BK21 FOUR IT-Bio융합시스템농업교육연구단 제 3회 국제학술대회

"International Conference on IT-Bio Convergence"

25 JANUARY 2022 I VIRTUAL CONFERENCE

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	Ms. Pu Reum Mun Chonnam National University, Korea
	Ms. Hyeon Jung Jung Chonnam National University, Korea
	Ms. Ji Hyeon Kim Chosun University, Korea

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Center for IT-Bio Convergence System Agriculture
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National Research Foundation of Korea

Welcome Message

It is my great pleasure to welcome you all. I would like to thank the 25 of distinguished speakers and graduate students for joining us from around the world. I also would like to thank Chonnam National University professors and Chosun University professors for their efforts for this conference.

The Korean government has set up the convergence of agriculture and IT technology as one of the national goals, and is preparing and promoting a plan to spread smart farms as a strategy to strengthen the connection between agricultural and R&D policies. Accordingly, Sunchon National University is promoting the Brain Korea 21 Program in IT-Bio Convergence System with Chonnam National University and Chosun University.

Smart farm is combination of various technologies that not only produce safe food and agricultural products that satisfy consumers' preferences, but also promote safety and further protect the environment by combining agriculture and IT technology containing big data. I think the purpose of this conference is very important because it requires active exchange of opinions and on-site verification among experts in each field.

Although it is not a face-to-face conference, but a conference through a screen, various uncomfortable situations may be happened, but we prepared this conference with a positive hope so that more people can participate in the conference because a long trip is unnecessary. Thank you to the professors at Chonnam National University, Chosun University, and Sunchon National University for dedicated work, and I would like to thank the speakers, all participants and committee member, especially Dr. Chong Dae Kim for their active participation in this conference.

Thank you.

January 25, 2022

Chul Ju Yang, Professor, Sunchon National University

General Chair of the International Conference on IT-Bio Convergence

조직위원장 초대글

여러분 모두를 환영하게 되어 매우 기쁩니다. 전 세계에서 모인 25명의 저명한 연사들과 대학원생들에게 감사드립니다. 또한 이번 학술대회를 위해 수고해 주신 순천대, 전남대, 조선대학교 교수들에게도 감사의 말씀을 드립니다.

우리 정부는 농업과 IT기술의 융합을 국가목표 중 하나로 설정하고, 농업과 R&D 정책의 연계를 강화하기 위한 전략으로 스마트팜 확산 방안을 추진하고 있습니다. 이에 순천대학교는 전남대학교, 조선대학교와 함께 Brain Korea 21 프로그램인 IT-Bio 융합시스템전공을 운영하고 있습니다.

스마트팜은 소비자의 취향에 맞는 안전한 식품과 농산물을 생산할 뿐만 아니라 빅데이터를 포함한 농업과 IT기술을 결합하여 안전성을 높이고 환경을 더욱 보호하는 다양한 기술의 융합입니다. 각 분야 전문가들 간의 적극적인 의견 교환과 현장 검증이 필요한 자리이기 때문에 컨퍼런스의 목적이 매우 중요하다고 생각합니다.

대면을 통한 컨퍼런스가 아니라 온라인을 통한 컨퍼런스이기에 여러 가지 불편한 상황이 발생할 수 있지만, 많은 이동이 불필요하기 때문에 더 많은 사람들이 컨퍼런스에 참여할 수 있도록 긍정적인 희망을 가지고 컨퍼런스를 준비했습니다. 순천대, 전남대, 조선대학교 교수님들께서 많은 참여를 해주셔서 감사드리고, 연사님과 참석자 여러분, 위원님들, 특히 이번 컨퍼런스에 적극적으로 참여하신 김종대 박사님께도 감사드립니다.

2022년 1월 25일

순천대학교 동물자원과학과 양철주 교수

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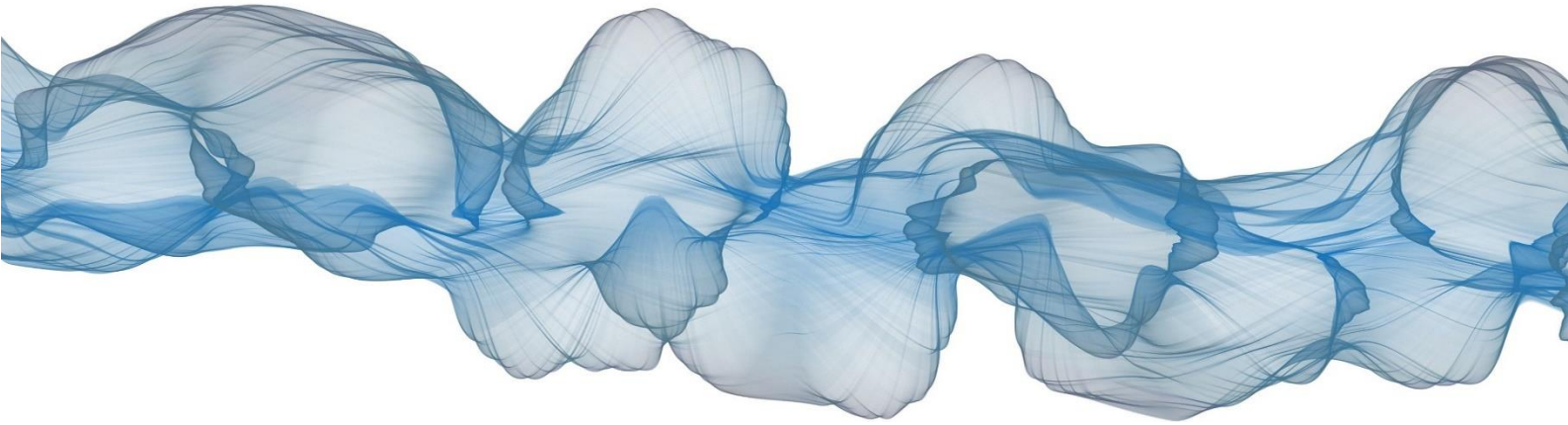

Congratulatory Address

I’d like to thank all the participants joining us today.

Despite Covid 19, I’m very pleased to be here to meet with distinguished scholars from the academic world.

Personally, I'd like to take this opportunity to thank Chairman Yang for leading the symposium.

And I also would like to express my deep gratitude to the professors of Chonnam National University and Chosun University, who are co-operating the Brain Korea 21 Four Interdisciplinary Program in IT-Bio Convergence System.

Since its opening in 1935 as an Agricultural college, Sunchon National University has established itself as a hall for academic research and education for over 87 years.

Under the educational ideology of "truth and creation.", we are doing our best to cultivate "creative talents" with the intelligence and character required by the rapidly changing era of the 4th industrial revolution.

I believe this symposium will provide good opportunity to understand the current situation of smart farming, one of the leading industry of the 4th industrial revolution and a convergence field between IT and biotechnology.

I hope all the participants share their various opinions and take further steps for the advancement of smart farming technology.

Once again, I sincerely welcome all of you who are joining today and wish you a symposium with good results. Thank you.

January 25, 2022

Ph. D. Koh, Young Jin

President of Sunchon National University

축사

오늘 함께 해주신 모든 분들께 감사드립니다.

코로나19에도 불구하고, 학계의 저명한 학자들을 만나게 되어 매우 기쁩니다.

개인적으로 이번 심포지엄을 이끌어주신 양 회장님께 감사의 말씀을 전하고 싶습니다.

또한, IT-Bio융합시스템에서 Brain Korea 21 4개 학제 간 프로그램을 공동 운영하고 계신 전남대학교와 조선대학교 교수님들께도 깊은 감사의 말씀을 드립니다.

순천대학교는 1935년 농과대학으로 개교한 이래, 87년 넘게 학술연구와 교육의 장으로 자리매김하고 있습니다.

우리 대학은 '진리와 창조'라는 교육 이념 아래 급변하는 4차 산업혁명 시대에 요구되는 지성과 인성을 갖춘 '창의적 인재' 양성에 최선을 다하고 있습니다.

이번 심포지엄은 4차 산업혁명 선도산업의 하나이자 IT와 생명공학의 융합 분야인 스마트농업의 현주소를 이해할 수 있는 좋은 기회가 될 것으로 생각합니다.

스마트팜 기술 발전을 위해 참가자 모두가 다양한 의견을 나누고 한 걸음 더 나아가길 바랍니다.

다시 한번 오늘 참석해주신 여러분들을 진심으로 환영하며 좋은 결과가 있기를 기원합니다.
감사합니다.

2022년 1월 25일

순천대학교 총장 고영진

Welcome Address

We sincerely welcome your participation in the 3rd International Conference of the Brain Korea 21 FOUR Interdisciplinary Program in IT-Bio Convergence System. I'm Professor Jangho Kim of Chonnam National University, the head of the BK21 FOUR Interdisciplinary Program in IT-Bio Convergence System Agriculture.

Our BK21 FOUR Interdisciplinary Program in IT-Bio Convergence System Agriculture consists of researchers, students, and administrative staffs, including 27 excellent professors from Chonnam National University, Chosun University and Suncheon National University. In particular, as the nation’s first National and Private University associated BK Research and Education Group in the field of "Smart Farm", is committed to fostering high-quality human resources to lead the future agriculture and bio industry.

I am very happy and honored that our Education Research Group has invited Professor Chul Ju Yang of Suncheon National University as the general chair of the organizing committee to hold the 3rd International Conference of the Brain Korea 21 FOUR Interdisciplinary Program in IT-Bio Convergence System.

I appreciate, Ph.D. Young Jin Koh, the president of Suncheon National University for delivering congratulatory speeches for this international academic conference. Please continue to give great encouragement and attention. Also, I would like to thank everyone at home and abroad for participating in this conference.

In particular, I sincerely glad that this conference will be a great opportunity for students by participating various experts in IT, AI, Robotics, and agriculture fields. Once again, I would like to thank and welcome everyone who are with us today.
Thank you.

January 25, 2022

Head of Center for IT-Bio Convergence System Agriculture

Jangho Kim Ph.D.

2022 3rd International Conference of the Brain Korea21 FOUR Interdisciplinary Program in IT-Bio Convergence System

Virtual Presentation

The present and future of smart farm

January 25, 2022

7:50a.m. ~ 5:55p.m.

@Center for IT-Bio Convergence System Agriculture

■ Welcome Remark

Korean time	Chair: Prof. Ju Sik Cho
07:50~08:00	**Congratulatory address** President of Sunchon National University, Young Jin Koh
	Welcome address Dean of IT-Bio Convergence System Agriculture, Chonnam National University, Jangho Kim
	Welcome message Sunchon National University, Chul Ju Yang

■ Session 1 : Invited Lectures

Korean time / Speaker's time	Chair: Prof. Chun Bo Sim / Prof. Nak Young Ko
08:00~8:25 13:00~13:25	**"Applications of in ovo technologies in poultry production"** Dr. Rajesh Jha (University of Hawaii at Manoa, USA)
08:25~8:50 17:25~17:50	**"Population sampling and sensor-based tools for disease monitoring in swine farm"** Dr. Kyoung-Jin Yoon (Iowa State University, USA)
08:50~9:15 18:50~19:15	**"Impact and uncertainty of disease and climate on global food security and surveillance"** Dr. Paul D. Esker (Pennsylvania State University, USA)
09:15~9:40 19:15~19:40	**"How to achieve sustainable global nutrition security?** Dr. SeogChan Kang (Pennsylvania State University, USA)
09:40~10:05	**"Global seasonal crop forecasting for climate change adaptation"** Dr. Toshichika Iizumi (National Agriculture and Food Research Organization, Japan)
10:05~10:20	**Coffee break**

	Chair: Prof. Youngyoon Cho / Prof. Kyunghwan Lee
10:20~10:45 20:20~20:45	**"Identifying and characterizing translation of circular RNAs via Bioinformatics approach"** Dr. Juw Won Park (University of Lousiville, USA)
10:45~11:10 20:45~21:00	**"Advanced V2V Authentication for Roadside Infrastructure-less Vehicular Network"** Dr. Kiho Lim (William Paterson University of New Jersey, USA)
11:10~11:35	**"Influence of Features on Accuracy of Anomaly Detection"** Dr. Hoon Ko (Computer Infomation and Communication Research Center Chungbuk University, Korea)
11:35~12:00 10:35~11:00	**"Pig Talk: An AI-Based IoT Platform for Pig"** Dr. Whai-En Chen (Asia University, Taiwan)
12:00~12:25 08:30~08:55	**"Trends in Medical Information Hiding for Smart Healthcare: Algorithms and Applications"** Dr. Amit Kumar Singh (National Institute of Technology Patna, India)
12:25~13:30 (13:00~13:30)	**Lunch & Student Speakers** (Student Short Talks & Invited Lectures)
	Chair: Prof. Hoy Taek Kim / Prof. Okran Lee
13:30~13:55 21:30~21:55	**"Uncovering Regulatory Mechanisms of Salicylic Acid Biosynthesis for Plant immunity in Arabidopsis and Brassicaceae oilseed crops"** Dr. Heejin Yoo (The University of Utah, USA)
13:55~14:20 21:56~22:20	**"Nucleus-to-plastid anterograde signaling pathway : the role of photobodies in plant growth and chloroplast biogenesis"** Dr. Chan Yul Yoo (The University of Utah, USA)
14:20~14:45 23:20~23:45	**"Smart Farming : The future of Livestock"** Dr. Muhammad Irfan (University of Illinois at Chicago, USA)
14:45~15:10 11:45~12:10	**"Potentialities of using Artificial Intelligence (AI) in agricultural farming"** Dr. Ujjal Kumar Nath (Bangladesh agricultural University, Bangladesh)
15:10~15:35 07:10~07:35	**"Smart Livestock Farming Approaches in Developing Countries"** Dr. Phem Menghak (National Animal Health and Production Research Institute, Cambodia)
15:35~15:50	**Coffee break**
	Chair: Prof. Hoon Seonwoo / Prof. Chungghiu Lee
15:50~16:15	**"Developing of smart farm system in swine farm"** Dr. Yoo Yong Kim (Seoul National University, Korea)
16:15~16:40	**"Climate-Smart Agriculture through Climate Information Services"** Dr. Kwang-Hyung Kim (Seoul National University, Korea)
16:40~17:05	**"Impact of IoT/AI in Agriculture"** Dr. SATHISHKUMAR V E (Hanyang University, Korea)
17:05~17:30 16:05~16:30	**"Research progress and development of concept of the dynamic nutrition with automatic feeding system in smart farming"** Dr. Xin WU (Tianjin Institute of Industrial Biotechnology, CAS, China)
17:30~17:55 10:30~10:55	**"Smart farming challenges and confrontation"** Dr. Mohammed Farouk (Al AZHAER UNIVERSITY, Egypt)

■ Session 2 : Student Short Talks & Invited Lectures

Korean time/ Speaker's time	Chair: Prof. Hokyung Ha
13:00~13:30	**"Smart Swine Farm at Sunchon National University: A practical approach"** Muhammad Ammar Dilawar (Sunchon National University, Pakistan)
	"Patatin-related phospholipase pPLAIIIγ functions on anisotropic cell growth and xylem lignification when overexpressed" HaeSung Seo (Chonnam National University, Korea)
	"Interspecific hybridization for introgressing Clubroot resistance and Beta-carotene in Brassica oleracea Song Samnang (Sunchon National University, Cambodia)
	"A Machine Learning-Based Prediction Model for Smart Farms" Saravana Kumar (Sunchon National University, India)
	"Growth Estimate Model using the Fruit Tree Data" JongHoon Kim (Sunchon National University, Korea)

학회 프로그램

■ Welcome Remark

시간	좌장 : 조주식 교수
7:50~8:00	환영사 1 : President of Sunchon National University, Young Jin Koh
	환영사 2 : Dean of IT-Bio Convergence System Agriculture, Chonnam National University, Jangho Kim
	환영사 3 : Sunchon National University, Chul Ju Yang

■ Session 1 : Invited Lectures

Korean time / Speaker's time	좌장 : 심춘보 교수 / 고낙용 교수
08:00~8:25 13:00~13:25	초청강연 1 : **"Applications of in ovo technologies in poultry production"** Dr. Rajesh Jha (University of Hawaii at Manoa, USA)
08:25~8:50 17:25~17:50	초청강연 2 : **"Population sampling and sensor-based tools for disease monitoring in swine farm"** Dr. Kyoung-Jin Yoon (Iowa State University, USA)
08:50~9:15 18:50~19:15	초청강연 3 : **"Impact and uncertainty of disease and climate on global food security and surveillance"** Dr. Paul D. Esker (Pennsylvania State University, USA)
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10:05~10:20	**Coffee break**
	좌장 : 조용윤 교수 / 이경환 교수
10:20~10:45 20:20~20:45	초청강연 6 : **"Identifying and characterizing translation of circular RNAs via Bioinformatics approach"** Dr. Juw Won Park (University of Lousiville, USA)
10:45~11:10 20:45~21:00	초청강연 7 : **"Advanced V2V Authentication for Roadside Infrastructure-less Vehicular Network"** Dr. Kiho Lim (William Paterson University of New Jersey, USA)
11:10~11:35	초청강연 8 : **"Influence of Features on Accuracy of Anomaly Detection"** Dr. Hoon Ko (Computer Infomation and Communication Research Center Chungbuk University, Korea)
11:35~12:00 10:35~11:00	초청강연 9 : **"Pig Talk: An AI-Based IoT Platform for Pig"** Dr. WhaiEn Chen (Asia University, Taiwan)
12:00~12:25 08:30~08:55	초청강연 10 : **"Trends in Medical Information Hiding for Smart Healthcare: Algorithms and Applications"** Dr. Amit Kumar Singh (National Institute of Technology Patna, India)
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15:35~15:50	**Coffee break**
	좌장 : 선우훈 교수 / 좌장 이충규 교수
15:50~16:15	초청강연 16 : **"Developing of smart farm system in swine farm"** Dr. Yoo Yong Kim (Seoul National University, Korea)
16:15~16:40	초청강연 17 : **"Climate Smart Agriculture through Climate Information Services"** Dr. Kwang-Hyung Kim (Seoul National University, Korea)
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■ Session 2 : Student Short Talks & Invited Lectures

Korean time/ Speaker's time	좌장 : 하호경 교수
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	학생발표 2 : "Patatin-related phospholipase pPLAIIIγ functions on anisotropic cell growth and xylem lignification when overexpressed" HaeSung Seo (Chonnam National University, Korea)
	학생발표 3 : "Interspecific hybridization for introgressing Clubroot resistance and Beta-carotene in Brassica oleracea Song Samnang (Sunchon National University, Cambodia)
	학생발표 4 : "A Machine Learning-Based Prediction Model for Smart Farms" Saravana Kumar (Sunchon National University, India)
	학생발표 5 : "Growth Estimate Model using the Fruit Tree Data" JongHoon Kim (Sunchon National University, Korea)

"International Conference of the BK21 FOUR on IT-Bio Convergence"

BK21 FOUR
IT-Bio융합시스템농업교육연구단
제 3회 국제학술대회

Zoom Meeting (Session 1, Session 2)

January. 25 (Tue), 2022 (07:50 a.m. ~ 05:55 p.m.)

