

## Introduction of Novel Biochip Technology in Seed Science

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Novel technologies come with novel innovations. Biochips are small microprocessor, which can track desirable characteristics of materials under investigation. Introduction of biochip in seed science will provide huge avenue for agriculture in terms of profit, yield or satisfaction. A technology becomes fruitful when it satisfies human wants, enhance livelihood of the country. Biochip-seed integration at specific situations may enhance the productivity. Biochip technology along with satellite, software integration provides huge number of data through tracking biochemical reactions. Major advantages like tracking of biochemical and physiological changes in seeds under storage or in germination. Beside this many challenges also like complexity of technology, lack of technical personnel and heavy initial investment are also linked with commercialization of technology. Therefore, public-private partnership investment in research and development section, training of personnel and creating awareness among people especially farmers may make this technology practicable in near future.

**Key Words:** Biochips Technology, Seed Science, Biochip- Seed- Satellite, Satellite system.

### Introduction

Application of biochips in crop science provides one-step closer to adoption of novel technology for human and living beings. Biochips were developed in 1983 for research in fishery science. These small microprocessors are generally incorporated in material under investigation for tracking important information about ingredients of material. Although it is popular in electronics, computer science (Oyebola *et al.* 2017) and biology (Rajinder Singh, 2014); Novel biomedical application for micro fluid devices and in micro engineered cell culture is being observed in recent years (Azizipour *et al.*, 2020). The biological era of this technology will bring new developments in crop science & seed science as well. Introduction of biochip in seed science will surely lead to modern innovations in this sector.

### Components and Types of Biochip

Biochip has two components viz., - A. Transponder, B. Reader.

**Transponder**-It consists of following four parts-

- A. Antenna coil- for receiving and sending signal
- B. Computer Microchip- for storing UIN (Unique Identification Number) containing 10-15 digits.
- C. Tuning Capacitor- this capacitor remains active with small charge also.

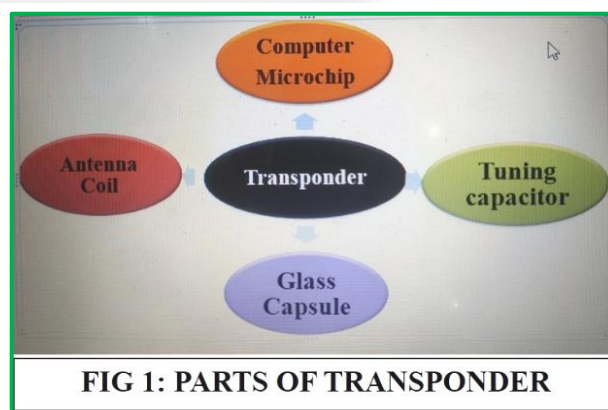


FIG 1: PARTS OF TRANSPONDER

D. Glass Capsule- made of soda lime glass and holds all the above three parts.

**Reader-** Provides required energy for activation of chip and reads radio signal.

**Biochip Types:** Biochip is of three types

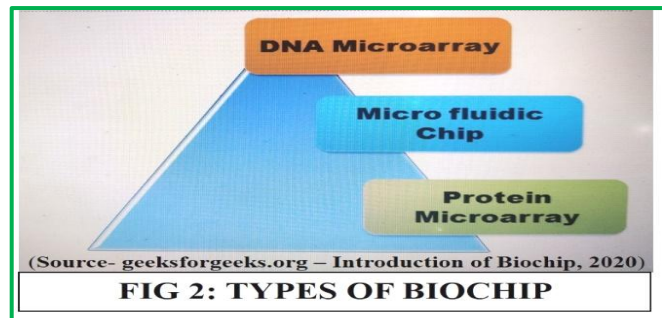


FIG 2: TYPES OF BIOCHIP

### Methodology of Integration

Methodology of seed-biochip integration is described below:-

**Step-1:** Seed is the investigation material in which the biochip is incorporated in embryo or endospermic tissue at a temperature of 17-20° C.

**Step-2:** In this step, seeds come closer to biochip and attached with intermolecular forces forming **Seed- Biochip Association or Cohesion complex**.

