PERFORMANCE EVALUATION OF COLOURED PLASTIC MULCH AND DRIP IRRIGATION ON BRINJAL UNDER OPEN FIELD CONDITION

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KELAPPAJI COLLEGE OF AGRICULTURAL ENGINEERING AND TECHNOLOGY

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PROJECT REPORT

Submitted in partial fulfillment of the requirement for the degree

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DEPARTMENT OF SOIL AND WATER CONSERVATION ENGINEERING
KELAPPAJI COLLEGE OF AGRICULTURAL ENGINEERING AND TECHNOLOGY
TAVANUR-679 573, MALAPPURAM
KERALA, INDIA
2021

DECLARATION

We hereby declare that this thesis entitled "**PERFORMANCE EVALUATION OF COLOURED PLASTIC MULCH AND DRIP IRRIGATION ON BRINJAL UNDER OPEN FIELD CONDITION**" is a bonafide record of research work done by us during the course of research and the thesis has not previously formed the basis for the award to us of any degree, diploma, associate ship, fellowship or other similar title, of any other University or Society.

Place: Tavanur

Date: 08/03/2021

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CERTIFICATE

Certified that the project entitled **"PERFORMANCE EVALUATION OF COLOURED PLASTIC MULCH AND DRIP IRRIGATION ON BRINJAL UNDER OPEN FIELD CONDITION"** is a record of project work done jointly by **Mr. Afrad Hasan (2017-02-001), Ms. Midhula B N (2017-02-033) and Ms. Nargees K (2017-02-034)** under my guidance and supervision and that it has not previously formed the basis for the award of any degree, diploma, fellowship or associate ship to them.

Place: Tavanur

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DEDICATED TO OUR PROFESSION

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SYMBOLS AND ABBREVIATIONS

%	Percentage
º	Degree
ºC	Degree Celsius
/	Per
’	Minute
”	Second
AET	Actual Evapotranspiration
cm	Centimeter
CU	Consumptive Use
DAT	Days After Transplanting
E	East
Epan	Pan evaporation
ER	Effective Rainfall
ET	Evapotranspiration
et al.,	And others
ETc	Crop evapotranspiration
etc.	Et cetera
ETo	Reference Evapotranspiration
FAO	Food and Agricultural Organization
Fig.	Figure
g	Gram
ha	Hectare
HDPE	High Density Polyethylene
hp	Horse power
hr	Hour
i.e.	That is
Kc	Crop coefficient
KCAET	Kelappaji College of Engineering and Technology

kg	Kilogram
km	Kilometre
kPa	Kilopascal
LDPE	Low Density Polyethylene
LLDPE	Linear Low-Density Polyethylene
lph	Litre per hour
m	Meter
mg	Milligram
MJ	Mega Joule
mm	Millimeter
Mha	Million hectares
Mt	Million tonnes
N	North
NIR	Net Irrigation Requirement
PET	Potential Evapotranspiration
PVC	Polyvinyl Chloride
q/ha	Quintal per hectare
RAW	Readily Available Water
RDF	Recommended Dose of Fertilizer
Rs	Rupees
Sl No.	Serial number
viz.	Namely
WR	Water Requirement

INTRODUCTION

CHAPTER 1

INTRODUCTION

India is now facing a water situation that is significantly worse than any that previous generations have had to face. All Indian water bodies within and near population centers are now grossly polluted with organic and hazardous pollutants. In this state, drip irrigation is an essential solution for the agricultural industry. Drip irrigation is the most efficient water and nutrient delivery system for growing crops. It delivers water and nutrients directly to the plant's roots zone, in the right amounts, at the right time, so each plant gets exactly what it needs, when it needs it, to grow optimally. It is a low-tech, highly efficient solution for small famers. It can increase agricultural production by as much as 50% using only 10% of the water that farmers currently use. Drip irrigation minimizes conveyances, deep percolation, runoff and evaporation losses as compared to other conventional methods of irrigation. This method is adoptable under sloping land and undulating terrain, poor quality water, water scarcity areas, shallow as well as problematic soils. Moreover, it checks weed growth, produce high quality product and improves soil physico-chemical conditions. Among the various factors known to augment the crop yield per unit area, irrigation with other suitable practices plays a pivotal role to boost up the crop yield. One way of providing ideal moisture regime to crop is to apply timely irrigation. Hence, proper scheduling of irrigation is a must to maintain the optimum moisture in soil. This can be achieved by introducing advanced and sophisticated methods of irrigation and improved water management practices. In order to maximize water use in agricultural fields, mulching along with drip irrigation is very important.

Plastic mulches provide many positive advantages such as increased yield, earlier-maturing higher-quality produce, insect management, and weed control. It also allows other components such as drip irrigation to achieve maximum efficiency (Sreedevi *et al.*, 2017).In India, generally organic mulches are used for moisture conservation and soil temperature moderation but they have partial control over these and have no appreciable control over weed growth. But now a day, plastic mulches have also been gaining acceptance in agriculture. Use of plastics in agriculture known as plasticulture, is becoming popular in Indian agriculture for boosting crop production. The use of polyethylene as a mulch with irrigation is a widespread practice in commercial vegetable production systems. The weather is hot and vegetables are sensitive to heat. This time mulching is an essential operation for achieving higher productivity. The notable advantage of the use of plastic as a mulch is its impermeability which prevents direct evaporation of moisture from the soil and thus cut down the water losses. It directly impacts the microclimate around the plant by modifying the radiation budget of the surface.

The plastic materials used as mulch for the cultivation of this crop are polyvinyl chloride or polyethylene films. Owing to its greater permeability to long wave radiation it can increase temperature around the plants during night in winter. Hence, plastic film mulch is preferred as mulching material for production of horticultural crops. Low density polyethylene (LDPE), high density polyethylene (HDPE) and flexible polyvinyl chloride (PVC) have all been used for mulching. Today, the vast majority of plastic mulch is based on linear low-density polyethylene (LLDPE) because it is more economic in use. Most commonly used plastic mulches are black mulches, two sided colour mulches including yellow/black, white/black, silver/black, and red/black, degradable mulches etc.

Along with drip irrigation and mulching fertigation can also be used to increase the yield of the crop. Application of fertilizer through the irrigation system is called it is the most advanced and efficient practice of fertilization. Fertigation combines the two main factors in plant growth and development, water and nutrients. Fertigation is the most efficient method of fertilizer application, and it ensures application of fertilizers directly to the plant root. Fertigation has many advantages such as efficient utilization and precise application of nutrients according to the nutritional requirement of the crop.

Brinjal (*Solanum melongena* L.) is an important solanaceous vegetable grown in tropical and subtropical regions of the world (Shweta *et al.*, 2018).It is produced comparatively by few countries, located in the warm areas of the Far East and is grown extensively in India, China, France, Italy, Spain, USA, Korea and Japan. It is moderate source of vitamins and minerals. India is second largest producer of brinjal after China. In India major brinjal growing states are West Bengal, Orissa, Karnataka, Bihar, Maharashtra, Uttar Pradesh and Andra Pradesh. It is very effective in providing nutrients to human as it contains about 1.5 g of protein, 5.0 g of carbohydrate, 0.3 g of fat, 18 mg of Calcium, 229 mg of potassium, 38 mg of iron per 100 g of fruit. Moreover, it also provides vitamins like A, B, B1, B2 and B5 etc. It comes with many potential health benefits. From reducing the risk of heart disease to helping with blood sugar control and weight loss, brinjals are simple and delicious addition to any healthy diet.

The information on the combined effect of mulching and irrigation is very meager. Since the response is location specific, an experiment on performance evaluation of coloured plastic mulch and drip irrigation on brinjal under open field condition was formulated, envisaging the following objectives.

1. To evaluate the effect of different plastic mulch on soil properties.
2. To evaluate the combined effect of drip irrigation and mulching on crop performance.

REVIEW OF LITERATURE

CHAPTER 2

REVIEW OF LITERATURE

Agriculture is important not only for the supply of food but also a way of life for a large chunk of population. The world population is estimated to be increasing day by day, but the space is getting limited. Here comes the importance of efficient agriculture with minimum losses and maximum output. So as to attain this goal, we conducted a study on evaluation of effect of different types of plastic mulch on the growth and yield of brinjal under open field condition. This study was conducted with an objective to evaluate the response of brinjal to different treatments of drip irrigation levels and different kinds of mulches in open field condition.

This chapter reviews the concepts and literatures available under the following subheads.

1. Effect of drip irrigation on growth and yield of crops
2. Effect of mulching on growth and yield of different crops.

3 Effect of drip irrigation system and plastic mulch on plant growth

4. Soil properties under mulching and drip irrigation

2.1 EFFECT OF DRIP IRRIGATION LEVELS ON GROWTH AND YIELD OF DIFFERENT CROPS

Drip irrigation is a type of micro-irrigation system and the most efficient water and nutrient delivery system for growing crops. It delivers water and nutrients directly to the plant's root zone, in the right amounts, at the right time, so each plant gets exactly what it needs, when it needs it, to grow optimally.

Bastug *et al.*,(2006) explained the effects of drip irrigation on flowering and flower quality of glasshouse gladiolus plant. The study was carried out to determine the effects of irrigation on flowering, flower quality and WUE of gladiolus (*Gladiolus grandiflorus* L.) planted in glasshouse in the winter and irrigated by a drip irrigation system under Mediterranean conditions. They used three irrigation levels, I1=50% E_{pan}, I2=75% E_{pan}, and I3=100% E_{pan}, based on the evaporation measured by a class A pan located in the glasshouse. After the study they found that the highest quality was obtained in the I3 irrigation treatment, followed by I2 and I1 and reached a conclusion that every mm of water is increasing flowering percentage of gladiolus about 0.3%.

Bozkurt *et al.,* (2011) conducted the experiment to determine the effects of different irrigation levels on water use, yield and some agronomic parameters of drip irrigated corn under the eastern Mediterranean climatic conditions in Turkey. The results showed that irrigation levels significantly affected yield and yield contributing parameters and the highest grain yield, yield components and highest water use efficiency (1.77 kg/m^3) were found in I120 treatment, while the lowest were found in I20 treatment.

Devaranavadgi *et al.*, (2011) conducted the experiment to study the effect of different drip irrigation levels on growth and yield of bitter gourd with black sandy loamy soil type at Main Agricultural Research Station, UAS, Raichur during rabi 2009-10. The results revealed that 100% ET level with drip irrigation produced superior values for plant height, number of leaves, number of fruits per plant, average fruit weight, fruit length, fruit girth and yield per hectare compared to other irrigation levels.

Hakkim and Chand (2014) evaluated the effect of drip irrigation levels on yield of salad cucumber grown under naturally ventilated polyhouse at PFDC, KCAET, Tavanur during May-August, 2013. The result showed maximum fruit number (49), fruit weight (7.194 kg/plant) and fruit yield (88.8 t/ha) were obtained from drip irrigation level of 65 % and the lowest fruit number (35), fruit weigh (5.043 kg/plant) and fruit yield (62.26 t/ha) were found at drip irrigation level at 50%. They concluded that drip irrigation level of 65% was the best irrigation level recommendation for salad cucumber grown under naturally ventilated polyhouse in order to get higher economical yield.

