CHAPTER – I

INTRODUCTION

Water and land are the two most critical resources to achieve the desired production of food, fibre, feed, and fuel to sustain the demand of growing population. Agriculture is by far the biggest user of water accounting more than 70 % of water utilization worldwide and 90 % of water utilization in the developing countries.

Day by day population of India is increasing. This increasing population will increase requirement for food, fibre, feed and fuel. To full fill this requirements land and water are the two most essential resources. But per capita availability of land and water are decreasing day by day. So it is very essential to efficient use of these resources. The total surface and ground water availability of the county is estimated to be 1953 and 432 billion cubic meters (BCM) respectively. In India, the requirement of water for agricultural purpose is estimated to increase from 470 BCM in 1985 to 740 BCM in 2025. With increasing pressure of population, the per capita availability of arable land, which was 0.34 ha in 1950-51, is likely to shrink to 0.08 ha in 2025. Similarly, the per capita water availability, which was more than 5300 m³ in 1951, has already dropped to 1653 m³ in 2007. Further it is likely to be less than 1500 m³ by 2025 (Anon., 2006).

The Gujarat is the extreme western state of India. The state has an area of 19.6 M ha, representing 6 % of the country. Gujarat state has 33 % irrigate area, out of 10.7 M ha of cultivable land. The western peninsular regions are known as Saurashtra and Kutch. The Junagadh is part of Saurashtra region located at 21.5°N latitude and 70.1°E longitude with an altitude of 60 meter above mean sea level.

Gujarat’s total water resource potential is 50,000 MCM of which the surface water is about 38,000 MCM (76 %) and groundwater is about 12,000 MCM (24 %). North, South and Central Gujarat regions have 17 river basins, having 89 % share in the total surface water. Kutch region has the highest number of river basins (97 river basins), having only 2 % share in the total surface water. Saurashtra region has 71 river basins, having 9 % share in the total surface water. The groundwater resources of Gujarat are one fourth of the total water resources. The total utilizable groundwater recharge in the State is 15080 MCM per annum, out of the gross annual recharge of
15874 MCM. The groundwater recharge rate per unit area is the highest for South and Central Gujarat (0.235 MCM/sq. km), followed by Saurashtra and North Gujarat (0.188 MCM/sq. km) and lowest for Kutch (0.015 MCM/sq. km). The demand of these resources is continuously increasing. Therefore, it becomes necessary to utilize these resources judiciously.

The demand of water is continuously increasing. Therefore, it becomes necessary to utilize these resources judiciously. For the efficient utilization of water, latest technology like mulching and drip irrigation can help a lot. By using this technology water use efficiency can be increased and it reduces the wastage of water. In Saurashtra region of Gujarat has shortage of water during summer season, therefore in this season growing muskmelon crop would be recommended since it has less water requirement. Muskmelon is short duration crop so can have good earning in short duration. Growing of muskmelon with use of latest technologies like mulching and drip irrigation would give better result.

1.1 Muskmelon (Cucumis melo)

The species Cucumis melo (Muskmelon) belong to cucurbitaceous family, which consists of nearly 100 genera and 750 species. Among the cucurbit, the muskmelon is one of the important vegetable crop grown extensively in India and tropical and sub-tropical countries of Asia and Africa. Its growth is favoured by hot and dry weather. Environment significantly influences the flavour and sweetness of muskmelon. Over the years, the area under cultivation and the volumes produced have been decrease in India. In 2013-14, India produced about 7,61,000 tonnes in 37,000 hectares and in 2014-15, India produced about 8,79,000 tonnes in 46,000 hectares (Anon., 2015).

Muskmelon known as ‘shakarttetti’ in gujarati and ‘kharabooja’ in hindi. In India, muskmelon is mainly cultivated in Gujarat, Tamil nadu, Uttar Pradesh, Punjab, Maharastra, Andhra Pradesh and Telangana. Direct-seeded melons should be sown when the soil temperature is above 18 °C, but the optimum temperature range for germination is between 21 °C and 35 °C. Maturity is achieved within about 90 to 120 days depending upon the variety, region, soil and climate.

Many irrigation experiments have shown that muskmelon is sensitive to water (Faberio et al., 2002). Therefore, irrigation must be in specific amount to avoid
excessive irrigation that can lead to lower quality and plant disease. Roots are mainly located within the top 40–50 cm of soil.

Muskmelon has high nutritive value. Muskmelon is low in Sugar and Calories because of high percent of water percent in it which are useful for those who want to reduce body weight. The nutritive value varies from variety to variety. A rough analysis of the food value is given in below Table 1.1 (Choudhary, 2000).

**Table 1.1: Nutritive value per 100g of edible portion of muskmelon**

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>Nutritive value</th>
<th>Nutrients</th>
<th>Nutritive value</th>
<th>Nutrients</th>
<th>Nutritive value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein</td>
<td>0.6 gm</td>
<td>Carbohydrate</td>
<td>5.4 gm</td>
<td>Vitamin C</td>
<td>32 gm</td>
</tr>
<tr>
<td>Minerals</td>
<td>0.6 gm</td>
<td>Calories</td>
<td>25 cal.</td>
<td>Iron</td>
<td>1.3 gm</td>
</tr>
</tbody>
</table>

In India, farmers commonly raise muskmelon under flood method of irrigation (River bank basin) where in losses through conveyance, application, evaporation and percolation are common besides having adverse effects of cyclic over irrigation or water stress. To solve this problem, mulching can conserve soil moisture and drip irrigation which increases the water use efficiency and production of muskmelon.

