Journal of Plant Genetics and Breeding

Yildiz, J Plant Genet Breed 2017, 1:1

Editorial Open Access

Crop Production for Increasing Population

Mustafa Yildiz

Department of Fidel Crops, Faculty of Agriculture, Ankara University 06110 Ankara, Turkey

***Corresponding author:** Mustafa Yildiz, Department of Fidel Crops, Faculty of Agriculture, Ankara University 06110 Ankara -Turkey, Tel: +090- 596 1611; E-mail: myildiz@ankara.edu.tr

Received date: October 20, 2017; **Accepted date:** October 24, 2017; **Published date:** November 12, 2017

Editorial

Plants comprise the source of life on earth. Ninety percent of the energy and 80% of the protein consumed by humans are of plant origin. Thousands of people die every year in many parts of the world due to hunger and malnutrition. It is necessary to increase crop production so that human beings can feed on a sufficient and balanced diet to sustain their existence on Earth. This can only be achieved by increasing the amount of yield obtained from each unit area of land, since it is not possible to further increase existing cultivating areas.

It is estimated that world population will increase by 1.5% per year to 8 billion in 2020 and 11 billion in 2050 [1]. The area of land covering the Earth is 14 billion hectares. Currently, 10% of this land area is cultivated. Twenty percent of the world's land is covered with pastures, 20% with mountains, 20% with glaciers and 20% with deserts. The remaining 10% of the area has a very shallow soil cover. Given the impossibility of agricultural activities in mountains and glacier-covered areas, there are areas of potential agriculture, such as marshlands, deserts, or areas with insufficient land cover. It is largely impossible to use pastures that cover rugged and very sloping areas as cultivating fields. The conversion of deserts and inadequate land cover into agricultural land requires great investment.

In parallel with increasing population, agricultural areas are being used for other non-agricultural purposes (settlement, road, factory, etc.) or are shrinking rapidly due to erosion, salinization, acidification, intensive agriculture and overgrazing. It is estimated that agricultural land per capita, which is now 0.26 hectares, will decrease to 0.15 hectares by 2050. In addition, the availability of water resources for modern agriculture will become difficult due to increased water consumption and increasing water pollution [1]. It is expected that food requirements in the most populous parts of the world will double by 2025 [1].

The yield in agricultural production declines due to biotic and abiotic stress factors. Chemical methods are commonly used to combat biotic stressors (diseases and pests) that reduce crop production. However, herbicides and insecticides have been shown to cause the emergences of new diseases and pesticides. In addition, unconscious use of fertilizers and chemicals applied in plant production has negatively affected long-term ecological balance. For example, it has been determined that overused nitrogen fertilizers are washed from the soil and pollute drinking water and the seas, while the nitrogen components that are escaping from the gaseous state are adversely affecting the ozone layer, which protects the earth from harmful rays of the sun. It has been understood that certain chemicals, which have permanent effects, accumulate in plants and this negatively affects the health of people and animals fed on those plants. Furthermore, the use of chemicals in agriculture causes an extra financial burden. As a result, it is not possible to increase crop production by using more chemical fertilizers and pesticides in the future. On the one hand, the world population is increasing day by day, on the other hand the limits of agricultural land have been reached, and it is clear that yield increases still need to continue into the future [2].

Developing a resistant or tolerant cultivar against stress factors is the main goal of plant breeding. Highly efficient genotypes are used to increase yield in a unit area of land. It is possible to increase the production to a certain degree by using high-yielding cultivars, fertilizing and applying chemicals where necessary. Significant increases had been achieved in food production by the improvement of high yielded wheat and rice varieties in mid 1960s in the world and this period has been called as "Green Revolution". However, current food production is insufficient against rapidly increasing world population. Development of new cultivars resistant to biotic and abiotic stress factors by using plant breeding (classical and modern) methods is a difficult task, because the resistance to these stress factors is caused by more than one gene (additive gene effect). Of course, the importance of plant breeding cannot be ignored. However, the development of environmentally friendly new methods to enhance crop production is extremely important.