Sankar *et al.,*(2015) took up an experiment to study the feasibility and economic viability of different levels and frequency of drip irrigation in comparison with flood irrigation on growth, yield and yield contributing characters of onion seed crop under western Maharashtra conditions at Directorate of Onion and Garlic Research, Rajgurunagar, Pune during 2009-2012 on clay loam soil type. It was observed that drip irrigation practices significantly improved the growth, yield and water use efficiency of onion seed production under western conditions of Maharashtra. Among the various methods, irrigation levels and frequency drip irrigation at 100% ET daily interval found to be superior in terms of improved growth characters, higher seed yield and water use efficiency that surface irrigation method.

Kumar *et al.*, (2016)explained the effects of drip irrigation on yield and water use efficiency on brinjal (*Solanum melongena*). The study was conducted in the farmers field located at IFTM University, Moradabad. They found out that water use efficiency decreased with increase in irrigation levels for all the treatments of drip irrigation system. Among the drip irrigation levels, highest field water efficiency was found at 65% irrigation level, indicating comparatively more efficient use of irrigation water with a possibility of water saving 35% water by adopting brinjal plot.

Trivedi *et al.*, (2016) carried out a study on effect of drip irrigation on yield and water use efficiency on brinjal, conducted in the farmers field located at IFTM University Moradabad. In this study, they provided six drip irrigation levels including 50%, 65%, 75%, 80%, 90% and 100% irrigation levels to the brinjal and fruit characteristics were recorded after every picking to find out the average value. They got the result that among the drip levels, the highest field water use efficiency was found at 65% irrigation level, indicating comparatively more efficient use of irrigation water with a possibility of water saving of 35% water.

Xiukang and Yingying (2016) conducted a study on evaluation of the effect of irrigation and fertilization by drip fertigation on tomato yield and water use efficiency in greenhouse. This two-season (2012 and 2013) study evaluated the effects of irrigation and fertilizer rate on tomato growth, yield, and WUE. This study showed that an increased irrigation level increased the fruit yield of tomatoes and decreased the WUE and finally arrived at the conclusion that an irrigation amount of 151 to 208 mm was the recommended one for drip fertigation of tomatoes.

Bhat *et al.*, (2017) conducted a study on water requirement and irrigation scheduling of maize using CROPWAT model. This study focused on developing an optimal irrigation scheduling, to increase crop yield under water scarcity conditions. The crop water requirement and irrigation requirement were found to be 304 mm and 288.2 mm respectively.

2.2 EFFECT OF MULCHING ON GROWTH AND YIELD OF DIFFERENT CROPS.

The process of covering the open surface of the ground by a layer of some external material is called mulching and the material used for covering is called as mulch. It improves the quality and health of the soil.

Singh *et al.*,(2006) conducted an experiment during 2002-2003 and 2003-2004 to study the effect of black and white polyethylene mulches and two organic mulches namely Cordia leaf and Leptodenia clippings on soil hydrothermal regimes, macro and micronutrient concentrations in leaf and soil, growth and fruit yield of brinjal. Result shows that mulch treatments retained more soil moisture at all the depths as compared to control. The synthetic and organic mulches conserved 55 and 36 per cent more moisture per 0.15 cm soil depth respectively as compared to control. Leaf tissue-N and K were higher under Cordia leaf mulch and P was highest under black polyethylene mulch but micro nutrient concentrations were variable. Plant height, stem girth, plant spread, no. of fruits/plant and fruit yields increased with mulch application.

Gordon *et al.*,(2010) conducted an experiment in okra to evaluate the effect of coloured plastic mulch. Treatments consisted of five mulch colours: black, white, red, silver, and blue installed either with or without spun-bonded row cover. The results revealed that the use of darker (black, blue, red) coloured plastic mulches increased early and total yield of okra compared with bare soil with and without row cover.

Ashrafuzzaman *et al.*,(2011) conducted a field study to evaluate the effect of coloured plastic mulch on growth and yield of chilli. The plastic mulches were transparent, blue, and black and bare soil was the control. Transparent and blue plastic mulches encouraged weed population which were suppressed under black plastic. Plant height, number of primary branches, stem base diameter, number of leaves and yield were better for the plants on plastic. However, mulching did not affect the length and diameter of the fruits and number of seeds per fruit. Plants on black plastic mulch had the maximum number of fruits and highest yield.

Rafezi *et al., (*2012) carried out an experiment in tomato to evaluate the effect of coloured plastic mulches (blue, black, clear, red and silver on black) on weed and crop yield, which shows that soil temperature increased under the various coloured plastic mulches about 3 to 6° C more than it in bare soil. Number of branches and leaves were better for the plants grown over plastic compared to bare soil. Mulching increased marketable yield relative to bare soil as the plants grown on silver/black plastic mulch indicated a 65% increasing in marketable mulch compared to control treatment. The plastic mulches resulted in an 84-98% reduction in weed biomass.

Turczuk *et al.,*(2016) conducted an experiment in brinjal to study the effect of synthetic mulches of polyethylene foil and polypropylene textile. Results shows that the highest yield was observed when the average air temperature was high and at the same time rainfall was evenly distributed throughout the vegetation season. They also found that mulching the soil with polyethylene black foil, or transparent foil, previously having applied a herbicide.

Rajasekar *et al.,* (2017) conducted a study to find out the impact of mulching and fertigation on growth and yield of grafted brinjal under drip irrigation system. Results revealed that, application of plastic mulching and fertigation treatments showed significantly enhanced plant height, number of branches, fruit weight, number of fruits and yield. Plastic mulching along with drip fertigation, control weeds and further increases the efficiency of the system.

Pankaj Kumar *et al.,*(2019) conducted an experiment at Bhagalpur on the effect of mulching method (without mulching T-0, straw mulching T-1 and mulching with 30-micron Bicoloured silver and black plastic T-2) on the yield and yield attributes of Mukta Keshi variety of brinjal. They got result that the highest yield (480.24 q/ha) was obtained when mulching with 30-micronBicoloured silver and black plastic, while straw mulching and no mulching produced 414.51 q/ha and 356.33 q/ha of brinjal production.

2.3 EFFECT OF DRIP IRRIGATION SYSTEM AND PLASTIC MULCH ON PLANT GROWTH

Rajbir Singh *et al.,* (2009) conducted a two-year field study during 2001-2002 and 2002-2003 on sandy loam soil to investigate the effect of drip irrigation and black polyethylene mulch compared with surface irrigation, on growth, yield, water-use efficiency and economics of tomato (*Lycopersiconesculentum* Miller.*).* Drip irrigation at 80% evapo- transpiration (ET) crop based on pan evaporation applied gave significantly higher fruit yield (45.57 tonnes/ha) compared with the surface irrigation (29.43 tonnes/ha).

Bayeberihum (2011) conducted an experiment to evaluate the effect of mulch and amount of water on the yield of tomato under drip irrigation system and to assess the potential of deficit irrigation to improve the economic efficiency of tomato production at Adet Agricultural Research Center for horticultural crops trial site (North-western Ethiopia) from 2006 to 2007. A factorial combination of three levels of water combined with three mulch treatments [namely without mulch, black plastic mulch and straw or crop residue mulch (STM) amid three replications and two days irrigation interval was used. Amount of water significantly affected the number of fruits per plant, average weight of fruits marketable and total fruit yield/ha. Significant difference was also shown between mulch treatments on number of fruits, unmarketable, marketable and total fruit yield/ha. Based on the partial budget analysis, the highest net benefit was obtained via 440mm water with straw mulch amid a net benefit (52,959.40 birr/ha and a marginal rate of return (MRR) 690%.

Dıazperez and Eaton (2015) carried out an experiment on eggplant plant growth and fruit yield as affected by drip irrigation rate. The study was carried out at the University of Georgia, during the fall of 2010 and 2011. The design was a randomized complete block with five treatments and four replications. Treatments consisted of irrigation rates based on ETc (33%, 67%, 100%, 133%, and 167% the rate of ETc). ETc was calculated by multiplying the reference evapo-transpiration (ETo) by a crop coefficient (Kc), which is dependent on the crop stage of development. Available Kc values for eggplant were developed for bare soil (unmulched) production. the results from this research indicate that eggplant may tolerate moderate water stress, since plants irrigated at 67% ETc had no detrimental effects on plant growth and leaf gas exchange and produced fruit yields similar to those of plants irrigated at 100% ETc. Thus, there is a potential to reduce current irrigation rates without negatively impacting fruit yields or quality.

Biswas (2015) conducted a study which investigated the combined effects of drip irrigation and mulches on yield, water-use efficiency and economic return of tomato. The treatments of the study comprised different combinations of three drip irrigation levels (100,75 and 50% of crop water requirement, ETc) and two mulches (black polyethylene sheet and paddy straw). The yield of tomato increased with the increasing amount of irrigation water in control treatment. The trend was reversed when drip irrigation was coupled with mulches. The highest yield for each mulch (81.12 t/ha for polyethylene and 79.49 t/ha for straw) was obtained when 50% of water requirement was applied. With100% water application polyethylene-mulched treatment produced lower yield than the straw-mulched treatment. The highest water use efficiency of 592 kg/ha/mm was obtained with 50% water application under polyethylene mulch. The highest net return (US$7098/ha), incremental net return (US$1556/ha), and incremental benefit-cost ratio(7.03) were found for 50% water application with straw mulch. The study thus reveals that drip irrigation with mulch has an explicit role in increasing the land and water productivity of tomato.

Rajasekar *et al*., (2017) conducted on a study on Impact of mulching and fertigation on growth and yield of grafted brinjal under drip irrigation system. There were 18 treatments replicated thrice in a Strip Plot Design with three factors viz., plastic mulching, fertigation levels and irrigation levels. The result unveiled that, application of plastic mulching and fertigation treatments showed significantly enhanced plant height, number of branches, fruit weight, number of fruits and yield. Application of fertilizers through drip ensures proper utilization and results in better yield. Plastic mulching along with drip fertigation, control weeds and further increases the efficiency of the system. The study indicated that drip irrigation 80% ET0 level, 100% RDF with 25μ plastic mulch condition resulted in higher yield. Combination of drip irrigation with plastic mulch enhance the soil moisture availability, was achieved by the prevention of water loss through evaporation.

2.4 SOIL PROPERTIES UNDER MULCHING AND DRIP IRRIGATION

To reduce evapotranspiration from the soil, farmers use polyethylene coversheets that also control weed growth, increase soil temperature and enhance crop yield. Plastic mulches also directly affect the microclimate around the plant by modifying the radiation budget and decreasing the soil water loss. It enhances crop production by increasing fruit quality, gross yield, and earlier production.

Tindall *et al.,* (1991), conducted on a study on Mulch Effect on Soil Properties and Tomato Growth Using Micro-Irrigation. The objective of this experiment was to determine the effects of mulch type (plastic mesh and straw) and micro-irrigation on soil physical properties and growth of tomato. Soil properties beneath the two types of mulches were compared in terms of surface evaporation, measured during 24-h periods several times each year and bulk density, organic C, pH, infiltration rate, and cone index measured at the end of the 1988 growing season. Straw mulch resulted in a significantly greater infiltration rate, and lower pH, bulk density, surface evaporation, cone index, soil temperature and matric potential than the plastic mulch. Yields were higher under the straw mulch compared to the plastic mulch and irrigation increased yield with a straw mulch in 1987 but not 1988. Yields were not increased by irrigation of the plastic mulch treatment.

