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Effect Extract of Soursop Leaf (Annona Muricata) and Mangosteen Peel (Garcinia Mangostana) on SGPT Level in the Liver of Mice (Mus Musculus) Exposure to Gamma Radiation

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Abstract**—** *Research has been done in mice given exposure to gamma radiation and the use of antioxidant compounds that can reduce the impact of damage on exposed organs. The purpose of this study was to find out how the effects of soursop leaf extract and mangosteen peel on SGPT levels from rats exposed to gamma radiation. This study used 60 male rats and was divided into groups given radiation exposure and groups that were given radiation and given antioxidants. The administration of antioxidants was given orally according to the prescribed dose, while gamma radiation exposure was given for 10 minutes, 20 minutes, 30 minutes, 40 minutes and 50 minutes. The levels are tested using a blood analyzer. The results showed that exposure to gamma radiation can cause liver damage seen from the high percentage of damage and high SGPT, but along with the increase in the antioxidant dose given it was able to reduce the percentage of damage and its value from SGPT.*

Keywords**—***Gamma Radiation, Mangosteen Peel, Liver, SGPT, Soursop Leaf.*

I. INTRODUCTION

Currently, nuclear technology is developing very rapidly, its application has covered a variety of fields, one of which is in the field of health, namely radiation therapy and chemotherapy. The use of radiation therapy in the medical field has risk because radiation exposure can cause biological damage and death in cancer cells and normal cells, and does not rule out the possibility that the radiation given can hit healthy organs around the target organ of radiation. As in the case of thoracic cancer therapy, there is an increase in the value of LFT (liver functional tests) in stages during radiotherapy. This increase in the LFT value can be attributed to damage to liver cells [1]. Cells that are not directly exposed to radiation can respond as well as cells that are directly exposed to radiation [2].

In addition to radiation therapy, treatment in cancer is with chemotherapy. Chemotherapy is a treatment process using drugs with the aim of destroying or slowing the growth of cancer cells. Giving chemicals in the body during chemotherapy will be filtered through the liver so that chemotherapy can cause damage to the liver. In the case of cervical cancer chemotherapy, high levels of SGPT (Serum Glutamic Pyruvate Transaminase) showed liver dysfunction due to the toxicity of the use of chemotherapy drugs [3].

Free radicals are unstable molecules or atoms that have a group of atoms with unpaired electrons so that they tend to attract electrons from other molecules. When free radicals attract electrons, it triggers a chain reaction that increases the number of free radicals. If free radicals are not inactivated, their reactivity can damage all types of cellular macromolecules, including carbohydrates, proteins, lipids and nucleic acids [4].

Free radicals can also interact with organs in the body, one of which is the liver. When radiation hits the liver there will be cell damage so that the function and work of the liver are disrupted. Biomarkers of liver organ damage are levels of Serum Glutamic Pyruvate Transaminase (SGPT). SGPT is an enzyme that is inside liver cells (hepatocytes). An increase in the SGPT ratio indicates high liver damage [5].

Liver damage from an organism due to radiation exposure can be proven by conducting research using tested mice (*Mus musculus L.*) to observe microscopic images of liver cells and test SGPT levels. One way to reduce free radicals arising from radiation in mice is to provide antioxidants. Antioxidants are compounds that can neutralize or destroy free radicals in the body.

Soursop leaves contain toxic compounds such as alkaloids, flavonoids, tannins, saponins, steroids, and acetogenins [6]. Acetogenins in soursop leaves can be used to fight cancer by inhibiting ATP (adenosine triphosphate) which gives energy to cancer cells [7]. Antioxidant compounds contained in mangosteen peel (*Garcinia mangostana L.*) are alkaloids, saponins, flavonoids, tannins, and polyphenols [8]. Mangosteen peel also contains xanthones which are important compounds not found in other fruits. In addition, xanthones have higher antioxidant and antimicrobial properties than vitamin C and vitamin E [9].

The increased dosage of mangosteen peel extract (*Garcinia mangostana L.*) can provide hepatoprotective effects as evidenced by isoniazid-induced hepatocyte repair [10]. Ethanol extract of soursop leaves (*Annona muricata L.*) has hepatoprotective activity on liver histology of Rattus novergicus rats exposed to high-dose paracetamol [11].

