



「Which Cutting & Water Treatments Extend *Rose's Vase Life* the Most?»

Team 5

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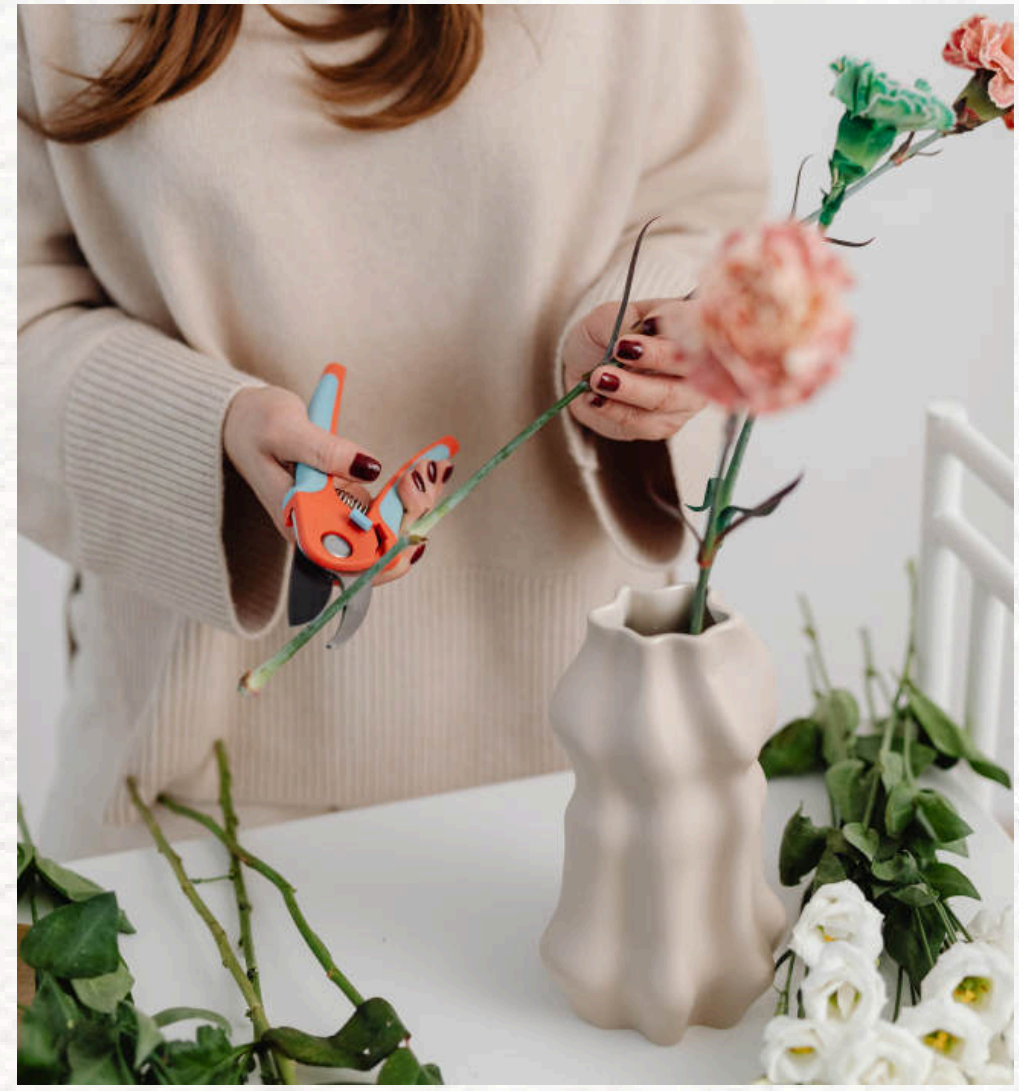


