A Review Article: Use of fertilizers and their gradual release of mineral nutrients as a remedy to this problem have an adverse environmental impact.

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Abstract:

Throughout Agriculture has mostly relied on the use of natural fertilizers throughout human history, which are compounds that increase the nitrogen levels in the soil. Modern agriculture was made possible by the introduction of synthetic fertilizers at the end of the 19th centuryproduction of agriculture. Their application enhanced crop yields and sparked an agricultural revolution unlike anything the world had ever seen.In the near future, synthetic fertilizers are anticipated to continue to have a significant impa ct on human life, both positively and negatively. They are frequently utilized for producing all t ypes of crops and are essential to plant growth.

The significance of synthetic fertilizers is their ability to provide the soil with precise amounts o f constant nutrients.They have an instantaneous impact on the soil, as opposed to organic fertiliz ers, which must decompose before being absorbed. Particularly helpful to plants that are dying o r extremely starved is its immediate efficacy. Despite these advantages of synthetic fertilizers, th ere are also drawbacks, such as the destruction of helpful soil bacteria that turning dead plants and animals into nutrient-rich organic materials. nitrogen, phosphate, and potassium-based synthetic fertilizers leach into groundwater, increasing their toxicity

resulting in the polluting of water. When fertilizers spill into streams, rivers, lakes, and other bodies of water, aquatic ecosystems are affected. The nitrate content of soil rises as a result of

synthetic fertilizers. Methaeglobinaemia is brought by these harmful nitrites harming the vascular and respiratory systems, resulting in suffocation and, in severe cases, death, and reacting with the hemoglobin in the blood. (when blood methaemoglobin level is 80 percent or more) Plants that thrive in excessively fertilized soil lack iron, zinc, carotene, vitamin C, copper, and protein. In spite of that synthetic fertilizers can yield results remarkably quickly The indiscriminate and unchecked use of these synthetic substances might result in fertilizer pollution in your garden or at industrial farms where growth equals profit

Key words: (chemicals, soil, environment, fertilizers, elements).

١ -In troduction:

A vital component of the population is the soil. The use of high inputs of chemicals into the soil in the form of fertilizers, pesticides, fungicides, insecticides, nematocides, and herbicides, along with intensive irrigation practices, helped achieve the goal to a certain stage in order to meet the growing general needs for products from diverse crops. However, despite the application of fertilizers, crop yields decreased

In order to increase crop quality and satisfy global food demand, chemical formulations introduced as fertilizers and pesticides in the correct quantities are essential for food management resources in agriculture. As opposed to that, if used in a disproportionately large or excessive amount, there Inorganic fertilizers and pesticides have negative implications that should not be disregarded. They have a lengthy shelf life in the soil and atmosphere and have an impact on a variety of biotic and abiotic variables. They have a detrimental effect on the environment, human health, microbiota, other creatures, and soil. Via The soil is harmed by atmospheric deposition, waste disposal, industrial effluents, direct application, excessive agrochemical and industrial chemical use, trace metal contamination, and urban rubbish (1,2). Soil pollution decreases soil health by lowering soil biodiversity and fertility and altering nutrient cycle, which prevents the breakdown of soil organic matter. Soil contamination reduces crop output and jeopardizes the safety of food, especially when bioconcentrated contaminants infiltrate creatures along the food chain (3) .

Plants can potentially absorb soil contaminants either through their leaves or roots. Long-term consuming tainted food , including by humans, can spread illness and result in animal fatalities(4) Particularly, urbanization pollutes soil in peri-urban areas, which have to deal with the dumping of municipal solid waste and the deposition of urban air pollution (1,6). Aggregate soil stability is decreased by acid rain., has an impact on the activities of soil microbes and enzymes, increases soil erosion, and makes nutrients more mobile, all of which contribute to nutrient loss(1,7,8,9) , Also, there is a connection between soil pollution and the quality of irrigation water and flooding incidents. To fulfillUrban and industrial sewage, as well as the

