

ORAL

Analysis Of Risk Factors Affecting The Level Of Pesticidity Poisoning In Farmers In Kelurahan Tarus Kupang District

Debora G. Suluh

Environmental Health Department, Health Polytechnic of Kupang

Email: maureenmaura@gmail.com

Abstract

Background: Pesticides are a mixture of chemicals, or other bioactive substances and basically pesticides are toxic, the main purpose of the use of pesticides by farmers is to kill pests that will later give the impact on increasing agricultural yields. The use of pesticides in excessive amounts and doses will actually have a detrimental impact on the health of farmers and consumers. the impact can be both acute and chronic. **Purpose:** To analyze the relationship between risk factors for exposure to pesticides and the level of acute poisoning of pesticides in farmers in Kupang District of Tarus, a type of study *observational* with approach *cross-sectional study*. **Methods:** The study sample was 50 farmers, research variables included: number of pesticides, practice of mixing pesticides, how to use, frequency of exposure, completeness of PPE, behavior after spraying and the level of acute poisoning of pesticides. The research data is then processed, presented in tables and graphs and analyzed by univariate, bivariate with test statistics. *Chi-square*. **Results:** The results of the analysis show that there are 2 variables that are significant to the mild and moderate acute cone level of farmers, namely the *number of pesticides*; with a value $p = 0.002$; PR = 0.058; 95% CI = 0.007 - 0.5 and the method for using pesticides with a value $p = 0.019$; PR = 5,333; 95% CI : 1,209 - 23,536; the variable of *mixing practice* and *spray-out behavior* was not significant for the incidence of mild, moderate, or severe poisoning, but directly showed symptoms of mild or moderate poisoning in farmers; variable *frequency of exposure* and *completeness of PPE* showed a relationship to symptoms of mild and moderate poisoning but were not further analyzed for significant incidence of poisoning levels because the data was constant. **Conclusions:** It is recommended to farmers to always pay attention to safety factors in applying pesticides by always using PPE, both when spraying and mixing pesticides and wherever possible reducing the number of pesticides used both in terms of type and number.

Keywords: Level of poisoning, Pesticides, Farmers.

*Correspondence: maureenmaura@gmail.com

Present Address: Piet A. Tallo St. Liliba -
Indonesia



©The Author(s) 2018. This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated.

INTRODUCTION

Pesticides are chemicals, mixtures of chemicals, or other bioactive substances. Basically the pesticide is poisonous. The habit of farmers in using pesticides sometimes violates the rules, in addition to the dosage used exceeds the dose, farmers also often mix several types of pesticides, with the reason to increase their toxicity to plant pests. Such actions are actually very detrimental, because they can cause higher levels of pollution to the environment by pesticides and can also contaminate users directly resulting in poisoning. In this case, poisoning can be grouped into 3 groups, namely severe poisoning, moderate poisoning, and mild poisoning.

Several studies have shown that there are many negative impacts from the use of pesticides, not only in people who consume agricultural products, but also to farmers perpetrators / users of pesticides. Data collected by WHO shows that 500,000 - 1,000,000 people per year have experienced pesticide poisoning and around 500 - 1,000 of them experience very fatal effects such as

cancer, disability, infertility and liver disorders.

The incidence of pesticide poisoning in several regions in Indonesia is very high. Based on the results of blood cholinesterase monitoring of 347 agricultural workers in Central Java, 23.64% were moderate poisoning workers and 35.73 were severe poisoning. The Ministry of Health of the Republic of Indonesia in 1989 reported that in Tawangmangu, Karanganyar Regency, Central Java there had been 42.2% pesticide poisoning which caused various chronic diseases to farmers. (Public Health and Environmental) The

Tarus sub-district is one part of the Kupang Tengah sub-district, where approximately 70% of the people are engaged in the agricultural sector and the rest are engaged in animal husbandry, trade and others. The most common farming business carried out by people in Tarus Village is rice, with a variety of technological innovations. In addition to rice farming as a superior commodity, farmers also cultivate vegetables and horticulture, although the area is limited such as cabbage, cabbage flowers, long

beans, mustard greens, lombok, cucumbers and watermelons which are mostly cultivated in the dry season / the rainy season.

The high agricultural activity in this region, allows farmers to use technology related to agriculture, and based on the results of preliminary studies it is known that farmers in this region also use pesticides to get maximum crop yields, but pay less attention to their own health and safety factors.