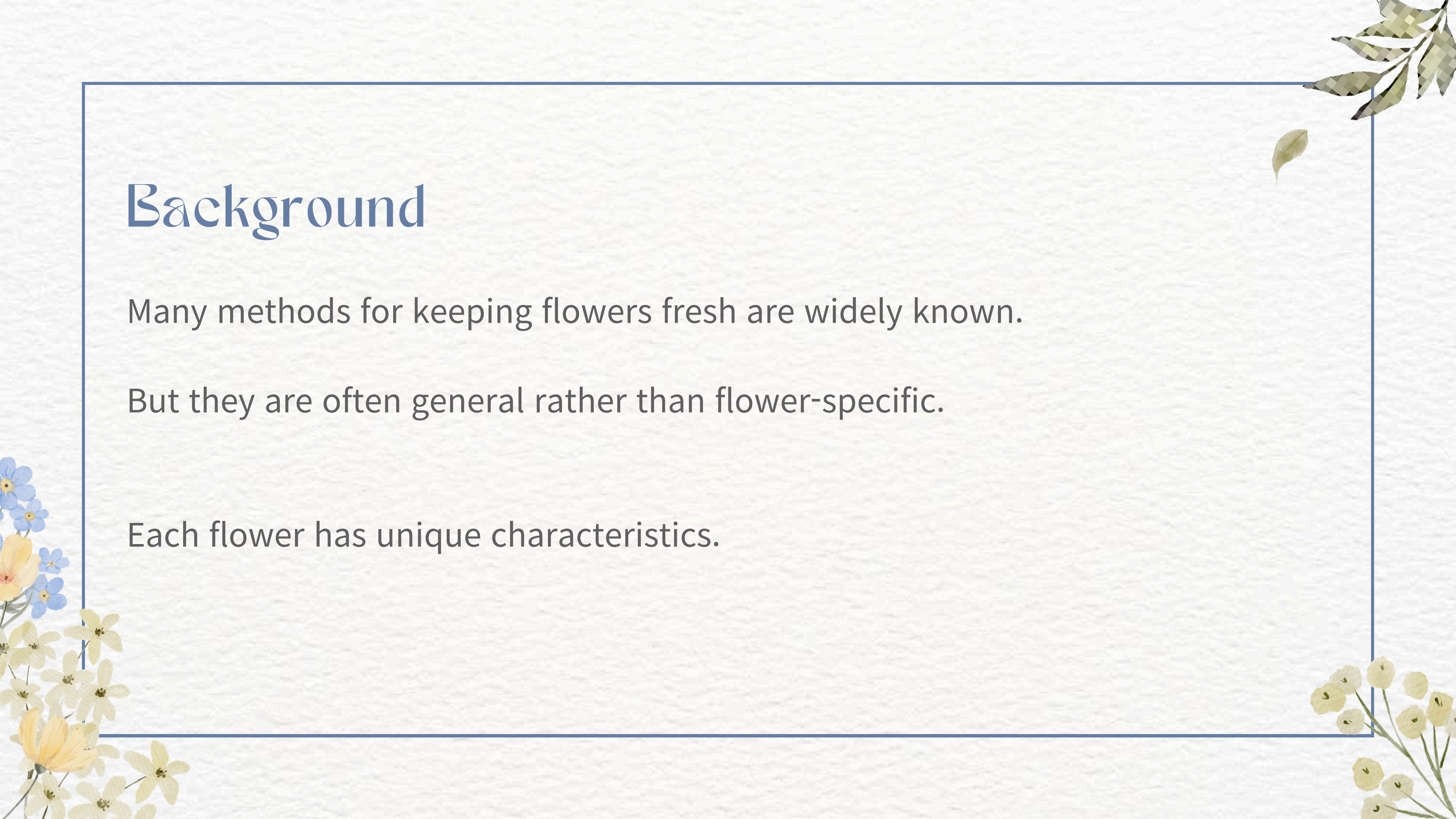
1. Background

Background



Background





Background

Many methods for keeping flowers fresh are widely known.

But they are often general rather than flower-specific.

