

ORGANIC FARMING: A NEW HOPE FOR PROTECTION FROM ADVERSE HEALTH EFFECTS OF EXPOSURE TO INORGANIC PESTICIDES AND FERTILIZERS

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ABSTRACT

There was a time when every scientific research had a large importance in society but ignoring its side effects. So some that types of invention are widely accepted which are not eco-friendly. The conventional farming i.e. the Inorganic farming is one of its example. Due to the use of inorganic pesticides and fertilizers some serious environmental problems are appeared. The fertilizers and pesticides used in this type of farming are very reactive. They form some hazardous substances by reacting among themselves. The deposition of such hazardous substance is very bad for the fertility of soil. Various cycles in soil such as nitrogen cycle, carbon cycle, and water cycle are affected. The pesticide and the fertilizers pollute the water bodies and ground water system. The most important worry due to the application of the inorganic fertilizers and pesticide is that some useful soil microorganism as the earthworm dies due to it. The best example if we put an earthworm in a beaker containing urea solution then it will die. So the application of the in inorganic fertilizers are also responsible for death of farmer friend earthworm. Some helping microorganism as Nitrogen fixing bacteria also die due to this type of Fertilizer. The gradual application of Fertilizer is responsible for the Some of those are water pollution, soil pollution, air pollution, ozone layer depletion, greenhouse effect etc. So now we have to think some different in our farming. Organic farming is such a type of farming, which has no side effect on water, soil or air. This method has effective production. In this method organic fertilizers and organic pesticides are used. Vermicomposting, green manure are the organic fertilizers. Organic/bio insecticides are formed from cow urine, tobacco leave extract, neem leave extracts. The most important point in those substances that those are eco- friendly and their production is easy and economic. So In a single sentence we can say "organic farming is the safe guard of soil"

KEYWORDS: Bio pesticides, contamination, Bio fertilizers Vermicompost, Green compost, Fertility, Phosphogypsum.

INTRODUCTION

Survival of the fittest is the law of this nature and man has proved itself as the most devolved and fittest organism in this earth. But during our adaption with the environment we also misbalanced the equilibrium of our environment. Global warming, greenhouse effect, ozone layer depletion are its results. These environmental problems are big problems for every nation of world and everybody are thinking for it but the problem is more for developing countries like India. We have to change our industrial thoughts along with the cultivation procedure as both are not eco friend.

From the earlier stages man is depending on trees for his food clothing and shelter. When civilization is created by man in the form of village and society trees were planted in planed manner, to which we call cultivation or farming. With the passing of time various researches are

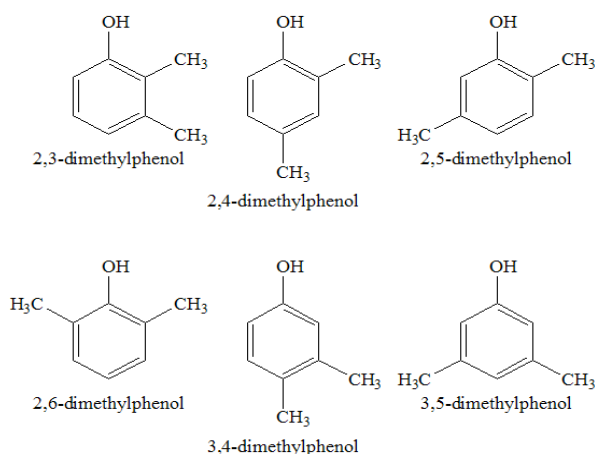
done on farming and the method of farming is changed or modified from day to day. Viewing the demand of the population, in our method of cultivation we had to set only one goal that is only the more and batter production. To improve the production we use pesticides (Pesticides are any substance or mixture of substances intended for preventing or destroying pests. The term applies to herbicides, fungicides and other substances used to control pests) and fertilizers (Fertilizers are made of nutrients, such as nitrogen and phosphorus.). The function of fertilizer is to improve the production by providing the soil artificial fertility only by increasing the nutrient present in the soil. The function of pesticide is to save our crops from pests and disease. Various chemicals are used as fertilizers and pesticides. This type of farming is known as inorganic farming. Viewing the demand of population this farming is easy looking and effective.

