

# THE APPLICATION OF PESTICIDES FOR CONTROLLING PEST AND ITS IMPACT TO AGRICULTURE ECOSYSTEM AND PUBLIC HEALTH

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# THE APPLICATION OF PESTICIDES FOR CONTROLLING PEST AND ITS IMPACT TO AGRICULTURE ECOSYSTEM AND PUBLIC HEALTH

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## ABSTRACT

One of the limiting factors for increasing agricultural production is the attack of pests. It had been done many ways of controlling insect pest, and one of them used synthetic pesticides. The study was aimed at determining the negative impacts of using pesticides on the agricultural ecosystem and public health. Study used reference studies including: scientific journals, research reports and seminar proceedings. Data of various sources were analyzed descriptively and qualitatively to answer the study problems. Result study indicated that pesticides had negative impacts on agricultural ecosystems, including resistance, resurgence, biological magnification, death of non-target organisms, secondary pest outbreaks and environmental pollutions. In addition to those negative impacts, pesticide exposure could deactivate the work of enzymes and hormones that regulated the body's homeostatic. The reactions most often arise due to pesticide exposure were heavy cough, shortness of breath and dermatitis. The organ of body most often disturbed due to pesticide exposure was liver.

**Keyword:** pesticides, environmental pollution, public health

## PRELIMINARY

### BACKGROUND

Food is one of the most crucial issues for life because whoever is human on the earth needs food. Agricultural development aims to increase agricultural production to meet these food needs which are always increasing. The success of increasing agricultural production is only possible if using modern technology, and one of them is the use of pesticides as a means of controlling plant-disturbing organisms.

Pesticides are toxic chemicals that have been widely used by farmers to kill Plant Disturbing Organisms because they are considered disturbing and harmful during crop cultivation. The use of synthetic pesticides is considered to help farmers to avoid pest attacks and agricultural production will rise. It appears that the farmers are very familiar with pesticides and have considered pesticides as part of the cultivation system so that it can led to dependence on these poisons which are feared with pesticide syndrome.

Anshori and Prasetyono (2016) stated that soybean farmers in Bantul D.I district. Yogyakarta, still relied on pesticides in its farming with the cost of pesticide application of 15.9% of the total production costs to maintain and secure soybean production from pest attacks. Meanwhile the research results of Ardiwinata and Nursyamsi (2012) explained that farmers in Central Java were accustomed to using pesticides because it was believed that pesticides were effective in dealing

with pest attacks. The use of pesticides was increasingly intensive and tended to be uncontrolled; consequently, agricultural agroecology and human health as consumers became ignored. Nevertheless, it cannot be denied that pesticides have been instrumental in increasing agricultural food production, in particular have led our country to be self-sufficiency in rice in the eighties. Pesticides have several advantages, so they are often used by farmers, the advantages are easy to obtain, easy to apply and the results can be seen quickly. The use of pesticides seems to have integrated with food crop farmers and even often become the ultimate weapon in the cultivation of food crops. However, the use of synthetic pesticides turned out to have created new problems, including the existence of increasingly negative impacts they felt result from its toxicity as a poison and lack of knowledge in large part of the community which was closely related to the use of the poison.

Pesticides that cause the most environmental pollution and threaten human health are synthetic pesticides, especially types of organochlorines because these compounds are not easily decomposed by the sun (Wilkinson, 1976; Said, 1994)

### **Problem**

The study problems are: (1) why are synthetic pesticides still used to control pests and how do they affect the agricultural ecosystem and (2) how do pesticides affect on public health?

### **Study objectives**

This study aims to find out why synthetic pesticides are still used to control pests and how they affect the agricultural ecosystem and (2) how pesticides affect on public health?

### **METHOD APPROACH**

This article is prepared with a literature approach. As a source of information, the study material was obtained from several references such as: scientific journals (national and international), proceedings of seminars, and research reports. In addition, a preliminary study was carried out in two different places, namely in the upstream part: how farmers were still using pesticides intensively for controlling Opt, and in the downstream part: what were the negative effects of the poison for farmers by observing the incidence of pesticide poisoning and method of handling in Jember Regional Hospital. This was very important to see the sources of causes and objects which were caused by poisoning in the community (farmers). Then, data obtained were analyzed quantitatively descriptively to answer the proposed problems.

