Effect of Chilli Pepper (*Capsicum frutescens* L.) on the Bleeding Time, Coagulation Time, and Platelet's Amount of Rats

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Abstract

*Chilli pepper (*Capsicum Frutescens *L.) is traditional medicine, used in Indonesia for many purposes. As a drug, it is good for the heart and blood vessels. The objective of our study was to assess the effect of aqueous extracts of dried fruits of Chilli pepper (*Capsicum Frutescens *L.) on bleeding time, clotting time and platelet's amount of rats. The study was carried out on normal white rats, wistar strain. Extracts were administered orally at three doses (0.630 g/kg BW, 0.945 g/kg BW, 1.418 g/kg BW) and acetosal was used as standard drug. All the doses of aqueous extracts of the dried fruits of chilli pepper (*Capsicum Frutescens *L.) used in this experiment caused a significant ($p<0.05$) increase in the bleeding time, clotting time and reduction of rats' platelets' amount compared to standard. Chilli pepper (*Capsicum Frutescens *L.) can influence the bleeding time and clotting time, and can reduce the platelets' amount better than acetosal and the increased doses of the aqueous extracts have better effect. The above results showed that the aqueous extracts of the dried fruits of Chilli pepper (*Capsicum Frutescens *L.) has promising potential to be a drug for cardiovascular disease.*

Key words: *chilli pepper, bleeding time, coagulation time, platelets' amount, rats.*

INTRODUCTION

Chillies show more or less the same aroma components as paprika, but their content in capsaicin (the amide of 3-hydroxy-2-methoxy-benzylamine with 8-methyl-6-noneneoic acid) and related compounds (collectively called capsaicinoids) is much higher (up to 1%). Pungency of chilli is produced by the capsaicinoids, alkaloid compounds, that are found only in the plant genus *Capsicum*. The nature of the pungency has been established as a mixture of seven homologous branded-chain alkyl vanillyl-amides (Hoffman et al. 1983). They often are called capsaicin after the most prevalent one. Dihydrocapsaicin is usually the second most prevalent capsaicinoid, while the other five compounds, nor-capsaicin, nordihydrocapsaicin, nornordi-hydrocapsaicin, homocapsaicin, homodi-hydrocapsaicin, are considered minor capsaicinoids because of their relatively low abundance in most natural products. Capsaicin is a powerful and stable alkaloid that can be detected by human taste buds in solutions of ten parts per million. Capsaicin's composition ($C_{18}H_{27}NO_3$) is similar to peperin ($C_{17}H_{19}NO_3$), that gives black pepper its bite.

The medicinal applications of capsaicinoids have brought innovative ideas for their use. Medicinal use of *Capsicum*s has a long history, dating back to the Mayas who used them to treat asthma, coughs, and sore throats. The Aztecs used chilli pungency to relieve toothaches. The pharmaceutical industry uses capsaicin as a counter-irritant balm for external application (Carmichael 1991).

In addition, the spice is also used as a form of herbal pain medication to relieve diarrhea, circulation issues, heart problems, and aching.

Platelets are particles (actually, remnants of cells) circulating in the blood that are needed for blood clots to form. Platelets initiate the formation of blood clots by sticking together (clumping or aggregating), a process called platelet aggregation. Clumps of platelets then are bound together by a protein (fibrin) formed by clotting factors present in the blood. The clumps of platelets and fibrin make up the blood clot. Blood clots are important because they stop bleeding (for example, a cut or laceration on the skin). When bleeding occurs from a cut, platelets become activated and form a network by attaching to the blood vessel wall at the site of bleeding, and by also attracting other clotting factors in the blood (such as fibrin) to stop ongoing bleeding rapidly. However, if a blood clot forms inside an artery, it blocks the flow of blood to the tissue that the artery supplies, which can damage the tissue. For example, a blood clot that forms in a coronary artery supplying blood to the muscle of the heart causes a heart attack, and a blood clot that forms in an artery supplying blood to the brain causes a stroke.