Salaua *et al.,* (1992) conducted a study on effects of mulching on soil properties, growth and yield of plantain on a tropical ultisol in southeastern Nigeria. The effects of five different mulches (elephant grass, plastic, elephant grass on plastic, plastic on elephant grass and woodshavings) on soil properties and on growth and yield of plantain were compared. In general, organic mulches maintained more favourable physical and chemical soil properties than synthetic (plastic) mulch or the unmulch treatment. At the 5 cm depth, the mean monthly maximum soil temperature was lowest under woodshavings and the soil water suction within a row was lowest under the elephant grass mulch, while water infiltrability was highest under the woodshavings mulch. Mulching significantly enhanced vegetative growth and increased bunch yield in both first and second year crops. Increase in total yield (first- and second-year crops) was on average about 41% higher with mulched treatments than with the control. Among the mulched treatments, total yield was highest with the elephant grass on plastic treatment. The yield of the second-year crop was on average about 57% lower than that of the first-year crop. Total bunch yield (in tonnes per hectare) and soil exchangeable potassium (in milliequivalents per 100 g) were significantly correlated.

Meulen and Cammeraat (2005) carried out a study on effects of irrigation and plastic mulch on soil properties on semi-arid abandoned fields. This research took place on abandoned agricultural fields at two different locations in Spain. This research provides several sound indications of the positive effects of the former application of irrigation combined with plastic covers on agricultural fields. The results of the measurements concerning soil quality indicators give rise to a theory about the effect of irrigation in combination with evaporation reduction by plastic covers in the past in the southeast of Spain. When irrigation was used in combination with plastic soil surface covers to enhance crop yield, evaporation was reduced. This resulted in higher soil moisture content that improved plant growth.

Zhang *et al.*, (2016) carried out a study on effects of mulching on soil properties and growth of tea olive (*Osmanthus fragrans*). This study aimed to compare the effects of mulching with inorganic (round gravel, RG), organic (wood chips, WC), and living (manila turf grass, MG) materials on soil properties at 0–5-cm and 5–10-cm depths, as well as on the growth and physiological features of*Osmanthus fragrans*L. 'Rixianggui' plants. Soil samples were collected at three different time points from field plots of *O. fragrans* plants treated with the different mulching treatments. Mulching did not affect soil bulk density, pH, or total nitrogen content, but consistently improved soil organic matter. Considering the effect of mulching on soil properties and plant growth and physiology, round gravel and wood chips appear to be a better choice than manila turf grass in 'Rixianggui' nurseries. Further studies are required to determine the effects of mulch quality and mulch-layer thickness on shoot and root growths.

MATERIALS AND METHODS

CHAPTER 3

MATERIALS AND METHODS

This chapter deals with the materials used and the various methodologies adopted for the study. The methods adopted to evaluate the effect of different plastic mulches on growth and yield of brinjal crop under open field conditions were explained in detail.

3.1 STUDY AREA

3.1.1 Location

The experiment was performed in an open field of the Instructional Farm, KCAET, Tavanur, Kerala using brinjal crop. The site is situated at the meeting point of 10°51’18” N latitude and 75°59’ 11” E longitude at an altitude of 8.54 m above mean sea level.

3.1.2. Climate

Climatic conditions of study area are given below,

Temperature (Maximum/Minimum): 36/23°C

Wind: 10 km/h

Humidity: 74%

Dew point: 24°

3.1.3 Soil properties

a)Texture

Soil texture refers to the relative size of soil particles in a given soil. The soil particles are grouped in to gravel, sand, silt and clay, according to their size.

Soil sample was collected from the field and kept it in the oven at for 24 hrs. The oven dry sample was ground and 500g sample taken for sieve analysis.

(a)

(b)

Plate 3.1 a) Sieve shaker, b) Sieving

b) Bulk density

Bulk density is the weight of the soil in a given volume and is determined by Core cutter method.

Procedure of core cutter method:

Exposed a small area of the soil and leveled the surface about 300 mm square in area. Placed the dolley over the top of the core cutter and pressed the core cutter in to the soil mass using the rammer. Pressing was stopped when about 15 mm of the dolley protruded above the soil surface. Weighed the soil in the core cutter and then kept the soil in hot air oven for 24 hours and weighed.

$$Soilwatercontent\left(\frac{g}{g}\right) = \frac{Weightofmoistsoil - Weightofovendry}{Weightofovendrysoil} \quad (3.1)$$

$$Soil\ bulk\ density\left(\frac{g}{cm^3}\right) = \frac{Weight\ of\ oven\ dry\ soil}{Volume\ of\ soil} \quad (3.2)$$

c)Porosity

Soil porosity is the percentage of the soil volume occupied by pore spaces.

$$Soil\ porosity = 1 - \frac{Soil\ bulk\ density}{2.65} \quad (3.3)$$

d)Infiltration

Infiltration is the process by which water on the ground surface enters the soil. Infiltration capacity is defined as the maximum rate of infiltration. The infiltration depth and corresponding time were taken using a double ring infiltrometre method and data were plotted to obtain infiltration rate.

3.1.4. Source of irrigation

The source of irrigation water was a filter point well-constructed in an unconfined aquifer.

3.2 EXPERIMENTAL DETAILS

Area: 19.5 × 5.5 m

Bed area: 5 × 1 m

Application used: Plastic mulching, Drip irrigation and fertigation

Irrigation levels: 3

Irrigation frequency: Daily

3.2.1. Crop details

Crop/variety: Brinjal – Haritha

Spacing: 0.75×0.6 m

Recommended dose of fertilizer: N: P_2O_5: K_2O = 60:20:25 kg/ha

Fertigation levels: 1 (100% RDF)

Frequency of fertigation: 40 splits once in 3 days

3.2.2. Details of treatments

a. Irrigation treatments

T1: Application of irrigation through drip at the rate of 60%of ETc

T2: Application of irrigation through drip at the rate of 80% of ETc

T3: Application of irrigation through drip at the rate of 100% of ETc

b. Mulches

M0: No mulch (control)

M1: Black mulch

M2: Yellow/black mulch

M3: Silver/black mulch

R1: replication no 1, R2: replication no 2 and R3: replication no 3

c. Treatment combinations

Table 3.1 Description of treatments

Sl. No.	Treatments	Indication
1	M1T1	60% ET_C with black mulch
2	M2T1	60% ET_C with yellow/black mulch
3	M3T1	60% ET_C with silver/black mulch
4	M0T1	60% ET_C with control (no mulch)
5	M2T2	80% ET_C with yellow/black mulch
6	M1T2	80% ET_C with black mulch
7	M3T2	80% ET_C with silver/black mulch
8	M0T2	80% ET_C with control (no mulch)
9	M3T3	100% ET_C with silver/black mulch
10	M2T3	100% ET_C with yellow/black mulch
11	M1T3	100% ET_C with black mulch
12	M0T3	100% ET_C with control (no mulch)

3.2.3. Specification of drip irrigation system

The details of the drip irrigation system used for the experimental purpose are given below:

i. Pump –2 hp
ii. Operating head – 1.0 kg/cm^2
iii. Mainline -38 mm PVC
iv. Submain line -19 mm PVC
v. Lateral -16mm LDPE
vi. Emitter -2 lph online emitter

3.2.4. Plan of layout

The details of the treatment are given in table 3.1 and the experimental layout is depicted in fig.3.1.

The details of layout are as follows,

i. Statistical design: Randomized Block Design

ii. Number of replications: 3 (Plants only)

iii. Total number of treatment combinations: 12

iv. Width of bed: 1 m

v. Total number of beds: 12

vi. Number of plants per bed: 7

vii. Spacing:

Plant to plant distance: 0.75 m

Distance between pair of plants: 0.60 m

Distance between beds: 0.3 m

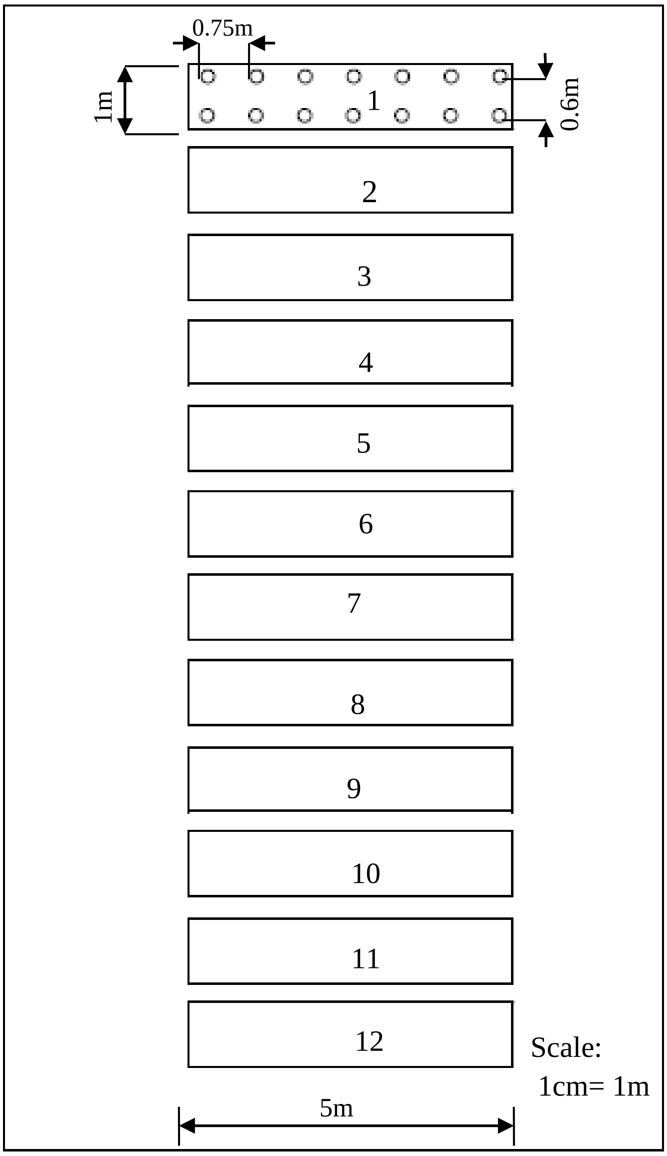

Fig 3.1 Layout of the experimental field

3.4 EXPERIMENTAL FIELD SETUP

3.4.1 Land preparation

The experimental field was thoroughly ploughed with tractor drawn cultivator and rotavator in order to achieve proper tilth.

3.4.2 Bed preparation

Prepared 12 beds of convenient size and each bed is having 5 m length, 1 m width and 0.15 m height. Plants were grown as double rows with spacing of 0.6 m between the rows and 0.75 m spacing between plants. Intercultural operations were done manually in periodic manner.

Plate 3.2 Land preparation

Plate 3.3 Bed preparation

3.4.3 Installation of drip system

i. Laying of Drip system

Irrigation water was pumped using 3 hp monoblock pump set and conveyed through the mainline of 38 mm diameter PVC pipes after filtering through the disc filter. From the main pipe, sub mains of 19 mm diameter PVC pipes were installed and then the water is conveyed to LDPE laterals of diameter 16mm. Discharge rate of single dripper is 2 lph. Venturi injector was installed along with irrigation unit for fertigation.

Plate 3.4 Installation of drip lines

ii. Laying of mulch

The plastic mulch was laid on the field on 24th December, 2020. The three types of mulch sheets (yellow on black, silver on black and black)were used to cover the beds as per treatments. After laying the specified mulches on different beds, a hole of 5cm diameter is made using a cylindrical metallic sheet. Then the healthy seedlings were transplanted in to the hole made.