rising need for drinking water, are being quickly used for irrigation. This is particularly common in places like China, where 3.62 million acres of agricultural land have been watered with contaminated water and sewage (1), Trace metal contamination of soil is common in peri-urban regions as a result of air buildup, industrial waste and the irrigation of waste water (1,10,11). Exudates from plant roots and soil microbial activity have a direct impact on the supply of metallic traces. Soil microbes are to blame for decreased soil fertility and biodiversity. because of their great susceptibility to excessive trace metal concentrations (12,13) . Moreover, trace metals accumulate in surface organic deposits because of their strong affinity fo r organic matter and are passively absorbed by plants through water movement(14) Research have shown that traces of metal accumulate includes stalks and leaves in agricultural foods having higher amounts than vegetables and fruits (15) Agrochemical use and reliance have significantly increased as a result of intensive farming and monoculture. Due to improper nutrient management, combined with improper pest and weed management, fertilizer and pesticide soil pollution results (4) The fate of pesticide metabolites is also a worry because it is unclear how they behave in the environment, particularly in the food chain (16) The risk of soil pollution increases with population growth. So, there being toxins and the accompanying hazards of bioabsorption pose a threat to food safety. By lowering soil fertility and biodiversity, soil pollution causes decreased yields from crops causes agriculturally productive land to become ineffective areas . As a result, this has an impact on the food security dimensions of food availability and stability. The size and geographic spread of the soil contamination, which, in particular in urban and peri-urban regions, hinders food access, provide a barrier to food accessibility. Hence, soil pollution poses a threat in relation to all facets of food safety (20).

2- Healthy soils are necessary for long-term food security :

The ability of living soil to function within the bounds of a natural or organized ecosystem, to maintain plant and animal productivity, is what is meant by "soil health." As the foundation for healthy food production and a contributor to both local and global food security, soil health encompasses a wide range of essential soil properties. To preserve the quality of the water and air, as well as to advance plant and animal health, the world's food consumption must increase by 60% by 2050. (17,18), But one-third of the world's soils are already experiencing moderate to severe soil degradation as a result of soil erosion, nitrogen loss, salinization, damming, and pollution. Decisions that are based on solid evidence and knowledge of the soil are crucial for achieving sustainable soil management (19). Systemic trophic and nutritional issues are brought on by nutrient-deficient soils. More than two billion people worldwide suffer from micronutrient deficiencies, which are a significant source of disease and mortality. (20,21,22,23) Low quantities of certain elements (including iron, lithium, magnesium, zinc, copper, and iodine) in crop tissue are caused by nutrient-poor soils. (24) .

3- The effects of agricultural chemicals on the environment :

because chemical fertilizers increase the expansion and vitality of plants, they fit into the world's food safety, however plants produced in this manner won't have enough time to develop healthy vegetative traits such a strong root system, healthy shoot system, and nutritious qualities (25) When chemicals are processed, certain toxic substances or gases that contribute to air pollution, including NH, are produced as byproducts. This is when the adverse effect of chemical fertilizers itself begins. carbon dioxide, methane, etc, When trash from untreated industries is discharged into adjacent water, it will result in water contamination. bodies. It also has the most harmful effect of the accumulation of chemical residues in water bodies, such as water eutrophication. It's time to acknowledge that these agricultural production inputs are depleting our climate and biodiversity since their constant usage on soil degrades soil health and quality and results in soil contamination. As a result, if it were to be used indefinitely without any mitigation measures or judicious use, it would consume all natural resources and endanger life on Earth as we know it. Adopting new agricultural technical techniques, such as the use of organic inputs like manure, can lessen or eliminate the detrimental impacts of these synthetic chemicals on human health and the environment Avoid using intensive chemical farming and instead use bio-fertilizers, bio-pesticides, slow-release fertilizers, and nano-fertilizers, etc

4- effect on soil deterioration and compaction :

An important part of the land degradation syndrome and a significant issue in modern agriculture, soil compaction has a detrimental effect on soil resources. (26). Crushing aggregate units reduces the pore size between soil particles, which reduces compaction caused by the use of heavy equipment, which reduces the use of organic fertilizers, repeated use of chemical fertilizers, and plowing for several years at the same depth, all of which change the composition of the soil as it is compacted (27). The overuse of fertilizers for extended periods of time and intensive crops is one of the main causes of stress. Problems brought on by excessive soil strength, restriction of root growth, poor aeration, poor drainage, runoff, erosion, and degradation of the soil are all brought on by soil compaction (28) .