MATERIALS AND METHODS

Type of research was *observational* with approach *cross-sectional* aimed at analyzing the relationship between risk factors for pesticide exposure and the level of pesticide poisoning on farmers in Kupang District of Tarus, Variables in this study were independent variables consisting of pesticides, mixing pesticides, how to use, frequency of exposure, completeness of PPE, behavior after spraying and the dependent variable is the level of pesticide poisoning. The population in this study were all farmers who were in the Tarus

Village area as many as 65 farmers both rice and vegetable farmers who were active, with a sample size of 50 samples. The sampling technique used at the time of data collection is the technique *accidental* or *accidental sampling*, where data collection is based on farmers who are currently carrying out spraying activities on their farms. (Notoatmodjo, 2005). Data obtained from the results of interviews and observations (observations) carried out in the field at the time of the study using questionnaire sheets and observation. Data from research results are presented in the form of tables or graphs and analyzed by univariate, bivariate with test statistics. *chi square*

RESEARCH RESULTS

Results of the study of risk factors that affect the level of pesticide poisoning in farmers in Tarus Village generally show the 6 factors (*Number of Pesticides, mixing practices, how to use pesticides, the frequency of exposure, the completeness of the PPE and the after-spraying behavior*) give effect to the occurrence of symptoms of poisoning

both mild and moderate, and there is only 1 variable (*number of pesticides*) which showed a significant relationship to the occurrence of the level of pesticide poisoning to farmers. To be clear, it can be seen in the following description: The

Number of pesticides

From the research shows that as many as 41 (82%) farmers use more than one type of pesticide, namely insecticides and fungicides. The following table 3.1 illustrates the relationship between the number of pesticides and the level of poisoning of pesticides on farmers

Table 3.1 Relationship of the Number of Pesticides Used with the Level of Poisoning of Pesticides in Farmers in the Tarus Kelurahan 2018

Number of Pesticides	Symptoms ofAcute Poisoning Level		<i>p</i>
	Mild	Moderate	
> 1 type of pesticide	28 (97%)	13 (62%)	0.002
1 type of pesticide	1 (3%)	8 (38%)	
OR = 0.058	95% <i>CI</i> = 0.007 - 0.5		

Source: Processed Primary Data, 2018

Table 3.1 shows the results of statistical tests for values $\rho = 0.002$, PR is 0.058 with 95% confidence interval (CI): 0.007 - 0.5. because the value of $\rho < 0.005$ can thus be stated that there is a relationship between the number of pesticides used and the incidence of Pesticide Poisoning Levels on farmers in

Tarus Village. the PR value < 1 and CI ranged from 0.007 to 0.5 means that the population represented by the sample prevalensnya value < 1 , so that we can conclude the risk factor (Total pesticides) can prevent the occurrence of acute toxicity rate at which farmers use pesticides

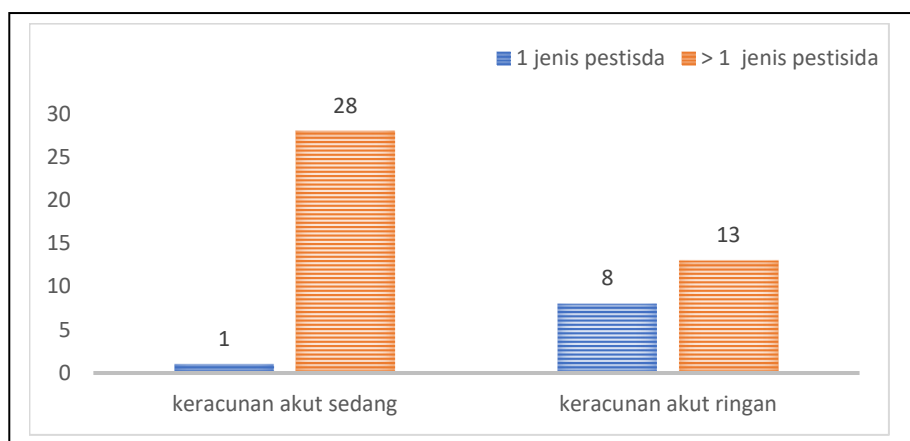


Figure 3.1 number pesticides used with the level of poisoning that occurred in farmers in Tarus District Kupang District In 2018

Figure 3.1 shows that farmers using > 1 type of pesticide experienced 28 moderate levels of acute poisoning and 13 mild acute poisoning by farmers and farmers using 1 type of pesticide experiencing moderate poisoning as much as 1 farmer and light poisoning level of 8 farmers. poisoning that occurs in farmers starts from low to moderate acute poisoning. From the results of the study, it can be explained descriptively that farmers who use 1 type of pesticide will experience a mild level of poisoning compared to farmers who use more than 1 type of pesticide. Symptoms of poisoning that generally appear on farmers are dizziness, headaches, itching, nausea and difficulty breathing. So that it is expected that farmers do not apply > from one type of pesticide together, will tend to aggravate the occurrence of acute poisoning levels in the petania.

