

STEEPING BAY LEAVES (SYZYGIVM POLYANTHUM) TO INCREASE CHOLINESTERASE LEVELS DUE TO PESTICIDE EXPOSURE IN FARMERS

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ABSTRACT

Farmers are at high risk of pesticide exposure. The threat of death from pesticides reaches 168,000 per year. Pesticide free radicals cause health problems in the form of impaired function of nerves, liver, and kidneys and cause cancer. Low blood cholinesterase (CHE) indicates pesticide residue. Steeping bay leaves (*Syzygium polyanthum*) are expected to improve liver function to detoxify pesticide-free radicals that have already entered the body. This study aims to determine the effect of steeping bay leaves (*Syzygium polyanthum*) on increased cholinesterase (CHE) levels. Qualitative research with pre-experimental design one group pre-test-post test. As a population is a group of farmers in the Pasuruan area. The sample size in this study was 20 respondents using purposive sampling techniques. The research procedure is to measure cholinesterase levels in the blood before and after steeping bay leaves (*Syzygium polyanthum*) after 15 days. The data were analyzed by paired t-test. There was an increase in average blood cholinesterase levels of 399.35 U/L after 15 days of regular consumption. Blood cholinesterase levels before treatment were 5,301.25 U/L and after treatment became 5,700.00 U/L. The paired t-test results showed a significance value of $p = 0.000$. The average working time of the participants 18.5 years is very likely to have a lot of pesticide residues in their bodies and cause disruption of the normal function of several organs, causing mild and severe health problems. Bay leaf steeping (*syzygium polyanthum*) has been shown to increase cholinesterase (CHE) levels. To avoid the threat of health problems, farmers should diligently consume steeping bay leaves regularly.

Keywords: cholinesterase levels; famers; pesticide exposure; steeping bay leaves (*syzygium polyanthum*)

INTRODUCTION

Farmers have a high risk of exposure to pesticides. Some factors that affect farmers' exposure to pesticides include organophosphate and organochlorine pesticides which are widely used by farmers and have high toxicity (Panggabean et al., 2023). Comment utiliser les pesticides en général en pulvérisant cela facilite l'entrée des toxines des pesticides par le système respiratoire (Boateng et al., 2023). In general, farmers in rural areas have a low level of education, which affects the low understanding of the dangers of pesticides and the low level of compliance with the use of personal protective equipment (Tambo et al., 2023). Pesticides that have high toxicity cause health problems. The threat of death due to prolonged contact with pesticides reaches 168,000 per year (Febriana et al., 2023). Early detection efforts for pesticide exposure can be done by checking blood cholinesterase levels. Low blood cholinesterase indicates that there are pesticide residues in the farmer's body (Silva et al., 2023). Pesticide free radicals gradually cause health problems in the form of impaired function of nerves, liver, and kidneys and cause cancer (Hesami Arani et al., 2023). Steeping bay leaves are expected to improve liver function to detoxify pesticide-free radicals that have already entered the body (Hartanti et al., 2019).

Bay leaves contain vitamins A, B6, and C which can support the performance of lymphocytes and neutrophils to fight free radical agents. The active substance of bay leaves (*Syzygium polyanthum*) can reduce the risk of stomach irritation that can be caused by exposure to pesticides in the

gastrointestinal tract or due to increased stomach acid through the mechanism of inhibition of the urease enzyme. The content of polyphenols in bay leaves (*Syzygium polyanthum*) can reduce the risk of cardiovascular disease and keep the heart working optimally. Linalool contained in bay leaves is believed to reduce stress and depression (Hartanti et al., 2019). Furthermore, the aim of this study is to determine the effect of steeping bay leaves (*syzygium polyanthum*) to increase blood cholinesterase (CHE) levels as an indicator of improved body function against pesticide exposure in farmers.

METHOD

Study design praeksperimental one group pretest-posttest (Epidemiologico, 2020). 20 respondents were eligible for the first stage of blood cholinesterase and Hb measurements. Anamnesa related to health complaints experienced in the last week and then gave bay leaf steeping every day for 2 weeks. Furthermore, measurements of cholinesterase levels, Hb levels, and anamnesis about health complaints were carried out. The research setting will be carried out from July to August 2023 in 4 Pasuruan areas that have large rice fields, namely Bangil District, Grati District, Gadingrejo District, and Rejos District. In addition, the area has a population mostly working as farmers with a low level of education so there is still low compliance in the use of personal protective equipment according to safety standards. Participants were 20 farmers selected by purposive sampling with criteria 1). Hb levels and BMI within normal limits, 2). Gender: male, age 25-56 years, 3). Not smoking while treating, 4). As a farmer for more than 3 years and frequent contact with pesticides. Variables in this study included steeping and greetings and cholinesterase levels.

