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ORGANIC FORMULATIONS IN FLORICULTURE: A REVIEW

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To achieve organic and sustainable agricultural goals, organic formulations offer an effective alternative by eliminating the need for synthetic and inorganic chemicals. These formulations are derived from plant and animal-based raw materials such as cow dung, cow urine, cow milk, curd, honey and jaggery. Common organic inputs like Jeevamruth, Panchagavya, Amritpani and Beejamruth can be applied individually or in combination. Being easily accessible, simple to prepare, eco-friendly and cost-effective, these formulations play a crucial role in regulating plant physiological processes, enhancing growth, mitigating stress-induced limitations and boosting yield. In floriculture, organic formulations are widely used as substrate media, components in plug plant production, nursery preparations for flower seeds, pot mixtures for foliage plants and essential media for greenhouse crops to improve soil physical properties. They are also applied as soil drenches, bulb soaks, foliar sprays, propagation aids for ornamental crops, hardening agents for tissue-cultured plants, fertilizers for growth and development and natural plant protection solutions.

Key words : Amritpani, Beejamruth, Jeevamruth, Panchagavya and production.

Introduction

Floriculture is a rapidly evolving branch of horticulture that focuses on the cultivation, processing and marketing of ornamental plants, playing a crucial role in landscape beautification and garden maintenance to enhance visual appeal. In India, the floriculture industry includes flower production and trade, nursery and potted plants, seed and bulb cultivation, herbal rental services, tissue culture propagation and essential oil extraction. With the increasing global demand for flowers, floriculture has created new opportunities for commercial agriculture.

Agriculture significantly contributes to India's economic development, and floriculture, as a vital segment of the allied agricultural sector, has been recognized as a "sunrise industry" by the Government of India. It has received 100% export-oriented status due to the rising demand for flowers in both domestic and international markets. Over the years, the Indian floriculture industry has evolved from growing traditional flowers to cultivating high-value cut flowers for export (Organic Agriculture Overview, USDA).

Organic farming incorporates time-tested sustainable practices such as crop rotation and the application of composted animal manures and green manure crops, adapting them to modern economic viability. In organic production, the focus is on maintaining overall system health by optimizing interactions between various management practices (Yeptho *et al*, 2021).

Vermiwash, a nutrient-rich foliar spray, is a liquid biofertilizer produced by passing water through a column of worm-activated organic matter. It contains the excretory and secretory products of earthworms, enriched with essential micronutrients and beneficial microorganisms that promote plant growth and protect against infestations. Additionally, fresh vermiwash is rich in sugars, amino acids and phenols and contains plant growth-promoting hormones such as indole acetic acid and humic acid, which enhance plant vitality (Gulsar and Iyer, 2006).

Need for Organic Formulations

Restoring Soil Health : Addresses soil degradation and sustains long-term fertility.

Reducing Production Costs: Lowers input expenses for farmers.

Enhancing Produce Quality: Improves crop quality while reducing dependence on chemical fertilizers, pesticides, fungicides and herbicides.

Cost-Effective and Eco-Friendly: Organic liquid formulations are economical, user-safe and environmentally friendly.

Easily Accessible Raw Materials: Farmers can readily obtain the required ingredients, making these formulations both practical and cost-efficient.

Methods of Organic Formulations

- Panchgavya
- Jeevamrit
- Vermiwash
- Biostimulant
- Seaweed Extract

Effect of Panchgavya

Panchagavya: A Natural Growth enhancer in Floriculture

Panchagavya is a traditional organic formulation composed of five key ingredients derived from indigenous cows: cow dung, cow urine, cow milk, cow curd and cow ghee. Rich in essential nutrients, beneficial microorganisms, growth-regulating substances and natural insecticidal/pesticidal properties, Panchagavya enhances plant productivity by promoting the growth of roots, stems, branches and leaves.



Fig. 1 : Composition of Panchagavya.

Research Highlights on Panchagavya in Floriculture

• Humic acid + Panchagavya accelerated spike emergence by 50%, reduced days to harvesting and improved spike length, rachis length, number of florets per spike and vase life (Trivedi *et al.*, 2022).

