



Study on the Incidence of Malaria in Certain Areas of Patna and Biological Control of its Vector

• Misha Saumya • Jyoti • Pushpa Kumari
• Joyita Das

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Corresponding Author : Joyita Das

Abstract : *The larvae of Anopheles were treated with the leaves of Cynodon dactylon and Psidium guajava to study the number of mortalities as a biological method of control. Psidium guajava showed high efficacy than Cynodon dactylon. Comparative study of chemical control and biological control of Anopheles was conducted by fumigation method. Cynodon dactylon leaves were most potent and caused greater mortality of mosquitoes as compared to the mosquito coils which caused only inactivation of mosquitoes.*

Survey was also conducted to study the incidence of malaria in certain areas of Patna.

Key Words: *Anopheles, Biological control, malaria*

Misha Saumya

B.Sc. III year, Zoology (Hons.), Session: 2011-2014,
Patna Women's College, Patna University, Patna,
Bihar, India

Jyoti

B.Sc. III year, Zoology (Hons.), Session: 2011-2014,
Patna Women's College, Patna University, Patna,
Bihar, India

Pushpa Kumari

B.Sc. III year, Zoology (Hons.), Session: 2011-2014,
Patna Women's College, Patna University, Patna,
Bihar, India

Joyita Das

Assistant Professor, Deptt. of Zoology,
Patna Women's College, Bailey Road,
Patna-800 001, Bihar, India
E-mail : joyitadas11@gmail.com

Introduction :

Malaria is one of the most common vector-borne disease prevalent in the tropical and sub-tropical areas of the world, including regions in Africa, Asia, and America as per the report given by World Health Organization (2007). It is caused by the protozoan *Plasmodium* (four species) which is transmitted by the vector, female *Anopheles* in course of feeding. Over 1.2 million global deaths due to malaria were reported in both children and adults by Murray et al. (2012). According to Harrison (1978), eradicating malaria by targeting the *Anopheles* vector using insecticides and other chemical methods were among the most important achieved strategies in the past years in

accordance with the guidelines of World Health Organization (1993,1995). The remarkable toxic and persistent effects of many synthetic chemical insecticides and the emergence of insecticide resistant mosquito strains are among the major impediments in such control strategies. Integrated Vector Management (IVM) efforts are now oriented towards controlling *Anopheles* either at the larval stage or at adult stage using diverse means of biological control as per Beier (2008). Shifting towards biological control of *Anopheles* was mainly due to its negligible side effects on human, wild flora and fauna as also on the other aspects of the environment, in addition to the very minimal recorded cases of mosquito resistant strains to these biological agents.

Materials and Methods :

Study was conducted to calculate the different doses of two different plant part (leaves) with which the larvae of *Anopheles* were treated. The selected doses were 0.50gm and 0.60gm of dried *Cynodon dactylon* (Hindi : *doob*) and *Psidium guajava* (English : guava) leaves powder in 100ml water. Pilot study was done to determine the selected doses for the present work. Ten larvae in each of the four beakers were treated with the above mentioned doses of dried and powdered leaves of *doob* and guava. Larvae in two beakers were kept as control. Those were not treated with the leaves of *Cynodon dactylon* and *Psidium guajava*.

Comparative study of chemical control and biological control of the adult *Anopheles* was conducted by the fumigation method. An ideal model was set up for the process and a mosquito coil was kept in the fumigation chamber along with ten *Anopheles* mosquitoes. Similarly, 30gm and 50gm of dried leaves of guava and *doob* were burnt with coconut husk in the ratio 1:1.

A survey on the incidence of malaria was also

conducted. Study of the clinical cases in different hospitals of Patna in Kurji, Boring road, Danapur cantonment and Bailey road was undertaken.

Results and Discussion :

Researches show that mosquitoes have developed chloroquine resistance and uses of other chemicals are a threat to the environment according to Brown (1958). Some indigenous plant based products offer a safer alternative to synthetic chemicals and can be obtained by individuals and communities easily at a low cost. As per Raghvendra et al. (2011), many factors such as relying on ineffective conventional vector control approaches, shortage of epidemiological control bodies, scarce availability of resources and infrastructure and poor management plans lead to a decline in the effectiveness of controlling malaria at the level of its vector.

Plants have phytochemicals which protect them from their natural enemies and predators. This property of phytochemicals can also be used therefore for similar purpose by human beings, for example to repel insects like mosquitoes. It has been observed that *Anopheles* mosquitoes are rarely found in the presence of *Cynodon dactylon* even in the waterlogged areas. This may be due to some repellent chemical like oleic acid present in *Cynodon dactylon*. According to Jaiarj et al. (1999), *Psidium guajava* is one of such folk medicine that has been used for the management of various disease conditions. Various plant parts have been used in traditional medicine to manage conditions like malaria. Our investigation was also aimed at analysing the efficacy of plant parts like leaves of *Psidium guajava* and *Cynodon dactylon*.

