

Chapter 53

Nutrigenomics and Green Technologies: The Flavor of Future

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ABSTRACT

Green technologies can operate in diversified areas, and at the same time, these technologies contribute to produce more healthy and nutritious food. Biotechnology, the greenest tool of green technology, has the potential to increase the agricultural production, as well as to genetically modify food or its nutritional components to support health and to reduce the risk of diet-related diseases. Recent advances in molecular biology coupled with the wealth of information from 'omics technologies' have fostered the emergence of a multidisciplinary field of science 'Nutrigenomics' that tends to unfold the role of nutrition on gene expression. Amalgamation of both green technologies and nutrigenomics will help to solve problems arising due to negative effects of food, nutrition, and environment. The chapter provides an overview of green technology and its impact on nutrition and health through the study of nutrigenomics.

INTRODUCTION

Green Revolution and other technological innovation in the field of agriculture has been the major driving force to increase agricultural productivity to more than three folds between 1960 and 2015. A remarkable change in the process of industrialization and globalization of food and agriculture has been noticed during the same period (FAO, 2017). In the earlier days, the primary aims of agricultural technologies were focused on increasing production and crop productivity. Today the challenges before agriculture are comparatively higher and much more complex. Rapid population growth and increased human activities have resulted in the overexploitation of the environment, and has threatened the ability

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of the agriculture sector to provide food as well as nutrition for the people (Welch et al, 1999). There are increasing concerns that the agricultural production system must be supported by modern technologies that are ecologically sound, eco-friendly and economically viable.

Satisfying increased demands on agriculture with existing farming practices is likely to pose more competition for natural resources and increased use of agrochemicals. This resource intensive farming system have resulted in massive deforestation, soil degradation, nutrient depletion, high levels of greenhouse gas emissions, loss of biodiversity, water scarcity, carbon foot-print, natural resource depletion etc which are considered as major challenges to the sustainability of the world's agriculture. For sustainability there is a need to increase food production while at the same time it is required to decrease the negative impacts of agriculture on land, water, and climate (Foley et al, 2011).

There is requirement of sustainable as well as innovative agriculture systems that protect and enhance the natural resource base, and at the same time increasing productivity (Murgai et al., 2001). A sustainable agricultural system is that where high quality of food is produced without degrading the quality of environment. Indiscriminate use of various agrochemicals such as insecticides, pesticides, weedicides, chemical fertilizers etc. may cause undesirable effects not only to the agricultural ecosystem but also to human health due to their persistent nature. Global warming and rising temperature is also a major detrimental factor for crop yield as well as the nutritional quality of the crop (Leeuwis and Hall, 2010). At higher temperatures plants develop more quickly, leaving less time to accumulate human nutrients such as sugars, fat, and protein (Fedoroff et al, 2010). Similarly, rising CO₂ levels are also predicted to lower the nutritional quality of certain crops, lowering mineral and protein content (Myers et al, 2014). Interestingly research have shown that future increases to atmospheric CO₂ will also impact the nutritional protein content of crops (Medek et al, 2017) as well as minerals such as zinc and iron (Medek et al, 2017; Myers et al, 2014; Myers et al, 2017) Hence, to maintain or improve an individual's nutritional profile, it will remain important to make available additional varieties of nutrient-rich foods. Thus, eco-friendly as well as economically viable technological improvements are needed which apart from curtailing our dependency on chemical based agro products and agricultural fossil fuel, would help address undesirable effects of climate change and the intensification of natural hazards (CEO Council, 2008). In this regard the use of green technology plays a vital role as its having the potential to meet the requirements of sustainable agricultural (Ghadiyali and Manish, 2012. Dwivedi et al 2017).

Green technology: Global collaborative encyclopedia, Wikipedia, defined Green technology as "the application of one or more of environmental science, green chemistry, environmental monitoring and electronic devices to monitor, model and conserve the natural environment and resources, and to curb the negative impacts of human involvement" (<http://en.wikipedia.org>). The Organization for Economic Cooperation and Development (OECD) has defined the term "green growth" as "the pursuit of economic growth and development, while preventing environmental degradation, biodiversity loss and unsustainable natural resource use" (Diretto, 2007).

Green Technology (GT) is eco-friendly technology that reduces environmental damage (OECD, 2010). Various environmental technologies, used for monitoring and assessing environmental pollution, their prevention, control and remediation, are taken in under green technologies to reduce the human impact on the environment and create ways of sustainable development (Acemoglu et al, 2012; Soni, 2015). Green technologies are sustainable technologies which will not create footprint when used for various processes/applications. Green inventions often involve - renewable resources, energy efficiency, recycling, safety and health concerns etc. Green technologies support the use of natural organic resources and avoid production of green gasses and aim to reduce waste, pollution, and use of fossil fuel in agri-

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