

Research Article

Papaya Leaf Extract as Herbal Biomedicine for Deadly Dengue Fever – A Case Study

Vikram Kannamreddy*¹, K. Vikas², M. Jeeva¹, Girija Prasad Patnaik¹ and R. Narmadha¹

¹Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore, TN, India

²Department of Electronics and Communication Engineering, College of Engineering, Guindy, Chennai, TN, India

Abstract

Dengue is an endemic viral disease transmitted by mosquitoes of *Aedes* genus. The symptoms include sudden fever, frontal headache, muscle pain, skin rash, hyper tension, breakbone fever and thrombocytopenia. Papaya leaves used as an ancient herbal biomedicine to cure many diseases due to presence of so many active biological compounds. A study was conducted on eight dengue patients to know the effect of papaya leaf extract on dengue fever. Among them patient 1 and 2 were author 1 and 2 respectively and remaining patients were authors family members and relatives. All the patients were tested for platelet count, red blood cell count and hemoglobin count. Patients treated with papaya leaf extract thrice a day have documented higher platelet count compared to others patients. Within a short span of five days patients recovered from thrombocytopenia and their platelet count was above normal. In case of RBC and hemoglobin slight progress was observed, but the progress was not like platelet count. This study finally concluded that papaya leaf extract three times/day, for five consecutive days is beneficial to cure dengue viral fever.

Keywords: Dengue, Breakbone fever, Thrombocytopenia, Papaya leaf extract, Platelet count

*Correspondence

Author: Vikram Kannamreddy

Email: vikramreddy2882@gmail.com

Introduction

Dengue is a mortal arthropod-borne viral disease transmitted by mosquitoes belongs to the genus *Aedes* and family Flaviviridae. Under the *Aedes* genus there are four species viz., *Aedes aegypti*, *A. albopictus*, *A. polynesiensis* and *A. scutellaris* [1]. The causal agents of dengue are dengue virus with different serotypes from DEN 1 to DEN 4 [2]. The symptoms starts with sudden fever, frontal headache, muscle pain (myalgia) and skin rash after an incubation period of 4-7 days of septic mosquito bite. The body pain especially back pain is occasionally so severe that it is called “breakbone fever”. The most serious form of dengue fever called “dengue hemorrhagic fever” includes symptoms of hypotension, increased vascular permeability and thrombocytopenia. According to World Health Organization, Platelet count reduction is supposed to be an indication for severe dengue infection [3]. Normal platelet count of a healthy human is 150×10^3 to 450×10^3 platelets per microliter of blood. If the platelet count is less than 150×10^3 this condition is called thrombocytopenia and the count is more than 450×10^3 per microliter of blood, this condition is called thrombocytosis.

Early experimental evidences on dengue virus using leaf extracts of *Alternanthera philoxeroides* [4], *Piper retrofractum* [5] and *Psidium guajava* [6] showed antiviral properties but their inhibitory activity was not much effective. Recently, papaya leaves have been successfully used as traditional herbal biomedicine to treat dengue hemorrhagic fever. A lot of research work has been conducted on papaya plant parts like fruits, seeds and roots, indicating the presence of biologically active compounds [7, 8].

Papaya botanically *Carica papaya* belongs to the family of Caricaceae is a tropical fruit plant. Almost all the parts of papaya are useful. Green or tender papaya fruit, leaves and flowers can be eaten after cooking. Tender fruit lowers blood pressure and induce abortion. The ripe fruit of the papaya is generally eaten raw, without skin and seeds. The black seeds of the papaya are edible, have a spicy taste and used to stimulate menstruation or abortion. The latex of papaya is rich in ‘papain’ which can be used as meat tenderizer and can be applied externally as antiseptic [9]. Papaya leaves contain papain, chymopapain, L-tocopherol, ascorbic acid, flavonoids, cyanogenic glucosides and glucosinolates which cause increased platelet and red blood cell counts [10]. In the current study effect of papaya leaf extract (PLE) on platelet count, red blood cell count and hemoglobin content is evaluated to cure dangerous dengue viral fever.

Materials and Methods

A study was conducted to know the efficacy papaya leaf extract on dengue virus. The materials used in preparation of PLE and methods employed on patients and their treatments are presented here.

Matured papaya leaves were taken and made them in to small pieces. Macerated the leaves using pestle and mortar by adding 10 ml of water for 100 gram of leaves. Then filtered the macerated mixture and this papaya leaf extract (PLE) was used for diagnosis. Other medicines used in the experiment were paracetamol 500 mg and papaya leaf powder capsules which were purchased from pharmacy.



