



JANUARY 2018

## **Native probiotic bacteria boost yield and antioxidants in strawberry fruits in Bangladesh** **AN ENVIRONMENTALLY SAFE BIOTECHNOLOGY TO PRODUCE HIGH QUALITY STRAWBERRY WITH NO SYNTHETIC PESTICIDE**

Researchers from the Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), working with a colleague at the West Virginia University, USA, have discovered two new bacterial species from the roots of chili and rice that increase strawberry yield by 48% with no chemical pesticide use. Strawberries from the plants treated by these natural agents were found to contain 2-3 times higher levels of phenolic secondary metabolites and vitamin C than untreated control. Higher antioxidant activity of these strawberries can play a role in protecting human health from various diseases including cancer.

Strawberry is a newly introduced fruit crop in Bangladesh, which gained considerable interests from both growers and consumers. Resource-poor farmers of the country need an alternate production technology to keep the cost under control as well as minimize risk of health hazard by reducing use of synthetic pesticides. Strawberry is an excellent source of natural antioxidants including carotenoids, vitamins, anthocyanins, phenols, and flavonoids with high capacity of scavenging free radicals. Major phenolic compounds such as flavonoids present in strawberries exhibited high antioxidant and anticancer properties in different studies. Elevated levels of these secondary metabolites should provide better health benefits to the consumers of strawberry. Use of high frequency and doses of synthetic pesticides to protect strawberry plants and fruits from various soilborne and airborne diseases and pests in Bangladesh poses serious threat to the health of consumers. The new biotechnological approach will provide better health benefits and boost production in Bangladesh.

Team leader of this research project for Bangladesh component was Prof. Tofazzal Islam from Department of Biotechnology of BSMRAU who was also the corresponding author of the recently published article in the Nature Publishing Group's journal, *Scientific Reports*, Prof. Tofazzal Islam from Department of Biotechnology of BSMRAU mentioned that the team discovered two novel bacteria by screening 650 native plant probiotic bacteria in their biobank. These two bacteria can now be reliably used as natural biopesticide and/or biostimulants for increasing production of high quality strawberry without using health hazardous chemical pesticides. By genome sequencing, the group identified strains, BChi1 and BRRh-4 as *Bacillus amyloliquefaciens* and *Paraburkholderia fungorum*, respectively. Interestingly, BRRh-4 was also able to reduce 50% N, P, and K fertilizers use in rice production with 20% higher yield, which we recently published in another international journal *Rice Science*."

"We discovered BChi1 and BRRh-4 from the roots of native plants that can be used as renewable bioresources for industrial production of biostimulant and/or biopesticide for increasing strawberry production. Application of these bioresources will improve the health of soil, reduce environmental pollution and release of greenhouse gasses due to the use of synthetic chemicals, and more importantly reduce the cost of strawberry production" Prof. Islam said.

Dr. Mahfuzur Rahman from West Virginia University who was the Principal Investigator of this research project from West Virginia University in the USA said, "strawberry is highly susceptible to various fungal and microbial diseases. High humidity and warmer weather favours disease incidence in Bangladesh. In

addition, disease, can be a problem if same piece of land is used for growing the same crop repeatedly. To protect this new crop from these pests, strawberry farmers in Bangladesh tend to indiscriminately use many synthetic chemicals as a cocktail that are hazardous to human health and environment. As these two bacteria have strong inhibitory activities against strawberry pathogens, these natural renewable resources should be industrialized as biopesticides to replace synthetic chemical pesticides and promote sustainable production of safe and healthy strawberry in Bangladesh.” Due to similar concern, especially with fruit crops that are consumed fresh and raw, scientists all over the world have continued their efforts to discover and commercialize environment-friendly biopesticides to replace chemicals. “As elevated levels of the antioxidant secondary metabolites in strawberry fruits were achieved by the application of two plant probiotic bacteria, large-scale adoption of this technology would provide better health benefits to the consumers.”- said Dr. Rahman. “

The Vice-Chancellor of BSMRAU Prof. Dr. Giashuddin Miah, who was one of the co-authors of the published article, said, “Two plant probiotic bacteria discovered in this research merit further research for commercialization as biostimulants. Large-scale application of these bioresources will not only significantly increase the yield and health benefiting biochemicals in the fruits but also remarkably reduce the cost of production and environmental pollution. BSMRAU has been trying to develop such an ecofriendly biotechnology for a long time and current finding is obviously a breakthrough.”

The research was funded by a USDA Foreign Agriculture Service (FAS) program contract Agr number SR-CR-13-002 and support from the West Virginia University research seed grant and partially funded by the World Bank through a HEQEP CP # 2071 to Department of Biotechnology of BSMRAU.

"Plant probiotic bacteria *Bacillus* and *Paraburkholderia* improve growth, yield, and content of antioxidants in strawberry fruit" by Mosaddiqur Rahman, Abdullah As Sabir, Julakha Akter Mukta, Md. Mohibul Alam Khan, Mohammed Mohi-Ud-Din, Md. Giashuddin Miah, Mahfuzur Rahman, and M. Tofazzal Islam, is published in *Scientific Reports*. <https://www.nature.com/articles/s41598-018-20235-1>

### CONTACTS FOR INTERVIEW:

**Dr Md. Tofazzal Islam**, Professor, Department of Biotechnology, BSMRAU T: +1 304 290 1221 | E: [tofazzalislam@yahoo.com](mailto:tofazzalislam@yahoo.com)

**Dr. Mahfuzur Rahman**, Associate Professor, West Virginia University, Morgantown, WV 26506, Tel. +1 304-293-8838, +88-01762326573 (until February 12, 2018) | E: [mm.rahman@mail.wvu.edu](mailto:mm.rahman@mail.wvu.edu)



Greener strawberry plants with dark red fruits indicating higher contents of antioxidant pigments (e.g., anthocyanins) in beneficial plant probiotic bacteria (BChi1 and BRRh-4) treatments seen in lower panels of the images of the figure published in *Scientific Reports*.