Zoom address

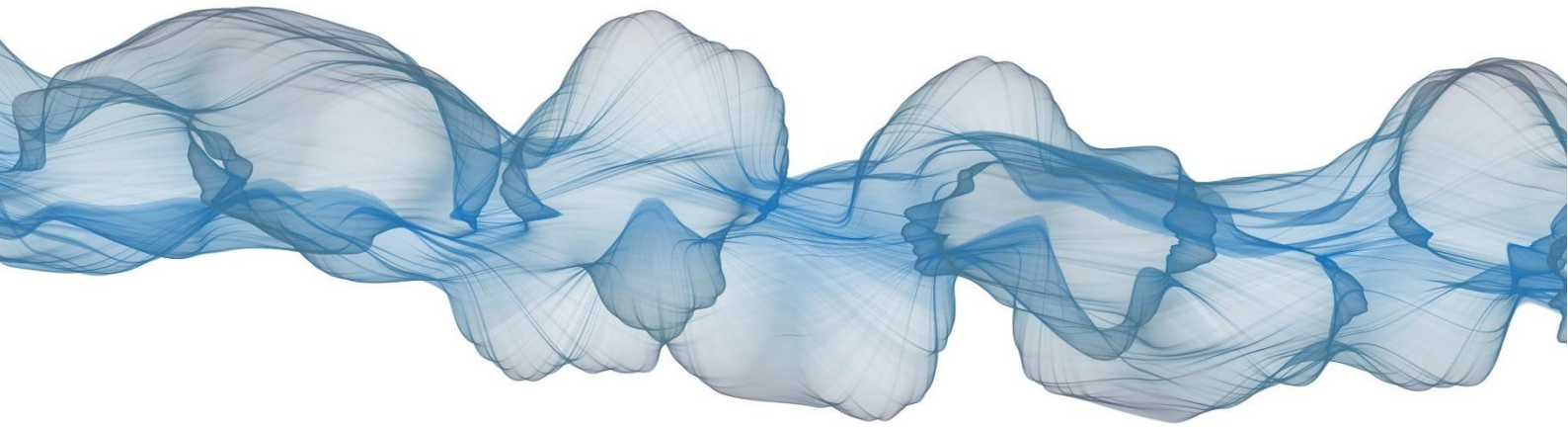
https://us06web.zoom.us/j/3576163864?pwd=VFJRblJ0YnFRNWdoNTBsTFpBam9rZz09

Meeting ID : 357 616 3864

Password : 220125

ABSTRACT

Session 1 : INVITED LECTURES



Applications of *in ovo* technologies in poultry production

Rajesh Jha

University of Hawaii at Manoa, Honolulu, HI, USA

The *in ovo* technique (IOT) was first used in 1938 to cultivate infectious agents in the developing chicken embryo. Consequently, around the second half of the twentieth century, researchers started to use IOT to evaluate the effect of different substances on developing embryos, hatchlings, and post-hatch chickens. Later in 1982, IOT was found to be an effective way of vaccination against Marek's disease. Since then, its use has been expanded for various reasons, primarily for injecting the eggs with nutrients and health modulators. Depending on the interests, the compounds are delivered to the embryo around day 12 or day 17 to 18 of incubation via air sac, amnion, yolk sac, allantois, or chorioallantoic membrane. *In ovo* injection of bioactive compounds like vaccines, nutrients, antibiotics, prebiotics, probiotics, synbiotics, creatine, follistatin, L-carnitine, CpG oligodeoxynucleotide, growth hormone, polyclonal antimyostatin antibody, peptide YY, insulin-like growth factor-1, etc. have been studied so far. These compounds affect hatchability, body weight at hatch, physiological functions, immune responses, gut morphology, gut microbiome, production performance, and overall health of poultry. However, the route, dose, method, and time of *in ovo* injection and injected compound and host factors can cause variation, thereby inconsistencies in results. Nevertheless, studies using this method have manifested the benefits of injecting different single bioactive compounds. Therefore, to optimize the potential benefits of IOT in poultry production, researchers should precisely know the proper route and time of injection, optimum dose, and effective combination of different compounds. More recently, the IOT is being researched for chick sexing (carried out while chicks are still *in ovo*) for producing male-only chicks employing Spectroscopic detection, Biomarker detection, and Gene editing. This talk will provide an insight into current practices and available findings related to *in ovo* techniques on performance and health parameters of poultry, along with challenges and future perspectives of this technique

Curriculum Vitae – RAJESH JHA, BVSc & AH, MSc, PhD

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Education

- **PhD,** Animal Science, University of Saskatchewan, Canada (2010)
- **MSc**, Animal Science & Aquaculture, Wageningen University, the Netherlands (2006)
- **BVSc & AH,** Veterinary Science & Animal Husbandry, Tribhuvan University, Nepal (1996)

Research and Teaching Positions

- Professor of Animal Nutrition: HNFAS, UHM (Aug 2021 to date)
- Associate Professor of Animal Nutrition: HNFAS, UHM (Aug 2017 to July 2021)
- Assistant Professor of Animal Nutrition: HNFAS, UHM (Sept 2012 to July 2017)
- Graduate Chair of Animal Sciences program (Aug 2016 to date).
- Visiting Professor: Kyoto University, Japan (May to Aug 2019)
- Research Associate, University of Alberta, Canada (Dec 2009 to Aug 2012)

Selected Refereed Journal Articles (last 5 years)

1. A. K. Singh, U. P. Tiwari, B. Mishra, and **R. Jha** (2022). Effect of in ovo delivered xylo- and mannan-oligosaccharides on growth performance, intestinal immunity, cecal short-chain fatty acids, and cecal microbiota of broilers. *J. Anim. Sci. Biotechnol.* (*doi: 10.1186/s40104-021-00666-z*).

2. R. Das, P. Mishra, and **R. Jha** (2021). In ovo feeding as a tool for improving performance and gut health of poultry: a review. *Front. Vet. Sci.,* 8:754246.

3. **R. Jha** and S. W. Kim (2021). Editorial: Nutritional Intervention for the Intestinal Health of Young Monogastric Animals. *Front. Vet. Sci.,* 8:668563.

4. A. K. Singh, B. Mishra, M. R. Bedford, and **R. Jha** (2021). Effects of supplemental xylanase and xylooligosaccharides on production performance and gut health variables of broiler chickens. *J. Anim. Sci. Biotechnol.,* 12:98.

5. **R. Jha** and P. Mishra (2021). Dietary fiber in poultry nutrition and their effects on nutrient utilization, performance, gut health, and on the environment: A review. *J. Anim. Sci. Biotechnol.,* 12:51.

6. A. K. Singh, R. K. Mandal, M. R. Bedford, and **R. Jha*** (2021). Xylanase improves growth performance, enhances cecal short chain fatty acids production, and increases the relative abundance of fiber fermenting cecal microbiota in broilers. *Anim. Feed Sci. Technol.,* 277:114956.

7. J. Zhang, K. Cai, R. Mishra, and **R. Jha** (2020). In ovo supplementation of chitooligosaccharide and chlorella polysaccharide affect cecal microbial community, metabolic pathways, and fermentation metabolites in broiler chickens. *Poult. Sci.,* 99:4476-4785.

8. **R. Jha**, A. K. Singh, S. Yadav, J. F. D. Berrocoso, and B. Mishra (2019). Early nutrition programming (in ovo- and post hatch-feeding) as a strategy to modulate gut health of poultry. *Front. Vet. Sci.,* 6:82.

9. **R. Jha**, J. M. Fouhse, U. P. Tiwari, L. Li, and B. P. Willing (2019). Dietary fibers and intestinal health of monogastric animals. *Front. Vet. Sci.,* 6:48.

10. S. Yadav, and **R. Jha** (2019). Strategies to modulate the intestinal microbiota and their effects on nutrient utilization, performance, and health of poultry. *J. Anim. Sci. Biotechnol.,* 10:2.

11. J. D. Berrocoso, R. Kida, A. K. Singh, Y. S. Kim, and **R. Jha** (2017). Effect of in ovo injection of raffinose on growth performance and gut health parameters of broiler chicken. *Poult. Sci.,* 96:1573–1580.

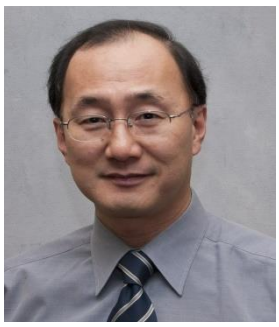
Population sampling and sensor-based tools for disease monitoring in swine farms

Professor. Kyoung-Jin Yoon

College of Veterinary Medicine, Iowa State University, Ames, Iowa, USA

Over the years, swine farms in many countries have become larger and more integrated with other commodity groups for profits and sustainability. As such, the operation of industrialized farms requires more sophisticated management and operation for efficiency, coining the term *Precision Swine Production*. Effective control of disease burden is a critical component of precision swine production for optimal productivity and animal well-being. Yet, disease surveillance/monitoring still largely depends upon a statistical sampling of pigs on a farm for testing. Furthermore, in a pig farm, it is challenging for the farm caretaker to constantly monitor all animals' health and well-being throughout the day. This approach may have been OK for conventional farming but may not be optimal for proactive disease control in modern swine farming. Sampling-wise, population-based sampling offers many merits over individual sampling. Periodic oral fluid sampling or environmental sampling can be an economic tool for assessing the free status of specific infectious diseases in farms. While population sampling provides a convenient way to monitor specific diseases, this may not be ideal for the early detection of diseased animals or any well-being issues. Disease management then can benefit from autonomous, noninvasive, and affordable devices that conduct frequent checks on the well-being status of pigs. Although many AV devices have been introduced for smart farming, those devices are for population monitoring, not individual animals, and still require expert interpretation. Recently we introduced the idea of an ear tag-based remote monitoring tool for objective measurement of some behavioral indicators that may help in assessing the health and welfare status. Our experience and thoughts with disease monitoring using population sampling and a multiparameter electronic sensor will be presented and discussed.

Acknowledgment: The author is grateful to Drs. Jeffrey Zimmerman and Santosh Pandey at Iowa State University for their continuous research collaboration.



Curriculum Vitae – Kyoung-Jin Yoon, DVM, PhD, DACVM

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Education

- Doctor of Veterinary Medicine, Summa Cum Laude (1985). Seoul National University, Seoul, Korea
- Master of Science (1987): Veterinary Preventive Medicine. Seoul National University, Seoul, Korea.
- Doctor of Philosophy (1995): Veterinary Microbiology. Iowa State University, Ames, Iowa, USA.
- Certification in Foreign Animal Diseases (1998). USDA APHIS.
- Diplomate (2000). American College of Veterinary Microbiologists

Research and Teaching Positions

- Adjunct Instructor. .31986-1987. College of Veterinary Medicine, Seoul National University, Suwon, Korea.
- Research Fellow. 1989-1990. Veterinary Science Research Institute, Seoul National University, Suwon, Korea.
- Assistant Professor. 1996 – April 2001. Department of Veterinary Diagnostic and Production Animal Medicine, College of Veterinary Medicine, Iowa State University, Ames, IA.
- Head of Virology and Molecular Microbiology Sections. Jan 1996 - 2010. Veterinary Diagnostic Laboratory, Iowa State University, Ames, IA.
- Associate Professor. May 2001 – April 2006. Department of Veterinary Diagnostic and Production Animal Medicine, College of Veterinary Medicine, Iowa State University, Ames, IA.
- Professor. May 2006 – present. Department of Veterinary Diagnostic and Production Animal Medicine. College of Veterinary Medicine, Iowa State University, Ames, IA.
- Adjunct Professor in Veterinary Virology, 2010 – present. School of Veterinary Medicine and Biomedical Science, University of Nebraska, Lincoln, NE.
- 'Guest' Professor (客座教授), 2010 – present. College of Animal Science and Veterinary Medicine, Qingdao Agricultural University. Qingdao, China.
- Head of Virology and Molecular R&D. Jan 2011 – present. Veterinary Diagnostic Laboratory, Iowa State University, Ames, IA.

Selected Refereed Journal Articles (last 2 years)

1. Miley D, Machado LB, Condo C, Jergens AE, Yoon K-J, Pandey S. 2021. Video capsule endoscopy and ingestible electronics: Emerging trends in sensors, circuits, materials, telemetry, optics, and rapid reading software. Advanced Devices & Instrumentation 2021:9854040.
2. Pandey S, Kalwa U, Kong T, Guo B, Gauger PC, Peter DJ, Yoon K-J. 2021. Behavioral monitoring tool for pig farmers: Ear tag sensors, machine intelligence, and technology adoption roadmap. Animals 11:2665.
3. Azeem S, Gauger P, Sato Y, Guo B, Wolc A, Carlson J, Harmon K, Zhang J, Hoang H, Yuan J, Bhandari M, Kim H, Gibson K, Matias-Ferreyra F, Yoon K-J. 2021. Environmental sampling for avian influenza virus detection in commercial layer facilities. Avian Dis 65:391-400.
4. Kirchdoerfer RN, Bhandari M, Martini O, Sewall LM, Bangaru S, Yoon K-J, Ward AB. 2021. Structure and immune recognition of the porcine epidemic diarrhea virus spike protein. Structure 29:1-9.
5. Buckley AC, Michael DD, Faaberg KS, Guo B, Yoon K-J, Lager KM. 2021. Comparison of historical and contemporary isolates of Senecavirus A. Vet Microbiol 253:108946.
7. Yuan J, Kim H-J, Filtrup CT, Guo B, Imerman P, Ensley S, Yoon K-J. 2020. Utility of a PCR-based method for rapid and specific detection of toxigenic Microcystis spp. in farm ponds. J Vet Diagn Invest 32:369-381.
8. Qi Y, Lohman J, Bratlie KM, Peroutka-Bigus N, Bellaire B, Wannemuehler M, Yoon K-J, Barrett TA, Wang Q. 2019. Vitamin C and B3 as new biomaterials to alter intestinal stem cells. J Biomed Mater Res 107:1886-1897.
9. Ross K, Senapati S, Alley J, Darling R, Goodman J, Jefferson M, Uz M, Guo B, Yoon, K-J, Verhoeven D, Wannemuehler M, Kohut M, Mallapragada S, Narasimhan B. 2019. Single dose combination nanovaccine provides protection against influenza A virus in young and aged mice. Biomater Sci 7:809-821.
10. Buckely A, Kulshrestha V, van Green A, Montiel N, Guo B, Yoon K, Lager K. 2019. Experimental Seneca Valley virus infection in market-weight gilts. Vet Microbiol 231:7-10.
Full list: https://scholar.google.com/citations?hl=en&user=n6eBs3QAAAAJ

Impact and uncertainty of disease and climate on global food security and surveillance

Dr. Paul D. Esker

Pennsylvania State University

Agriculture is a global enterprise. As we increase production into new areas or move products worldwide, pathogens also move via those channels. A natural question is if the pathogen will always win? Along with that, it is necessary to ask if we have the tools, expertise, and support to identify these pathogens quickly, providing critical knowledge for managing the plant diseases that develop? Furthermore, can we predict when and where an outbreak will occur? The combinations of climate change, human activities, changing production practices, and movement of vectors and plant material are just a few components driving this challenge with emerging and re-emerging plant diseases. The lack of information or expertise makes it challenging to inform policy and rapidly respond to epidemics. These factors highlight the uncertainty in predicting or developing a sustainable risk monitoring and mitigation program. I will describe focus in my talk on some general aspects of uncertainty, emphasizing how this concept influences monitoring from local to global scales. I will discuss several recent publications and international efforts for improving real-time monitoring, data-sharing, and modeling across these different scales. Lastly, it is essential to recognize a need for a new long-term vision for training, funding, and credit/recognition for successful agricultural production.

Curriculum Vitae – Dr. Paul D. Esker

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Education

- B.Sc, Genetics, 1993-1995, University of Wisconsin-MarathonCounty
- B.Sc, Genetics and Bacteriology, 1995-1998, University of Wisconsin-Madison
- M.Sc, Plant Pathology, 1998-2001, Iowa State University
- PhD, Plant Pathology and Statistics, 2001-2005, Iowa State University

Research and Teaching Positions

- The Pennsylvania State University (July 2017 to current): Epidemiologist and Field
- Crops Plant Pathologist, Dept. Plant Pathology and Environmental Microbiology
- University of Costa Rica (July 2020 to current): Profesor Ad Honorem, School of Agronomy.
- University of Costa Rica (March 2012 to June 2017, leave July 2017-June 2020)
- Associate Professor and Director, Center for Research in Grain and Seed, School of Agronomy.
- University of Wisconsin (September 2007 to March 2012): Field Crops Extension Plant
- Pathologist, Department of Plant Pathology.

Selected Refereed Journal Articles (last 5 years)

1. Del Ponte, E., and 26 other authors. 2021. Fusarium graminearum species complex: A bibliographic analysis and web-accessible database for global mapping of species and trichothecene toxin chemotypes. Phytopathology (first look, September, 2021).
2. Duffeck, M., et al. 2021. Fusarium head blight of small-grains in Pennsylvania: Unravelling species diversity, toxin types, growth and triazole sensitivity. Phytopathology (first look, September 2021).
3. Madden, L.V., P.D. Esker, and S.J. Pethybridge. 2021. Forrest W. Nutter, Jr.: a career in phytopathometry. Tropical Plant Pathology. https://doi.org/10.1007/s40858-021-00469-7
4. Bandara, A.Y., D.K. Weerasooriya, R.V. Trexler, R. Poudel, T.H. Bell, and P.D. Esk. 2021. Soybean roots and soil from high- and low-yielding field sites are characterized by distinct microbial co-occurrence networks. Frontiers in Microbiology, https://doi.org/10.3389/fmicb.2021.675352.
5. Shah, D., T.R. Butts, S. Mourtzinis, J.I. Rattalino Edreira, P. Grassini, S.P. Conley, and P.D. Esker. 2021. A machine learning interpretation of the contribution of foliar fungicides to soybean yield in the north-central United States. Science Reports 11:18769.
6. Mourtzinis, S., P.D. Esker, J.E. Specht, and S.P. Conley. 2021. Advancing agricultural research using machine learning algorithms. Scientific Reports 11:17879.
7. Collins, A.A., A.Y. Bandara, S.R. May, D.K. Weerasooriya, and P.D. Esker. 2021. First report of tar spot of maize (Zea mays) caused by Phyllachora maydis in Pennsylvania. https://doi.org/10.1094/PDIS-11-20-2456-PDN.
8. Bradley, C.A., and 47 other authors. 2021. Soybean yield loss estimates due to diseases in the United States and Ontario, Canada from 2015-2019. Plant Health Progress, https://10.1094/PHP-01-21-0013-RS.
9. Bock, C., S.J. Pethybridge, J.G.A. Barbedo, P.D. Esker, A-K. Mahlein, and E.M. Del Ponte. 2021. A phytopathometry glossary for the 21st century:Towards consistency and precision in intra- and inter-disciplinary crosstalk. Tropical Plant Pathology, https://doi.org/10.1007/s40858-021-00454-0

Harnessing chemical ecology for sustainable global nutrition security

Dr. Seogchan Kang
Department of Plant Pathology & Environmental Microbiology, Penn State

My talk consists of two parts. First, I will briefly introduce how chemical ecology processes affect crop production and the environment and how an improved understanding of chemical ecology can help develop novel crop protection strategies. The second part will focus on whether smart agriculture is sufficient for overcoming complex challenges to global food/nutrition security. Steady global population growth (anticipated to reach >9 billion by mid-2050) continuously increases the need for more food. Efforts to meet this need face complex problems (Little, 2019). Increasing soil erosion and salinity, severe water shortage, and urban encroachment decrease arable land, but we cannot afford to convert more natural ecosystems for cop production. Extreme weather events driven by climate change stress crops, making them less productive and more vulnerable to other stressors. Invasive pathogens and pests, which move around through globalized crop production and trade systems, can not only cause crop loss but also disrupt commodity trade. Some microbes secrete metabolites highly toxic to animals and humans in colonized plants. The Food and Agriculture Organization of the United Nations estimates that 25% of the world's food crops are contaminated with such toxins. Heavy reliance on synthetic pesticides to control diseases and toxins pollutes the environment, disrupts ecosystem services, costs energy, and increases pesticide resistance. Ensuring global food/nutrition security by producing nutritious and safe food without continuously incurring such costs requires transformative technologies and disruptive ideas.