Table 3.2 Specifications of color plastic mulch used for the experiment

DETAILS	SILVER ON BLACK	YELLOW ON BLACK	BLACK ON BLACK
THICKNESS OF FILM	30 microns	30 microns	30 microns
PLASTIC FILM WIDTH	1.5m	1.5m	1.5m
LENGTH	5.5m	5.5m	5.5m
PACKAGING TYPE	400m Roll	400m Roll	400m Roll
LIGHT ABSORPTION, %	51	50	100
LIGHT REFLECTION, %	49	40	0

(a)

(b)

(c)

(d)

Plate 3.5(a) Laying of mulch,(b) Metallic cylinder for making holes, (c) Making holesin laid mulch sheet,(d) Overall view of field after application of mulch sheets

3.4.5 Transplanting brinjal seedling

About 3 weeks old healthy seedlings were brought from nursery and transplanted on 30th december, 2020 in well prepared experimental plots. Single brinjal seedlings were planted as per the treatment combinations in each hole of coloured plastic mulch.

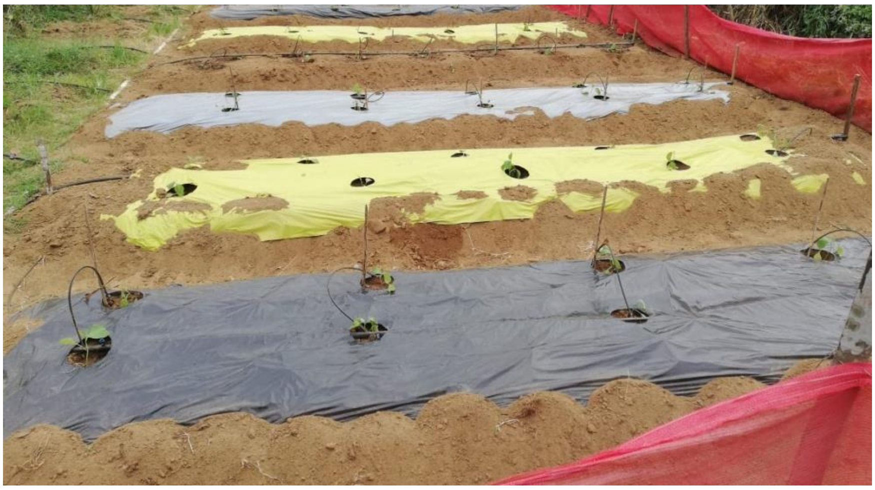

Plate 3.6 Transplanting of healthy seedlings

Plate 3.7 General view of brinjal crop at 40 DAT

3.4.6Plant protection

The main troubles occurred during the plant cultivation were some diseases like leaf spot (*Cercosporasolanimelongenae*, *Alterniamelongenae*), bacterial wilt (*Pseudomonas solanacearum*) and some pests like shoot borer (*Leucinodesorbonalis*). To avoid these issues some pesticides at required times were sprayed. The sprayed pesticides are Quinolphos (Ekalux) and Mancozeb 75% Wp. Manual weeding was done on the control bed at an interval of 2 weeks.

(a)

(b)

Plate3.8 Plant protection chemicals a)Quinolphos(Ekalux) b) Mancozeb 75% Wp

3.5 SCHEDULING OF IRRIGATION

Just after transplanting the field was given a light irrigation. Then later on irrigation was given as per the irrigation requirement of crop.

3.5.1 Estimation of crop water requirement

The crop water requirement of a crop is defined as the amount of water that is required to meet its evapotranspiration demands. Consumptive use (CU) is used to designate the losses due to ET and water that is used for its metabolic activities of plants. Thus, CU exceeds ET by the amount of water used for digestion, photosynthesis, transport of minerals and photosynthates, structural support and growth. Since this difference is usually less than 1%, ET and CU are normally assumed to be equal. The crop water needs mainly depend on the climate, crop type and stage of growth of crop. The crop evapotranspiration can be directly estimated by the mass balance or energy transfer methods. It can also be determined by from lysimeters or from the studies of soil water balance. Sometimes Penman – Monteith equation is also applied for the estimation of crop water requirement directly but the lack of consolidate information on the aerodynamic and canopy features of the cropped area restricts its use.

Nowadays, the crop water requirement is usually calculated from the crop coefficient approach.

The formula used is as follows.

$$ETc = Kc \times ETo \quad (3.4)$$

Where Kc is crop coefficient

ETo is reference crop evapotranspiration.

ETc is the crop evapotranspiration

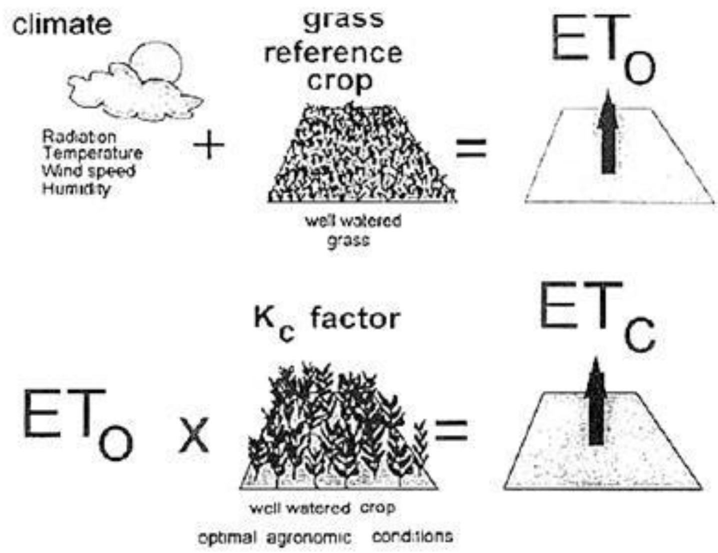

Fig.3.2. Estimation of evapotranspiration (Source; Allen *et al.*, 1998)

3.5.2. The crop coefficient (Kc)

It is generally the ratio of crop evapotranspiration to the reference crop evapotranspiration. Kc values mainly depend upon type of crop, climate and growth stage of crop. The crop coefficient predicts ETc under standard conditions, i.e., conditions where there are no limitations on crop growth due to water shortage, crop density, disease, weed, insect or salinity pressures. This represents the upper envelope of evapotranspiration.

In order to determine Kc, it is necessary to determine the total growing period of each crop, various growth stages of each crop and the value of Kc in different growth stages.

K_c values of brinjal for different growth stages are, 0.29 (Initial), 0.74 (Development), 1.03 (Midseason) and 0.18 (Late season) (Manohar *et al.*, 2001).

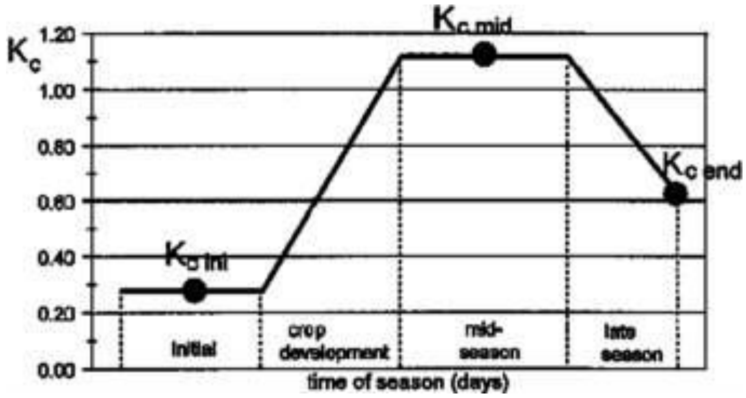

Fig.3.3 Variation of crop coefficient with crop growth stages (Source; Allen *et al.*, 1998)

3.5.3 Estimation of reference crop evapotranspiration (ETo)

Evapotranspiration is a combination of two processes- evaporation and transpiration. Crop evapotranspiration from an extensive surface of green grass of uniform height (0.12m), actively growing, completely shading the ground with an albedo of 0.23 and having ample water supply is called reference crop evapotranspiration and is denoted by ETo. Various methods are in use for the determination of ETo. FAO-56 Penman – Monteith Method (Allen *et al.*, 1998)

$$ETo = \frac{0.408\Delta(Rn - G) + \gamma\frac{900}{T+273}U2(es - ea)}{\Delta + \gamma(1 - .34U2)} \qquad (3.5)$$

Where,

ETo = Reference crop evapotranspiration (mm/day)

Rn = Net radiation at the crop surface ($MJ/m^2/day$)

G = Soil heat flux density ($MJ/m^2/day$)

T = Air temperature at 2 m height (°C)

U_2 = Wind speed at 2 m height (m/s)

es = Mean saturation vapour pressure (kPa)

ea = Mean ambient vapour pressure (kPa)

γ = Psychromatic constant (kPa/⁰C)

Δ = Slope (first derivative of the function e(T))

The FAO Penman-Monteith equation is used widely nowadays for the estimation of ETo.

3.5.4. Crop water requirement (CWR)

The crop water requirement is the amount of water equal to what is lost from a cropped field by the ET and is expressed by the rate of ET in mm/day. Estimation of CWR is derived from crop evapo-transpiration (ETc) which can be calculated by the following equation,

$$ETc = Kc \times ETo \qquad (3.4)$$

3.5.5 Net irrigation requirement (NIR)

Irrigation is necessary when rainfall could not meet the evapotranspiration demands of the crops. Irrigation should apply the right quantity of water at the right time. The timing and depth of future irrigations can be planned by calculating soil water balance in the root zone on a daily balance. The irrigation requirement, expressed in mm is calculated for the specified interval. Net irrigation requirement is the variation between concerned crop evapotranspiration growing under standard conditions with the effective rainfall for the specified time interval. It indicatively represents the fraction of crop water requirements that needs to be satisfied through irrigation contribution in order to ensure optimum crop growing conditions.

$$NIR = WR – ER – Ge \qquad (3.6)$$

where,

WR = Water Requirement

ER=Effective rain fall

Ge = Groundwater contribution from the water table (not considered in the study as this is negligible).

3.5.6 Duration of irrigation

The quantity of water for irrigation to be applied was computed for every day. For known discharge rate of emitters (2 lph), the duration of irrigation water was calculated by

$$T= Vn/Ne \times Np \times q \qquad (3.7)$$

Where,

Vn =Net water requirement

Ne = No of emitters per plant

Np = No of plants

q= Emitter discharge L/h

3.6 OBSERVATIONS RECORDED

3.6.1 Biometric observations

It is important to collect data on various growth and yield parameters which may facilitate to interpret the results in a better way. Growth parameters such as crop height, girth of stem and number of leaves and also crop yield were recorded for 3 plants in every bed. Observations were taken 3 times.

3.6.2 Soil parameters

To evaluate the effect of plastic mulches on soil properties, soil parameters such as soil moisture content, soil pH and soil temperature were measured thrice in a day (8.30 am, 1.30 pm and 5.30 pm) for each bed. Soil moisture content was recorded using soil moisture meter (plate3.10), soil pH was recorded by pH meter (plate3.11) and soil temperature by using thermometer (plate3.12)

Plate3.9Soil moisture meter

Plate3.10 pH meter

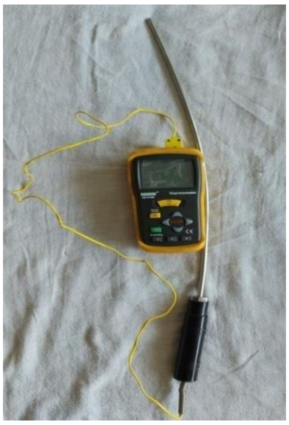

Plate 3.11 Soil thermometer

3.6.3 Yield parameters

Harvesting was started at the 15^{th} week after transplanting. The crop period was not over and harvest was continuing as once in a week. The results reported are upto the fourth harvest of the crop. Total of four picking was done. Weight of fruit is noted and total yield is calculated.