In this study, the antiplatelet aggregation effect of aqueous extracts of the dried fruits of chilli pepper (*Capsicum Frutescens* L.) has been evaluated. The test substances were given orally during the periode of 28 days. Antiplatelet aggregation effect was tested by measuring bleeding time (the time interval between the onset of the first drop of blood until the blood stops flowing), coagulation time (the time required to form fibrin threads), and platelet's amount of Wistar strain rats.

MATERIAL AND METHODS

Extracts were administered orally at three doses (0.630 g/kg BW, 0.945 g/kg BW, 1.418 g/kg BW). Acetosal was used as standard drug and CMC Na suspension as negative control.

Controlled variables

Test animals, types of rat food pellets (CP12), place and maintenance processes (enclosure and maintenance time), chilli pepper taken at the same place (from the cultivation of chilli pepper in the village of District Karanglo Bandungan).

Test animals

Rats (Wistar strain, male gender, age 2-3 months, and 200-300 g body weight).

Test of anti-platelet-aggregation

Measuring the bleeding time. Blood was obtained from mouse's tail. The blood was absorbed with paper. The interval time between the first blood drop until the blood stopped was the bleeding time (Vogel, 2002).

Measuring coagulation time. Blood from the tip of the tail were absorbed with capillary pipe for 30 second. The capillary pipe was broken every 15 second until the fibrin threads formed at the broken part. The coagulation time was the time needed for the formation of fibrin threads.

RESULTS AND DISCUSSION

In this experiment, three parameters were observed, i.e. bleeding time (the time interval between the onset of the first drop of blood until the blood stops flowing), coagulation time (the time required to form fibrin threads), and platelet's amount of Wistar strain rats.

The bleeding time were observed to see the effect of the test material on the process of platelet's hemostatic process. The effect was shown by the length of bleeding time after giving the test material. The observation on the coagulation time is used to see the effect of the test material on the formation of secondary hemostatic plug, the hemostatic process of the coagulation phase. During the coagulation phase, many enzymes and proenzymes interact. The activation of one proenzyme

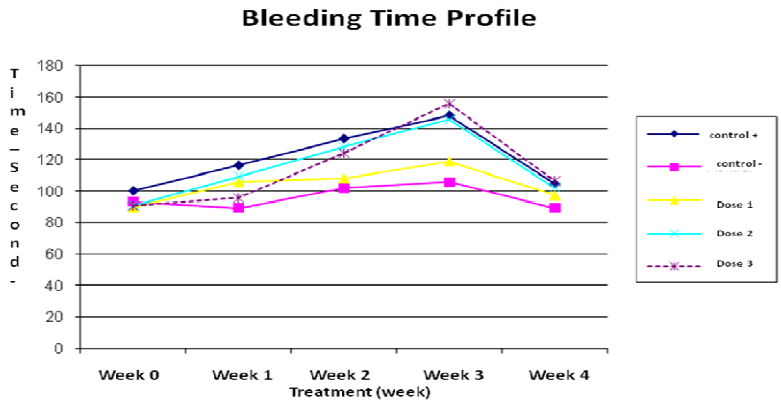

Figure 1. Bleeding time profile.

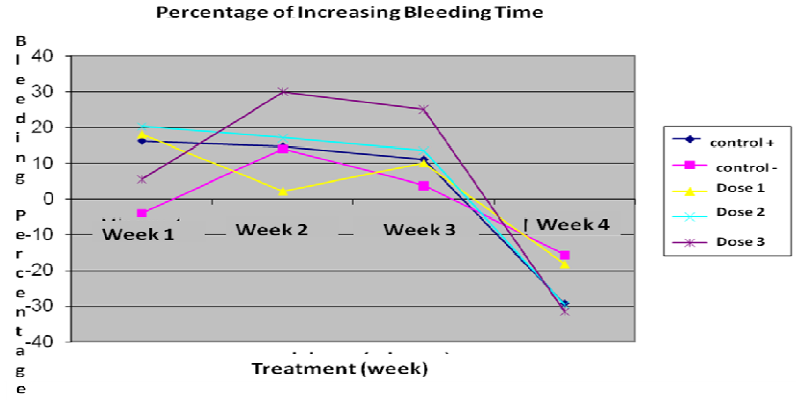

Figure 2. The percentage of increasing bleeding time.

can form an enzyme that activate the second proenzyme and so on, results in a chain reaction. The stage on coagulation phase caused the change of sirculated fibrinogen to become undis-solved fibrin. The effect was shown by the longer coagulation time after the test material was given.

