2012 International Award for Young Agricultural Researchers

Antimildew compounds from wood rot fungi and sequence characterized amplified region markers associated with downy mildew disease resistance in pearl millet

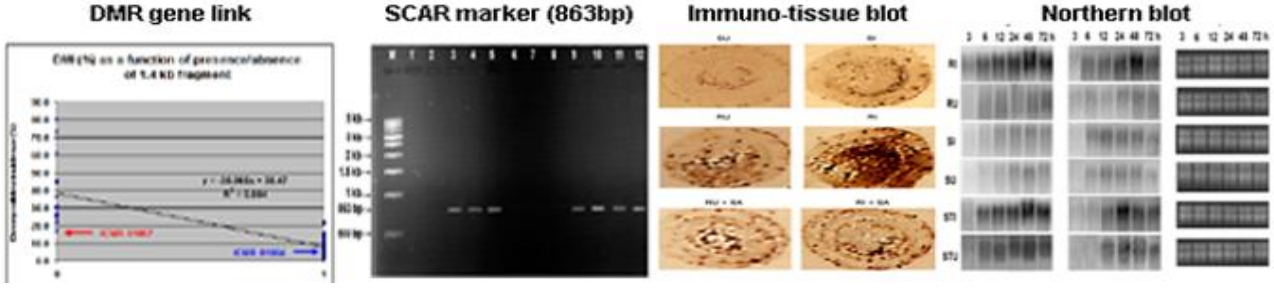
Dr. Sudisha Jogaiah
Post-doctoral researcher
University of Mysore, Republic of India

Reason for Award

Pearl millet [*Pennisetum glaucum* (L.) R. Br.] is a vital crop that has resistance to hot and arid environments and has been cultivated since the prehistoric age in India and Africa. The Tift 23 A1 line, which has an average yield two times larger than traditional varieties, was developed and released in India, however, the infection of pearl millet by downy mildew has become a serious problem. As a countermeasure against downy mildew, the award winner isolated a novel anti-mildew compound from fungus (*Ganoderma applanatum*), and succeeded in developing a DNA marker that selects downy mildew disease resistance in pearl millet. He has also been studying downy mildew control in pearl millet using plant immune response. A practical measure for downy mildew control is expected to be developed in the near future, and contribute to agriculture in the harsh environment of semi-arid areas.

Outline of Research Achievements

Pearl millet [*Pennisetum glaucum* (L.) R. Br.] is one of the vital crops that feed poor people inhabiting in semi-arid and arid tropics of Asia and Africa and provides basic sustainable living. Downy mildew, caused by *Sclerospora graminicola* (Sacc.) Schroet, is the most serious hazard in realizing the increased production of pearl millet. Dr. Sudisha Jogaiah worked in one of the leading research laboratories headed by Prof. H. Shekar Shetty on cereal downy mildew research in India. His research was mainly focused on the cereal crop pearl millet and downy mildew host pathogen interaction. The salient outcome of his research work has led to the identification of newer chemicals, biotic and abiotic inducers, novel anti-mildew compound. These has got considerable agrochemical potential, environmentally safe, economically feasible and exploitation of these agents will pave the ways to pearl millet downy mildew disease management. He developed SCAR marker linked to *Sclerospora graminicola* isolates which will track the presence of pathotype-1 and genetic analysis of isolates in existing populations of downy mildews in pearl millet growing regions of the world. Also, cloned SCAR markers associated/linked to downy mildew disease resistance can be exploited in a wide range of genetic backgrounds, which can be utilized for genetic improvement for resistance to disease. This is low-cost, high-throughput alternative to conventional phenotypic screening in pearl millet breeding for exploiting resistant markers. Dr. Sudisha also contributed for the development of host resistance and identifying the newly emergent phytopathogens of India. Currently, his research is focused on exploring beneficial microorganisms on tomato for inducing resistance against bacterial and Fusarium wilt diseases under the supervision of Prof. Shin-ichi Ito, Laboratory of Molecular Plant Pathology, Faculty of Agriculture, Yamaguchi University, Japan.



Main Publications:

(1) Murali, M., **Sudisha**, **J**., et al. 2012. Rhizosphere fungus *Penicilliumchrysogenum* promotes growth and induces defense-related genes and downy mildew disease resistance in pearl millet. Plant Biology. DOI: 10.1111/j.1438-8677.2012.00617.x.

(2) **Sudisha**, **J.,** et al.2011. Elicitation of resistance and defense related enzymes by raw cow milk and amino acids in pearl millet against downy mildew disease caused by *Sclerosporagraminicola*. Crop Prot. 30 (7): 794-801.

(3) **Sudisha**, **J**., et al. 2009. Molecular characterization of *Sclerosporagraminicola*, theincitant of pearl millet downy mildew revealed by ISSR markers. J. Phytopath. 157: 748-755.

2012International Award for Young Agricultural Researchers

Improvement of reproductive biotechnology techniques for livestock and endangered species

Ms. Kanokwan Srirattana
Post graduate researcher
Suranaree University of Technology, Kingdom of Thailand

Reason for Award

The winner is one of an important member of the first Thai researcher team to succeed in cloning cattles from somatic cells.She is also a leader in somatic cell cloning technology. She has been applying somatic cell cloning technology not only to the breeding of Thai native cattle and other domestic animals, but also to the protection of endangered species such as gaur and marbled cat. Moreover, by examining bovine and buffalo embryos cloned from somatic cells using molecular biological methods, she obtains new findings on mitochondrial DNA distribution and gene expression. Her works and findings are expected to contribute not only to livestock farming and the breeding of domestic animals, but also to the protection of endangered species and the conservation of biodiversity.