The vast diversity of plants and plant-associated microbes and the many strategies they have evolved to interact with other organisms potentially help develop environment-friendly crop production strategies (Kang et al. 2021). Plant evolution and colonization of terrestrial ecosystems are intimately associated with various forms of microbial partnerships. Endophytes, mycorrhizal fungi, and rhizobia help plants proliferate even in suboptimal environments by boosting their ability to mine essential resources and cope with stressors. Many other types of plant-associated fungi and bacteria also support plant growth and health. Research in my lab has focused on understanding the mechanism of diverse interaction strategies plants and microbes have invented through evolutionary arms races and strategic alliances with other organisms. One strategy is secreting a wide variety of proteins, metabolites, and RNAs to manipulate surrounding organisms and environments. Rapid advances in understanding the nature of such molecules and their mechanism of action, facilitated in large part by genomics data and tools (Kang et al. 2022), have already helped develop various crop protection strategies. However, compared to extensive research on secreted proteins, studies on secreted metabolites, especially those that are volatile, have been limited. Because volatile organic compounds (VOCs) can travel through air, water, and porous soils, they can mediate short- and long-distance organismal interactions. We are investigating how VOCs participate in fungal-fungal and fungal-plant interactions with the primary focus on their role in plant growth/health and biological control. Notable insights from this investigation and potential applications of chemical ecology will be briefly presented.

Kang, S., Kim, K.-T., Choi, J., Kim, H., Cheong, K., Bandara, A., and Lee, Y.-H. (2022) Genomics and informatics, conjoined tools vital for understanding and protecting plant health. Phytopathology *in press*.

Kang, S., Lumactud, R., Li, N., Bell, T.H., Park, S.-Y., Kim, H.-S., and Lee, Y.-H. (2021) Harnessing chemical ecology for environment-friendly crop protection. Phytopathology 111: 1697-1710.

Little, A. (2019) The Fate of Food: What we will eat in a bigger, hotter, smarter world. Harmony Books, New York

Curriculum Vitae – Dr. Seogchan Kang

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Education

- PhD, Physiological Chemistry, 1991, University of Wisconsin, Madison
- MS, Chemistry, 1985, Seoul National University, Korea
- BS, Chemistry, 1983, Seoul National University, Korea

Research and Teaching Positions

- Assistant Professor-Professor, Department of Plant Pathology,1997-present, & Environmental Microbiology Penn State
- Research Associate, Department of Biology, University of New Mexico, 1995-1997
- Postdoctoral Fellow, Department of Biological Sciences, Purdue University, 1994-1995
- Visiting Research Scientist, Central Research and Development, DuPont Co., 1991-1994

Selected Refereed Journal Articles (last 2 years)

1. **Kang, S.**, Lumactud, R., Li, N., Bell, T.H., Kim, H.-S., Park, S.-Y., and Lee, Y.-H. (2021) Harnessing chemical ecology for environment-friendly crop protection. Phytopathology 111: 1697-1710.
2. Bily, D., Nikolaeva, E., Olson, T., Robert, S., **Kang, S.**, and Molnar, C. (2021). First Report of Aloe vera Rust Caused by *Uromyces aloes* in an Ornamental Nursery in the United States. Plant Disease (Note) 105: 3739
3. Kim, H., Kim, J., Hwangbo, A., Akerboom, J., Looger, L., Duncan, R., Son, H., Czymmek, K., and **Kang, S**. (2021) Evaluation of multi-color genetically encoded Ca^{2+} indicators in filamentous fungi. Fungal Genetics & Biology 149: 103540.
4. Geiser, D.M., ---- **Kang, S.**, ---- and Zhang, X. (2021) Phylogenomic analyses of a 55.1 kb 19-gene dataset resolves a monophyletic *Fusarium* that includes the *Fusarium solani* species complex. Phytopathology 111: 1064-1079.
5. Kim, S., Kim, C.-Y., Park, S.-Y., Kim, K.-T., Jeon, J., Chung, J., Choi, G., Kwon, K., Choi, J., Jeon, J., Jeon, J.-S., Khang, C.H., **Kang, S.**, and Lee, Y.-H. (2020) Two nuclear effectors of the rice blast fungus modulate host immunity via transcriptional reprogramming. Nature Communications 11: 5845.
6. Jeong, M.-H., Kim, J., **Kang, S**., Choi, E.-D., Kim Y., Lee, Y., Jeon, M.-J., Yu, N.-H., Park, A.-R., Kim, J.-C., Kim, S., and Park, S. (2021) Optimization of *Agrobacterium tumefaciens*-mediated transformation of *Xylaria grammica* EL000614, an endolicheni fungus producing grammicin. Mycobiology 49: 491-497.
7. Lee, Y., Kim, Y.S., Balaraju, K., Seo, Y.-S., Park, J., Ryu, C.-M., Park, S.-H., Kim, J.F., **Kang, S.** and Jeon, Y.-H. (2020) Molecular changes associated with spontaneous phenotypic variation of *Paenibacillus polymyxa*, a commonly used biocontrol agent, and temperature-dependent control of variation. Scientific Reports 10: 16586.
8.Kellogg, J. and **Kang, S.** (2020) Metabolomics, an essential tool in exploring and harnessing microbial chemical ecology. Phytobiomes J. 4: 195-210.
9. Molnar, C., Nikolaeva, E., Kim, S., Olson, T., Bily, D., Kim, J., and **Kang, S.** (2020) *Phytophthora* diversity in Pennsylvania nurseries and greenhouses inferred from clinical samples collected over four decades. Microorganisms 8: 1056.
10. Sun, Y., Gao, M., **Kang, S.**, Yang, C., Meng, H., Yang, Y., Zhao, X., Gao, Z., Xu, Y., Jin, Y., Zhao, X., Zhang, Z., and Han, Z. (2020) Molecular mechanism for mechanical wounding-induction of flavonoid accumulation in *Dalbergia odorifera* T. Chen. Gene 11: 487.
11. Rauf, C. A., Rafique, K., Naz, F., and **Kang, S.** (2020) First report of Vascular Wilt on Lentil (Lens culinaris Medikus) Caused by *Fusarium redolens* in Pakistan. Plant Disease (Note) 104: 2524
12. Chung, H., **Kang, S.**, Lee, Y.-H., and Park, S.Y. (2020) Expression Patterns of Transposable Elements in *Magnaporthe oryzae* under Diverse Developmental and Environmental Conditions. Res. Plant Dis. 26: 38-43.
13. Rafique, K., Rauf, C. A., and **Kang, S.** (2020) First report of *Fusarium equiseti* causing vascular wilt on Lentil (*Lens culinaris* Medikus) in Pakistan. J. Plant Pathology (Note) 102: 571.

ABSTRACT

Global seasonal crop forecasting for climate change adaptation

Dr. Toshichika Iizumi

National Agriculture and Food Research Organization

This talk aims to briefly overview the recent progress in global seasonal crop forecasting. Such forecasting services can support many players in food supply chains strengthening their preparedness for anticipated production shocks due to extreme climate events (high temperatures, drought, etc.) and even the impacts from long-term climate change. Seasonal crop forecasting therefore is valuable for national food agencies and commercial entities particularly in import-dependent countries. The National Agriculture and Food Research Organization–Asia-Pacific Economic Cooperation Climate Center (NARO-APCC) Crop Forecasting Service is an example of such the services and provids yield forecasts for global cropland on a monthly basis using seasonal temperature and precipitation forecasts. Recently, 1.5-year of testing the operation of the service was completed and evaluated through the comparison with reported and predicted yields for Europe and the United States from the European Commission's Joint Research Centre (EC/JRC) and the US Department of Agriculture (USDA). The main outcomes from the test operation and challenges for the future research will be presented.

Curriculum Vitae – Dr. Toshichika Iizumi

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Education

Ph.D., Geoenvironmental Sciences, 2007, University of Tsukuba, Japan
M.A., Biosystem Sciences, 2003, University of Tsukuba, Japan
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Research and Teaching Positions

Principal Scientist, Institute for Agro-Environmental Sciences, NARO, 2020–Present
Senior Researcher, National Institute for Agro-Environmental Sciences (NIAES), 2016–2020
Visiting Scholar, Liu Institute for Global Issues, University of British Columbia, 2015
Researcher, NIAES, 2011–2015
Visiting Scholar, Department of Geography, McGill University, 2013–2014
Visiting Researcher, Institute for Climate and Atmospheric Science, School of Earth and Environment, University of Leeds, 2010
Postdoctoral Researcher, NIAES, 2007–2010

Selected Refereed Journal Articles (last year)

Published Articles

1. Iizumi, T., N. Hosokawa, and R. Wagai (2021) Soil carbon-food synergy: sizable contributions of small-scale farmers. CABI Agriculture and Bioscience, 2, 43
2. Jägermeyr, J., Müller, C., Ruane, A. C., Elliott, J., Balkovic, J., Castillo, O., Faye, B., Foster, I., F olberth, C., Franke, J. A., Fuchs, K., Guarin, J. R., Heinke, J., Hoogenboom, G., Iizumi, T., Jain, A. K., Kelly, D., Khabarov, N., Lange, S., Lin, T.- Phillips, M., Porter, C., Rabin, S. S.,Scheer, C., Schneider, J. M., Schyns, J. F., Skalsky, R., Smerald, A., Stella, T., Stephens, H., Webber, H., Zabel, F., and Rosenzweig, C. (2021) Climate impacts on global agriculture emerge earlier in new generation of climate and crop models. Nature Food, 2, 873–885
3. Kim, K.H., Y. Doi, N. Ramankutty, and T. Iizumi (2021) A review of global gridded cropping system data products. Environmental Research Letters, 16, 093005.
5. Iizumi, T., Shin, Y., Choi, J., van der Velde, M., Nisini, L., Kim, W., and Kim, K.-H. (2021) Evaluating the 2019 NARO-APCC Joint Crop Forecasting Service yield forecasts for Northern Hemisphere countries. Weather and Forecasting, 36, 879-891
6. Iizumi, T., I.-E. A. Ali-Babiker, M. Tsubo, I. S. A. Tahir, Y. Kurosaki, W. Kim, Y. S. A. Gorafi, A. A. M. Idris, and H. Tsujimoto (2021) Rising temperatures and increasing demand challenge wheat supply in Sudan. Nature Food, 2, 19–27.

Identifying and characterizing translation of circular RNAs via Bioinformatics approach

Dr. Juw Won Park

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Over the past two decades, studies have discovered a special form of alternative splicing (AS) that produces a circular form of RNA. This stands in contrast to normal AS which produces a linear form of RNA. Although these circRNAs have garnered considerable attention in the scientific community for their biogenesis and functions, the focus of these studies has been on the regulatory role of circRNAs with the assumption that circRNAs are non-coding. As non-coding RNAs, they may regulate mRNA transcription, tumor initiation, and translation by sponging miRs and RNA-binding proteins (RBPs). In addition to these regulatory roles of circRNAs, however, recent studies have provided strong evidence for their translation. The translation of circRNAs is expected to have an important role in promoting cancer cell growth and activating molecular pathways related to cancer development. The development of a computational tool for identifying and characterizing the translation of circRNAs using high-throughput sequencing data will increase identifiable proteins translated from circRNAs. In turn, it will have a substantial impact on helping researchers understand the functional role of proteins derived from circRNAs.

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Education

Ph.D. in Computer Science, July 2009, University of Iowa, Iowa City, IA, USA
Advisors: Prof. Alberto Segre and Prof. James Cremer
M.S. in Computer Science, May 1999, University of Iowa, Iowa City, IA, USA
B.S. in Computer Science, February 1995, Korea University, Seoul, Republic of Korea

Research and Teaching Positions

Faculty: KY INBRE (Kentucky IDeA Networks of Biomedical Research Excellence), 09/2015~ current Bioinformatics Core, University of Louisville, KY, Associate Professor: Department of Computer Science and Engineering, 08/2021~current, University of Louisville, KY
Assistant Professor: Department of Computer Science and Engineering, 08/2015-07/2021,University of Louisville, KY, Postdoctoral fellow: Department of Microbiology, Immunology, & Molecular 12/2012~07/2015,Genetics, UCLA, CA
Postdoctoral fellow: Department of Internal Medicine, University of Iowa, IA 08/2009~12/2012
Graduate Research Assistant: Department of Computer Science, Center for 01/2003 ~ 07/2009, Statistical Genetic Research, University of Iowa, IA

Selected Refereed Journal Articles (last 2 years)

1.Koo H, Hwang JY, Jung S, Park H, Bok J, Park JW, "Position Specific Alternative Splicing and Gene Expression Profiles Along the Tonotopic Axis of Chick Cochlea.", Front Mol Biosci. (2021)8:726976.
2. Kumar A, Sundaram K, Mu J, Dryden GW, Sriwastva MK, Lei C, Zhang L, Qiu X, Xu F, Yan J, Zhang X, Park JW, Merchant ML, Bohler HCL, Wang B, Zhang S, Qin C, Xu Z, Han X, McClain CJ, Teng Y, Zhang HG, "High-fat diet-induced upregulation of exosomal phosphatidylcholine contributes to insulin resistance.", Nat Commun. (2021) 12(1):213
3. Chaabane M, Andreeva K, Hwang JY, Kook TL, Park JW*, Cooper NGF*, "seekCRIT: Detecting and characterizing differentially expressed circular RNAs using high-throughput sequencing data.", PLoS Comput Biol (2020) 16(10): e1008338 *co-corresponding authors
4. Hwang JY, Jung S, Kook TL, Rouchka EC, Bok J, Park JW, "rMAPS2: an update of the RNA map analysis and plotting server for alternative splicing regulation." Nucleic Acids Research, (2020) 48 (W1): W300-W306
5. Chaabane M, Williams RM, Stephens AT, Park JW, "circDeep: Deep learning approach for circular RNA classification from other long non-coding RNA." Bioinformatics, (2020) 36(1):73-80Curriculum Vitae: Juw Won Park, Ph.D January 5, 2022 Page 4 of 7
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Advanced V2V Authentication for Roadside Infrastructure-less Vehicular Network

Dr. Kiho Lim

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Advancement of autonomous driving and vehicular ad-hoc networks (VANETs) have demanded many applications requiring vehicle-to-vehicle (V2V) communications as vehicles cooperatively share their traffic information (collected by sensors) with each other to improve driving safety, traffic efficiency and convenience. In order to secure V2V communications, authentication has been carried out in the presence of the central trusted authority and infrastructures. However, the scenarios where the infrastructures are not available have not been addressed well. In this presentation, we introduce an advanced V2V Authentication scheme for roadside infrastructure-less vehicular networks to authenticate vehicles locally without involvement of a trusted authority and infrastructures. Our protocol utilizes the sensors installed in vehicles to verify the shared surrounding objects. The proposed scheme is robust against possible security threats (e.g., location spoofing attack and man-in-the-middle attack). An extensive simulation was also conducted in an autonomous driving environment to evaluate our scheme.

Curriculum Vitae – Dr. Kiho Lim

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Education

Doctor of Philosophy in Computer Science University of Kentucky 08/2016
- Thesis: Secure and authenticated message dissemination in Vehicular Networks and an incentive-based architecture for Vehicular Cloud
- Advisor: Dr. D. Manivannan

Master of Science in Computer Science University of Kentucky 05/2012
- Thesis: A Protocol Suite for Vehicular Ad-hoc Networks
- Advisor: Dr. D. Manivannan

Bachelor of Engineering in Computer Engineering Chosun University, South Korea 08/2007

Research and Teaching Positions

Assistant Professor 08/2019 – Present
Department of Computer Science, William Paterson University of New Jersey

Assistant Professor 08/2016 – 07/2019
Department of Computer Science, University of South Dakota

Graduate Research Assistant 08/2013 – 05/2016
Computer Science, University of Kentucky

Graduate Teaching Assistant 08/2008 – 12/2015
Computer Science, University of Kentucky

Selected Refereed Journal Articles

1. Choi, G. H., Lim, K., & Pan, S. B. (2021) A User Identification System based on Resolution Adjusted 2D Spectrogram of Driver's ECG for Intelligent Vehicles. Mobile Information Systems. (Accepted for Publication)
2. Kim, J., Joung, J, & Lim, K. (2021) Intelligent Reflecting Surface-Aided Space-Time Line Coded Systems. IEEE Wireless Communication Letters. (Accepted for Publication)
3. Choi, G. H., Lim, K., & Pan, S. B. (2021). Driver Identification System Using Normalized Electrocardiogram Based on Adaptive Threshold Filter for Intelligent Vehicles. Sensors, 21(1), 202.
4. Hong, T., Choi, J. A., Lim, K., & Kim, P. (2021). Enhancing Personalized Ads Using Interest Category Classification of SNS Users Based on Deep Neural Networks. Sensors, 21(1),199.
5. Wang, X., Nguyen, M., Carr, J., Cui, L., & Lim, K**.** (2020). A group preference-based privacy-preserving POI recommender system. Information & Communications Technology Express, Artificial Intelligence and Data Science. 6(3), 204-208.
6. Kim, H., Ben-Othman, J., Mokdad, L., & Lim, K**.** (2020). CONTVERB: Continuous Virtual Emotion Recognition Using Replaceable Barriers for Intelligent Emotion-Based IoT Services and Applications. IEEE Network, 34(5), 269-275.
7. Choi, J. A., & Lim, K**.** (2020). Identifying machine learning techniques for classification of target advertising. Information & Communications Technology Express, Artificial Intelligence and Data Science, 6(3), 175-180.
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Influence of Features on Accuracy of Anomaly Detection

Dr. Hoon Ko

Computer Infomation and Communication Research Center, Chungbuk University

The biggest problem with conventional anomaly signal detection using features was that it was difficult to use it in real time and it requires processing of network signals. Furthermore, analyzing network signals in real-time required vast amounts of processing for each signal, as each protocol contained various information. This paper suggests anomaly detection by analysing the relationship among each feature to the anomaly detection model. The model analyzes the anomaly of network signals based on anomaly feature detection. The selected feature for anomaly detection does not require constant network signal update and real-time processing of these signals. When the selected features are found in the received signal, the signal is registered as a potential anomaly signal, and is then steadily monitored until it is determined as either an anomaly or normal signal. As the results, it determined the anomaly with 99.7% (0.997) accuracy inf(4)(S0)and in casef(4)(REJ) received 11,233 signals with a normal or171anomaly judgment accuracy of 98.7% (0.987).

