IJPSR (2018), Volume 9, Issue 5 **(Research Article)**

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 01 August, 2017; received in revised form, 10 October, 2017; accepted, 20 October, 2017; published 01 May, 2018

LARVICIDAL ACTIVITY OF LEAF EXTRACT OF GINGER AND TURMERIC ON MOSQUITO LARVAE

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Keywords:

Ginger, Turmeric, Larvicidal activity, *Aedes aegypti*

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ABSTRACT: Dengue fever is an important public health problem in tropical and sub-tropical Continent. Recently the number of severe forms of the disease, dengue hemorrhagic fever, and dengue shock syndrome are increased. Dengue virus, a arbo-virus responsible for dengue fever and spread through its vector, *Aedes aegypti*. Controlling the mosquito is the good strategy to prevent this disease. The traditional chemical pesticides used to control mosquito have many drawbacks, and natural products are more acceptable in this aspect. The bio-efficacy of ginger (*Zingiber officinale*) and turmeric (*Curcuma longa*) ethanolic leaf extract was assessed against the fourth instars larvae of *Aedes aegypti*, under the laboratory conditions. Both shows moderate activity against *Aedes aegypti* larvae. However, the combined treatment of both leaf extract (1:1) shows highest activity. Combination of 50 μgml^{-1} turmeric and 50 μgml^{-1} ginger killed all of the population within 24 h. This is an eco-friendly and low-cost approach, may use to control *Aedes aegypti*.

INTRODUCTION: In tropical and sub-tropical continent including Asian country, risk of dengue fever is very high. Annually, there are 2 million infections, 500,000 cases of dengue hemorrhagic fever and 12,000 deaths [1]. *Aedes aegypti* is generally known as a vector for an arbo-virus responsible for dengue fever, which is endemic to Southeast Asia, the Pacific island area, Africa and the America [2]. This mosquito also acts as a vector of yellow fever in Central and South America and West Africa [3]. However, dengue fever became an important public health problem as the number of reported cases continues to increase, especially with more severe forms of the disease, dengue hemorrhagic fever, and dengue shock syndrome, or with unusual manifestations like in central nervous system [4, 5].

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.9(5).2034-36

Article can be accessed online on: www.ijpsr.com

DOI link: http://dx.doi.org/10.13040/IJPSR.0975-8232.9(5).2034-36

A. aegypti is a cosmotropical species that proliferates in water containers in and around houses. Secondary vectors include *Aedes albopictus*, an important vector in Southeast Asia and that has spread to the America, Western Africa and the Mediterranean rim, *Aedes mediovittatus* in the Caribbean, *Aedes polynesiensis* and *Aedes scutellaris* in the western Pacific region. *A. aegypti* breeds in many types of household containers, like water storage tanks, flower vase *etc* [6].

Chemical insecticides used to control are harmful for human health as those contain neurotoxic and carcinogenic agents and are even carried through food chain which in turn affects the human through bioaccumulation. Moreover, due to repetitive use of same insecticide, vectors may become resistant [7, 8]. Chemical insecticides are also toxic for non-target organisms like bees, butterfly *etc*., which have ecological importance. Therefore, alternative eco-friendly methods of controlling mosquito larvae are essential for controlling mosquito bearing diseases. Ginger *(Zingiber officinale*) and Turmeric (*Curcuma longa*) are use as spice in Indian

subcontinent [9, 10]. Different parts of both plants are traditionally use as medicine, and recent studies reveal diverse therapeutic properties [11, 12]. India is the largest producer of ginger and turmeric and the rhizome of both plants have economical value. After harvesting, remaining part of the plants are going to waste and have no economic importance. In this study, we prepared the ethanolic extract of ginger and turmeric leaves and assessed the larvicidal activity against *Aedes aegypti* under laboratory conditions.

MATERIALS AND METHODS:

Collection of Plant and Preparation of Extract: Plants were collected from cultivation field near Panskura, West Bengal, India (22°24'01.6" N, 87°44'48.9" E). The voucher specimen kept in our research laboratory for further reference (NB/2015/21 and NB/2015/22). Plant leaves were cleaned thoroughly and shade dried at room temperature, crashed by an electrical blender to produce powder. The eathanolic extract of plant material was prepared at room temperature in 1:100 (w/v) ratio. The extracts were filtered through a Buchner funnel with Whatman number 1 filter paper and the filtrate was dried in air [13].