Outline of Research Achievements

Since Dolly, the first cloned sheep was born, numerous cloned animals have been produced for commercial, medical and research purposes. Ms. Srirattana and team have successfully produced several domestic cloned animals, namely four cloned calves from a deceased dairy bull, two cloned calves from native Thai cattle, two cloned goats and two cloned kittens. For endangered species, a cloned gaur calf was successfully produced. They also worked on leopard and marbled cat cloning. To improve the cloning efficiency, suitable donor cells and chemical treatments were performed. Fetal fibroblasts, ear fibroblasts, granulosa cells and cumulus cells have similar potentials to support the development of bovine and buffalo cloned embryos to blastocyst stage with the same quality. Moreover, Trichostatin A treatment could improve the development of bovine cloned embryos to the blastocyst stage resulting in healthy calves offspring but no beneficial effect was found on gaur-bovine cloned embryos. Ms. Srirattana also worked on buffalo oocyte vitrification and mitochondrial DNA analysis of buffalo-bovine and gaur-bovine cloned embryos. Work on telomere length of cloned kitten was also observed.

Main Publications:

(1) Full-term development of gaur-bovine interspecies somatic cell nuclear transfer embryos: effect of Trichostatin A treatment. *Cell reprogram.*, 14,248-257 (2012)
(2) Constant transmission of mitochondrial DNA in intergeneric cloned embryos reconstructed from swamp buffalo fibroblasts and bovine ooplasm. *Anim Sci J.*, 82,236-243 (2011)
(3) Effect of donor cell types on developmental potential of cattle (*Bos taurus*) and swamp buffalo (*Bubalus bubalis*) cloned embryos. *J Reprod Dev.*, 56,49-54 (2010)

2012 International Award for Young Agricultural Researchers

Development of technology for quality and functionality improvement of traditional foods, and application of novel emulsifying technology for new processing system

Dr. Lijun Yin
Professor
China Agricultural University, People's Republic of China

Reason for Award

A great deal of knowledge has been accumulated regarding local agricultural products and traditional foods. Efforts to integrate this knowledge and apply it to improvements in food processing, and thereby enhance its value and availability, are especially important in rapidly developing countries, in order to facilitate the development of rural areas through enhanced agricultural markets. In rapidly industrializing China, the winner developed technology to industrialize the production of traditional foods such as tofu, fermented tofu and fermented black soybeans, and adapted this technology for practical use. She also developed a technique to produce functional materials from Shaji (Seabuckthorn [*Hippophaeramnoides*. L]), a local product. Moreover, she developed a stabilization method using nanodispersion of fat-soluble vitamins, by applying a microchannel emulsification technique. Her research results and experience in product promotion are expected to facilitate networking with researchers inside and outside China, and to make a significant contribution to the development of traditional foods in East and Southeast Asia, which have similar food cultures.

Outline of Research Achievements

Emulsification technique and emulsions are widely used in food industry. Particle size and distribution are important parameters that affect emulsion stability, and emulsions with precisely controlled particle size exhibited better stability and delivery properties. Lijun YIN and her colleagues showed that monodispersed oil-in-water (O/W) emulsions with large particles stabilized by proteins using a straight-through microchannel (MC), whose particle sizes were controllable, and whose coefficients of variation were less than 6.5%. These monodispersed emulsions possessed high stability, which were evaluated to be useful for bioreactor, and food or chemical materials.

Functional lipids, such as carotenoids, associated with many health benefits. However, most of these bioactive substances not only are water-insoluble but also possess low stability, impairing their bioavailability and limiting their use in food formulations. She combined emulsification and evaporation to produce the β-carotene nanodispersion with water-solubility. The performance of the selected emulsifiers and their binary combinations not only influenced the mean particle size of the nanodispersions but also the solubility, bioavailability and stability of functional lipid by micronizing the droplets.

She and her group also paid close attention to the potential application of emulsions in food industry. She conducted the research on using new type coagulant with bittern solution as the aqueous of emulsions to improve the quality and yield of traditional firm tofu. She confirmed that emulsified coagulant significantly improved the water content and moisture resistant of tofu by delaying the solidification of soybean protein. In addition, it might increase the yield, make tofu smoother and softer, and cause the gel network more homogenous and compact.

Main Publications:

(4) Li J.L., Qiao Z.H., Tatsumi E., Saito M., Cheng Y.Q. and **Yin L.J.*** A Novel Approach to Improving the Quality of Bittern-Solidified Tofu by W/O Controlled-Release Coagulant. 2: Using the Improved Coagulant in Tofu Processing and Product Evaluation. Food and Bioprocess Technology, 2012. In press

(5) Li J.L., Cheng Y.Q. , Wang P., Zhao W.T., **Yin L.J. ***, Saito M. A novel improvement in whey protein isolate emulsion stability: Generation of an enzymatically cross-linked beet pectin layer using hrseradish peroxidase. Food Hydrocolloids, 2012, 2: 448-455

(6) Wang P., Liu H.J., Mei X.Y., Nakajima M., **Yin L.J.***. Preliminary study into the factors modulating β-carotene micelle formation in dispersions using an in vitro digestion model. Food Hydrocolloids, 2012, 2: 427-433