



## CHEMICAL EDUCATION: A CATALYST IN FOOD PRODUCTION (A REVIEW)

**Muhammad Y. Ibrahim**

Department of Chemistry  
Federal College of Education, Kano  
Email: mibrahimyar@yahoo.com

### ABSTRACT

For any nation to command respect among the comity of nations, it has to be sufficient in terms of food production (to provide enough food for her citizens) and not depending on aids from other nations. To meet the food challenges of today, technological advancement via science education acquisition is necessary. Chemical education is essential in terms of food production, because factors that affect agricultural production viz: fertilizers, pesticides, herbicides, preservation, etc are direct products of chemistry. This paper highlights some of the contributions of chemical education in catalyzing food production.

**Keywords:** fertilizers, herbicides, pesticides, preservation, production

### Introduction

Science is the systematic study of nature and is the foundation on which technology is built. Science education is a process which involves the act of teaching and learning science. It is an agent of social mobility which builds citizens that could make reasoned decisions about scientific issues that affect their lives in the society (Okafor, (2003) in Nafiu, (2009).

Chemistry studies the composition, structure and properties of matter together with the associated changes and how such changes impact on the welfare of man and society. Chemical education on the other hand provides routes for tailoring the properties of existing substances to meet some particular need or applications, and for creating entirely new materials designed from the beginning to have particular desired properties. By such accomplishments, chemist through technology has made dramatic contributions to improving a whole lot of human living in agricultural production, controlling the spread of diseases, reducing environmental pollution etc. (Stella, 2008).

To meet the food demands of the twenty first century, new and novel approaches in farming must be devised. It has already been demonstrated that through biotechnology it is possible to grow larger and better crops. These techniques, not only for improved yields, but also for better frequency, that is more crops every year. For example, it is known that a certain bacterium produces a protein

molecule that is toxic to leaf-eating caterpillars. Incorporating the gene that codes for the toxin into crops enables plants to protect themselves so that pesticides are not necessary. Moreover, chemist can devise ways to increase the production of fertilizers that are less harmful to the environment and substances that would selectively kill weeds. (Raymond, 2005).

Man made a lot of breakthroughs in science and technology, viz: Agricultural production, mitigating environmental pollution, quality energy production etc. But nonetheless food sufficiency is still posing a serious challenge. The rapidly increasing population is putting tremendous pressure on food supply, hence the search for new ways to enhance food production. Nowadays development in science and technology are playing a very vital role in forestalling food scarcity.

### Role of Chemistry in Agriculture and Food Production

The factors that affect agricultural production are the richness of the soil, insects and diseases that damage crops, and weeds that compete for nutrients. The employment of chemistry in food production has brought a lot of development in terms of food production. The relevance of chemistry can be viewed from the areas mentioned below:

### 1. Pesticides

Pesticides are chemical substances used for mitigation, control or elimination of animals; most especially insects detrimental to human health or economy. (Ludvick, 1987).

Crops are affected by different pests and by competition from weeds. Several insects and other arthropods, fungi, molluscs, and bacteria attack crops and result in quantitative and qualitative losses. (WHO, 1990). Most pesticides are chemicals that are used in agriculture for the control of pests weeds or plant disease. These chemicals may be extracted from plants or may be synthetic. Chemicals used in pest and disease control are among the most important inputs, that have contributed substantially to agricultural production. The commonly used subgroups (of pesticides) include organochlorines, (e.g. aldrin, BHC, DDT, toxaphene), organophosphorous (e.g. azinophosmethyl, methyl parathion). Synthetic pyrenoids (e.g. allethrin, bioresmethrin) etc (WHO, 1990). Pesticide is any substance or mixture of substances intended for preventing, destroying or controlling any pest (FAO, 1986).

The contribution of chemical education in controlling pests is evident from the above discussion. The chemical substances or mixtures used to fight pests are products of chemical reactions.

