^{+})	6.00(21.70^{+})
Vermiwash	33.68(5.25^{+})	56.03^{b}(0.266^{-})	18.25^{a}(52.08^{+})	22.50^{ab}(34.32^{+})	4.40(14.88^{+})	4.98(1.01^{+})
Control	32.00	56.18^{b}	12.00^{b}	16.75^{b}	3.83	4.93
C.D.	—	9.05	4.29	6.7	—	—
SE(m)	1.40	2.99	1.42	2.20	0.30	0.39
SE(d)	1.98	4.22	2.01	3.11	0.42	0.55
C.V.	8.08	9.78	16.36	19.85	13.97	15.21

*DAT: Days After Transplanting

**Value in parenthesis denotes the comparison of treatments over control

Yield Attributes. Present studies revealed that foliar spray of panchagavya and vermiwash at one per cent concentration resulted in a significant increase in fresh weight and dry weight. Vermiwash exhibited growth promoting effects on the plant height, length and diameter of the internode, number of leaves, leaf surface area, root length, wet and dry weight of the shoot and root of *Abelmoschus esculentus* (Hatti *et al*., 2010). Similar findings were observed in *Vigna mungo* (Kumar *et al*., 2011), chickpea (Yadav *et al*., 2017) and *Abelmoschus esculentus* cv. Arka Anamika (Rakesh *et al*., 2017) and in black gram (Choudhary *et al*., 2017). The dry matter production of amaranthus was recorded to be significantly higher in three per cent concentration of foliar spray of panchagavya (Venkatalakshmi *et al*., 2009). Two sprays of panchagavya in sesame at 30 days after sowing and flowering stage recorded significantly highest total dry matter production, seed weight per capsule and seed yield ha^{-1} over no spray of panchagavya (Ravusaheb, 2008). Foliar application of panchagavya exhibited significant effects on crop growth, seed yield and yield attributes incumin (Sunil *et al*., 2012). Crop growth and yield enhancement noticed in 10 per cent spray of panchagavya in cauliflower. It might be due to the presence of bacteria, fungus and actinomycetes in panchagavya may have led to an augmentation of nutrient mineralization and solubilization (Chawla *et al*., 2023). Panchagavya and jeevamruth were found promising alternate strategies of seed priming to develop healthy seedlings under salinity conditions in bitter gourd (Patil *et al.,* 2021). Liquid organic manure can supply essential plant nutrients and growth promoting substances which can increase the yield. It is also rich inmicrobial populations like bacteria, actinomycetes, phosphate solubilizers, fluorescent Pseudomonas, and nitrifiers (Leo *et al*., 2013).

Table 3: Effect of liquid manure on yield attributes.

Treatment	Fresh weight (g)	Dry weight (g)
Panchagavya	410.62^{a}	58.03^{a}
Vermiwash	404.18^{a}	54.40^{a}
Egg aminoacid	308.15^{b}	38.63^{bc}
Fish aminoacid	338.88^{b}	44.56^{b}
Control	294.71^{b}	34.30^{c}
C.D.	50.56	7.91
SE(m)	16.62	2.60
SE(d)	23.51	3.68
C.V.	19.46	11.32

CONCLUSIONS

From this study, it is inferred that the application of one per cent panchagavya as foliar spray at weekly intervals significantly improved morphological characters in green amaranthus. It was also noticed that fresh weight and dry weight were enhanced after the application of liquid manures. The highest dry weight of 410.62gm was obtained in panchagavya treated plants which was on par with vermiwash treated plants. The application of liquid organic manures can reduce the dependence on synthetic fertilizers. Therefore, it can be recommended as an alternate source of nutrients for organic cultivation of green amaranthus and promote sustainable agriculture by reducing environmental pollution.

FUTURE SCOPE

Liquid organic manure can enhance crop growth and productivity. Effect of liquid organic manures on other vegetables should be studied to assess their growth and crop yield. Concentration should also be standardised for each liquid manure on different vegetables and identify the periodicity of application to harness the maximum benefit of application of organic manures.

Author Contribution: Rekha VR Nair has conceived and designed the experiment. Sreethu VA has done the experiment whereas Raji Swaroop and Anjitha Das collected the review and made significant contribution for documenting the work.

Acknowledgement. The authors extend their gratitude to Kerala Agricultural University for providing fund and research facilities.

Conflict of Interest. None.

REFERENCES

Boraiah, B., Devakumar, N., Shubha, S. and Palanna, K. B. (2017). Effect of Panchagavya, Jeevamrutha and cow urine on beneficial microorganisms and yield of capsicum (*Capsicum annuum* L. var. grossum). *Int. J. Curr. Microbiol. App. Sci*., *6*(9), 3226-3234.

Chawla, G., Hariyana, K., Tetarwal, P., Khinchi, A., Khan, S.and Kumar, P. (2023). Response of Organic Manures and Panchagavya on Yield Attributes of Cauliflower (*Brassica Oleracea* L. Var Botrytis). *Biological Forum -an International Journal*, *15*(10), 727-730.

Choudhary, G. L., Sharma, S. K., Singh, K. P., Choudhary, S. and Bazaya, B. R. (2017). Effect of Panchagavya on Growth and Yield of Organic black gram (*Vigna*

mungo L.) Hepper. *International Journal of Current Microbiology and Applied Sciences*, *6*(10), 1627-1632.