Plate 1 Matured papaya leaves



Plate 2 Matured papaya leaf extract

Patients selected for this study were eight in number. Among them patient 1 and 2 were author 1 and 2 respectively and remaining patients were authors family members and relatives. All the eight patients were tested positive for dengue alone. The patient treatments are as follows: Patient 1, 2 and 3 were given with PLE three times /day each time 50 ml. Patient 4 and 5 were given with PLE two times /day each time 50 ml. Patient 6 and 7 were given with paracetamol 500 mg and papaya leaf powder capsules 500 mg, both were given thrice a day. Patient 8 was given with paracetamol 500 mg thrice a day and more liquid fruit diet. The treatment of diagnosis was for 5 continuous days. All the patients were tested for platelet count (platelet No. $\times 10^3$ per microliter of blood) at before treatment imposition (BTI), 1 day after treatment imposition (DATI), 2 DATI, 3 DATI, 4 DATI and 5 DATI. All the patients were also tested for red blood cell (RBC) count (million cells per microliter of blood) and hemoglobin content (grams per deciliter) at BTI, 1 DATI, 3 DATI and 5 DATI.

Results and Discussion

Effect of diagnosis treatments on platelet count

Higher platelet count was observed in the patients diagnosed with PLE thrice a day and platelet multiplication rate from 1 DATI to 5 DATI was also much higher in these patients compare to other patients. There was not much difference between the patients diagnosed with PLE thrice a day and twice a day. In case of patients taken paracetamol 500 mg + papaya leaf powder capsules 500 mg and also the patient treated with paracetamol 500 mg + liquid fruit diet the platelet increasing trend from 1 DATI to 5 DATI was much lower compared with patients 1 to 5. One of the symptom in dengue the 'breakbone fever' was observed in patient 1 (author 1) and patient 2 (author 2) before imposition of treatment but 3 days after treatment imposition there was no pain at all. This study clearly indicated that PLE taken 3 times per day each time 50 ml was greatly influenced the platelet count due to presence of active herbal biological compounds. These results were supported by the findings of Subenthiran, where it was hypothesized that two genes namely arachidonate 12-lipoxygenase (ALOX 12) and platelet activating factor receptor (PTAFR) are responsible for platelet activation, aggregation and multiplication [11]. These genes were activated by the biological active compounds of papaya leaf extract and this might be the reason behind the higher platelet count of patients treated with papaya leaf extract (**Table 1** and **Figure 1**).

Effect of diagnosis treatments on red blood cell count and hemoglobin content

Red blood cell count and hemoglobin content are directly related because hemoglobin is a protein inside RBC. In this study both RBC count and hemoglobin content were not much increased in all the treatments. All the patients showed increase in RBC and hemoglobin from 1 DATI to 5 DATI but not like platelet count. This clearly indicated that papaya leaf extract has no direct influence on RBC and hemoglobin as like platelet count. Similar findings were

reported by Pangtey and coworkers. According to them there was no significant difference between treated and control patient groups [12] (Tables 2 and 3).

All the patients were observed for more than one month after medication to see the side effects on their metabolism due to intake of PLE. It was noticed that there was no single side effect on the patients after intake of papaya leaf extract, papaya capsules and also paracetamol.

Table 1 Effect of diagnosis treatments on platelet count

P. No	Diagnosis Treatments	Platelet count (No. x 10 ³ / μl of blood)					
		BTI	1 DATI	2 DATI	3 DATI	4 DATI	5 DATI
1	PLE 3 times/day	35.50	49.50	83.80	135.00	246.20	295.50
2	PLE 3 times/day	60.30	82.00	105.00	176.00	255.30	310.20
3	PLE 3 times/day	56.50	75.50	98.50	148.70	210.50	275.20
4	PLE 2 times/day	105.00	117.80	148.00	176.00	225.70	257.30
5	PLE 2 times/day	95.70	116.00	156.60	195.50	244.50	287.30
6	Paracetamol 500 mg + papaya capsule 500 mg 3 times /day	86.40	97.50	110.50	137.50	178.30	198.00
7	Paracetamol 500 mg + papaya capsule 500 mg 3 times /day	110.00	122.50	143.00	158.00	179.70	196.50
8	Paracetamol 500 mg 3 times /day + liquid fruit diet	135.50	141.00	158.50	171.00	182.50	185.50

