Organic Nutrient Solutions for Commercial Cultivation of Orchids

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Abstract

Organic farming indicates a traditional food production systems such as crop rotations, mixed cropping, mixed farming, organic manuring, residue recycling, agro-forestry systems which are amalgamated with modern practices of crop cultivation and livestock management to enhance profitability without dependence on off-farm resources. In orchid cultivation, organics are used as substrate media, as a component in plug plant production, in preparation of nursery for hardening of tissue culture plants, to improve the soil physical properties, as a soil drench of bulb soaking or foliar spray, in propagation of ornamental crops, and as a plant protection.

Introduction

Orchids are the second largest families of flowering plants and are globally distributed. Till date, 29199 species have been identified and accepted, with several hundred new species added each year. In addition to their geographical and taxonomic diversity, orchids are also widely used for a variety of reasons, both legally and illegally, sustainably and unsustainably. One of the best-known plant groups in the global horticultural and cut flower trades, orchids are also harvested, grown and traded for a variety of purposes, including as ornamental plants, medicinal products and food. Most popular global orchid trade is in artificially propagated cut flowers and plants grown under controlled conditions. Taiwan and Thailand were the largest exporters, with most plants sent to South Korea (40%), the USA (27%) and Japan (20%) (UNEP-WCMC, 2017). The orchids have taken a significant position in cut flower industry due to its attractiveness, long shelf life, high productivity, right season of bloom, easy in packing and transportation. Orchid accounts for a large share of global floriculture trade both as cut flowers and as potted plants and is estimated around 10% of international fresh cut flower trade. Reported Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES) trade in live artificially propagated plants is dominated by a small number of genera with huge number of hybrids (e.g. Cymbidium Sw., Dendrobium Sw. and Phalaenopsis Blume, Cattleya, Oncidium).

Among the orchids, Cymbidium ranks first and in floricultural crops it accounts for 2.7% of the total cut flower production. Improper farming practices such as monocropping, imbalanced fertilization, poor soil organic matter management, soil contamination, soil compaction, mining of soil nutrients, water logging, depletion of ground water, decline in soil biodiversity and changing pest and disease complex and application of imbalanced NPK fertilizers ratio of 7.9:3:1 as against normal...
values of 4:2:1 are the major factors for soil degradation. Looking the adverse effects of fertilizers and chemicals stress is being given to promote organic farming (Bhattacharya, 2004). Among commercial orchids, Cymbidiums are heavy feeders for their robust growth of bulbs and leaves. Application of organic manure increases the water holding capacity, aeration of growing media, allows root development and modify media temperature. During potting of Cymbidium seedlings in 10-12 cm pot, application of dried poultry manure at the rate of 10g/pot as basal dose and weekly drenching of vermiculite or wash (1:20) will help in growth and flowering Cymbidium. Organic manure comprised of mustard oil cake, dried fish and bone meal (8kg: 0.5 kg: 4 kg) is also beneficial for Cymbidium. It contains 3.5% nitrogen, 2.1% phosphorus, 2.7% potassium, 4.5% calcium and 1.6% Mg. The mixture is prepared by decomposing for 21 days in water followed by sun drying. 5 g of this organic mixture at 6 monthly interval and weekly spraying of vermiwash is beneficial for 2-3 years old Cymbidium.

**Important Substrate Media for Orchid Cultivation**

**Cocopeat:** Cocopeat is a multipurpose growing medium made out of coconut husk. The fibrous coconut husk is pre washed, machine dried, sieved and made free from sand and other contaminations such as animal and plant residue. Cocopeat is a very good alternative to traditional peat moss and Rock wool. It has air filled porosity and high water holding capacity and is an ideal growing as well as propagating medium for orchids. It is 100% organic and eco-friendly, free from soil borne pathogen and weed. It has a pH of 5.7 – 6.5, EC level <1 mS/cm and excellent for plant growth.

**Vermiculite:** This is a micaceous mineral produced by heating to 745°C. These are expanded plate like particles having very high water holding capacity, aeration and drainage. Vermiculite is hydrated aluminium iron magnesium silicate material with accordion like structure. It has a very low bulk density, a neutral pH, a high CEC and small amounts of potassium and magnesium. It is well suited for propagation media.

**Perlite:** This is a siliceous mineral of volcanic origin. Perlite is rigid, sterile and essentially infertile with minimum CEC and neutral pH. Perlite may be included in the mix to increase aeration and to lower bulk density. It is generally recommended for use in a propagation media as well as in flower drying.

**Rock wool:** It is produced by burning a mixture of coke, basalt, lime stone and slag from iron production at 1600°C temperature. The fiber rock wool is available in cubes and slabs. It is non-biodegradable, pH is 7 to 8.5, no buffering capacity, contain calcium, magnesium, iron, manganese, copper and zinc, CEC is negligible, does not require pasteurization, light is weight, high water holding capacity and good aeration.

