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EFFECT OF MATURITY STAGE OF *Carica papaya*-THAILAND VARIETY ON LIPIDS SERUM PROFILE OF SPRAGUE DAWLEY RATS

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ABSTRACT

The effects of *Carica papaya* maturity stage on lipids serum profile of Sprague Dawley Rats were investigated. Forty rats randomly assigned to one of four treatments: a) Standard Diet, b) Green Ripe Stage of Papaya Diet, c) Ripe Stage of Papaya Diet, or d) Mannitol Diet. Each diet of the four treatments was consists of 5% cellulose; 5% dietary fiber; 5% dietary fiber + 6% mannitol; and 5% cellulose + 6% mannitol, respectively. The diet fed to male Sprague Dawley Rats (255-330 g) *ad libitum* for two weeks. The result showed the decreasing of total cholesterol, HDL and triglyceride after feed intervention during two weeks period. The highest decreasing of mentioned lipids profile affected by mannitol diet, and followed by ripe stage papaya diet, green stage papaya diet and the lowest decreasing was showed by standard diet. It was related to the composition change of soluble and insoluble dietary fiber during ripening of *Carica papaya*.

Keywords: *Carica papaya*-Thailand variety, maturity stage, mannitol, dietary fiber, lipids profile

INTRODUCTION

It is well established that consumption of dietary fiber can prevent many degenerative diseases, such as heart disease, atherosclerosis, diabetic, obesity, or colon cancer. Heart and blood artery diseases are the first caused of death in Indonesia (DepKes RI, 1992).

Heart and blood artery diseases are related to metabolism of lipid components. The effect of dietary fiber consumption on preventing of diseases that mentioned can be detected from the lipid profile of blood serum. Chylomicron is a lipoprotein that has a low density because 98% is composed of lipids. The function of chylomicron is to transport dietary fats, especially in the form of triglycerides and ester cholesterol, into the body. Fatty acids are changed to be triglyceride by almost of all body tissue. Triglycerides synthesis by heart was used to produce blood lipoprotein. The cholesterol also needs as structural components of plasma lipoprotein. Deddy *et al.* (1993) said that in the human body there are 65% (1.5 mg/dl) of plasma cholesterol existed in form of low density lipoprotein (LDL). LDL is the main of blood lipoprotein which is has the function of cholesterol transfer from heart to the tissue, whereas high density lipoprotein (HDL) works as a catalyst to facilitate chylomicron catabolism.

The role of dietary fiber in lipid metabolism maybe related to its ability to binding the organic compound, such as sterol (Spiller and Freeman, 1983). There are any evidences that showed the specific role of dietary fiber in decreasing of cholesterol content in blood. The differences of maturity stage of papaya-Thailand can be the difference sources of dietary fiber. Total fiber content and proportion of soluble fiber and insoluble fiber derived from previous research were 16.27% (soluble fiber : insoluble fiber = 2.3: 13.98) in green ripe stage, and changed to 8.13% (soluble fiber : insoluble fiber = 3.62 : 4.51) in ripe stage. This study is an initial study that aims to examine the effect of papaya maturity stage on serum lipid profile of Sprague Dawley rats. This research was conducted in conjunction with assessment of laxative effects of components (fiber and mannitol) in the *Carica papaya*-Thailand variety with a different maturity stage.

MATERIALS AND METHODS

Animals and diets. Forty male Sprague Dawley rats weighing 255-330 g were randomly assigned to one of four treatments (10 rats/treatment). The animals were allowed free access to water and feed *ad libitum* for a total of 21days. During the period of adaptation (7 d), the rats were individually housed at room temperature and fed with AIN-93 (American Institute of Nutrition 1993) standard diet. Following the adaptation phase, rats were feed intervention for two weeks (14 d). Treatment included Standard Diet (containing 5% cellulose), Green Mature Stage of Papaya Powder Diet (containing 5% dietary fiber), Ripe Stage of Papaya Powder Diet (containing 5% dietary fiber + 6% mannitol), or Mannitol Diet (containing 5% cellulose + 6% mannitol), as shown in Table 1. Daily feed consumption were recorded and body weight were recorded every 3 days during the experiment.

