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## The Use of Pesticides Against Blood Cholinesterase Level (The Analytical Study on Farmers in Torpedo Village, Sabbang Sub District, Luwu Utara District)

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### Abstract

Blood Cholinesterase was a enzymes form of biological catalyst in the body's tissues role to keep the muscles, glands and nerve cells to work in an organized and harmonious. Blood Cholinesterase is an indicator of subclinical pesticide poisoning and it can be determined by examining blood Cholinesterase activity into someone. The purpose of this study was known the relationship use of pesticide on levels of blood Cholinesterase on a rice farmer in the village torpedo Sabbang sub district, Luwu Utara district. This type of research is analytic survey research with cross sectional study to determine the relationship use of pesticide on levels of blood Cholinesterase on a farmer in the village of torpedo Sabbang sub district, Luwu Utara. The number of samples in this study were 73 samples. The results showed that length use of pesticides by respondents have longer use than shorter use, but from the results of statistical tests Ho refused meaning there was no significant relationship between length use of pesticides with high levels of farmers blood Cholinesterase,  $P > 0.005$ . There was no significant relationship between how pesticides mixing with high levels of farmers blood Cholinesterase, based on the statistical test Ho rejected  $P > 0.005$ . There were still some farmers do not use PPE at the time of contact with the pesticide, but from the results of statistical tests Ho refused meaning there was no significant relationship between the use of PPE with high levels of farmers blood Cholinesterase,  $P > 0.005$ . Suggestions in the study was expected that health care workers to provide education on the dangers of pesticides on health.

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It was expected that farmers in the gathering / dispensing pesticides in order to follow the rules of the use of pesticides. It was expected to farmers to use personal protective equipment (PPE) at the time of contact with the pesticide.

**Keywords:** Pesticides; Blood Cholinesterase; personal protective equipment.

## **1. Introduction**

Pesticides are chemical compounds that are important to agricultural fields as it can support increased agricultural production and make more efficient and economical farming. This was because pesticides caused by a material that can control pests as purely agricultural production. Along with the development of science and technology, the pesticide was already a primary material for each farmer to support the work activities.

Increased agricultural production is a positive impact on the use of pesticides, but these chemical compounds also gave enormous negative impact that may affect the food. Pesticides used when spraying the pest can cause residual material known in agricultural yields invitation pesticide residues. If the residue is entered into the human body by consuming agricultural products would quickly stimulate cancer. Almost all the chemical substances in addition to toxic pesticides also can stimulate cancer [1]. The research conducted by [2] on farmers who use 2,4D (2,4 Dichlorophenoxyacetic acid) in Sidrap regency, also shows the influence of the use of pesticides on the health status of farmers where it was found farmers in general have anemia, level of lightweight malnutrition, levels of hemoglobin, SGPT, SGOT, and unnormally urea levels and influenced by the duration of farming, the use of pesticides by spraying frequency and duration of use of pesticides 2,4D.

The farmer is one of the high-risk group against pesticide exposure. The use of pesticides which will continuously increase the dose of exposure that can eventually poison the farmers as users. It caused by management of plant pests with the use pesticides unwisely so give impact not only the health of the environment and also the healthy ecosystem [3]. Errors in the use and disposal of pesticide use will cause high pesticide residue in agricultural environment that would disrupt the balance of the environment and organisms that may be controlled to become resistant and increases the number of population [4]. Attention is needed in the use of pesticides is the choice of pesticides, procedures for storage, dosing, retailing, mixing up the hygiene procedures. It is also a concern is the use of personal protective equipment that is not true and is not complete so it can be contaminated with pesticides through the skin or the respiratory tract [5].

