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Fertilizer Guidance for Vanilla Production in Florida[1]

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Commercially cultivated vanilla (*Vanilla planifolia* and *Vanilla × tahitensis*) thrives in warm, humid climates, making Florida a suitable region for its cultivation (Chambers et al. 2019). Precise nutrient management is crucial to ensure healthy vine growth, flowering, and fruit yield in commercial production systems. Given its long juvenile period, vanilla needs consistent and appropriate nutrient inputs for root development, vine elongation, and reproductive growth. Organic substrates are commonly used for vanilla cultivation but often lack essential nutrients, leading to deficiencies and reduced growth (Diez et al. 2016).

This publication provides general fertilizer guidance tailored for vanilla cultivation in Florida. The information presented in this publication is based on research reports, field trials, and the authors' observations with the goal of assisting commercial vanilla growers.



Figure 1. Vanilla (*Vanilla planifolia*) grown under a shade-house production system using organic mulch as growing medium, which is a common cultivation method in Florida and tropical production regions. Credit: Used with permission from Pedro Portal, *Miami Herald*.

Basis of Fertilizer Guidance

In controlled studies, vanilla plants were grown in a container system using organic-based substrate (peat-based PRO-MIX®) under uniform environmental conditions. Nitrogen response was evaluated across multiple application rates (0–32 g N per plant per year) using a replicated randomized complete block design over approximately 15 months. Plant growth, leaf chlorophyll index (LCI), biomass, and tissue nutrient concentrations were measured to evaluate responses to nutrient supply.

Plant responses to nitrogen were analyzed using regression models to estimate optimal nutrient levels. Across multiple growth and physiological variables, optimal nitrogen supply ranged from 13 to 21 g N per plant per year, with an average near 16 g N per plant per year. These results indicate that plant performance is maximized at intermediate nitrogen levels rather than at the highest fertilizer inputs (Taco et al. 2026). These findings provide the basis for the nitrogen guidance presented in this publication.

Because these experiments were conducted under controlled container conditions, the guidance presented here is most directly applicable to container and soilless production systems commonly used for vanilla cultivation in Florida. Adjustments may be required under field conditions depending on soil properties and environmental factors.



Figure 2. Young vanilla plants established in a container-based production system using a peat-based substrate (PRO-MIX®) under controlled conditions at the Tropical Research and Education Center. Credit: Alejandra Taco, UF/IFAS.

Nutrient Requirements for Vanilla

Essential Nutrients

Vanilla plants are known to require 17 essential nutrients. These include primary nutrients (nitrogen [N], phosphorus [P], and potassium [K]), which promote the development of healthy plant tissues. Secondary nutrients (calcium [Ca], magnesium [Mg], and sulfur [S]), and micronutrients (iron [Fe], manganese [Mn], zinc [Zn], copper [Cu], boron [B], molybdenum [Mo], and nickel [Ni]) strengthen cell walls and are vital for processes such as enzyme activity and energy production that support flowering and pod formation (Cibes et al. 1947; Childers et al. 1959; Domínguez 2005; Ranadive 2005).

Nutrient Need by Growth Stage

Nutrient requirements shift with plant growth stages. During early growth and establishment, a balanced NPK ratio such as 10:10:10 supports root and shoot development. In the vegetative phase, higher N (e.g., 20:10:10) promotes vine elongation. For flowering and fruit set, P and K should be increased (e.g., 10:20:20) (Diez et al. 2016). Regular monitoring through tissue and soil analysis is recommended, especially in controlled environments or container production systems, to ensure optimal nutrient uptake.

Reference Leaf Tissue Nutrient Concentrations

Maintaining appropriate nutrient levels is essential for maximizing growth and yield in vanilla. Leaf tissue analysis is a valuable tool for diagnosing nutrient deficiencies and guiding fertilization practices during production.

Published information on tissue nutrient sufficiency ranges for vanilla is limited. N values presented here are supported by UF/IFAS controlled-environment research on *Vanilla × tahitensis*, where optimal N application rates ranged from 13 to 21 g N per plant per year with corresponding leaf N concentrations of 1.5%–2.2% (Taco et al. 2026).

The following concentrations should be considered provisional reference values based on a combination of available literature and leaf tissue analyses from healthy plants grown under Florida container production systems. These values should be used as general guidelines rather than strict sufficiency thresholds, as nutrient requirements may vary depending on cultivar, substrate composition, production system, and environmental conditions.

Macronutrients

- N: 1.5%–2.2%
- P: 0.3%–0.4%
- K: 3.1%–4.2%
- Ca: 3.2%–4.8%
- Mg: 0.4%–0.7%

Micronutrients

- Fe: 37–47 ppm
- Zn: 25–30 ppm
- Cu: 5–7 ppm
- Mn: 19–44 ppm
- B: 25–36 ppm

Fertilizer Guidance

Efficient nutrient supply for vanilla follows the 4R principles: right rate, right source, right placement, and right timing (Roberts 2007).

Application Rates

Nutrient requirements vary based on plant age and growing conditions. For vanilla plants up to two years old, annual guidance consists of the following:

- N: 16 g per plant
- P: 3 g per plant
- K: 9 g per plant
- Micronutrients: Apply Fe, Mg, Zn, and B periodically to support metabolic functions.

Nitrogen guidance is based on observed plant responses to increasing N supply under controlled conditions. Plant growth increased with N supply to an intermediate range (13–21 g N per plant per year), after which vine length declined (Figure 3).

