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NEEM GUM (*Azadirachta indica*) PREVENT OXYDATIVE STRESS IN DIAZINON-INDUCED RAT

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Abstract

Diazinon, an ogranphosphate pesticides can cause tissue damage due to oxidative stress. One can be measure by its metabolit such as Malondialdehyde (MDA). The high level of plasma MDA can be an indication of tissue damage that need treatment. One of oxidative stress prevention and treatment were using antioxidant. Neem Gum, a sap from neem tree containt polischaride that has potential effect as an antioxidant. This study goal was to uncover the potention of Neem Gum as an antioxidant to prevent oxidative stress caused by Diazinon. A total of 30 wistar rats were divided into 3 groups: the normal group (KN) was given corn oil, the negative control (KD) was induced by diazinon 100 mg/kgBW, and the treatment group (KP) was given Neem Gum solution at a dose of 30 g/kgBW, after an induction Diazinon 100 mg/kg body weight. After 8 days of treatment plasma levels of MDA were measure. The Average plasma levels of MDA of KN group was 0,166 nmol/ml, KD was 0,172 nmol/ml and KP was 0,121 nmol/ml. Statistical analisys using one way anova showed significant diference between groups ($p<0,05$). Neem Gum has prevention effect from oxidative stress caused by Diazinon.

Keyword: Diazinon, Neem Gum, Malondialdehyde, oxydative stress, antioxidant

1. Introduction

Diazinon is one of the most frequently used types of organophosphate insecticides, use in the world is 40% and use in Indonesia reaches 77.8% of all types of insecticides [1]. Residual levels of diazinon in horticultural crops have exceeded the maximum recommended limit, followed by residual levels of chlorpyrifos, malathion and phenitortrione in the next order. Diazinon residues are also found in rice, soybeans, fruits, vegetables and fish[2].

Diazinon that enters the human body will undergo detoxification through hydrolysis by the carboxylesterase enzyme, differences in levels of this carboxylesterase enzyme can cause variations in sensitivity to the toxic effects of diazinon and cause oxidative stress to the target cells or organelles. Diazinon that enters the body will be metabolized in the liver into an active metabolite, namely diazoxon[3]. Diazoxon inhibits the AChE enzyme which causes ACh to remain bound to its receptor, increasing the influx of calcium ions (Ca2+) in the endothelium which will then bind to calmodulin (CaM). CaM will bind to endothelial nitric oxide synthase (eNOS) and produce nitrogen oxides (NO) which can act

as free radicals [4]. Previous studty show that diazinon causes an increase in MDA and NO levels and a decrease in the enzymes glutathione peroxidase, superoxide dismutase and catalase enzymes compared to the control group rats [5].

The high level of plasma MDA can be an indication of tissue damage that need treatment. One of oxidative stress treatment were using antioxidant. Neem Gum, a sap from neem tree containt polisacharide (D–glucose, D -glucuronic acid, L -arabinose, L -fucose, mannose dan xylose) that has potential effect as an antioxidant [6,7]. Gum Arabic for 12 weeks can increase the enzyme GSH, Catalase, also reduce HOMA-IR and blood glucose levels [8,9]. This study goal was to show the potention of Neem Gum as an antioxidant to prevent oxidative stress caused by Diazinon

2. Methods

A total of 30 wistar rats were divided into 3 groups, the normal group (KN) was given corn oil, the negative control (KD) was induced by diazinon 100 mg/kgBW, and the treatment group (KP) was given Neem Gum solution at a dose of 30 g/kgBW, after an induction Diazinon 100 mg/kg body weight. Neem gum solution were obtained from Merak Village, Sumberwaru Village, Banyuputih District, Situbondo Regency. Neem gum solution is made by purification method. The procedure was carried out for 8 days then followed by termination and examination of Plasma levels of MDA by using TBARS method.

3. Results

The Average plasma levels of MDA of KN group was 0,166 nmol/ml, KD was 0,172 nmol/ml and KP was 0,121 nmol/ml. The data obtained is in the form of MDA levels in nmol/ml units which can be seen in the table 1.

Table 1. Mean and standard deviation of plasma MDA levels

Group	Plasma MDA levels (nmol/mL)
KN	0,167
KD	0,172
KP	0,121

4. Discussion

The administration of Neem Gum at a dose of 30 g/KgBW had a lower average liver MDA level compared to the negative control group, this indicates that the administration of Gum neem at that dose had an effect on preventing MDA levels and had a protective effect on diazinon toxicity.

The antioxidant effect of neem gum have been carried out by Malviya et al, 2017 using the DPPH method showing that neem gum has compounds that easily bind free radicals by donating free hydrogen ions to free radicals thereby removing odd electrons which cause radical reactivity. This result was also supported by the results of the IR spectrum analysis test which indicated the presence of –OH groups in neem gum. Neem gum also has an effective concentration (EC50) which is sufficient to scavenge 50% of free radicals, so it was concluded in the study that neem gum has significant antioxidant potential to fight DPPH and hydroxyl free radicals [6].

Research conducted by Azanu et al., 2019 is in line with research conducted by Moniem et al., 2018 which states that neem gum can be a good substitute for gum arabic when used as an ingredient in food and pharmaceuticals. The results of this study are in accordance with previous studies that oral gum arabic for 8 days has a good hepatoprotective effect by reducing the occurrence of oxidative stress [7,10].

This is because the polysaccharides contained in gum arabic can reduce the occurrence of lipid peroxidation, increase the activity of antioxidant enzymes (SOD, CAT, and GPx), and increase their mRNA expression in damaged rat liver by causing oxidative stress [11,12].

5. Conclusion

Neem Gum has prevention effect from oxidative stress caused by Diazinon

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