The judicious use of pesticides was closely associated with good work habits applied related to the choice of pesticides, procedures for storage, mixing technique (dosing, mixing and retailing), the application of hygiene procedures and use of personal protective equipment (PPE). Incorrect work behavior will impact on the health problems that will directly reduce productivity and even agricultural production will also decrease [5]. The number of rice farmers in the village of torpedo, Sub district of Sabbang, District of Luwu in 2011 were 89 farmers. Based on researchers observations to the data of patient visits at the nearest health center that indicates the number of farmers to visit the nearest health services to diagnose various health problems such as nausea, vomiting, dizziness and headaches were related to their exposure to the compound pesticide long-term, length

time farming of farmers at Village of terpedo Sub District of Sabbang District Luwu by average of 5-30 years, and the frequency of exposure to pesticides annually for one-time harvest were 5 times (at the time of spraying stems and leaves 3 times and fruit 3 times), if conducted 2 harvests , then at least 10 times the farmers in contact with pesticides.

## **2. Research methods**

### ***2.1 Location and Time Research***

This research was conducted in the village of Terpedo, SubDistrict Sabbang, District of Luwu from April until May 2012

### ***2.2 Operational definitions and objective criteria***

As a limitation of the research object, the necessary operational definitions and objective criteria were:

#### 1. The Length use of pesticides

The Length use of pesticides was the span of time has been passed farmers in using pesticides for agricultural purposes shall be calculated from the first use of pesticides to the ongoing research and calculated the size of the year. The division of the Length use of pesticides of group were <5 years, 5-9 years, 10-14 years and  $\geq$  15 years.

Objective criteria:

Longer: If farmers use pesticides to combat the target pest  $\geq$  5 years

Shorter: If farmers have to use pesticides to combat the pest target <5 years

#### 2. Mixing

Mixing was the act of pesticides use with another compounds which suitable content and concentration based on dose on the label.

The objective criteria:

Eligible: If mixing was suitable with the dose listed in pesticides label

Ineligible: If mixing was not suitable with the dose listed in pesticides label

#### 3. The use personal protective equipment (PPE)

The Use of Personal Protective Equipment (PPE) meant was the use of a tool that adapat protect farmers of the onset of accidents and occupational diseases. The used PPE types included: mask, headgear (cap), long-sleeved

shirt, gloves, hands and heels (boat shoes)

Objective criteria:

Eligible : If farmers use a complete PPE when working with pesticides include: mask, headgear (cap), long-sleeved shirt, gloves, hands and heels (boat shoes)

Ineligible: If the farmers when working and did`nt fit the above criteria.

#### 4. Blood cholinesterase

Cholinesterase was pesticide residue levels in the blood of the respondents obtained after working with pesticides and proved by the results of laboratory tests with high levels of blood Haemoglobin (Hb) that exceeds that of above normal, using Tintometer Kit

Objective criteria:

Normal: If the cholinesterase results show 75% -100%

Abnormal: If the cholinesterase results show <75%

### 2.3 Population and sample

#### 1. Population

The population in this study were all farmers in the village of torpedo, sub district of Sabbang, Luwu District of as many as 89 farmers

#### 2. Sample

The sample in this study were some farmers in the village of torpedo, Sub district of Sabbang, District of Luwu were 73 farmers.

a. The sample size can be calculated by the following formula:

$$\begin{aligned} N &= \frac{N}{N(0.05)^2 + 1} \\ &= \frac{89}{89(0.0025) + 1} \\ &= 72.80 \\ &= 73 \end{aligned}$$

Thus, samples taken were 73 farmers

Information :

n: sample size

N: Large of population

$Z_{1-\alpha / 2}$ : Statistics Z ( $Z = 1.96$  for  $\alpha = 0.05$ )

#### **2.4 The technique of data collection**

1. The primary data was obtained through a questionnaire and conduct direct observations during the study
2. Secondary data was obtained from relevant agencies related with this research, the administration of Torpedo village, sub district Sabbang, District Luwu.

#### **2.5 Processing and presentation of data**

The data processing was conducted with the aid of a computer, while the presentation of data was done in the form of distribution of the table and be accompanied by explanations in narrative form.