Draw Backs of Inorganic Farming

The fertilizers and pesticides used in this type of farming are very reactive. They form some hazardous substances by reacting among themselves. The deposition of such hazardous substance is very bad for the fertility of soil. Various cycles in soil such as nitrogen cycle, carbon cycle, and water cycle are affected. The pesticide and the fertilizers pollute the water bodies and ground water system. The most important worry due to the application of the inorganic fertilizers and pesticide is that some useful soil microorganism as the earthworm die due to it. The best example if we put an earthworm in a baker containing urea solution then it will die. So the application of the in inorganic fertilizers are also responsible for death of farmer friend earthworm. Some helping microorganism as Nitrogen fixing bacteria also die due to this type of Fertilizer. The gradual application of Fertilizer is responsible for the acidity of the soil and also responsible for the decrease of fertility of the soil. If we will not use fertilizer in a land where fertilizer was used before then the crop yield will be very low. It is not possible for Govt. to give subsidy all time on fertilizers most importantly the soil management in inorganic farming is not effective or not an ideal one.

Reactivity of Inorganic Fertilizers and Pesticides

Nitrogen (N), phosphorus (P), and potassium (K) are the primary major nutrients required for plant growth and are the main components of most fertilizers. These chemicals are, energy intensive to use create vast amounts of waste, and contribute to greenhouse gas emissions. Producing one unit of N requires 1.4 units of carbon and 3 units of carbon are required to manufacture, transport and apply 1 unit of P as P₂O₅ fertilizer. For every ton of phosphoric acid produced, five tons of phosphogypsum are generated. Over the past 50 years, more than 700 million metric tons of phosphogypsum have accumulated in Florida alone, huge stacks at times covering more than 300 hectares at more than 60 meters high with settling ponds that threaten local water sources. The production of nitric acid, the primary feedstock for synthetic commercial fertilizer, is also a source of nitrous oxide, a greenhouse gas 310 times more potent than carbon dioxide, and accounted for 15.9 Tg CO₂e in 2005, the equivalent emissions of 2.9 million vehicles.



Molecular formula of some pesticides

The environmental impact of pesticides is often greater than what is intended by those who use them. Over 98% of sprayed insecticides and 95% of herbicides reach a destination other than their target species, including no target species, air, water, bottom sediments, and food. Though there can be benefits using pesticides, inappropriate use can counterproductively increase pest resistance and kill the natural enemies of pests. Many users are inadequately informed about potential short and long-term risks, and the necessary precautions in the correct application of such toxic chemicals are not always made. Pesticides can contaminate unintended land and water when they are sprayed aerially or allowed to run off fields, or when they escape from production sites and storage tanks or are inappropriately discarded.

Chemical's properties:- Its propensity for binding to soil, its vapour pressure, its water solubility, and its resistance to being broken down over time. Factors in the soil, such as its texture, its ability to retain water, and the amount of organic matter contained in it, also affect the amount of pesticide that will leave the area. Some pesticides contribute to global warming and the depletion of the ozone layer.

Effects on Soil Fertility

Many of the chemicals used in pesticides are persistent, soil contaminants whose impact may endure for decades and adversely affect soil conservation. The use of pesticides decreases the general biodiversity in the soil. Not using the chemicals results in higher soil quality, with the additional effect that more organic matter in the soil allows for higher water retention. This helps increase yields for farms in drought years, when organic farms have had yields 20-40% higher than their conventional counterparts. A smaller content of organic matter in the soil increases the amount of pesticide that will leave the area of application, because organic matter binds to and helps break down pesticides.

