The Inorganic Fertilizer as a Pollutant in Agriculture

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ABSTRACT: ***In order to supply the growing demand for food, consumer society requires more agricultural land per unit area to achieve optimum efficiency and the highest quality product. It is well understood that plant nutrition is one of the most critical variables influencing agricultural output and quality. The quality of the production is influenced by nutrient levels in the soil. The soil of permanent agricultural land will be deficient in nutrients, making it inefficient. As a result, producers fertilize the soil, combat pests, and improve the irrigation and agricultural process to make the land more efficient. Fertilization of these actions is always a top focus. Recent studies, on the other hand, have found that excessive fertilizer use necessitates the acquisition of additional property outside of the public and environmental health. Excessive fertilization and carelessness were mentioned, but there were also soil salinity, heavy metal accumulation, water eutrophication, and nitrate accumulation to consider in terms of air pollution from nitrogen and sulfur-containing gases, which can cause problems such as the greenhouse effect. This review attempts to expose environmental and health issues caused by incorrect fertilization, as well as solutions to these issues.***

KEYWORD: ***Agriculture, Environment, Fertilizer, Fertilization, Pollution.***

1. INTRODUCTION

Agricultural pollution refers to biotic and abiotic consequences of agricultural activities that result in contamination or deterioration of the environment and adjacent ecosystems, and/or cause harm to people and their economic interests. The pollution may originate from a number of sources, ranging from point source water pollution (from a single discharge point) to more diffuse, landscape-level causes, also known as non-point source pollution and air pollution. Once in the environment these pollutants may have both direct impacts in nearby ecosystems, i.e. killing local animals or polluting drinking water, and downstream effects such as dead zones produced by agricultural runoff is concentrated in big water bodies[1].

Management methods, or ignorance of them, play a significant influence in the quantity and effect of these pollutants. Management methods vary from animal management and housing to the spread of herbicides and fertilizers in worldwide agriculture practices. Bad management methods include poorly managed animal feeding operations, overgrazing, plowing, fertilizer, and inappropriate, excessive, or improperly timed application of pesticides.

Pollutants from agriculture significantly impact water quality and may be found in lakes, rivers, wetlands, estuaries, and groundwater. Pollutants from farming include sediments, fertilizers, diseases, pesticides, metals, and salts. Animal husbandry has an outsized effect on contaminants that enter the environment. Bacteria and pathogens in manure may find their way into streams and groundwater if grazing, storing dung in lagoons and spreading manure to crops is not adequately handled. Air pollution produced by agriculture via land use changes and animal husbandry practices have an outsized effect on climate change, and addressing these issues were a key component of the IPCC Special Report on Climate Change and Land[2].

Fertilization improves efficiency and provides higher quality of product recovery in agricultural operations. It is one of the most essential methods. Non-organic fertilizers primarily include phosphate, nitrate, ammonium and potassium salts. Fertilizer business is believed to be source of natural radionuclides and heavy metals as a possible source. It includes a significant percentage of the heavy metals including Hg, Cd, As, Pb, Cu, Ni, and Cu; natural radionuclide such 238U, 232Th, and 210Po. However, in recent years, fertilizer use grew rapidly across the globe, causing significant environmental issues. Fertilization may influence the buildup of heavy metals in soil and plant system. Plants absorb the nutrients via the soil, they may enter the food chain. Thus, fertilizer leads to water, soil and air pollution.

The usage of chemical fertilizers in Turkey is lower than industrialized and many developing nations. Chemical fertilizer used per acre in Turkey (N+P+K) are calculated as 100.4. These values are 665.5 in the Netherlands; 624.8 in Egypt; 373.2 in Japan; 301.5 in China; 287.5 in Britain; 205.4 in Germany; 180.1 in France; 160.8 in the USA; 126.4 in Italy; 121.4 in India; 115.4 in Greece and 106.9 in Indonesia kg/ha respectively. For the next 30 years, more fertilizer will be needed to get more goods[3].