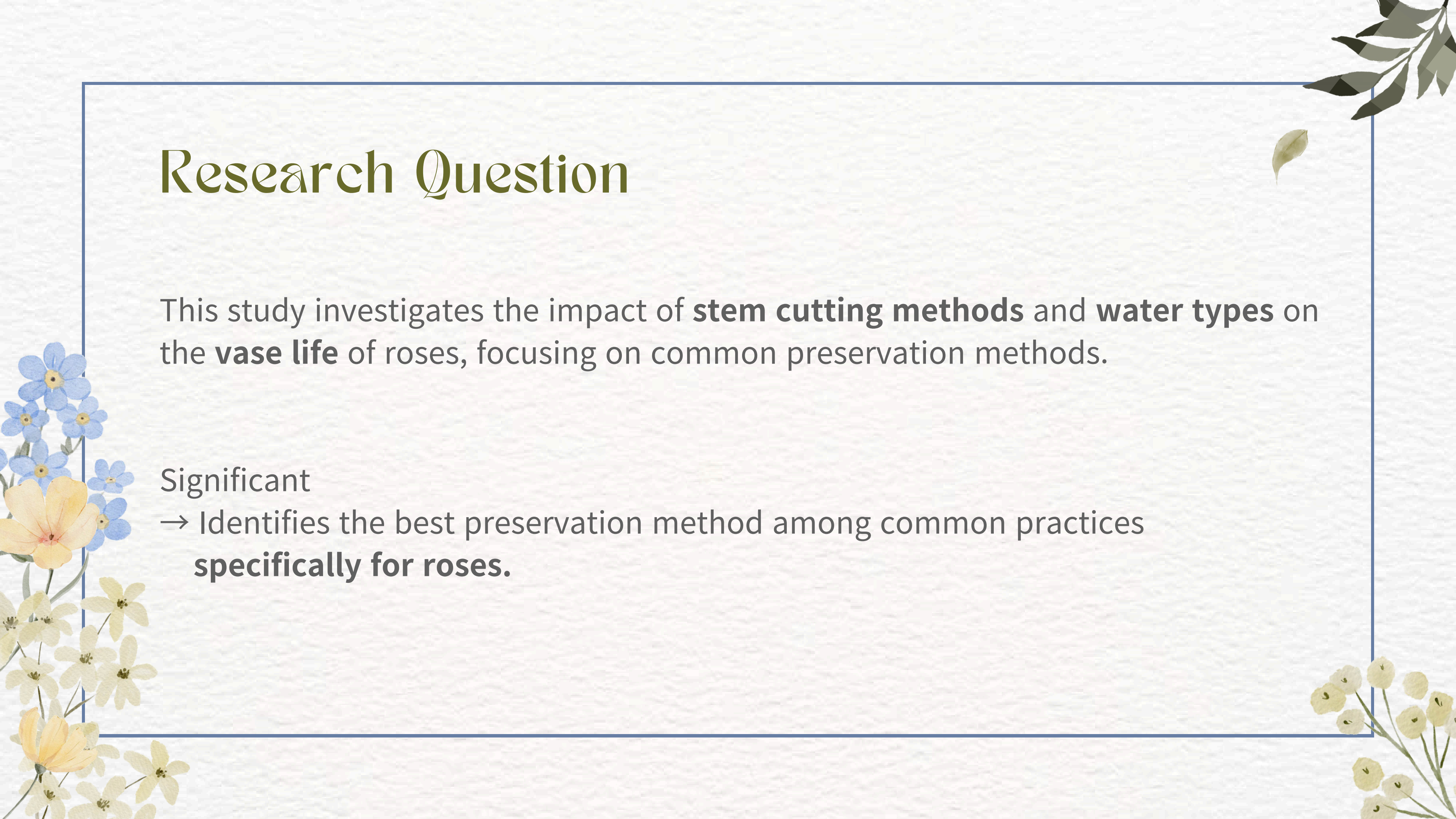
Each flower has unique characteristics.



**How common treatment methods affect
rose vase life?**



2. Research Question



Research Question

This study investigates the impact of **stem cutting methods** and **water types** on the **vase life** of roses, focusing on common preservation methods.

