# Efficacy Report

06/21/2022

**Study Title** : Efficacy of "NanoGraphene Fertilizer-FRESH", bean sprouts cultivation test

**Product Identity** : Graphene, nano calcium , nano magnesium , nano iron

**Data Requirements** : Proof of stimulating growth and production increase on bean sprouts

**Author** : Sang-cheol Lee _ Researcher at Smartnano Co., Ltd.

**Study completion date** : 06/01/2022

**Testing Facility**
89 Seoho-ro, Gwonseon-gu, Suwon-si, Gyeonggi-do,South korea
Seoul National University Agricultural and Life Science Startup Center

**Laboratory Project Number** : ER 11

# GOOD LABORATORY PRACTICE COMPLIANCE STATEMENT

**SUBMITTER** : Sang-cheol Lee [ Smartnano Co., Ltd. ]

**(Signature)** _____ Date: 06/01/2022
**Typed Name** : Sang-cheol Lee
**Title** : Director

**Research Director** :
**(Signature)** _____ Date: 06/01/2022
**Typed Name** : Sang-cheol Lee
**Title** : Director

## Table of Contents

# A. EFFICACY STUDY SUMMARY

**STUDY TITLE:** Efficacy of "NanoGraphene Fertilizer-FRESH", bean sprouts cultivation test

**LABORATORY PROJECT #:** ER 11

**TESTING FACILITY:** 89 Seoho-ro, Gwonseon-gu, Suwon-si, Gyeonggi-do, South korea
Seoul National University Agricultural and Life Science Startup Center

**STUDY DATES:**

**STUDY INITIATION DATE:** (05/24/2022)
**STUDY COMPLETION DATE:** (06/01/2022)

**TEST SUBSTANCE:**

**DESCRIPTION:** Dilute 1 bottle of 500ml FRESH 1,000 times in bottled water and apply foliarly to hydroponic cultivation test equipment
**INGREDIENT:** Graphene G4: 0.75g, nano Ca&Mg: 0.6g, nano Fe : 0.15g
**DILUTION:** Dilute 1,000 times with bottled water and apply by foliar fertilization

**TEST CONDITIONS:**

**WATER**: Bottled water, hardness: 1,000 mg/L or less
**CONTACT TIME** : (Not used)
**TEMPERATURE** : **18℃ ~ 22℃ (64°F ~ 72°F)**

**TEST RESULTS** :

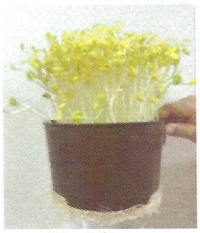
**Control results** :

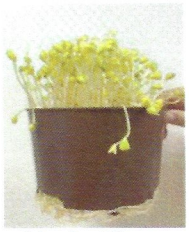
1. Increased height by approximately 5cm over 7 days. (There is a large individual difference in the control group)

**Conclusion** :

1. It grew stronger and more evenly than the stems and roots of bean sprouts.
2. The production of bean sprouts increased by about 35%
3. When cultivating bean sprouts hydroponically using nutrient solution, the harvest period from Day-1 to Day-7 can be advanced by at least 1 day.

Photos at Testing Facility


Fertilizer supply


No fertilizer supply


Fertilizer supply


No fertilizer supply


Fertilizer supply


No fertilizer supply


Day 1


Day 7

**height measurement**

Fertilizer / No Fertilizer

Fertilizer / No Fertilizer

# B. QUALITY ASSURANCE STATEMENT

**Study Title**: Efficacy of "NanoGraphene Fertilizer-FRESH", bean sprouts cultivation test

**Study #:** Project Number: ER 11

Quality assurance audits of this study were conducted and reported to management and the director as listed below:

(signature) _____ DATE: 06/01/2022_____
Typed Name: Lib Kim
Director of Quality Assurance

# C. STUDY REPORT- Detail

**STUDY TITLE** : Efficacy of "NanoGraphene Fertilizer-FRESH", bean sprouts cultivation test

**TEST FACILITY** : 89 Seoho-ro, Gwonseon-gu, Suwon-si, Gyeonggi-do, South korea
Seoul National University Agricultural and Life Science Startup Center

**TEST SUBSTANCE IDENTIFICATION**

**TEST SUBSTANCE NAME:** (Graphene: Cas No:1034343-98-0, Nano Calcium Magnesium hydroxide : Cas No: 39445-23-3, Nano iron hydroxide : Cas No: 11113-66-9 )

① Graphene G4: Cas No: 1034343-98-0; Graphene Layer - Median of single layer ranging from 1 to 5 layer; Graphene size - median size of 20nm, Glycerin-based

② Nano Calcium & Magnesium hydroxide: Cas No : 39445-23-3; median size of 5nm

③ Nano iron hydroxide: Cas No: 11113-66-9; median size of 5nm

**DESCRIPTION OF TEST SUBSTANCE**

**: 'FRESH'**: It is a transparent gold-color liquid fertilizer manufactured by mixing highly concentrated Graphene G4 with nano calcium & magnesium hydroxide, and nano iron hydroxide.
It can be stored at room temperature for 2 years and is supplied in various containers from 500ml to 20kg.

**CHEMICAL CHARACTERIZATION:**

**FRESH**

: We added a high concentration of Graphene G4 and nano calcium, nano magnesium and nano iron as described above the "test substance name". These are our proprietary materials. Graphene has inherent functions of being a drug delivery system, catalyst and having a chelating effect. Therefore, it delivers a high concentration of molecular-sized nano calcium, nano magnesium, nano iron and other essential trace elements to growing points within plants throughout a plant's growth cycle.