Excessive use of chemical fertilizers in agriculture, resulting in a significant number of environmental issues since certain fertilizers include heavy metals (eg. cadmium and chromium) and high quantities of radionuclides. Later these fertilizers agro-ecosystem represents the primary source of heavy metals and radionuclides in plants and some results in the buildup of inorganic contaminants. Greenhouses, aquaculture particularly large quantities of chemical fertilizers used during the peak season, so seriously contaminated well water, especially water resources, agricultural output quantity and quality of product deteriorates. Problems caused by too much fertilizer:

The quantity of nitrate may rise in drinking water and rivers as a consequence of excessive levels of nitrogen fertilizer usage. The quantity of phosphate may rise in drinking water and rivers as a consequence of the transfer of phosphorous fertilizer with the flow of surface. High amount of Nitrogen fertilizer utilized plants grew in soils. It comprises of carcinogenic chemicals such as nitrosamines, particularly vegetables such as lettuce and spinach leaves are consumed. There is hazardous buildup of NO3 and NO2[4].

1.1 Effects of Compound Fertilizers On Water Pollution:

Nowadays, human beings know of negative consequences on the environment of the usage of nitrogenous fertilizers. Nitrogen in agricultural regions reach the aquatic environment via three ways: Drainage, leaching and flow. Nitrate leaching especially related to agricultural activities such as fertilization and farming. Irrigated agricultural land in some of the dry and semiarid areas, increasing quantities of nitrate buildup in the soil utilized and together with the evaporation of water.

According to the circumstances, nitrate accumulated leached in different quantities. It penetrates the depth of earth. In the soil, fertilizers turned to nitrate via nitrification by microorganisms. Due to negatively charged of nitrate may enter ground water. Even in ideal circumstances, Plants consume 50 percent of nitrogenous fertilizers given to soil, 2-20 percent lost evaporation, 15-25 percent react organic compounds in the clay soil and the remainder 2- 10 percent interfere surface and ground water.

The bulk of nitrogenous fertilizers aren't absorbed products and they interact with both subterranean and surface water. Groundwater nitrate issue should be addressed in a worldwide perspective. 22 percent of agricultural lands in Europe for the international recommended drinking water nitrate content in groundwater concentration (≥ 11.3 mg/L) above. In European Countries, NO3-N concentration value is 23 mg/L while in the USA it is 45 mg/L. NO3 and NH + concentration, Nottingham, United Kingdom exceeds the specified limits.

The city of Nottingham is underlain by the unconfined Sherwood aquifer, which is susceptible to pollution from different sources originating from urban and industrial activity of the area. According to that research, samples of aquifer recharge, both artificial and natural, and of shallow and deep groundwater were obtained to evaluate the sources and degree of pollution from nitrogen species. Deep groundwater has modest amounts of ammonium (less than 0.3 mg-N/L) throughout, but considerably greater nitrate concentrations (less than 1.0 mg/N/L to 28.0 mg-N/L).

Most surviving groundwater samples had a nitrogen fertilizer source, perhaps sourced from an influent river draining a rural catchment. In that research, groundwater quality is constantly monitored and isotopic measurements were performed. Similar high amounts of NO3 and NH + have also been recorded in the USA. According to studies conducted out in wells used on farms in Ontario, Canada, about 14 percent of the wells were found to be above the limit levels of NO3-N concentration[5].

In that research, four farm wells were selected in each municipality where >50 percent of the land area was utilized for agricultural production. Within the practical limitations of the survey, it was estimated that a total of between 1000 and 1500 wells might feasibly be included in the research. Nitrate concentration was measured spectrophotometrically. In Antalya area of Kumluca their research on the measurement of nitrate consent of well water NO3 2.46-164.91 mg/L is changing and the region of about 50 percent of nitrate contamination of well water was exposed stated.

Water samples were collected from 20 wells in the area. The findings obtained indicated that the NO3 content of the well fluids in the area varied from 2.46 to 164.91 mg/L, NH4 content from 2.35 to 7.22 mg/L, [NO3-N]+ [NH4-N] content from 2.84 to 40.02 mg/L. It was discovered that the NO3 concentration of the 50 percent of the well waters were greater than 45 mg/L which was recognized as crucial threshold for the NO3 contamination in waterways. In Eskisehir, NO3 contamination in their research indicate that beneath the alluvial aquifer. The water analyses from 51 wells and 9 sample sites on the Porsuk River, collected over a 2-year period, were utilized to evaluate the nitrate contamination in the groundwater.