Tabel 1. Daily Feed Consumption.

Compound	Diet			
	Standard AIN'93 (g)	Green Ripe Papaya (g)	Ripe Papaya (g)	Mannitol (g)
Corn starch	618.3	614.5	617.3	558.3
Casein	142.3	133.9	136.9	142.3
Sucrose	100.0	-	70.4	100.0
Soybean oil	40.0	39.3	39.6	40.0
Cellulose	50.0	25.4	40.5	50.0
Mineral mixture*)	35.0	27.8	30.3	35.0
Vitamin mixture*)	10.0	10.0	10.0	10.0
L. cystine	1.8	1.8	1.8	1.8
Choline bitartrat	2.5	2.5	2.5	2.5
Papaya powder	-	151.5	117.4	-
Mannitol	-	-	-	60.0
Total	1000.0	1006.7	1066.7	1000.0
Total Dietary Fiber	50.0	50.0	50.0	50.0
Total Mannitol	-		60.0	60.0

*) Reeves *et al*., 1993

Sampling procedures. Blood samples were obtained from the rats after the adaptation phase and after the treatment. Before blood sampling, the rats fasted for overnight (12 hours). Retoorbital plexus used as the method of blood sampling. Before analysis of serum lipid profile, the serum separated from blood plasma by centrifugation at 4,500 x g for 15 min.

Analytical procedures. Total cholesterol was measured by CHOD-PAP enzymatic method (Richmond, 1973). Cholesterol LDL and HDL were determined by CHOP-PAP enzymatic method (Wielan and Seidal, 1983) and CHOD-PAP enzymatic method (Eckel *et al.*, 1977), respectively. Finally, the triglyceride was determined by GPO-PAP enzymatic method (Mc Gowan *et al*., 1983).

Statistical analysis. Values are given as the means and, where appropriate, significance of differences between mean values were determined by ANOVA and multiple range comparison by Fisher's least significant difference procedures. Values of p < 0,05 were considered significant.

RESULTS AND DISCUSSION

Provision of treatment diets tend to lower triglyceride concentrations (Figure 1). Decrease in triglycerides are 6.09%, 17.91%, 34.77% and 37.85% respectively due to a standard diet, green ripe papaya diet, ripe papaya diet and mannitol diet. The decrease of triglyceride levels in group of ripe papaya diet greater than green ripe papaya diet. This is because the proportion of soluble fiber is higher at ripe papaya diet. Some researchers argue that soluble dietary fiber can reduce triglycerides by inhibiting the absorption of triglycerides (Haskell *et al.*,1992 in Sembor, 1998; and Chandalia, 2000). Mayes (1997) claimed that it resulted in the formation of chylomicron and chylomicron remnan more slowly, thus giving a chance on lipoprotein lipase to hydrolyze chylomicron to triglycerides more before reach the heart and deliver triglycerides to the network. Therefore triglycerides in the blood decreases.