Mixing

Practices The practice of mixing pesticides by farmers illustrates how farmers mix pesticides before applying them to agricultural crops. The results can be seen in the following figure 3.2 and table 3.2

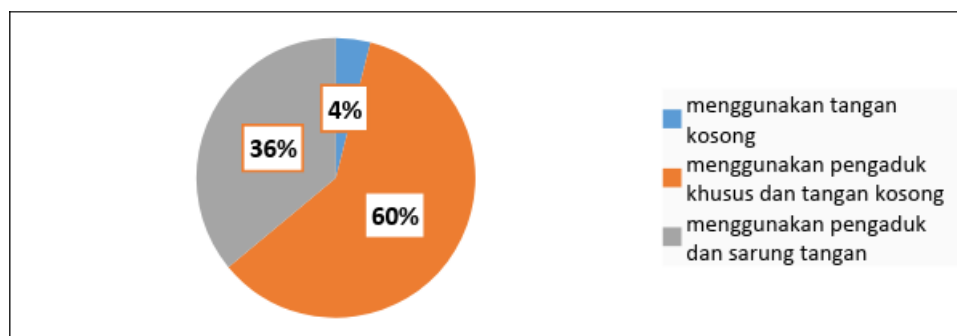


Figure 3.2 Practice of Mixing Pesticides by Farmers in Tarus Regency Kupang Village in 2018

Figure 3.2 shows that the practice of mixing pesticides by farmers in Tarus Village mostly uses special stirrers and gloves by 60%; using a special mixer and empty hands (without gloves) as much as 36% and mixing using bare hands as much as 4%. The results were then analyzed further to determine the relationship between the practice of mixing with the level of pesticide poisoning on farmers using the test *Chi Square* and the results obtained as shown in table 3.2 of this article:

Table 3.2 Relationship between the Practice of Mixing Pesticides and the Level of Poisoning Pesticide in Farmers in Tarus Village Year 2018

Practice Criteria Mixing	Symptoms Acute Poisoning Level		ρ
	Mild	Moderate	
Not/Tidak memenuhi syarat	14 (66.7%)	17 (58.6%)	0.563
le/Memenuhi syarat	7 (33.3%)	12 (41.1%)	
PR = 0.708		95% CI = 0.220 - 2.2283	

Primary data sources processed in 2018

Table 3.2 shows that the practice of mixing pesticides can interfere with health by causing symptoms of poisoning both moderate poisoning and mild poisoning. value $\rho = 0.563$, PR of 0.708 with 95% confidence interval (CI) 0.220 - 2.2283. because the value of $\rho > 0.005$ can thus be stated that there is no relationship between the practice of mixing pesticides with the level of acute

pesticide poisoning on farmers in Tarus Village. With values *CI* ranging from 0.220 - 2.2283, it can be explained that it cannot be ascertained whether the risk factors (mixing practices) can cause the level of acute mild, moderate or severe poisoning or can prevent the occurrence of levels of poisoning.

Ways to Use Pesticides

Variables on how to use pesticides illustrate how farmers use pesticides, both insecticides and fungicides, to eradicate pests in plants. To be clear, can be seen in the following:

Table 3.3 Relationship of How Pesticides Pesticide Poisoning Levels in Farmers in the Tarus Village in 2018

How to use Pesticides	Acute Poisoning Levels		<i>P</i>
	Are Medium	Mild	
Used with Mixed and used together	26 (66.7%)	13 (33, 3%)	0.019
Used separately	3 (27.3)	8 (73.7)	
<i>PR</i> = 5,333	95% <i>CI</i> = 1,209 - 23,536		

Table 3.3 shows the results of statistical tests on 50 farmers, it is known that the value $p = 0.019$, *PR* is 5.333 with 95% confidence interval (*CI*): 1,209 - 23,536. because the value of $p < 0.005$ can thus be stated that there is a relationship between the number of pesticides used and the incidence of the level of acute poisoning of pesticides in farmers in the village of Tarus. the *PR* value > 1 and *CI* ranged from 1.209 to 23.536 meant that the population represented by the

sample value prevalence > 1 , so that we can conclude the risk factors (how the use of pesticides) can cause acute poisoning is mild, moderate or severe on farmers' pesticide applicators

Frequency Exposure The

Frequency of pesticide exposure to farmers illustrates how often spraying farmers do spraying pesticides in one planting period. To be clear, can be seen in table 3.4 below.