Significant

→ Identifies the best preservation method among common practices **specifically for roses.**



3. Preliminary Design

3.1 Overview of Experimental Design

3² Factorial Design

TOTAL FACTORS	2 (A, B)
LEVELS PER FACTOR	3 Levels
TOTAL COMBINATIONS	9 Treatments

	L1	L2	L3
L1*	Tr1	Tr2	Tr3
L2*	Tr4	Tr5	Tr6
L3*	Tr7	Tr8	Tr9

3.2 Treatments (Independent Variables)

- Factors we will manipulate
Stem cutting method / Type of water
- Levels of each factor
Factor 1: Stem cutting method
Level: No cut / horizontal cut / diagonal cut

Factor 2: Type of water
Level: Sugar water / vinegar water / regular tap water

3.3 Response Variable (Dependent Variable)

What will be measured

- Petals Discoloration



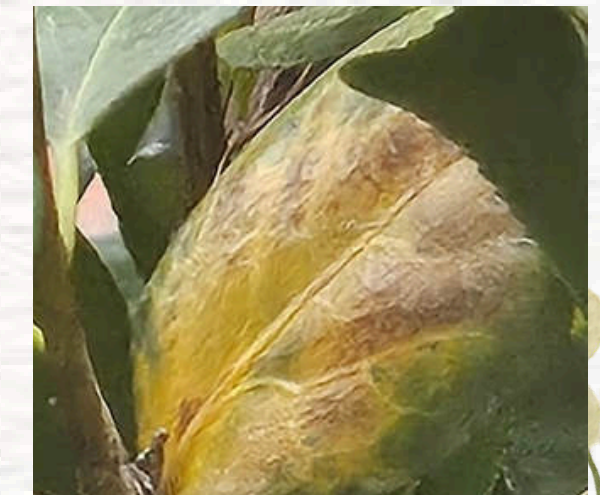
- Petals Abscission

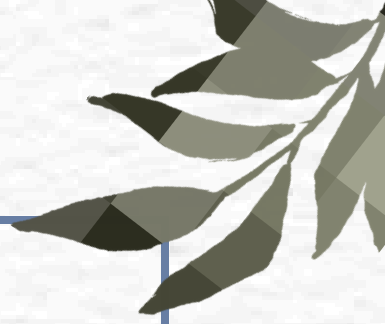


- Stem Bend



- Leaf Chlorosis

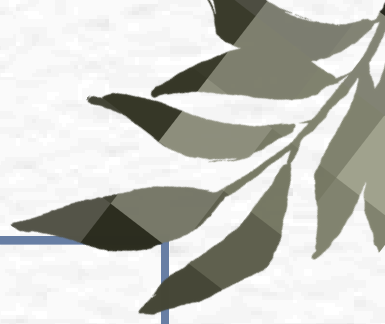




3.3 Response Variable (Dependent Variable)

How it will be measured

- Visual observation is conducted **every other day**.
 - Each rose is evaluated based on the following **four criteria**.
 - The **average score** of the two roses in each vase is defined as the freshness of the roses under that condition.
 - **Terminate** the experiment for vases that score **2.5 points or lower**.
 - **Record** the experiment **termination date** for each vase.
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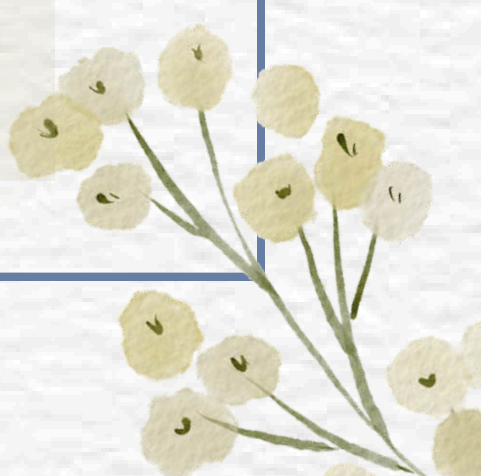
3.3 Response Variable (Dependent Variable)

How it will be measured

① Petals Discoloration

- No discoloration - 5 points
- [1%, 10%) discoloration - 4 points
- [10%, 30%) discoloration - 3 points
- [30%, 60%) discoloration - 2 points
- [60%, 100%] discoloration - 1 point