Dutta, A. K., Majee, S. K. and Das, R. (2018). Effect of BD-501 and Panchagavya on yield and quality of garden pea cv. Arkel. *International Journal of Latest Engineering and Management Research*, *3*(2), 50-53.

Hatti S. S., Londonkar R. L., Patil S. B., Gangawane A. K. and Patil C. S. (2010) Effect of Perionyx excavatus vermiwash on the growth of plants, *Journal of Crop Science*, *1*(1), 01- 05.

Jackson, M. L. (1973). Soil Chemical Analysis (2nd Ed.), Prentice Hall of India Pvt. Ltd., New Delhi, India pp.498.

Jangam, A. K. and Thali, P. (2004). WASP- Web agri Stat Package 2.0. ICAR Research Complex for Goa, Ela, Old Goa.403402 India.

KAU [Kerala Agricultural University] 2017. *Package of Practises Recommendations (Organic) Crops*, Kerala Agricultural University, Thrissur, pp. 328.

Kaur, P., Bhardwaj, M. and Babbar, I. (2015). Effect of vermicompost and vermiwash on growth of vegetables. *Research Journal of Animal, Veterinary and Fishery Sciences*, *3*(4), 9-12.

Kumar, R. S., Ganesh, P., Tharmaraj, K. and Saranraj, P. (2011). Growth and development of blackgram (*Vigna mungo*) under foliar application of Panchagavya as organic source of nutrient. *Current Botany*, *2*(3), 9-11.

Leo Daniel Amalraj, E., Praveen Kumar, G., and Mir Hassan Ahmed, S. K. (2013). Microbiological analysis of Panchagavya, vermicompost, and FYM and their effect on plant growth promotion of pigeon pea (*Cajanus cajan* L.) in India. *Org. Agr., 3*, 23–29.

Muthuvel, N. (2002). Effect of organics on growth and yield of bhendi var. Varsh Uphar. In *Proceedings National Conference on glory of Gomatha; Panchagavya as potentiator of plant cells: Effects on crop plants and the physiology that validates the effects, 2002*, 1-3.

Patil, P. D., Chaurasia, A. K., Shukla, P. K., Dubey, S. and Kumari, A. (2021). Impact of Seed Invigoration with Panchagavya, Beejamrutha on Seed Quality Parameters in Bitter Gourd (*Memordica charantia*) under Salinity Conditions. *Biological Forum -An International Journal, 13*(3), 21-26.

Rakesh, S., Poonguzhali, S., Saranya, B., Suguna, S. and Jothibasu, K. (2017). Effect of Panchagavya on growth and yield of *Abelmoschus esculentus* cv. Arka Anamika. *International Journal of Current Microbiology and Applied Sciences*, *6*(9), 3090-3097.

Ramesh, T., Rathika, S., Murugan, A., Soniya, R. R., Mohanta, K. K. and Prabharani, B. (2020). Foliar spray of fish amino acid as liquid organic manure on the growth and yield of Amaranthus. *Chemical Science Review and Letters*, *9*(34), 511-515.

Ravusaheb, M. (2008). Studies on nutrient management practices through organics in sesame *Sesamum indicum* L. M. Sc. Agri. Thesis, Univ. Agric. Sci., Dharwad, Karnataka, India.

Saritha, M., Vijayakumari, B., Hiranmai, Y. R. and Kandari, L. S. (2013). Influence of selected organic manures on the seed germination and seedling growth of cluster bean (*Cyamopsis tetragonoloba* (L.) Taub). *Science, Technology and Arts Research Journal*, *2*(2), 16-21.

Somasundaram, E., N. Sankaran, S. Meena, T. M. Thiyagarajan, K. Chandaragiri and Panneerselvam, S. (2007). Response of greengram to varied levels of Panchagavya (organic nutrition) foliar spray. *Madras Agriculture Journal*, *90*, 169-172.

Sunil, M. S, Kumawat, R., N. and Mertia, R., S. (2012). Organic seed production of cumin *Cuminum cyaminum* L. with foliar application of panchagavya and plant leaf extracts in arid western Rajasthan. *Int. J. Seed Spices*, *2*(2), 19-26.

Tharmaraj K, Ganesh P, Sureshkumar R, Anandan, A, Kolanjinathan K. (2011). A Critical Review on Panchagavya – A Boon Plant Growth. *Int. J. Pharm. Biol. Arch.*, *2*(6), 1611-1614.

Venkatalakshmi, K., Balasubramanian, A. and Sankaran, N. (2009). Influence of seed treatment and foliar spray of panchagavya on growth, yield attributes and yield of *Amaranthus viride*. *Madras Agricultural Journal*, *96*(1-6), 135-138.

Yadav, J. K., Sharma, M., Yadav, R. N., Yadav, S. K. and Yadav, S. (2017). Effect of different organic manures on growth and yield of chickpea (*Cicer arietinum* L.). *Journal of Pharmacognosy and Phytochemistry*, *6*(5), 1857-1860.

How to cite this article: Rekha V.R. Nair, Anjitha Das, Sreethu V.A. and Raji Swaroop (2024). Panchagavya: An Effective Plant Growth Booster in Leafy Vegetable. *Biological Forum – An International Journal, 16*(7): 256-259.