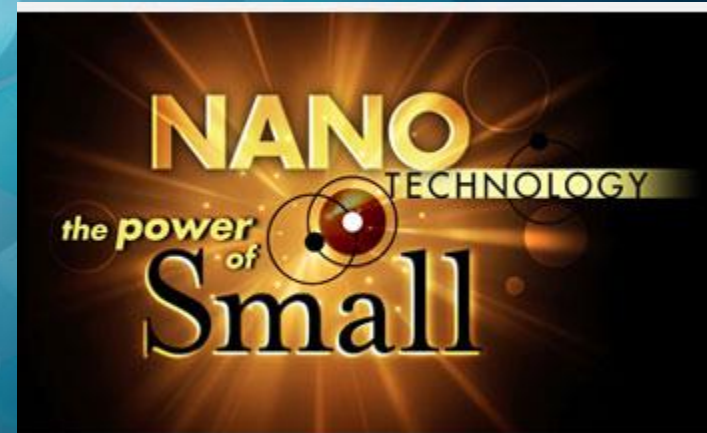


CLSU NANOTECHNOLOGY R AND D IN AQUACULTURE/AGRICULTURE

JUVY J. MONSERATE ,Ph.D.

NANOTECHNOLOGIST

Head, CLSU Nanotechnology R and D Facility



Project Title: Development of Cost Effective Nano (Zeolite-silica) Composite for the Removal of Pollutants from Water and Soil for Freshwater Tilapia Aquaculture Production

Proponent: Juvy J. Monserate

Co-Proponents : Dr. Karl Marx Quiazon /Dr. Jonathan Galindez

Implementing Agency: CLSU

Beneficiaries: tilapia farmers, researchers, educators, extension workers, students



Duration : 2 Years (Apr 2018– Mar 2020)

Budget : Y1 - 3,123,651.00

Y2 – 1,873,651.00

•Total : P 4,997,302.00

RATIONALE

- ❑ with the increasing pressure in terms in the usage of water for aquaculture, the product that will be developed in this project will of great benefit to tilapia industry.
- ❑ In our initial study, promising results were obtained: improving the water quality and reducing heavy metal accumulation. Hence, other possible benefits and importance of the study of this proposed project includes the following:
 - Reuse of water / recycling. Reduction in the pressure of too much extraction of underground water source. Scarcity of water, this project may able to solve/contribute in the use lower amount of water at lower ground water table source.
 - Healthy fish, higher survival, higher income
 - Reuse of agro-waste. Utilization of waste which can be converted into a high-valued product from a local available materials.

Theoretical Framework

ROOT CAUSE OF THE PROBLEM

1. Deteriorating water quality
2. Deteriorating soil quality



EXISTING PROBLEMS

1. Disease outbreaks
2. Fishkill outbreak
3. High Production cost
4. Lower income
5. Ineffectiveness and inefficiency of anti-fishkill products (*probiotics, zeolite, etc.*)



CURRENT SITUATION

1. High Fish Demand
2. Highly-intensified operation



SOLUTION

Improve water and soil quality

PROPOSED PROJECT

Development of cost-effective nano (zeolite-silica) composites for the removal of pollutants from water and soil for Freshwater Tilapia Aquaculture Production.

MAJOR ACTIVITY

Development of cost-effective nano (zeolite-silica) composite to be used for water and soil quality improvement and conditioning in aquaculture.

PHASE 1. Development stage

PHASE 2. Prototype and testing stage

EXPECTED OUTPUT

To develop cost-effective nano (zeolite-silica) composite to be used for water and soil quality improvement and conditioning in aquaculture.

SIGNIFICANCE

1. *Improved water and soil during pond preparation and during culture operation*
2. *Increase production*
3. *Increase income*
4. *Sustainable operation*

Gaps in the Knowledge

- Identification of a cost-effective, scientifically valid test to measure the stable carbon component of nano char is imperative and to develop a nanochar offset protocol for carbon markets. The stability of nanochar carbon in soils refers to its shelf life and makes it a highly promising product for consideration as a strategy for climate change mitigation.
- The definition of the variable BC+100, which stands for the amount of nanochar carbon that is expected to remain stable after 100 years, along with predictions of stability based on simple (Alpha) and more sophisticated (Beta) methods, allowed to correlate a molar ratio (H/C org) to the relative stability of nanochar (nano silica)

OBJECTIVES



General Objective: To develop cost effective NANO(ZEOLITE-SILICA) composites for the removal of pollutants in water and soil for freshwater tilapia aquaculture production.