Reduced permeability, hydraulic conductivity, and groundwater recharge result from these alterations (29). The ability of plants to absorb nutrients and overall porosity is hindered by excessive soil compaction, which also increases bulk soil density and penetration resistance. stating that stress significantly lowers root growth and production by more than 80% (30) . As soil mass density rises, nitrification declines by 50% while plant uptake of nitrogen, phosphorus, and zinc from the soil declines(31) . The decrease in biological activity in the soil as a result of compaction is very concerning. (32). Organic matter is the most crucial element in sustaining soil structure. Growing soil types and soils with a high organic matter content are more resilient to stress and can recover more quickly from minor stress damage. (33,34) When

fertilizers were used excessively, continuous monocultures were created, and mineral salts accumulated in the fertilizers, causing compaction layers to build in the soil and eventually degrading the soil.

- **excessive use of soil fertilizers and chemicals٥ -**

The soil supports a variety of environmental services and is home to soil organisms, which serve as a method for recovering nutrients. Overuse of chemical fertilizers can cause soil and soil acidification, which lowers the amount of organic matter in the soil, humus in the soil, beneficial species in the soil, and stunts plant growth. Changes in soil pH and plant growth, pest growth, and even greenhouse triggers Gases. Soil acidity reduces phosphate intake, and increases the quantity of poisonous ions in its soil and prevent crop growth. Humus depletion in soil decreases its capacity to store nutrients. greenhouse gases from fertilizer use that contains too much nitrogen damage the atmosphere. Large amounts of nitrogen fertilizers put to the fields over time destroy their delicate balance N, P, and K, the three macronutrients, reduced crop yields.

Clay soil has the ability to sequester excess chemicals effects of fertilization. Frequent chemical fertilizer applications canlead to the accumulation of hazardous materials in the soil heavy metals as cadmium, uranium, and arsenic. These harmful heavy metals don't just damage the ground; they also build up in cereals, fruits, and vegetables. triple-purpose fertilizer Superphosphate includes trace metals like cadmium and arsenic that build up in plants and can harm humans when they are consumed through food chains. (36).

Fertilizer Application without advising a soil test may have negative impacts, including nutrient imbalance and soil degradation. soil structure destruction and a rise in bulk density (37) . The amount of nutrients in the soil decreases over time when agricultural plants are harvested. Fertilizers are thus the fundamental element of modern agriculture. However, even though chemical fertilizers are the primary reason that enough crops are produced to feed the world's population, their excessive use poses significant problems for both the present and the future, such as deteriorated lands and soils, increased greenhouse gas emissions, and pollution of the air, water, and soil. These artificial fertilizers threaten not just the environment, but also people, animals, and microscopic organisms.

It is time for everyone to become aware of the harmfulby substituting various organic amendments like organic fertilizers that not only give plants with needed nutrients but also protect soil quality for later crops, one can avoid the usage of chemical fertilizers and pesticides. Numerous more technologies are now being developed, such as split or granular fertilizers, nitrification inhibitors, nano fertilizers, slow-release or controlled-release fertilizers, etc. They are all viable options that can be employed to address these pressing issues and protect the ecology and our environment. (35).

6- The structure of the microbial community :

The soil plays the role of soil and the environment. Plant roots secrete organic matter that contains carbon in the root zone(38,39) It is the source of the energy, nitrogen, and carbon required for soil microbes to thrive and reproduce. Since many bacteria congregate near plant roots, there is a difference between the soil's nutritional level and its microbial composition. (40). The roots of plants are where dirt, microorganisms, and roots come into the most touch. Root microorganisms are crucial for the energy transfer and soil material cycling processes. Application of fertilizer is a crucial management practice in agricultural production that not only improves crop development and output but also has adverse effects on soil microorganisms. A decline in soil fertility and a number of environmental issues are currently being caused by the growing use of chemical fertilizers. Not only does bio-organic fertilizer enhance the (41) by adding beneficial microbes and organic materials, but it also gets rid of many environmental issues brought on by artificial fertilizers. Studies have revealed the effectiveness of different fertilization methods. significant impact on the ecology and structure of soil's microbial biomass

