

# Inorganic fertilizer advantages and disadvantages



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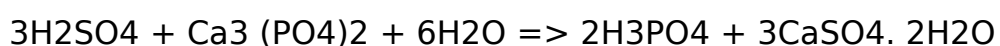
In modern agriculture, fertilizers are important substances that help improve the growth of plants in more efficient ways by putting in the soil or on leaves. Fertilizer are consider as the nutrient for plants and contain trace elements. Since modern agriculture are established and depends heavily in science and chemistry, more and more researchs, regarding to different types and different processes of fertilizer, are available to increase the harvest of crops.

There are two types of fertilizers: organic fertilizers and inorganic fertilizers. Organic fertilizers are consisted of organic matter and living organisms like other plants and animals. Inorganic fertilizer are composed manufactured chemicals and minerals, such as Nitrogen, potassium, phosphorus and much more. Organic fertilizer are released by microorganism into decompositional nutrients. Inorganic fertilizer, however, are much more easier to produce and high concentrated. Still there's many concerns either the use of some inorganic fertilizer are safe enough to use.

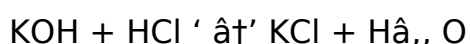
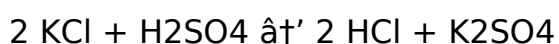
When trying to understand how inorganic fertilizer works, it is important to discuss about the composition of soil and the kind of chemistry reactions taken place within the soil. In *The Nature and Properties of Soils*, Nyle C. Brady, and Ray R. Weil discussed that soil is made of fifty percent of inorganic compounds. The inorganic matters are mostly sand, silt, and clay. Since clay are the larger than sand or slit, it's composition influence the absorption of fertilizers and involve in catalyzing reactions. For example, some crystalized layer silicates are clay materials that are important in chemical ion exchanges. Since most clay are negative charged and like to bond with anions, this reaction enables the silicates to control the reactions

of nutrients in the fertilizer when the charged molecules are stored in soil or exchange out of the soil systems. Another examples is aluminum and iron oxides are also stored in clay influences the catalyzing reactions in the soil due to its positive charged character (Brady & Ray, 740).

Due to increases in population -loss of land and with the understanding of soil's characteristic to control fertilizer, it is important to know the suitable benefits of fertilizers to increase productions. In one of her articles, Kelly Nuttall explained a wider variety of inorganic fertilizers and their purposes. Phosphoric acid is another form of phosphorus for fertilizers. Industrially, phosphoric acid can be prepared from by adding sulfuric acid to the phosphate rock.



The method of using phosphoric acid was discovered at least a hundred years ago. It is used for best acid soil. Another type of fertilizer she discussed was the use of Potassium. There are two main types of potassium fertilizer: Potassium sulphate and Potassium Chloride (Nuttall 2010). In Chemistry of the Elements, Norman Greenwood shows the preparation of Potassium sulphate and Potassium Chloride used in manufacturing (Greenwood 73-74).



Inorganic fertilizer are produced in many ways but the most well know procedure is the use of Haber-Borch process for the nitration-containing fertilizer. In Descriptive Inorganic, coordination, and solid-state chemistry, <https://assignbuster.com/inorganic-fertilizer-advantages-and-disadvantages/>

Glen E. Rodgers mentioned that it is “ commercial preparation of ammonia” by, first, cleaned the methane to remove sulfur. Then let it enters the Haber Bosch process to synthesize ammonia. It is the use of fixed nitrogen taken from the air and passed through catalyst that converts the nitrogen gas into ammonia (Rodgers 439-440).

$3 \text{H}_2 + \text{N}_2 + \text{heat, pressure, \& catalyst} \Rightarrow 2 \text{NH}_3(\text{g}) = \text{anhydrous ammonia}$

When anhydrous ammonia are insert into the sort or fertilizer with water , under pressure, it becomes ammonium:

$\text{NH}_3(\text{g}) + \text{H}_2\text{O} \Rightarrow \text{NH}_4\text{OH} \Rightarrow \text{NH}_4 + \text{OH}^- \Rightarrow \text{NO}_3^-$

Figure 1. The Haber-Bosch process

According to Professor Zmaczynski, during the 1930's, many countries like America used this methods to insert ammonia directly to the soil as an inorganic nitrogen fertilizers. Better technology are produced and processed further for carrying on the chemical reaction. Although it was a little more expensive back then but it was one of the most effective way during the World War II. Now, the use of ammonia in fertilizer had become one of the most important chemicals in the United States. The use of fertilizers today had increase since the 1940. Therefore, the necessity for nitrogen fertilizers will continue to be increased (Zmaczynski 1985).

Nevertheless, there are many concerns that use of nitrogen can be damaging. many theories dedicate that too much of nitrogen to the soil can kill or disturb the nitrogen fixation cycle. When talking about nitrogen cycle, W. C. Lindemann, Soil Microbiologist and C. R. Glover, Extension Agronomist <https://assignbuster.com/inorganic-fertilizer-advantages-and-disadvantages/>

discussed that “ biological nitrogen fixation is the process that changes inert  $N_2$  to biologically useful  $NH_3$ . This process is mediated in nature only by bacteria.” Therefore, if these bacteria in the soil are killed by the strong fertilizer, then less nitrogen is added naturally (Lindemann& Glover 1-3). As the result, more fertilizer must be added to supply enough nutrient to the plant. Since Inorganic nitrogen fertilizers are relatively cheap and farmers end up putting more nitrogen fertilizer than they need. The crop end up having too many extra nitrogen. When the crop are being water, the extra nitrogen will drained off from the land and enter the water supply. This causes contamination of high levels of nitrogen ions in water can lead to health problems which can trigger algal and bacterial blooms and cause cancer. This was one of the cases for rural Californians in 2010. These organisms are able to get rid of all the oxygen from the water fast. In California watch for Circle of Blues, Julia Scott believed that the nitrogen ions are the main contaminant in california. Extreme levels of nitrate in drinking water have been implicated health problems in human such as disease called the “ blue baby syndrome” (Scott 2010).

Overall, inorganic elements such as nitrogen, potassim, phorphorus and much more are used for inorganic fertilizers. Inorganic fertilizers are made from minerals and are chemically synthetic. It is much less complex and high concentrated than organic fertilizer. They are useful because it has the ability to enable clay of the soil to control its absorption of nutrient. It can be produce through Haber-Borsch process for nitration-containing fertilizer. It is affordable, easy to use and very effective. The disadvantage of inorganic

fertilizers is that nitrogen fertilizers can cause contamination and toxic waste if too many were added to the soil and the plants.

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Figure 1. The Haber-Bosch process from <http://www.initrogen.org/fileadmin/timeline/1913.html>

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