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Effectiveness of ECO BIO BALL (EBB) against *Culex quinquefasciatus* in Buckingham Canal, Chennai, Tamil Nadu.

KEYWORDS: Eco Bio Ball, Culex quinquefasciatus, larvicidal activity, water purification.

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ABSTRACT *EBB, a novel control of mosquito larvae and uses as a water – purifying system. Which is composed of clay, potash alum and it incorporates the bacterial stain solution. Water quality has received considerable attention in allocation processes for maximizing the satisfaction of various sectors. However, pollutants impurities that impede adequate supply of water have a detrimental effect on the quality and harmful for living organisms including aquatic life. For the reduction of water pollution level, various chemical and biological treatments are available but the emergence of an amazing technology of a multiculture of anaerobic and aerobic beneficial microorganism is presently gaining popularity due to its environmentally friendly nature. The Bacterial Stain Solution has ability to purify and revive nature. Application of EBB has been experimental in laboratory condition and has the objective of enhancing and improving the water quality. Main significant contribution of Bacterial stain and EBB is based on the rehabilitation of polluted and degraded water bodies is to restore aquatic habitats and ecosystems. The EBB showed high inhibitory activity against mosquito emergence as well as water purifying effect.*

Introduction:
Some aspects of human ecology greatly influence mosquito distribution[1], species, relative abundance and their survival[2]. All mosquito breed in water more often quiescent. Often mosquito species, groups, subgenus and genus have their own preferred habitat based on locations and conditions of the water body[3]. Most shallow aquatic ecosystem, including natural and constructed wetlands, provide suitable habitat for a variety of mosquito species are human pests with painful bites that limit outdoor activities. A conflict exists between our appreciation of wetlands and some of their inevitable inhabitants[4].

With current increasing trends in population growth and socio-economic development, the quality and quantity of water is gaining widespread attention worldwide. This increasing concern about water quality and quantity necessitates the interventions in water systems to meet the objective of sustainable water supply and prevent potential environmental deterioration. It [5] emphasized that sustainable water management which incorporates both socio-economic and environmental perspective is a different but essential task in order to prevent potential environment deterioration.

In recent years, the large amounts of polluted water are discharged into rivers and causing serious future uncertainty in water quality. However, method that integrates water quantity and quality in water resources allocation has the potential to add values to decision markers who faces the challenges[6]. Various conventional methods are in practice for purification of water and removing the pollutants contaminants, but most of them are costly and non-eco-freiendly[7].

Bacterial stain solution consist of many micro-organisms which is able to purify the water and revive in nature. These multiculture are effective, beneficial and non-pathogenic microorganisms coexisting together[8]. Bacterial stain solution is applied to many environments to break down organic matter. These bacteria are non-genetically engineered, not pathogenic, not harmful and not chemically synthesized. It is a natural and organic technology that has been found to be useful in numerous ways to benefit mankind. Some claims of application include sustainable agriculture, industrial, health, odor control, waste management and recycling, environmental remediation and eco-friendly cleaning[9].

In this study, we report on the larvicidal activity and water – purifying effect of EBB under laboratory conditions.

Materials and Methods:
2.1 Collection of mosquito:
The *Culex* mosquito larvae were collected by dipper method [10] from Buckingham canal, Chennai, India (Fig 1).

Fig 1: Study Area – Bukingham Canal

Analysis of water samples:
The water samples is analyzed various water quality parameters such as pH, Dissolved Oxygen, Biological Oxygen Demand, Sulphate, Phosphate, Ammonia, Nitrite, Nitrate, Total Dissolved Solids, Total Suspended Solids and Turbidity by referring the standard methods of APHA (1995).

2.3 Preparation of clay:
The clay were brought and it was made powdered. The powdered clay were heated well for few minutes so that

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the clay gets oxidized well.

2.4 Collection of bacterial stains:
Bacterial stain were imported from Institute of Microbial Technology- ***Chandigarh*** and collected from Justice Basheer Ahmed Syed College for women, Teynampet, Chennai, India. The bacterial stain solution contains the combination of the photosynthesizing bacteria, lactic acid bacteria, yeasts, fermenting fungi. The main species involve the lactobacillus sp. Streptoccus lactis (lactic acid bacteria), Rhodopseudomonas and rhodobacter (photosynthetic bacteria), saccharomyces, candida sp (yeast), streptomyces sp, (actinomuycetes) penicillum sp (fermenting fungi). These different species of micro-organisms are used to bread down the organic matter.

2.5 Alum powder:
The alum is commercially available. Thus, alum stone is collected and brought to the laboratory condition. Then it is broken down into pieces and powdered well using mortar and pestle.

Preparation of Eco Bio Ball:
The Eco bio ball were made by mixing 10mL of bacterial stain solution with 20-30gms of alum powder were added to that bacterial solution and mixed well. Powdered clay was slowly added and thoroughly kneaded forming in to the size of tennis ball. After, it was dried at room temperature for 2-3 days until the white color layer forms around the ball.

Assay of EBB:
Sewage water was collected from the study area and tested for various water quality parameters. The five different experiments were carried out in order to note the efficiency of EBB in control of larvicidal activity and purification of water. The experiments was analyzed day by day and noted the larval death and also the changes in water quality. Before introducing the EBB and after introducing EBB, various water quality parameters were analyzed.

Results
The water quality parameters which is tested in sewage water before the introduction of Eco Bio Ball and also after the introduction of Eco Bio Ball showed a drastic changes. The estimated levels of water parameters such as pH, turbidity, Dissolved Oxygen, Biological Oxygen Demand, Ammonia, Phosphate, Sulphate, Total Dissolved Oxygen, and Total Suspended Solids are high in concentration were the indicators of water pollution.

