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ANALYSIS OF PESTICIDE RESIDUES IN POTATO PLANTS IN MOAT DISTRICT, EAST BOLAANG MONGONDOW REGENCY, INDONESIA

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Abstract

The use of pesticides on highland vegetable crops by farmers is considered highly intensive. This is primarily due to favorable climatic conditions for developing plant pests and diseases. Pesticides are toxic bioactive chemical substances (at concentrations > 0.5 ppm). Each of these poisons carries risks to the environment and humans in their use. Pesticide residues are specific substances found in agricultural food crops or animal feed, either as a direct or indirect result of pesticide use. This research aims to determine the presence of pesticide residues in potatoes cultivated by the community of Moat Subdistrict, East Bolaang Mongondow Regency. This study adopts a qualitative descriptive approach with laboratory experimentation. Representative samples were taken from ten potato plantations in Moat Subdistrict, East Bolaang Mongondow villages. They were then analyzed at the Laboratory of Plant Protection and Quality Testing. Based on the research findings, the researchers concluded that six locations of potato tubers in 10 villages in Moat Subdistrict, East Bolaang Mongondow Regency, did not contain pesticides. In comparison, the remaining four locations showed pesticide content.

Keywords: Potato, Pesticide, Residue.

INTRODUCTION

In vegetable cultivation, farmers are almost always confronted with the problem of plant pests. The majority of farmers (98%) use pesticides to control these pests, and spraying is the most common method used (71.4%) (Prabaningrum, 2017). Potato plants are a strategically crucial horticultural commodity in providing food to support food security. Potato seed production is a multiplication phase where seed stocks are repeatedly propagated, which can lead to a decrease in tuber quality. The production of mini tubers is highly dependent on the variety and plant maintenance (Karjadi, 2016).

One of the main challenges faced in potato cultivation is the attack of pests such as thrips (*Thrips palmi*), peach aphids (*Myzus persicae*), and leaf rollers (*Phtorimaea operculella),* which can cause yield losses of 25-90%. In addition, bacterial wilt disease caused by *Ralstonia solanacearum* and leaf rot disease caused by *Phytophthora infestans* can result in yield losses of over 50% (Prabaningrum, 2017).

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Throughout human civilization, pesticides have been utilized in the field of health to protect the human body from diseases transmitted by vectors and in agriculture to control the infestation of various plant pests in the field and storage areas. In principle, pesticides are toxic substances that are beneficial when used properly and correctly (Hasibuan, 2015).

Chemical pesticides are the most widely used substances by farmers in Indonesia to control pests on Fresh Plant Originated Food (FPOF). Approximately 95.29% of farmers in Indonesia use pesticides because they are considered effective, easy to use, and economically beneficial. The use of pesticides in agriculture and plantations starts from the beginning to the end of the crop cycle, including soil preparation, land preparation, plant maintenance, harvesting, and even post-harvest. Furthermore, the extensive use of pesticides is supported by the wide variety of registered pesticides whose usage has been permitted. Based on data from the Ministry of Agriculture until 2016, the number of registered and permitted pesticide brands in Indonesia has reached 3,207. Despite the benefits of pesticides in improving agricultural yields, pesticides are toxic and bioactive chemical substances (at concentrations > 0.5 ppm). Each poison is dangerous in its usage, both to the environment and humans (Handayani *et al.,* 2017).

The data from food safety surveillance conducted by the Makassar Agricultural Quarantine Center between 2009 and 2007 revealed the presence of organophosphate pesticide residues in kale and water spinach sold in Terong Makassar supermarkets. A study by the Makassar Environmental Health and Infectious Diseases Control Technical Center, a Class 1 facility, 2010 examined the impact of pesticide use on farmers and the environment in the Uluere District of Bantaeng Regency, South Sulawesi Province. The study found pesticide residues in potatoes, specifically <0.002 mg/kg carbaryl, <0.002 mg/kg carbofuran, and 6.46 mg/kg chlorpyrifos (Yusnani, 2013). There were pesticide residues found in vegetables in South Sumatra, particularly in curly chili peppers, potatoes, and shallots, with organophosphate and carbamate residues dominating. Sumiati (2005) also discovered pesticide residues in oranges in Batu and Malang Regency (Purbosari *et al.,* 2021).