Degradation and sorption are both factors which influence the persistence of pesticides in soil. Depending on the chemical nature of the pesticide, such processes control directly the transportation from soil to water, and in turn to air and our food. Breaking down organic substances, degradation, involves interactions among microorganisms in the soil. Sorption affects bioaccumulation of pesticides which are dependent on organic matter in the soil. Weak organic acids have been shown to be weakly absorbed by soil, because of pH and mostly acidic structure. Absorbed chemicals have been shown to be less accessible to microorganisms. Aging mechanisms are poorly understood but as residence times in soil increase, pesticide residues become more resistant to degradation and extraction as they lose biological activity.

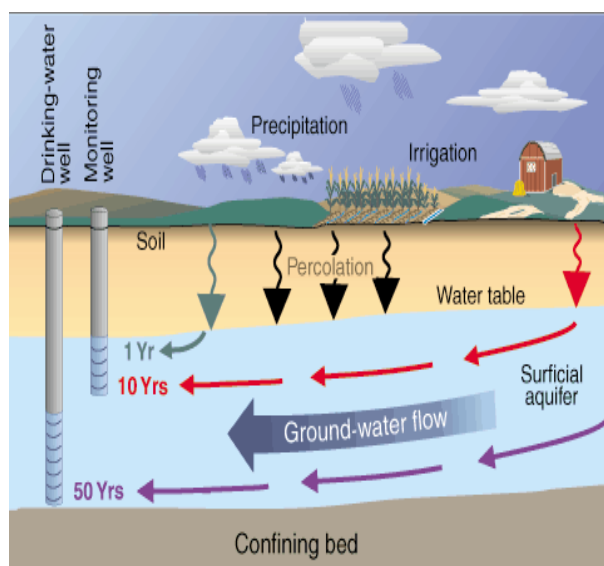
Effect on Air

Pesticides can contribute to air pollution. Pesticide drift occurs when pesticides suspended in the air as particles are carried by wind to other areas, potentially contaminating them. Pesticides that are applied to crops can volatilize and may be blown by winds into nearby areas, potentially posing a threat to wildlife. Weather conditions at the time of application as well as temperature and relative humidity change the spread of the pesticide in the air. As wind velocity increases so does the spray drift and exposure. Low relative humidity and high temperature result in more spray evaporating. The amount of inhalable pesticides in the outdoor environment is therefore often dependent on the season.

Pesticides that are sprayed on to fields and used to fumigate soil can give off chemicals called volatile organic compounds, which can react with other chemicals and form a pollutant called tropospheric ozone. Pesticide use accounts for about 6 percent of total tropospheric ozone levels.

Effect on Flowing Water

There are three water quality concerns associated with different forms of nitrogen. First, the combined concentrations of nitrate (NO₃) plus nitrite (NO₂) in excess of 10 mgNL can contribute to methemoglobinemia ("blue baby syndrome") in infants if ingested.^[1] To guard against this, the U.S. Public Health Service limits nitrate plus nitrite concentration in public drinking water supplies to 10mgNL. Secondly, unionized ammonia (NH₃) may be toxic to fish at concentrations as low as 0.02mgNL. Finally, elevated total nitrogen concentrations (including nitrate, ammonia, and organic forms) in rivers can promote the process of cultural eutrophication in coastal waters, whereby increased production and decomposition of algae, leads to reduced oxygen concentrations. This, in turn, may reduce the abundance and diversity of marine life and may promote the outbreak of nuisance algae.



Effect on Ground Water System

Another large problem due to the use of pesticides and fertilizer is ground water pollution. Non-point pollution caused by fertilizers and pesticides used in agriculture, often dispersed over large areas, is a great threat to fresh groundwater ecosystems. Intensive use of chemical fertilizers in farms and indiscriminate disposal of human and animal waste on land result in leaching of the residual nitrate causing high nitrate concentrations in groundwater. Nitrate concentration is above the permissible level of 45 ppm in 11 states, covering 95 districts and two blocks of Delhi. DDT, BHC, carbamate, Endosulfan, etc. are the most common pesticides used in India. But, the vulnerability of groundwater to pesticide and fertilizer pollution is governed by soil texture, pattern of fertilizer and pesticide use, their degradation products, and total organic matter in the soil.