**Step-3:** Association or Cohesion Complex joined seed and biochip after 4- 5 days.

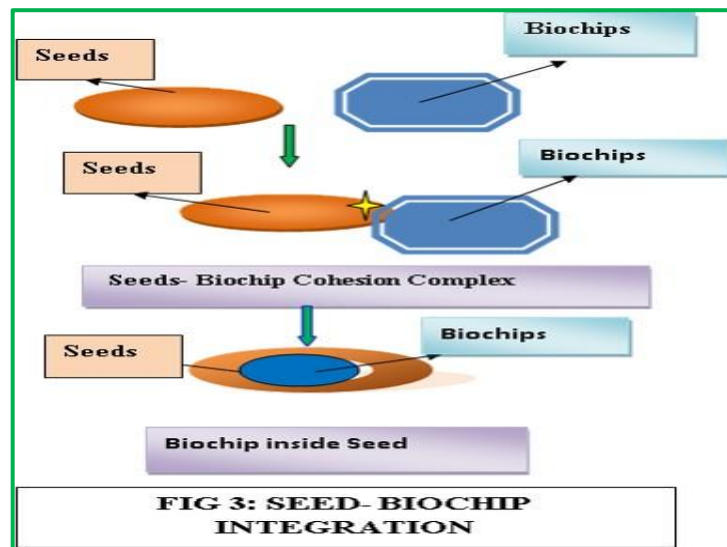


FIG 3: SEED- BIOCHIP INTEGRATION

### Biochip-Seed- Satellite System Conglomeration

We already know how seed and biochip gets integrated stepwise in Fig 3 (Seed Biochip Integration). In this section, regulation of biochip seed by satellite system is explained. Through the use of geostationary satellites, each and every point on earth's surface can be sensed. The biochip integrated into the seed/plant system will get the IR signal from the signal passing tower which is activated by the control system. Afterwards, the biochip will observe and record the biochemical signals based on plants metabolism and will pass it to the geostationary satellite. This signal will be ultimately received by the receiving tower and will be analysed. The physiological status of the plants and their requirements can be recommended based on the analyzed data. Whole Biochip- Seed- Satellite working system is shown in a pictorial diagram (Fig 4).

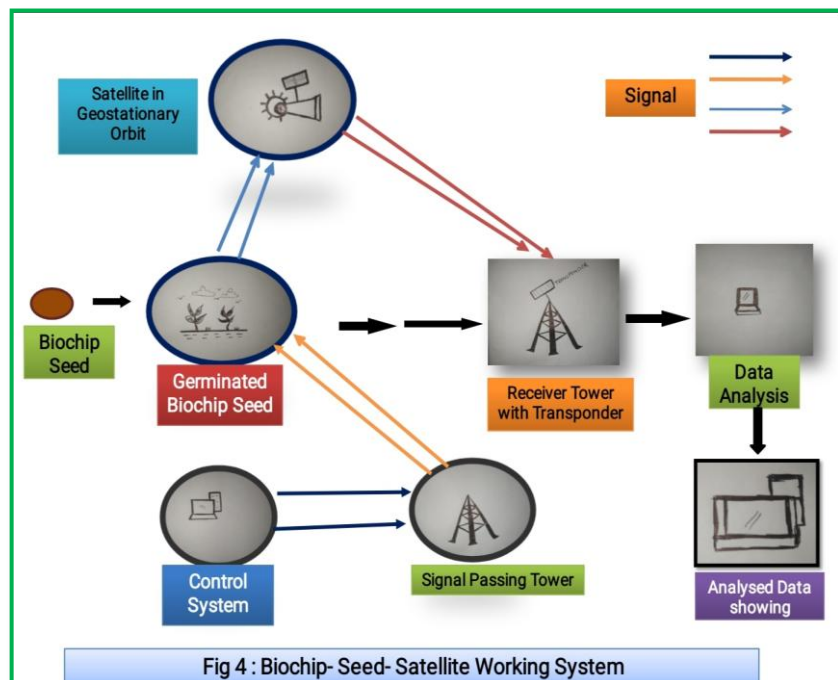


Fig 4 : Biochip- Seed- Satellite Working System

## Scope

- Biochip seed can access physiological and biochemical alterations inside the seeds/seedlings/plants.
- Biochip-seed-satellite integration gives a spill proof system to know valuable information about physiological developments in plants.
- Technology provides valuable data necessary for input (fertilizer, pesticides, irrigation) optimization.
- Control system can track enzyme activity level, how plant respond to fertilizers, pesticides, seed treatment.
- It can give complete access to probable harvesting period based on that farmers can plan for market conglomeration.
- It can also estimate pollination, initiation of reproductive phases based on biochemical changes in plants.

## Conclusion

Inception of novel biochip seed technology with high quality infrastructure (Satellite, Software data analysis etc.) may be a god gift in seed science. Procedure of transmission of infrared (IR) signal from transmitter tower- biochip- satellite to transponder of receiver tower may give a full proof system along with software data analysis and their inference. Traditionally farmers only depend on morphological traits to know about the nutrient requirement of the plants which need more time that ultimately may lead to yield losses. Biochip technology may help the farmers in pin pointing plant requirements in time. However many challenges like complexity of technology, lack of technical personnel and heavy initial investment are also associated with the commercialization of this technology. Beside this more research is needed to know differential performance of biochips seed and normal seed. Nevertheless, it will require initial investment either by government or in PPP (Public- Private Partnership) mode for research & development programme in this sector as well as for creation of infrastructure for commercial application of this technology. In this era of global warming and climate change possibilities of this technology is very high, who knows may be it will be a next model technology for increasing food grain production. Manuscript is concluding with positive note that in future Biochip Seed Technology may give prosperous analysis for well being of living creature.

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