### 1.2 Mulching

Mulching is the process of covering the soil to make more favorable conditions for plant growth, development and efficient crop production. Mulch technical term means ‘covering of soil’. While natural mulches such as leaf, straw, dead leaves and compost have been used for centuries, during the last 60 years the advent of synthetic materials has altered the methods and benefits of mulching. The research as well as field data available on effect of synthetic mulches make a vast volume of useful literature. When compared to other mulches plastic mulches are completely impermeable to water; it therefore prevents direct evaporation of moisture from the soil and thus limits the water losses and soil erosion over the surface. In this manner, it plays a positive role in water conservation. The suppression of evaporation also has a supplementary effect; it prevents the rise of water containing salt, which is important in countries with high salt content water resources.

Plastic film with its moisture barrier properties does not allow the soil moisture to escape water that evaporates from the soil surface under mulch film,
condenses on the lower surface of the film and falls back as droplets. Thus, moisture is preserved for several days and increases the period between two irrigations.

A wide range of plastic films based on different types of polymers have all been evaluated for mulching at various periods in the 1960s. LDPE, HDPE and flexible PVC have all been used and although there were some technical performance differences between them, they were of minor nature. Owing to its greater permeability to long wave radiation which can increase the temperature around plants during the night times, polyethylene is preferred. Today the vast majority of plastic mulch is based on LLDPE because it is more economic in use.

Plastic mulches are now available in different colors and thickness. The use of plastic mulch has become a standard practice for all farmers who benefit from reduced evaporation, weed control, reduced fertilizer leaching and soil compaction as well as elevated soil temperatures that promote earlier plant maturity.

1.3 Irrigation Level under Drip

Day by day water availability is decreasing so it is very essential to efficient use of water. For the optimum use of water, it should be supply as per the requirement of the crop. An excessive irrigation level has a negative effect on marketable yield, mainly due to greater number of rotten fruits (Pew and Gardner, 1983). Watering is effects on fruit quality. Large amount of irrigation resulted lower soluble solid concentration which is very important fruit quality parameter. Deficit of water produces smaller fruits and lower yield. Therefore, it should be supply as per the requirement of the crop with high efficiency. For this drip irrigation is best which have high water use efficiency.

In drip irrigation, water is applied to each plant separately in small, frequent, precise quantities through dripper emitters. The water is delivered continuously in drops at the same point and moves into the soil and wets the root zone. It is one of the best and latest methods for efficient utilization of irrigation water with 70 to 90 % efficiency. It is an efficient method of application of water in which, the water and fertilizer are applied at low rate over long period of time at frequent intervals with low-pressure delivery system, in order to avoid water stress to the plant. It has high water use efficiency, higher crop yield, less labour requirement and relatively low operating cost, less weed growth, less insect and pest attacks, shorter growing season
and earlier harvest of the crop. Use of poor quality of water is also possible through drip up to certain limit, more automation, easy to control and more irrigated crops cultivation is possible in problem soils are some advantages of drip irrigation as compared to conventional methods.

1.4 Practical Utility of Research Problem

Muskmelon is summer season crop. In summer season, there is a shortage of water. Farmers are suffering problem of earning in this season due to the lack of water. Muskmelon cultivation can solve farmers earning problem. It is require precise amount of water for growing and also short duration crop. So that farmers can cultivate this crop in summer season and earn money.

Muskmelon is sensitive to water, excessive soil water can damage for melon and cause fruit quality problems while inadequate irrigation causes water stress and reduces production (Sensoy et al., 2007). Therefore, irrigation must be in specific amount to avoid excessive/deficit irrigation that can lead to lower yield and quality of produce. By performing this field experiment appropriate irrigation level will find out for the better growth and higher yield of muskmelon, also reduces the wastage of excess water.

Water is costly inputs; every effort must be made to enhance water use efficiency by reducing their wastage. In recent years mulching and drip irrigation system was found to be very effective in achieving higher water use efficiency. In drip irrigation water is delivered precisely in the crop root zone as per the crop needs and according to crop developmental phase. Mulching increase the soil temperature, retard the loss of soil moisture and check the weed growth which are the key factors contributing to the production of muskmelon.

The outcome of the study will help farmers for higher earnings under cultivation of muskmelon by suggesting adequate irrigation level and suitable type of plastic mulch. Specific objectives of the study are as under:

1.5 Objectives

1. To study the effect of different irrigation level on growth, yield and water use efficiency of muskmelon.

2. To study the effect of different plastic mulch on growth, yield, water use efficiency and weed intensity of muskmelon.
3. To study the interaction effect of different irrigation level and plastic mulch on growth, yield and water use efficiency of muskmelon.

4. To evaluate the economic feasibility of different irrigation level by drip and mulch on muskmelon.