### **3. Result and Discussion**

#### **3.1 Result**

##### **1. Characteristic of respondents**

##### **a. Age of Respondents**

**Table 1:** Distribution of Respondents by Age Group In the village of torpedo, Sub district Sabbang, 2012

Respondents age (Year)	n	%
≤ 34	12	16.4
35 - 41	14	19.2
42 - 48	21	28.8
49 - 55	18	24.7
≥ 63	8	11
Total	73	100

Table 1 shows the respondents age in this study include: 12 people (16.4%) were age ≤ 34 , 14 people (19.2%) were aged of 35-41, 21 people (28.8%) were aged of 42-48, 18 people ( 24.7%) were aged of 49-55 and 8 people (11%) were aged ≥63.

**b. Respondent's Education level**

**Table 2:** Distribution of Respondents by education level In the village of torpedo, Sub district Sabbang, 2012

Education level of respondents	n	%
Elementary school	13	17.8
Junior High School	35	47.9
Senior High School	25	34.2
Total	73	100

Table 2 shows the education respondents in this study include: elementary school were 13 people (17,8%), junior high school were 35 people (47,9%) and senior high school were 25 people (34,2%).

**2. Research variables**

**a. Level of blood cholinesterase**

**Table 3:** Distribution respondents by blood cholinesterase level In the village of torpedo, Sub district Sabbang, 2012

Level of blood cholinesterase	n	%
Normal	37	50.7
Abnormal	36	49.3
Total	73	100

Table 3 shows the Level of blood cholinesterase in this study include: 37 people (50,7%) were normal and 36 people (49.3%). Were abnormal.

**b. Length time of farming**

**Table 4:** Distribution respondents by Length time of farming In the village of torpedo, Sub district Sabbang, 2012

Length time of farming	n	%
Longer	68	93.2
Shorter	5	6.8
Total	73	100

Table 4 show that respondent's length time consist of : longer time were 68 people (93,2%) and shorter time were 5 people (6,8%).

**c. Mixing**

1) Pesticides Type

**Table 5:** Distribution respondents by pesticides type In the village of torpedo, Sub district Sabbang, 2012

Type of pesticides	n	%
Actra	12	16.4
Chix	10	13.7
Decis	12	16.4
Matador	12	16.4
Sidazinon	27	37.0
Total	73	100

Table 5 show that the type of pesticides was used by respondent consist of : 12 people (16,4 %) use actra, 10 people (13 %) use chix, 12 people (16,4%) use 12 people, 12 people (16,4 %) use matador, and 27 people (37%) use sidazinon.

2) The amount used pesticides

**Table 6:** Distribution respondents by amount of pesticides In the village of torpedo, Sub district Sabbang, 2012

The amount of pesticides (Ml)	n	%
250	9	12.3
500	57	78.1
750	7	9.6
Total	73	100

Table 6 show that the amount of pesticides were used respondents consist of 9 people ( 12,3 %) use 250 ml, 57 people (78,1 %) use 500 ml, 7 people (9,6 %) use 750 ml.

3) The amount of used water

Table 7 shows the amount of water used by the respondent, were: 9 people (12,3 %) with 1000 cc, 5 people (6,8 %) with 1500 cc, 56 people (76,7 %) with 2000 cc, and 3 people (4,1 %) with 3000 cc.

1) Size accuracy of pesticides and water

**Table 7:** Distribution respondents by amount of used water In the village of torpedo, Sub district Sabbang, 2012

The amount of water (CC)	n	%
1000	9	12.3
1500	5	6.8
2000	56	76.7
3000	3	4.1
Total	73	100

**Table 8:** Distribution respondents by accuracy of size In the village of torpedo, Sub district Sabbang, 2012

Accuracy of Size	n	%
Yes	70	95.9
No	3	4.1
Total	73	100

Table 8 show that the size accuracy of water and pesticides were used by respondents consist of : 70 people (95,5 %) who use accurate water and pesticides and 3 people (4,1%) for who use inaccurate water and pesticides.

2) Mixing

**Table 9:** Distribution respondents by mixing technique In the village of torpedo, Sub district Sabbang, 2012

Mixing	n	%
Eligible	70	95.9
Ineligible	3	4.1
Total	73	100

Table 9 show the respondents mixing consist of : 70 people (95,5%) for eligible and 3 people (4,5% for inegible.