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Education

Ph.D. in Computer Science — 2004.08
Howon University, Republic of Korea

M.S. in Computer Science — 2000.02
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B.S. in Computer Science — 1998.08
Howon University, Republic of Korea

Research and Teaching Positions

Researcher, Institute for Computer and Information Communication	2021.09 ~ current
Senior member, IEEE	20190.3 ~ current
Collaborator, GRCAD/ISEP/IPP(Portugal)	2016.02 ~ current
Research Professor, IT Research Institute, Chosun University	2017.10 ~ 2021.08
Researcher, Department of Informatics, J. E. Purkinje University (Czech)	2013.06 ~ 2015.07
Post Doc., GRCAD/ISEP/IPP(Portugal)	2008.02 ~ 2013.01
Research professor, KAIST(KOREA)	2007
Visiting professor, Daejin University	2002 ~ 2006

Selected Refereed Journal Articles

Hoon Ko, Kwang Cheol Rim, and Isabel Praca, "Influence of Features on Accuracy of Anomaly Detection for Energy Trading System," SENSORS, Vol. 21, No. 21, 2021.6.

Minho Lee, Libor Mesicek, Kitae Bae, and Hoon Ko, “AI Advisor Platform for disaster response based on Big Data,” Concurrency and Computation-Practice and Experience, 2021.

Tae-Yeun Kim, Sung-Hwan Kim, and Hoon Ko, "Design and Implementation of BCI-Based Intelligent Upper Limb Rehabilitation Robot System," ACM Transactions on Internet Technology, Vol. 21, Issue. 3.

Hoon Ko, Marek Ogiela, Lidia Ogiela, Libor Mesicek, Myoungwon Lee, Junho Choi and Pankoo Kim, “ECG based Advanced Personal Identification Study with Adjusted(Qi∗Si),” IEEE Access, Vol. 7, Issue. 7, pp. 40078-40084, April 2019.

Pig Talk: An AI-Based IoT Platform for Pig

Dr. Whai-En Chen

Asia University, Taiwan

On pig farms, many piglets die because they are crushed when sows roll from side to side or lie down. On average, 1.2 piglets are crushed by sows every day. To resolve the piglet mortality issue, this paper proposes PigTalk, an Artificial Intelligent (AI) based Internet of Things (IoT) platform for detecting and mitigating piglet crushing. Through real-time analysis of the voice data collected in a farrowing house, PigTalk detects if any piglet screaming occurs, and automatically activates sow-alert actuators for emergency handling of the crushing event. We propose an audio clip transform approach to pre-process the raw voice data, and utilizes Min-Max Scaling in machine learning (ML) to detect piglet screams. In our first contribution, the above data pre-processing method together with subtle parameter setups of the machine learning model improve the piglet scream detection accuracy up to 99.4%, which is better than the previous solutions (up to 92.8%). In our second contribution, we show how to design two cyber IoT devices, i.e., DataBank for data pre-processing and ML_device for real-time AI to automatically trigger actuators such as floor vibration and water drop to force a sow to stand up. We conduct analytic analysis and simulation to investigate how the detection delay affects the critical time period to save crushed piglets. Our study indicates that PigTalk can save piglets within 0.05 seconds with 99.93% of the successful rate. Such results are validated in a commercial farrowing house. PigTalk is a new approach that automatically mitigates piglet crushing, which could not be achieved in the past.

Curriculum Vitae – Dr. Whai-En Chen

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Education

Research and Teaching Positions

Research Assistant Professor in Computer Science, National Chiao Tung University, Taiwan, R.O.C. Jan. 2002~July 2007

Assistant Professor in Computer Science and Information Engineering, National I-lan University,

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Director in Computer Science and Information Engineering, National I-lan University, Taiwan, R.O.C. Sep. 2008~July 2013. Associate Professor in Computer Science and Information Engineering, National I-lan University,

Taiwan, R.O.C. Aug. 2010~2016/08., Chairman of CSIE at NIU 2018

Selected Refereed Journal Articles (last 5 years)

Whai-En Chen, Y. -B. Lin and L. X. Chen. "PigTalk: an AI-based IoT Platform for Piglet Crushing Mitigation," in IEEE Transactions on Industrial Informatics, doi: 10.1109/TII.2020.3012496.

Whai-En Chen* and Chia Hung Liu. “High-performance user plane function (UPF) for the next generation core networks”. IET Networks. Volume 9, Issue 6, November 2020, p. 284 – 289.

Whai-En Chen*, Yi-Lun Ciou. ENUM-based Number Portability for Mobile Communication Networks. Journal of Internet Technology. vol. 20, no. 1 135-145. Jan. 2019.

Whai-En Chen*, Li-Yao Tseng, Chien-Lung Chu. An Effective Failure Recovery Mechanism for SIP/IMS Services. MONET 22(1): 51-60 (2017).

Trends in Medical Information Hiding for Smart Healthcare

: Algorithms and Applications

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With the growth and popularity of the utilization of medical images in smart healthcare, the security of these images using watermarks is one of the most recent research topics. In the last three years, COVID-19 is one of the most dangerous viruses and extremely contagious diseases in human history. During this pandemic time, patent digital records, called as electronic health records (EHR), are collected and exchanged from various sources such as smart and intelligent devices for information acquisition with accurate diagnosis. Unfortunately, exchanging EHR among hospitals, doctors, and medical team faces many challenges associated to ownership conflicts, data security and privacy. Furthermore, identity theft is the increasingly a 21st-century problem and largest contributor to fraud in India and other countries. Stolen personal information can have a negative financial impact, but stolen medical information cuts to the very core of personal privacy. Although some organizations such as digital imaging and communication in medicine (DICOM), health insurance portability and accountability act (HIPAA) etc. have provided guidelines and standards for the security of health records. However, it is established that currently no one has addressed the issue of ensuring the security after the data is retrieved by an authorized person. Hence, the organization standards, mandates, and guidelines have not been completely addressed.

Therefore, proper healthcare data and related image security is becoming equally important in smart healthcare. Medical information hiding is the highly recommended scheme for this purpose.

This talk highlights the basic ideas of medical information hiding, major characteristics, recent applications, concepts of embedding and recovery process of digital watermark (s), and the summary of different interesting state-of-the-art techniques. Further, potential issues and some existing solution are discussed in brief. This talk will be an important reference to find out research directions for fledgling researchers and students.

Curriculum Vitae – Dr. Amit Kumar Singh

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Education

PhD - Department of Computer Engineering, National Institute of Technology Kurukshtera, Haryana, India
M Tech - Department of Computer Sc. & Engineering, Jaypee University of Information Technology, Waknaghat, Solan, Himachal Pradesh, India
B Tech - Department of Computer Sc. & Engineering, IET Purvanchal University Jaunpur, Uttar Pradesh, India

Research and Teaching Positions

National Institute of Technology Patna, Bihar, India, Since August 2018
Jaypee University of Information Technology Waknaghat, Solan, Himachal Pradesh, India (April 2008 to July 2018)

Selected Refereed Journal Articles (last 2 years)

A Anand, AK Singh, **Hybrid Nature-Inspired Optimization and Encryption-based Watermarking for Smart Healthcare**. **IEEE Transactions on Computational Social Systems**. January - 2022, doi:10.1109/TCSS.2022.3140862.
A Anand, AK Singh, **Deep Learning based Covert Communication: A survey**. **ACM Transactions on Multimedia Computing, Communications, and Applications**. January - 2022, doi:10.1145/3508365.
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A Anand, AK Singh, A method for authenticating digital records for healthcare systems. Sustainable Computing: Informatics and Systems, 1-8, November-2021, doi: 10.1016/j.suscom.2021.100621.
B Fang, J Chen, Y Liu, W Wang, K Wang, AK Singh, Z Lv, Dual-channel Neural Network for Atrial Fibrillation Detection from a Single Lead ECG Wave. IEEE Journal of Biomedical and Health Informatics, 1-9, Oct-2021, doi: 10.1109/JBHI.2021.3120890.
Xinrui Ge, Guofu Wei, Jia Yu, AK Singh, Naixue Xiong, An Intelligent Fuzzy Phrase Search Scheme over Encrypted Network Data for IoT. IEEE Transactions on Network Science and Engineering, 1-13, Oct-2021, doi: 10.1109/TNSE.2021.3117587.
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A Anand, AK Singh, Cloud based Secure Watermarking using IWT-Schur-RSVD with Fuzzy Inference System for Smart Healthcare Applications. Sustainable Cities and Society, 1-7, September – 2021, **doi: 10.1016/j.scs.2021.103398.**
N. Sharma, A. Anand, A.K. Singh, A.K. Agrawal, **Optimization based ECG watermarking in RDWT-SVD domain**. **Multimedia Tools and Applications,** 1-17, September - 2021,doi: 10.1007/s11042-021-11519-2.
DK Mahto, AK Singh, **A survey of color image watermarking: State-of-the-art and research directions**. **Computers & Electrical Engineering**. 93, July - 2021, doi:10.1016/j.compeleceng.2021.107255.
AK Singh, Z Lv, H Ko, **Introduction to the Special Issue on Recent Trends in Medical Data Security for e-Health Applications**. **ACM Transactions on Multimedia Computing, Communications, and Applications**. 17(2s), 1-3, May – 2021, doi: 10.1145/3459601.
AK Singh, J Wu, Ali Al-Haj, Calton Pu , **Introduction to the Special Issue on Security and privacy of medical data for smart healthcare**. **ACM Transactions on Internet Technology**. 21(3), 1-4, June - 2021, doi: 10.1145/3460870.
A Kumar, R Singh, V Bharti, AK Singh, SK Singh, **MetaMed: Few-shot medical image classification using gradient-based meta-learning**. **Pattern Recognition**. 120, 1-13, June - 2021, doi: 10.1016/j.patcog.2021.108111.
AK Singh, A Anand, Z Lv, H Ko, A Mohan, **A survey on healthcare data: A Security perspectives**. **ACM Transactions on Multimedia Computing, Communications, and Applications**. 17(2s), 1-26, May - 2021, doi: 10.1145/3422816.
Y DUAN, Y ZHANG, Y HUANG, M LI, M MAO, AK SINGH, Y LI , **Fast Search of Lightweight Block Cipher Primitives via Swarm-like Metaheuristics for Cyber Security**. **ACM Transactions on Internet Technology**. 21(4), 1-15, July – 2021, doi: 10.1145/3417296.
Z LV, L Qiao, AK Singh, Q Wang, **Fine-grained Visual Computing Based on Deep Learning**. **ACM Transactions on Multimedia Computing, Communications, and Applications**. 17(1s), 1-19, April – 2021, doi: 10.1145/3418215.
R Singh, T Ahmed, A Kumar, AK Singh, AK Pandey, SK Singh, Imbalanced Breast Cancer Classification Using Transfer Learning. IEEE/ACM Transactions on Computational Biology and Bioinformatics, 18(1), 83-93, 2021, doi: 10.1109/TCBB.2020.2980831.
A Kumar, SK Singh, S Saxena, AK Singh, S Shrivastava, K Lakshmanan, N Kumar, and R K Singh, CoMHisP: A Novel Feature Extractor for Histopathological Image Classification Based on Fuzzy SVM With Within-Class Relative Density. IEEE Transactions on Fuzzy Systems, 1-14, 2020, doi: 10.1109/TFUZZ.2020.2995968.
A Anand, AK Singh, Z Lv, G Bhatnagar, Compression-then-Encryption based Secure Watermarking Technique for Smart Healthcare System, IEEE Multimedia, 2020 doi: 10.1109/MMUL.2020.2993269.
A Anand and AK Singh, Joint Watermarking-Encryption-ECC for Patient Record Security in Wavelet Domain, IEEE Multimedia, 27 (3), 66-75,

Uncovering Regulatory Mechanisms of Salicylic Acid Biosynthesis for Plant immunity in Arabidopsis and Brassicaceae oilseed crops

Dr. Heejin Yoo

The University of Utah

Brassicaceae oilseed plants such as *Brassica napus* and *Camelina sativa* are outstanding sources for food, feedstock, and biofuels. Especially, canola oil derived from *B. napus* cultivars with reduced levels of erucic acid and glucosinolate is popular for both food and biodiesel. However, *B. napus* is highly susceptible to various pathogens including fungal pathogen *Leptosphaeria maculans*. While *C. sativa* is generally more resistant to various pathogens than *B. napus,* underlying mechanism of contrasting disease responses is largely unknown. Here, we discovered that *B. napus* has distinct transcriptional regulatory mechanisms of salicylic acid (SA) biosynthesis from those in *C. sativa* and *Arabidopsis thaliana* (Arabidopsis). SA is a plant defense hormone controlling immune responses in both local infected tissue and uninfected systemic tissue. SA can be synthesized by two pathways, the isochorismate synthase 1 (ICS1) pathway and the phenylalanine ammonia lyase (PAL) pathway. In the well-studied Brassicaceae family model species Arabidopsis, SA is mainly synthesized via ICS1 pathway with transcriptional regulation of *ICS1* as a key regulatory mechanism. Preliminary results show that *C. sativa ICS1* expression is induced to control immune mechanism for SA biosynthesis in systemic tissue similar to Arabidopsis, while *B. napus ICS1* expression is not induced in response to pathogen infection in systemic tissue. This contrasting regulation of SA biosynthesis is suggested to explain more disease susceptibility in *B. napus*. Our research aims to elucidate molecular mechanisms for distinct transcriptional regulation of SA biosynthesis in *B. napus, C. sativa*, and Arabidopsis in response to various pathogens to uncover the links between SA biosynthesis and pathogen resistance in oilseed crops. Understanding conserved or specific regulatory mechanisms in diverse plant species will provide novel and effective genetic engineering strategies to improve disease resistance while minimizing fitness costs.

Curriculum Vitae – Dr. Heejin Yoo

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Education

Doctor of Philosophy, Purdue University (Plant Biochemistry, Plant Molecular Biology) **2008.8.-2014.5**
Department of Biochemistry/Department of Horticulture, Purdue University, West Lafayette, USA
Purdue University Interdisciplinary Life Science Program (PULSe)

Bachelor of Science, Seoul National University (Plant Biology) **2004.3.-2008.2**
Horticultural Science in the Department of Plant Science,
Seoul National University (SNU), Seoul, Korea

Research and Teaching Positions

Assistant Professor, University of Utah	2022.01 - current
Assistant Professor, Oklahoma State University	2019.08-2021.12
Postdoctoral Associate, Duke University (PI: Xinnian Dong, PhD)	2014.08.-2019.07
Postdoctoral Associate, Purdue University (PI: Natalia Dudareva, PhD)	2014.06-2014.08
Research Assistant, Purdue University (PI: Natalia Dudareva, PhD)	2008.08-2014.05

Selected Refereed Journal Articles (last 5 years)

1. **Yoo H***, Shrivastava S*, Lynch JH*, Huang D, Widhalm JR, Guo L, Carter BC, Qian Y, Maeda HA, Ogas J, Morgan JA, Marshall-Colón A, and Dudareva N. (2021) Overexpression of arogenate dehydratase reveals an upstream point of metabolic control in phenylalanine biosynthesis. ***The Plant Journal***
2. **Yoo H***, Greene GH*, Yuan M*, Xu G, Burton D, Liu L, Marqués J and Dong X. (2020) Translational Regulation of Metabolic Dynamics during Effector-Triggered Immunity. ***Molecular Plant*** 13:88-98
3. Xu G*, Greene GH*, **Yoo H***, Liu L, Marqués J, Motley J and Dong X. (2017) Global translational reprogramming is a fundamental layer of immune regulation in plants. ***Nature*** 545:487–490
4. Widhalm JR, Gutensohn M, **Yoo H**, Adebesin F, Qian Y, Longyun G, Rohit J, Joseph HL, McCoy RM, Shreve JT, Thimmapuram J, Rhodes D, Morgan JA, and Dudareva N. (2015) Identification of a plastidial phenylalanine exporter that influences flux distribution through the phenylalanine biosynthetic network. ***Nat. Comm.*** 6:8142
5. Zheng XY*, Zhou M*, **Yoo H***, Pruneda-Paz JL, Spivey NW, Kay SA and Dong X. (2015) Spatial and temporal regulation of biosynthesis of the plant immune signal salicylic acid. ***Proc. Natl. Acad. Sci. USA*** 112:9166-9173

Nucleus-to-plastid anterograde signaling pathway

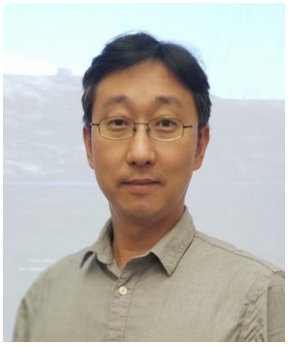
: the role of photobodies in plant growth and chloroplast biogenesis

Dr. Chan Yul Yoo

The University of Utah

Photobodies are biomolecular condensates that contain photoreceptors to regulate almost every facet of plant growth and development. Photobodies are formed through a biophysical process called liquid-liquid phase separation in response to changes of light quality and quantity.

However, the function of photobodies in the regulation of nucleus-chloroplast communication is unclear. Using a combination of cell biology and molecular genetics, we show that the formation of photobodies in the nucleus triggers the assembly of plastid (chloroplast) RNA polymerase complex by degrading phytochrome-interacting transcription factors, the PIFs. We identified novel phytochrome signaling components and regulatory mechanisms to link light-dependent photobody formation to the control of plant growth and chloroplast biogenesis. Our work provides new framework of the nucleus-to-organelle or anterograde signaling pathway by which phase separation of photobodies in the nucleus controls gene expression in organellar genome.