In the study conducted by [3], a new production method has been developed and yields of seed and crude oil have been increased significantly in sunflower by stimulating plants physiologically via defoliation of a certain number of leaves forming the surface for photosynthesis. Three oil type sunflower cultivars were used in the study. When plants reached to 'Star-Shaped Head Stage', which is the beginning of the reproductive period, 4 different defoliation treatments were performed. These were: control (no leaves removed), 2 leaves removed, 4 leaves removed and 6 leaves removed. Half of the leaves were removed from just below the head, while the other half was removed from the middle part of the plant. After harvest, seed yield per plant, seed yield per decare, crude protein percentage, crude oil percentage, crude protein yield per decare and crude oil yield per decare were determined. According to the results obtained in this study, when leaves are reduced in sunflower cultivation, yields of seed and crude oil per decare will increase 10.46% and 14.98%, respectively. Using the method based on physiological stimulation of plants via decreasing the number of leaves at the beginning of the reproductive stage in sunflower has resulted in significant increases in agricultural characteristics such as seed yield and crude oil yield.

A. tumefaciens, a plant pathogen, naturally infects the wound sites in dicotyledonous plants. Virulent strains of *A. tumefaciens*, when interacting with susceptible dicotyledonous plant cells, induce diseases known as crown gall [4]. In an unpublished study conducted by Mustafa Yildiz, gall size caused by wild type *Agrobacterium tumefaciens* strain 136NC was decreased by stimulating plant defense mechanism in sunflower. Stems of 6-week-old sunflower plants were inoculated by *Agrobacterium tumefaciens*. Four weeks after

inoculation, galls were appeared on stem. It is obvious that stimulated plants showed the highest defense response against pathogen attack and consequently formed smaller galls on the stem than the control ones (Figure 1).

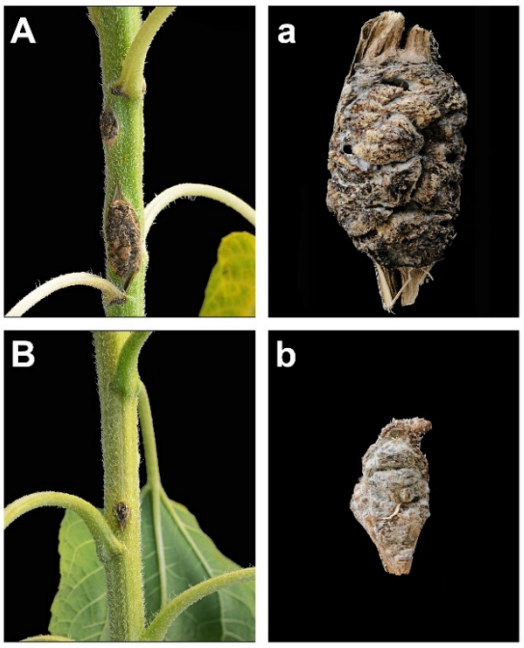

Figure 1: Defense response of sunflower plants to *Agrobacterium tumefaciens* infection. A-a: Control (non-stimulated plant), B-b: Stimulated plant

Two studies mentioned above showed that crop production could be increased and resistance against pathogens could be gained to plants not only by using chemicals and breeding new cultivars but also stimulating plants physiologically.

References

1. Vasil IK (1998) Biotechnology and food security for 21st century: A real-world perspective. Nature Biotechnology. 16: 399-400.
2. Ozcan S, Yıldız M, Mirici S, Sancak C (1999) Transgenic plant technology. Turkey 3rd Field Crops Congress, 15-18 December, Adana, Turkey, p. 11-16.
3. Taher M, Javani M, Beyaz R, Yildiz M (2017) A new environmental friendly production method in sunflower for high seed and crude oil yields. Fresenius Environmental Bulletin, 26(6): 4004-4010.
4. Nester EW, Amasino R, Akiyoshi D, Klee H, Montoya A, et al. (1984) The molecular basis of plant cell transformation by Agrobacterium tumefaciens. Basic Life Sciences, 30: 815-822.