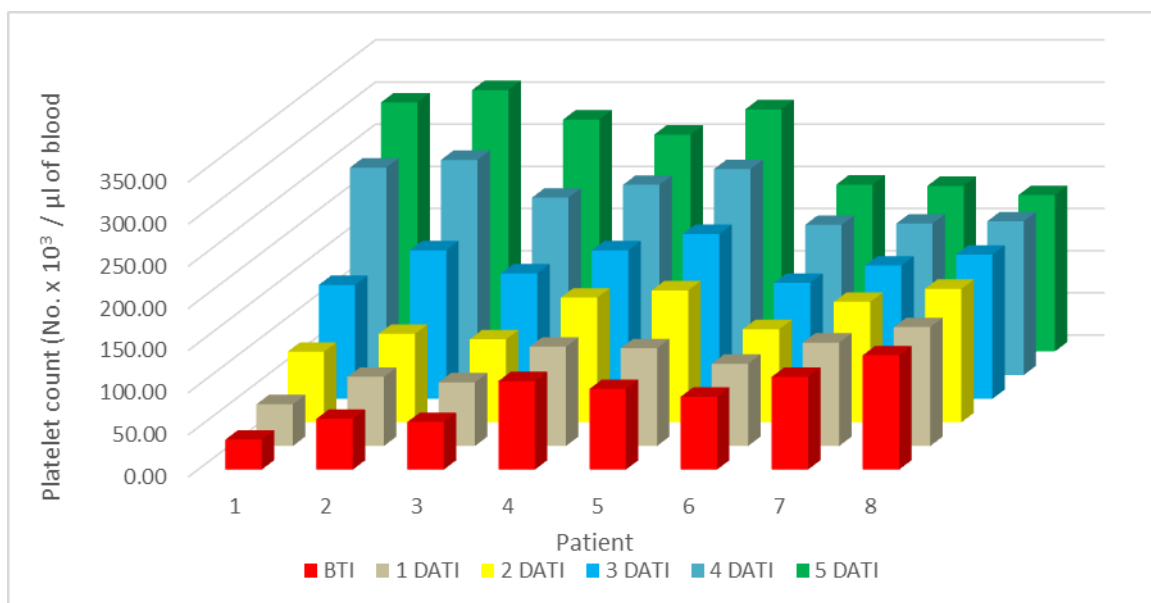


Figure 1 Plate count of patients at different intervals

Table 2 Effect of diagnosis treatments on red blood cell count

P. No	Diagnosis Treatments	RBC count (No. x 10 ⁶ / μl of blood)			
		BTI	1 DATI	3 DATI	5 DATI
1	PLE 3 times/day	5.25	5.36	5.47	5.77
2	PLE 3 times/day	5.38	5.37	5.58	5.79
3	PLE 3 times/day	4.75	4.79	5.12	5.31
4	PLE 2 times/day	5.56	5.59	5.67	5.83
5	PLE 2 times/day	4.23	4.23	4.79	5.05
6	Paracetamol 500 mg + papaya capsule 500 mg 3 times /day	4.23	4.29	4.58	4.58
7	Paracetamol 500 mg + papaya capsule 500 mg 3 times /day	5.13	5.19	5.32	5.41
8	Paracetamol 500 mg 3 times /day + liquid fruit diet	5.39	5.45	5.53	5.77

Table 3 Effect of diagnosis treatments on hemoglobin content

P. No	Diagnosis Treatments	Hemoglobin content (g / deciliter of blood)			
		BTI	1 DATI	3 DATI	5 DATI
1	PLE 3 times/day	14.35	14.46	15.01	15.12
2	PLE 3 times/day	14.51	14.55	14.75	14.96
3	PLE 3 times/day	12.37	12.56	12.69	13.12
4	PLE 2 times/day	13.13	13.37	13.96	14.11
5	PLE 2 times/day	12.17	12.57	12.92	13.34
6	Paracetamol 500 mg + papaya capsule 500 mg 3 times /day	12.31	12.26	12.78	13.12
7	Paracetamol 500 mg + papaya capsule 500 mg 3 times /day	13.39	13.42	13.58	13.46
8	Paracetamol 500 mg 3 times /day + liquid fruit diet	14.07	14.18	14.51	14.59

Conclusion

In this study on effect of papaya leaf extract on dengue affected patients, it was revealed that in the patients given with papaya leaf extract there was great increase in platelet count was observed. Within five days period patients recovered from thrombocytopenia and their platelet count was above optimum. In case of red blood cells and hemoglobin content slight increment was noticed, but the improvement was not like platelet count. Finally based on the results observed in this experiment, it was concluded that papaya leaf extract thrice a day, each time with 50 ml continuously for 5 days was cured deadly dengue fever by activation, aggregation and multiplication of platelet count with no side effects.

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