Table 3.1 Relationship of Frequency of Pesticide Exposure with Pesticide Poisoning Level in Farmers in Tarus Village in 2018

Frequency of Exposure of	Acute Poisoning Level		<i>P</i>
	Medium	Light	
1 times a week	29 (100%)	21 (100%)	
> 1 times per week	0	0	
<i>OR</i> =	<i>95% CI</i> =		

Table 3.1 shows that the results of statistical tests on the frequency of pesticide exposure to 50 farmers were all exposed to swimming pesticides once a week, with moderate poisoning of 29 farmers and light poisoning rates of 21 farmers. This variable is no longer carried out further statistical tests because the existing data is constant.

Use of PPE The

Use of PPE is an illustration of the habit of farmers using complete personal protective equipment in applying / using pesticides. The results of the analysis of the completeness of the PPE are presented in Figure 3.4 below.

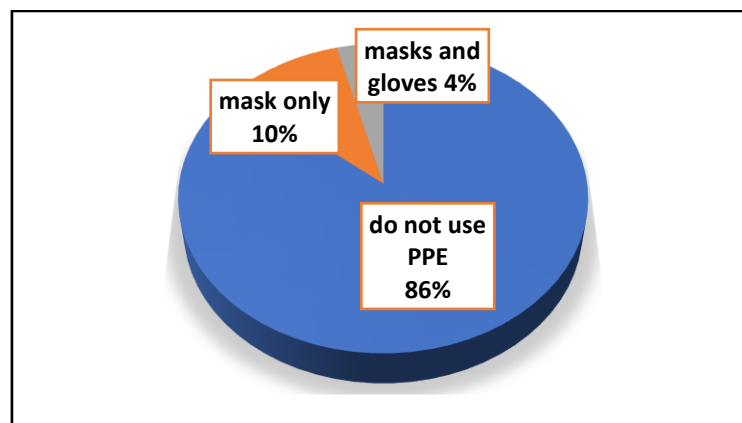


Figure 3.4 Use of personal protective equipment (PPE) by Farmers when Applying Pesticides in Tarus Village in 2018

Figure 3.4 shows that 86% of farmers did not use PPE when applying pesticides, 10% of farmers only used masks only and 4% of farmers use masks and gloves when applying pesticides. The use of PPE is then categorized by the criteria of fulfilling the requirements and not fulfilling the requirements and analyzed by chi square. The results of the analysis can be seen in table 3.5 below:

Table 3.5 Relation of Completeness of PPE with the Level of Poisoning of Pesticides in Farmers in the Tarus Village in 2018

Frequency of Exposure of	Acute Poisoning Level		<i>P</i>
	Medium	Lightly	
Complete	29 (58%)	21 (42%)	
Complete	0	0	
<i>OR</i> =	<i>95% CI</i> =		

Table 3.5 shows that the results of statistical tests on the completeness of PPE in 50 farmers, 100% did not use PPE completely, with moderate poisoning rates of 29 farmers and light poisoning rates of 21 farmers. This variable is no longer carried out further statistical tests because the existing data is constant.

Behavior Out of Spray

Variable behavior of spray out is an illustration of actions carried out by the person who is spraying. Table 3.6 below illustrates the behavior of farmers after spraying:

Table 3.6 Relationship between Behavior of Spray and the Level of Poisoning of Pesticides in Farmers in the Tarus Village in 2018

How to use Pesticides	Acute Poisoning Level		<i>P</i>
	Medium	Mild	
Not Qualified	17 (58.6)	13 (61, 9)	0.81
Qualifies	12 (41.4)	8 (38.1)	5
<i>PR</i> = 0.872	<i>95% CI</i> = 0.276 - 2,572		

The results of the statistical test show that the value $p = 0.815$, PR is 0.872 with 95% *confidence interval (CI)* : 0.276 - 2,572, because the value $p > 0,005$ can thus be stated that there is no relationship between the amount of spray-out behavior and the occurrence of Levels to pesticide concoctions on farmers in Tarus Village. With values *CI* ranging from 0.276 to 2.572, it can be explained that it cannot be ascertained whether risk factors can cause levels of toxicity or can prevent the occurrence of acute poisoning. Figure