**STUDY OBJECTIVE:** By overcoming physiological obstacles, we reduce the use of chemical fertilizers, increase immunity, strengthen cell walls, and confirm increased production.

**TEST METHOD:** Bean sprout cultivation test using general simple hydroponic cultivation equipment

# D. STUDY MATERIALS TEST METHOD

### PREPARATION OF TEST SUBSTANCE

Dilute 500ml of FRESH 1,000 times with water and apply foliar application to a simple hydroponic cultivation kit using a sprayer.

### PREPARATION OF TEST SYSTEM/STRAINS

Use a 1liter plastic container for 1,000-fold dilution.

### EXPOSURE CONDITIONS

Dilute 500 ml of FRESH 1,000 times with water and apply foliar application to a simple hydroponic cultivation kit using a sprayer . Foliar fertilization performed once a day (7 times in total)

### TEST SYSTEM RECOVERY

FRESH is consumed naturally through foliar application, so there is no need for system restoration.

## PROTOCOL CHANGES

**'FRESH'** is diluted 1,000 times with water applied for to 3,300$m^2$ cropland twice a month. If calcium deficiency occurs due to high temperature, additional foliar application maybe performed, so there is no change in the protocol.

### PROTOCOL DEVIATIONS

If the plant's nutrient movement is not good due to high temperatures, additional foliar application of 'FRESH' is necessary. Other than that, there is no reason to change the protocol.

# E. CONTROLS

### PREPARATION OF CONTROL(S)

Tests were conducted under the same conditions, on hydroponic cultivation kits that were sprayed fertilizer and hydroponic cultivation kits that were not spray fertilizer.

# F. STUDY ACCEPTANCE CRITERIA

### STUDY REQUIREMENTS

1) Dilute 500ml of FRESH 1,000 times in water and apply foliarly to a simple hydroponic cultivation kit using a sprayer.

## G. DATA ANALYSIS

### CALCULATIONS

The amount of transpiration is calculated by measuring the weight of bean sprouts harvested from the hydroponic cultivation kit with and without fertilizer.

### STATISTICAL ANALYSIS

Statistical analysis using bean sprouts grown in a hydroponic cultivation kit

## H. STUDY RETENTION

### Data Retention

Prepare and preserve research reports.

### Specimen Retention

Bean sprouts could not be preserved using a hydroponic cultivation kit, so photos and reports were used instead.

## I. STUDY RESULTS

In 7 days, height increased by approximately 30% and weight increases by 23%.

## J. STUDY CONCLUSION

FRESH promotes the healthy growth of plants and increases resistance to diseases by maximizing the movement of nano calcium, nano magnesium, nano iron and other trace elements precisely and continuously. It is a comprehensive bioactive plant agent that helps plants overcome various physiological disorders under adverse growing conditions. Taste of plants and productivity of plant growth are also increased with FRESH.

**REPORT SUBMITTED BY:**

**Sang-cheol Lee**_____
Study director:

_____
Study completion date: 06/01/2022

## Appendix 1. Photos at Testing Facility

**Day 1**
**2022.06.27**

Fertilizer / No Fertilizer

**Day 2**
**2022.06.28**

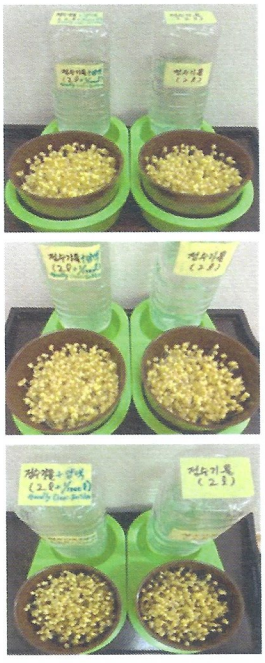
Fertilizer / No Fertilizer

**Day 3**
**2022.06.29**

Fertilizer / No Fertilizer

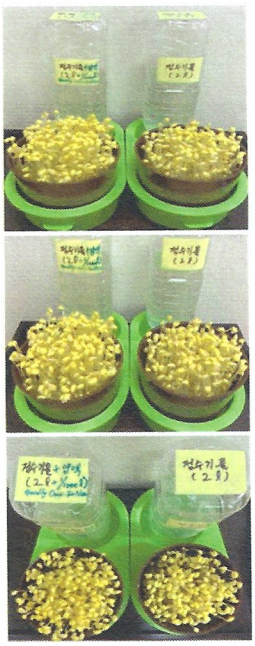
**Day 4**
**2022.06.30**

Fertilizer / No Fertilizer



**Day 5**
**2022.07.01**

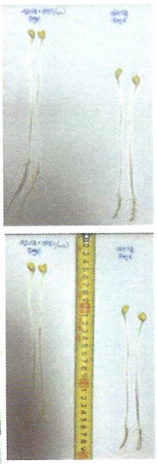
Fertilizer / No Fertilizer



**Day 6**
**2022.07.02**

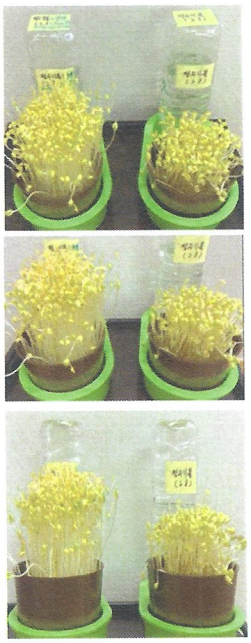
Fertilizer / No Fertilizer

Fertilizer/No Fertilizer



**Day 7**
**2022.07.03**

Fertilizer / No Fertilizer



Fertilizer / No Fertilizer