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Effect of Pesticide Pollution on Environment and Human Health

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Abstract: Less than 0.1% pesticides applied for pest control reach to their target pest Thus, more than 99.9% pesticides used to move into environment where they adversely affect public health and beneficial biota, and contaminated soil water and the atmosphere of the ecosystem.

In this study we concern about the environment impact of repeated pesticide use has prompted research into the environmental fate of these agents which can emigrated field to air, other land water bodies. How long the pesticidal remain in the soil depends an how strangely it is bound by soil components and how readily it is degraded.

It also depends upon the environmental condition at the time of application e.g. Soil water content pesticides use must ensure public safety and environment protection with both the chemical itself and their potentially harmful metabolites. This paper reviews what is known of the influence of the physical and chemical characteristic of the soil system, such as moisture content organic and absorption of and degradation of pesticides and their access to groundwater and surface water. Thus new tools or technique with greater reliability than those already existing are needed to predict the potential hazardous effect of pesticides and thus contribute to reduction the adverse effect on human health and the environment.

Key word *:-contamination, degradation, pesticides, formulation risk assessment.*

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I. Introduction :-

Land and water pollution is any physical and chemical change in land or water which adversely affect the growth of plant and other organism and directly or indirectly become a health hazardous to mankind. The various pollutant originating from different source enter the arable land (soil) or accumulated on land surface. After reaching the soil these toxic pollutant affect the biotic component of soil system in various ways.

To prevent or reduce losses by pests pesticides and herbicides are widely used in most sectors of the agricultural production and thus can improve yield as well as quality of the product which is to be grown, even in terms of cosmetic appeal, which is often important to consumers. It put adverse effect on the product but pesticides can also improve the nutritional value of food and sometimes its safety. Pesticides can be considered as an economic, labor-saving, and efficient tool of pest management with great popularity in most sectors of the agricultural production. There are also many other kinds of benefits that may be attributed to pesticides, but these benefits often go unnoticed by the general public. Thus, from this point of view, These include the funigicides, bactericides, inseclicides and nematicides, beside these herbicides (weed killer) are also use to eradicated weed from crop field among insecticides, chlorinated hydrocarbon like aldrin, lindane, taxophene, heptachlor, DDT, DDE, DDD etc are persistent nature do not break down easily are fat soluble and accumulate in fatty tissue of animal. DDT may persist for 10 or even more year in soil. Which make the natural water resources contaminated with hazardous chemical.

To minimize risk to human health, biodiversity and the environment , pesticides have been developed to function with reasonable certainty the published results are not always in agreement with this fact. in reality, we never know whether a pesticide is safe under all circumstances or not, Even though the development of toxicity reference levels for pesticides incorporates uncertainty factors that serve to achieve this regulatory standard, nor can we predict with certainty its performance in hypothetical situations. Scientific investigation is bound by the tools and the techniques that are absorption on soil colloids, the weather condition prevailing after application, and how long the pesticides persist in nature and enter in the tropic level of environment.

Despite their popularity and extensive use, pesticides serious concerns about health risks arising form the exposure of farmers when mixing and applying pesticides or working in treated field and from residues on food and in drinking water for the general population have been raised. These activities have caused a number of accidental poisoning, and even the routine use of pesticides can pose major health risks to farmers both in the short and the long run and can degrade the environment. In developing countries, farmers face great risks of exposure due to the use of toxic chemicals that are banned or restricted in other countries, incorrect application techniques, poorly maintained or totally inappropriate

spraying equipment, inadequate storage practices, and often the reuse of old pesticide containers for food and water storage. Obviously, exposure to pesticides poses a continuous health hazard, especially in the agricultural working environment. By their very nature most pesticides show a high degree of toxicity because they are designed to kill certain organisms and thus create some risk of harm. Within this context, pesticide use has raised serious concerns not only of potential effects on human health, but also about impacts on wildlife and sensitive ecosystems. Often, pesticide applications prove counterproductive because they kill beneficial species such as nature enemies of pests and increase the chances of development of pest resistance to pesticides. Furthermore, many end users have poor knowledge of the risks associated to the use of pesticides, including the essential role of the correct application and the necessary precautions. Even farmers who are well aware of the harmful effects of pesticides are sometimes unable to translate this awareness into their practices.

