Agricultural Productivity Enhancement Using Low Temperature Plasmas

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Globally, 108 million people in 2016 were reported to be facing Crisis food insecurity or worse [1]. This represents a drastic increase compared to 2015 when the figure was almost 80 million. Enhancing agricultural productivity has been the world\'s primary means of assuring that the needs of a growing population don\'t outstrip the ability to supply food. Over the past 50 years, productivity growth in agriculture has allowed food to become more abundant and cheaper by conventional methods. Over the past five decades, the global agricultural output increased, on average, by 2.24 percent per year. In the latest decade (2001-10), global output of total crop and livestock commodities expanded by 2.50 percent per year.

To increase agricultural productivity, we need non-conventional ways to boost agricultural productivity. One of such ways is low temperature plasma, because it provides a lot of reactive oxygen species and reactive nitrogen species [2-18]. Here, we describe advantages of plasma agriculture, namely, advantages of agricultural applications of plasmas. There are three main categories of improvement methods of the agricultural productivity and output: irrigation, fertilization, and crop protection. Atmospheric pressure nonthermal plasmas can contribute such improvements in the three categories by various ways such as sterilization, fertilization, water treatment and purification, soil treatment, seed treatment, storage improvement, insecticide, pre-harvest treatments, post-harvest treatments, because they provide radicals, ions, electrons, light, as well as electric field without appreciable thermal damage and DNA mutation to plants, crops, and fruits. Low temperature plasmas offer novel ways for germination enhancement, growth enhancement, crop yield enhancement, water saving cultivation, crop protection, and so on. We demonstrate several advantages of plasma agriculture.

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