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# Controlled evaluation of organic versus inorganic nutrient sources on cucumber plant growth

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**Abstract**

Cucumber has a special place among the cucumber class vegetables. It can be easily grown in both Zayed and Kharif seasons. Cucumber is mainly used in raw form like salad, raita, pickle making. Apart from these, it is also used in chaat. But a treatment with 75% mineral nitrogen and 25% organic nitrogen was combined together and it produced higher cumulative yields compared to other treatments, especially when composted plant was applied Organic fertilizers were determined to increase some growth parameters, such as height and girth of the stem, and soil characteristics like nitrogen and phosphorus content and organic matter Organic fertilizers improved soil properties like nitrogen and phosphorus content and organic matter levels. These findings indicate that though inorganic fertilizers can increase yield, the incorporation of organic matter can enhance plant growth parameters and soil fertility, providing an equilibrium solution for nutrient management in cucumber production.

**Keywords:** Organic nitrogen yield combination substitute plant quality cucumber materials & methods

## Introduction

The origin place of cucumber is said to be India. Preference for cucumber (*Cucumis sativus* L.) as one the most widely cultivated vegetables around the globe stems from its refreshing taste and significant nutritional value. In addition it has high water content which is excellent as a thirst quencher Cucumber (*Cucumis sativus* L.) is a highly cultivated vegetable crop, with its nutritional value and economic importance. Cucumber plant growth and yield are greatly dependent upon the availability of nutrients, hence the importance of fertilization in cultivation. Organic and inorganic fertilizers have long been used to improve soil fertility and plant productivity. Nevertheless, the relative efficacy of such nutrient sources on cucumber growth continues to be the topic of current research.

Organic manures, obtained from plant materials like farmyard manure (FYM) and vermicompost, are reported to enhance soil health, microbial activity, and a slow-release of nutrients. For example, FYM applications have significantly impacted growth attributes such as true leaf number and leaf size, whereas vermicompost has affected plant height and fruit diameter. On the other hand, inorganic fertilizers, normally made up of artificial substances such as NPK (nitrogen, phosphorus, potassium), provide easily available nutrients that can result in instant enhancements in plant yield and growth. Research has demonstrated that inorganic nutrient solutions may increase overall yield than organic manuring.

The decision between inorganic and organic fertilizers requires consideration for factors other than short-term plant growth, such as long-term soil fertility, environmental effects, and sustainability. Excessive usage of inorganic fertilizers has the potential to break the natural nutrient equilibrium in the soil, resulting in reduced soil quality and enhanced erosion susceptibility. Hence, the implications of these sources of nutrients on cucumber growth are critical factors in formulating sustainable farm practices.

**1. Experimental Site & Conditions**

A. Controlled experiment such as a greenhouse or special research field would be the best place for an experiment comparing organic and inorganic nutrient sources of cucumber plant growth. The location needs to have uniform soil condition and water access. Different treatments of organic and inorganic fertilizers would be used while other parameters such as sunlight, temperature, and watering schedule would remain constant across all treatments A. Site Selection & Preparation: Location: Either a greenhouse or a field with uniform soil type and drainage. Plot Layout: A randomized complete block design (RCBD) is ideal, with plots replicated many times to control for variations within the experimental area. Soil Preparation: The land should be tilled and leveled, and existing organic matter considered.

B. Treatment Groups: Plants with no fertilizer application. Inorganic Fertilizer Group: Plants that are given a standard NPK fertilizer (e.g., 15-15-15) at recommended application rates.

Organic Fertilizer Groups: Plants that are given varying types and quantities of organic material, such as: Compost: Digested organic material. Manure: Animal manure, such as poultry or cow manure. Vermicompost: Compost produced by earthworms. Other organic amendments: Depending on the research question, other materials such as cover crops or green manure may be utilized. Integrated Nutrient Management: A treatment receiving a mix of organic and inorganic fertilizers can also be included.

C. Cucumber Variety: One particular variety of cucumber should be selected and planted uniformly across every plot. D. Nutrient Application: The application time and procedure of fertilizers should remain the same for all treatments. Organic fertilizers should be mixed into the soil prior to planting or applied as a top dressing at growing stage. Inorganic fertilizers may be used as a starter application and side-dressed or top-dressed subsequently as required.

E. Growing Conditions: Watering: Plants must be watered regularly to supply enough soil moisture. Temperature and Light: Greenhouse trials must have suitable temperature and light conditions for cucumber development. Pest and Disease Management: Pest and disease management must be uniform in all treatments, possibly utilizing integrated or organic means.

**2. Plant Material Organic vs. Inorganic:** The experiment will contrast the growth of cucumber plants raised with organic nutrient supplies (e.g., compost, manure) with inorganic supplies (e.g., synthetic fertilizers such as NPK). Growth Parameters: The research will probably include growth parameters such as plant height, leaf length, and possibly the number and size of cucumber fruits formed. Possible Outcomes: Identifying which form of nutrient source results in greater growth and yield. Evaluating the long-term impact of each nutrient source upon soil health. Potentially determining the most sustainable and successful nutrient management tactic for growing cucumber.