II. Pesticides affecting human health

Pesticides are either applied directly to the soil or standing crop plant in different ways and in different form. They are applied to leaves, flower fruits. The pesticides applied to standing crop reach the soil after being washed down either by rain or irrigation water. Although insecticides could reduce the diseases caused by insect pest, they have an adverse effect on other forms of life. Besides killing the target the chemical also kill the range of useful microorganism. Some pesticides as DDT, chlorolane, aldrin the heptachlor seems to be carcinogenic in human.

Pesticides residues are present in the body of most humans. It is largely because our food sources are affected by pesticides. The concentration of the pesticide is our food at a safer level is called tolerance level which differ from pesticide to pesticide.

Risk assessment of pesticide impact on human health is not an easy and particularly accurate process because of differences in the periods and the levels of exposure, type of pesticides (regarding toxicity), mixtures or cocktails used in the field, and the geographic and meteorological characterstics of the agricultural areas where pesticides are applied. Such difference refer mainly to the people who prepare the mixture in the field, the pesticide sprayers, and also the population that lives near near the sprayed areas, pesticide storage facilities, greenhouses, or open fields. Therefore, considering that human health risk is a function of pesticide toxicity and exposure, a greater risk is expected to arise from high exposure to a moderately toxic pesticide than from little exposure to a highly toxic pesticide. However, whether or not dietary exposure of the general population to pesticide residues pesticide. However, whether or not dietary exposure of the general population to pesticide residues found on food and drinking water consists of a potential threat to human health, is still the subject of great scientific controversy.

Concerns about impacts of pesticide use on human health and the environment led the EU to develop a ‘Thematic Strategy on Sustainable Use of Pesticides’. Moreover, agricultural scientists started to develop alternative crop management systems to minimize the negative effects of farming (based mainly on pesticide use for crop protection) to the environment and to human health. In particular, the integrated Crop Management (ICM) includes guidelines to be used by the farmer unions to enforce actions for production of safe agricultural product with simultaneous respect to the environment. In addition, ICM includes measures for implementation of good agricultural practices (GAP), the safety and hygiene of workers, the safety of the product, the full traceability of the measurements, and specific actions for the preservation of the environment. For the control of pests, ICM encourages the use of complementary methods of pest management (such as crop resistance against incsects and fungi, biological control, and other cultural or physical measures) to reduce the animal pest or weed population below its economic injury level and to minimize pesticide impacts on other components of the agro-ecosystem. Concerning pesticide use, ICM allows pesticide use only through an Integrated Pest Management (IPM) program, where certain criteria are used for pesticides selection, specific instructions are followed for their application on crops, and residue analysis is used as one of the tools for enforcement. Pesticides that are selected for use in IPM are: (1) biologically effective (high selectivity, fast impact, optimal residual effect, good plant tolerance, low risk of resistance), (2) user friendly (low acute toxicity and low chronic toxicity, optimum formulation, safe packaging, easy application method, long store stability), (3) environmentally friendly/compatible (low toxicity to non-target organisms, fast degradation in the environment, low mobility in the soil, no residues in food and fodder above the MRLs, low application rate), (4) economically viable/profitable (good cost/profit ratio for the farmer, broad spectrum of activity, applicable in IPM, innovative product characteristics, competitive, patentable). Specific instruction that are followed during pesticide application on crops include (1) the use of pesticide at the recommended dose when a pest is found or a precautionary treatment thought necessary, (2) the optimization of pesticide use for economic saving through adjusted doses according to pest population density, and (3) the minimization of pesticide need by altering the cultivation system to lower the risk of pests. Regarding the analysis of the amount of active ingredient applied or the money spent on pesticides, these variable

should be used only as a first approximation, because the dosage of active ingredients is not closely related to environmental activity, while environmental friendly and innovative compounds are often more expensive than obsolete, hazardous ones. All the previously mentioned indicate clearly that the introduction of IPM system would contribute to a significant reduction of the pesticide impact on human health and environment the environment without affecting crop productivity or increasing the probability of crop losses.