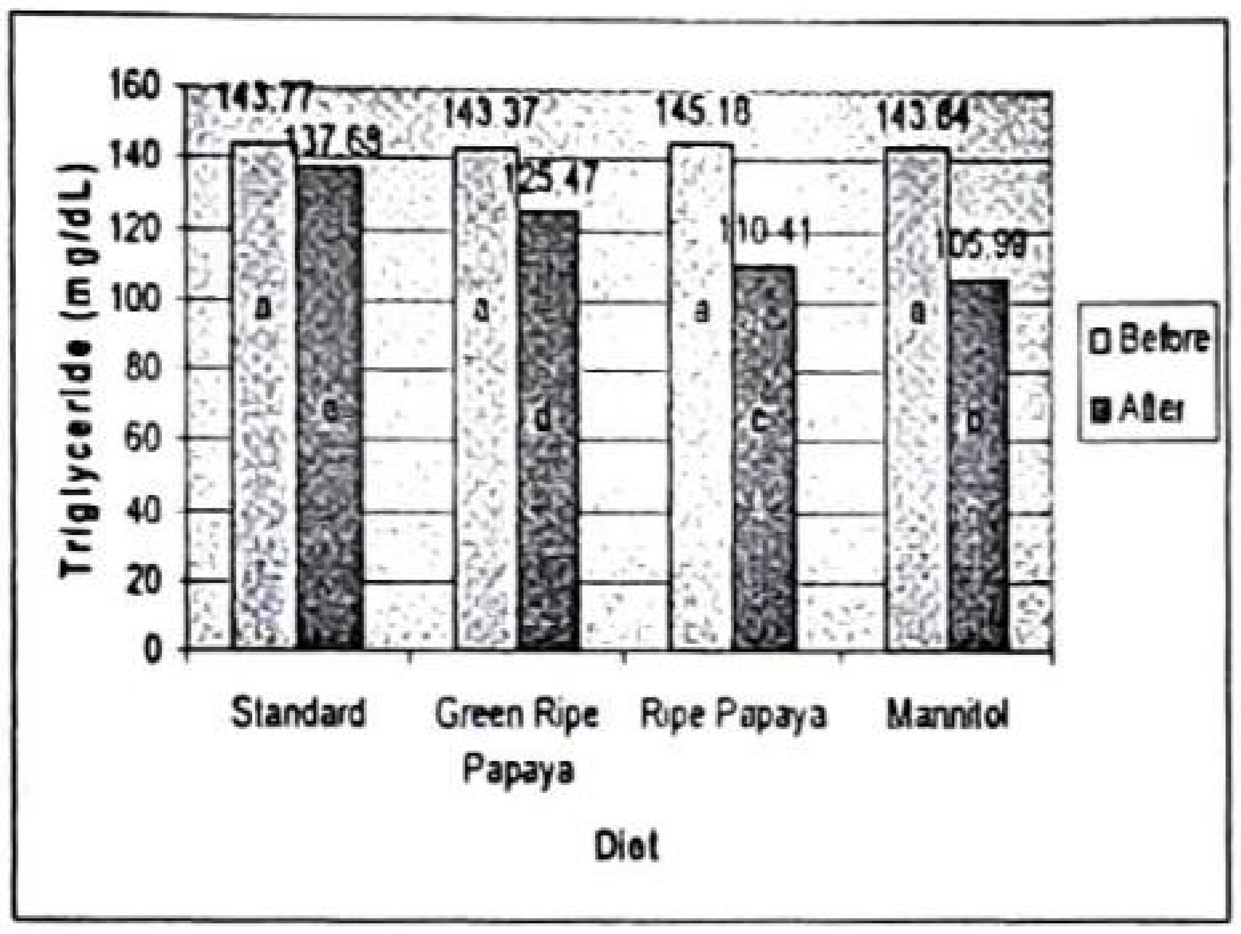

Figure 1. Effect of Diet on Triglyceride Serum

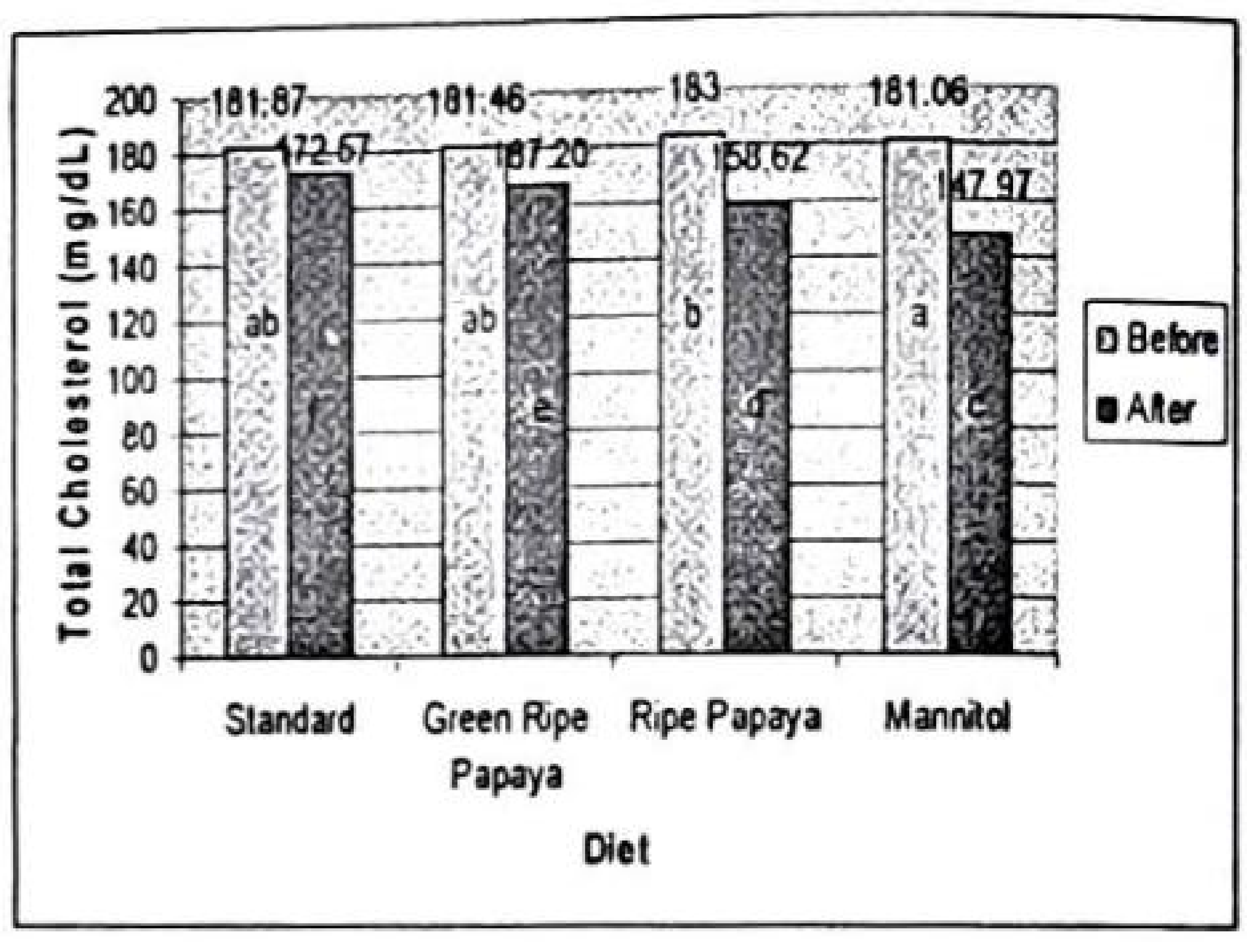

Figure 2. Effect of Diet on Total Cholesterol Serum

All rats that received dietary treatment decreased total cholesterol (Figure 2). The decrease amounted to 9.3% for the standard diet group; 14.26% for the group of green ripe papaya diet; 24.38% for the group of ripe papaya diet and 33.09% for the group of mannitol diet. These data indicate that soluble fiber with a larger proportion of the ripe papaya diet potentially greater role in lowering cholesterol than a diet of green ripe papaya. Soluble fiber that is viscous may decrease the rate of glucose and sterol absorption in the intestine (Kahlon *et al.*, 2000). Soluble fiber has the ability to bind and hold water because the polysaccharides have a residual sugar with polar groups. Hydration ability of soluble fibers can cause the formation of the gel matrix that increase the viscosity of intestinal contents and reduce the speed of nutrient absorption (Schneeman, 1986). In addition, soluble fiber is more capable of binding bile acids and carried out with feces. Decreased bile acid will cause the liver to synthesize bile from cholesterol as base ingredients. Therefore, the amount of cholesterol in plasma and in tissues will be reduced.

It was proved by Anderson *et al.* (1990) in the Mc Intosh M (2001), namely that the administration of psyllium (rich of soluble fiber) as much as 5.1 g in patients with hypercholesterolemic male patients during 8 weeks resulted in a decrease by 8.9% cholesterol compared to placebo. Chandalia *et al.*(2000) also mentioned that the decrease in the rate of absorption of insulin will suppress excretion thereby reducing the stimulation of HMG Co A reductase by insulin which causes a decrease of serum cholesterol.