② Petals Abscission

- No petal abscission - 5 points
 - 1~2 petals abscised - 4 points
 - 3~5 petals abscised - 3 points
 - 6~9 petals abscised - 2 points
 - 10 or more petals abscised -1 point
- 

3.3 Response Variable (Dependent Variable)

How it will be measured

③ Stem Bend

- No bending - 5 points
- $[10^\circ, 22.5^\circ)$ bending - 4 points
- $[22.5^\circ, 45^\circ)$ bending - 3 points
- $[45^\circ, 90^\circ)$ bending - 2 points
- 90° or more bending - 1 point

④ Leaf Chlorosis

- No Chlorosis - 5 points
- $[1\%, 10\%)$ Chlorosis - 4 points
- $[10\%, 30\%)$ Chlorosis - 3 points
- $[30\%, 60\%)$ Chlorosis - 2 points
- $[60\%, 100\%]$ Chlorosis - 1 point

3.4 Experimental Units

Experimental Unit

One vase
= One experimental unit

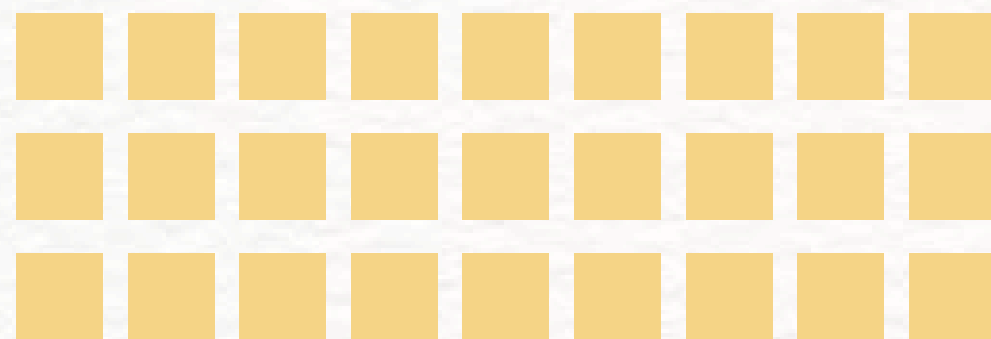
Factors & Levels

Factors = 2
Levels per factor = 3

Sample Size

Replications = 3
Experimental units = 27

Planned Sample Layout (27 units)

