CHAPTER ONE

INTRODUCTION

Maize is one of the world's three most widely cultivated crops (along with wheat and rice) and is arguably the most economically important cereal crop on a worldwide basis. That status is only likely to become more apparent in the next decade. Demand for maize is projected to increase by 50% to over 800 million tons per year by the year 2020 and will surpass both rice and wheat in global demand (**Pingali and Pandey 2001**).

Biotechnology is expected to play an increasingly important role in maize genetic improvement to meet this expanding demand. About 30 percent of world production is used for direct human consumption and as an industrial input, while 70 percent is used as animal feed. Maize as a major source of carbohydrate is used as food, in livestock diet, in the textile industry and also in the pharmaceutical industry **(Jaliya *et al*., 2008).**

Maize (*Zea mays L.*) is an important crop for human consumption, particularly in developing countries, where this cereal can represent up to 65% of the total calories and 53% of the protein intake **(Bressani 1991)**. Although the protein content of maize is relatively high (9% on average), its quality is poor due to an imbalance in three essential amino acids, in which the contents of tryptophan and lysine are low, whereas that of leucine is high. This amino acid balance ratio is not enough to satisfy the FAO requirements for human nutrition, especially for children.

Many biotechnological tools were used to transferring DNA and have received special attention, leading to several strategies such as biolistic or *Agrobacterium tumefaciens.* Particle bombardment and *Agrobacterium* mediated transformation are two popular methods currently used for producing transgenic cereals **(Shouh *et al*., 2004),** the application of *Agrobacterium* mediated transformation to monocotyledonous species, including rice and maize, has been recently reported.

Biolistics, Gene guns or Particle guns, the process often is called by other names such as micro projectile bombardment, particle bombardment, particle acceleration, or ballistics. The most widely used device for plant transformation is the Biolistic® PDS-1000/He Particle Delivery System **(Kikkert, J. R. 1993)**. Biolistics, is a commonly used method for genetic transformation of plants and other organisms. Millions of DNA-coated metal particles are shot at target cells or tissues using a biolistic device or gene gun.

The DNA elutes off the particles that lodge inside the cells, and a portion may be stably incorporated in the host chromosomes. A stopping screen halts the macro carrier, and the micro carriers continue toward the target and penetrate the cells. Because of its physical nature and simple methodology, the biolistic process can be used to deliver substances into a wide range of intact cells and tissues from a diversity of organisms. In plant research, the major applications have been transient gene expression studies, production of genetically transformed plants, and inoculation of plants with viral pathogens **(Sanford, J. C. 2000).**

Possibilities of in vitro plant technology (genetic transformation, recovery of somaclonal variants or haploid plants, somatic hybridization, and micropropagation, among others) have rapidly expanded in such a way that it is practically, or at least theoretically, possible to manipulate any aspect of plant performance, from the modification of food quality to increased some important traits in plants or to tolerant the environmental stresses, biotic or abiotic. An important requirement for new approaches towards plant somatic cell genetics is the successful handling of cell cultures in vitro, the basic sources of cell suspension are callus cultures composed of dedifferentiated.

Maize biologists have long awaited the development of an effective and efficient transformation method. Few plants share maize's importance to both agronomy and basic biology, and the ability to create transgenic maize easily and rapidly would be a tremendous advantage for both those trying to improve the agronomic characteristics of maize and those hoping to use transformation as a tool to explore fundamental questions about maize genetics and development, therefore, the main objective of the present research is to:

1. Evaluate the most suitable concentration of growth regulators for callus induction from mature and immature embryo explants of the maize hybrids,
2. Regenerate and high throughput callus for transformation,
3. Transform of *Anthranilate synthase* genes by particle bombardment to callus,
4. Screening the genetic transformation of this gene.