

## **NSP in Agriculture and Environments**

 "Chemical-Free" Agriculture – substitute for chemical pesticides and plant-growth promotor, soil-rehabilitation and bioavailability
"Zero-Antibiotics" Livestock – detoxification, antimicrobial and anti-virus (Avian Influenza)
Water/Soil Pollution Remedy



# The NSP "Zero-pesticide" Agriculture

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Since 2014, large-scale rice cultivation field test was conducted over 200 acres in central Taiwan. These rice fields were treated with NSP without using any pesticides, The rice was <u>harvested with the surprisingly high 20% increase in weight yield, in addition, the healthy plants and stronger stalks were observed</u>. Totally free of using the conventional pesticides for rice cultivation has been achieved by the NSP "zero-pesticide" formulation.

The technology is also used for more than 30 species of crops, fruit and vegetable including <u>potatoes</u>, <u>corn</u>, tomatoes, strawberries, tobacco, Chinese herbs and tea trees. All are demonstrated with the improvements in yield and quality of the harvest.



Showing improved plant physiology with straighter rice stalks



Improved the size, sweetness and surface texture appearance

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## Agricultural Field Trial in N. Carolina (Corn) in 2011

2011 Field Test in USA (NSP for "Chemical-Free" Agriculture")



Average height 60 cm Leaves are thin









## Agricultural Field Trial in N. Carolina (Potato) in 2011

2011 Field Test in USA (NSP for "Chemical-Free" Agriculture")



#### Averaged height 55 cm

### Averaged height 80 cm Much better growth

**NSP** applied

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### Celebration Party of First Successful Field Trial Tests (Invited by Farmers) (6-18-2015)



#### -The NSP Technology-



Uniquely thin Silicate Platelets (NSP) for Insecticide-Free Agricultures, Plant Growth and Environmental Remediation J&A Tech Jiang-Jen (JJ) Lin\*, National Taiwan University, Taipei, Taiwan (October 14, 2016)(Conference in Baltimore)

**Abstract**: In 2004, we invented an exfoliation process for randomizing the multilayered structures of naturally occurring silicate minerals to yield a new class of silicate nanomaterials, i.e., natural nanoscale silicate platelets (NSP). The geometric dimension of the individual NSP units is approximately (50-300) x (50-300) x 1.0 nm3 with high surface area of ca. 750 m2/g. Due to the thin thickness (1.0 nm) of geometric shape and high ionic charges (18,000 ions/platelet in the form of  $\equiv$ SiO-Na+), The NSP silicates enabled to adhere onto any polar organics, in a particular case, to interrupt the growth of harmful bacteria including the most toxic Silver- and Multi-Resistant Staphylococcus aureus (MRSA). The intensive adhering property gives rise to the new mechanism of NSP inhibiting bacteria growth by physical capturing and/or quorum sensing interaction in an equilibrium manner.

Consequently, a number of applications have been derived for NSP, including the prevention of plant diseases during the growth of rice and vegetables. In the years of 2010 to 2015, the NSP has been further modified by cationic and anionic surfactants to promote their prominent uses for absorbing organic toxics in water, physically removing bacteria, and controlling fungal or viral infections. For the agricultural uses, a large-scale pilot test of field trial over 200 acres and three consecutive growing seasons in the same field of rice growth has been accomplished in the central area of Taiwan since 2014. The rice fields were treated with NSP water dispersion without applying any conventionally-used pesticides. In these field tests, the harvest of rice grain was surprisingly recorded to have a bonus result of 20% grain weight increase. Different from the conventional method of reducing the uses of synthetic insecticides, the NSP technology is a "zero pesticide" cultivation or "totally-free" of organic chemicals. Besides the rice plantation, the NSP technology is also applied for other crops such as vegetables, potatoes, corn, tomatoes, tobacco, strawberries, Chinese herbs and tea trees. The achievements of pesticide-free, harvest increase and disease-resistant plants were obtained consistently. Furthermore, the NSP in water was successfully applied for growing animal livestock of chickens and pigs without using any antibiotics or "zero-antibiotics". The safety of cytotoxicity/genotoxicity toward human cells, oral lethal does (LD50), and the outcomes of NSP in environments such as soils and water lakes (algae and toxins) were also studied, shown to be environmentally friendly and non-toxic to the environment (soil and water).

The unique "NSP-technology" is being pursued for its broad uses in agriculture, livestock, water treatment, and environmental remediation.



### The Diversity and The Potential of NSP Applications "Zero-pesticide" Agriculture "Zero-Antibiotics" Livestock and Anti-virus (bird flu) Soil/Water Environmental Cleanliness

- 1. <u>"Zero-pesticide"</u>: Free of chemicals in agricultural crops
- 2. <u>"Zero-Antibiotics"</u>: Free of antibiotics in poultry and aquaculture / fish farming
- 3. Crop Protection from Diseases, Insects, Bacteria, Virus, Fungi, etc.
- 4. Seed Protection from Frost (protection from cold weather in winter)
- 5. Plant Growth Promoter (non-biotech method)
- 6. <u>Bacterial Removal</u> from contaminated water and soil (avoid the rotation plantation)
- 7. <u>Deodorant spray</u> for environment and air pollution
- 8. <u>Anti-virus</u> (bird flu and African swine fever)