National importance is a subject of ground water now days it is used for drinking, domestic water by 70 percent of the nation's population and domestic purpose which being further contaminated. Whose especially concern people lives in the agriculture area where pesticides are being used, about 99 percent of the population relies upon ground water for drinking purpose. At 1970s, soil acts as a protective filter to stopped pesticides from reaching ground water but the pesticides percent has increased day by day and studies has change now.

Effect on Human Health

There are numerous ways to enter the pesticides in living organism like through dust, inhalation of aerosols and vapor which contains through oral exposure. There are various ways to exposure of pesticides one is direct contact and seconds is indirect contact, consuming food, water and through dermal exposure comes under direct way whereas sprayed onto food, especially fruits and vegetables are under indirect ways. Drinking water ends up its quality due to secrete into soils and groundwater as well as secretion of pesticides slowly pollute the air. Those pesticides which are direct contact with the chemicals which very harmful for living organism

The effects of pesticides on human health are more harmful based on the toxicity of the chemical and the length and magnitude of exposure. Farm workers and their families experience the greatest exposure to agricultural pesticides through direct contact with the chemicals. But every human contains a percentage of pesticides found in fat samples in their body. Children under the age of six months are more apt to experience exposure from breast milk and inhalation of small particles. Pesticides may be absorbed through dermal contact, ingestion, and inhalation. Pesticides tracked into the home from family members increase the risk of toxic pesticide exposure which is normally area specific. Also, toxic residue in food may contribute to a child's exposure to a certain pesticide. The chemicals can bioaccumulation in the body over time. Children may be exposed due to their closer proximity to the floor and

natural tendency to put contaminated objects in their mouth, and also because children tend to spend more time at home in a potentially contaminated environment. Hand to mouth contact will be dependent on the age of the child, much like lead exposure, typically from dust within the home.

These are the causes which force us to think substitute in farming.

Organic Farming



Figure: organic farm.

Organic agriculture is a production system that sustains the health of soils, ecosystem and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved.

Methods of Organic Farming

Organic farming is the farming where the objective is to produce better crop without the application of chemical fertilizer and also to save it from pests without the application of chemical pesticides. Actually in this type of farming bio fertilizer/organic fertilizer and bio pesticide/organic pesticides are used

The total procedure can be divided in to two steps-

1. Use of organic fertilizer.
2. Use of organic pesticides

The most important thing in the organic farming is that the bio fertilizers and bio pesticide are produced from easily available organic substances which are around us, by simple biodegradation.

Organic Fertilizers:- These are the different of organic fertilizers

Vermicompost

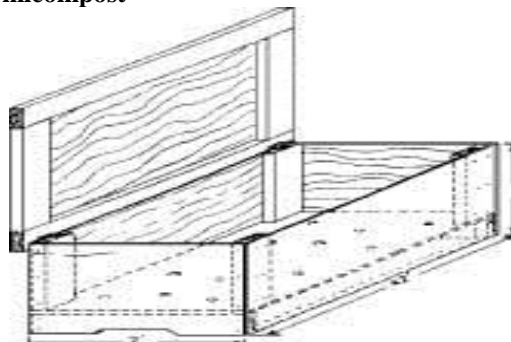


Figure of a worm bin (vermicompost tank).

It is the compost which is prepared in the presence earthworm. Viewing the economical feature and ecological affect and other benefits we can say, it is the best compost. After the collection of compost if the earthworms are put in to a hard soil they can make the soil soft.

Many gardeners compost both yard waste and kitchen waste with compost piles, sheet composting or some other method during the growing season. Fortunately, very little yard waste is generated during winter months when cold temperatures make composting difficult. However, usable kitchen waste is constantly being generated and must be disposed of. Vermicomposting is the process of using worms and micro-organisms to turn kitchen waste into black, earthy- smelling, nutrient- rich humus.



Figure: vermicompost and composting worm.

Given the right environment, the worms will go to work to digest the kitchen scraps and bedding faster than any other compost method. The material will pass through the worms' bodies and become "castings." In about 3-4 months, the worms will have digested nearly all the garbage and bedding and the bin will be filled with a rich, black natural fertilizer and soil amendment. Compared to ordinary soil, the worm castings contain five times more nitrogen, seven times more phosphorus and 11 times more potassium. They are rich in humic acids and improve the structure of the soil.