**d. Personal protective equipment (PPE)**

1) The farmer who use PPE



**Table 10:** Distribution respondents by farmer who use PPE In the village of torpedo, Sub district Sabbang, 2012

Farmer who use PPE	N	%
Use	73	100
Do not use	0	0
Total	73	100

Table 10 show that the farmer who use PPE were all farmers use PPE (100%).

2) The farmer who use complete PPE

**Table 11:** Distribution respondents by farmer who use complete PPE In the village of torpedo, Sub district Sabbang, 2012

Farmes who use complete PPE	n	%
Complete	61	83.6
Incomplete	12	16.4
Total	73	100

Table 11 show that the farmer use complete farmer consist of ; complete were 61 people (83,8 %) and incomplete were 12 people (16,4%).

3) The use of Personal Protective equipment

**Table 12:** Distribution respondents by farmer who use complete PPE In the village of torpedo, Sub district Sabbang, 2012

The use of PPE	n	%
Eligible	61	83.6
Ineligible	12	16.4
Total	73	100

Table 12 show the farmers in use of PPE consist of : 61 people (83,8%) were eligible were and 12 people (16,4%) were ineligible.

**3.2 Analysis relationship research variables**

**a. The relationship between duration with Farmer`s Blood Cholinesterase**

The table 13 above shows that the duration use from the 68 respondents, the longer use with abnormal blood cholinesterase level were 35 people (51.5%) and the longer use with use with normal blood cholinesterase level were 33 people (48.5%) while the 5 respondents which shorter use with use with abnormal blood cholinesterase level were 1 person (20%) and shorter with use with normal blood cholinesterase level were 4 (80%).

Based on the statistical test,  $P = 0.187$  indicates that  $H_0$  accepted means there was no significant correlation between the farming duration with farmer`s blood cholinesterase s ( $P > 0.05$ )

**b. The relationship mixing with Farmer`s Blood Cholinesterase**

Table 14 above shows that mixing from 3 respondents, mixing was Ineligible with levels of abnormal blood cholinesterase was 1 person (33.3%) and the mixing with normal blood cholinesterase were 2 people (66.7%), while 70 respondents of mixing qualify with abnormal blood cholinesterase were 35 people (50%) and Qualified with normal blood cholinesterase were 35 (50%).

Based on the statistical test,  $P = 0.510$  indicates that  $H_0$  accepted means there was no significant correlation between mixing with farmer`s blood cholinesterase ( $P > 0.05$ ).

**Table 13:** Distribution of respondents based on relationship duration with level of farmer`s blood cholinesterase at Torpedo village , 2012

Duration	Level of blood cholinesterase				Total		P
	Abormal		Normal		n	%	
	n	%	n	%			
Longer	35	51.5	33	48.5	68	100	0.187
Shorter	1	20	4	80	5	100	
Total	37	50.7	36	49.3	73	100	

**c. The relationship use of PPE with level of blood cholinesterase**

The table 15 above shows that the use of PPE from 12 respondents, the ineligible use of PPE with abnormal blood cholinesterase were 7 people (58,3%) and with the normal blood cholinesterase were 5 people (41,7%), whereas the use of eligible PPE with abnormal blood cholinesterase were 29 people (47,5%) and with the with normal blood cholinesterase were 32 people (52,5%).

Based on the statistical test,  $P = 0.357$  indicates that  $H_0$  accepted means there was no significant relationship

between the use of PPE with high levels of farmer`s blood cholinesterase ( $P > 0.05$ ).