The dose of water extract of dried fruit of Chilli pepper was the ordinary dose used by people and previous research has proven its pharmacological effect.

The observation of anti-platelet-aggregation effect with parameter on bleeding time showed that there was a significant increase since the day 7 in all groups compared with the day 0 (figure 1).

On the day 14 and 21, the bleeding time of the dose 0,945 g/kg BW and 1.418 g/kg BW were significantly higher than acetosal as standard (control positive) but it is not the case with the dose 0,630 g/kg BW, which did not show higher bleeding time than control positive.

The observation of anti-platelet-aggregation effect with parameter on coagulation time showed that there was a significant increase since the day 7 in all groups compared with the day 0 (figure 3).

On the day 21, the coagulation time of the dose 0,945 g/kg BW and 1.418 g/kg BW were not significantly higher than acetosal as standard (control positive) and the dose 0,630 g/kg BW was not higher than control positive.

The observation of platelet's amount showed that there was a significant decrease since the day 7 in all groups compared with the day 0 (figure 5).

The dose 0,945 g/kg BW and dose 1,418 g/kg BW did not have any difference with control positive, so we can conclude that at that doses extract water of dried fruit of chilli pepper have almost the same

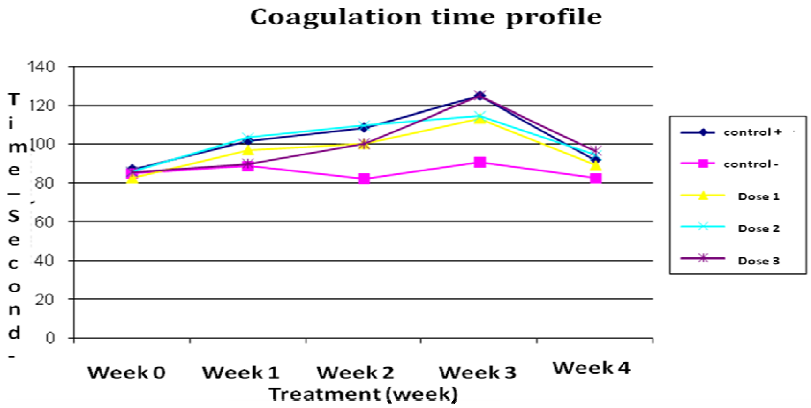

Figure 3. Coagulation time profile

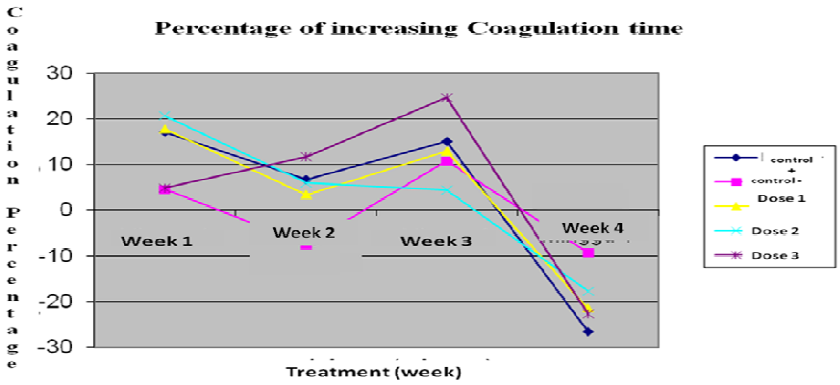

Figure 4. Percentage of increasing coagulation time

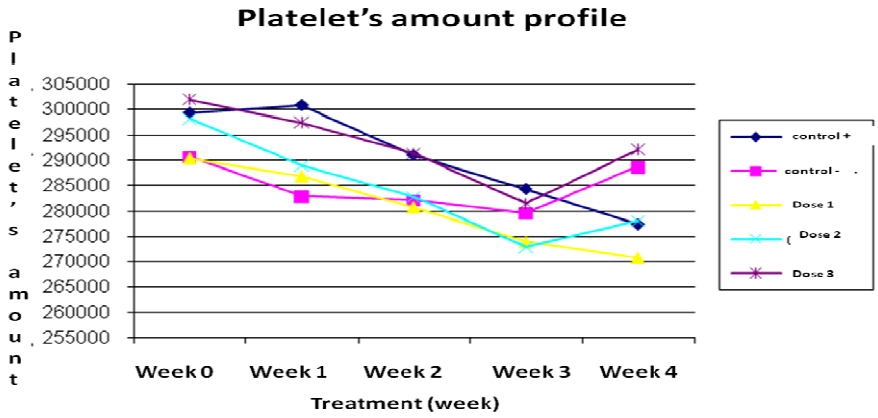

Figure 5. Platelet's amount profile.

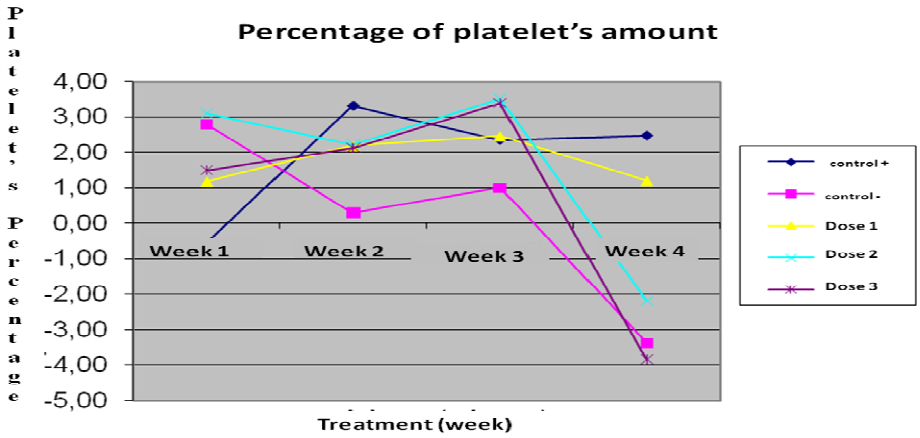