To keep your bin going, you will need to remove the castings from time to time and there are several ways to go about it. One way to do this is to shine a bright light into the bin. The worms are sensitive to light and will move to the lower layers of the bin. Remove the top

layer of casting by using your hands or a sieve. Each time you remove some bedding, the worms will be exposed to the light and they will keep migrating down to the bottom of the bin. Pick out any wigglers or worm eggs (small, opaque cocoons) and return them to the bin. Refill the bin with fresh layers of moist bedding and food. Another method of harvesting composts is to push the black, decomposed material to one side of the bin, and fill the other side with new, moist bedding and kitchen scraps. Then wait several days. The worms will migrate to the freshly filled side of the bin and you can just scoop out the finished compost. Make sure you pick out any wigglers or worm eggs and return them to the bin.

Cow Dung Compost

It is the traditional compost. In this composting processes cow dung is kept on soil. Some other waste materials such as straw, reject food, reject vegetable are also put in to it. After 6 to 8 months it becomes excellent manure. Its nutrient label is very high. It is popularly used by our farmers in rice farming and also in vegetable farming. It has no side effect on soil and due to the availability of cow dung it can play an excellent role in our farming

Green Manure

In agriculture, green manure is a type of cover crop grown primarily to add nutrients and organic matter to the soil. green manure is not something that the farmer shall keep as a valuable item. It is kept only for a fixed time period after which the plants enacting as green manure is ploughed back into the soil. Yes, it kills that plant but is beneficial for the other important crops that feeds our stomach.

Leguminous plants such as clover and pulses fix the atmospheric nitrogen into nitrates and phosphates so that plants can use them without any difficulty or without much wastage of energy. Green manures increase the percentage of organic matter in the soil, thereby improving the capacity of the soil to retain water and make it more porous so that it can afford more of oxygen for the plants to survive

Advantages of Green Manuring

Improves soil fertility.

Supplies a part of nutrient requirement of crops.

Adds fresh matter to the soil largely for supplying the nutrient contained in the biomass.

This can be either grown in sites and incorporated or grown elsewhere and brought in for incorporation in the field to be manured.

Leguminous plants are largely used as green manure due to their nitrogen fixing capacity. Some non-leguminous plants are also used for features like local availability, drought tolerance, quick growth and adaptation to adverse conditions.

Organic Pesticides:- These are the methods of preparing organic pesticides

Step 1: Combine 1 teaspoon baking soda and 1/3 cup vegetable oil in a bottle or jar with a secure lid, and shake vigorously until the mixture is blended. Label the container "organic pesticide concentrate."

Step 2: Put 2 teaspoons of this mixture in a clean spray bottle, add 1 cup of water and shake until combined.

Step 3: Spray the plants you want to protect. This solution kills aphids, white flies and spider mites. Organic Pest Repellent

Step 1: Dissolve 1 cup of grated solid castile soap in a bowl with 1 cup of boiling water. Set aside until cool enough to handle. (See References 2, page 4)

Step 2: Pour 2 cups of boiling water into a glass blender pitcher and add 1 cup of chopped tobacco leaves. Let the mixture steep for about 10 minutes. (See References 2, page 4)

Step 3: Add one whole peeled garlic bulb and 1 cup chopped tansy to the pitcher. Blend on medium speed until the mixture has a smooth, uniform consistency. (See References 2, page 4)

Step 4: Strain the mixture through cheesecloth or a fine-mesh strainer into the soap mixture, and stir to combine. Set the contents of the strainer aside for your compost pile.

Step 5: Funnel the liquid into a spray bottle, and for three days in row -- at sunrise and sunset -- spray the liquid on the plants you wish to protect. Spray insects directly if possible. This solution repels rather than kills, so bugs may return. Reapply as needed. (See References 2, page 4)

Benefits of Organic Farming

Benefits to Soil

Improves its physical structure Enriches soil with micro-organisms (adding enzymes such as phosphatase and cellulase).