**3. Treatments & Experimental Design Randomized Complete Block Design (RCBD):** This design aids in reducing the impact of environmental variation by arranging similar experimental units (plots of land) into blocks. Treatments are subsequently assigned randomly within each block. Treatments: A set of treatments should be included, including: Control: No application of fertilizer. Inorganic Fertilizer: A typical NPK fertilizer at a suggested rate. Organic Fertilizer: Different types of organic matter like compost (e.g., cow dung, poultry manure, garden compost), vermin compost, or specific organic fertilizers like nettle fertilizer. Integrated Nutrient Management: Blends of organic and inorganic fertilizers (e.g., 75% NPK + 25% organic manure) to examine synergistic effects. Replicates: Each treatment must be applied to several plots (replicates) within each block to enhance the reliability of results. Plot Size and Spacing: Plots ought to be of adequate size with sufficient spacing between plants and rows to ensure healthy growth and reduce competition. Data Collection: Plant Growth Parameters: Vine Length: Take the measurement of the main stem at frequent intervals. Number of Leaves: Record the leaves per plant. Number of Branches: Record the number of lateral branches. Leaf Area: Record leaf length and width to calculate leaf area. Plant Height: Record the plant height at various growth stages. Yield Parameters: Number of Fruits: Record the number of fruits per plant or plot. Fruit Weight: Measure the weights of the fruits from each plot. Fruit Length and Diameter: Determine the length and diameter of the fruitsd. Nutrient Uptake: Leaf Nutrient Analysis: Conduct leaf tissue analysis to measure the concentration of required nutrients (N, P, K, etc.). Fruit Nutrient Analysis: Conduct fruit analysis to evaluate nutrient composition. Soil Analysis: Observe soil samples prior to and after the experiment to determine differences in soil attributes (organic matter, pH, nutrient content).

**4. Application Schedule**

a. Pre-plant Incorporation: Organic Manures: Add organic manures (e.g., FYM well-rotted, vermicompost, or poultry manure) to the soil 1-2 weeks prior to planting. The rate would vary according to the manure type and nutrient content, but a common range could be 5-20 t/ha. Inorganic Fertilizers: In case of inorganic fertilizers, add a basal dose of NPK fertilizer (e.g., 120-60-60 kg/ha) prior to planting. b. Post-Planting Applications: First Application (3-4 weeks after planting): Administer a second inorganic NPK fertilizer at a diminished rate, or liquid organic fertilizer application. Second Application (6-8 weeks post-planting): Administer another dose of either inorganic fertilizer (if applied) or liquid organic fertilizer, possibly emphasizing potassium for fruit formation. Foliar Sprays: Use foliar sprays of micronutrients (e.g., boron, zinc) during flowering and fruiting periods to improve fruit quality and plant health. c. Treatment Groups: Control (No fertilizer): One treatment group with no fertilizer application to act as a comparison baseline. Organic Manures Only: Different organic manures at different rates of application. Inorganic Fertilizers Only: Different rates and proportions of inorganic NPK fertilizers. Integrated Nutrient Management: Integrations of organic and inorganic sources at different proportions. Liquid Organic Fertilizers: Different concentrations of liquid organic fertilizers. d. Monitoring and Data Collection: Plant Growth: Measure vine length, leaf count, stem girth, and leaf area at frequent intervals (e.g., weekly or fortnightly). Nutrient Uptake: Monitor plant tissue samples for the content of nutrients at various growth phases. Yield and Fruit Quality: Measure fruit yield per

plant, fruit weight, fruit length, fruit diameter, and TSS (Total Soluble Solids).

**5. Cultural Practices**

A. Treatments: Specify the various sources of nutrients to test. This may include: Inorganic: NPK fertilizers of standard type, maybe with different ratios and rates of application. Organic: Compost (e.g., farmyard manure, vermicompost), green manure, organic amendments, or nutrient liquid (e.g., nettle tea). Integrated: Blends of organic and inorganic sources, maybe at different proportions. Replicates: Employ replicates for every treatment so that the results are statistically significant and to compensate for variation. Control: Add a control group with no fertilizer added to provide a baseline for comparison. Planting: Use the same cucumber seeds or seedlings of the same age and variety for all the treatments. Potting Medium: Use the same standardized potting mix for all the pots to reduce differences in soil conditions. Perform the experiment in a greenhouse or a controlled field to reduce environmental variability. B. Cultural Practices During Growth: Planting: Sow cucumber seeds or seedlings at the same depth and spacing in every pot. Watering: Irrigate all plants equally, providing even moisture content. Sunlight/Light: Provide equal sunlight or artificial light exposure to all plants. Temperature: Regulate an optimum temperature range for cucumber development, if possible, in the specific optimal temperature range for the variety. Nutrient Application: Administer the prescribed nutrient sources as per the experimental plan. Pest and Disease Management: Adopt suitable strategies for managing pests and diseases to prevent them interfering with the outcomes. Weeding: Weed out any invading weeds that compete with the cucumbers for nutrients and resources. Pruning: Prune plants in line with standard horticultural practices for cucumber production to promote maximum fruit yield. C. Monitoring and Data Collection: Plant Height: Take readings of plant height at regular intervals (e.g., weekly). Leaf Area: Take measurements of leaf area (e.g., with a leaf area meter) to measure photosynthetic capacity. Number of Leaves: Take readings of number of leaves per plant at regular intervals. Number of Fruits: Take readings of the number of fruits per plant. Fruit Weight: Weigh the fruits after harvesting to evaluate yield. Fruit Length and Diameter: Take measurements of fruit size (length and diameter) to evaluate fruit quality. Nutrient Analysis: Determine the nutrient content (N, P, K, etc.) of leaf and/or fruit samples to evaluate nutrient uptake. Soil Analysis: Determine soil samples (pre- and post-experiment) for nutrient content and other soil properties of interest. Yield: Take the marketable yield for every treatment (e.g., kg/plot or kg/ha). Earliness: Record days to flowering and first harvest. D. Data Analysis: Analyze data gathered using statistical software (e.g., R, SPSS) Make.

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