(9,42) The physical and chemical characteristics of the soil are altered by various fertilizer applications, and this in turn alters the bacterial community composition of the soil. According to earlier research, the microbial community structure is significantly influenced by soil characteristics such as pH, nitrate, accessible phosphate, and potassium.. Fertilization influences soil microbial diversity by having a direct impact on the quality of the soil's nutrients. Long-term application of nitrogen fertilizers has an impact on the nitrogen cycle and related bacterial populations when combined with other mineral fertilizers. Chemical fertilizer use over an extended period of time can drastically lower soil pH, which is directly associated to decreasing bacterial diversity and considerable population composition changes. Bacteria (43)

7- Possibility of using bio-fertilizers in place of chemicals fertilizers:

The global expansion in human population poses a serious challenge to food security as the amount of land available for cultivation is constrained and even diminishes over time. (44). Consequently, it is crucial that agricultural output increase significantly over the coming decades in order to satisfy the needs of the rising food demand of the emerging population. A biofertilizer is a substance containing microorganisms that colonize the roots or inner part when applied to seeds, plants, or soil, of plants and promote plant growth by boosting the host plant's nutritional supply. Due to their enormous potential to boost crop output and food safety, microorganisms are used as a biological fertilizer as an alternative to chemical fertilizers in the agricultural industry. Work has been done extensively on biofertilizers to reveal their existence

The the capacity to provide the crop with the required nutrients in enough quantity to increase crop output. Numerous microbial processes that boost the availability of nutrients that plants can

easily absorb are accelerated by the use of biofertilizers (45). In order to produce plant growth-stimulating substances in the soil, the biological system that is naturally accessible to mobilize nutrients, biofertilizers fix atmospheric nitrogen and dissolve insoluble phosphate. This significantly boosts soil fertility and, ultimately, crop yield. The use of biofertilizers is encouraged since they are anticipated to be a safe substitute for chemical inputs and to greatly reduce environmental disturbance. Bio-fertilizers are inherently cost effective and environmentally friendly and their prolonged use, greatly increases soil fertility. The use of bio-fertilizers has been shown to increase nutrients such as protein, vitamins, and nitrogen fixation, which raise crop yields by roughly 40%

benefits of utilizing bio-fertilizers incorporate affordable and excellent dietary sources Suppliers of fine chemicals and micronutrients, suppliers of Organic matter, the release of growth hormones, and other factors balance out the negative impacts of chemical fertilizers. Microbes are essential soil components that play a crucial part in numerous essential soil ecosystem processes that make soil dynamic for nutrient mobilization and sustainable for crop production(47) .

8- Fertility of Soils Improvement :

Physical fertility refers to the composition, texture, and water-retention of the soil. properties, how plants' roots receive water, and how those roots penetrate the soil Biological fertility refers to the species that exist in the soil and their capacity to perform significant functions. The type of soil, its acidity or alkalinity, and the surrounding temperature are just a few examples of the many variables that affect how much access plants have to nutrients. The nutrients determine the proportional importance of these factors. (9) both the plant and the soil. Notably, soil structure influences how well this occurs because it carries water and minerals. Compared to sandy soils, clay and soils with organic matter store nutrients and water far better. Soil structure will have a significant impact on the soil microbial community as well. The plants that depend on these organisms won't be able to grow bacterial or fungal species to absorb nutrients if the soil does not enable them to exist . Application of fertilizer was, until recently, the most widely used treatment for nutritional shortages. Timing is crucial since the plant's life cycle changes the phytonutrient requirements. Because the proper trace elements may not be immediately identifiable by deficiency symptoms, Liebig's law's effect may make it difficult to identify legitimately inadequate nutrients. If the necessary structural and biological conditions are not met, additional fertilizers will be of little or no use. Increasing the soil's biological and structural fertility will increase the health of plants. Applying compost incorrectly wastes time and money and can have negative effects on the environment (19).

9- Chemical fertilizer industry :

The following is a presentation of the main types of fertilizers that are widely used for the purpose of increasing plant production (48) .