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II. Research Method

This study used 60 male mice aged 6-8 weeks and an average body weight of 18-20 grams. The mice were grouped into groups namely without radiation and given extract then irradiated. Radiation exposure given for 10 minutes, 20 minutes, 30 minutes, 40 minutes and 50 minutes, and a mixture of soursop leaf and mangosteen peel extract given with 5 dose variation is 6.19 mg/kg BB, 7.19 mg/kg BB, 8.19 mg/kg BB, 9.19 mg/kg BB dan 10.19 mg/kg BB.

Soursop leaf extract and mangosteen peel have given to mice in the form of a powder that has been packaged and sold on the market, one capsule of soursop leaf extract containing 550 mg Annona muricata and extract of mangosteen peel containing 500 mg garcinia mangostana. The dose of antioxidant extract given to mice was calculated based on the weight of each mouse. Soursop leaf and mangosteen peel extract is given once a day for 14 days before the mice are irradiated by being fed to the mice using the gastric sonde.

Radioactive sources used include Co-60, Am-241, Cs-137, and Na-23. The radioactive source is placed in a semicircular container and there is a hole for inserting radioactive sources so that exposure to gamma radiation can be precise about mice, as in (Fig.1) Around the radiation exposure area, lead is used for radiation protection.

Fig. 1. Gamma radiation exposure in mice.

SGPT measurement is after the mouse is exposed, dislocated and dissected, blood is taken through the heart with a syringe. The blood that has been taken is put into the Eppendorf tube then centrifuged, the purpose of the centrifuge is to separate the blood cells and serum. A separate serum is taken and put in another clean and dry tube, then closed. Measurement of SGPT enzyme activity is carried out by taking serum and adding reagent solution, then homogenized. After that, the absorbance was measured by a spectrophotometer blood analyzer.

III. Result and Discussion

In this study, the data obtained in the form of SGPT levels from each treatment group. The relationship between the duration of radiation exposure and the effects of soursop leaf extract and mangosteen peel on SGPT mice's liver showed polynomial function, and that showed a decrease in the percentage of damage along with the increasing dose of antioxidants given.

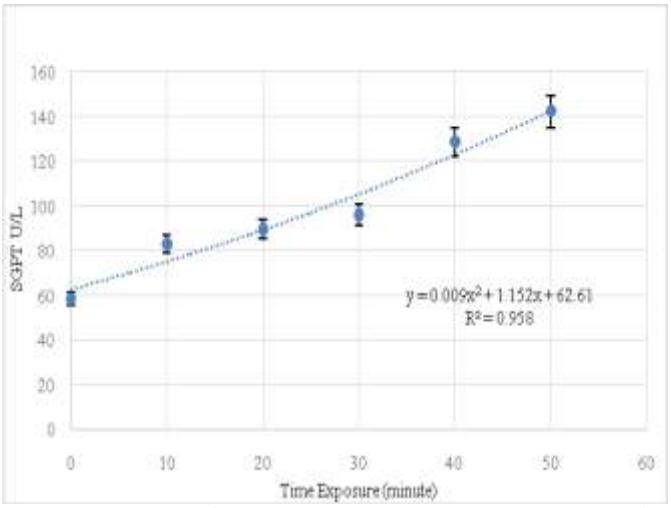

Fig. 2. Relationship of the duration exposure to radiation on the levels of SGPT liver of mice.

The relationship of duration exposure to gamma radiation with liver SGPT levels in mice as shown in (Fig. 2) If liver cells are damaged, it will cause an increase in SGPT levels in blood serum. Gamma radiation exposure in mice with a variation of 5 times shows that the longer exposure to gamma radiation is given, the more free radicals are produced resulting in higher SGPT levels. This indicates the more severe damage that occurs to the liver of the mice.

The administration of soursop leaf extract and mangosteen peel in mice as a prevention of the effects of gamma radiation has an effect on the decrease in SGPT levels, as seen in (Fig. 3).The more antioxidant extracts are given, the lower SGPT levels in the blood. This is because soursop leaves and mangosteen peel are antioxidants that can prevent or counteract the formation of free radicals due to the interaction of radiation with cells.

