Journal of Biology and Medicine: Open Access

Research | Vol 1 Iss 2

A Study Related to the Effectiveness of Flavonoids from Different Edible Portions of Musa Paradisiaca

S. Vijayakumar* and N.R. Vijayalakshmi

Department of Zoology, VTM NSS College, Dhanuvachapuram, Kerala, India

*Corresponding author: Vijayakumar S., Department of Zoology, VTM NSS College, Dhanuvachapuram, Kerala, India, E-mail: vattavila123@rediffmail.com

Received: July 22, 2020; Accepted: September 10, 2020; Published: September 20, 2020

Abstract

Banana is an elongated, edible fruit has many health promoting factors. The main biochemical factor found in banana is flavonoids. Flavonoid compounds are reported to have various functions in plants. The ability to synthesise flavonoids in a given plant vary considerably among different tissues. Flavonoids extracted from different parts of the Banana (Musa paradisiaca) like inflorescence, stem, and raw banana etc. orally applied at doses of 0.5 mg and 1 mg/ 100g BW showed hypoglycemic, hypolipidemic activities in rats. Even though the flavonoids from different parts of banana showed hypolipidemic as well as hypoglycemic activities, significant reduction was noticed in the rats fed 1 mg/100 BW flavonoids from raw banana.

Keywords: ***Musa paradisiaca; Flavonoids; Cholesterol; Glucose; Phospholipids; Triglycerides; and Free fatty acid.***

1. Introduction

Flavonoids constitute one of the largest groups of naturally occurring phenols. They are ubiquitous in all parts of green plants and as such are likely to be encountered in any work involving plant extracts. For this reason, it is important that chemists, biochemists and plant physiologists isolate and identify these natural products in all their many forms. It is estimated that about 2% of all carbon photosynthesized by plants is converted into flavonoids or closely related compounds. Most tannin too are flavonoid derived. Polyphenolic compounds are interchangeably called tannins by investigators [1-3]. Consumption of flavonoids may be beneficial because they possess antiinflammatory [4-7], anti-proliferative [8], antifertility [9], antihepatotoxic [10], anticarcinogenic [11], antiallergic [12], antioxidant [13], hypolipidemic [14] and hypoglycemic [15] activities. The relationship of flavonoids to human health or disease is evident from the biological activities of flavonoids mentioned above. Since banana is a common fruit eaten by men from times immemorial and is a rich source of flavonoids, the need to furthering our understanding on the various edible portion of the plant was deeply felt. The concentration of flavonoids vary from root to inflorescence, it was felt necessary

Citation: Vijayakumar S and Vijayalakshmi NR. A study related to the effectiveness of flavonoids from different edible portions of musa paradisiaca. J Bio Med Open Access. 2020;1(2):110.

to undertake an experiment to provide much information regarding the most beneficial edible portion which is also a rich source of the potent flavonoid. The various parts of the plant such as inflorescence, stem, and raw banana etc. were selected to study the hypolipidemic and hypoglycemic effect of flavonoids present in those parts.

2. Materials and Methods

Flavonoids were extracted from various parts of the banana plant by the method of Markham [16]. Male albino rats (Sprague – Dawley Strain weighing 100-125g) were divided into 7 groups of 6 rats each. The details of which are given below. Group 1 was treated as control. Flavonoids extracted from inflorescence (groups II and V), stem (groups III and VI), and raw banana (groups IV and VII) were administered to animals of groups II to IV at doses 0.5 mg/100g BW and groups V to VII at doses 1.0 mg/100g BW daily by gastric intubation. The rats were housed in polypropylene cage and water was given adlibitum. At the end of 45 days the rats were deprived of food overnight and sacrificed by decapitation. Blood was collected in the test tubes and tissues were removed and collected in ice cold containers and estimated blood glucose cholesterol, phospholipids, free fatty acids and triglycerids of serum and tissues by different methods [15-20]. The data given in the tables are the average of the values from the number of animals used in the respective tables ± SEM. Statistical significance was calculated using Student 't' test [21].

Table 1: Concentration of Blood Glucose Dose Response Study of Flavonoids From Various Parts of Banana.

Groups	Doses (mg/100 g BW/day)	Blood glucose (mg/100 ml)
I	--	87.2 ± 2.6 1
II	0.5	75.1 ± 1.95a
III	0.5	81.2 ± 2.31
IV	0.5	76.9 ± 1.99b
V	1.0	76.5± 1.91b
VI	1.0	79.1 ± 2.21
VII	1.0	70.6 ± 1.41a
Average of the values of six rats in each group ± SE. Groups II to XIII are compared with group I. a = P < 0.01, b = 0.01 < P < 0.05.		

Table 2: Concentration of Cholesterol in Serum and Tissues (Values Expressed as mg/100ml serum; mg/100 g wet Tissue).