Curriculum Vitae – Dr. Chan Yul Yoo

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Education

Ph.D. Plant Molecular Genetics, Department of Horticulture, Purdue University, IN, US 2011
B.S Biology, Department of Biology, Yonsei University, South Korea 2004

Research and Teaching Positions

Assistant Professor, School of Biological Sciences, University of Utah 2022-present
Adjunct Assistant Professor, Oklahoma State University 2020-2021
Assistant Project Scientist, University of California Riverside 2015-2020
Faculty Mentor: Meng Chen, Ph.D
Hargitt Postdoctoral Fellow & Postdoctoral Associate, Duke University 2013-2015
Faculty Mentor: Meng Chen, Ph.D.
Postdoctoral Associate, Purdue University 2012-2013

Selected Refereed Journal Articles (last 5 years)

Yoo CY*, Jiangman He*, Qing Sang*, Qiu Y, Long L, Kim RJ, Chong E, Hahm J, Morffy N, Zhou P, Strader L, Nagatani A, Mo B, Chen X, Chen M (**2021**) Direct photoresponsive inhibition of a p53-like transcription activation domain in PIF3 by *Arabidopsis* phytochrome B. ***Nature Commun*** 12:5614

Willige BC*, Zander M*, **Yoo CY**, Phan A, Garza RM, Trigg SA, He Y, Nery JR, Chen H, Chen M, Ecker JR, Chory J (**2021**) PHYTOCHROME INTERACTING FACTORs trigger environmentally responsive chromatin dynamics. ***Nature Genet*** 53:955-961

Qiu Y*, Pasoreck EK*, **Yoo CY***, He J, Wang H, Bajracharya A, Li M, Larsen H, Cheung S, Chen M (**2021**) RCB initiates *Arabidopsis* thermomorphogenesis by stabilizing the thermoregulator PIF4 in the daytime. ***Nature Commun*** 12:2042 * **Co-first authors**

Yoo CY, Han S, Chen M (**2020**) Nucleus-to-plastid phytochrome signaling in controlling chloroplast biogenesis. ***Annu Plant Rev*** 3:251-280

Yoo CY, Pasoreck EK, Wang H, Cao J, Blaha GM, Weigel D, Chen M (**2019**) Phytochrome activates the plastid-encoded RNA polymerase for chloroplast biogenesis via nucleus-to-plastid signaling. ***Nature Commun*** 10:2629

Yang EJ*, **Yoo CY*,** Liu J*, Wang H, Cao J, Li F, Pryer K, Sun T, Weigel D, Zhou P, Chen M (**2019**) NCP activates chloroplast transcription by controlling light-dependent dual nuclear and plastidial switches ***Nature Commun*** 10:2630 * **Co-first authors**

Yoo CY, Williams D, Chen, M (**2019**) Quantitative analysis of photobodies. ***Methods Mol Biol*** 2026:135-141

Yoo CY, Mano N, Finkler A, Weng H, Day IS, Reddy ASN, Poovaiah BW, Fromm H, Hasegawa, PM, Mickelbart MV (**2019**) A Ca^{2+}/CaM-regulated transcriptional switch modulates stomatal development in response to water deficit. ***Sci Rep*** 9:12282

Smart Farming : The future of Livestock

Dr. Muhammad Irfan

University of Illinois at Chicago

Smart Livestock farming is the future of agriculture which aims to managing farms using the latest technologies like Artificial Intelligence (AI), IoT (Internet of Things), drones and robotics to enhance the quality and quantity of livestock products by minimizing human labour needed for production. It is a need of time in the livestock industry to utilize automation to increase production efficiency and sustainability. The techniques used in smart farming help farmers to check the nutrient requirements of each animal according to their production in order to prevent diseases and enhance production and health. Large scale commercial farmers can implement smart farming methods including wireless IoT devices to detect the location, health and welfare of their animals. Smart farming and IoT based livestock production are paving a direction for the Third Green Revolution. In the future, information and communication technology (ICT) based smart animal farms can gather, evaluate and analyse data with IoT from different sources in the livestock sector. In the past few years, the fourth industrial revolution has found its way into livestock and agriculture using ICT. In the field of livestock, smart ear tags, lameness detectors, and smart collars were developed, which allows real-time monitoring of individual animals. The researchers and policymakers at international and national levels should work together to implement smart livestock products according to the needs of the modern livestock farmers.

Keywords: Smart livestock farming, Internet of Things, Artificial Intelligence, sustainability

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Education

DEGREE	DATE	UNIVERSITY / BOARD
Ph.D.	2020/08/21	Kyungpook National University, Daegu, Korea.
MS	2017/08/18	Kyungpook National University, Daegu, Korea.
DVM	2014/08/22	PMAS, Arid AgricultureUniversity, Pakistan.
F.Sc. (Pre-Med)	2009/08/15	BISE Faisalabad, Pakistan.
Matriculation	2007/08/01	BISE Faisalabad, Pakistan.

Research and Teaching Positions

Currently working as Post-Doctoral Research Associate on stem cell mediated nerve regeneration

Working on cardiovascular physiology (Antiplatelet cellular signaling pathway and Antithrombotic properties of natural compounds) in collaboration

Working on development of natural antithrombotic agents in the new era of ethnomedicine using *in vitro* and *in vivo* techniques

Eligible to render services of Veterinary Medicine and Surgery

Selected Refereed Journal Articles (last year)

Ryan Pasiewicz, Yessenia Valverde, Raghuvaran Narayanan, Ji-Hyun Kim, **Muhammad Irfan,** Nam-Seob Lee, Anne George, Lyndon F Cooper, Satish B Alapati, Seung Chung. C5a complement receptor modulates odontogenic dental pulp stem cell differentiation under hypoxia. *Connective Tissue Research.* (2021).

Muhammad Irfan, Yuan Yee Lee, Ki-Ja Lee, Sung Dae Kim, Man Hee Rhee. Comparative Antiplatelet and antithrombotic effects of red ginseng and fermented red ginseng extracts. *Journal of Ginseng Research* (2021).

Muhammad Irfan, Tae-Hyung Kwon, Dong-Ha Lee, Seung-Bok Hong, Jae Wook Oh, Sung-Dae Kim, Man Hee Rhee. Antiplatelet and Antithrombotic Effects of Epimedium koreanum Nakai. *Evidence-Based Complementary and Alternative Medicine* (2021)

Jung-Hae Shin, **Muhammad Irfan,** Man Hee Rhee, Hyuk-Woo Kwon. Antiplatelet effect of cudraxanthone B is related to inhibition of calcium mobilization, αIIbβ3 activation, and clot retracti on. *Applied Biological Chemistry* (2021). 64:4 (2021)

Jung-Hae Shin, **Muhammad Irfan,** Man Hee Rhee, Hyuk-Woo Kwon. Derrone inhibits platelet aggregation, granule secretion, thromboxane A2 generation, and clot retraction: an in vitro study. *Evidence-Based Complementary and Alternative Medicine.* (2021).

Yuan Yee Lee, **Muhammad Irfan,** Yixian Quah, Evelyn Saba, Sung-Dae Kim, Seung-Chun Park, Myung-Gyun Jeong, Yi-Seong Kwak, Man Hee Rhee. The increasing hematopoietic effect of the combined treatment of Korean Red ginseng and Colla corii asini on cyclophosphamide-induced immunosuppression in mice. *Journal of Ginseng Research* (2021).

Potentialities of using Artificial Intelligence (AI) in agricultural farming

Dr. Ujjal Kumar Nath

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Agriculture is the largest industry plays a vital role in economy of a country. Agriculture is the backbone of developing countries. In old era, agriculture was experienced dependent and shared by peoples. In year 2020, agriculture represented 4% of worldwide GDP and it was represented over 25% of GDP in some agriculture depended nations. Present pandemic, population growth, quality food and ever changing climate demand technologies in agriculture. Artificial intelligence (AI) is a technological solution to cope with rising population and global climatic changes. AI is simulation of human intelligence by robotics, drones, satellites, planes, smartphone Apps, etc. AI is a cutting-edge technology in agriculture for improving yield. The world's population will reach 9.1 billion in 2050, which need 70% more food than current requirement. Therefore, scientist and farmers should be more creative in developing farms in limited space and getting high yields of a quality product. AI in agriculture helps to control pests, organize farming data, produce healthier crops, reduce workload, and many more. AI provides much automation in agriculture and helps farmers to monitor crops even when they are absent in the fields. Many companies are working to improve AI technology. The potential of improving AI means ceiling for growth in the agricultural sector is massive. The smart implementation of AI into agriculture would help the sustainability of agriculture future.

Key words: Artificial intelligence, precision farming, sustainability, potentiality, agriculture

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Web search: https://www.researchgate.net/profile/Ujjal_Nath(research gate)
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Education

D.Sc. degree in Plant Breeding, Department of Crop Sciences,, Division- Plant Breeding, Georg-August University, Göttingen, Germany, — Oct 2004 – Mar 2008

M.S. degree in Genetics and Plant Breeding, Bangladesh Agricultural University, Mymensingh, Bangladesh — 2000-2001

B.Sc. degree in Agricultural Science Bangladesh Agricultural University, Mymensingh, Bangladesh — 1992-1995

Research and Teaching Positions

Completed a PostDoc in Germany with the funding of DAAD scholarship — Jun 2011-Dec2011

PostDoc at South Korea on Green Biotechnology — Dec 2015-

Provost Shaheed Shamsul Haque Hall, Bangladesh Agricultural University, , Mymensingh Bangladesh Agricultural University, Mymensingh — Oct 2020-

Assistant Proctor in Bangladesh Agricultural University — Jan 2013- Apr 2014

Professor, Department of Genetics and Plant Breeding, Bangladesh Agricultural University (BAU), Mymensingh, Bangladesh — Jun 2012

House Tutor (general) in Ashraful Haq Hall, Bangladesh Agricultural University — Apr 2008 – Aug 2012

Associate Professor, Department of Genetics and Plant Breeding, Bangladesh — Jun 2008 – Jun 2012

Head of the Department of Genetics and Plant Breeding, Bangladesh Agricultural University (BAU), Mymensingh, Bangladesh — Jul 2010 – Jun 2012

Assistant Professor, Department of Genetics and Plant Breeding, BAU — 2004– 24/06/08

Lecturer, Department of Genetics and Plant Breeding, BAU — 2001 – 2004

Scientific officer (SO) in JICA (Japan International Cooperation Agency) funded project on "Phyto-remediation against Cadmium (Cd) using *Brassica juncea* for soil reclamation" at the department of Genetics and Plant Breeding, Bangladesh Agricultural University, Mymensingh, Banglades — Jul 1999 – Jun 2001

Selected Refereed Journal Articles (last 5 years)

Biswas PL, Nath UK, Ghosal S, Goswami G, Uddin MS, Ali OM, Latef AAHA, Laing AM, Ming GY, Hossain A (2021) Pyramiding of Bacterial Blight Resistant Genes in Rice (Oryza sativa L.): Response against Xanthomonas oryzae pv. oryzae. Plants. 10:2048 (1-16).

Xu R, Pan R, Zhang Y, Feng Y, Nath UK, Gan Y, Shi C, Akhter D (2021) RNA-Seq-Based Profiling of pl Mutant Reveals Transcriptional Regulation of Anthocyanin Biosynthesis in Rice (Oryza sativa L.). International Journal of Molecular Sciences. 22(18) 9787: 1-18.

Khatun K, Debnath S, Robin AHK, Wai AH, Nath UK, Lee DJ, Kim CK, Young CM (2021) Genome-wide identification, genomic organization, and expression profiling of the CONSTANS-like (COL) gene family in petunia under multiple stresses. BMC Genomics 22:727 (1-17).

Hu L, Zhang X, Yuan Y, Wang Z, Yang S, Li R, Nath UK, Zhao Y, Tian B, Shi G, Xie Z, Wei F, Wei X (2021) Comparative Transcriptome Identifies Gene Expression Network Regulating Developmental Pollen Abortion in Ogura Cytoplasmic Male Sterility in Chinese Cabbage (Brassica rapa ssp. pekinensis). Horticulturae 7(157):1-14.

Wai AH, Muhammad W, Khan ABMMM, Nath UK, Lee DJ, Kim ST, Kim CK, Chung MY (2021) Genome-wide identification and expression profiling of the PDI gene family reveals their probable involvement in abiotic stress tolerance in tomato (Solanum lycopersicum L.). Genes. 12: 23

Smart Livestock Farming Approach in Developing Countries

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National Animal Health and Production Research Institute

1. Department of Animal Breeding and Husbandry in the Tropics and Subtropics, Institute of Agricultural Sciences in the Tropics (Hans-Ruthenberg-Institute), Hohenheim University, Germany
2. National Animal Health and Production Research Institute, General Directorate of Animal Health and Production, Ministry of Agriculture, Forestry and Fishery, Cambodia

The objective of the review is to describe the current smart technologies that are being applied in livestock farming and the main challenges to approaching the smart farming evolution in developing countries. The world, particularly in developing countries is facing global warming and rapid population growth, in the era of the fourth agricultural revolution (4.0) occurred during the past two decades, the integration of ICT and AI in an agriculture field is being applied to address these challenges and secure the food security and sustainable production. Smart farming in the livestock sector refers to smart management, smart feed/feeding and smart breeding to maximize productivity, efficiency and sustainability. Precision animal farming by the development and use of technology, digitalization proved in improved production and monitoring of disease outbreaks. Improved ruminant production to intensification system reduced the competition of protein consumption with human, hence silage and TMR technology, cut and carry forage, integration of crop and tree species in farming systems (agroforestry) are kinds of well-selected methods in the smart feeding. The migration and crossed breeding with imported genotypes by artificial insemination and embryo transfer, and the selection based on genomic technology are widely applied in animal breeding. However, breeding for more productivity would not be appropriate, the selection program would also include adaptability traits to a tropical climate, welfare issues, and retain the social-cultural traits that tend to be smart, appropriated and sustainable. To approach smart livestock farming, the developing country is lacking the feasibility to apply and improve the current production situation different from the developed world. The driven policy, human resources, sense and critical need of local community, delivery system and availability of the suitable network, sensor, smart device/equipment, genetic resource information, phenotypic recording, germplasm delivery system, market need, a contribution from a private sector, research institution, and international collaboration.

Keywords: smart livestock farm, precision animal farming, animal breeding, developing countries

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Education

Attending Ph.D. in Animal Breeding, Institute of Agricultural Sciences in the Tropics (Hans-Ruthenberg-Institute), Hohenheim University, Germany — Apr 2021-Present

Attended Master degree (M.Sc.) in Animal Breeding and Genetics Faculty of Agriculture, Khon Kaen University, Khon Kaen, Thailand — Aug 2015-Jul 2017

Attended Bachelor Degree (B.Sc.) in Animal Science, Animal Science faculty, Royal University of Agriculture, Phnom Penh Cambodia — Oct 2010-Nov 2014

Research and Teaching Positions

Government officer (Vice chief), Animal Breeding and Genetics laboratory National Animal Health and Production Research Institute General Directorate of Animal Health and Production. — Feb 2017- Present

University Lecturer on Animal Breeding and Genetics — Aug 2018- Present

Short-term consultant for evaluation project on Sustainable Livelihood Project- Improved Cattle raising method, Muslim Aid, Cambodia — May-June 2019

Short-term consultant for designing Livestock Training Materials CAVAC — Sep-Dec 2018

Worked in Thai Native chicken farm and Animal Genomic Lab, Khon Kaen University, Thailand — Jan 2016-Dec 2016

Research assistant at Center for Livestock Development Study Royal University of Agriculture, responsible for project entitled "Improved Forage-Base Livestock Feeding Systems for Smallholder Livelihood in Cambodia-Loa-Vietnam Development triangle site" conducted in Cambodia-Loa-Vietnam Development triangle site funded by IFIAD and CIAT — Apr 2013-Jul 2015

Selected Refereed Journal Articles (last 5 years)

Phem, M., M. Duangjinda, Y. Phasuk, N. Duanghaklang and K. Sujikara. 2017. Expression of glucocorticoid receptor (NR3C1) gene in 3 different breeds of Thai chickens. The 18th Agricultural Conference. 23-24 January, 2017. Khon Kaen university, Khon Kaen, Thailand. Khon Kaen Agriculture Journal (KAJ) 45 (1): 90-95. (Excellence oral presenter awardee)

Phem, M., Thim, S., Theng, K. and Seng, M. 2015. Working with ethnic group: A case study of introducing pig fattening to Garay ethnicity in Ouyadav district, Ratanakiri province. The 6th International Conference on Environment and Rural Development, 06-08 March, 2015. Bohol Island State University, Bohol, The Philippines. International Journal of Environmental and Rural Development (IJERD) 6 (2): 29-34. (Excellence poster presenter awardee)

Phem, M. 2015. Current status of livestock reproduction and the use of advanced reproductive biotechnologies in Cambodia. In: International training course on Dairy herd Improvement by the Use of Reproductive Biotechnologies. Nueva ecija, the Philippines.

Theng, K., Phem, M., Seng, T., Long, R., Kang, S., Thim, S., Pen, M., Seng, M. 2015. Cattle body condition score and factor correlate to market price in Ratanakiri. In: The 1st national conference on agriculture and rural development. Phnom Penh, Cambodia.

Phem, M., Thim, S., Theng, K. and Seng, M. 2014.Working with ethnic group: a case study of introducing pig fattening to Garay ethnicity in Ouyadav district Ratanakiri province (p. 1-17). In: The 14th International Students Summit, Tokyo University of Agriculture, Japan

Developing of smart farm system in swine farm

Dr. Yoo Yong Kim

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Recently, terminology of ICT (information and communication technologies) and/or smart farming concept refers to managing farms using advanced technologies and facilities to increase quantity and quality of products while optimizing the human labor required by production. To make better and advanced swine farm, smart farming technologies are classified sensors, software, connectivity, location, robotics and data analysis even though some technologies such as sensors and software are already adapted in domestic swine farm. New technologies are continually introduced in swine farm, but there is question whether advanced technologies and facilities are cost-effective method point of view economic analysis. Although huge amount of money is invested in smart farming, swine producers still doubt if there will be a positive profit or retrospective cost by new advanced swine farm. When we turn way our eyes on other countries like Denmark and Hollands, we agonizing about new technologies and facilities those are really needed to improve productivity or reproductivity in swine farm. As we knew, Denmark and Hollands are very well known as advanced countries in swine industry moreover lots of swine farms in those countries achieve the highest productivity in the world although they are still using conventional management with pretty old facilities. New technologies and facilities in swine farm will be available as long as financial situation is possible and output will be greater than investment. Without consideration of economic analysis and/or cost-effective investment, new technologies and high expenses of facilities will be a fetal mistake for managing of swine farm. For sustainable swine production in Korea, prudent investment is essential even though it is new and advanced technologies and facilities. Or an individual swine farm falls into the financial risk because pork price in Korea frequently fluctuates unaccountably.