Source of Fertilizer

Selecting appropriate sources enhances nutrient availability and uptake:

- N: Urea Ammonium Nitrate (often abbreviated as UAN) at 28% or similar water-soluble forms.
- P: Triple superphosphate, ammonium phosphorate, or an organic source such as bone meal.
- K: Potassium sulfate (often abbreviated as SOP) or potassium nitrate.
- Micronutrients: Water-soluble formulations containing Fe, Zn, B, and others.

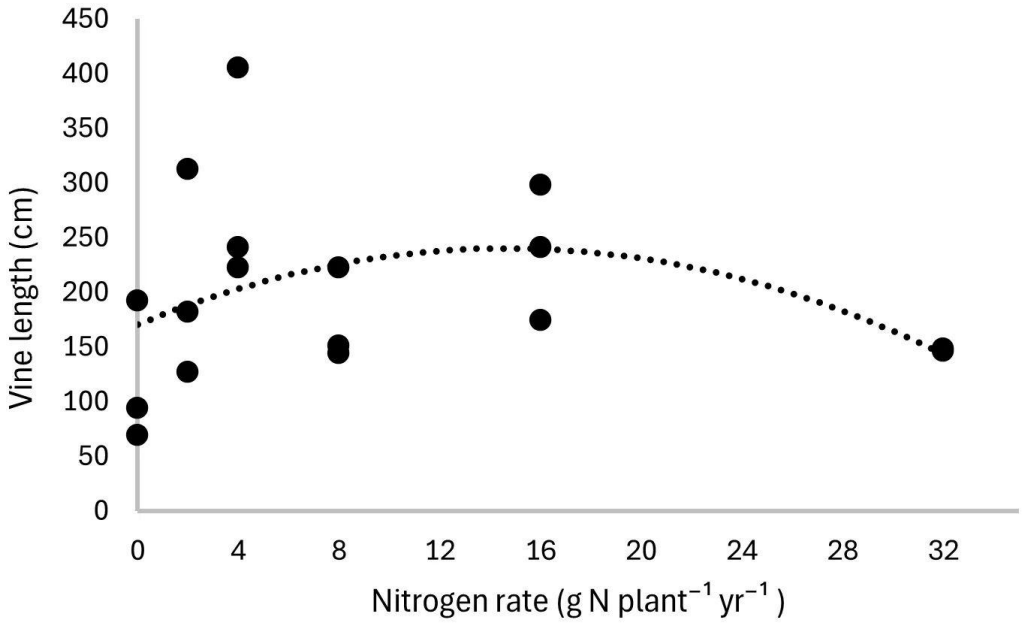


Figure 3. The effect of nitrogen application rate on vine length of vanilla plants. Growth increased with N supply up to an intermediate range (approximately 13–21 g N per plant per year), after which vine length declined.
Credit: Taco et al. 2026.

Fertilizer Placement

Fertilizers should be applied near the root zone without direct contact, allowing roots to absorb nutrients efficiently while minimizing salt accumulation and nutrient leaching.

Methods of Application

Container Production

Incorporate fertilizers into the substrate or apply them via fertigation to target the root zone.

Field-Grown Vanilla

Apply nutrients in a band around the plant base and lightly incorporate into the topsoil.

Application Timing

Fertilizer application timing should follow these guidelines:

- Apply fertilizers monthly during the active growth periods to maintain a steady nutrient supply.
- Micronutrient sprays may be applied every three to four months.
- For foliar feeding, monthly sprays using a 1% solution of a balanced fertilizer (e.g., 17:17:17) or diluted NPK (5–8 g/L) every one to two weeks can enhance vegetative and reproductive growth (Anandaraj et al. 2005).
- Increase N during vigorous vine expansion.
- Prioritize P and K during flowering and pod development.
- In warmer months, frequent applications may be required. Reduce fertilizer input during cooler or dormant periods to prevent salt accumulation.

Complementary Management Practices

Irrigation

Maintain consistent moisture to support nutrient uptake. Avoid overwatering, as vanilla roots are susceptible to root rot pathogens such as *Fusarium*. Use well-drained substrates and regularly monitor root health (Odoux and Grisoni 2010).

Soil pH

Vanilla prefers slightly acidic conditions in the range of pH 5.5–6.5. Adjust pH using lime (to raise) or sulfur (to lower) as needed.

Control of Humidity

Maintain 70%–80% humidity. In controlled environments, humidifiers or micro-sprinkler/fog systems can improve fruit set and overall plant health (Arya and Lenka 2019).

Soil or Growing Media

Vanilla is commonly grown in well-drained, organic-rich soils or container substrates with high porosity and moderate water-holding capacity. In Florida, container production systems using peat, bark, or coir-based substrates are widely used. Because nutrient availability and retention vary with soil texture, organic matter content, and pH, fertilizer guidance should be adjusted based on substrate characteristics and verified through soil and tissue testing (Santiago Pérez et al. 2021).

Conclusion

Successful vanilla cultivation in Florida depends on balanced nutrient management, appropriate substrate conditions, and routine monitoring of plant health. Controlled-environment studies indicate that optimal nitrogen supply occurs within an intermediate range (approximately 13–21 g N per plant per year), supporting vigorous vegetative growth without excessive nutrient accumulation.

The fertilizer guidance presented in this publication provides practical guidelines for managing nutrient inputs in container-based vanilla production systems. However, this guidance should be adjusted based on site-specific conditions and supported by regular tissue and soil testing because nutrient responses can vary with soil or substrate properties and environmental conditions.

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