- Vermicompost + Panchagavya significantly enhanced growth and flower quality in Celosia (Sendhilnath *et al.*, 2021).
- 75% RDF + Glomus fasciculatum + Trichoderma harzianum + Amrit Pani + Panchagavya + dry mulch + Agnihotra ash improved growth and flowering attributes in gerbera (Bellubi, 2014).
- NPK + Panchagavya positively influenced growth and yield parameters (Sharma *et al.*, 2021).
- Various concentrations of Panchagavya improved physicochemical and biochemical properties, with a 3% dilution recommended for foliar spray to maximize growth and yield (Rakesh *et al.*, 2017).
- Panchagavya (5%) application resulted in the highest number of leaves per plant, florets per spike, spike diameter, rachis length, corm weight, cormels per plant and propagation coefficient (Kumar *et al.*, 2010).
- Panchagavya + Manchurian Mushroom Tea maximized plant height, stem length, vase life and flower quality, achieving 100% stem strength, minimal calyx splitting (0.00%) and zero disease incidence (Sharma *et al.*, 2010).
- Media application of Panchagavya (1:30) recorded the highest pseudobulb length and girth, spikes per plant, florets per spike, spike length and rachis length in Cymbidium hybrids (Naik *et al.*, 2010).
- Spraying 4% Panchagavya + 4% Manchurian Mushroom Tea resulted in maximum plant height, flowering duration, spike length, spike weight, florets per spike, keeping quality of cut spikes, number of spikes per plant and yield per square meter (Mahawer *et al.*, 2010).

Effect of Jeevamrit in Floriculture and Sustainable Agriculture

Jeevamrit is a liquid organic manure widely used in organic farming, valued for its rich content of natural carbon, biomass, nitrogen, phosphorus, potassium and essential micronutrients required for crop growth. It enhances nutrient uptake (N, P, K), promotes plant height and root development, increases fruit yield and improves quality attributes such as protein and fiber content, ultimately contributing to higher overall productivity.

Research Findings on Jeevamrit Application

• Jeevamrit drenching and foliar application

significantly improved flower yield parameters, including the number of flowers per plant and yield per plant, plot and hectare. The highest benefit-cost ratio was observed with this method (Parmar *et al.*, 2024).

- Jeevamrit application enhanced plant growth and soil health, while a combination of benzyl adenine with balanced NPK fertilizer resulted in higher cutting yield. It has proven to be a viable alternative to chemical fertilizers for marigold cultivation, particularly for cut flower production (Kaushal *et al.*, 2024).
- Jeevamrit foliar application resulted in maximum stem diameter and the highest number of florets per spike in *Iris* cv. *Frigia*, proving its effectiveness in promoting growth and flowering (Thakur *et al.*, 2023).
- Higher plant height, increased plant spread (N-S & E-W), more primary branches, larger flower diameter, greater flower yield, individual flower weight and extended shelf and vase life were recorded with Jeevamrit application (Hegde *et al.*, 2023).
- Jeevamrit combined with organic mulch significantly improved vegetative and flowering attributes, highlighting its role in sustainable crop management (Gupta *et al.*, 2021).
- Among different treatments, Jeevamrit applied at 2L/m² every 15 days resulted in maximum plant height, plant spread, number of side shoots, number of flowers per plant and per square meter, flower weight, flower diameter and extended flowering duration (Choudhary *et al.*, 2021).
- Fermented organic formulations like Panchagavya, Jeevamrit, Beejamrit and Vermiwash are gaining popularity among farmers and researchers due to their role in enhancing crop productivity, maintaining soil fertility and reducing cultivation costs (Sharma *et al.*, 2019).
- Jeevamrit application proved most effective for early bud initiation, maximum number of flowers per plant, longest flower buds, larger flower diameter, highest number of petals per flower, extended flowering duration, improved flower stem length and enhanced post-harvest qualities (Trivedi *et al.*, 2016).
- A combined application of Panchagavya + Vermiwash + Jeevamrit resulted in superior plant

growth, including increased plant height, leaf area, leaf count, shoot development and flowering traits such as early bud initiation, larger flower diameter, increased petal count, higher flower yield per m² and extended flowering duration (Trivedi and Kumar, 2015).

• Jeevamrit serves as a rich source of beneficial microorganisms, aiding in nitrogen fixation, phosphorus solubilization and providing essential nutrients like carbon, nitrogen, phosphorus, potassium and micronutrients (Sreenivasa *et al.*, 2010; Devakumar *et al.*, 2014).