Keywords: ICT, smart farming, swine farm

Curriculum Vitae – Dr. Yoo Yong Kim

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Education

- 1999~2000, Department of Animal Science, The Ohio State University (Post-doc. fellow)
- 1994~1999, Graduate School, The Ohio State University (Ph.D) Advisor: Dr. Donald C. Mahan
- 1988~1990, Department of Animal Science, College of Agriculture, Seoul National University (MS)
- 1983~1987, Department of Animal Science, College of Agriculture, Seoul National University (BS)

Research and Teaching Positions

- 2001 ~ Present., Professor, Seoul National University
- 2006.03. ~ 2012.03., External Board Member of Farmsco Ltd.(feed company)
- 2008.11. ~ 2012. 11., Chairman, Department of Food and Animal Science Biotechnology
- 2014.07. ~ Present., Chairman, Council of Pork Supply and Demand
- 2020.08. ~ Present., Present President, The 19th AAAP Animal Science Congress
- 2022.01. ~ Present., President, Korean Society Animal Science and Technology

List of Prize-giving

Kook dam academic
award (2009. 4)

Education award of Seoul National University (2010. 11)

"Distinguished international alumni award" by The Ohio State University (2011. 3)

The Great Award of Korea swine association (2011. 10)

Purina' s Great Award "Animal Nutrition and Feed" (2011. 12)

The 20th Grand Prize of Ministry Agriculture, Forest and Food (2017. 12)
-"Science and Technology in the field of Agriculture, Forest and Food"

Research Achievements since 2001

Conduct weaning, growing/finishing pigs, sow experiment

Own experimental farm since 2005 (Jacob farm)

- 500 sows with 3 week batch system
- 72 sows per batch

Climate-Smart Agriculture through Climate Information Services

Dr. Kwang-Hyung Kim

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Climate-smart agriculture (CSA) has gained prominence as a response to challenges posed by climate change in the agricultural sector. CSA is an approach that helps guide actions to transform agri-food systems towards green and climate resilient practices. CSA aims to tackle three main objectives: sustainably increasing agricultural productivity and incomes; adapting and building resilience to climate change; and reducing and/or removing greenhouse gas emissions. From the good understanding of CSA, we can then need to discuss how to promote CSA in the agricultural sector. In fact, there is a growing interest in understanding the linkages between the climate information services (CIS) and the adoption of CSA practices. In this presentation, I would like to share a story about the farmer Smart, where the use of CIS that are demand-driven, cost-effective, timely, and easy to access can be linked to the adoption of the CSA farm management practices. This particular story, with the understanding of CSA, will be able to indicate the importance of CIS as one major mainstream strategy for climate change adaptation and mitigation through the promotion of CSA practices

Curriculum Vitae – Dr. Kwang-Hyung Kim

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Education

- Ph.D. : Virginia Tech, Biological Sciences Ph.D Dissertation Advisor: Christopher B. Lawrence, 2005-2009
  Dissertation Advisor: Christopher B. Lawrence, Ph.D.
  "Functional analysis of pathogenicity factors in animal and plant pathogenic fungi"
- M.S. : Seoul National University Agricultural Biotechnology, 2000-2002
  Thesis advisor: Young-Ho Kim, Ph.D.
  "Structural and molecular resistance mechanism of the hot pepper against Anthracnose pathogen"
- B.S. : Seoul National University Applied Biology Chemistry, 1996-1999
  Undergraduate Research Advisor : Yong-Hwan Lee, Ph.D.

Research and Teaching Positions

- Associate Professor, Department of Agricultural Biotechnology @ Seoul National University, 3/2021-present
- Chief Technical Advisor, DeRISK South East Asia @ Alliance of Bioversity International and CIAT, 9/2020-present; Scientific Project Leader, SAMIS @ FAO Laos, 4/2018-present
- Research Fellow, Climate Services & Research Division @ APEC Climate Center, 2/2013-2/2021
- Adjunct Associate Research Scientist, International Research Institute for Climate and Society, Columbia University, USA, 7/2015-6/2016
- Senior Research Scientist, Bio Research Center @ Samsung Techwin/Electronics, 10/2010- 02/2013
- Postdoctoral Associate, Virginia Bioinformatics Institute @ Virginia Tech, 09/2009- 09/2010

Selected Refereed Journal Articles (last 5 years)

Kim, K.-H., Doi, Y., Ramankutty, N., and Iizumi, T., 2021. A review of global gridded cropping system data products. Environ. Res. Lett. 16:093005.

Kim, K.-H. and Lee, J., 2020. Smart plant disease management using agrometeorological big data. Res. Plant Dis. 26(3), 1-13.

Kim, K.-H. and Choi, E.D., 2020. Retrospective study on the seasonal forecast-based disease intervention of the wheat blast outbreaks in Bangladesh. Front. Plant Sci. 11:570381.

Kim, K.-H., Raymundo, A.D., and Aikins, C.M., 2019. Development of a rice tungro epidemiological model for seasonal disease risk management in the Philippines. Eur. J. Agron. 109:125911.

Impact of IoT/AI in Agriculture

Dr. SATHISHKUMAR V E

Hanyang University, Seoul, Republic of Korea

Increasing population and decreasing agricultural land in the past decade created a huge surge for shifting from traditional agricultural practices to artificial intelligent assisted smart farms. Various technologies are employed for adopting smart farming in a safe and sustainable manner. Initially sensor-based systems were developed for monitoring and automation applications. Due to the emergence of Internet of Things (IoT) and Artificial intelligence methods, the sensor applications were upgraded. Sensors were connected using IoT and data from IoT sensors equipped in smart farms are analysed using Data Mining/ Deep learning methods for developing intelligent decision-making systems. Although developments in smart farming were carried out in Industry research level, delivering the high-cost smart farms to common population is a challenging one. Future research should be focussed towards delivering a cost efficient and user efficient smart farms to all famers.

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Education

- Doctor of Philosophy, Department of Information and Communication Engineering, Sunchon National University, Sunchon, Republic of Korea — Aug 2018- Aug 2021
  Thesis: *A Study on Regression accuracy improvement using hybrid feature selection techniques*
  Supervisor: ***Prof Yongyun Cho***
- One Year Korean Language, Inha University, Incheon, South Korea. Passed Korean Language Level (1-4) — Aug 2017-Aug 2018
- Research Associate, VIT University, Vellore, India. Worked with VIT University Research Publications Management. — Aug 2015-Aug 2017
- ME, Biometrics and Cyber Security, PSG College of Technology *First Class with Distinction (CGPA-8.73)* — Aug 2013- May 2015
- B. Tech, Information Technology, Madras Institute of Technology Campus, Anna University First Class (CGPA-7.3) *First Class (CGPA-7.3)* — Aug 2009-Jun 2013

Research and Teaching Positions

- Assistant Professor, Department of Computer science and Engineering, Kongu Engineering College, Tamilnadu, India., *Subjects Handled: Artificial Intelligence, Data Mining, C Programming* — Dec 2020- Nov 2021
- Smart Farming, Cryptography, Biometric Technologies, Data Mining, Big Data Analytics

Selected Refereed Journal Articles (last 2 years)

Sathishkumar V E, Changsun Shin, Youngyun Cho, "Efficient energy consumption prediction model for adata analytic-enabled industry building in a smart city", *Building Research & Information,* Vol. 49. no. 1, pp. 127-143, 2021.

Sathishkumar V E, Youngyun Cho, "A rule-based model for Seoul Bike sharing demand prediction using Weather data", *European Journal of Remote Sensing,* Vol. 52, no. 1, pp. 166-183, 2020.

Sathishkumar V E, Jangwoo Park, Youngyun Cho, "Seoul Bike Trip duration prediction using data miningtechniques", *IET Intelligent Transport Systems,* Vol. 14, no. 11, pp. 1465-1474, 2020.

Sathishkumar V E, Jangwoo Park, Youngyun Cho, "Using data mining techniques for bike sharing de mandprediction in Metropolitan city", *Computer Communications,* Vol. 153, pp. 353-366, 2020.

Sathishkumar V E, Yongyun Cho, "Season wise bike sharing demand analysis using random forest algorithm", *Computational Intelligence,* pp. 1-26, 2020.

Sathishkumar V E, Myeongbae Lee, Jonghyun Lim, Yubin Kim, Changsun Shin, Jangwoo Park, Yon gyunCho, "An Energy Consumption Prediction Model for Smart Factory using Data Mining Algorithms" *KIPS Transactions on Software and Data Engineering*, Vol. 9, no. 5, pp. 153-160, 2020.

Sathishkumar V E, Jonghyun Lim, Myeongbae Lee, Yongyun Cho, Jangwoo Park, Changsun Shin, a nd Yongyun Cho, "Industry Energy Consumption Prediction Using Data Mining Techniques*", Internati onal Journal of Energy Information and Communications*, Vol. 11, no. 1, pp. 7-14, 2020.

Research progress and development of concept of the dynamic nutrition with automatic feeding system in smart farming

Dr. Xin WU

Tianjin Institute of Industrial Biotechnology, CAS (Chinese Academy of Sciences)

Biological and chemical reactions are carrying out continuously and following certain rules at all times in organisms. Nutrients maintain the material composition and physiology of the indispensable elements of life forms, but also the material basis of life activities. Life on earth has evolved under the daily rhythm of light and dark. Consequently, most creatures experience a daily rhythm in food availability. With the gradual deepening understanding on dynamic changes of animal nutrition and the knowledge of assessment on biological valence of nutrients, the researchers find that nutrients digestion, absorption and utilization shows significant differences on spatial distribution in the body. Moreover, the physiological activities such as digestion and metabolism of nutrient present cyclical variety. Compared to daytime, organs' digestive function and basal metabolism decline in the nighttime in monogastric animals such as pigs. Metabolism of nutrients is a complex and unified physical activity so that nutrient levels remain relatively homeostasis. Feed ingredients nutrition requirements for the biological potency of extremely accurate assessment of real-time dynamic progress, and the nutrient feelings, digestion, absorption and utilization has certain periodicity. Animal organisms' nutritional needs are real-time dynamic changing. Feed ingredients nutrition requirements for the biological potency of extremely accurate assessment of real-time dynamic progress, and the body of nutrient digestion, absorption and utilization has certain periodicity. We briefly outline the concept, scientific worth, theoretical foundation and practice of dynamic nutrition in animal nutrition as well as human nutrition firstly, to provide the theoretical basis and guidance for research and application of dynamic nutrition in monogastric animals. Feeding standards provide a based support for development of feed industry with automatic feeding system in smart farming.

Keywords: animal nutrition; dynamic nutrition; metabolism; circadian rhythm; Automatic feeding system

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Education

- Postdoc, Nanchang University, Nanchang, China 2010.10-2013.05
- Doctor Degree of Ecology, Institute of Subtropical Agriculture, the Chinese Academy of Sciences, Changsha, China 2005.09-2010.07
- Graduate University of Chinese Academy of Sciences, Beijing, China 2005.09-2006.07

Research and Teaching Positions

- Full professor, Tianjin Institute of Industrial Biotechnology, Chinese Academy of Sciences, Changsha, China; 2021.01-current
- Visiting scholar, Erasmus MC, Erasmus University Rotterdam, The Netherlands 2020.01-04
- Vice president, Institute of Biological Resources, Jiangxi Academy of Sciences, Nanchang, China 2019.01-current
- Full professor, Institute of Subtropical Agriculture Chinese Academy of Sciences, Changsha, China; 2018.12-,current
- Associate professor, Animal Nutrition and Health Center Institute of Subtropical Agriculture Chinese Academy of Sciences, Changsha, China; 2012.11–2018.12
- Visiting scholar, INRA, AgroParisTech, Paris, France 2013.05-2014.05
- Assistant professor, Institute of Subtropical Agriculture Chinese Academy of Sciences, Changsha, China; 2010.07-2012.11

Selected Refereed Journal Articles (last 5 years)

1. Chunyan Xie, Yumei Zhang, Kaimin Niu, Xiaoxiao Liang, Haihua Wang, Junwei Shan, Xin Wu*. Enteromorpha polysaccharide-zinc replacing prophylactic antibiotics contributes to improving gut health of weaned piglets. Animal Nutrition, 2021, 7(3): 641-649.
2. Lumin Gao, Chun-yan Xie, Xiao-xiao Liang, Zhi-hong Li, Biao Li, Xin Wu*, Yu-long Yin. Maternal yeast-based nucleotides supplementation modifies intestinal barrier function and immune response of neonatal pigs. Animal Nutrition, 2021, 7(1): 84-93.
3. Chunyan Xie, Xinyi Duan, Cimin Long, Xin Wu*. Hepatic lipid metabolism is affected by daily 3-meal pattern with varying dietary crude protein with a pig model. Animal nutrition, 2020, 6: 16-23.
4. Xin Wu, Chunyan Xie, Cimin Long, Jun Li, Xihong Zhou, Zhiyong Fan, Francois Blachier, Yulong Yin*. Effects of a daily 3-meal pattern with different dietary protein contents on pig growth performance, carcass and muscle quality traits. Journal of the Science of Food and Agriculture, 2018, 98(1): 415–421.
5. Yin Jie, Yuying Li, Hui Han, Shuai Chen, Jing Gao, Gang Liu, Xin Wu*, Jinping Deng, Xingguo Huang, Rejun Fang, Tiejun Li*, Russel J. Reiter, Guoqiang Zhu, Wenkai Ren*, Yulong Yin. Melatonin reprogramming of gut microbiota improves lipid dysmetabolism in high fat diet-fed mice. Journal of Pineal Research, 2018, 65(4):e12524. Technologies. 10(2), (2019)

Smart farming challenges and confrontation

Dr. Mohammed Farouk

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Many factors led to innovate the farming technologies and to continue the agricultural development systems worldwide. The animal production sector represents a crucial pillar to achieve agricultural development and to attain human demands from animal products. Although there are advancement aspects in the smart animal farming technologies such as the Internet of Things (IoT), and Information and Communication Technology (ICT), smart animal farming should attain some criteria to be involved effectively in an applicable form. For instance, smart animal farming should concur with many factors including the main principles of animal welfare, the economical benefits, sustainable development, and the accuracy of the collected data. Furthermore, the permeability to take some biological samples stills limited to conducting scientific research. In aquaculture farms (such as fish or shrimp smart farming), Biofloc processing system and the Recirculating Aquaculture Systems were developed to monitor the water quality and the individual larvae well-being. While controlling the water quality needs additional research efforts. This review aims to highlight the most recent applications of smart farming technologies and various applications of the animal production sector. Furthermore, it uncovers the most related points to smart animal farming that needs further investigation.

Curriculum Vitae – Dr. Mohammed Farouk

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Education

- Post Doctorate in husbandry, Jilin Agricultural University, Changchun City, Chin 2018
- PhD in Animal Husbandry, Faculty of Agriculture, Al-Azhar University 2011
- MSc in Animal Husbandry, Faculty of Agriculture, Al-Azhar University 2007
- BSc in Animal Production, Faculty of Agriculture, Al-Azhar University 2001

Research and Teaching Positions

- Associate Professor, Animal Production, July-2018-current
  Faculty of Agriculture, Al-Azhar University
- Post Doc Fellow, School of Animal Science and Biotechnology, April 2016 – April 2018
  Jilin Agricultural University, Changchun City, China
- Assistant Professor, Department of Animal Production, September-2011- July 2018
  Faculty of Agriculture, Al-Azhar University, Cairo, Egypt
- Senior Teaching Assistant , Department of Animal Production, May-2007-September 2011
  Faculty of Agriculture, Al-Azhar University
- Teaching Assistant , Department of Animal Production, May-2003-May 2007
  Faculty of Agriculture, Al-Azhar University
- Assistant Researcher, National Institute of Oceanography and Fishery, March-2002-May 2003
  Alexandria, Egypt

Selected Refereed Journal Articles (last 5 years)

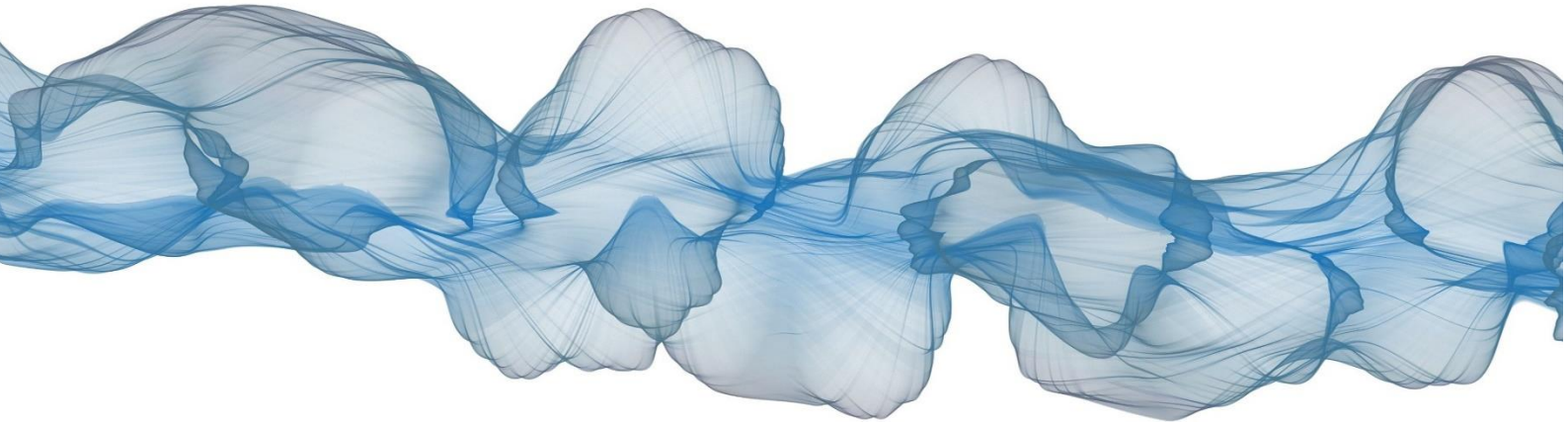
1. Eldawy, M.H., Lashen, M.E., Badr, H.M., **Farouk, M.H**., 2021. Milk production potential and reproductive performance of Egyptian buffalo cows. Tropical Animal Health and Production. 53 (2), 282
2. Pan, L., Liu, Y., Lan, H., Bao, N., Zhao, Y., Sun, H., Qin, G., **Farouk, M.H.**, 2021. Biological mechanisms induced by soybean agglutinin using an intestinal cell model of monogastric animals. Frontiers in Veterinary Science. 8, 639792.
3. Zhao, Y., Naren, G., Qiang, J., Qin, G., Bao, N., **Farouk, M.H.**, 2021. Identification of allergic epitopesof soybean β-conglycinin in different animal species. Frontiers in Veterinary Science. 7, 599546.
4. Pan, L., Zhao, Y., **Farouk, M.H.**, Bao, N., Wang, T., Qin G., 2018. Integrins were involved in soybean agglutinin induced cell apoptosis in IPEC-J2. International Journal of Molecular Sciences. 19 (2),

ABSTRACT

Session 2 :

STUDENT SHORT TOLK

& INVITED LECTURES



Smart Swine Farm at Sunchon National University: A practical approach

Md Ammar Dilawar

Sunchon National University

Smart swine farming aims to achieve more efficient, sustainable and productive farm operations based on the effective use of Artificial Intelligence (AI), IoT (Internet of Things), and information and communication technology (ICT). The individual animal analysis and monitoring has a greatest potential and known as precision livestock farming (PLF). By using PLF sensors and devices, key performance indicators of swine production, health and welfare are continuously and automatically measured. By keeping in view the need of smart farming in livestock sector, a smart swine farm project is initiated at Sunchon National University. Smart ear tags will be used to monitor the pig health, body temperature and heart rate of pigs. This will help to detect early onset of diseases and farmers can take precautionary measures in advance. Infrared red cameras are used for checking the temperature of vulva and anus for the detection of sows in heat and successful insemination. The 3d Kinect cameras will be used to estimate the body weight of pigs using deep learning techniques. Furthermore, energy shortage and the release of greenhouse gases from the livestock farms is a crucial problem throughout the world. Therefore, environment friendly renewable energy sources like geothermal heat pump, air heat pump and solar energy is using as the swine farm. The implementation of smart techniques at livestock farms is a need of time and it is necessary for the sustainable livestock production, animal health and welfare.