Pesticides are used multiple times during growth and are sometimes used before harvesting to increase crop yield and enhance quality (Adriyani, 2006). Excessive use of pesticides becomes a source of contamination in food, water, and the environment. As a result, residues directly or indirectly reach the human body (Raini, 2007 & Sudarma *et al*., 2020).

Considering the abovementioned issue, the researcher is interested in conducting a study titled "Analysis of Pesticide Residues in Potato Plants in Mooat District, Bolaang Mongondow Timur Regency."

RESEARCH METHODS

Place and time

This research was conducted in October - November 2021, in Mooat District, Bolaang Mongondow Timur, and at the Laboratory of the Plant Protection Center.

Tools and materials

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The tools used in this study included hoe, knife, cutting board, aluminium foil, 50 ml measuring glass, stirrer, erlenmeyer flask, pesticide detection kit, distilled water, detection reagent, potato.

Research Procedure

The sampling for the research was conducted in potato plantations in the Mooat District, Bolaang Mongondow Timur Regency villages. There were 10 sampling stations set up in the villages of Kecamatan Mooat. The sampling aimed to determine the presence of pesticide residue in the potato tubers grown in the villages of Mooat District, Bolaang Mongondow Timur Regency.

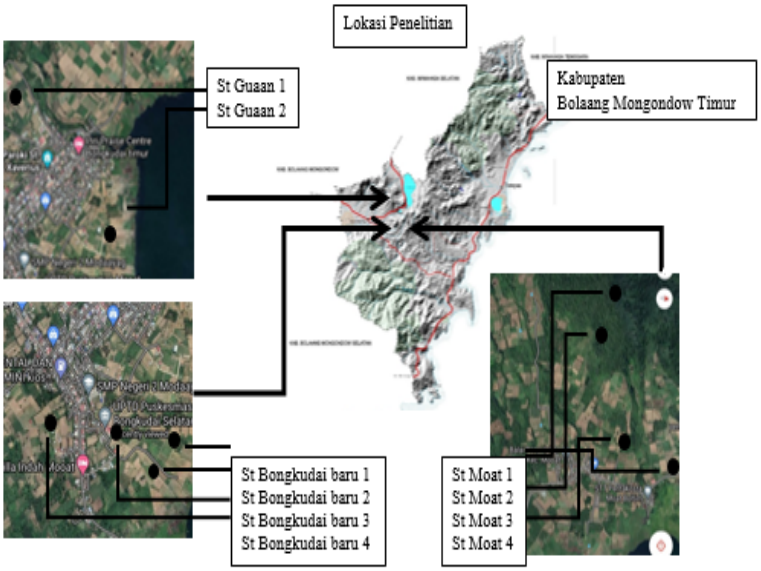

Figure 1. Sampling Location

Sample Testing

The analysis of pesticide residue was carried out using the Pesticide Detection Kit. The samples were thoroughly washed and cut into small pieces. Then, 10 ml of the sample was placed into a measuring glass, and 20 ml of water was added. The mixture was shaken or stirred for 1 minute. After stirring for 1 minute, the activator solution was added to the measuring glass. It was stirred again and left to stand for 3 minutes. The kit was then immersed in the solution for 1 minute. After removing the kit, it was left to adhere for 3 minutes, and the result was observed. If the color turned blue, it indicated a negative result, while a white color indicated a positive result.

Data analysis

The data obtained from the research results were analyzed qualitative descriptively.