Microbial activity in worm castings is 10 to 20 times higher than in the soil and organic matter that the worm ingests.

Benefits to Plant growth

Enhances germination, plant growth, and crop yield Improves root growth and structure.

Enriches soil with micro-organisms (adding plant hormones such as auxins and gibberlic acid)

Benefits to Environment

Helps to close the "metabolic gap" through recycling waste on-site Large systems often use temperature control and mechanized harvesting, however other equipment is relatively simple and does not wear out quickly.

Production reduces greenhouse gas emissions such as methane and nitric oxide.

Employment

Organic methods often require more labor than traditional farming, therefore it provides rural jobs.

Economic view

The economics of organic farming, a subfield of agricultural economic encompasses the entire process and effects of organic farming in terms of human society; including social costs opportunity costs unintended consequences, information asymmetries and economies scale. Although the scope of economics is broad, agricultural economics tends to focus on maximizing yields and efficiency at the farm level. Economics takes an anthropocentric approach to the value of the natural world: biodiversity from the above analytical study organic farming will stand as a permanent soil to various problems related to soil. And the nature development in farming that is the organic farming will decrease the water pollution also by which soil pollution possibility by polluted water will be minimum. Organic farming is running successfully in and outside the country and it's the real time to increase the area of organically cultivated lands, otherwise it will be too late.

Some entities such as the European union subsidize organic farming, in large part because these countries want to account for the externalities of reduced water use, reduced water contamination, reduced soil erosion, reduced carbon emissions, increased biodiversity, and assorted other benefits that result from organic farming.

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News

Janofsky, M (August 4, 2006) New York Times. Retrieved 2006-08-24.

Janofsky, M (2006-08-02) New York Times. Retrieved 2007-10-10.

COCLUSION

From the above analytical study organic farming will stand as a permanent soil to Various problems related to soil. And the nature development in farming that is the organic farming will decrease the water pollution also by which soil pollution possibility by polluted water will be minimum. Organic farming is running successfully in and outside the country and it's the real time to increase the area of organically cultivated lands, otherwise it will be too late.

REFERENCE

1. Greene, Stanley A.; Pohanish, Richard P. (editors) Sittig's Handbook of Pesticides and Agricultural Chemicals. SciTech Publishing, Inc, 2005.
2. Tomlin, Clive (editor) "The Pesticide Manual", 14th edition, 1350 pages. British Crop Protection Council (BCPC), 2006.
3. Hamilton, Denis; Crossley, Stephen (editors) Pesticide residues in food and drinking water. J. Wiley. Hond, Frank et al. (2003). Pesticides, 2004,
4. Skipton, S.; Hay, D. Drinking Water: Nitrate and Methemoglobinemia ("Blue Baby" Syndrome); Publication G98-1369; University of Nebraska Cooperative Extension: Lincoln, NE, 1998, g1369.htm (accessed Feb), 2002.
5. National Research Council. Clean Coastal Waters: Understanding and Reducing the Effects of Nutrient Pollution; National Academy Press: Washington, D.C., USA, 2000.
6. Smil, V. Enriching the Earth: Fritz Haber, Carl Bosch and the Transformation of World Food Production; MIT Press: Cambridge, MA, USA, 2001.
7. Romkens, M.J.M.; Nelson, D.W.; Mannering, J.V. Nitrogen and Phosphorus Composition of Surface Runoff as Affected by Tillage Method. J. Environ. Qual, 1973; 2(2): 292–295.
8. Steinheimer, T.R.; Scoggin, D.K.; Kramer, L.A. Agricultural Chemical Movement Through a Field-Size Watershed in Iowa: Subsurface Hydrology and Distribution of Nitrate in Groundwater. Environ. Sci. Technol, 1998; 32: 1039–1047.
9. Walter A. Alarcon, et al. (July). "Acute Illnesses Associated With Pesticide Exposure at Schools". Journal of the American Medical Association, 2005; 294(4): 455–465.