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Analysis of Pesticide Residue Chlorpyrifos Content in "Onion Palu" (*Allium ascalonicum* L.) Using Gas Chromatography

Jamaluddin[1]*, Kunnisa Ariefa[1], Nurlina Ibrahim[1], Yonelian Yuyun[1]

[1]Program Study of Pharmacy, Faculty of Mathematic and Natural Sciences, Tadulako University, Palu, Central Sulawesi, Indonesia.

Abstract: This study aims to determine the presence of chlorpyrifos pesticide residue content and determine the amount of content in onion Palu. The sampling technique was done by purposive sampling, each taken from three different locations. Assay performed using gas chromatography capillary column and nitrogen carrier gas. The results showed that the onion Palu containing chlorpyrifos pesticide residue levels of 0.229 mg/kg to onion Palu from Guntarano village; 0,008 mg/kg for the onion Palu from Sidera village; and 0,008 mg / kg for onion Palu from Maku village. The content of chlorpyrifos residue obtained from the two sampling sites still below the MRL (Maximum Residue Limits), while one sample is above the MRL where chlorpyrifos maximum residue limits for onion in ISO 7313: 2008 about 0.2 mg/kg.
Keywords: Pesticides, Chlorpyrifos, Onion Palu, Gas Chromatography.

Introduction

Province of Central Sulawesi, especially in Palu valley are superior commodity onion local area is well known as a source of raw materials typical fried onions compared to other red onions in Indonesia. One of the specific commodity red onion from Central Sulawesi is "Palu Onion" or better known as the Palu Fried Onions.[1]

Red onion varieties from Palu valley is the raw material for processing fried onions and has become a "local brand" Palu. Palu onion farming began in the last decades, especially around the Palu valley, Tinombo, Gontarano, and several other areas in Donggala. This onion adapt quite well in lowland and dry climates. Potential land in Central Sulawesi still roomy enough for the development of the onion that is supported by rainfall, air temperature and soil suitable and adequate facilities and infrastructure.[2]

Onion production process Palu often face problems caused by the high intensity of pests and diseases as well as cultivation system is not optimal. Pests that attack plants Onion Palu is moth (*Spodoptera exigua* HBN) as well as the form of spots on leaf disease caused by *Alternaria porii* Ell.[2,3] Approximately 80% of onion farmers in Central Sulawesi believe that chemical pesticides can reduce yield loss and rapid control of pests and diseases.[4]

Some research indicates that the use of pesticide poisoning cases have a negative impact on human, animal, environmental pollution and pest resistance. Data collected by WHO indicates 500000-1000000 people per year world wide has experienced pesticide poisoning and about 500-1000 people per year of which suffered greatly fatal ascancer, defects, infertility, and disorders of the liver. Uncontrolled use of pesticides will lead to various health problems and environmental pollution.[5]

Hence, this study aims to determine the presence of chlorpyrifos pesticide residue content and determine the amount of content in Palu Onion.

Materials and Methods

Plant Material

The sample used in this study is Palu onion taken from 3 different locations, namely the Guntarano Village (Subdistrict Tanantovea), Sidera Village (Subdistrict Biromaru), and Maku Village (District of Dolo). The sampling technique was done by purposive sampling, which is based on the consideration of researchers who consider the pesticide chlorpyrifos was found in the samples taken. Consideration of the results of the survey to farmers who use the Onion Hammer pesticides during the production process Onion Palu.

Apparatus

The measurements were made on Agilent 7890 Gas Chromatography with FPD detector (Flame Photometric Detector).

Reagents and solutions

All the chemicals used for this study were of analytical grade.

Sample Preparation

Red onion peeled and washed, then cut/sliced into small pieces and then ready to be extracted.

Extraction

Samples that have been sliced onion and weighed as much as 25 g put in a 100 ml Erlenmeyer and added diklormetan soaked for 1 hour. Pipette 25 ml from the marinade and put in around flask, was concentrated in a rotary evaporatorat a temperature of 40°C waterbath, until almost dry. Extract the residue was dissolved in 5 ml of isooctane : toluene (9: 1).

Preparation of Standard Solution chlorpyrifos

A number of reference standard for purity of 9.99 ng/ml was taken as 0.05 ml, then put in a 5 mL volumetric flask. Then diluted with isooctane solvent and paid back to the mark so that the concentration of a solution containing 0.1 ng/mL.