OBJECTIVES



• Specific Objectives:

- 1. To develop/process the nano (Zeolite –silica) composites from clinopholite clay and biochar respectively as raw materials .
- 2. To characterize the nano zeolite and nano silica using zeta potentials, SEM, FTIR, XRD, AFM;
- 3. To establish a protocol on the adsorption and desorption process involving application of nano(zeolite-silica) composites ;
- 4. To study the effect of nano(zeolite-silica) composites on the adsorption/desorption process
- 5. To establish a recyclable adsorption/desorption system/process
- 6. To study the effect of nano(zeolite – silica) composites on the improvement of water quality used for aquaculture purposes under laboratory conditions;
- 7. To evaluate the economic feasibility on the use of nano (zeolite- silica) composites char in the over-all fish production in ponds Revised from comment #5 nano char change to nano silica / nano clay change the word into nano zeolite made from organo modified and intercalated clinopholite clay

EXPECTED OUTPUTS

- Year 1 :** PHASE 1. DEVELOPMENT OF NANO
(ZEOLITE – SILICA) COMPOSITES FOR WATER AND
SOIL QUALITY IMPROVEMENT
- Year 2 :** PROTOTYPE PRODUCTION AND LABORATORY
TESTING OF NANO (Zeolite-silica) composites

EXPECTED OUTPUTS

Year 1 : DEVELOPMENT OF NANOPOROUS NANOCHAR PARTICLES FOR WATER AND SOIL QUALITY IMPROVEMENT

The first phase of the study will focus in the development stage of nano (zeolite-silica) composites particles suitable for aquaculture operation. This stage will involved the following major activities:

- 1. Synthesis of nano (zeolite-silica) composites.**
- 2. Characterization of nano char (nano silica) using zeta potentials (Nano Partica), SEM-EDX, FTIR, UV-Vis, XRD, AFM, BET**
- 3. Establishment and optimization of a protocol on the adsorption and desorption process involving application of nano (Zeolite-silica) composites.**
- 4. Evaluating the effect of nano (Zeolite-silica) composites on the adsorption/desorption process and on water quality .**
- 5. Establishment of a recyclable adsorption/desorption system.**

Year 2 : PROTOTYPE PRODUCTION AND LABORATORY TESTING OF NANO (Zeolite-silica) composites

- ❑ Evaluating the effect of nano(zeolite-silica) pellets in the water quality under laboratory condition. The ideal dosages, mode of application, desorption protocol for reused nano composites pellets will be evaluated particularly in improving the water quality. The water quality that will be examined includes pH, ammonia, nitrite, and other toxic substances from fish wastes.
- ❑ Evaluating the effect of nanochar in the soil quality under laboratory condition. The efficiency of the developed nanochar in improving the quality of deteriorated soil used in intensive operation will be tested under laboratory condition (pH, nitrates, ammonia, TDS, BOD, DO, Pb) . A deteriorated soil with high organic matter from intensively operated farm will be collected. The soil quality parameters that will be evaluated include soil acidity, ammonia, nitrite, and other toxic gases and substances in the soil. The needed amount (or dosage) needed and best mode of application to improve soil acidity and removing toxic gases and substances in the soil will be determined.

EXPECTED OUTPUTS

Year 2 : ROTOTYPE PRODUCTION AND LABORATORY TESTING OF NANOPOROUS NANOCHAR PARTICLES

The second phase of the project will focus in the prototype production of nano (zeolite - silica) composites and testing of the developed product. The testing stage will focus in the two major factors that affects fish production, the water and soil quality. This second phase of the study will involve the following major activities:

- 1. Evaluating the effect of nano (zeolite-silica) composite in the water quality under laboratory condition .
- 2. Evaluating the effect of nano (zeolite-silica)composites pellets in the soil quality under laboratory condition .The efficiency of the developed nano (zeolite - silica)composites in improving the quality of deteriorated soil used in intensively operation will be tested under laboratory condition (pH, nitrates, ammonia, TDS, BOD, DO, Pb)
- Determination of the shelf-life of the nano (Zeolite-silica) composites pellets and the disposal, and recycling the waste (after/during regeneration)
- The shelf-life of the product will be determined by storing the product on varying temperatures and moisture content,

Project Title: Development of Colloidal Gold Nanoparticles (AuNPs) Immune Assay for Rapid Detection of Bacterial Pathogens in Freshwater Tilapia Aquaculture

Proponent: Dr. Karl Marx A. Quiazon

Co-Proponents : **Dr. Juvy Monserate**/Dr. Joel Salazar

Implementing Agency: CLSU, Munoz, Nueva Ecija

Beneficiaries: Tilapia farmers, Researchers, Educators, Extension workers, Students

Duration : 2 Years (June 2018– May 2020)

Budget : Y1 - 3,199,661

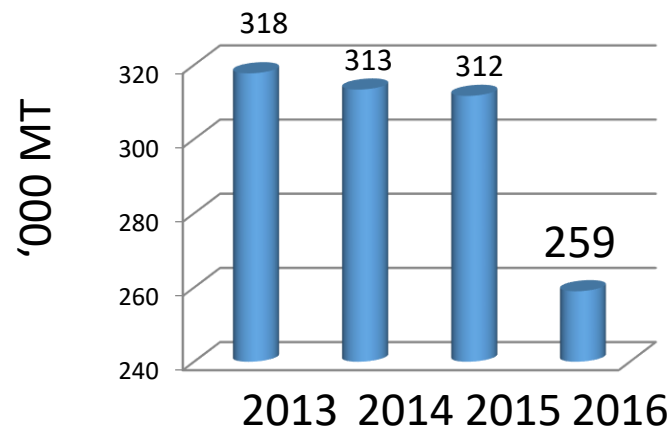
Y2 – 1,796,811

Total : **P 4,996,472**



RATIONALE

- ❑ Declining production recorded (2013-2016)
- ❑ Huge economic loss as a result of any fishkill/disease outbreaks (Batangas-P8.5M, Lake Sebu-P126M; lake Buhi-P178M)
- ❑ Common bacterial pathogens (*Aeromonas* & *Streptococcus* spp.)
- ❑ Diagnostic approaches (expensive & time-consuming, highly technical)
- ❑ A need for cheaper, rapid and user-friendly kit (Develop rapid detection kit using colloidal gold nanoparticle)