Groups	Doses (mg/100 g BW/day)	Tissues			
		Serum	Liver	Kidney	Heart
I	--	68.9± 2.06	340.5±9.19	363.2±10.89	243.1±6.32
II	0.5	65.41±1.5	365.41±1.5	346.3±8.31	231.5±5.55
III	0.5	64.93±1.49	324.23±8.10	358.96±9.33	260.57±7.81
IV	0.5	65.41±1.5	343.08±9.6	348.07±8.35	230.4±5.52
V	1.0	60.96±1.28b	305.95±6.4b	320.53±6.41b	220.44±4.4b
VI	1.0	65.39±1.5	326.8±7.84	345.33±8.28	235.53±5.88
VII	1.0	59.08±1.18a	304.19±6.08b	336.7±7.4	221.46±4.87b
Average of the values of 6 rats in each group ± SE. Groups II to XIII are compared with group I. a =P <0.01, b = 0.01 <P <0.05.					

Table 3: Concentration of Phospholipids in Tissues (Values Expressed as mg/100 g wet Tissue).

Groups	Doses (mg/100 g BW/day)	Tissues		
		Liver	Kidney	Heart
I	--	2208 ± 66.25	2220.7 ± 62.17	2018.9 ± 52.49
II	0.5	1837.09 ± 42.25a	1902.11± 45.65a	1934.65 ± 34.69
III	0.5	1848.84 ± 42.52a	2175.6 ± 58.74	1935.36 ± 48.39
IV	0.5	1802.1 ± 39.64a	2055.09 ± 53.43	2089.55 ± 58.59
V	1.0	1799.32 ± 35.98a	1744.13± 34.88a	1838.62 ± 42.28b
VI	1.0	1945.8 ± 48.64b	2020.9 ± 50.61	1882.35 ± 44.23
VII	1.0	1899.09 ± 47.49	1899.48± 43.68a	1971.73 ± 50.27
Groups II to XIII are compared with group I. a = P < 0.01, b = 0.01 < P <0.05.				

Table 4: Concentration of Free Fatty Acids in Tissues (Values Expressed as mg/100 g wet Tissue).

Groups	Doses (mg/100g BW/day)	Tissues		
		Liver	Kidney	Heart
I	--	289.3 ± 8.1	457.65 ± 13.72	179.5 ± 5.2
II	0.5	240.46 ± 5.la	418.31 ± 10.45	152.85 ±3 .51a
III	0.5	274.03 ± 7.53	370.68 ± 7.41a	161.78 ± 3.88b
IV	0.5	276.13 ± 4.26a	400.12 ± 9.2b	155.96 ± 3.66a
V	1.0	249.5 ± 6.23a	385.5 ± 8.48a	150.49 ± 3.31a
VI	1.0	282.3 ± 7.9	421.6 ± 10.54	166.68 ± 4.16
VII	1.0	213.11 ± 7.59	400.7 ± 9.21b	155.33 ± 3.65a
Average of the values of six rats in each group ± SE. Groups II to XIII are compared with group I. a = P < 0.01, b 0.01 <P < 0.05.				

Table 5: Concentration of Triglycerides (Values Expressed as mg Glycerol/100 g wet Tissue).

Groups	Doses (mg/100 g BW/day)	Liver
I	--	429.25 ± 12.87
II	0.5	415.15 ± 10.37
III	0.5	419.77 ± 10.91
IV	0.5	415.91 ± 10.39
V	1.0	390.8 ± 7.81b
VI	1.0	425.61 ± 12.34
VII	1.0	394.49 ± 8.28
Average of the values of six rats in each group ±SE. Groups II to XIII are compared with group I. a = P < 0.01 b = 0.01 < P < 0.05.		

3. Result and Discussion

Food consumption and weight gain did not show any significant difference in the experimental groups when compared to the control group. Concentration of blood glucose shown in Table 1 though blood glucose levels showed reduction in

all experimental groups, highly significant decrease was observed only in groups II and V. Concentration of cholesterol (Table 2) Hypocholesterolemia was noted in the serum, liver, heart and kidney of animals of groups V and VII.. In the kidney hypocholeterolemia was noted in animals of groups IV, V and XI. Concentration of Phospholipids is shown in Table 3. Phospholipid concentration was significantly lowered in the liver of all experimental groups except VII. In the kidney significant decrease was observed in groups II, V and VII. In the heart significant reduction was shown in II and V. Concentration of free fatty acids is shown in Table 4. Free fatty acid concentration in the liver was decreased to significantly lower levels in groups II, IV and V. In the kidney pronounced decrease was observed in groups II, V, and VII, while in the heart significant reduction was observed in the groups II, IV, V, and VII. Concentration of Triglycerides is shown in Table 5, Triglycerides level in the liver showed significant decrease in group V only. On evaluating the results of the experiment, it was shown that various parts of the banana plant exert some glucose lowering effect. This effect seems to vary with the variations in the dose of flavonoids administered to the animals. Hypoglycemic activity was higher in inflorescence, stem and raw banana. Maximum activity was shown on administration of 0.5 mg of the flavonoids from raw banana. Hypercholesterolemic effect was predominant in serum, liver and heart of animals administered flavonoids from various portions, activity being significant in serum and tissues of groups received 0.5 mg flavonoid from raw banana. In the case of phospholipids, reduction was seen in all 0.5 mg flavonoids administered groups. Maximum effect was shown by animals of groups IV and VII (raw banana). Levels of free fatty acids reduced significantly in the liver of animals received flavonoids from inflorescence and stem axis (pith). In the heart, phospholipids lowering effect was noted only in 0.5 mg flavonoid administered group.

