**Photorhabdus Insect-Related Proteins (PirAB) an Insecticidal Toxin against Dengue Vectors, *Aedes aegypti***

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A number of vector-borne diseases posed genuine problems, including health and economic problems. Dengue fever is among the most hazardous vector-borne disease, which concern the public health issue [1]. The major cause of the fever is dengue virus (DENV), is a mosquito-borne RNA(+) (positive stranded) virus, belongs to *Flaviviridae* family and *Flavivirus* genus [2]. Mosquito *Aedes aegypti* is the major vector and source of transmission of dengue virus. Toxins from *Bacillus thuringiensis* had been successfully used against the larvae of *A. aegypti*, but a gradual resistance was notice in the insects against the toxins over the years [3].

*Photorhabdus* bacteria such as *P. luminescens*, *P. temperata* and *P. asymbiotica* produce an array of new toxins and virulence factors, against the insects including *A. aegypti*, and no resistance has been reported in the insect vectors against these toxins to date [3,4]. All three species of *Photorhabdus* are nematodes symbiont of the genus *Heterorhabditis* [5].

*Photorhabdus* sp. are now well known entomopathogenic bacteria against a wide range of insects when released in to the gut of insects [2]. Complete genome analysis of *Photorhabdus* sp. revealed that genes encoding hemolysins, and proteases are critical of insecticidal activities [6]. The loci; plu4092-4093 and plu4436-4437 encoding polypeptide chains in *Photorhabdus* sp., have been termed as PirA and PirB, respectively, for "*Photorhabdus* insect-related proteins A and B," reveal sequence similarity with endotoxins of *B. thuringiensis* as well as with developmentally regulated protein from *Leptinotarsa decemlineata* [7].

Moreover, it has been reported that the PirAB toxin from *Photorhabdus* sp. had the potential to kill larvae of many insects including *A. aegypti*. The PirAB toxin have been determined to equally effective, either expressed in *E. coli* expression system or/and purified from the culture of *Photorhabdus* sp [8]. The Pir toxins function as binary proteins and both are necessary for insecticidal activity [9]. All the two components of Pir (PirA and PirB) are encoded by genes, located at plu4093-4092 (pirA) and plu4437-4436 (pirB) loci in *Photorhabdus* genome. Both Pir components exhibit a strong functional similarity to the δ-endotoxins of *B. thuringiensis*, which make them a substitute of Bt toxin [9]. PirA component of the binary protein exhibits a bit sequence similarities with known toxic proteins, however, its counterpart (PirB) shows strong sequence similarity with the N-terminal side of the pore-forming domain of the Cry2A insecticidal toxin [10]. These similarities suggest the presence of a similar motif in PirAB. Moreover, PirB has also a strong similarity with the developmentally regulated protein (DRP) of *L. decemlineata* [11]. The DRP has been thought to have a putative juvenile hormone esterase (JHE) property because of its pattern of expression, that matches insect development profile and the levels of JH produced [12]. It is therefore, assumed that PirB may exhibit the same kind of activity. However, further study is need to elucidate a the PirB activity [6,13].

It has been evaluated in a comparative study of the rate of mortality of PirAB, PirA and PirB, when applied to *A. aegypti*. The PirAB was most effective against the larvae of *A. aegypti* as compared to PirA or PirB exclusively [14]. The PirB activity was improved gradually and was tended to be stable after 2 days. However, PirA caused mortality in larvae of *A. aegypti* and tended to be stable after 4 days of treatment [14].

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It is concluded that chemical control of *A. aegypti* has more hazardous environmental consequences and biological control is a best solution against the dengue virus. However, there are consistent raise of resistance against *Bt* and other biocontrol system. *Photorhabdus* toxins are comparatively new and more efficient and the level of the resistance in the insects is still at very primitive. The *Photorhabdus* toxins PirAB is more efficient *A. aegypti*, and can to used against *A. aegypti* to control the dengue fever.

**Bibliography**


