

Pesticides Use in Nepal and its Effects on Human Health – A Review

Sagar GC* and Jyoti Neupane

Department of Plant Pathology, Agriculture and Forestry University, Nepal

*Corresponding Author: Sagar GC, Department of Plant Pathology, Agriculture and Forestry University, Nepal.

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Abstract

To meet the increasing demand of food, there need to be increase in the agriculture productivity. This can be achieved by using climate smart agriculture practices. Among many factors (sowing time, fertilizers, irrigation, improved crop varieties, pests etc.) affecting crop productivity the attack of pests can reduce crop yield significantly. This can be overcome using pest's specific pesticides. Pesticide is a toxic chemical substance that works by attracting, seducing and then killing the pests. The use of pesticides is increasing at the rate of 10-20% per year in Nepal with average use of 396 g/ha but in case of vegetables it is much higher, 1600g/ha in area with commercial vegetable production. There is a five-fold increase in pesticides import from 132 tons in 2007-08 to 635 tons in 2017-18. There are 3034 trade names and 169 pesticides registered in Nepal. Ninety percent of the pesticides used in Nepal are purchased from India. The pesticide used daily in agricultural farms if inhaled or eaten with food can cause significant human health hazard. Effect of pesticide on human may be acute or delayed depending upon how much the person is exposed to pesticides and lead to acute health problems like allergy, skin irritation, dizziness, lethargy, swelling of the body etc. Long term exposure may lead to serious health problems like Leukemia, neurological problems, skin cancer, fetal deaths, birth defects etc. Adverse effect of pesticide has been found more in pregnant women, with 5-9% increase in adverse birth outcomes, 13 grams decrease in birth weight of a child with gestational length, preterm birth and birth abnormalities.

Keywords: Human Health; Nepal;

Introduction

Rapid growth of population demands significant increase of food production to offset human needs. The UN Sustainable Development Goal (SDG) 2 commits "End hunger, achieve food security and improved nutrition and promote sustainable agriculture", whereas Target 2.3 states "by 2030 double the agricultural productivity and the incomes of small-scale food producers" and Target 2.4 "by 2030 ensure sustainable food production systems and implement resilient agricultural practices that progressively improve land and soil quality".

To meet the increasing demand of food and the targets of SDG 2, there is immediate need to increase food production. Among many factors like sowing time, fertilizers, irrigation, improved crop vari-

eties, pests etc. affecting agriculture productivity attack of insects and pests is very common, requiring regular use of pesticides. In Nepal over 900 pesticides are used on different crops and soil treatment [1,2]. The pests are invasive and if not controlled can damage the crops productivity significantly. A pesticide is a toxic chemical substance or a mixture of substances or biological agents that are intentionally released into the environment in order to avert, deter, control and/or kill and destroy populations of insects, weeds, rodents, fungi or other harmful pests. Pesticides work by attracting, seducing and then destroying or mitigating the pests [3]. All the herbicides, insecticides, nematicide, piscicide, rodenticide, avicide, fungicide, bactericide, insect repellent, animal repellent and antimicrobial are included under pesticides [4].

Current pesticide use status in Nepal

People from Nepal were practicing organic farming till 1950 before the introduction of Dichloro Diphenyl Trichloro Ethane (DDT) for the eradication of Malaria. The major pesticides used in Nepal are organochlorines (such as Benzene Hexachloride (BHC), dieldrin, chlordane), organophosphates (like ethyl parathion, methyl parathion, malathion, and oxydemeton methyl), carbamates and some synthetic pyrethroids [5]. With the Nepalese farmers heading towards commercialization, the use of pesticides in the farmer's field is also increasing rapidly. Pesticide use in agriculture farms in Nepal has become highly prevalent with the rate of pesticide use increasing about 10-20% each year [6]. The average use of pesticide was 142g/ha [7] which is now increased to 396 g/ha, however a much higher rate (1600 g/ha) is used in commercial vegetable production like Sarlahi, Kavre, Tistung, Palung, Dhading and some other districts of Terai area [8]. A study from the Wageningen University of Netherlands in Nepal shows the average pesticide use is much higher 2.9 kg/ha [9]. According to PRMS [10], 1098 pesticides by trade name and 108 common names have been registered for use under Pesticide Act 1991 and rules 1993. As per the information from Plant Quarantine and Pesticide Management Centre, in the last fiscal year Nepal imported 635 tons of pesticides worth around Rupees 830×10^6 of which 85 percent were applied to vegetables. There is a five-fold increase in pesticides import from 132 tons in 2007-08 to 635 tons in 2017-18. There are 3,034 trade names and 169 pesticides registered in Nepal. Ninety percent of the pesticides used in Nepal are purchased from India [11].