Plate 3.12Crops in the field at harvesting stage

Plate 3.13 Harvested Brinjal

RESULTS AND DISCUSSION

CHAPTER 4

RESULTS AND DISCUSSION

The results of the experiment on the evaluation of effect of plastic mulch on the growth and yield of brinjal under open field condition are presented in this chapter.

4.1 STUDY AREA

4.1.1 Soil properties

a) Soil texture

The particle size distribution curve was plotted as shown in fig 4.1 with sieve analysis observations (Appendix 3) and it shows that the soil contains about 80% sand particles. The texture of the soil was found out as sandy soil by using sieve analysis method.

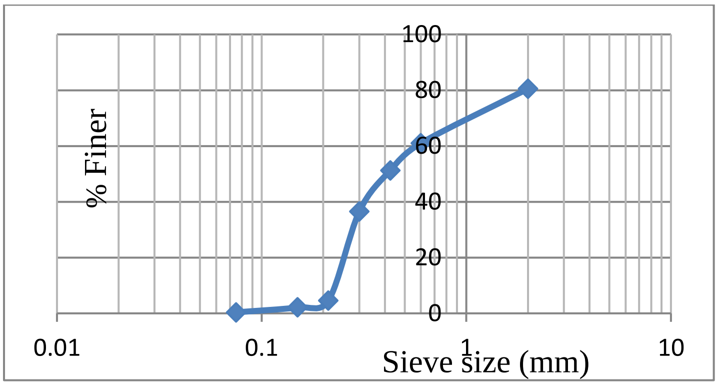

Fig.4.1. Particle size distribution curve

b) Bulk density

The bulk density of the soil of study area was determined as 1.648 g/cm^{3} by core cutter method as mentioned in section 3.1.3

$$Bulk\ density = \frac{1678.4}{\pi \times \frac{10^2}{4} \times 13} = 1.648 \text{ g/cm}^3.$$

This value of bulk density is in the range of bulk density values of sandy loam soil.

c)Porosity

Porosity of the soil was found as 37.8% by using the equation mentioned in section 3.1.3

$$Porosity = 1 - \frac{1.648}{2.65} = 0.378$$

=37.8%

This range of porosity comes in sandy loam soil.

d) Infiltration rate

The infiltration rate of the soil of study area was measured by double ring infiltrometer as mentioned in section 3.1.3. The observations taken are given in table 4.1 and a graph of accumulated infiltration and elapsed time was plotted as shown in fig. 4.3. Infiltration rate of the soil was observed as 0.1 and it was found to be in the range for sandy loam soil.

Table 4.1 Infiltration data of experimental area

(1)	(2)	(3)	(4) = [(2)÷(3)]	(5)
Time (hr : min)	**Depth of infiltration (cm)**	**Time increment (min)**	**Infiltration rate (cm/min)**	**Cumulative infiltration**
8 : 47	0.6	-	0.6	0.6
8 : 48	0.3	1	0.3	0.9
8 : 49	0.3	1	0.3	1.2
8 : 50	0.4	1	0.4	1.6
8 : 51	0.3	1	0.3	1.9
8 : 52	0.2	1	0.2	2.1
8 : 54	0.3	2	0.15	2.25
8 : 56	0.4	2	0.2	2.45
8 : 58	0.4	2	0.2	2.65
9 : 01	0.3	3	0.1	2.75
9 : 04	0.5	3	0.1	2.85
9 : 07	0.3	3	0.1	2.95
9 : 10	0.4	3	0.1	3.05
9 : 15	0.6	5	0.1	3.15
9 : 20	0.7	5	0.1	3.25
9 : 25	0.7	5	0.1	3.35
9 : 30	0.6	5	0.1	3.45
9 : 40	0.9	10	0.1	3.55

9 : 50	1.2	10	0.1	3.65
10 : 00	1.00	10	0.1	3.75
10 : 10	0.4	10	0.1	3.85

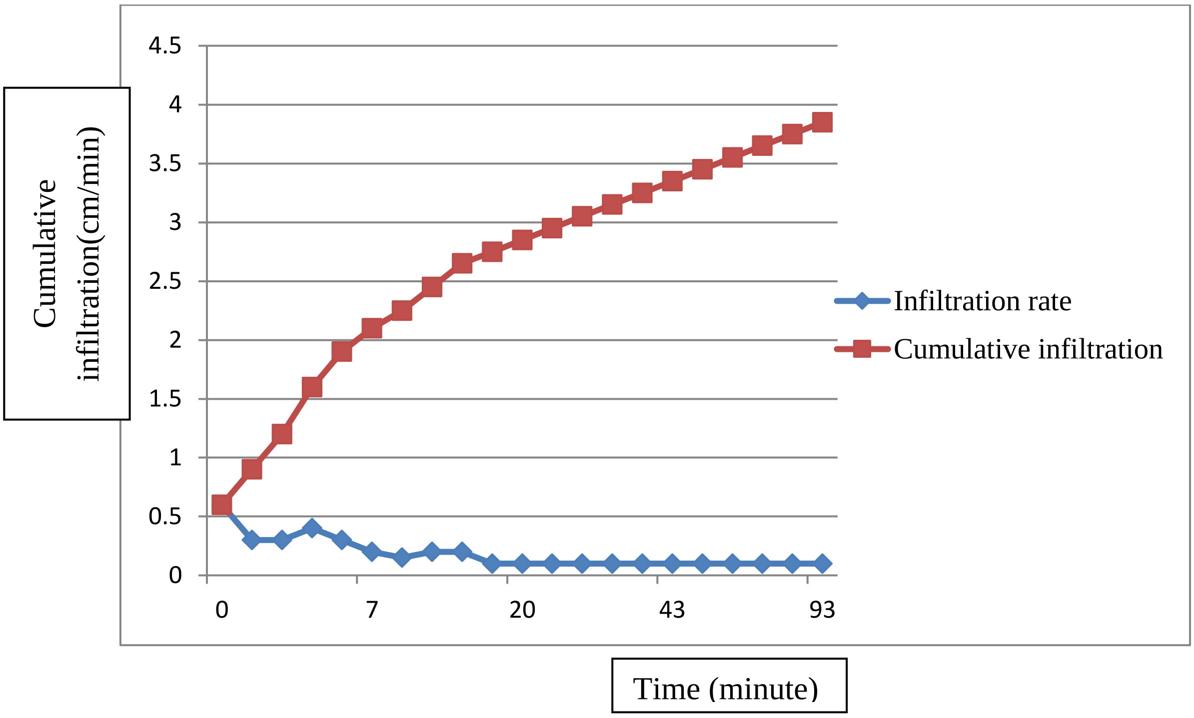

Fig 4.2 Cumulative infiltration vs elapsed time

4.2. Fertigation requirement of brinjal

The type and quantity of fertilizers required for brinjal crop during its different growth stages are explained in table 4.1.

Table 4.2 Fertigation requirement of brinjal

Stage	Crop stage	Duration in days	Fertilizer grade	Total fertilizer (kg/162 m^2)	Fertilizer (g/plant)
1	Transplanting to plant establishment stage	18	Basal P 19:19:19 13:0:45 Urea	1.944 0.264 0.5832 0.826	4.909 0.667 1.473 2.08
2	Vegetative	36	19:19:19	0.253	0.639

	stage		13:0:45 Urea 12:61:0	3.108 2.916 0.097	7.85 7.36 0.245
3	Flower initiation to first picking	66	19:19:19 13:0:45 urea 12:61:0	0.713 5.7024 2.673 0.1782	1.80 14.4 6.75 0.45

4.3 Scheduling of irrigation

The I[st] draft of this research work was done in the year 19-2020 with the same crop at Instructional Farm, KCAET, Tavanur. The irrigation schedule was done by using CROPWAT for the same crop and the water requirement for the 100% ET_C was obtained as given in the table 4.3. (Habeer, *et al.*, unpublished data, 2020; unreferenced).

Table 4.3 Water requirement of brinjal crop under drip irrigation during summer

Sl, No.	Crop stage	ETc (mm/day)	ETc (l/plant/day)	100% ETc (l/plant/day)
1	Initial	2.89	1.18	1.18
2	Initial	2.40	0.98	0.98
3	Initial	2.87	1.174	1.174
4	Development	2.88	1.178	1.178
5	Development	2.96	1.21	1.21
6	Development	2.72	1.113	1.113
7	Development	2.54	1.04	1.04
8	Middle	3.05	1.25	1.25
9	Middle	2.61	1.07	1.07
10	Middle	2.61	1.07	1.07
11	Middle	2.62	1.072	1.072
12	Late	3.58	1.47	1.47
13	Late	3.35	1.37	1.37
14	Late	2.85	1.166	1.166
15	Late	2.44	0.998	0.998

The crop evapotranspiration for the 80% and 60% ET_C irrigation levels were determined from previous year's data. It is given in the table 4.4.

Table 4.4 Water requirement of brinjal crop under different drip irrigation levels

Sl No	Crop stage	ETc (mm/day)	ETc (l/plant/day)	100% ETc (l/plant/day)	80% ETc (l/plant/day)	60% ETc (l/plant/day)
1	Initial	2.89	1.18	1.18	0.944	0.708
2	Initial	2.4	0.98	1.47	1.176	0.882
3	Initial	2.87	1.174	1.174	0.9392	0.7044
4	Development	2.88	1.178	1.178	0.9424	0.7068
5	Development	2.96	1.21	1.21	0.968	0.726
6	Development	2.72	1.113	1.113	0.8904	0.6678
7	Development	2.54	1.04	1.04	0.832	0.624
8	Middle	3.05	1.25	1.25	1	0.75
9	Middle	2.61	1.07	1.07	0.856	0.642
10	Middle	2.61	1.07	1.07	0.856	0.642
11	Middle	2.62	1.072	1.072	0.8576	0.6432
12	Late	3.58	1.47	1.47	1.176	0.882
13	Late	3.35	1.37	1.37	1.096	0.822

4.4 Biometric observations

Different biometric parameters like plant height, number of leaves and stem girth were observed and the values of these parameters measured at various weeks are shown in following tables.