Nitrogen fertilizers : The primary ingredient in these fertilizers, ammonia, is created when hydrogen is removed from hydrocarbons like coal, crude oil, natural gas, and water and reacts with nitrogen taken from the atmosphere. In terms of cost and environmental impact, natural gas is the greatest alternative for obtaining the raw materials required to produce ammonia as well as the fuel to carry out the reaction process. When combined with other substances, ammonia, which has 82% nitrogen by weight, helps create a variety of nitrogen fertilizers, the most significant of which is urea

Phosphate fertilizers: The primary raw material used to create phosphate fertilizers is phosphate rock. When sulfuric acid is added to phosphate rocks, which is how these fertilizers are made, superphosphate fertilizer creates 16–21% phosphorous pentaxide. While the addition of phosphoric acid results in the production of superphosphate fertilizer - mono, which contains 43–48% of phosphorous pentaoxide (49).

Potash fertilizers :A liquid solution containing sulfur or chlorine particles is used to extract potassium. Before usage, these components are concentrated after being cleaned of sodium chloride. The materials are either utilized directly as potassium fertilizer or converted into potassium chlorides and sulfates before being used. The energy sources used to produce this fertilizer are electric power and liquid fuel. Among the most significant nations producing potash are Canada, Russia, and not Russia, as well as some Western European nations including France, Spain, and Italy, as well as Jordan and occupied Palestine (50).

Global demand for chemical fertilizers :١٠ -

The global demand for nutrients in 2003 was roughly calculated to be 168 million tons of nutrients

(Composed of 65% nitrogen, 21% phosphorus pentoxide, and 14% potassium oxide). While the global production in the same year was estimated at about 380 million tons of raw fertilizer materials, including 133 million tons of ammonia, 136 million tons of phosphate rock, 46 million tons of potash and 64 million tons of sulfur. Arab countries contribute in different proportions to the global production of fertilizers. In 2003, Arab countries contributed 7% of ammonia production, 9% of urea production, 32% of phosphate rock production, 4% of potash and 8% of sulfur (51) .

11- the fertilizer industry's impact on the environment:

In 1996, the world produced 136 million tons of fertilizer from 325 million tons of raw materials, or about 80 million tons of nitrogen, 33 million tons of phosphorus, and 23 million tons of potassium oxide. Sales were estimated to be around 50 million US dollars. fertilizer sector leads to 1998. Estimates by the Isherwood Organization of gases emitted into the atmosphere, the most important of which are carbon and nitrogen oxides, indicate that the production of fertilizers contributed 1.2% of the total emissions of these oxides at the global level (equivalent to 280 million tons of (CO2). Each year, this industry emits other gases like sulfur dioxide and carbon monoxide in addition to carbon dioxide. The emissions from fertilizers were distributed as follows :

%٤٨)quantity) in the gaseous state, i.e. 133 million tons of CO emitted per year of the overall-

Equivalent E Nitrogen oxides account for 26% of the total. 75 million tons of CO2, or 26% of the total amount of NO274 million tons, are produced as pure CO2 gas each year. The production of 12 million tons of pure CO2 is used in the ammonia industry (52).

12- Nitrogen Environmental contamination caused by the fertilizer industry :

When nitrogen is created using natural gas, it is anticipated that the amount of CO2 produced is around 2.7 tons; if coal or oil is used, the amount of CO2 produced is increased by about 25%.For every ton of nitrogen used in urea production, 6.1 tons of CO2 are needed. Every year, the fertilizer sector contributes to the 2% of CO2 emissions into the atmosphere from all other human activities, or about 7% of the overall amounts of CO2 emitted as a result of different essential operations. The manufacturing of nitric acid, which is used to make fertilizers like ammonium nitrate and nitrophosphate, results in the release of massive amounts of N2O gas, which is thought to be more damaging than CO2 in terms of the global warming issue since it affects the ozone layer. The amount of N2O released varies from 0.1 to more than 10 kg every ton of nitric acid (100%) produced. When compared to other human activities, which account for around 50% of the total world N2O emissions, the fertilizer sector is thought to be responsible for just about 6% of those emissions. in connection with global warming. As with Nox oxides, they are likewise created at factories that make nitric acid and ammoniaNitric oxide, N2O, can be oxidized to produce Nox, and this has a one-week lifetime in the atmosphere before it precipitates as air and rain or as sulfur particles and causes acid rain or smog. (53).