Effect of Vermiwash in Floriculture and Crop Productivity

Vermiwash is a liquid biofertilizer applied as a foliar spray, obtained by passing water through a column of earthworm-activated organic matter. It contains the excretory and secretory products of earthworms along with essential micronutrients that promote plant growth. Vermiwash is typically prepared using plastic tanks or small buckets with layers of broken stones, coarse sand, garden soil, earthworms, cattle dung, straw and water.

Research Findings on Vermiwash Application

- Panchagavya + Vermiwash significantly enhanced vegetative growth and flower yield attributes in African marigold, including increased plant height, number of primary and secondary branches, plant spread, early flower bud initiation and improved flower yield (Trivedi *et al.*, 2022).
- Among thirteen foliar treatments, the highest flower yield per plant was observed in those treated with a combination of marigold extract, FAA (Fish Amino Acid), Vermiwash, Panchagavya, FeSO₄ and ZnSO₄ (Mohana *et al.*, 2021).
- Earthworms process plant debris and animal waste, producing vermicast—an excellent organic fertilizer. During rains, vermiwash is generated as an extract of both earthwormworked biomass and earthworm body fluids, enriching soil fertility (Patnaik *et al.*, 2021).
- A combined application of cow urine and vermiwash significantly improved plant emergence, height, number of leaves per plant, leaf size (length and width), early spike emergence, spike and rachis length, corm size and weight and the number of cormels (Tamrakar *et al.*, 2021).
- Vermiwash application increased the productivity

of *Gerbera jamesonii L.*, reduced pest and disease damage and decreased dependency on chemical fertilizers (Subasinghe *et al.*, 2020).

- Foliar application of vermiwash (2%) combined with cow urine at fortnightly intervals resulted in significantly higher plant height, number of leaves, leaf area and number of shoots (Shah *et al.*, 2018).
- Comparative studies show that vermiwash improves soil physiochemical properties, reduces insect pest infestation and enhances nutrient uptake, leading to higher crop growth and yield, supporting sustainable crop production (Verma *et al.*, 2018).
- Vermiwash application enhanced plant height, number of leaves post-bud emergence, spike length, rachis length, number of florets, vase life, number of corms per square meter, corm weight and cormel count per plant (Kumar *et al.*, 2013).
- Vermiwash improved flower quality in Dendrobium orchid cv. Sakura Pink, with earthworms restoring and enriching soil fertility. Vermiwash, vermicast and earthworm body fluids acted as natural growth promoters and protectors, reducing pest and disease incidence while lowering irrigation needs (Sinha *et al.*, 2010).
- Application of a common basal dose + 3% vermiwash resulted in maximum leaf length, leaf width, petiole length, spathe length, spathe width and extended spike longevity in floriculture crops (Nagalakshmi *et al.*, 2010).

Effect of Biostimulants

• A plant biostimulant is any substance or microrganism applied to plants with the aim to enhance nutrient efficiency, abiotic stress tolerance and or crop quality traits regardless of its nutrients content. By extension plant biostimulants are also designated as commercial products containing mixtures of such substances and/or microorganisms.

Research Findings on Biostimulants Application

• As a result, this the highest benefit-to-cost ratio and module is recommended to farmer for increasing the availability of nutrients and the maximum load of beneficial bacteria in the soil, which helps to improve the performance of African marigold cv. 'Pusa Narangi Gainda'. (Bisth *et al.*, 2022).Thus, use of bio-enhancers resulted in excellent vegetative growth and flower yield attributes in African marigold Cv. Punjab Gainda No. 1 (Trivedi *et al.*, 2022). This study indicated that foliar application of superior for growth and yield parameters of Floribunda cv. Mirabel (Parveen *et al.*, 2021).