Table 4.5 Average value of biometric observations for each treatment on 13 DAT

Average value for different treatments on 12/01/2021			
Treatment	**Height of plant (cm)**	**Number of leaves (No.s)**	**Girth of stem (cm)**
M1T1	8.2	2	0.7

M2T1	8.7	3	0.8
M3T1	9.1	2	0.9
M0T1	6.6	1	0.8
M2T2	6.4	2	0.7
M1T2	8.6	2	0.9
M3T2	7.2	3	0.8
M0T2	7.0	3	0.7
M3T3	9.4	2	0.7
M2T3	5.6	2	0.7
M1T3	5.2	2	0.5
M0T3	4.3	3	0.6

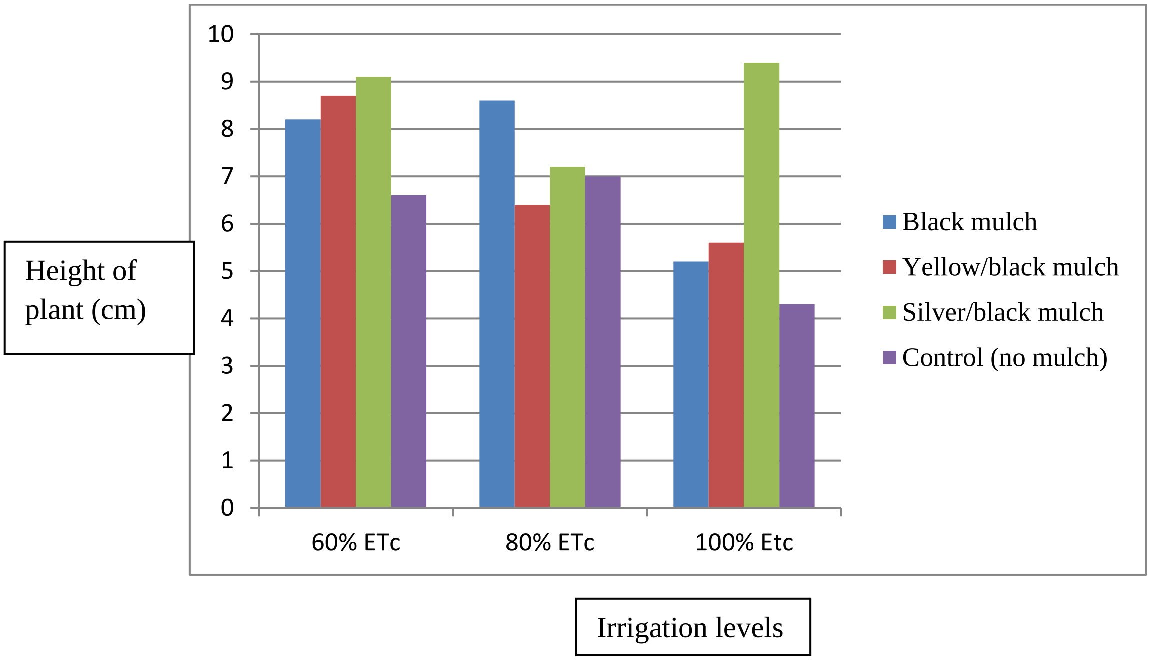

Fig 4.3 Variation in height of plant for different mulches at 13 DAT

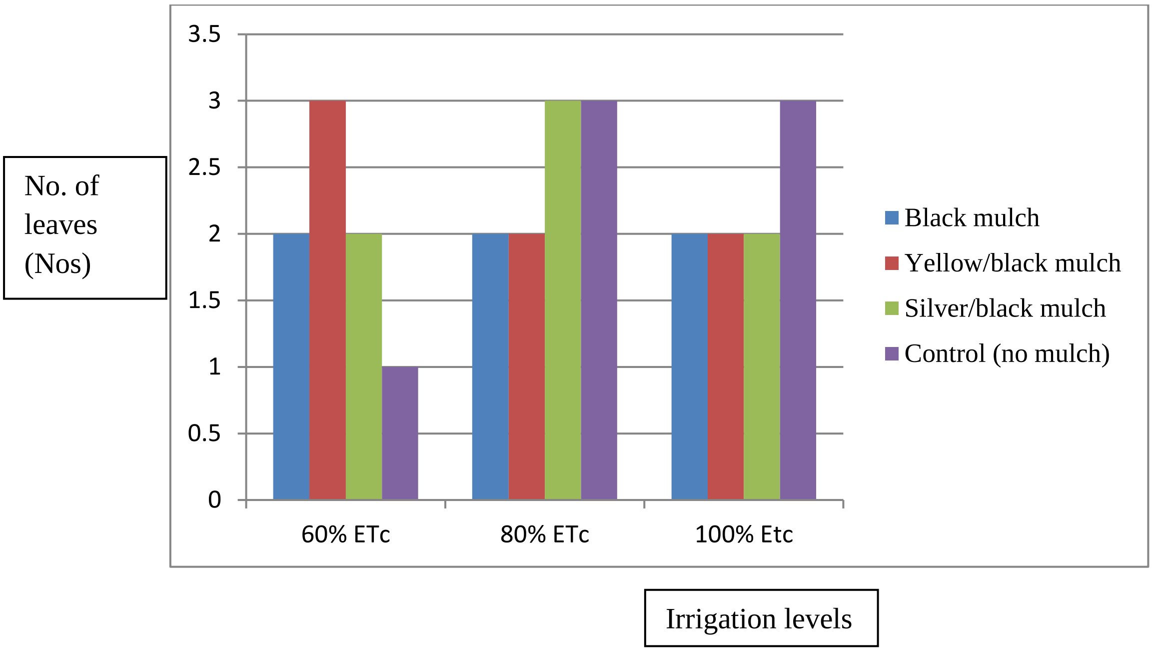

Fig 4.4 Variation in number of leaves for different mulches at 13 DAT

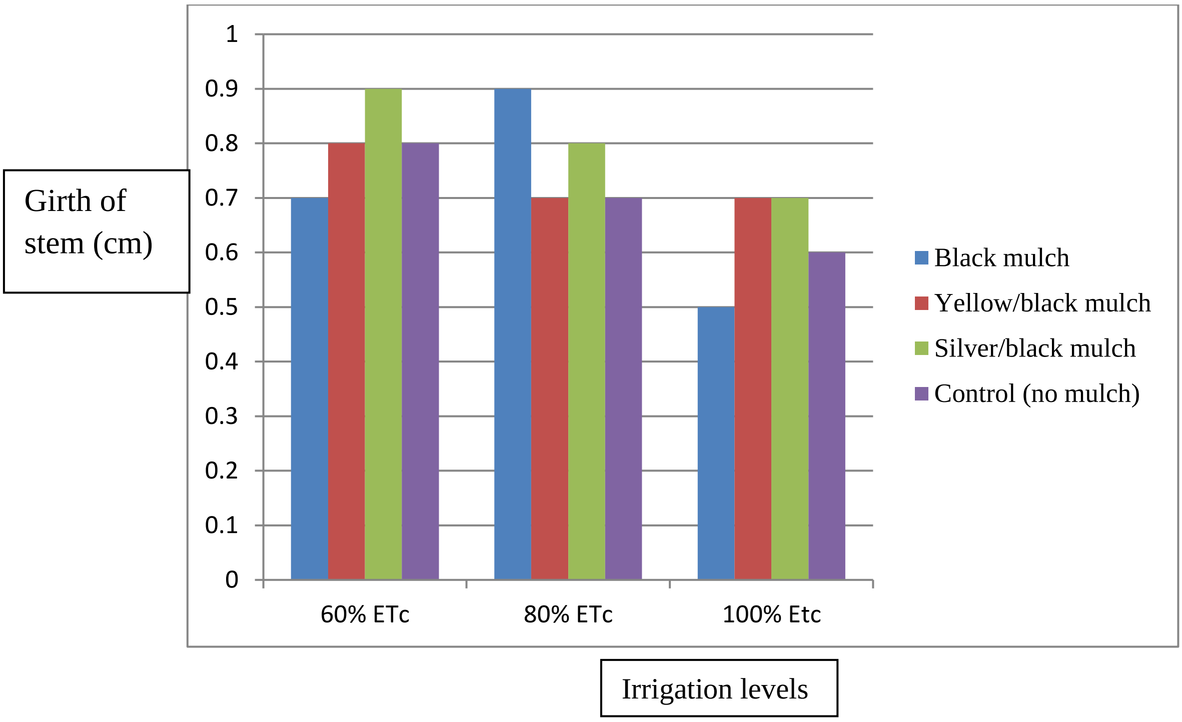

Fig 4.5 Variation in stem girth for various treatmentsat 13 DAT

Fig 4.3 shows the variation in height of plant at 13 DAT. The results show that the plant height was observed greater (9.4 cm) in silver/black mulch along with irrigation level of 100% ETc as compared to other treatments.The number of leaves were observed higher (3 no.s) in Yellow/black mulch,Silver/black mulch and control treatments with 60%, 80% and 100% ETc respectively as shown in Fig.4.5 and Table 4.5.The stem girth of brinjal was found greater (0.9 cm) for black mulch with 80% irrigation level and silver/black mulch with 60% irrigation level.

Table 4.6 Average value of biometric observations for each treatment on 31 DAT

Average value for different treatments on 29/01/2021			
Treatment	**Height of plant (cm)**	**Number of leaves**	**Girth of stem (cm)**
M1T1	9.1	4	1.5
M2T1	9.8	10	1.5
M3T1	10	9	1.7
M0T1	8.1	4	1.3
M2T2	10.1	11	1.9
M1T2	8.1	5	1.4
M3T2	11.8	13	1.8
M0T2	10.6	18	1.7
M3T3	10.7	7	1.6
M2T3	8.2	7	1.7
M1T3	8	6	1.5
M0T3	5.7	7	1.2