Bay leaves (*Syzygium polyanthum*) are given in the form of steeping, the manufacturing process is as follows: 100 grams of bay leaves (*Syzygium polyanthum*) are boiled with 1000 cc of water to boil then let stand for 30 minutes and then drink until finished. Regular bay leaf steeping every day for 2 weeks. Blood cholinesterase is an enzyme produced by the liver used as a parameter for exposure to organophosphate pesticides. Cholinesterase examination is done by taking the respondent's venous blood as much as 1-2 cc. Blood collection was carried out 2 times per participant, namely before treatment and after treatment. Venous blood measurement that has been taken is then taken to the health laboratory for measurement of cholinesterase levels. Normal values of cholinesterase for ages less than 40 years are 4,260-11,250 U/L while for ages over 40 years 5,320-12,920 U/L. Bias is anticipated by restricting participants through inclusion criteria and encouraging participants to comply with recommended recommendations such as getting enough rest and not smoking during treatment. The study size sample of as many as 20 from 4 research locations, with each region taking as many as 5 participants who had met the inclusion criteria. Quantitative variables of participants' blood cholinesterase levels are data with a ratio scale, then comparative analysis is carried out to assess whether there is a difference in average values between before and after treatment in participants. Statistical methods data obtained are first carried out normality tests to assess whether the data group is normally distributed or not, if it is normally distributed it is tested with a parametric paired sample t-test, if it is not normally distributed it is tested with a nonparametric test. The conclusion is based on a probability value of < 0.05 , then H_0 is rejected.

RESULTS AND DISCUSSION

Table 1.
CHE participant rate by age

Age Group	f	%	CHE			
			<Normal		Normal	
< 40 years	4	20%	1	5%	3	15 %
≥ 41 years	16	80%	9	45%	7	35%
Total	20	100%	6	50%	10	50%

Based on the data table above, the age of 80% of participants over 40 years with CHE enzyme levels below normal as much as 45% and 35% normal. The age of participants under 40 years was 20% with normal CHE levels of 15% and 5% below normal.

Table 2.
Participant's length of work as a farmer

LENGTH OF WORK	SUM	%
5-10 years	2	10
11-15 years	4	20
16-20 years	5	25
21-25 years	8	40
26-30 years	1	5
Total	20	100

Based on the data table of working as farmers, 40% of participants worked as farmers between 21-25 years.

Health complaints experienced by participants

Based on the results of interviews with participants, data were obtained; Complaints of dizziness as much as 70% but after treatment to 65%, complaints of muscle pain remained at 45% but the quality of pain has been reduced, diarrhea at 1% but after treatment to 0%, mild itching 60% down to 25%, complaints of watery eyes 30% down to 25%, anorexia 10% down to 0%.

Haemoglobin (Hb) participant levels

Haemoglobin (Hb) levels of participants before treatment were still in the normal range of 10.7 g/dl to 14.1 g / dl.

Body Mass Index (BMI) participant

From the measurement results, there are body mass indexes between 18.5 to 25.2, these results are still within the normal range.

Table 3.
Cholinesterase (CHE) participant levels

	Pretest		Posttest		Mean Difference
	Mean	SD	Mean	SD	
CHE	5.301,25	1.677	5.700,0	1.502	399,35

There was an increase in cholinesterase enzyme levels by 399.35 U/L after consuming bay leaf steeping regularly for 15 days.

Table 4.
 Parametric Test Paired sample t test.

	MEAN	SD	t	df	Sig. (2-tailed)
Pair 1 CHE <i>Pretest</i> -CHE <i>Posttest</i>	-399.35	419.907	-4.253	19	.000

From the paired sample t test results, the mean value is -399.35 and the standard deviation value is 419.907, the significance value p value = 0.000 with alpha 0.005.

Decreased cholinesterase (CHE) levels of participants over the age of 40 are aggravated by degenerative processes (Panggabean et al., 2023). Decreased blood plasma cholinesterase (CHE) levels in participants under the age of 40 years due to frequency and duration of pesticide exposure (Hamka et al., 2021). The average length of work of participants of 18,5 years is very likely to have a lot of pesticide residues in their bodies and cause disruption of the normal function of several organs, causing mild and severe health problems (Pawestri & Sulistyaningsih, 2021). There is a strong association between the length of work with decreased CHE rates (Aguera et al., 2022). Measurement of Hb levels and BMI to assess the nutritional status of participants to narrow down confounding variables that can cause bias in research results even though there is no significant relationship between Hb levels and CHE. Nutritional status can affect the body's ability to ward off free radicals from pesticides (Abraham et al., 2023). The entrance of pesticides into the body through the skin, and mucous lining of the gastrointestinal and respiratory tracts (Sandoval-Herrera et al., 2023). Complaints felt in the form of dizziness, nausea, fatigue, and mild diarrhea caused by pesticides binding to CHE and forming phosphorylated cholinesterase (Omedes et al., 2024). CHE levels in blood plasma increase after consuming steeping bay leaves regularly every day. The use of personal protective equipment during contact with pesticides can minimize the entry of pesticides into the body because several prevalence studies results show low CHE caused by frequency, duration of contact with pesticides, and compliance with the use of personal protective equipment (Hyland et al., 2024). Likewise, the procedures for the use and use of pesticides must be adjusted to the rules of use that are available on the packaging (Erminia Schiano et al., 2024).

CONCLUSION

Bay leaf steeping has been shown to increase cholinesterase (CHE) levels. To avoid the threat of health problems, farmers should diligently consume steeping bay leaves regularly.

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