### **ANALYSIS AND SYNTHESIS**

Farmers were still allowed to use synthetic pesticides. However, pesticides were part of technology in which the presence was still needed to protect the cultivated plants. Agriculture was not against synthetic pesticides, but it should be on guard that the technology was marked 'poison' that had the meaning of likely "double-edged knife" on one side, it could reduce the pest population on either side, the presence of poison could not choose friends and opponents, anyone who was exposed to the poison would be poisoned and cause death.

In the upstream part, pesticides were introduced into the agricultural ecosystem through various methods including direct spraying into agricultural and farm areas, in forests, in livestock grazing areas, in other places including in urban areas and cities, with the purpose to protect plants from pest attacks, protect livestock from insect vector diseases and other invaders.

Result of the author's survey (2012) in Pujon Subdistrict, Batu, showed that most of the Pujon villagers were still using synthetic pesticides to protect carrot, apple and mustard plants that were cultivated. In fact, in harvest season they had mixed with pleasure about 5 to 6 types of insecticides into one formulation to protect cultivation of horticultural crops.

To protect cultivated crops from pest attacks, most farmers to date were still allowed to use pesticides, but they had to follow the rules set by the government, namely in the context of integrated pest control (IPM) which was a new paradigm in agricultural development. Some principles of pesticide used in IPM according to Untung (2001) were: (a) IPM was not against pesticides, but IPM wanted to use pesticides in such a way that the principles and targets of IPM could still be maintained by reducing negative effects; (b) pesticides were used at times and places if natural control and other means of control were not able to withstand pest populations which under certain conditions were able to increase beyond the control threshold; (c) if the monitoring results required using insecticides, the type of pesticide used had to have high target selectivity and "narrow spectrum"

#### **Negative impact of using pesticides on agricultural ecosystems**

Pesticides effect the environment both biotic and abiotic. The effects of pesticides on the biotic environment include: (a) reducing species diversity by reducing the population and number of natural enemy species in the ecosystem (Pimentel, 1982); fortunately, 2001) (b) the emergence of pest resistance to pesticides: that is a type of pest which can initially be killed by an insecticide dose then becomes immune to the dose (Untung, 2001); (c) the emergence of pest resurgence, this characteristic arises when a type of pest after experiencing insecticide treatment does not decline but instead increases with the population before spraying with insecticides; Untung (2001) explained that pest resurgence arises because many causes include the killing of natural enemies of pests by pesticides so that the pest naturally has no control. (d) secondary pest explosion: insecticidal applications aimed at eradicating certain types of pests actually result in the emergence of other types of pests. This is because the insecticides used are "broad spectrum" which means they can kill various types of pests and their natural enemies

The effects of pesticides on the abiotic environment include: (a) soil and water: the soil is considered as a place to dispose of chemicals, while for pesticides it is considered a reservoir. There are many data that reveal the negative impact of pesticide treatment on soil fertility (Edward and Thompson, 1973); and (b) biomagnification: is a phenomenon of increasing the concentration of chemicals in the body of organisms along the food chain, so that the concentration of toxic substances in the body of organisms at the end of the food chain becomes thousands of times (fortunately, 2001).



## **Impact of Pesticides on Public Health**

### **Pathophysiology of Pesticide Poisoning**

Pesticides have an impact on health through absorption by passing through the skin, through the mouth and breathing. Absorption of pesticides through skin contact if the substance of a toxic pesticide attaches to the skin for a long time, while that through breathing through droplets, vapors and fine powders. According to Bolognesi (2003) the mechanism of pesticide intoxication through: (a) influences the action of enzymes and hormones. Work from pesticide toxins will deactivate enzyme activators so that they will interfere with synthesis, secretion, transportation and metabolism, disruption of homeostasis, reproductive system and child growth, (b) damaging tissues. Induction of serotonin and histamine production which will trigger allergic reactions and create new, more dangerous compounds.

Direct contamination of harmful substances from pesticides can cause poisoning. Poisoning is divided into three groups: (a) mild acute poisoning that causes dizziness, headache, mild skin irritation, aching body and diarrhea (b) severe acute poisoning with symptoms of nausea, chills, stomach cramps, difficulty breathing out saliva, pupil eyes shrink and pulse increases, (c) chronic poisoning with manifestations of fainting, convulsions, and even death. Chronic poisoning is more difficult to detect because it is not immediately felt and does not cause specific symptoms and signs. However, chronic poisoning for a long time can cause health problems.