The average nitrate content in the groundwater of the research region was 40.0 mg/L; 34.2 percent of the nitrate concentration of the samples were over 45 mg/L the maximum limit in drinking water standards. Their research relates to the content of nitrate Demre, Antalya area of about 45 percent of well water that is permitted by the World Health Organization, 50 mg/L is over the limit value indicated. In the same research in the beginning of growing season with high concentration of NO3 training period before the decrease in again showed a rise after discovered that.

One of the most significant factors of the contamination of water is nitrate which is the fundamental component of fertilizer. Both the nitrate content of groundwater and surface water is raised by agricultural operations. Nitrate is the most prevalent type of dissolved nitrogen in groundwater. However, it may be present in the form of nitrite (NO2 -), nitrogen (N2), nitrogen oxide (N2O) and organic nitrogen[6].

Nitrates from drinking water of the body is absorbed in the digestive tract 4-12h and is excreted by the kidneys. The mechanism, as well as the salivary glands may concentrate nitrate. As a consequence, the mouth is converted to nitrite in the anaerobic environment. It is feasible to evaluate the toxicological consequences of nitrate in three phases. The main harmful impact of nitrate concentrations in drinking water of 50 mg NO - /L surpasses the value of the intestine in adults, digestive and urinary systems, inflammation is observed.

Seconder toxicity, excessive nitrate content in drinking water induced disease in babies methamoglobianemi. Stomach acid does not occur in babies younger than six months. In this condition, nitrate nitrite interacts with hemoglobin in the blood is minimized methamoglobin comprises of nitrite in the digestive system. Meanwhile, iron contained in hemoglobin and blood oxygen transport function diminished. As a consequence, babies are discovered strangled to death. Advancing age, it is removed as a consequence of the rise in stomach acids[7].

Toxicity in acid medium of secondary and tertiary amines tertiary nitrites, alkyl ammonium bases and react appropriately amides arises a s a consequence nitrosamine occurs, as a result of this and nitrosoamines. Strong carcinogenic effects of this chemical has been found in recent research. One of the most significant detrimental consequences of excessive fertilizer usage is water eutrophication. Increased quantities of nitrogen and phosphorous compounds in water as a consequence of the rise in the quantity of higher aquatic plants and algae formation and deterioration of water quality and water environment in the event of life is described as eutrophication[8].

Eutrophication in the bottom layer, oxygen-free environment as a consequence, not appropriate for drinking and water supply, decrease in the number of living species in the aquatic environment fish deaths, expansion of undesirable species, odor issue, the media seem to be unfit for leisure.

2. DISCUSSION

According to the experts and studies the impact of chemical fertilizers on the soil is not immediately apparent. Because soils have high buffering capacity owing to their components. Over the time, it says that arose from the pollution, loss of soil fertility, soil degradation processes happening in the soil leads to deterioration of the balance of the present element. On addition, harmful chemicals collect inside the vegetables and producing detrimental effects in people and animals when fed.

Soil structure in agricultural production are extremely significant and it is considered as an indication. Unconsciously, the fertilization, soil, just as in the degradation of the building is caused by industrial pollutants. Especially NaNo3, NH4NO3, KCI, K2SO4, NH4Cl destroy the structure, such as fertilizers, soil, soil structure, degradation is difficult to get high-quality and efficient product.

Particularly high level of salt and potassium containing fertilizers, have a negative effect on soil, pH, soil structure degradation and the growing characteristic of acid irrigation or other agricultural activities or from the advantages obtained from it is not feasible or extremely rare. Continuous use of acid-forming nitrogen fertilizers produces a drop in soil pH, liming, if not conducted to avoid the decreasing efficiency of field crops. Basic usage of fertilizers in the soil leads to a rise in pH. Increases in soil and plants, seedlings pH circuit of a rapid decrease in the production and quality declines, but produces harmfulness. In addition, increasing the size of soil contamination through accumulating in the soil[9].

