CHAPTER I
INTRODUCTION

Papaya (*Carica papaya* Linn.) is an important tropical fruit crop and has long been known as wonder fruits of the tropics. It belongs to the family Caricaceae and is native of Tropical America and it was introduce in India during 16\(^{th}\) century. It is grown in almost all tropical and subtropical countries of the world. It gives higher production of fruits per hectare and income next to banana. In India, it is grown in an area of 13.6 lakh ha with an annual production of 61.08 lakh tonne and productivity 44.9 MT/ha. In Gujarat the area is 2.017 lakh ha with an annual production of 12.41 lakh tonne and productivity 61.53 MT/ha (Anon., 2017).

The major papaya growing countries are Hawaii, Malaysia, Burma, India, Australia, Sri Lanka, Kenya, and Brazil. Andhra Pradesh, Gujarat, Maharashtra, Karnataka, Madhya Pradesh, Bihar, West Bengal, Tamil Nadu, Kerala, Assam and Rajasthan are prime state of India where this crop is cultivated. These states provide ideal climatic conditions for its growth and production. The leading producer of papaya in India is Andhra Pradesh followed by Gujarat.

Papaya is a herbaceous plant because the stem does not have much wood and remains soft and green until its death. The leaves are large, 50-70 cm wide. Some plants have perfect (with female and male organs) flowers but other plants have flowers with only one sex (female or male). Fruit pear-shaped, pendant and with lots of seeds.

Papaya has become a popular fruit plant due to its fast growth, high yield, long fruiting period and nutritional value. Other properties attributed to the papaya are that the fruit juice enhances iron absorption, acts on the central nervous system and heart. Latex is digestive and anti-parasitic, anti-asthmatic and rubefacient. Flowers are anti-bronchitis. Immature fruits of papaya are rich source of papain and proteolytic enzyme which is helpful in protein digestion, tenderizing meat and for medicinal and industrial purpose. Papaya fruit is very low in calories (43 calories per 100 g) and contains no cholesterol; however, it is a rich source of phyto-nutrients, minerals and vitamins.

Propagation of papaya is only through seeds as a viable option. The germination of papaya seeds is slow, erratic and incomplete (Chacko and Singh,
The seed is enclosed within a gelatinous sarcotesta (aril or outer seed coat which is formed from the outer integument). Whilst this sarcotesta is reported to prevent germination (Yahiro, 1979). The slow and asynchronous germination is attributed due to the presence of inhibitors (mainly phenolic compounds) in the sarcotesta and seed coat (Chow and Lin, 1991 and Reyes et al. 1980). In addition to inhibitor substances about 20% of papaya seeds are embryoless (Nagao and Furutani, 1986). Dormancy is also observed in seeds from which sarcotesta has been removed (Tokuhisa, 2007). Therefore, freshly extracted seeds are normally cleaned to remove the sarcotesta and washed in running tap water and pre-soaked in various plant growth regulators to enhance the germination percentage and seedling vigour (Chia, 1990).

Commercially papaya is grown by transplants, because of the high cost of seed. Initial growth of papaya seedling is slow and has low competitive ability with weeds (Morales-Payan and Stall, 1997). A papaya transplant is considered ready to be planted in the field when it is 20 cm in height with stem thickness of 1 cm in diameter, with at least four true leaves (Morales-Payan, 1998 and Nishina et al. 2000). Papaya transplant production usually takes 35 to 45 days from seedling emergence (Moles-Payan, 1998 and Nishina et al. 2000) and transplant quality can be affected by factors such as plant growth regulators, nutrients and substrates (Palmer-Rannie et al. 2002).

Gibberellins were discovered during scientific studies on diseases of rice caused by the fungus Gibberella fujikuroi. The effects of GA3 were studied on different plants. Gibberellins support seed germination between many other effects by alpha-amylase which breaks down starch. Released sugars support the embryo growth until it becomes autotrophic. The positive influence of gibberellins on the germination of many non-dormant seeds has been proved many times.

Gibberellins are plant hormones that regulate growth and influence various developmental processes, including germination, dormancy, stem elongation, flowering, sex expression, enzyme induction and leaf and fruit senescence. Gibberellins act in improving the mobilization of seed reserves during the germination process. The quality of seedlings used in the formation of an orchard defines the productive potential of the crop, requiring high quality and strong seedlings with good nutritional status.

Container grown nursery stock is becoming a more widely accepted and popular method for producing seedlings. A container is a basic tool, consisting of any
device creating a partially or fully enclosed space that can be used to contain, store and transport objects or materials. Any receptacle which can be used to holding the media, seed and later, the seedling is called container. Different types of containers i.e., earthen pots, tubes, palmyrah baskets, bamboo baskets, seed boxes, leaf, cups (paper and plastic), tin trays, manure bricks, pellets and even cylindrical rolls of moss were used in the past. Many types of containers prepared from wood, earth, plastic, metal, cement concrete are available for propagation and growth of nursery plants. Among various popular types of containers, sometimes, creates pollution by leaving traces for a long period in soils. By the time some were gradually replaced by light weight, durable, easy to transport, cheap and resistant polythene bags (Ferdousee et al., 2010 and Jabbar et al., 2010).

The close spacing of cells of container allows growers to maximize plant density in valuable greenhouse or net house space. Because cell sizes are relatively small compared to traditional wooden flat-grown crops, growers use least soil media to produce thousands of plants. Each plant grows individually, in a separate cell, roots do not intertwine and thus do not have to be separated at the time of transplanting. Container production of seedlings has produced larger plant material in a shorter time compared to ground beds. Seeds sown in a container can be kept in a protected environment that provides their basic needs of warm temperatures, water and oxygen. This can increase the rate of germination. Other advantages of container are large, fibrous, compact root system, higher physiological function, reduced transplant shock, better survival and early growth.

Papaya is an important fruit crop of tropical and subtropical region. For successful production of papaya, vigorous and healthy seedling is the most important for papaya growers. Gibbrellic acid is the most important PGR and considered as an important germination promoters and contribute to early, vigorous seed germination and uniformity thus, improving the performance of papaya seed. Container grown nursery stock is becoming a more widely accepted for producing seedlings, it is also required shorter duration for healthy seedling production. Not only the types of the containers are of important but also the eco-friendliness of the material have also importance. After successful transplanting of the seedling the waste container may be reused or recycled or may create certain pollution to the atmosphere.

Looking to the immense need and importance of healthy seedling of better quality, the research problem has been finalized by using various types of containers
Introduction

and different concentrations of GA\textsubscript{3}. The type of containers are finalized on the bases of volume of media used, feasibility to transport, quick use of seedlings for transplanting and also the traces left behind after transplanting in the main field. The findings of this research will help nurserymen, growers and researchers to produce and supply early germination and healthy seedlings.

Hence the present experiment was undertaken at Fruit Research Station, Lalbaug; Junagadh Agricultural University, Junagadh during March to May 2017, under net house condition to find out the effect of GA\textsubscript{3} and different containers on seed germination and seedling growth of papaya cv. Madhubindu.

Objectives

1. To study the effect of GA\textsubscript{3} concentrations on germination and seedling growth of papaya cv. Madhubindu.
2. To study the effect of different containers on germination and seedling growth of papaya cv. Madhubindu.
3. To study the interaction effect of GA\textsubscript{3} and different containers on seed germination and seedling growth of papaya cv. Madhubindu.