RESULTS AND DISCUSSION

The analysis of pesticide residues in potato tubers was carried out using the pesticide testing method with the Pesticide Detection Kit. Based on the laboratory examination results, the first sample of potatoes from Guaan village showed a negative result, indicating no pesticide contamination. The second sample of potato tubers from Guaan village tested positive for pesticide residues, indicating contamination. The

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third sample of potato tubers from Mooat village was also detected as positive for pesticide residues. The fourth and fifth samples of potato tubers from Mooat village tested negative, indicating no pesticide presence. The sixth sample of potato tubers from Mooat village tested positive for pesticide contamination. The seventh, eighth, and ninth samples of potato tubers from Bongkudai Baru village tested negative, indicating no pesticide residue. The tenth sample from Bongkudai Baru village tested positive for pesticide contamination.

Table 1. Analysis of Pesticide Residues in Potato Tubers

No	*Commodity*	*Location*	*Result*
1	Potato 1	Guaan 1	Negative / Blue
2	Potato 2	Guaan 2	Positive / White
3	Potato 3	Mooat 1	Positive / White
4	Potato 4	Mooat 2	Negative / Blue
5	Potato 5	Mooat 3	Negative / Blue
6	Potato 6	Mooat 4	Positive / White
7	Potato 7	Bongkudai Baru 1	Negative / Blue
8	Potato 8	Bongkudai Baru 2	Negative / Blue
9	Potato 9	Bongkudai Baru 3	Negative / Blue
10	Potato 10	Bongkudai Baru 4	Positive /Putih Kebiruan

The sampling for this study was carried out in potato plantations in various villages in the Mooat District, East Bolaang Mongondow Regency, Indonesia. There were 10 sampling stations located in different villages within the Mooat District. The objective was to determine the presence of pesticide residue in potato tubers grown in the villages of Mooat District, East Bolaang Mongondow Regency.

The samples used in this research were potato tubers. Tubers are formed from lateral branches between the roots. The formation of tubers is marked by the cessation of elongated growth of rhizomes or stolons, followed by enlargement, resulting in swollen rhizomes. Tubers are storage organs containing carbohydrates, proteins, fats, vitamins, minerals, and water (Samadi, 1997).

The analysis of pesticide residues in potato tubers was conducted using the pesticide testing method with the Pesticide Detection Kit. Based on the laboratory examination results, the first sample of potatoes from Guaan village showed a negative result, indicating no contamination by pesticide residue. The second sample of potato tubers from Guaan village tested positive for pesticide residue contamination. The third sample from Mooat village was detected as positive for pesticide residue. The fourth and fifth samples from Mooat village tested negative, indicating no pesticide contamination. The sixth sample from Mooat village tested positive, indicating pesticide contamination. The seventh, eighth, and ninth samples from Bongkudai Baru village tested negative, indicating no pesticide residue contamination. The tenth sample from Bongkudai Baru village tested positive for pesticide residue contamination.

Based on the research results in Table 1 above, it can be concluded that three potatoes contain pesticides in high concentrations, namely the potatoes from Guaan 2, Mooat 1, and Mooat 4 villages. One potato tested positive for pesticide residue at a low concentration, taken from Bongkudai Baru 4 village. The remaining four potatoes tested negative, indicating no pesticide residue contamination.

Pesticides are toxic substances that provide benefits in the field of agriculture but can have an impact on public health. Pesticide residues refer to substances present in agricultural produce or animal feed, directly or indirectly, due to pesticide use. Pesticide residues can indirectly affect consumers, but in the long term, they can cause health disorders, such as nerve and enzyme metabolism disturbances (Wudianto, 1997).

The direct impacts on health include poisoning, itching, nausea, and digestive disorders, while the long-term effects include reproductive disorders, pregnancy complications, and cancer. One significant detrimental effect of pesticide use is its potential to damage the surrounding water ecosystems near agricultural fields. When pesticides are used, residual water containing pesticides is generated. This pesticide-contaminated water can flow through rivers or irrigation channels (Yuantari, 2011).

CONCLUSION

Based on the research findings, the researcher concludes that out of the 10 locations in the villages of Kec. Mooat, Kab. Bolaang Mongondow Timur, 6 locations of potato crops do not contain pesticides, while the remaining 4 locations have pesticide residues.

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