4. Summary and Conclusion

Food therapy has been receiving astonishingly greater importance now a days. As Hippocrates said let food be your medicine, from the inception to the demis, food has a very important role in the growth, maintenance and repair mechanisms in our body. The investigations on the effect of flavonoids from banana (*Musa Paradisiaca*), a comparatively cheaper and palatable fruit, showing hypoglycaemic, hypolipidemic, and hypo cholesterolemic properties. The above findings may generate a general awareness on the consumption of banana as a healthier food. Further studies may be promising in the field of drug development.

REFERENCES

1. Abad MJ, Bermejo P, Villas A, et al. Isolation of two flavonoids from tanacetum microphyllum as pma-induced ear edema. J Nat Prod. 1993;56(7):1164.
2. Despande SS and Salunkhe, DK. Interactions of tannic acid and catechin with legume starches. J.Food Sci. 1982; 47:2080.
3. Griffiths DW, Jones DH J. Cellulase inhibition by tannins in the testa of field beans (Vicia faba). Sci. Food Agric. 1977;28:983-989
4. Middleton EJR. Kandaswami C. The impact of plant flavonoids on mammalian biology. Implications for immunity, inflammation, and cancer. In: Advances in Flavonoid Research, Ed. Harborne, J. B: London. 1993; 619-652.

5. Borissova P, Valcheva S, and Belcheva A. Antiinflammatory effect of flavonoids in the natural juice from Aronia melanocarpa, rutin and rutin-magnesium complex on an experimental model of inflammation induced by histamine and serotonin. Acta Physiologica et Pharmacologica Bulgarica.1994;20(1):25.
6. Middleton E. Kandaswami C. Effects of flavonoids on immune and inflammatory cell function. Biochem. Pharmacol. 1992;43:1167-1179.
7. Kim HK, Namgoong SY, Kim HP. Anti-inflammatory activity of flavonoids: Mice ear edema inhibition. Arch. Pharm Res. 1992;18–24
8. Kandaswami C, Perkins E, Soloniuk DS, et al. Antiproliferative effects of citrus flavonoids on a human squamous cell carcinoma in vitro. Cancer Lett. 1991;56(2):147-152.
9. Kumar P, Laloraya M, Laloraya MM. The effect of some of the polyphenolic compoundes on sperm motility in vitro: A structure activity relationship. Contraception. 1989;39:531-539.
10. Gabor M. The pharmacology of benzopyrene derivatives and related compounds, Budapest Academicai Kaido. 1986.
11. Griffths DW, Jones DIH. Cellulase inhibition by tannins in the testa of field beans (Vicia faba). J Sci Food Agric. 1977;28:983.
12. Kamboj VP, Shetty BS, Chandra H, et al. Antifertility activity of 3, 4-trans-2, 2-dimethy-3-pheny1-4-p (beta-pyrrolidinoethoxy)–pheny 1-7-ethoxychroman. Indian J Exp Biol. 1977;9:103-104.
13. Kandaswami C, Perkins E, Soloniuk DS, et al. Antiproliferative effects of citrus flavonoids on a human squamous cell carcinoma in vitro. Cancer Letters. 1991;56:147.
14. Kandaswami C, Perkins E, Soloniuk DS, et al. Ascorbic acid-enhanced antiproliferative effect of flavonoids on squamous cell carcinoma in vitro. Anticancer Drugs. 1993;4:91.
15. Maxson ED and Rooney LW. Evaluation of methods for tannin analysis in sorghum grain. Cereal Chem. 1972;49:719.
16. Markham KR. Techniques of Flavonoid Identification, Academic Press, London, New York Paris San Diego San Fransisco Sao Paulo Sydney Tokyo Toronto. 1982.
17. Abell LL, Levy BB, Brodie BB, et al. A simplified method for the estimation of total cholesterol in serum and demonstration of its specificity. J BioI Chem. 1952;195(1):357-366.
18. Falhol K, Lund B, and Falholt W. An easy colorimetric micromethod for routine determination of free fatty acids in plasma. Clin Chem Acta. 1973;46(2):105-111.
19. Van Handel E and Zilversmith DB. Micromethod for the direct determination of serum triglycerides. J Lab Clin Med. 1957;50:152.
20. Folsch J, Lees M, and Sloane Stanley J. A simple method for the isolation and purification of total lipids from animal tissues. Biol Chem. 1957;226(1):497-509.
21. Bennet C.A and Franklin NL. In Statistical Analysis in Chemistry and Chemical Industry, Joh Willey and Sons, New York, 1967.

Citation: Vijayakumar S and Vijayalakshmi NR. A study related to the effectiveness of flavonoids from different edible portions of musa paradisiaca. J Bio Med Open Access. 2020;1(2):110.