According to Venkatesan et.al (2000), oleic acid and linoleic acid are quite potent against larvae of *Anopheles*. Oleic acid is about 52.8% larvicidal and stearic acid contains about 21.4% of

antimalarial action. Different larvicidal components present in guava plants are chiefly oleic acid, palmitoleic acid, stearic acid, palmitic acid and linoleic acid. Leaves of *Psidium guajava* contains an essential oil rich in cineol, tannins, malic acid, flavonoids and a number of other fixed substances according to Olajde et.al (1999). *Psidium guajava* and *Cynodon dactylon* are easily accessible and the presence of different larvicidal components in them may prove as a better option. Tentatively, in our work, *Psidium guajava* was more effective as compared to *Cynodon dactylon* for the treatment of larvae.

Table 1: Showing mortality of *Anopheles* larvae with *Cynodon dactylon* (Hindi : doob) and *Psidium guajava* (English : guava) when treated with doses of 0.50gm/100ml and 0.60gm/100ml

DAYS	DOSES (gm/100ml)	0.50		0.60	
	PLANTS	Cynodon dactylon (Doob)	Psidium guajava (Guava)	Cynodon dactylon (Doob)	Psidium guajava (Guava)
1.		0	4	1	6
2.		1	5	3	7
3.		3	6	7	8
4.		6	8	9	10
5.		7	10	10	-
6.		9	-	-	-
7.		10	-	-	-
8.		-	-	-	-
9.		-	-	-	-
10.		-	-	-	-

Smoke produced by burning of dried leaves of *Azadirachta indica* has been used for the protection against mosquitoes since ancient times as per Tyagi et.al (1994). Likewise, *Cynodon dactylon* showed remarkable efficacy against the mosquitoes as compared to *Psidium guajava*. Important point to be noted is that the plants' leaves showed higher mortality in comparison to the

synthetic mosquito repellent coils available commercially.

Table 2: Showing time taken for mortality of adult *Anopheles* with *Cynodon dactylon* and *Psidium guajava*.

DAYS	DOSES (In gm.)	0.30		0.50	
	PLANTS	Cynodon dactylon (Doob) Hours	Psidium guajava (Guava) Hours	Cynodon dactylon (Doob) Hours	Psidium guajava (Guava) Hours
1.		05:00	05:20	04:10	04:00
2.		04:50	05:30	03:50	04:20
3.		04:45	05:20	04:00	03:50
4.		05:00	05:20	03:40	04:10
5.		04:50	05:10	03:40	04:30
6.		05:00	05:00	03:50	04:10
7.		05:00	05:30	04:00	04:00

Incidence of malaria was observed in certain areas of Patna. The clinical cases recorded in these hospitals showed fewer cases of the disease. Though the incidence of malaria is greater in India and in Bihar but the areas studied in Patna showed lesser cases of malaria in the areas under survey. This may be due to greater awareness and therefore, the preventive measures taken by the people in those places.

Table 3: Showing incidence of clinical cases of malaria in certain areas of Patna in August-September 2013.

Serial No.	Selected areas	Number of cases
1.	Kurji	2
2.	Boring Road	0
3.	Danapur Cantt	4
4.	Bailey Road	0

Conclusion :

Since mosquitoes have developed resistance against certain of the chemicals used for their control and use of chemicals are causing various health related disorders, therefore, there is need to control *Anopheles* using biological means of

control. In addition to this, use of biological agents till now has shown no adverse environmental effects. Hence, biological control is a better option. In our studies, *Psidium guajava* leaves were most efficient as compared to *Cynodon dactylon* for the treatment of larvae. There are many larvicidal properties present in these leaves due to which it can be used as a potent biological agent against *Anopheles* larvae.

In the control of the adult *Anopheles*, the leaves of *Cynodon dactylon* were most effective as compared to *Psidium guajava*. Moreover, the treatment by botanicals was much more efficacious than that with synthetic coils. This may be because for the adults, the treatment was done by fumigation method. The smoke of these leaves in combination with the coconut husk may have had a different impact. The incidence of malaria in different areas of Patna as observed by clinical cases showed lesser cases of malaria. This may be due to greater awareness and therefore, the preventive measures taken by the people. Biological control would definitely provide a better alternative for the prevention of the disease.

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