Contamination through the skin is the most common contamination, although not all of them end in acute poisoning. More than 90% of cases of poisoning worldwide are caused by contamination through the skin (Djojsumarto, 2008). Risk factors for skin contamination are affected by dermal toxicity, concentration, formulation, exposed skin area and extent, and the physical condition of individuals exposed. The risk of poisoning is greater if the lethal dose 50 (LD50) gets smaller, the concentration of pesticides attached to the skin gets thicker, the form of pesticides in a form that is easily absorbed, exposed skin is more easily absorbed such as the back of the hand, the area exposed widely and if the condition of the system individual immunity is weak.

### **Pesticide poisoning and countermeasures**

All liquid formicides can be absorbed through the skin and intestines perfectly. The most frequent types of poisoning in Indonesia are organophosphates and organochlorines. The carbamate group has similar effects to organophosphate effects, but rarely causes poisoning cases. There are still other types of pesticides such as rat poison (anticoagulant and zinc phosphite) and herbicides (parakuat) which are also very toxic.

Suharsono's (2014) study in Batu showed that the prevalence of hypothyroidism in children under five in pesticide exposure areas was 36.4%, and children under five who lived in pesticide exposure areas were 2.1 times more likely to develop hypothyroidism than children in non-exposure areas. The prevalence of stunting in the exposure area (33.3%) was higher than in the non-exposure area (17.5%). Furthermore, the results of environmental examination showed 85.0% of water samples and all soil samples were positive for pesticide residues. Several studies abroad prove that exposure to pesticides in pregnant women affects the quality of growth of children born.

The results of research by Safitrah, Kusuma & Ilham (2016) stated that pesticides became the second highest cause including organophosphate pesticides (2.8%), carbamate (2.8%) and non-specific pesticides (5.6%) which occurred intentionally for experiments. suicide and accidental drinking. Management varies among patients using antidotes, antibiotics, antihistamines, analgesics, hemostatic agents, anti-infections, and several other gastrointestinal drugs.

Prevention and management of pesticide poisoning (MOH, 2007) are as follows :

1) In children: do not play with pesticides, use or even hold used pesticide packaging, do not play with agricultural equipment used to spray pesticides, do not cross or swim in irrigation channels or drainage ditches, do not enter or play on land just been sprayed with pesticides, washed work clothes, shoes and hands before entering the house and before touching a child, washing vegetables and fruit as well as possible, avoiding the use of pesticides at home, especially in the home.

2) Pesticide poisoning on the skin: wash with soap every time you finish using pesticides, quickly change clothes affected by pesticides, immediately wash the affected body parts, pesticides with soap and cold water. If pesticides enter the eye, wash your eyes with clean water for 15 minutes.

3) If pesticides are swallowed if the person is unconscious, lay on a sloping position and make sure he keeps breathing. If the person is not breathing, quickly give mouth-to-mouth breathing assistance. Breathing mouth-to-mouth help can help the rescuer to be exposed to pesticides, so use a pocket mask, a piece of cloth, or a thin plastic bag whose center has been perforated before you give mouth-to-mouth relief. Look for pesticide packaging and read the label or information immediately. If the person can drink, give plenty of clean water to drink. Seek medical help if possible.

4) If the pesticide is inhaled leave immediately the area where inhaling toxins, especially if in a closed room. Inhale fresh air, loosen clothes to make breathing easier. Sit with your head held up and your shoulders upright. If the person is unconscious, lay on his side and watch so he can breathe smoothly. If you do not breathe, immediately do mouth-to-mouth breathing. Seek medical help.

## CLOSING

Pesticides may still be used in agricultural cultivation in accordance with the prevailing rules and standards in accordance with IPM principles. IPM is not anti-pesticide, pesticides are still a part of technology that uses pesticides in such a way that the principles and objectives of IPM can still be maintained by reducing as little as possible the negative impacts. Pesticides have a negative impact on the environment including emergence: resistance, resurgence, bio magnification, death of non-target bodies and occurrence of hazard. Impact of pesticide exposure on public health is: Contamination of harmful substances directly from pesticides can cause poisoning. Poisoning is divided into three groups: (a) mild acute poisoning that causes dizziness, headache, mild skin irritation, aching body and diarrhea (b) severe acute poisoning with

symptoms of nausea, chills, stomach cramps, difficulty breathing out saliva, pupil eyes shrink and pulse increases, (c) chronic poisoning with manifestations of fainting, convulsions, and even death.

