I- INTRODUCTION

Coffee is one of the most important agricultural products in the international markets. This beverage is popular and well accepted due to its stimulating effect and organoleptic qualities. The world production of coffee in 1977-1978 and 1978-1979 was 69.2 and 76.9 million 60-kg bags, respectively. In 1977, about 75% of produced coffee was sold in the international markets producing 12 billion US dollars, **Arimath et al. (1984)**. There are several countries that depend heavily upon the revenue of coffee exportation in order to buy modern goods and advanced technology. Brazil, colombia, Ivory-coast, Mexico and Indonesia are the leading countries in coffee produc-tion. Besides, coffee plants have a great economic importance in some countries mainly in Yemen.

Coffea arabica L. and Coffea canephora pierre (Robusta coffee) are the two commonly cultivated coffee species in the world. Quality beverage is produced from C. arabica, which is cultivated at higher altitudes. These species represent 70% of the commercial coffee of the world and about 99% of Latin American production. On the other hand C. canephora is usually grown in tropical areas at lower altitudes which represent 80% of the African production. On a very reduced scale, Coffea Liberica is grown in some African countries as well as, C. racemosa in Mozambique, and C. dewevrei in Ivory coast and Zaire. These later species produce beans of lower quality that are acceptable only in local markets.

Botanically, coffee belongs to family Rubiacea and is classified taxonomically under the genus Coffea which includes at least 64 species grouped into four sections **(Chevalier, 1947)**.

The most important species is Coffea arabica which was introduced by Arab and persian invaders from Ethiopian highlands into Yemen. From these plantations, seeds reached India, Ceylon, Amsterdam and Paris. Environmental conditions in Yemen are suitable for horizontal and vertical extensions of its culture as compared with other leading countries. Yemen has suffered a decline in coffee production as a result of increasing cultivation of gat (Catha edulis) which is a stimulant drug. The area devoted to coffee plantation decreased from 9000 ha. in 1971 to 7000 ha. in 1983. The USDA expected production of green coffee to amount of 53000 sixty Kilo bags in 1985-986 with an exportable surplus of 43000 bags. In the peak year of 1981-1982 58000 bags were produced and exports were 48000 bags as stated in Arab Agriculture 1987 year book. However, the government of Yemen made considerable efforts to promote coffee cultivation to increase income.

The Agriculture Ministry of Yemen started a program to improve coffee production and its quality. This program aims to extensively increase the area under coffee production and to introduce and select better cultivars. These selected cultivars must be propagated vegetatively to prevent

variability between plants due to sexual propagation. Also, great number of plants are needed to cover the requirements of extensive new areas, via vegetative propagation techniques.

Recently, tissue culture techniques are used to overcome different problems of both sexual and traditional vegetative propagation methods. Organogenesis, embryogenesis, protoplast culture, one node cuttings, meristem culture and anther culture were techniques that were developed and used in this sphere. Embryogenesis is valuable in large scale production of plants from different explants mainly leaves or internodes. The production of embryoids and plantlets from leaf explants offer number of advantages. These advantages are fast production of somatic embryos, abundance and react faster and more sensitive to differentiation, **Staritsky and Van Hasselt (1980).**

The objectives of this investigation are to study the possibilities of reducing losses in plant materials via leaf discs and internode segments as explants for high callus production, encouraging induction of numerous somatic embryos and their development into plantlets. Also, histological studies of developmental stages were carried out to determine the optimum conditions for embryogenic cell induction. The best period for transferring them into differentiation medium and the conditions for their subsequent development into embryos. In the same time, phenols were determined to findout

the best antioxidant to be used for reducing necrosis and to enhance explant growth.Furthermore, microcuttings propagation and multiplication of the resulted plants were concerned in this study.