Tilapia Volume Production 2013-2016 (PSA)

Region	Annual production (MT)	Share	Value (M peso)
1. Pampanga	107,122.88	41.23 %	7.5M
2. Batangas	59,397.65	22.86 %	4.2M
3. Rizal	12,691.52	4.88 %	0.9M
4. Pangasinan	11,287.48	4.34 %	0.8M
5. Laguna	7,972.36	3.07 %	0.6M
6. Tarlac	6,619.69	2.55 %	0.5M
7. Camarines sur	6,109.41	2.35 %	0.4M
8. Isabela	5,936.13	2.28 %	0.4M
9. Maguindanao	5,882.77	2.26 %	0.4M
10. Nueva Ecija	4,188.46	1.61	0.3M
Other provinces	32,609.68	12.55 %	2.3M
Phil Statistics Authority (2014-2016)			

Conceptual framework

INPUT

- ❑ Colloidal gold nanoparticles immune assay for tilapia bacterial disease detection

ISSUES

- ❑ Disease/Fishkill outbreaks
- ❑ Costly and non-user-friendly diagnoses (farmer's level)

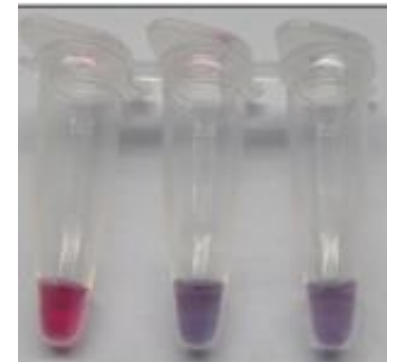


PROCESS

- ❑ Development and optimization of colloidal gold nanoparticles immune assay detection kit
- ❑ Prototype development and laboratory and field testing of diagnostic kit

OUTPUT

- ❑ Colloidal gold nanoparticles immune assay rapid detection kit



OBJECTIVES

General Objective: To develop rapid diagnostic kit against bacterial pathogens infecting tilapia industry in the Philippines using colloidal gold nanoparticles (AuNPs).

Specific Objectives:

1. To isolate different bacterial pathogens infecting Philippine tilapia industry;
2. To standardize and optimize protocol in the production of polyclonal antibodies of each isolated pathogenic bacteria infecting tilapia;
3. To standardize and optimize protocol in the biofunctionalization of colloidal gold nanoparticle to be used for immune assay in the detection of different pathogenic bacteria infecting tilapia,

Specific Objectives:

4. To develop and optimize protocol on the use of colloidal gold nanoparticles as rapid detection kit for the different bacterial pathogens in tilapia;
5. To perform laboratory and field testing of the developed rapid detection kit against bacterial pathogens infecting tilapia industry;
6. To determine the economics of production on the use of the developed product (RDK) for different bacterial pathogens in tilapia

Nano-Pluz Foliar Fertilizer (EUP Approved) on Efficacy Testing (FPA)


Foliar Fertilizer



Contact:
DR. JUVY J. MONSERATE
Nanotechnologies
Mobile #: 09257671064
E-mail: juvymonserate@yahoo.com



Current Funded Researches :

Research Title /Funding Agency	Expected Output
<p>Development of Cost Effective Nano Materials for the Removal of Pollutants from Water and Soil for Tilapia Aquaculture Production (PCAARRD) P 5.0 Million (2 years, 2018-2020)</p>	<p>Nano composites (Zeolite-Silica) Adsorption/desorption Agent</p>
<p>Development of Colloidal Gold Nanoparticles (AuNPs) Immune Assay for Rapid Detection of Different Bacterial Pathogens Causing Disease Problems in Tilapia Industry (PCAARRD) P5.0M (2 years , 2018-20200)</p>	<p>Rapid Detection Kit</p>
<p>Characterization, Formulation and Efficacy Testing of Rice Hull as Nanosilica structured Nanobiofertilizer for Rice Production (PHILRICE)P2.85 M (2 years , 2018-2020)</p>	<p>Nanobiofertilizer for Rice Production</p>
<p>Comparative Study on the Emission from Open Burning and Waste to Energy using Nanotechnology (EMB-DENR) P1.0M (1 year, 2018)</p>	<p>Policy Formulation</p>



"ENABLING SMALL THINGS TO DO BIG THINGS"

CLSU LEADING IN ENABLING STUDENTS AND FACULTY AND STAFF
AS KNOWLEDGE GENERATORS CONTRIBUTING TO NATION
BUILDING"