These metabolite extracts were then dissolved in ethanol to obtain a final concentration of 1000 mgl^{-1} as a stock plant extract.

Larval Toxicity Test: A laboratory reared colony of *A. aegypti* larvae was used for the larvicidal bioassay. The larvicidal activity was done as per guideline of World health organization [14] with modifications. In brief, 20 number of fourth instars mosquito larvae were placed in a conical flask with 249 ml phosphate buffered saline, maintain at room temperature with 12/12 h light dark cycle. The mosquito larvae were treated with different concentrations of plant extract from a 1000 mgl^{-1} stock. After 24 h and 48 h count the number death larvae and mortalities was calculated against an untreated control by the following formula [15].

% of Mortality = (Mortality in treatment/ Mortality in control) * 100

The experiment was performed in triplicate and result is expressed as average of three experiments.

RESULTS: Mortality of *A. aegypti* after the treatment of ginger and turmeric extract are shown in **Table 1**.

TABLE 1: RESULTS OF THE MORTALITY OF IV INSTAR *A. AEGYPTI* LARVAE AFTER THE TREATMENT OF PLANT EXTRACT AT DIFFERENT CONCENTRATIONS AND IN DIFFERENT PERIOD

Plant extract	Concertation (μgml^{-1})	% of Mortality (24 h)	% of Mortality (48 h)
Turmeric	25 μgml^{-1}	10	22
	50 μgml^{-1}	25	35
	75 μgml^{-1}	32	47
	100 μgml^{-1}	38	61
Ginger	25 μgml^{-1}	10	35
	50 μgml^{-1}	40	49
	75 μgml^{-1}	38	75
	100 μgml^{-1}	68	70
Turmeric + Ginger (1:1)	12.5 μgml^{-1} turmeric + 12.5 μgml^{-1} ginger	20	75
	25 μgml^{-1}turmeric + 25 μgml^{-1} ginger	45	100
	50 μgml^{-1} turmeric + 50 μgml^{-1} ginger	100	100
	75 μgml^{-1} turmeric + 75 μgml^{-1} ginger	100	100

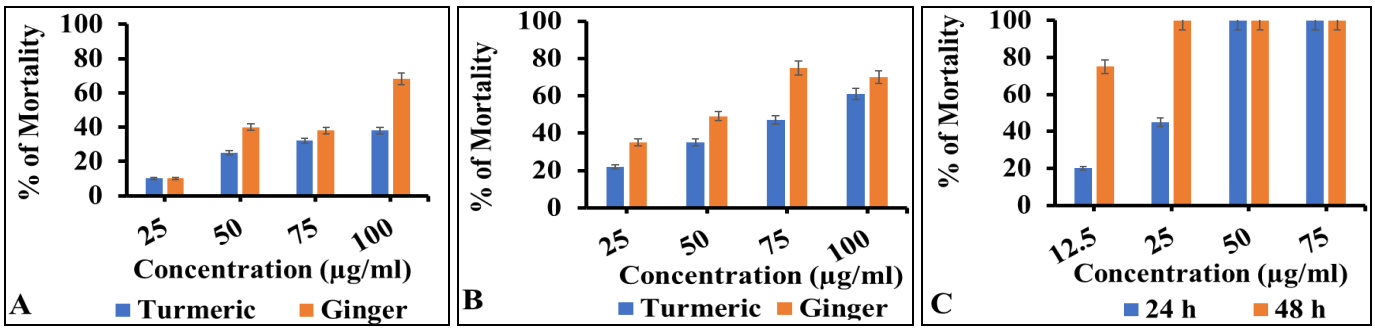

FIG. 1: LARVICIDAL ACTIVITY OF GINGER AND TURMERIC LEAF EXTRACT. (A) MORTALITY AFTER 24 H TREATMENT (B) MORTALITY AFTER 48 H TREATMENT (C) COMBINE EFFECT OF BOTH AFTER 24 H AND 48 H

DISCUSSION: Mosquito life cycle follows eggs, larval stage, pupa and adult stage. The larval stage is more attractive target to kill them as it moves on water at this stage, which makes it easy to deal with them in this own habitat. Some fishes also take these larvae as their foods. The use of conventional chemical insecticides in the water sources, ultimately introduces many health risks to people and our ecosystem. Insecticides produced from plant, are more acceptable in this regard.