Quantitative analysis (Calculation of residue levels)

a. Standard Solution
1 mL of the standard solution with a concentration of chlorpyrifos 0.1 ng/mL was injected into the gas chromatography apparatus.

b. Sample solution
1 mL of sample solution was injected into a gas chromatography apparatus

Data Analysis

Pesticide residue levels were calculated using the following formula:

Residue levels=

$$\frac{\frac{area\ of\ sample}{area\ of\ standard} x\ V\ injection\ stdr\ x\ C\ stdr\ x\ \frac{vol.end\ of\ ml}{vol.injection}\ x\ correction\ factor}{weight\ sample\ (g)}$$

Note:
V = volume
C = concentration
Stdr = standard

Results & Discussion

The results of the analysis of the levels of chlorpyrifos residues in samples obtained Onion Palu can be seen in table 1.1

Table1.1 Data Content of chlorpyrifos residues (mg /kg) in the sample OnionPalu

No	Samples	Treatment	Retention time (min)	Area	The residue levels (mg/kg)	Average residue levels (mg /kg)
1.	Onion Palu from the Guntarano village	A	5.893	1293.15845	0,222	0,229
		B	5.893	1422.82214	0,237	
2.	Onion Palu from the Sidera village	A	5.897	36.40189	0,006	0,008
		B	5.898	60.14925	0,01	
3.	Onion Palu from the Maku village	A	5.895	37.62720	0,006	0,008
		B	5.897	53.13797	0,009	

Method in this study followed the procedures from Laboratory Institute of Protection Food and Horticulture (BPTPH) Maros with some consideration because this laboratory is the only specialized laboratory testing of pesticide in eastern Indonesia nationally accredited. Working procedures in BPTPH Maros using duplo that is making sample footage performed twice on each sample to be examined. Duplo method consists of simploie first shots and dumploie duplicate footage or footage both aimed as a useful bench mark for comparison of results and useful for the results obtained various.

Chlorpyrifos pesticide residue test results conducted on Pesticide Testing Laboratory Institute of Protection Food and Horticulture (BPTPH) Maros shows that it contains chlorpyrifos in the sample. Based on Table1.1, chlorpyrifos pesticide residue levels obtained in the origin of Onion Palu 3 villages namely Guntarano Village, Sidera Village and Maku Village of 0.229 mg/kg, 0.008 mg/kg, and 0.008 mg/kg. The results are still below the Maximum residue limits (MRL) for Onion is 0.2 mg/kg based on the ISO 7313: 2008, except in sample from the Guntarano village lightly past the maximum limit. Chlorpyrifos residue levels that exceed the maximum residue limits (MRL) of this Guntarano village due to the high use of insecticides that do farmers.

The consideration of chlorpyrifos compounds analyzed in this study is due to these pesticides, including the type of pesticides commonly used by farmers in combination with other pesticides, where chlorpyrifos has maximum residue limits (MRL) relatively small so that the likelihood of relatively high toxicity. Chlorpyrifos sensitive to alkaline hydrolysis and low persistence at high soil pH. Frequency intensive spraying by farmers for planting onions can cause high chlorpyrifos residues in the soil is high. While half the time required by chlorpyrifos to biodegrade in soil that is 60-120 days. This can be a factor in the detection of chlorpyrifos onion plants.[6]

Residue levels that exceed the maximum residue limits (MRL) set will have a negative impact on the environment, especially on the health of consumers. Action toxic organophosphate pesticide is when organophosphate pesticides entering the human body will be attached to the enzyme cholinesterase in the blood. Organophosphate pesticides will form strong bonds with the phosphate, thus becoming corrupted and lost its ability to hydrolyze asethilkholin.[7]

Cholinesterase is an enzyme found in the cellular fluid, whose function is to stop the action of the acetylcholine by hydrolyzing way into choline and acetic acid. Acetylcholine is a neuro hormone contained between nerve endings and muscles, as a function of chemical media continue nerve stimulation or impulses to receptors of muscle cells and glands. If the stimulus is ongoing will cause a disruption in the body. For that stop stimulation induced by acetylcholine by the hydrolysis into choline and acetic acid.[7]

In blood, cholinesterase will bind the organophosphate pesticide groups. The reaction between

organophosphates and cholinesterase called phosphorylase. Phosphorylase enzyme is no longer able to hydrolyze acetylcholine, resulting in acetylcholine got a chance to stay and accumulate at sites of receptors. Because cholinesterase can not solve acetylcholine, nervei mpulses to flow continuously (constant) cause sarapid twiching of muscles and eventually leads to paralysis. At the time of the muscle sof the respiratory systemis not was death. The binding between organophosphates and cholinesterase almost irreversible. This is there a sons why very dangerous organophosphates.[7]

Exposure to low doses of chlorpyrifos alone can cause nausea, dizziness, confusion and difficulty breathing. Higher doses can cause paralysis of the respiratory system or even death. Small children are very susceptible to chlorpyrifos and other pesticides due to the body and brain is still developing, and chemicals that affect the nervous system during growth can cause permanent damage.[8]

Conclusion

1. The assessment levels of chlorpyrifos pesticide residues by gas chromatography showed that the samples had residues of pesticides chlorpyrifos;
2. Chlorpyrifos pesticide residue levels in the sample Onion Palu respectively 0.229 mg/kg for the Onion Palu from Guntarano village; 0.008 mg/kg for the Onion Palu from Sidera village and 0.008 mg/kg for the Onion Palu from Maku village.

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