**Peat:** It is the common component of artificial growing media. Peats are composed of several species of plant including mosses, sedges and grasses. In a growing medium, the value of peat is determined by the type of plant material and degree of decomposition. Peat are classified into four categories viz, Hypnaceous moss, Reed and Sedge, Humus or Muck and Sphagnum Moss.

**Humus or Muck:** These peats are the decomposed debris of finely divided plant materials of unknown origin. It contains sufficient quantities of silt and clay particles and does not improve drainage or aeration. Humus is not recommended for use in growing media due to its rapid decomposition and particle size.

**Sphagnum Moss:** This is the dehydrated remains of acid bog plants from the genus Sphagnum. It is low in soluble salts, long lasting in the mixture, uniform in the composition and improves drainage and aeration. Sphagnum peat moss has a good water holding capacity, high CEC, low nutrient levels and a comparatively low pH (3.0-4.5). It is the most desirable form of organic matter for the preparation of growing media for epiphytic orchids.

**Bark:** These are by-products of the pulp, paper and plywood industries. Hardwood bark is the common ingredient of a growing medium. Bark is aged with lime and leaching to reduce the risk of toxicity of plants. Hardwood bark along with nitrogen makes a good potting media. Soft wood bark is acceptable but it lowers the pH of a media and so, liming is required. Barks are lighter in weight, sterile and have capacity to retain water as well as to drain the same.

**Vermi-compost:** It is prepared from the organic wastes upon the action of earthworms. It contains 2.5-3.0% Nitrogen, 1.0-1.5% Phosphorus and 1.5–2.0% Potash and ideal for commercial cultivation of potted orchids.

**Vermiwash:** It is washings from the earthworms collected during the preparation of vermin-compost, used as spray in raising of Nursery, lawn and orchids (Ismail and Pramoth, 1995). Vermiwash is rich in growth promoting substances as foliar spray or drenching.

**FYM/ Compost:** It is prepared from the decomposition of organic wastes through anaerobic organisms. It contains fair amount of macro and micro-nutrients and most commonly used organic supplement given to the flower crop cultivation. FYM contains 0.5-1.5% N, 0.4-0.8% P₂O₅ and 0.5–0.9% K₂O whereas Garden compost contains 0.5% N, 0.3% P₂O₅ and 0.8% K₂O.

**Panchgavya:** It is a natural growth promoter and contains essential plant nutrients. It is prepared by mixing of fresh cow dung (5kg), cow’s urine (3 litres), cow’s milk (2 litres), cow’s curd (1 litre), cow’s ghee (100g), sugarcane juice (3 litres), Tender coconut water (3 litres), banana fruits (12 Nos.).
Usually, 1 to 5% solution of Panchgavya at 15 days intervals is used only after filtering.

**Liquid manures:** 10 kg each of equivalent amount of ground leaf fern (*Dryopteris sikkimensis*), *Artemisia vulgaris* and rotten cowdung manures are mixed with 100 litres of water and kept for one month for fermentation and after that the solution become ready for use in different dilutions (Plate 1 to 4).

Spraying of liquid manure in higher dilution (1:30 or 1:20) improved vegetative growth of young plants whereas lower dilution 1:15 and 1:10) enhanced reproductive growth of *Cymbidium*, *Zygopetalum* and other orchids as compared to NPK sprays. Cowdung can be kept as a component of a growing media because of rich in primary major elements (N, P & K) and secondary elements (Ca, Mg & S) for commercial cultivation of epiphytic orchids like *Cymbidium*, *Dendrobium*, *Vanda*, *Phalaenopsis*, *Cattleya*, *Oncidium* and *Paphiopedilum* and terrestrial orchids such as *Phaius tankervilleae*, *Thunia* spp, *Arundina graminifolia*, *Calanthe* spp. (Anonymous, 2004-2005). Application of Panchgavya (1:20 or 1:30) in substrate influenced profoundly on growth of *Cymbidium* as compared to foliar spraying.

Anions present in organic liquid manure were estimated by ion chromatography Table 1.

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<td>Flouride</td>
<td>14.550</td>
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<td>15.848</td>
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<td>Nitrates</td>
<td>101.70</td>
<td>66.43</td>
<td>33.48</td>
<td>15.308</td>
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<td>Sulfate</td>
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<td>615.21</td>
<td>308.03</td>
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**Conclusion**

Spraying of organic diluted liquid manure in the ratios of 1:20 and 1:10 could be beneficial for improved vegetative and reproductive growth of orchids respectively due to the presence of higher amount of nitrate and phosphate ions and lesser amount of chloride ions.

**References**


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organic liquid ‘ferticide’. In: Ismail Vermicology. The
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