Rats that received a standard diet treatment decreased triglyceride and total cholesterol levels in the lowest since the fiber components in the form of insoluble fiber. Conversely, groups of rats with mannitol diet decreased triglyceride and total cholesterol levels are highest. This can be caused by low feed intake (Table 2) and calories, so that has stimulated the use of fat reserves to be broken as a source of energy. Mannitol is a sugar alcohol that can not be used as a source of calories that cause the biggest loss of rats weight (Figure 3).

Decrease in feed intake and body weight during the study were also result in increased LDL (cholesterol carrier to the network) and a decrease in HDL (catalyst of chylomicron catabolism). The increase in LDL due to the range of 7.7% - 14.27%, while the decrease in HDL ranged 26.13% - 36.7%. This leads to the use of fat reserves for the needs of all body tissues. In other words metabolism leads to fat catabolism process because the calories lack of the body.

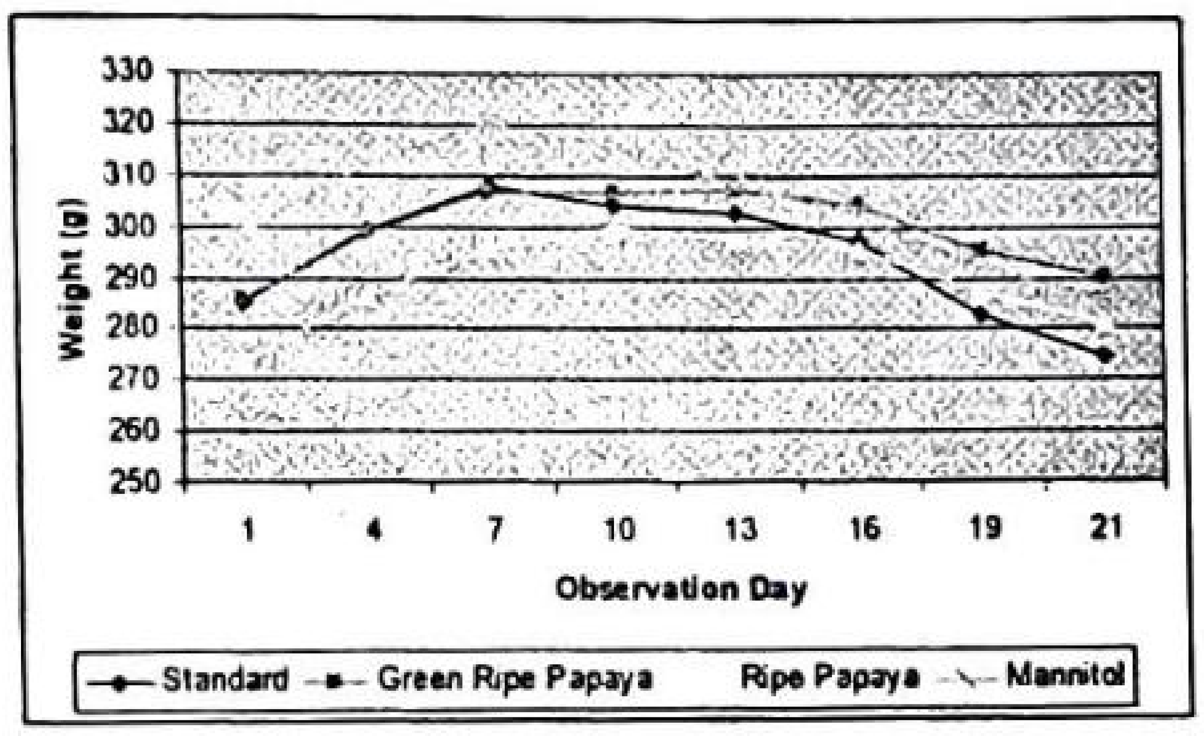

Figure 3. The Change of Rats Weight During The Study

Table 2. Feed Intake (g/d/rat)*)

Diet	Observation Time		
	First Week**)	Second Week	Third Week
Standard	17.6 a	11.9 ab	5.1 a
Green Ripe Papaya	17.7 a	12.8 b	8.0 a
Ripe Papaya	17.5 a	12.8 b	7.1 b
Mannitol	18.0 a	10.9 a	6.4 ab

*) The same notation in the same column indicate no significant difference

**) All groups of rats fed with standard (adaptation)

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