## REFERENCES

- ACF. (2010). USER'S MANUAL Pesticides. ACF International.
- Anshoro, A and C. Prasetyono. 2016. Pesticides on soybean cultivation in Bantul D.I district. Yogyakarta. Caraka Tani - Journal of Sustainable Agriculture, Vol. 31 No. March 1<sup>st</sup> 2016. Pg. 38-44
- Ardiwinata, A.N. and D. Nursyamsi. 2012. Pesticide Residues in Rice Production Centers in Java Middle. Journal of Food, Vol 21, No. 1.
- Bolognesi, c., Carrasquilla, G., Volpi, S., Solomon, K., & Marshall, E. (2009). Biomonitoring of Genotoxic Risk in Agricultural Workers from Five Colombian Regions: Association to Occupational Exposure to Glyphosate. Journal of Toxicology and Environmental Health, Part A, 72, 986-997.
- Damalas, C., & Eleftherohorinos, I. G. (2011). Pesticide Exposure, Safety Issues, and Risk Assessment Indicators. International Journal of Environmental Research and Public Health ISSN 1660-4601 [www.mdpi.com/journal/ijerph](http://www.mdpi.com/journal/ijerph).
- Edward and Thompson, 1973. Pesticides in the soil fauna. Residue Rev 45: 1-79
- Herlina, Y. 2017. The impact of pesticide use on the agricultural environment
- Lesar, F. Y., Joseph, W., & Rattu. (2014). The Relationship Between Level of Education and Knowledge About the Dangers of Pesticides for Health By Managing Pesticides in Farmers' Groups in Belang District, Southeast Minahasa Regency. FKM Sam Ratulangi University.
- Mahyuni, E. L. (2015). Risk Factors in the Use of Pesticides Against Health Complaints on Farmers in Berastagi District, Karo District, 2014. Publicity Vol. 9, No. 1, 79 - 89.
- MOH, R. (2007). Basic Medication Guidelines at Puskesmas. Jakarta: RI Ministry of Health.
- Pimentel, D. 1982. Prespective of Integrated Pest Managenet. Crop Protection 1982 (1): 5-26
- Safitrih, L., Kusuma, A. M., & Ilham, M. (2016). Incidence and Management of Poisoning at the Emergency Room of the RSUD Prof. Dr. Margono Soekardjo Purwokerto in 2012-2014. Litbangkes Media, Vol. 26 No. 3, 175-180.
- Said, E.G., 1994. The negative impact of pesticides, a record for all of us. Agrotek Vol 2 (1), IPB. Bogor, pp. 71-72

- Setiyobudi, B., Setiani, O., & Endah W, N. (2013). Relationship of Pesticide Exposure in Pregnancy with Low Birth Weight Infant Activity (LBW) in Ngablak District, Magelang District. Indonesian Journal of Environmental Health Vol. 12 No. 1.
- Suhartono. (2014). Impact of Pesticides on Health. Bogor: Proceedings of the National Seminar on Organic Agriculture.
- Ton, S.W., 1991. Environmental Considerations With Use of Pesticides in Agriculture. Paper at the VIII Lustrum, Faculty of Agriculture, USU, Medan.
- Untung, K. 2001. Introduction to Integrated Pest Management. Gajah Mada University Press
- Wahyuni, E.L. 2015. Risk factors for pesticide use on health complaints to farmers in Berastagi District, Karo District, KESMAS Journal Vol. 9, No.1, March 2015: 79 - 89
- Wilkonson, C.F., 1976. Insecticides biochemistry and Physiology. London. New York. Rheine. 768 p
- WHO. (2010). International Code of Conduct on the Distribution and Use of Pesticides: Guidelines for the Registration of Pesticides. Rome, Italy: World Health Organization.
- Yuantari, M. G., Widianarko, B., & Sunoko, H. R. (2015). Risk Analysis of Pesticide Exposure to Farmer Health. Pack 10 (2) 239-245, 239-245.



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