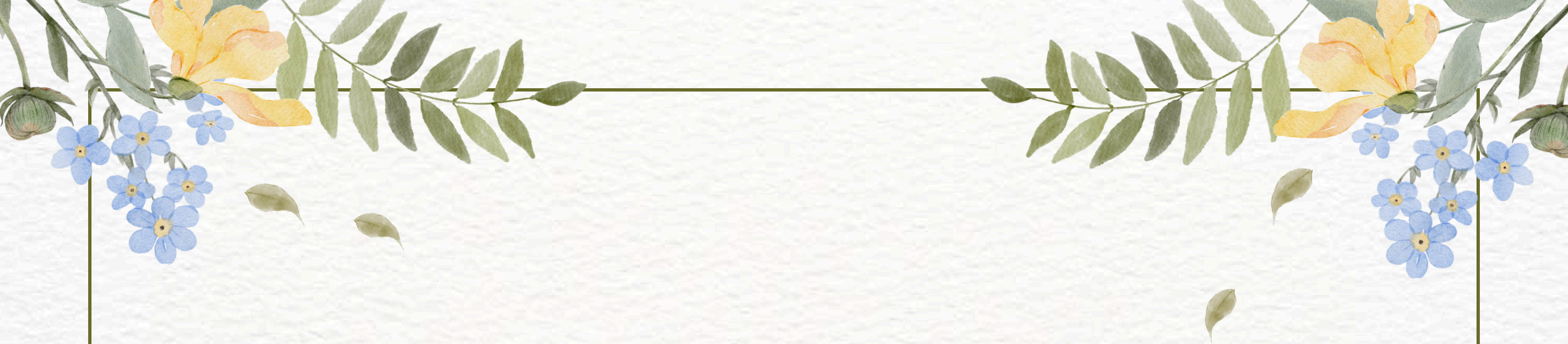


$$3 \times 3 = 9$$

TREATMENT COMBINATIONS

$$9 \times 3 = 27$$

TOTAL VASES



4. Methodology

EXPERIMENT DESIGN



One Vase per Observation

Total: 27 Units

Factor A: Stem-cutting

No cut

Horizontal cut, Diagonal cut

Factor B: Water Type

Regular tap water

Sugar water, vinegar water

STATISTICAL WORKFLOW

STEP 01

Check Assumptions



STEP 02

2-Way ANOVA Test



STEP 03

Evaluate
Interaction Effect ($A \times B$)

IF INTERACTION IS SIGNIFICANT

Interpret simple main effects and perform Tukey HSD within **each level**.

IF INTERACTION IS NOT SIGNIFICANT

Interpret main effects and apply Tukey HSD for **each factor**.



5. Feasibility



5.1 REQUIRED RESOURCES



Roses (54 Stems)

Total for 27 vases (2 stems each). Sourced from wholesale market for cost-efficiency.



Solutions & Vases

27 vases with Tap, Vinegar, and Sugar water treatments (9 combinations × 3 replications).



Measurement Tools

Protractor for bending angle, Camera for visual logs, and Cutting tools (Scissors).

5.2 ESTIMATED TIME

1–2

WEEKS DURATION

Aligned with the typical lifespan of cut roses. Data collection occurs every other day until termination.

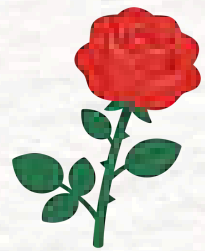
Termination: Score ≤ 2.5

Frequency: Every other day



5.3 POTENTIAL CHALLENGES

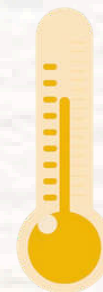
BIOLOGICAL FACTOR



Initial Quality Variation

Individual roses may differ in initial freshness, stem thickness, and bud size
→ Presence non-treatment variability

ENVIRONMENT



Environmental Consistency

Maintaining identical temperature, humidity, and light exposure is challenging

MEASUREMENT



Subjectivity in Assessment

Visual inspection of discoloration and stem bending is inherently subjective.
→ Risk of systematic measurement bias.



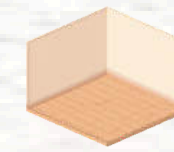
5.4 MITIGATION STRATEGIES

STANDARDIZED PURCHASING



- ✓ Single vendor & same-day purchase
- ✓ Visual inspection of initial freshness
- ✓ Exclusion of poor-quality specimens

SPATIAL RANDOMIZATION



- ✓ Random assignment of vase positions
- ✓ Consistent ambient room conditions

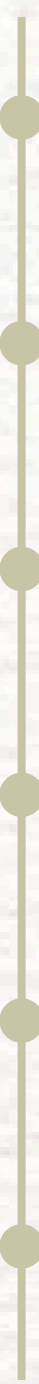
OBJECTIVE SCORING



- ✓ Clearly defined scoring rubric
 - ✓ Photographic records for reference
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Project Plan



Week 10

Establish the overall research framework

Week 11

Finalize detailed experimental setup

Week 12

Purchase materials and conduct the experiment

Week 13

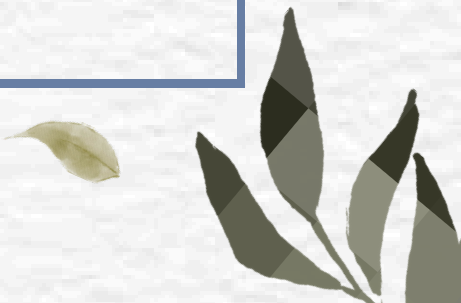
Organize experimental results and perform data analysis

Week 14

Prepare the report

Week 15

Final Presentation & Report





Q&A