Keywords: Smart swine farming, smart ear tags, Artificial Intelligence, sustainability

Curriculum Vitae – Muhammad Ammar Dilawar

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Education

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- Doctor of veterinary medicine (DVM), Arid Agriculture University, Pakistan, 3.5/4

Research and Teaching Positions

- Poultry Nutrition, Smart Farming, Meat Quality, Renewable Energy

Selected Refereed Journal Articles (last 5 years)

1. Dilawar, M. A., Saturno, J. F. L., Mun, H. S., Kim, D. H., Jeong, M. G., & Yang, C. J.(2019). Influence two plant extracts on broiler performance, oxidative stability ofmeat and odorous gas emissions fromexcreta. Annals of Animal Science, 19(4), 1099-1113.

2.Dilawar, M. A., Mun, H. S., Rathnayake, D., Yang, E. J., Seo, Y. S., Park, H. S., &Yang, C. J. (2021). Egg Quality Parameters, Production Performance and Immunity ofLaying Hens Supplemented with Plant Extracts. *Animals*, *11*(4), 975.

3. Mun, H. S., Dilawar, M. A., Jeong, M. G., Rathnayake, D., Won, J. S., Park, K. W., ...& Yang, C. J. (2020).Effect of a Heating System Using a Ground Source GeothermalHeat Pump on Production Performance, Energy-Saving and Housing Environment of Pigs. *Animals*, *10*(11), 2075.

4. Mun, H. S., Dilawar, M. A., Rathnayake, D., Chung, I. B., Kim, C. D., Ryu, S. B., ... &Yang, C. J. (2021). Effect of a Geothermal Heat Pump in Cooling Mode on theHousing Environment and Swine Productivity Traits. *Applied Sciences*, *11*(22), 10778.

Patatin-related phospholipase *pPLAIIIγ* functions on anisotropic cell growth and xylem lignification when overexpressed

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Patatin-related phospholipase A (pPLAs) are major lipid acyl hydrolases and play important roles in various plant developmental and physiological processes. pPLAs are classified into three groups: pPLAI, pPLAII, and pPLAIII. Among the four members of pPLAIIIs (α, β, γ, δ), we focused on the characterization of *pPLAIIIγ* in Arabidopsis. The overexpression of *pPLAIIIγ* displayed distinct morphological growth pattern, in which the anisotropic cell expansion is disrupted. This phenotype is consistent with the general phenotype induced by *pPLAIIIs* overexpression. Microtubules has long been highlighted for their functional roles in plant cell expansion. Only a phospholipase D (PLD) family of gene, PLDδ, was reported for their binding property with microtubules. Previous report that *PLDs* gene expression was modulated by *pPLAIII* gene, supported the possible regulation of PLDs by *pPLAIII* genes. In accordance with these results, transcriptional changes of *PLD* genes and microtubule-associated gene by overexpression of *pPLAIIIγ* was first analyzed in this study. All things considered, this study suggests that the longitudinally reduced cell expansions observed in *pPLAIIIs* overexpression is driven by the interaction with microtubule via transcriptional modulation of *PLD* and *MAP* genes. Also, the overexpression of *pPLAIIIγ* show reduced lignification in stem. Transcript levels of lignin biosynthesis-related genes as well as lignin-specific transcription factors were decreased. Peroxidase-mediated oxidation of monolignols occurs in the final stage of lignin polymerization. Two secondary cell wall-specific peroxidases were downregulated following lowered H_2O_2 level when *pPLAIIIγ* was overexpressed, which suggests a functional role of *pPLAIIIγ* in the reduction of lignification by peroxidases alteration when overexpressed in Arabidopsis.

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Education

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- B.S in Applied plant science, Chonnam National University (2017-2021)

Selected Refereed Journal Articles (last 5 years)

1. Jang JH, Seo HS, Lee OR (2021). The reduced longitudinal growth induced by overexpression of pPLAIIIγ is regulated by genes encoding microtubule-associated proteins. ***Plants***
2. Jang JH, Seo HS, Lee OR (2022). Overexpression of pPLAIIIγ in Arabidopsis reduced xylem lignification of stem by regulating peroxidases.

ABSTRACT

Interspecific hybridization for introgressing Clubroot resistance and Beta-carotene in *Brassica oleracea*

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Multiple R-gene is required to achieve strong resistance against clubroot, a disease caused by *Plasmodiophora brassicae* in Cabbage (*Brassica oleracea*, 2n=18, CC). Most of the R-genes were identified in Chinese cabbage (*B. rapa*, 2n=20, AA), which could be transferred to cabbage via interspecific hybridization. We present a breeding scheme to transfer six major *CR*-loci namely, *Crr1*, *Crr2*, *Crr3*, *CRa*, *CRb* and *CRc* from Chinese cabbage line, LCR36 to cabbage line, Plimio. Approximately, 48% of the interspecific hybrid embryos were rescued, of which chromosomes of 48.15% colchiploid plants were successfully doubled. The hybridity of the colchiploid interspecific hybrids were confirmed by diagnostic sub-genome specific Conserved Ortholog Set (COS) markers, ploidy level, pollen fertility and meiotic chromosome number analyses. Backcross generations are characterized by very low seed set (0.57-1.33% success rate) in backcrossed generations (using Plimio as the recurrent parent). Marker assisted selection using the six *CR*-loci specific markers identified the resistant plants in F_1 and backcross generations.

β-carotene (Orange color) is one of the secondary metabolites and water-soluble pigments that are widely distributed in plants, occurring in the leaves, petals, sepals, and fruits to orange/yellow coloration. In contrast, new reports suggested the presence of orange (perhaps β-carotene) coloration in the inner leaves of Chinese cabbage, but cabbage lacks this color. In this study, we carried out a wide range of interspecies crossing for introgressing orange color responsive *Or* mutant gene from Chinese cabbage into cabbage. Cytological and flow cytometry results showed successful production of interspecies colchiploids. Backcross generations are characterized by low seed sed (0.85-1.93% success rate) in backcrossed generations (using cabbage line as the recurrent parent). Marker assisted selection (MAS) using *OR* mutant specific markers identified the *Or* mutant gene plants in F_1 and backcross generation. In the BC_3F_1 progenies of the interspecies hybrids showed wide range of variation at molecular and morphological levels. We successfully produced plants with desired orange inner leaves in cabbage.

The success so far is the first report of successful introgression of multiple R-genes and *Or* mutant gene via interspecific hybridization in the initial backcrossed generation, indicating that an elite cabbage line having strong resistance to clubroot and orange inner-leaves materials can be produced upon the completion of the breeding scheme.

Keywords: *Brassica*, Clubroot, R-gene, *Or* mutant gene, Beta-carotene, Interspecific hybridization, Embryo rescue.

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Education

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- Graduated master degree Major in Horticulture, Sunchon National University, South Korea. 2019
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- Study at Peak Live Secondary school. 2004-2007
- Computer Skills : Microsoft Word and Excel, PowerPoint, Internet and Email
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Work Experience

Student Volunteered in Help Our Homeland Nov 2010 – Mar 2011

Student Volunteered in workshop Sep 05 – Sep 20, 2011

"Self Preparation for Success after High School" help prepare workshop

Student Volunteered in workshop May 10 – 8 Jun,2011

"Career Opportunity and Working Environment of Rural Development Profession" at Royal University of Agriculture.

Oversea training course on "Field Work in Rural Area" 20th -24nd November 2012

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Adoption and diffusion of agriculture technology in Cambodia April to June, 2013

Cambodia (RUA, Michigan State University) in Pailin, Kompong cham and Kompot province.

Volunteered in Royal University of Agriculture (Mushroom and Hydroponic farm). 2012 – 2014

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A Machine Learning-Based Prediction Model for Smart Farms

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Energy usage is one of the most closely related factors affecting many parts of the smart farm, such as plant growth, crop production, device automation, and energy supply. Recently, to use energy efficiently and control smart farms' conditions, 4th industrial revolution technologies such as IoT, AI, and big data have been widely used in smart farm environments. Especially, machine learning technologies with big-data analysis have been actively applied as powerful prediction methods to support environmental energy usage in smart farms. This research proposes a machine learning-based prediction model for peak energy use by analyzing energy-related data collected from various ecological variables and growth devices in a smart paprika farm. This research can provide an effective and viable way for smart farm managers or greenhouse farmers who can better manage the problem of agricultural energy economically and environmentally. Therefore, we hope that the recommended machine learning method will help improve the smart farm's energy use or their energy policies in various fields related to agricultural energy. To find out the most prediction model comparative evaluation tests are performed using representative ML algorithms such as Support Vector Regression (SVR) and K-Nearest Neighbors (KNN), random forest (RF), eXtreme Gradient Boosting (XGB) and gradient boosting machine (GBM) with binary regression for a different number of input features. The machine learning performance metrics, including R-squared (R^2), root mean squared error (RMSE) and mean absolute error (MAE), are associated with these two algorithms. It is concluded that the RF-based model is more successful than others in the prediction accuracy of 92%. Our future research will focus on finding the worst and best predicted days using variable-temperature data in the smart farm. Discover the best crop growth using ML algorithm models analysis using the parameters of various data measurement techniques and deep learning with big data.

Keywords: Environmental energy Usage Smart Farm, Machine Learning, Agricultural Big-data

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Research and Teaching Positions

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- **Research interests** : Big Data Analytics, Machine Learning, R- studio programming and python, Data Mining, Mathematics, Matlab.

Education

- **Madres University Chennai**

Jaya College is a co-educational institution situated within the city of Thiruninravur, Chennai. It is affiliated to University of Madras

Degree Name Bachelor degree - Mathamatics Dates attended or expected graduation 2010

- **Sunchon National University South Korea**

Degree Name Master Information and Communication Engineering Dates attended or expected graduation 2016-2018

- **Skills & endorsements**

Microsoft office packages: Excel , Ms Word.

Programming language: R-progreming and python, Mathlab.

Language skill

Tamil : Mother tongue language, English : Second language (Good Listening, Reading, Writing, and Speaking ability), Korean : Third language (Intermediate Level)

Growth Estimate Model using the Fruit Tree Data

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Recently, a smart farm technology is drawing attention as an alternative to the decline of farm labor population problems due to the aging society. Especially, there is an increasing demand for automatic harvesting system that can be commercialized in the market. Pre-harvest crop detection is the most important issue for the harvesting robot system in a real-world environment. In this paper, we proposed a real-time Fruit trees Growth Estimate algorithm by using deep learning and probability models. In general, It is hard to keep track of the same tree instance between successive frames, because the tree growing environment is disturbed by the change of lighting condition and a background clutter without a stochastic approach. Therefore, this work suggests that individual fruit object detection for each frame is conducted by improved module structure model, and the continuous instance tracking between frames is performed by projection module and probability model. and We using CROP (Central Roundish Object Painter), which identifies the object at the center of an RGB image. Primarily CROP works for roundish fruits in various illumination conditions, but surprisingly, it could also deal with images of other organic or inorganic materials, or ones by optical and electron microscopes, although CROP was trained solely by 172 images of fruits. The method involves image segmentation by deep learning, and the architecture of the neural network is a deeper version of the original U-Net. This technique could provide us with a means of automatically collecting statistical data of fruit growth in farms. As an example, we describe our experiment of processing time series photos automatically to collect the data on the size and the position of the target fruit. We have verified the performance of the proposed method, an experiment was shown a good result in real-world test data.

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HONORS AND AWARDS

1. Underwater Location Recognition and Flow Path Control System for Underwater Robots. (Received the Best Paper Award from Spring Conference of the Korean Smart Media Association, May, 2021)
2. Autonomous driving model using reinforcement learning. (Received the Best Paper Award from Fall Conference Korean Multimedia Association, Nov, 2020)

PUBLICATIONS (Since 2020)

Published

1. Kim, J., Huh, J., Jung, S., Sim, C. (2021) A Study on an Enhanced Autonomous Driving Simulation Model Based on Reinforcement Learning Using a Collision Prevention Model. Electronics Vol. 10, No. 18: 2271-2289.

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Guide for Zoom Meeting Attendance

Zoom 설치 및 회의 참가 가이드

“International Conference of the BK21 FOUR on IT-Bio Convergence”

Zoom Meeting (Session 1, Session 2)

January. 25 (Tue), 2022 (07:50 a.m. ~ 05:55 p.m.)

Zoom address

https://us06web.zoom.us/j/3576163864?pwd=VFJRblJ0YnFRNWdoNTBsTFpBam9rZz09

Meeting ID : 357 616 3864

Password : 220125

BK21 FOUR
IT-Bio융합시스템농업교육연구단
제 3회 국제학술대회

・이미 zoom 프로그램이 설치되어 있다면, zoom meeting link (URL)를 클릭해주시면 바로 zoom meeting에 참여할 수 있습니다.
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  Guide of Zoom program setup

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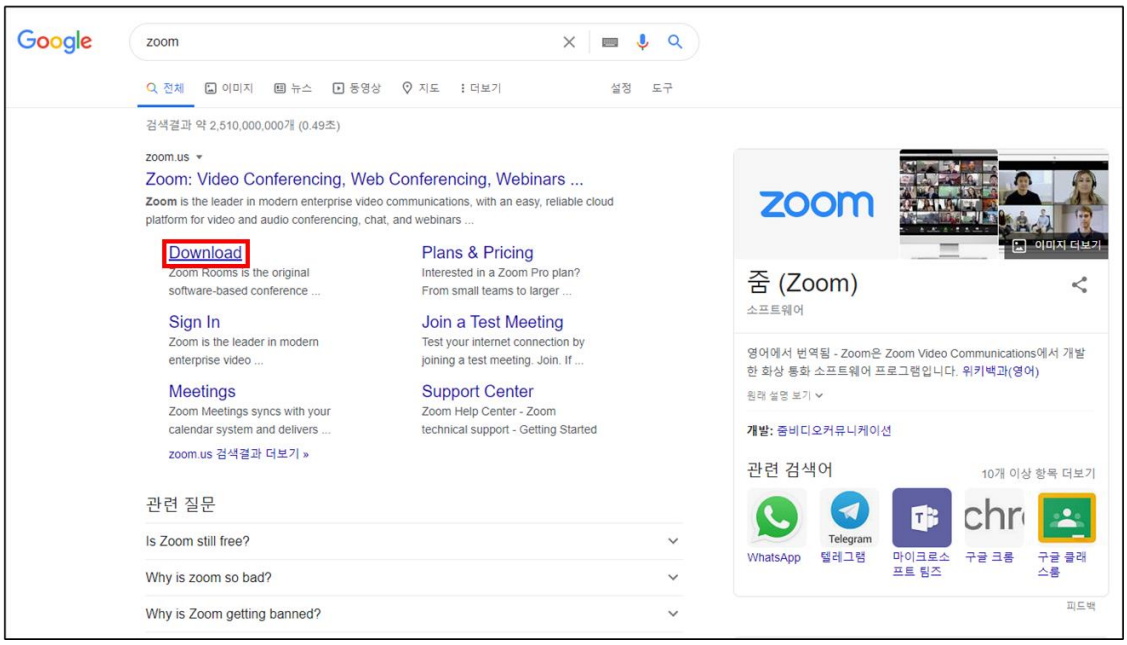
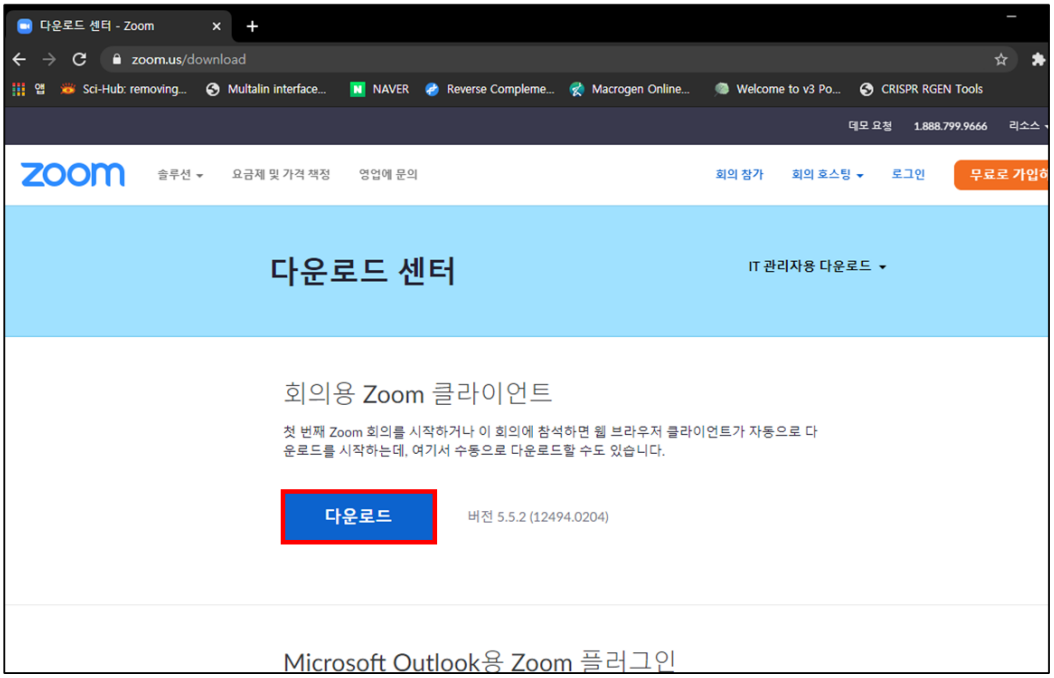
   Search “zoom” in Google > Click the Download button



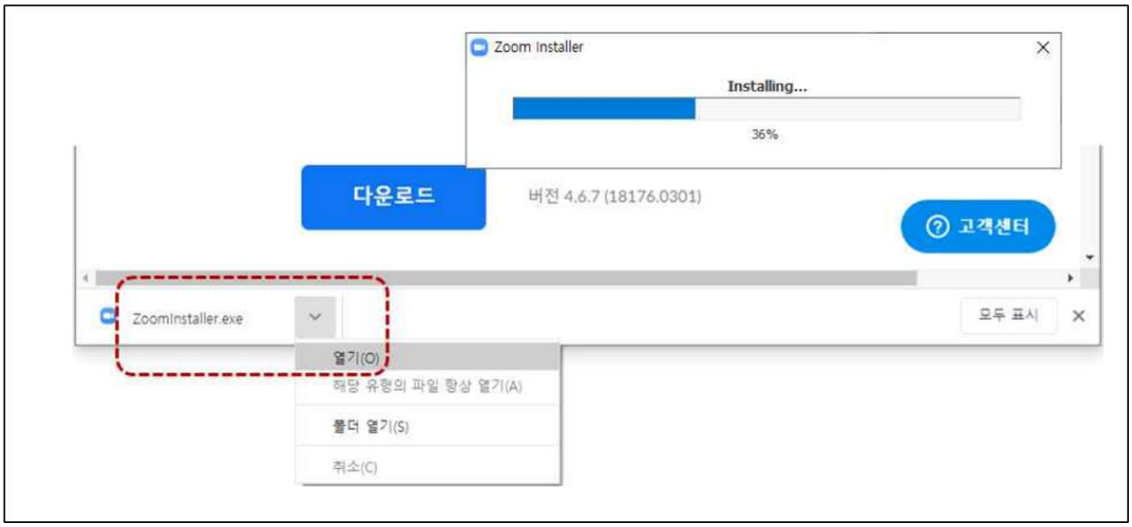
- **Zoom 설치 및 회의 참가 가이드**
  Guide of Zoom program setup