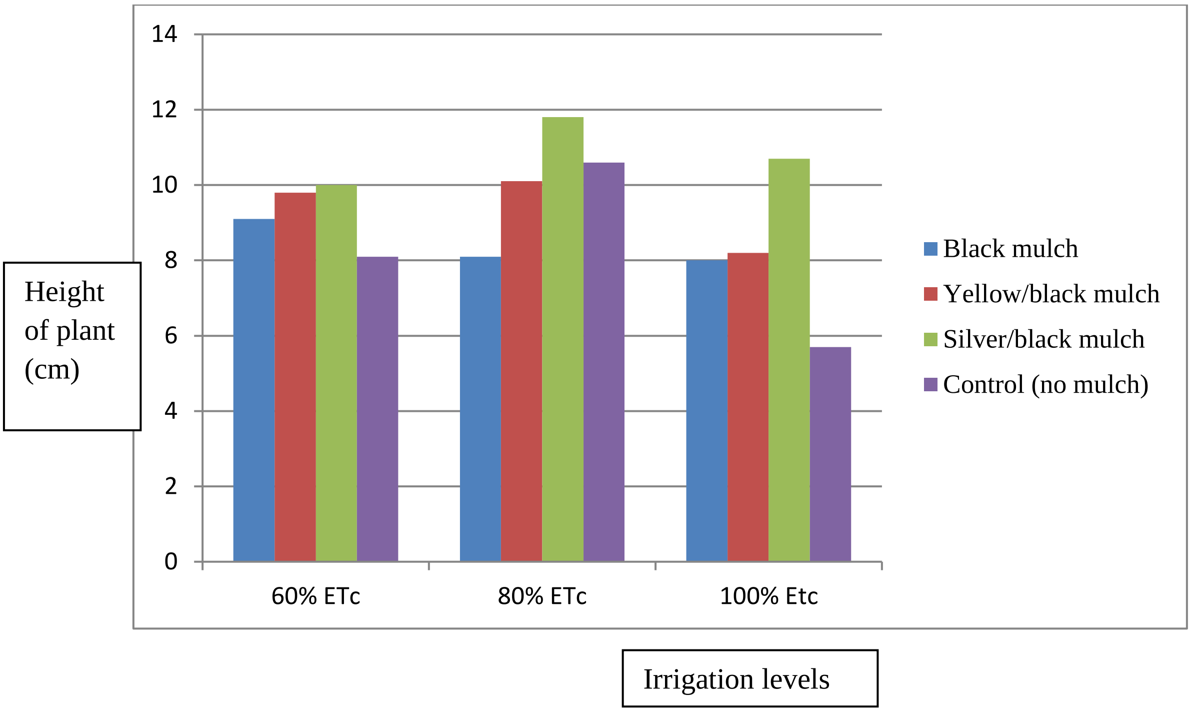

Fig 4.6 Variation in height of plant for different mulches at 31 DAT

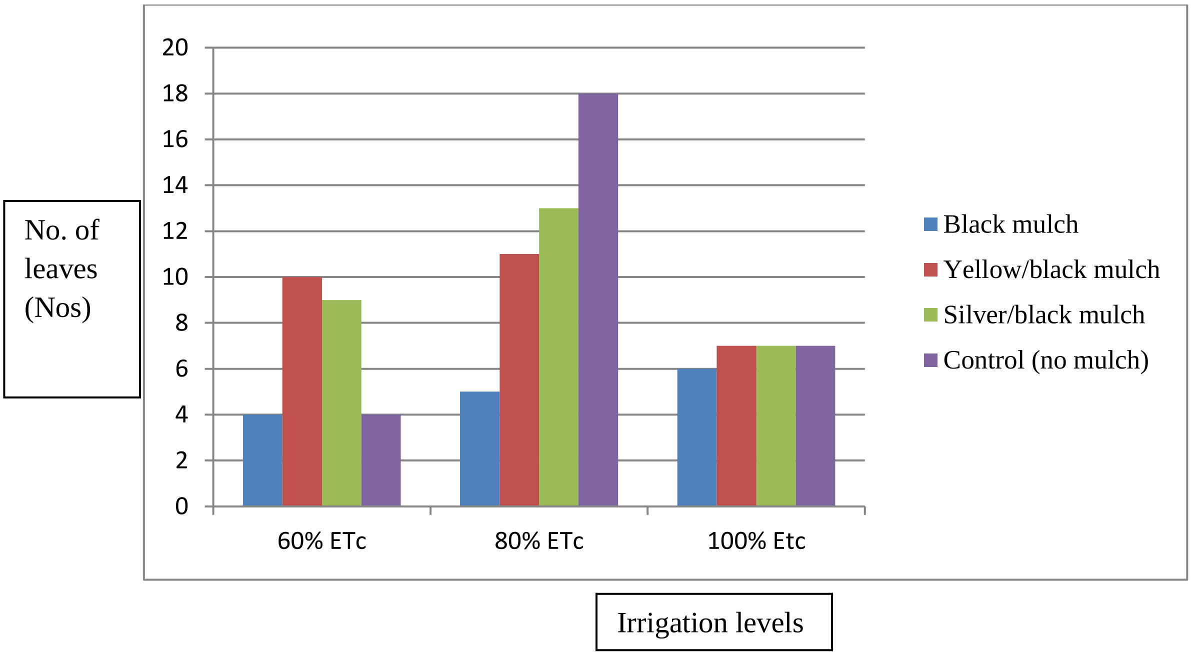

Fig 4.7 Variation in number of leaves for different mulches at 31 DAT

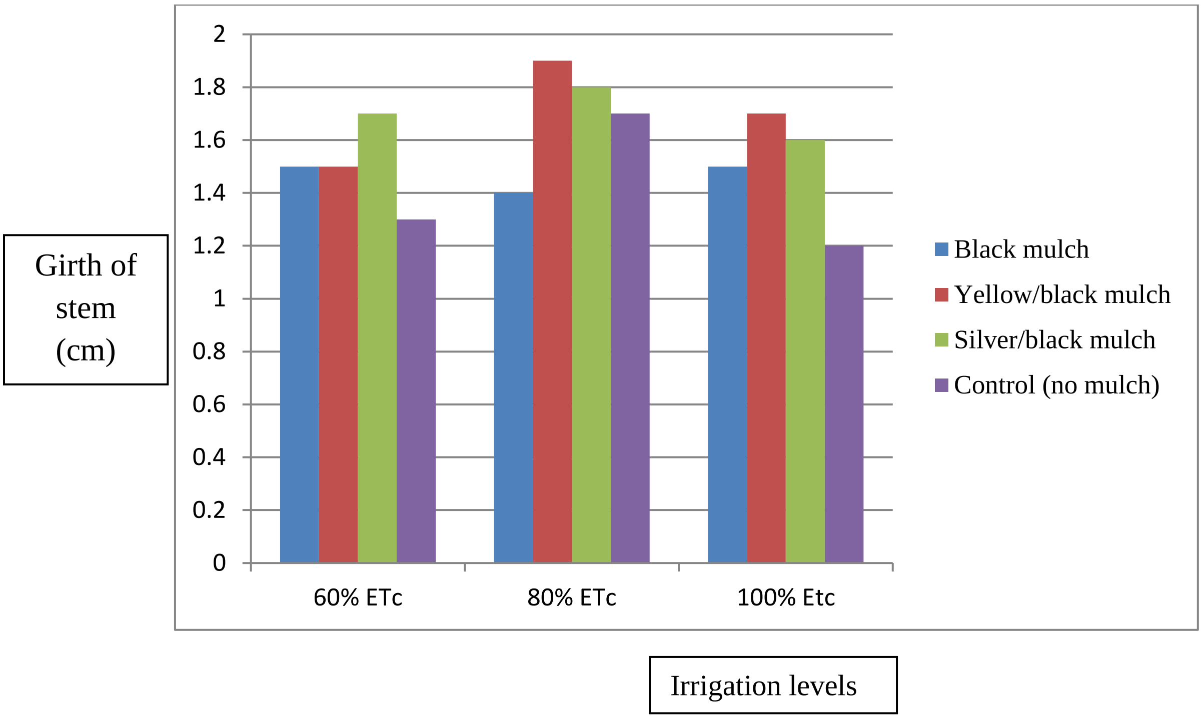

Fig 4.8 variation in stem girth for various treatments at 31 DAT

Fig 4.6 shows that 31 days after transplanting maximum growth in plant height occurred in silver/black mulch along with irrigation level of 80% ETc. Second highest growth occurred in silver/black mulch accompanied with irrigation level of 100% ETc. There is only a slight variation in control bed with 80% irrigation level and yellow/black mulch with 80% irrigation level.

From the Fig 4.7, it was found that the growth of leaves (measured in terms of its number) is maximum for control bed with 80% ETc, second greatest is silver/black mulch with 80% irrigation level.

From Fig 4.8,it is clear that the growth of stem girth- of brinjal is greater for yellow/black mulch with 80% irrigation. Next higher value of stem girth was observed in silver/black mulch with 80% irrigation level.

Table 4.7Average value of biometric observations for each treatment taken at 55 DAT

Average value for different treatments at 26/02/2021			
Treatment	**Height of plant (cm)**	**Number of leaves**	**Girth of stem (cm)**
M1T1	39.8	23	3.6
M2T1	44.8	25	2.5
M3T1	66.4	21	2.5
M0T1	36.5	16	2.6
M2T2	49.8	27	2.5
M1T2	34.4	19	2.7
M3T2	45	29	2.5
M0T2	46.7	20	2.7
M3T3	43.5	32	2.7
M2T3	28.3	29	2.8
M1T3	36.3	29	2.2
M0T3	19.8	21	2.5