Research in the province of Rise on the territory of our country, one-way ammonium sulfate fertilization of tea, really led to an increase in acidity of soils with low pH. Today 85 percent of the area has fallen below pH 4 which is regarded as the critical threshold. In Nevsehir during the past twenty-five years as a consequence of nitrogen fertilization of potatoes grown in 100-fold increased acidity of the soil pH has dropped to 2.

Granting the land, excessive nitrogen fertilizers Rhizobium sp. activities, such as symbiotic nitrogen fixing bacteria is adversely impacted. In this instance, the portion of the air plugs to profit from the free nitro. In addition, higher nitrogenous fertilizers restrict the activities of nitrifying bacteria. Thus, the cost of the second nitrogen source is harmed. Given high quantities of potassium fertilizers in the soil of Ca and Fe with Zn disturb the balance of nutrients by the plants and hinder the reception. However, the negative impacts on organisms, given the diversity of worms and soil mite has been catastrophic and fatal effect.

It is recognized to be one of the most significant inputs of fertilizers in agricultural productivity. When it is implemented insufficient, rates of productivity and quality are produced substantial losses. When it is too much applied, it produces air pollution via nitrogen oxides (NO, N2O, NO2) emissions. Nowadays, there exist several gases in the atmosphere. Their names include water vapor, carbon dioxide, methane, hydrogen sulfide (H2S) and chloro-fluoro hydrocarbons, such as halon gases connected with these substances.

Also there are several gases on lower levels of tropospheric ozone. These gases contribute to the greenhouses effect. As a worldwide, atmospheric N2O rises from 0.2 to 0.3 percent per year. Also in case of excessive use of nitrogenous fertilizers, particularly nitrate content of levels of the plant would endanger human health level reaches the leaf vegetables consumed.

Calcareous and alkaline soils, particularly applied to the soil surface structure and ammonium fertilizers with urea, may result in evaporation of NH3. Evaporation of ammonia, a wide number of soil and environmental variables may be regulated and directly proportional to the concentration of ammonia in the soil solution. Ammonia emission from fertilized areas, adjacent to result in depositing on ecosystems and plant harm. NH3 may be oxidized and converted into nitric acid, sulfuric acid from industrial sources, produce acid rain following the chemical changes. Acid rain may harm plants. Also, it may harm organisms that they dwell in both lakes and reservoirs[10].

Pesticides and herbicides are sprayed on agricultural land to combat pests that impair crop production. Soil contamination may occur when pesticides persist and build in soils, which can change microbial activities, enhance plant absorption of the chemical, and are harmful to soil species. The degree to which the pesticides and herbicides remain relies on the compound's specific chemistry, which influences sorption dynamics and consequent fate and transport in the soil environment. Pesticides may also accumulate in animals that consume infected bugs and soil organisms. In addition, pesticides may be more damaging to beneficial insects, such as pollinators, and to natural adversaries of pests than they are to the target pests themselves.

3. CONCLUSION

Today, usage of fertilizers is regarded as an essential agricultural technique. Because soil replenishes nutrients. However, initially soil analysis should be done properly. After that, fertilizer should be supplied to soil. The structure and chemical composition of the soil should be determined and the most suitable kind of fertilizers should be chosen. The most appropriate technique should be processed. Otherwise, the fertilizer should be remembered that mistakes will result in the loss of both energy and money. Fertilizing should be done in time, should not be improper periods. For example, a strong rainfall to the seasons, fertilization, fertilizers water will combine with the surrounding soil via leaching.

For this reason, fertilizer will be lost from soil, as well as contamination of nearby water and thus it will result in eutrophication. Water produced by chemical fertilizers is the most efficient method to avoid eutrophication, particularly in the form of phosphorus flow will cease. In addition, sedimentation, nutrients, dilution, pressure water application, filtration, water alga sit or herbicides, such as the inclusion of certain physical and chemical techniques may be effective.

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