

## **CUBE Kishore Bharati Assistantship Report November 2024 (Second half)**

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During the Second half of November 2024, I was scheduled to attend ChatShaala but was unable to participate due to health issues. Although I had the opportunity to moderate discussions alongside Theertha M.D., Enas Shirin, and Kiran Yadav, I struggled to coordinate effectively with my fellow interns. This impacted my ability to fully engage in ChatShaala and support the team as intended. Despite these challenges, I still had some key highlights during my time there:

### **A) Developing Context to Curriculum by addressing Simple questions**

1. **Understanding Thigmonasty and Plant Responses** - In our discussion, we explored the phenomenon of thigmonasty, also known as seismonasty, in plants. This refers to a nastic response where a plant reacts to physical stimuli like touch or vibration. We discussed how certain plants, such as those in the Mimosoideae subfamily (e.g., Mimosa) and Dionaea (Venus flytrap), exhibit this non-directional response. Thigmonasty serves as a defense mechanism against herbivory and is also important in the pollination of some plant species. Understanding this concept provided insights into how plants interact with their environment at a mechanistic level.
2. **Understanding Bacillus Thuringiensis and Genetic Engineering** - The conversation on Bacillus thuringiensis (Bt) revolved around its application in agriculture, especially in the creation of genetically modified (GM) crops, such as Bt cotton. Bt produces a toxin that is lethal to certain herbivorous insects like moths, beetles, and flies, while being safe for humans and non-target organisms. This bacterium's use as a natural insecticide dates back to the 1920s. We discussed the genetic modification process, specifically how the Cry gene from Bt is introduced into plants to create pest-resistant crops. Additionally, concerns about the ecological impact, such as whether Moina (water fleas) or humans could be affected by the Cry protein, were raised. The discussion also covered how to culture Bt and extract its DNA to isolate the Cry gene for genetic engineering purposes.

3. Understanding Housekeeping Genes and Their Role in Cellular Functions - The role of housekeeping genes in maintaining basic cellular functions was another important topic. Housekeeping genes are responsible for regulating fundamental cellular processes like cell cycle, DNA replication, and metabolism. These genes are constitutively expressed and are crucial for the normal functioning of cells. They are often used as reference genes in gene expression studies, as they provide a baseline for comparing the expression of other genes.
4. Understanding Fruit Fly Culture and trapping in Homelab- The discussion on fruit fly culture focused on the media used to rear *Drosophila melanogaster* in the laboratory. Various Homelab media were compared, with Cubists sharing the types of media used in their respective labs. To effectively trap fruit flies in the Homelab, we discussed various methods and tools, which included the use of traps containing fermented fruit or other attractants. Trapping is essential for monitoring the presence and growth of fruit fly populations in a controlled environment. The development stages of fruit flies, including the instar larvae stages and their differences, were also covered. We learned that the first, second, and third instar larvae differ primarily in size but also in terms of their feeding behavior and developmental processes. We also discussed the transition from larvae to pupae, known as metamorphosis, and the process of eclosion, where the adult insect emerges.
5. Understanding Genetic Engineering in Plants and the Role of Tissue Culture - One of the most significant discussions revolved around the role of tissue culture in plant genetic engineering. We explored how tissue culture techniques enable the propagation of plants, the development of genetically modified plants, and the successful transfer of specific genes, such as the Cry gene from Bt, into crops. The role of plant tissues and the methodology of creating calluses or cell cultures in the laboratory were discussed in detail.

## **B) Citizen Science Projects**

1. Understanding Nail Regeneration - The discussion revolved around understanding regeneration and growth and how by simply using mehndi/ ink we can track the nail

growth and understand the role of hormones in nail growth.

2. Understanding Subtropical Zones and Mango Flowering - The discussion focused on understanding the subtropical zones and their relation to tropical and temperate zones. The subtropical zones, which are geographically situated between the tropics and temperate zones, play a crucial role in the growth and flowering patterns of plants such as mango trees. Mango flowering was discussed in detail, with emphasis on the physiological events involved in the initiation of flowering. We explored how florigenic promoters (FP) are synthesized in mango leaves and induce flowering. In subtropical regions, cooler temperatures play a significant role in floral induction, whereas in tropical regions, the age of the previous flush governs flowering. Techniques such as tip pruning and the application of potassium nitrate (KNO<sub>3</sub>) were also discussed as methods to synchronize mango flowering in these regions. The variation in flowering due to different climatic conditions in both tropical and subtropical zones is crucial for optimizing mango production.

#### **D) Homelab updates**

Further plans - Culturing and Maintaining Chlorohydra and Moina in Homelab

#### **E) Future Plans for Enhancing CUBE Program Operations**

1. Resolving issues on Documentation of Context to Curriculum Chat on STEM Games.
2. Joining through the microphone mode - Participants find it difficult to join through microphone mode.

Possible solution - We can have a screen recording of how to change the setting of the browsers so that Cubists find it easy to join through microphone mode.

3. Activation of CUBE groups - With the help of reliable Cubists, simple discussion can be carried out in small CUBE groups so that new Cubists find it easier to join the discussion.
4. Making celebration of Goof ups more streamline.