### 2. Fertilizer

Plants need certain nutrients to complete their life cycle. These can be divided into macro and micro-elements. The macro elements include, phosphorous, potassium, calcium, magnesium and sulphur (Fitz Patrick, 1986). Carbon, hydrogen and oxygen are combined in photosynthetic reaction and are obtained from air and water. (Foth, 1990). The micro elements are found in most soils and their availability to plants are particularly important, hence a slight change in their availability can cause them to be either toxic or deficient (Shuman, 1982). The macro elements affect plants growth in acting as catalysts in regulating the acidic content of the plants.

Fertilizers are materials added to the soil to supply elements required for plant nutrition. They may be products manufactured for the purpose, byproducts from manufacture of other chemical products or natural materials. The primary function of the fertilizer industry is to supply these nutrients. These nutrients elements cannot be added to soil ordinarily in elemental form, because plants will not be able to make use of them. They have to be added in the form of components. The knowledge of chemistry is required in harnessing these elements before converting them into compounds,

followed by subsequent formulation of fertilizers from them. The common examples of these types of chemical compounds used as fertilizers are ammonium nitrate, urea, sodium nitrate (nitrogenous fertilizers), superphosphate, calcium metaphosphates, phosphoric acid (phosphorous fertilizers) etc (Akpatata, 2000).

### 3. Herbicides

Herbicides are chemicals employed to inhibit or destroy plant growth, especially of weeds or other undesirable vegetation. There are about 30,000 species of weeds and in any year a typical farm field is infested with between 10-50 weed species. Weeds compete with crops for all resources: light, water and nutrients. The more weeds, the less the crop yield: some weeds can have devastating effect on crops, for example, the production of soyabeans can be reduced by, 60% if there is just one individual of the weed called cocklebur per row foot. (Daniel and Edward 1998).

The task of controlling weeds in crop production was challenging hence the search for relevant chemicals that could be employed to destroy or inhibit the undesirable weeds. Thus, the use of herbicides has increased in recent years to a degree which would previously have been thought to be impossible. This has only been possible by the development of numerous new herbicidal substances (through chemistry education) with appropriate selectivity for the various cultivated plants. The control of weeds has provided many benefits viz: freeing agricultural crops from weed competition results in higher food production, reduced harvesting cost, improved food quality and lowered processing costs, contributing to an abundant supply of low cost and high quality food. (Akubundu and Otunoga, 1977 in Akpatata 2000).

### 4. Food Preservation

The storage of crops and other agricultural products for food and for periods of scarcity and famine is probably as old as agriculture. Agricultural produce is subject to attack by a wide range of pests and diseases during storage. Large quantities of these products may be wasted or eaten by insects and rodent pests and losses in nutritional and commercial quality-occur when disease organisms (fungi and bacteria) are associated with the damage. To counter these attacks chemicals are necessary for the preservation of food.

The utilization of chemical additives in food probably began when man first learnt that meat could be preserved by the addition of sodium chloride. This and similar practices continue to expand and develop till today. Chemicals substances are used in food production, processing and marketing. When used in the right proportion,

they contribute immensely to the abundance, variety, stability, flavor and appearance of the food supply. (Akpata, 2000).

#### 5. Constraints to Chemical Education

Certain factors are militating against the delivery of chemical knowledge, they include; inadequate supply of qualified chemistry teachers, poor utilization and selection of instructional resources (where available), poor methodology, obsolete curriculum, (Ibrahim, 2009). As well as ignorance of the role of chemical education in food production and non-challant attitudes on the part of the government.

#### Conclusion

Chemical principles and products have been utilized to control pests and weeds and in fertilizer production. For our country to avoid the danger of becoming a beggar nation it has to embark on a mass food production programme to cater for our rapidly increasing population. This can be achieved with the contribution of chemistry-backed technologies that can devise ways to increase the production of fertilizers that are less harmful to the environment and substances that will selectively kill weeds.

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