Figure 6. Percentage of platelet's amount.

effect as acetosal on the decreasing of the platelet's amount on day 21.

From the platelet's amount decreasing, it was seen that the decreasing of dose 0,630 g/kg BW was 1%, dose 0,945 g/kg BW was 3% and on the positive control and the dose 1,418 g/kg BW was 2,5% (figure 6).

On the 28th day, all doses showed a decrease in the bleeding time, clotting time and reduction of the rats' platelets' amount due to the accumulation of the capsaicin (and acetosal as standard) in the blood and the presence of minerals such as phosphorus and calcium, the presence of which accelerate blood clotting, causing activation from prothrombin to thrombin, and polymerization of fibrinogen molecules occurred and eventually form the fibrin strands that bind to each other. So the effective time was 14-21 days.

All the doses of aqueous extracts of the dried fruits of chilli pepper (*Capsicum Frutescens L.*) used in this experiment, caused a significant ($p<0.05$) increase in the bleeding time, clotting time and reduction of the rats' platelets' amount compared to standard (acetosal).

CONCLUSION

Chilli pepper (*Capsicum Frutescens L.*) can influence the bleeding time and clotting time, and can reduce the platelets' amount better than acetosal and the increased dose of the aqueous extracts have better effect. The best dose was 1,418 mg/kg BW rat.

The above results shows that the aqueous extracts of the dried fruits of Chilli pepper (*Capsicum Frutescens L.*) is promising to be a drug for cardiovascular diseases, although it still needs further investigation.

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