People are also unaware of the negative impacts of pesticides on human health. Shrestha, *et al.* [12] reported that most of the farmers don't care about the different pesticides handling practices and more than 50% of the people use their bare hands for mixing pesticides in Dhading. Pesticide [11] reveals that most of the Nepali farmers do not follow the instructions before applying the pesticides and there is a trend of harvesting within four to five days of pesticide spraying which leaves traces of pesticides on the farmer's harvest. In Nepal, 80% farmers choose chemical pesticide for the pest management, 90% of them are aware of the adverse effect of chemical pesticides, more than 84% of the farmers use at least one of the protection measure while using chemical pesticides, 17% of them have received a training on at least short term Integrated Pest Management (IPM), 90% of them rely on local pesticide re-

tailer for purchasing the pesticides and required technical know-how and none of them knew the harmful effects of pest residue and practiced pesticide disposal methods [13]. Sharma [14] reported 51.5% of the farmers kept the remaining pesticides after use in their house freely and 23.5% of the farmers destroy the remaining pesticides either by burning or by burying, while 22.5% of the farmers were found to leave the remaining pesticides outside the house and in the fields without care.

Effect of pesticide on human health

The pesticide used daily on farms crops have many negative impacts on human health. Mostly infants and children are vulnerable to the negative effects of pesticides because of its non-specific nature and inadequate application. Rapid growth and development of the body, they breathe faster per minute and the children coming in contact with the pesticides more than others as part of everyday life are the basic reasons for their increased vulnerability to pesticides. Developing systems of them are less able to detoxify and excrete these pesticides compared to adults. With the increase in use of pesticides in the past few decades, exposure to these pesticides is increased considerably. World Health Organization reported 30 million cases of pesticides poisoning per year with 220,000 deaths in the developing countries [3]. Hicks [15] reported 2.2 million people mainly from developing countries are under risk of pesticide exposure. Human exposure of pesticides occur by inhaling the air, while taking food (90%) and water and through skin during adulthood, prenatal and neonatal period. Prenatal exposure occurs due to exposure of fetus to organochlorines, neonatal suffers during the time of lactation. Pesticides have the ability to affect human health causing infertility, cancer in both male and female reproductive system, developmental toxicity, neurotoxicity and immunotoxicity which may be due to the ability of organochlorine to alter the activity of certain enzymes, hormones, neuro transmitters and growth factor [16]. Pesticides exposure cause short and long terms effects. Diarrhea, abdominal pain, Vomiting, Nausea etc. are the short term effects, whereas skin diseases, cancer, asthma, depression, diabetes, genetic disorders and death are the long term effects of pesticides exposure [17]. Orsi, *et al.* [6] reported that the effect of pesticide on human may be acute or delayed depending upon the level of human exposure to pesticides and that lead to acute health problems like allergy, skin irritation, dizziness, lethargy, swelling of the body etc. Study shows that long term low dose exposure of

pesticides leads to the development of respiratory diseases like asthma and reduction of sperm quality and sperm count [18]. From the study in Nepal and India it is revealed that with the use of pesticides 31% of the farmers complained headache, 24% complained skin burning, 27% complained eye irritation, 10% and 9% of farmers complained for nausea and dizziness respectively [19,20]. Adverse effect of pesticide has been found more in pregnant women, with 5-9% increase in adverse birth outcomes, 13 gram decrease in birth weight of a child with gestational length, preterm birth and birth abnormalities [6]. Atreya [21] reported increase in health hazard due to increasing use of pesticides for the commercialization in agriculture. This has caused the pesticide illness which costs 16.80 US\$ annually per person but after leaving the cost of pain and discomfort caused and long term effects like cancer or environmental and ecological costs, annual pesticides cost to human health per person is 2.50 US\$ which is very low.

Conclusion

From the review it is concluded that the use of pesticides in Nepal is increasing. Most of the pesticide users in Nepal are unaware of the negative impacts of chemical pesticides and do not follow precaution for the safe use of pesticides. Pesticides are found to cause both short term (blur vision, nausea, dizziness, skin irritation etc.) and long term effects (asthma, cancer etc.) on human health. Children are very susceptible to pesticides because of their developing body and pregnant mother exposed to pesticides gives birth to a child with low birth weight, birth abnormalities, short gestational length and preterm birth.

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