In this study, the mortality of larvae after 24 h treatment of ginger and turmeric leaf extract showed 38 % and 68 % respectively at a concentration of 100µgml^{-1} (**Fig. 1**). After 48 h, it was increased to 61 % and 70 % respectively. Hence, standalone use of both ginger and turmeric leaf extract not any significance. The combination of both leaf extract in 1:1 is able to kill all of the population after 24 h at 100 µgml^{-1} concentration.

This result clearly reveals that both the leaf extract of ginger and turmeric could serve as a potential larvicidal agents against the *A. aegypti* larvae and they have demonstrated a synergist act too.

CONCLUSION: The present strategy might be used to control dengue vector. This approach could reduce the possibilities of physiological resistance development in mosquito population. Before that, the mode of action and larvicidal efficiency of the both plants extract under the field conditions should be evaluated. Besides, further investigation is required regarding the effect on non-target organism, which is extremely important.

ACKNOWLEDGEMENT: Nil

CONFLICT OF INTEREST: The authors declare that they have no conflict of interest.

REFERENCES:

1. Harrington LC, Scott TW, Lerdthusnee K, Coleman RC, Costero A, Clark GG, Jones JJ, Kitthawee S, Kittayapong P, Sithiprasasna R and Edman JD: Dispersal of the dengue vector *Aedes aegypti* within and between rural communities. The American journal of tropical medicine and hygiene 2005; 72(2): 209-20.
2. Bhatt S, Gething PW, Brady OJ, Messina JP, Farlow AW, Moyes CL, Drake JM, Brownstein JS, Hoen AG, Sankoh O and Myers MF: The global distribution and burden of dengue. Nature 2013; 496(7446): 504-7.
3. Karunamoorthi K: Vector control: a cornerstone in the malaria elimination campaign. Clinical Microbiology and Infection 2011; 17(11): 1608-16.
4. Zhang H, Zhou YP, Peng HJ, Zhang XH, Zhou FY, Liu ZH and Chen XG: Predictive symptoms and signs of severe dengue disease for patients with dengue fever: a meta-analysis. BioMed Research International 2014; 1-10.
5. Gubler DJ, Ooi EE, Vasudevan S and Farrar J: Dengue and dengue hemorrhagic fever. CABI, 2014.
6. Guha-Sapir D and Schimmer B: Dengue fever: new paradigms for a changing epidemiology. Emerging themes in epidemiology 2005; 2(1): 1-10.
7. Gunasekaran K, Vijayakumar T and Kalyanasundaram M: Larvicidal and emergence inhibitory activities of Neem Azal T/S 1.2 per cent EC against vectors of malaria, filariasis and dengue 2009; 130: 138-45.
8. Murugan K, Hwang JS, Kovendan K, Kumar KP, Vasugi C and Kumar AN: Use of plant products and copepods for control of the dengue vector, *Aedes aegypti*. Hydrobiologia 2011; 666(1): 331-38.
9. Ravindran PN and Babu KN: Ginger: the genus Zingiber. CRC press, 2016.
10. Priyadarsini KI: The chemistry of curcumin: from extraction to therapeutic agent. Molecules 2014; 19(12): 20091-112.
11. Rashmi KJ, Tiwari R: Pharmacotherapeutic properties of ginger and its use in diseases of the oral cavity: A narrative review. Jou of Advanced Oral Research 2016; 7(2): 1-6.
12. Prasad S, Gupta SC, Tyagi AK and Aggarwal BB: Curcumin, a component of golden spice: from bedside to bench and back. Bio adv 2014; 32(6): 1053-64.
13. Khanra K, Panja S, Choudhuri I and Bhattacharyya N: Antibacterial, insecticidal activity and cytotoxicity of methanol, ethanol, hot aqueous and cold aqueous extracts of *Crotalaria juncia*. Int. J. Curr. Res. Biosci. Plant Biol 2015; 2(10): 98-103.
14. WHO: Guidelines for Laboratory and Field Testing of Mosquito Larvicides. http://www.who.int/iris/handle/10665/69101.
15. Rahuman AA, Gopalakrishnan G, Ghouse BS, Arumugam S and Himalayan B: Effect of *Feronia limonia* on mosquito larvae. Fitoterapia 2000; 71(5): 553-5.

How to cite this article:
Khanra K, Choudhuri I and Bhattacharyya N: Larvicidal activity of leaf extract of ginger and turmeric on mosquito larvae. Int J Pharm Sci & Res 2018; 9(5): 2034-36. doi: 10.13040/IJPSR.0975-8232.9(5).2034-36.