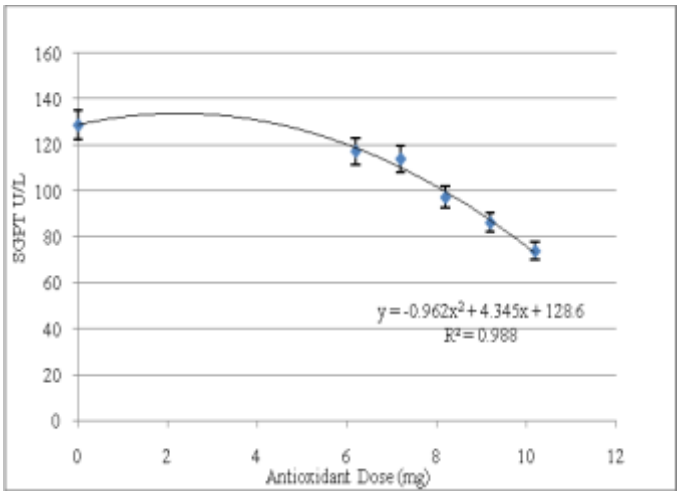

Fig. 3. The relationship between giving antioxidant extract to liver SGPT levels in mice that were irradiated for 40 minutes.

Gamma radiation is ionizing radiation that can cause liver

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cell damage to mice, characterized by high levels of SGPT. Under normal conditions, SGPT remains in liver cells. However, if the body is exposed to radiation, there will be an interaction between radiation and cells that will produce free radicals [12]. These free radicals can damage liver cells and the cell wall breaks, so the SGPT will exit the liver cells and enter the bloodstream, resulting in high levels. High levels of SGPT are also because the free radicals formed will react with epithelial cells so that they can increase oxidative stress [13].

High levels of SGPT in the blood indicate higher levels of liver cell damage due to exposure to radiation, which will then bind to lipids from the liver cell membran to form lipid peroxidation and induce the formation of free radicals.

From the results of the SGPT, it appears that soursop leaves and mangosteen peel can prevent an increase in SGPT levels due to exposure to gamma radiation. Soursop leaf and mangosteen peel are able to inhibit the outbreak of liver cells due to free radicals. This is also in accordance with the nature of the soursop leaf itself, which has a hepatoprotector effect, which can reduce free radicals, thus providing protection against increased levels of SGPT and other damage.

Annona muricata leaf extract also significantly reduced the increased serum AST levels. In mangosteen peel extract as a hepatoprotector because it can minimize the extent of free radical curves that indicate the number of free radicals found in the liver of mice and reduce the level of damage to liver cells of mice [14].

From research, acetogenin contained in soursop can be used to suppress colon, pancreatic, ovarian, colon, breast, liver and cervical cancers. Annonaceous acetogenin works by inhibiting the production of ATP by interfering with mitochondrial complex [15]. Soursop leaf extract also has high antioxidant activity because it has an average free radical inhibition rate in the body of almost 85% [16].

Xanthones are a chemical content found in mangosteen peel as a high-level antioxidant. The main content of xanthone is alfa-mangosteen and gamma-mangosteen, which have many benefits in providing protection from free radicals. Xanthones are flavonoid compounds in the phenol group which are found in nature [17]. Polyphenol compounds such as flavonoids can inhibit oxidation reactions through the mechanism of radical scavenging by giving one unpaired electron in free radicals so that the amount of free radicals decreases [18].

Decreased SGPT levels occur because the compounds contained in mangosteen peel extract and soursop leaves work as antioxidants by donating electrons to free radicals so as to reduce liver cell membrane lipid peroxidation. Cell membrane lipid peroxidation can cause liver cell damage. Liver cells contain various enzymes, these enzymes normally located in liver cells. Damage to the liver will cause the liver enzymes to release in the bloodstream so that the levels are in the blood increases and indicates a malfunction liver [19].

IV. CONCLUSION

Soursop leaf extract and mangosteen peel have given as a prevention of the effects of gamma radiation was able to reduce SGPT levels from 128.66 U/L to 74 U/L. Damage to liver cells caused by free radicals. These free radicals cause high levels of SGPT. Soursop leaves and mangosteen skin can inhibit the rupture of liver cells due to free radicals.

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