**Table 14:** Distribution of respondents based on relationship mixing technique with level of farmer`s blood cholinesterase at Torpedo village , 2012

Mixing	Level of blood cholinesterase				Total		P
	Abormal		Normal		n	%	
	n	%	n	%			
Ineligible	1	33.3	2	66.7	3	100	0.510
Qualified	35	50	35	50	70	100	
Total	37	50.7	35	49.3	73	100	

**Table 15:** Distribution of respondents based on relationship PPE use with level of farmer`s blood cholinesterase at Torpedo village , 2012

Use of PPE	Level of blood cholinesterase				Total		P
	Abnormal		Normal		n	%	
	n	%	n	%			
Ineligible	7	58.3	5	41.7	12	100	0.357
Eligible	29	47.5	32	52.5	61	100	
Total	37	50.7	36	49.3	73	100	

### 3.3 Discussion

Based on the results of the research data presentation above it can be discussed based on the study variables were:

#### 1. The length of use

Exposure to pesticides was also dependent on the length use of a various kind pesticides. Pesticides was especially from the aspect of trademark also variety contains based on the type and brand name. So that the effects of pesticide use will also vary on individual especially against the length of exposure to the chemical compounds of pesticide.

As well known that exposure to pesticides in individuals can occur through the skin and the respiratory tract so that the length of exposure to the pesticide compound will be members cause the different effects including the magnitude of the acceptable effect.

The results showed that average length use of pesticides from farmers' were above five years even up to 27 years being a farmers and during the time it's always occurs contact with pesticides, the average frequency of contact farmers with pesticides of at least 8 times, it can be seen from the number of harvested two times a year, and the first time the process of planting until harvest, a minimum of farmers four times held spraying, began from spraying of stems, leaves, fruit and pests, but if the farmer's land was very broad, the spraying frequency certainly increase because spraying can not conducted only once, and maybe the contact frequency can be above 8 times a year.

Based on the statistical test,  $P = 0.187$  indicates that  $H_0$  accepted means there was no significant correlation between the length of farming with high levels of farmers blood cholinesterase ( $P > 0.05$ ).

The absence of a relationship between a meaningful relationship between the length of farming, it was caused every contact with pesticides, farmers always use PPE, beside of that if pesticides come into the body, body will neutralize every chemical compounds with white blood cell so it can't affect the function of organ.

An increase in white blood cells caused by the function of white blood cells so that the body's natural antibody production of white blood cells increased to handle the pesticide compounds that enter the body. While the occurrence of decreased levels of red blood cells and hemoglobin caused by cell production decreased due to the pesticide chemical compounds which not only affects the function of other organs, including the production of red blood cells and hemoglobin [6]. This was in line with the results of research conducted by Nurzaidar (2010) in the Village of Lamtti Rilau, Sub district Sinjai, District of Sinjai said that there was no significant relationship between length use of pesticide levels with high levels of farmer's blood cholinesterase.

Results of research about the length of use with high levels of farmers blood cholinesterase in the Torpedo show there are no meaningful relationship, it was because although farmers are often in contact and contact time farmers is very long, but the levels of farmers blood cholinesterase are still normal, It was caused because farmers realize that pesticides poison which can be deadly, so farmers when doing mixing and spraying always use personal protective equipment.

## **2. Mixing pesticides**

Technique of mixing (dosing, mixing and retailing) was intended by the use of pesticides with give additional other fluids which are generally water with the balanced content or concentration. In the process of dosing, mixing and retailing were the most susceptible with the contamination of pesticide compounds. so need to be careful in doing this action.

The results showed that the basically, the mixing process of pesticides had been appropriate because farmers in the Torpedo often get counseling on how to use pesticides, and prior to use farmers always read the rules of life, even there are re inappropriate technique found, it is because farmers only estimate because they was already accustomed. There are several types of pesticides commonly used by farmers in the village of Torpedo such as ACTRA, decis, sidazinon, matador, and others.

Based on the statistical test,  $P = 0.0510$  showed that  $H_0$  accepted means there was no significant correlation between mixing with levels of farmers blood cholinesterase, ( $P > 0.05$ ).

The relationship between meaningful relationship mixing with farmers blood cholinesterase, it was because any contact with pesticides, farmers was always using PPE, besides if pesticides get into the body, the body (white blood cell) will neutralize the chemical compounds that enter the body so it does not affect organ function.

An increase in white blood cells caused by the function of white blood cells as body's natural antibody so production of white blood cells increased to handle the pesticide compounds that enter the body.