A part from the already mentioned above, chemical crop protection has been changed tremendously over the last years, not only in the development of new active ingredients, but also in the assessment of the behavior of these chemicals in the environment, the residues in crop plants, and of their potential toxicity to humans and the environment this is attributed to the great scientific progress in many disciplines such as chemistry, biology, and molecular biology which has improved considerably the way of searching for new agrochemicals and the re-assessment of safety for the already used pesticides. Thus, new agrochemicals with novel modes of action and improved safety profiles are now a reality. Moreover, these new agrochemicals in combination with the appropriate measure taken for safer and more effective pesticide application make the chemical crop protection as one of the most well-established technologies in agriculture which seems that it will continue to play an important role in the agribusiness in spite of the rapid emergence of novel biotechnological solution

III. Pesticide affecting the Environment

Alteration in both pysico-chemical (abiotic) and biological (biotic) component of biosphere by mankind resulting in environment degradation world over. Major environmental problem are in fact the manifestation of degradable environment at global level. These problem include air and water pollution, loss of biodiversity and wildlife, carbon emission ozone layer deputation, global warming and climate change.

Herbicides and pesticides, put adverse effects on the environment in addition to their potential negative effects on human health also (water, soil and air contamination, toxic effects on non-target organisms). In particular, inappropriate use of pesticides has been linked with: (1) non-target organism adversly effected (e.g., populations of beneficial species may reducted), (2) From mobile pesticides or from pesticide drift, water is contaminated (3) air pollution form volatile pesticides, (4) injury on non-target plants from herbicide drift, (5) injury to rotational crops from herbicide residues remained in the field, (6) crop injury due to high application rates, wrong application timing or unfavorable environmental conditions at and after pesticide application.

There are various hazardous effects of pesticides on the environment depend on the interactions between the physicochemical properties (vapor pressure, stability, solubility, p/Ka) of the pesticide and herbicides, soil adsorption and soil persistence, the soil factors (pH, organic components, inorganic surfaces, soil moisture, soil micro flora, soil fauna), the plant species, and the climatic variation. Also, the toxicity, the dosage applied, the weather conditions prevailing after the pesticide application, and how long the pesticide persists in the environment could account for its adverse effects on the environment. Soil factors and weather conditions have long been recognized as the most important factors that affect the fate of the pesticide in the environment and consequently the activity, selectivity, and adverse effects on the environment. Unfortunately, since these factors vary from site to site and from year to year, the results from any field study on the fate and behavior of the pesticide are specific for one particular location and season. Therefore, for the environmental risk assessment, the behavior and the fate of a pesticide are initially assessed by the calculation of the predicted environmental concentration (PEC), which in the United States is referred to as estimated environmental concentration (EEC). These concentration are calculated for soil, water sediment, and air, and the validation is performed by comparison with the data obtained from the three levels of tests (needed for approval-registration purposes) to assess the pesticide toxicity on key non-target organisms. Also, the toxicity exposure ration (TER) is also calculated to determine whether the risk to the organism is acceptable or not.

As we know that the agricultural soil is the primary recipient of pesticides herbicides and other chemical, the natural water bodies that are adjacent to irrigational and agricultural areas are usually the ultimate recipient for pesticide residue which contaminate the water bodies with hazardous chemicals – and also on terrestrial and aquatic organisms when addressing potential adverse effects of pesticides on the environment.

IV. Negative Impact of Pesticides

The adverse effects of pesticides on the environment on human health and environment now days it appears that people have become increasingly concerned about pesticide use and particularly about their impacts on human health and environmental quality. These increased concerns resulted mainly from reduced trust in the agricultural and industrial methods of production as well as on the authority's regulations aimed at protecting both the environment and human health. Therefore, considering the existence of several uncertainties in the evaluation of

pesticide safety, scientific data, policy guidelines, and professional judgment must be incorporated when estimating whether a pesticide can be used beneficially within the limits of an acceptable risk.