13 – Environmental pollution and the phosphate fertilizer industry:

emissions of phosphorus compounds brought on by the production of phosphate fertilizers and phosphoric acid lead to the formation of acid rain, in which we have already shown the responsibility of using coal and oil products in the nitrogen industry as well(53). Also, The

synthesis of sulfur fertilizers produces sulfur gas, which is a key factor in the development of precipitation, which Fluorine is 5.4% of the element Fluorine – the acid. Fluorine, which naturally occurs in 3% of mineral phosphate rocks and pollutes the atmosphere, must be eliminated. Fluoride Some fluoride compounds are released in the acidic environment , the procedure. If such (Flousilicic (Acid) remains for the manufacture of phosphates and it is possible to exploit and sell the resulting acid, part of the fluorine remains in the acid (Liming) and we did not get rid of it. Phosphogypsum5 tons of phosphogypsum produced by the production process, 1 ton of. 4 Phosphogypsum is a material that turns phosphorus into phosphoric acid. Impure phosphogypsum is primarily composed of calcium sulfate, but it also contains fluorine, a few trace elements that are primarily found in soil, and aluminum. Radium decomposes phosphate rocks, which are arsenic, nickel, cadmium, lead, and radium .

The use of phosphogypsum consequently causes various environmental issues. If this fertilizer is thoroughly processed to exclude radon gas—rather than radium—this will undoubtedly raise the cost of manufacture. All living things are toxic when cadmium is present in high concentrations, and its removal from phosphate rock is currently a very expensive process, which is one of the factors influencing the production and use of this type of fertilizer in agricultural production. Therefore, there have been research efforts to look at the possibilities of using this substance for good while lessening its influence on the environment. In order to make oil shale clinker, it has also been combined with other minerals. Burning a mixture of it with oil shale cement was the focus of some research in Turkey, and this experiment led to positive results (54).

-Fertilizer manufacturing waste and environmental pollution:١٤

Phosphogypsum, fluorine compounds, and dust are all products of the production of phosphate fertilizers, and the issue of phosphogypsum and its effects on the environment has been addressed. While the production of sodium chloride salts from the synthesis of potassium fertilizers derived from mineral salts. Ammonia must be manufactured with chemical auxiliary materials, some of which need to be changed every few years because they contain oxides or are utilized for other purposes. recovered a variety of minerals in addition to other substances that needed to be recycled for the production of nitric acid utilizing sources of sulfur other than those commonly used in a rimstone that can sometimes be used because it is rich in mineral substances. Some cinders, brimstone sludges and other waste need special methods of disposal, and this includes disposal of liquid waste sludge, filter dust packages, scrubber wastes in treatment units, and scraped waste. Fertilizer plants (55) and empty chemical containers, filter bags, old filters Which are shut down due to financial or environmental concerns, or because they run out of raw materials in some phosphate and potassium mines. Restoration, cleaning, organizing the space, and garbage disposal are all major issues. An abundance of production is

not the only aspect of good industrial management . but it also covers the steps involved in the product's storage, transportation, and circulation, as well as how to deal with the waste generated during these processes. The environmental authorities must keep track of this because proper management of these operations may help keep the pollution caused by the fertilizer business below the allowable limits (53) .

15- Fertilizer industry energy and environmental pollution :

Energy production for any purpose is an important source of pollution. In the field of fertilizer manufacturers, the volume of energy consumption in 2003 amounted to about 141 million tons of oil. This figure constituted 1.45% of the total global consumption of primary energy. The nitrogen fertilizer industry consumed about 92% of the total energy consumed in the fertilizer industry, while the phosphate and potassium fertilizers consumed 4% each. The use of modern technologies in the manufacture of nitrogen fertilizers reduces the average specific consumption by no less than 37% of the total energy demand. The phosphate fertilizer industry can also contribute to energy generation, according to modern technologies, through the production of various acids.(48)

Conclusions:

the extensive, ongoing use of chemicals of any kind in agriculture, that is fertilizers, insecticides, etc., puts all living things at some level of risk. The excessive and disproportionate use of pesticides has damaged agricultural soil, and restoring it will require time and change. Even if we can't completely stop the negative impacts of chemical fertilizers right now, we can clearly lessen their influence by reducing their usage, encouraging using biological fertilizers. Biofertilizers won't minimize however, they will enhance soil quality in a variety of ways, including by maintaining soil microbial communities and nutrient cycles.

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