2. "다운로드" 클릭
   Click the download button



- **Zoom 설치 및 회의 참가 가이드**
  Guide of Zoom program setup

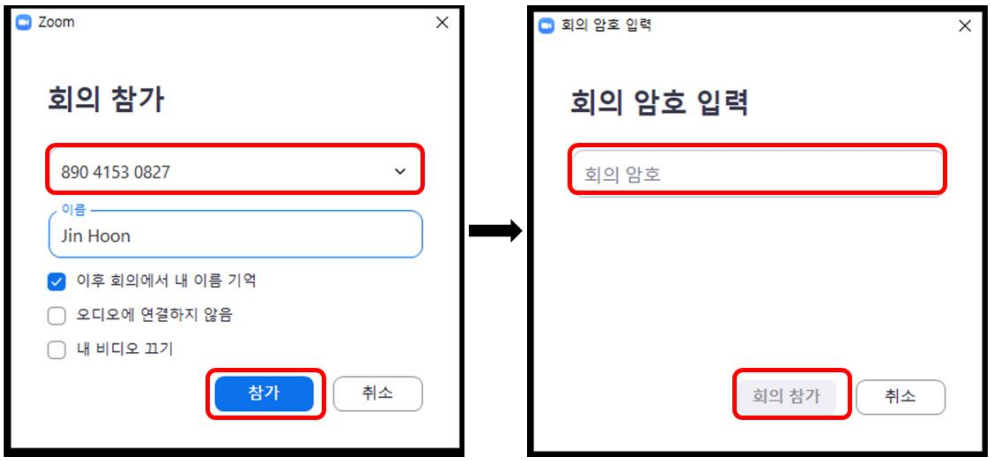
3. Zoom 설치파일 실행 후 설치
   Open the zoom installation file > Install the zoom program



4. Zoom 프로그램 실행 후 '회의참가' 버튼 클릭
   After running zoom program, click the 'participation in meeting' button

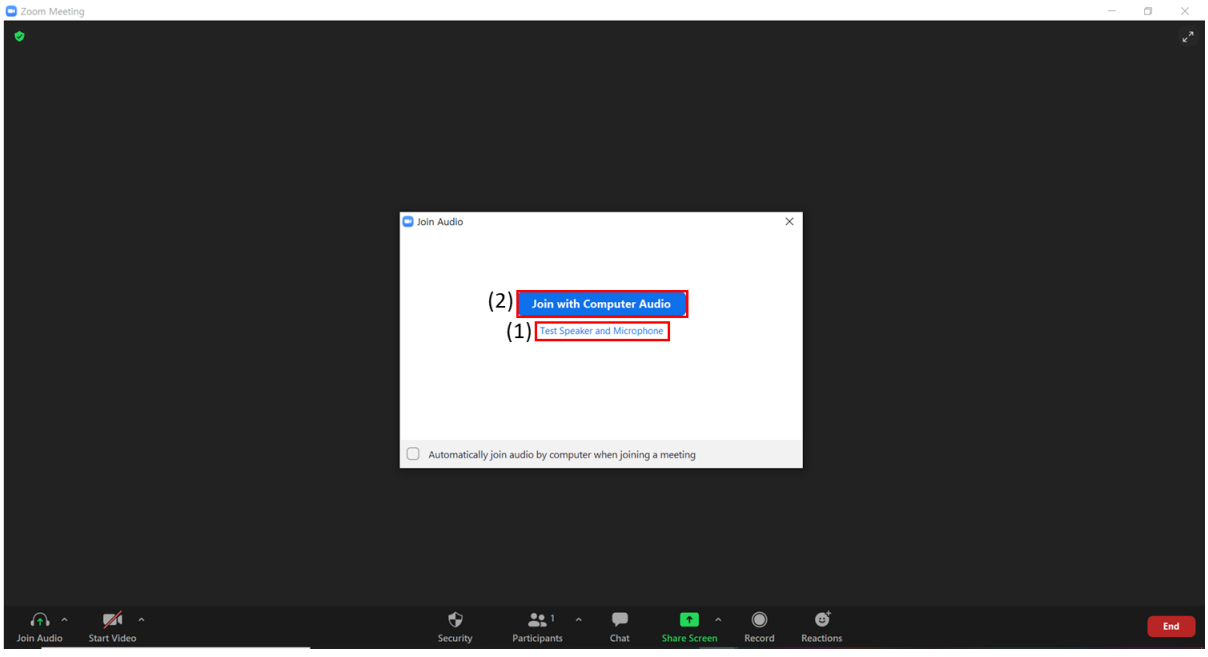
- **Zoom 설치 및 회의 참가 가이드**
  Guide of Zoom program setup

5. Meeting ID를 입력하고 '참가' 버튼을 클릭 > 회의 암호 입력 후 '회의 참가' 클릭
   Enter the Meeting ID and click the'Join' button
   > Enter the meeting password and click'Join the Meeting'



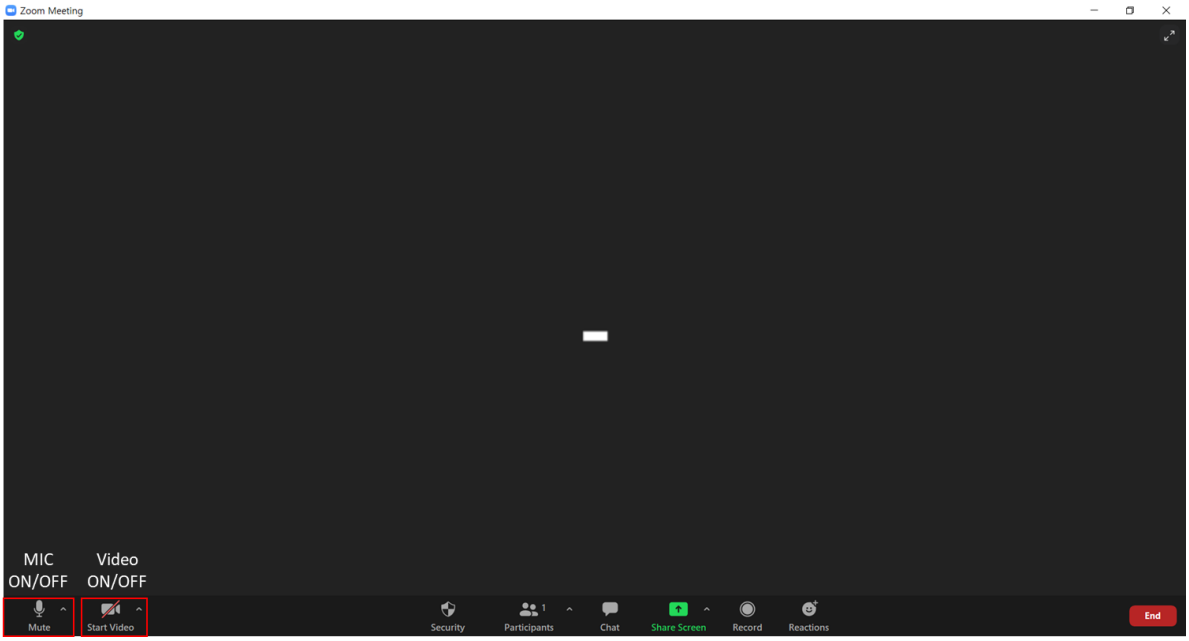
- **Zoom 설치 및 회의 참가 가이드**
  Guide of Zoom program setup

6. (1) 스피커, 마이크 테스트 버튼을 눌러서 작동 유무를 확인한다
   Before join the meeting, Please check the speaker and microphone (click the **'Test Speaker and Microphone'** button
   (2) 컴퓨터 오디오로 참가 버튼을 누르면 회의 화면을 볼 수 있다.
   Click the 'Join with computer audio' button > You can see the meeting



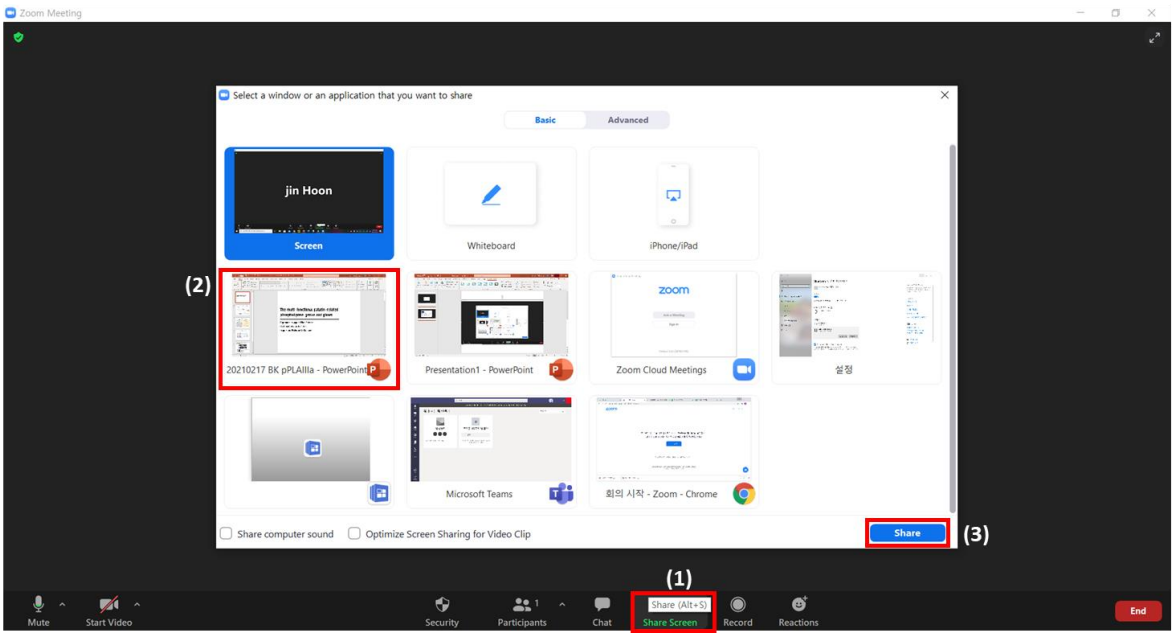
- **Zoom 설치 및 회의 참가 가이드**
  Guide of Zoom program setup

7. (1) 미팅에 참여한 뒤, 음소거 버튼으로 마이크를 ON/OFF 할 수 있다. **(필요시에만 마이크를 켜 주시길 바랍니다.)**
   After joining the meeting, you can turn the microphone ON/OFF with the mute button. **(Please turn on the microphone only when necessary.)**
   (2) 비디오 시작 버튼을 클릭하면 웹캠 (얼굴 화면)을 보여줄 수 있습니다. **(가급적 비디오를 켜 주시길 바랍니다.)**
   Click the **'start video button'**, you can show your webcam (face screen) **(We recommend turning on the video.)**



- **Zoom 설치 및 회의 참가 가이드**
  Guide of Zoom program setup
  발표자 화면공유 (Speaker's screen sharing)

8. (1) 화면 공유 버튼을 클릭 > (2) 공유할 창 (ex, ppt 파일)을 클릭 > (3) '공유' 버튼을 클릭
   (1) Click the **'Share Screen'** button > (2) Click the screen you want to share. > (3) Click the **'Share'** button



- **Zoom 설치 및 회의 참가 가이드**
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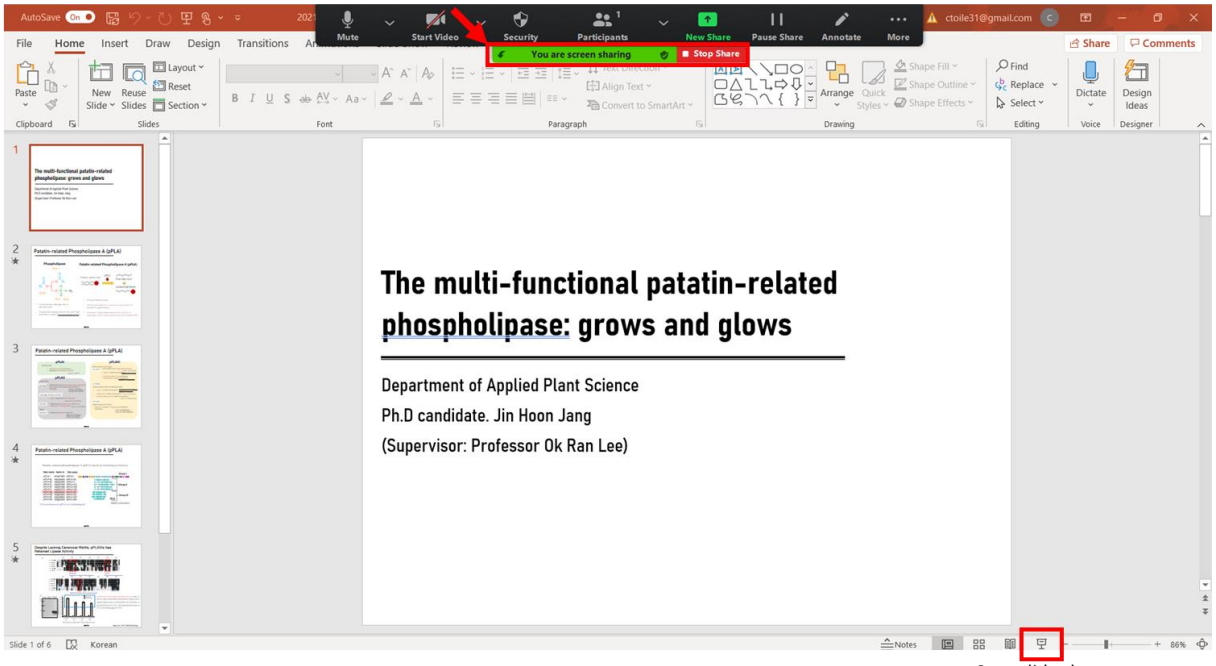
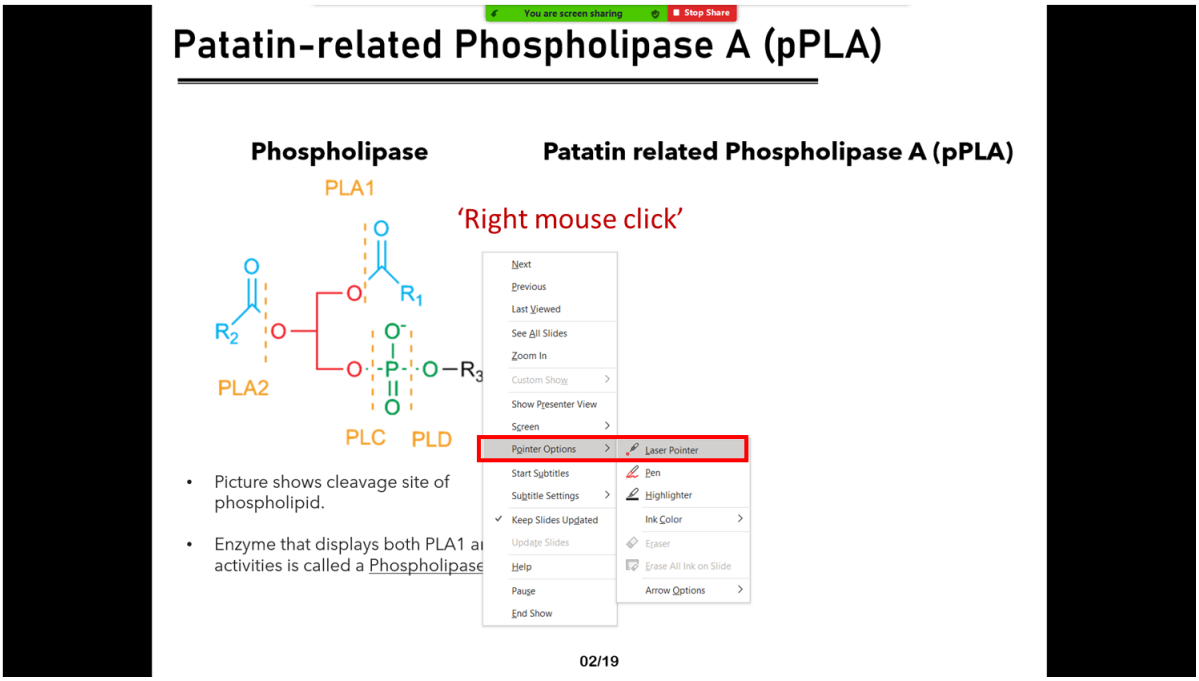
9. 화면공유가 되었다면, **화면공유중 이라는 안내문구**를 확인할 수 있다. > 슬라이드 쇼 버튼을 누르고 발표 시작
   If the screen is shared, you can check the message that **'You are screen sharing'** > Start to presentation

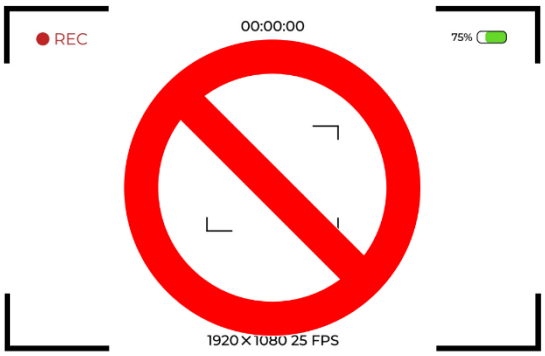


Start slide show

- **Zoom 설치 및 회의 참가 가이드**
  Guide of Zoom program setup
  발표자 화면공유 (Speaker's screen sharing)

10. 파워포인트 발표 (슬라이드쇼) 중 마우스 우클릭 > 포인터 기능 사용가능
    Right mouse click on ppt slide > You can use the pointer



 'https://kor.pngtree.com/so/음소거'	 'https://kor.pngtree.com/so/카메라
발표자를 제외한 모든 참가자들 음소거 해주세요. **Please press the mute button.**	실시간 온라인 강의(ZOOM) 시, 별도의 기기를 이용하여 녹화하는 행위 금지 (저작권 및 초상권 침해 가능성) **Do not recording**

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"International Conference on IT-Bio Convergence"

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