Amount of Pesticides

The results of the study showed that 82% of farmers used pesticides > 1 type, insecticide and fungicide. From the results of these studies, it can be explained descriptively that farmers who use 1 type of pesticide will experience a mild level of poisoning compared to farmers who use more than 1 type of pesticide. Symptoms of poisoning that generally appear on farmers are dizziness, headaches, itching, nausea and difficulty breathing. Insecticidal pesticides are used for the purpose of

killing pests in plants while fungicides play a role in eradicating fungi. The use of insecticides and fungicides together will certainly have a positive impact on plant growth, but unwittingly mixing these two types of pesticides will have a less favorable impact on farmers as people who apply pesticides. The insecticide used not only kills exposed pests but also plants where the pest is located. Therefore, farmers must be able to distinguish the workings of insects on the body of pests and plants (Djojsumarto, 2006), so that there is not much residue left that can affect humans and the environment. Avoiding the occurrence of pesticide poisoning is also very important for farmers to pay attention to ways of applying pesticides, the provisions regarding the use of PPE, it is expected that farmers do not apply > from one type of pesticide together, because it will tend to aggravate the occurrence of acute poisoning in the petania.

Pesticide Mixing Practices. The results showed that most farmers mixed pesticides using special stirrers and

gloves at 60%; using a special mixer and empty hands (without gloves) as much as 36% and mixing using bare hands as much as 4%. After further analysis, it was found that there was no relationship between the practice of mixing pesticides with the level of acute pesticide poisoning on farmers in Tarus Village, even though the results of the analysis showed no association with the occurrence of acute poisoning levels in farmers, but the data showed that 50 respondents showed the presence of poisoning after each application of pesticides. This can occur because people tend not to use PPE as an initial protection against direct contact with the farmer's body.

Pesticides can enter the human body or animals through *dermal contamination*, are sucked into the respiratory tract (*Inhalation*), and enter through the digestive tract (*oral*). When farmers mix pesticides without using special tools or gloves and masks as PPE, it can be ascertained that the farmer has been contaminated with pesticides. This can be seen from the results of research where farmers complained of itching on

the skin after mixing and applying pesticides.

How to use pesticides

The results of statistical tests on 50 farmers revealed that the value $p = 0.019$, PR was 5,333 with 95% *confidence interval (CI)* : 1,209 - 23,536. because the value of $p < 0.005$ then it is stated that there is a relationship between the number of pesticides used and the incidence of the level of acute pesticide poisoning on farmers in Tarus Village. with $PR > 1$ and *CI* ranges from 1,209 - 23,536, it means that the population represented by the sample has a prevalence value of > 1 , so it can be concluded that risk factors (*how to use pesticides*) can cause mild, moderate and severe acute poisoning on farmers using pesticides.

Pesticides are a mixture of chemicals that aim to eradicate pests in plants. Of one type of pesticide there are already several active ingredients, so that if farmers use more than one type of pesticide then use it together, of course the results will have a good impact on the plant, but not for humans and the

environment. People who carry out pesticide mixing activities, can certainly experience acute symptoms of pesticide poisoning from mild acute symptoms to moderate acute symptoms. This is evidenced from the results of research that shows that as many as 39 respondents (farmers) who mixed pesticides showed the occurrence of acute keracuna symptoms of mild to moderate with signs and symptoms of dizziness, headache, nausea, itching and even shortness of breath. Therefore, farmers are expected to be able to apply the pesticides separately and it is best to use PPE as a basic standard that must be obeyed.

Frequency of exposure

The results of statistical tests on the frequency of pesticide exposure in 50 farmers showed that in the period of ± 1 time a week-farmers were always exposed to pesticides, with a moderate level of poisoning as many as 29 farmers and light poisoning rates of 21 farmers. Continuous exposure without enough time will have a more serious impact on the health of farmers, so it is hoped that

farmers can pay attention to the length of time before contact again with pesticides for subsequent applications.