While the occurrence of decreased levels of red blood cells and hemoglobin caused by decreased of cell production due to the pesticide chemical compounds which not only affects the function of other organs, include the production of red blood cells and hemoglobin [6, 7].

This is in line with the results of research which conducted Nurzaidar in the Village of Lamtti Rilau, Sub district of Sinjai, District of Sinjai said that there was no significant relationship between mixing of pesticides with farmers blood cholinesterase. It was caused when farmer mix pesticides, they always wear Personal protective equipment (PPE) such as gloves and masks, in addition, farmers also always maintain the cleanliness after contact with pesticides.

### **3. The Use of PPE**

The use of PPE will create a safe atmosphere of the likelihood of accidents and occupational diseases in any work that would facilitate performance when maintaining work productivity. The level use of protective equipment (PPE) was very influential on the level of safety, where the lower the frequency of personal protective equipment influence, the greater the chance of work disease and accidents.

According to Law No. 23 of 1992 on Health and PP No. 102 of 2000 on the Indonesian National Standard (SNI), every worker must be protected in carrying out its work on the likelihood of danger caused by factors that endanger health.

The use of personal protective equipment required at the time of mixing, spraying and fertilization, it was conducted to avoid direct contact with the pesticide.

The impact of pesticides on the user directly causing both mild acute poisoning, acute or chronic large. Mild acute poisoning caused dizziness, headache, mild skin irritation, body ache and diarrhea. Severe acute poisoning cause symptoms of nausea, chills, abdominal cramps, difficulty breathing salivation, pupils shrink and pulse rate increased. While chronic poisoning was more difficult to detect because it is not immediately felt and causes no specific symptoms and signs of skin cancer, neurological disorders, miscarriages, birth defects, kidney disorders, liver and respiratory.

Pesticide contamination can take place in several ways were skin, mouth, and breathing, and because of that, it

was required PPE at the time of mixing, spraying and and fertilization.

The results showed that farmers in the Torpedo village always use Personal Protective Equipment (PPE) at the time of mixing, spraying and fertilization, the most often used PPE were masks, gloves, high heels (boot), headgear and long sleeves. The use of PPE were done to avoid direct contact with the pesticide, from observations there are still farmers who at the time of mixing do not use PPE such as gloves because farmers did not touch directly on pesticides such as when stirring, farmers use wood, but nevertheless, the farmer must still use PPE to avoid accidents [8,9].

Based on the statistical test,  $P = 0.357$  indicates that  $H_0$  accepted means there was no significant relationship between the use of PPE with high levels of farmers blood cholinesterase ( $P > 0.05$ ). This happens because basically farmer always use PPE at work of mixing, spraying etc, so even though the farmers had experience long farming and use of pesticides, the levels farmers blood cholinesterase were still normal. In addition, if a pesticide into the body, the body with white blood cells will neutralize the chemical compound that enter the body so there are no effect to the organ function.

An increase in white blood cells caused by the function of white blood cells as body's natural antibody so the production of white blood cells increased for handling the pesticide compounds that enter the body.

While the occurrence of decreased levels of red blood cells and hemoglobin caused by cell production decreased due to the pesticide chemical compounds which not only affects the function of other organs, was including the production of red blood cells and hemoglobin [6,10,11].

#### **4. Conclusion**

Based on the results of research and discussion it can be concluded were:

1. The length use of pesticide have more longer time than shorter time, but from the results of statistical tests  $H_0$  refused meaning there was no significant relationship between length use of pesticides with high levels of farmer`s blood cholinesterase,  $P > 0.005$ .
2. There was no significant relationship between how mixing of pesticides with high levels of farmer`s blood cholinesterase, based on the statistical test  $H_0$  rejected  $P > 0.005$ .
3. There are still some farmers do not use PPE at the time of contact with the pesticide, but from the results of statistical tests  $H_0$  refused meaning there was no significant relationship between the use of PPE with high levels of farmer`s blood cholinesterase,  $P > 0.005$

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