- The obtained results showed that beneficial effect had been taken from low levels of natural leonardite in marigold (Karagoze, 2021). Chitosan has been used both as a biostimulant as well as to combat pathogenic infections/adverse stress conditions in various plant species. Being reported to be lesser toxic in comparison to synthetic plant hormones, chitosan is a preferred plant growth promoter in sustainable commercial plant tissue culture of orchid germplasm. (Bhattacharya *et al.*, 2021).
- The most effective treatment was MLE and GA₃ at 100 mg/L. MLE and seaweeds may be applied as a promise and ecofriendly plant growth stimulants to modulate the growth and productivity of gladiolus (Mazrou, 2019). Higher yield *viz.*, number of cut flowers per plant, number of cut flowers per m² and yield of flowers per ha and quality parameters *viz.*, maximum length of bud, diameter of bud, diameter of flower, vase life, *in situ* longevity, fresh weight, dry weight and pedicle length of flower in rose cv. Top Secret (Barad *et al.*, 2019).
- The test showed that the use of Spirulina and Klamath in the culture medium can significantly influence the germination of the Portulaca grandiflora and resulted in a significant increase in chlorophyll content and improved absorption of NPK (Prisa, 2019). All natural stimulant treatments significantly increased all vegetative growth characters and flowering parameters in comparison with the control (Abdou *et al.*, 2018.) Panchagavya 3 percent was significantly increasing the plant growth characters, flowering parameters and the quality characters like shelf life was achieved in Gundumalli (*Jasminum sambac* Ait) (Sendhilnathan *et al.*, 2017).

Effect of Seaweed extract

Seaweeds are the plants especially marine algae growing in the sea, lakes and large wetlands, like the rockweeds, kelps, sea lettuce, and dulses. Liquid extracts derived from marine algae is known as seaweed extract. Used as foliar spray, application to soil and for soaking of seeds material before sowing benefits. It enhances the germination Increases uptake of plant nutrient.



Plate 1 : Gerbera grown using organic formulation.



Plate 2 : Healthy and treated Corms.

Research Findings on Seaweed Extract application

• The application of macroalgae to manipulate various biotic and abiotic stress of crops. utilize various seaweeds to increase the features and yield of ornamental crops. Resulted Gerbera *M. pyrifera* yield ehanced, Rose *Ascophyllum nodosum*, improved rooting capacity and chlorophyll and protein content in rose shoots, Marigold *Ecklonia maxima*, Number of floras & seeds per blossom head amplified (Kularathne *et al.*, 2021). The addition of *D. subspicatus*

biomass or extract accelerated germination, induced shoot formation, and produced welldeveloped seedlings during acclimatization. A complete and efficient protocol of germination and seedling development of *C. warneri* was there fore achieved using biomass and aqueous extract of *D. subspicatus* (Navarro *et al.*, 2021).

- The longest flowering duration was recorded. Increasing yeast concentration to in combination with seaweed extract at 100 ppm showed the best characteristics of the new corm including corm FW, DW diameter and produced the highest number of cormels/corm. (Ibrahim and Tawafik, 2021). The results showed that the level of addition of Acadian organic fertilizer (2)g to the soil was significantly influenced of all parameters, that improving the qualities of vegetative growth, floral and corms yield (Al-saad, 2020).
- Microalgae extracts and biomasses are effective alternatives for in vitro propagation of *C. labiata* that can replace plant growth regulators, as they favored the formation of PLBs and plants (Corbalini *et al.*, 2020).The results reveal that application of *S. duplicatum* extract has significant effect on the growth of *V. tricolor seedling*. The best application is of algae weight. (Adiguna *et al.*, 2018).
- Seaweeds extract or active dry yeast seemed to be more effective than other treatments in this concern. The use of high level of compost in combination with seaweeds extract or active dry yeast noticeably improved the different vegetative growth characters and flowering parameters of gladiolus.(Abdou *et al.*, 2018).
- Spraying with plant extract (licorice, garlic) achieved increasing in plant height and increasing simple leaf area or total leaves area. The Ener gene and Marmarine appear significant floral spike height which reached and for every one



Plate 3 : Sea Weed Extract Liquid.



Plate 4 : Sea Weed extract Granular.



Plate5 : Sea weed extract powder.

compared with less value (Ali and Bairam, 2012). Seaweed and seaweed-derived products have been widely used as amendments in crop production systems due to the presence of a number of plant growth-stimulating compounds (Khan *et al.*, 2009).

Conclusion

- Organic formulations play a vital role in plant growth, development, disease and insect control and yield enhancement. They improve produce quality while reducing dependence on chemical, inorganic and synthetic inputs such as fertilizers, pesticides, fungicides and herbicides.
- Beyond eliminating chemical usage, these formulations restore soil health and enhance microbial diversity, ensuring efficient resource utilization and promoting long-term agricultural sustainability.
- The raw materials for preparing organic inputs are readily available, cost-effective and require minimal technical expertise, making organic liquid formulations a practical, eco-friendly and economical alternative to conventional chemicalbased farming.

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