Use of PPE

The results showed that 86% of farmers did not use PPE when applying pesticides, 10% of farmers only used masks and 4% of farmers used masks and gloves when applying pesticides. This data shows that 100% of farmers do not use PPE completely when applying pesticides. This will be very dangerous for the health of farmers, because when spraying, pesticides can enter the body of farmers through the respiratory tract, as well as direct contact with the skin. Gas and particles are sprayed, the size is so fine that it can enter the lungs and or attach to the mucous membrane of the nose depending on the size of the particles. This condition is quite dangerous to the health of farmers, because it is seen from the results of research on the signs and symptoms of the occurrence of poisoning levels that occurred in the 50 farmers who were sampled. While pesticides that stick to the surface of the skin can seep into the

body and cause poisoning. The occurrence of skin contamination is the most common contamination. Behavior after spraying The statistical test results show that the value $p = 0.815$, PR is 0.872 with 95% *confidence interval (CI)* : 0.276 - 2.572, and it is stated that there is no correlation between the amount of spray out behavior and the incidence of acute pesticide poisoning in farmers in Tarus Village . The results also showed that 30 (60%) farmers had behaviors that did not meet the requirements after finishing spraying including not changing clothes or washing hands after applying pesticides. Farmers usually go straight home and do other activities. This habit will certainly have an impact on the health of farmers because it is possible that the remaining pesticides left on clothes, hands or skin will be included or swallowed when the farmers eat, drink or smoke and other activities

CONCLUSION

There is a relationship between the number of pesticides used and the level of acute poisoning of farmers with a value of $p = 0.002$. There is no

relationship between the practice of mixing pesticides with the level of acute poisoning of pesticides on farmers with a value of $p = .563$. There is a relationship between how mixing pesticides with the level of acute pesticide poisoning to farmers with a value of $p = 0.019$. Frequency of exposure and use of PPE showed signs and symptoms of poisoning, but no further analysis because the data is constant. There is a relationship between the behavior of discharged spray with the level of acute poisoning of pesticides on farmers

SUGGESTION

Farmers always use PPE when mixing and for applying pesticides, in order to minimize the occurrence of direct contamination with pesticides. ²It is necessary to provide assistance from relevant agencies so that they can increase people's awareness and interest in using PPE

REFERENCE

Anonim, 1986. *Management of Pesticide Poisonings Symptoms and Treadments*, Japan: Ministry of

- Agriculture, Forestry and Fisheries.
- Afriyanto, 2008, *Kajian Keracunan Pestisida Pada Petani Penyemprot Cabe di Desa Candi Kecamatan Bandungan Kabupaten Semarang*. Program Pasca Sarjana Universitas Diponegoro Semarang
- Damalas A. Christos, 2011. *Pesticide Exposure, Safety Issues, And Risk Assessment Indicators*. Internasional Journal of Environmental and Public Health.
- Departemen Kesehatan RI, 1985. *Pemberantasan Serangga dan Bintang Pengganggu bagi Akademi Penilik Kesehatan Teknologi sanitasi*. Jakarta
- Djojosumarto Panut, 2008. *Pestisida dan plikasinya*. Penerbit PT Agromedia Pustaka, Jakarta Selatan
- Dwi Handjojo, 2001. *Faktor-Faktor Yang Berhubungan Dengan Keracunan Pestisida Petani Penyemprot Holtikultura di Desa Kagokan Kecamatan Gatak Kabupaten Sukoharjo Tahun 2000*. Thesis Program Paska Sarjana Universitas Diponegoro, Semarang
- Ekha, Isvasta, 1998. *Dilema Pestisida "Tragedi Revolusi Hijau"* Penerbit Kanisius, Yogyakarta
- Kementerian Kesehatan RI, 2012. *Pedoman Penggunaan Insektisida (Pestisida) Dalam Pengendalian Vektor*, kementerian kesehatan RI, Jakarta
- Kemenkes RI No. 1350/Menkes/XII/2001 tentang Pengelolaan Pestisida
- Lu Leilanie Jinky, 2007. *Risk Factors To Exposure And Health Symptoms Among Cut-Flower Farmers*. International Journal Of Environmental Health Research.
- Notoatmodjo, Soekidjo, 2010. *Metodologi Penelitian Kesehatan*, Jakarta, Penerbit PT.Rineka Cipta
- Peraturan Menteri Kesehatan RI Nomor 374/Menkes/Per/III/2010 tentang Pengendalian Vektor
- Soemirat, Juli, 2003. *Toksikologi Lingkungan*, Penerbit Gadjia Mada University Press
- Sastroutomo, Soetikno, 1992. *Pestisida, Dasar-Dasar Dan Dampak Penggunaannya*, Penerbit Pt Gramedia Pustaka Utama, Jakarta.