The physio-chemical parameters tested before the introduced of EBB (Table 1) had high concentration and after the introduced of EBB (Table 2) it were found to be low. Thus graphical representation shows clearly the changes in the physio-chemical parameters (Fig 2). The bacterial stain solution degrade the organic matter into inorganic matter. There clay balls will stops the growth of algae, to break down sludge to suppress pathogens and to eliminate the foul smelling odors caused by high level of ammonia, hydrogen sulfide and methane. The bacterial stain solution are alive but dormant. To active the microorganisms the concentrated solution is needed to be diluted with water and further gets activated.

After treating with EBB the major water quality parameters were found to be lowered and the water quality has been improved and cleared.

The mortality rate of the mosquito larvae after introducing the EBB had showed a marked decrease in its population. First day all the 100 larvae were active while introducing the EBB. On the second day 20 larvae was found died. On the third day again 20 larvae were died and 60 larvae were alive in condition. On the fourth day 24 larvae were died and remaining 36 larvae were alive. On the four day analysis it showed that there was some physical changes were observed. The water became colorless and odorless. On the fifth day 18 larvae were died and 18 larvae were alive. On the sixth day 16 larvae were died and remaining 2 larvae were alive and that 2 larvae slowly faced death on the seventh day analysis.

Thus EBB has remarkable effect in controlling mosquito larvae *Culex quinquefasciatus* and also in water purifying.

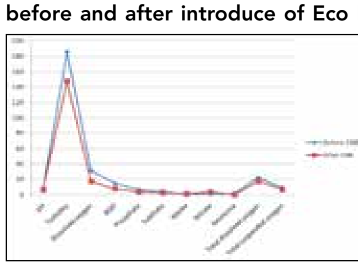
Table - 1
BEFORE INTRODUCE OF EBB – WATER PARAMETERS

Color	Yellowish color
Turbidity	189 NTU
Odor	Foul Smell
pH	8
Dissolved Oxygen	31.615 ml/L
Biological Oxygen Demand	14.371 ml/L
Phosphate	6.55 mg/L
Sulphate	4.4 mg/L
Ammonia	1.79 mg/L
Nitrite	0.7 mg/L
Nitrate	1.3 mg/L
Total Dissolved Oxygen	22.12 mg/L
Total Suspended Solids	9.1 mg/L

Table - 2
AFTER INTRODUCE OF EBB – WATER PARAMETERS

Color	White
Turbidity	148 NTU
Odor	No smell
pH	6.5
Dissolved Oxygen	17.244 ml/L
Biological Oxygen Demand	7.473 ml/L
Phosphate	3.55mg/L
Sulphate	2.5 mg/L
Ammonia	0.11 mg/L
Nitrite	1.25 mg/L
Nitrate	3.6 mg/L
Total Dissolved Oxygen	17.16 mg/L
Total Suspended Solids	6.74 mg/L

Fig 2: Graph represents the water quality parameters before and after introduce of Eco Bio Ball.



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Discussion:

All the mosquitoes must depend on water to complete their life cycle. The type of water in which the mosquito larvae is found can be an aid to the identification of particular species. The adult mosquitoes a very distinct preference for the types of sources in which to lay their eggs. They lay their eggs in such places like tree holes that periodically hold water pools in salt marshes, sewage effluent ponds, irrigated pastures, rain water pond, etc. each species therefore has unique environmental requirements for the maintenance of this life cycle.

In addition to biotic factors such as predation and competition other components found to influences oviposition behavior in mosquitoes include light intensity, size and color of container depth, turbidity, temperature, pH and dissolved oxygen [11]. It was reported that some *Culex sp* prefer highly polluted water for oviposition probably due to high population of microbes in such environment[12].

It was reported that in Malaysia, the EM (Effecitive Microorganism) technology is gaining considerable attention for its potential to reduce nutrients levels of polluted water and restoring water quality. The Malaysian government has realized that environmental consciousness is the most critical elements in laying the foundation of sustainable development ad is urging everyone to begin taking action before our rivers and wetlands are treated as waste lands and become a continuous flood ozone.

The EMAS (Effective Micro Organism Activated Substance) and EM (Effective Micro organism) mudballs adopted locally are emerging as one of the environmental solutions towards reducing water pollutants and thus improving water quality in the rivers and drains. The results of the projects nationwide have been demonstrated the effectiveness of EM technology in the river protection, and it would be continually used as a basis for the extension of EM technology in Malaysia in helping to recover, reinforce and sustain our river nature. EM is easy and convenient for use, safe, unharmful, low cost and economically effective and this has increases the effectiveness of application of this technology.

The EBB acted upon the polluted water and the bacteria present in the EBB will degrade and converts the organic to inorganic material. The EBB degraded the "Niche" and the mosquito could not be able to lay their eggs in the water. Thus the population of mosquito slowly becomes reduced.

Thus from the present study, it can be concluded that, EBB reduced the high concentration of water quality parameters and clears the water. The degradation of organic water matters in the polluted water had been converted into inorganic maters by bacterial stain solution and photosynthetic bacteria helps the sun rays to penetrate deep into the bottom of water.

Finally the use of microorganisms for the waste water remediation is friendly to the environment as the contaminants were converted to useful resources. Therefore, EBB helped in reducing the *Culex quinquefasciatus* mosquito larvae population.

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