The probability of reducing the environmental risk associated with the pesticide use is very low because the producers believe that lowering risk implies either decreased output on increased input resulting by the substitution for the pesticide inputs. Thus, policies aiming at reducing the risks associated with the use of pesticides will impose costs on the agricultural community, which in turn has implications for agricultural commodity prices. This has been confirmed by the cost-function-based production model used by Paul et al, which indicated that substantive costs would be imposed on the agricultural sector by the requirements of reduce environmental risk deriving from a given level of agricultural output, and implies induced innovation to augment pesticide quality associated with increased cost.

V. Conclusion

Pesticides are widely used in agricultural production to prevent or control pests, diseases, weeds, and other plant pathogens in an effort to reduce or eliminate yield losses and maintain high product quality, although pesticides are developed through very strict regulation processes to function with reasonable certainty and minimal impact on human health and the environment, serious concerns have been raised about health risk resulting from occupational exposure and from residues in food and drinking water. Occupational exposure to pesticides often occurs in the case of agricultural workers in open field and greenhouses, workers in the pesticide industry, and exterminators of house pests. Exposure of the general population to pesticides occurs primarily through eating food and drinking water contaminated with pesticide residues, whereas substantial exposure can also occur in or around the home. Reading the adverse effects on the environment (water, soil and air contamination form leaching, runoff, and spray drift, as well as the detrimental effects on wildlife, fish plants, and other non-target organisms), many of these effects depend on the toxicity of the pesticide the measures take during its application, the dosage applied, the played a key role in providing reliable supplies of agricultural produce at prices affordable to consumers, improving the quality of produce, and ensuring high profits to farmers. Although pesticides are developed to function with reasonable certainty ad minimal risk to human health and the environment, many studies have raised concerns about health risks from exposure of farmers (or other end-users of pesticides) and from non-occupational exposure of the population to residues found on food and drinking water. Several indicators have been used to assess the potential residues found on food and drinking water several indicators have been used to assess the potential risk of pesticides to human health and the environment. However, their use indicatd reduced certainty, suggesting the need for development of alternative indicators that should increase the accuracy and reliability of pesticide risk assessment and thus contricute to reduction of the possible adverse effects of pesticides on human health and the environment.

The development of new pesticides with novel modes of action and improved safety profiles and the implementation of alternative cropping systems that are less dependent on pesticides could minimize exposure to pesticides and the undesirable effects of exposure on human health. Moreover the use of appropriate and well-maintained spraying equipment along with taking all the precautions required in all stages of pesticide handling could also reduce exposure to pesticides. The overall optimization of pesticide handling strictly according to the regulations and also considering the public concerns about pesticide residues in food and drinking water could contribute to reduction of the adverse effects of pesticides on human health and environment all these may sound difficult, but seen to be promising way for sufficient supply of safe food production within viable agricultural production system.

Adsorption on soil colloids, the weather conditions prevailing after application, and how long the pesticide persists in the environment. Therefore, the risk assessment of the impact of pesticides either on human health or on the environment is not an easy and particularly accurate process because of differences in the periods and levels of exposure, the types of pesticides used (regarding toxicity and persistence), and the environmental characteristics of the areas where pesticides are usually applied. Also, the number of the criteria used and the method of their implementation to assess the adverse effects of pesticides on human health could affect risk assessment and would possibly affect the characterization of the already approved pesticides and the approval of the new compounds in the near future. Thus, new tools or techniques with greater reliability than those already existing are needed to predict the potential hazards of pesticides and thus contribute to reduction of the adverse effects on human health and the environment. On the other hand, the implementation of alternative cropping systems that are less depended on pesticides, the development of new pesticides with novel modes of action and improved safety profiles and the improvement of the already used pesticide formulations towards safer formulations (e.g., microcapsule suspensions) could reduce the adverse effects of farming and particularly the toxic effects of pesticides. In addition, the use of appropriate and well-maintained spraying equipment along with taking all precautions that are required in all stages of pesticide handling could

minimize human exposure to pesticides and their potential adverse effected on the environment.

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