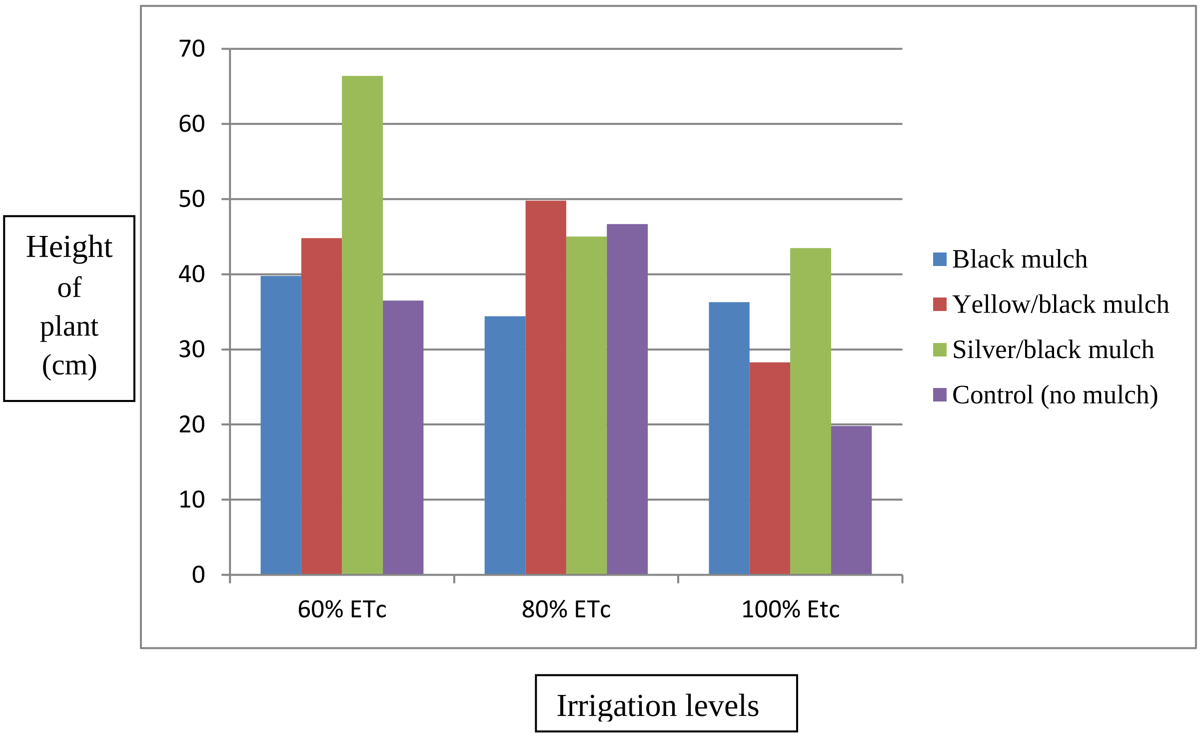

Fig 4.9 Variation in height of plant for different mulchesat 55 DAT

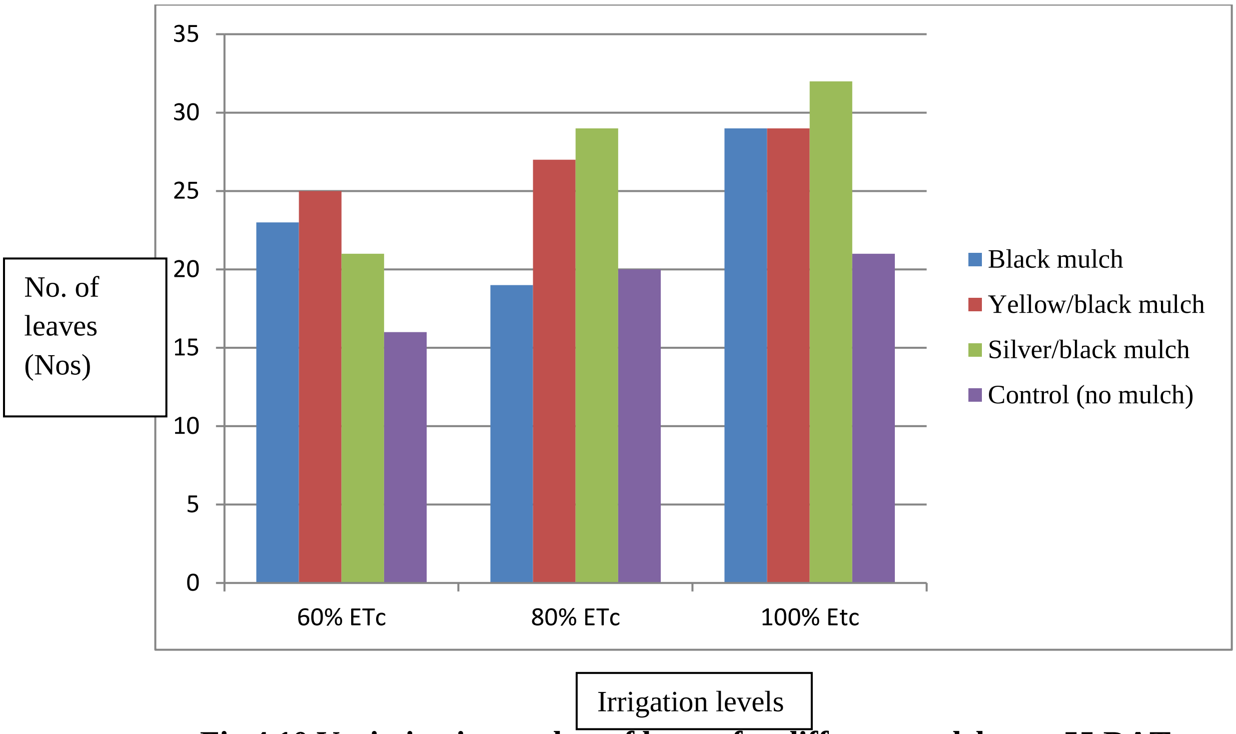

Fig 4.10 Variation in number of leaves for different mulches at 55 DAT

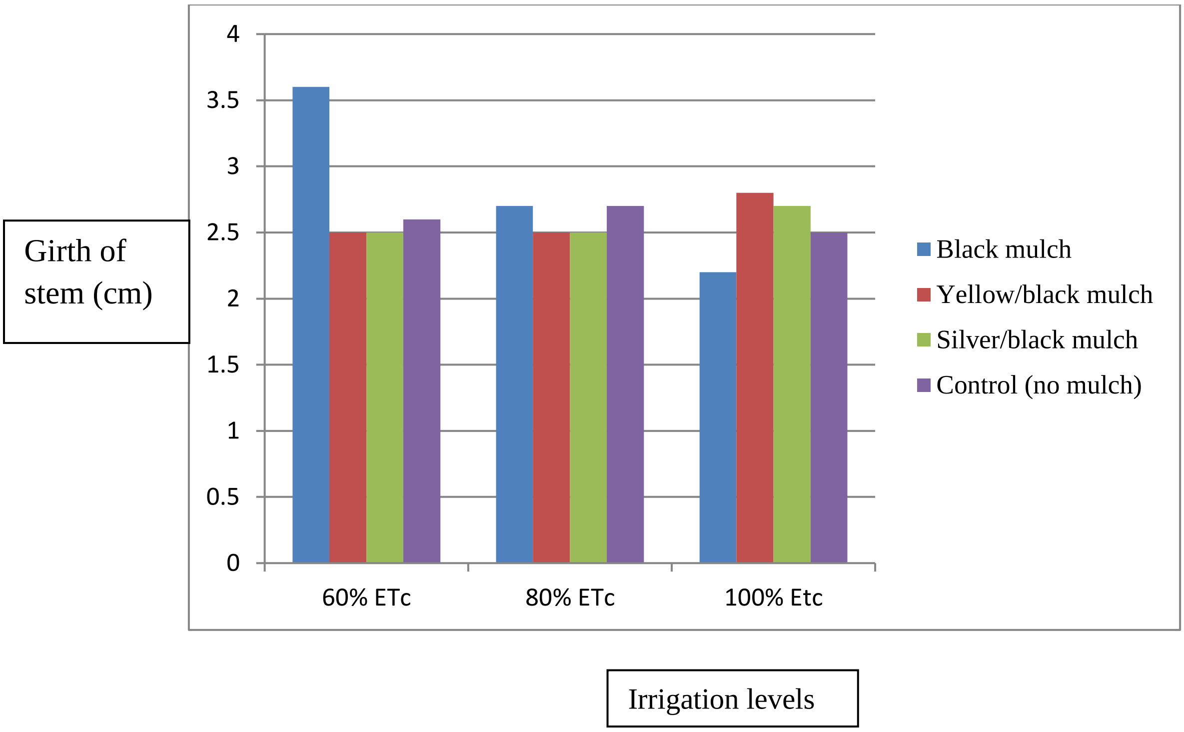

Fig 4.11 variation in stem girth for various treatments at 55 DAT

From Fig 4.3, maximum growth in plant height is in silver/black mulch along with irrigation level of 60% ETc. Second highest growth occurs in yellow/black mulch accompanied with irrigation level of 80% ETc. There is only a slight variation in silver/black mulch with 80% irrigation level and control bed with 80% irrigation level.

From the Fig 4.4, number of leaves was found to behigher for silver/black mulch with 100% ETc. In yellow/black mulch with 100% ETc irrigation level, then again for black mulch with 100% irrigation.

From Fig 4.5, growth of stem girth was greater for black mulch with 60% irrigation level and yellow/black mulch with 100% irrigation level.

From the experiment, it can be concluded that during the all stages of plant height observed, silver/black and yellow black mulches showed good performance compared to black mulch and control. Initial stages of growth 60% irrigation level of ETc are giving good performance in all mulches and in later growth stages, 80% irrigation level of ETc is giving good performance in all mulches. This is due to more vegetative growth of the plant in later stages. 100% irrigation level of ETc is not showing any significant difference in plant height. It is clear that 60% level of irrigation is enough in initial stages and 80% level of irrigation is only required in later stages for good performance so that there is a saving of 40% of irrigation water in initial stages and 20% of irrigation water in later stages of growth of plant.

In case of number of leaves, initial growth stage shows, almost similar number of leaves for all treatments and in later stage 80% and 100% irrigation level of ETc showed good results. The number of leaves is observed more in yellow/black mulch in later stages of growth. From this it is clear that 80% irrigation level is enough for growth of plant in case of number of leaves and there is a saving of 20% of irrigation water.

In case of girth of plant initial stage of growth, yellow/black, silver/black and black mulch showed good performance in 60% level of irrigation of ETc compared to 80 and 100% and there is no significant difference observed between treatments and later stage, 31 days after planting, shows better performance by yellow/black and silver/black mulch in 80% of irrigation level and in later growth stages there is not much significant difference between treatments except black mulch. This may be due to completion of vegetative growth stage.

The analysis of all above results clearly shows that 60 % irrigation level of ETc is only required in initial stages of plant growth and later stages of80%of irrigation level of ETc is only required for good vegetative growth of plant so that it is possible to save a 40% of irrigation water in initial stages and 40% later stages of plant growth. It is also clear that silver/black mulch shows good performance followed by yellow/black. The double-coloured mulch sheets giving better performance for vegetative growth due to its properties.

4.5 Observation of soil properties of various treatments in field

Different soil properties like soil pH, soil temperature and soil moisture content were observed and the values of these properties measured at various days are shown in the following tables.

Table 4.8 Soil properties at the time of transplanting

Sl. No.	Treatment	Soil pH	Soil temperature(⁰C)	Soil moisture content(%)
1	M1T1	6.8	33.1	10
2	M2T1	6.8	33.2	8
3	M3T1	6.9	33.5	8.1
4	M0T1	6.9	33.5	11.8
5	M2T2	6.9	33.6	10.8
6	M1T2	6.8	33.7	9.3
7	M3T2	6.8	33.4	12.0
8	M0T2	6.8	33.5	13
9	M3T3	6.8	33.4	10.9

10	M2T3	6.8	33.2	11.3
11	M1T3	6.8	33.6	13.5
12	M0T3	6.8	33.4	11.9

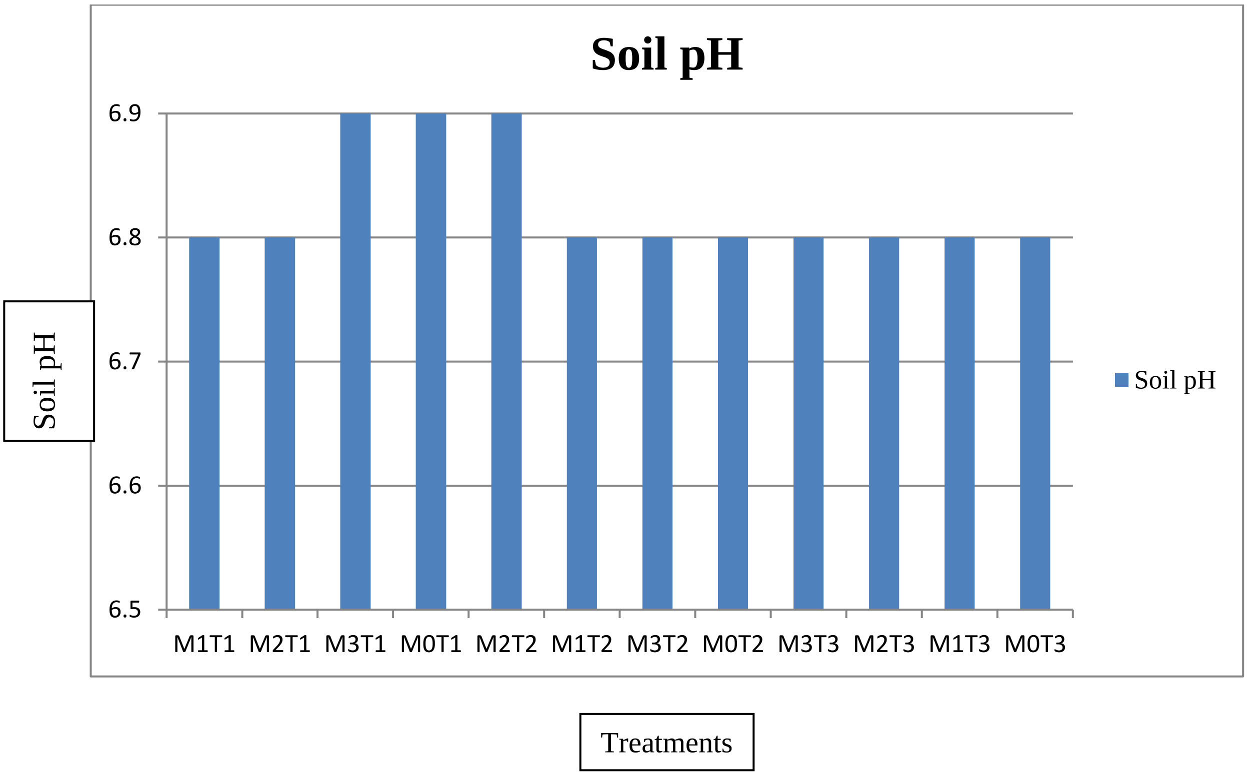

Fig.4.12 Soil pH at the time of transplanting

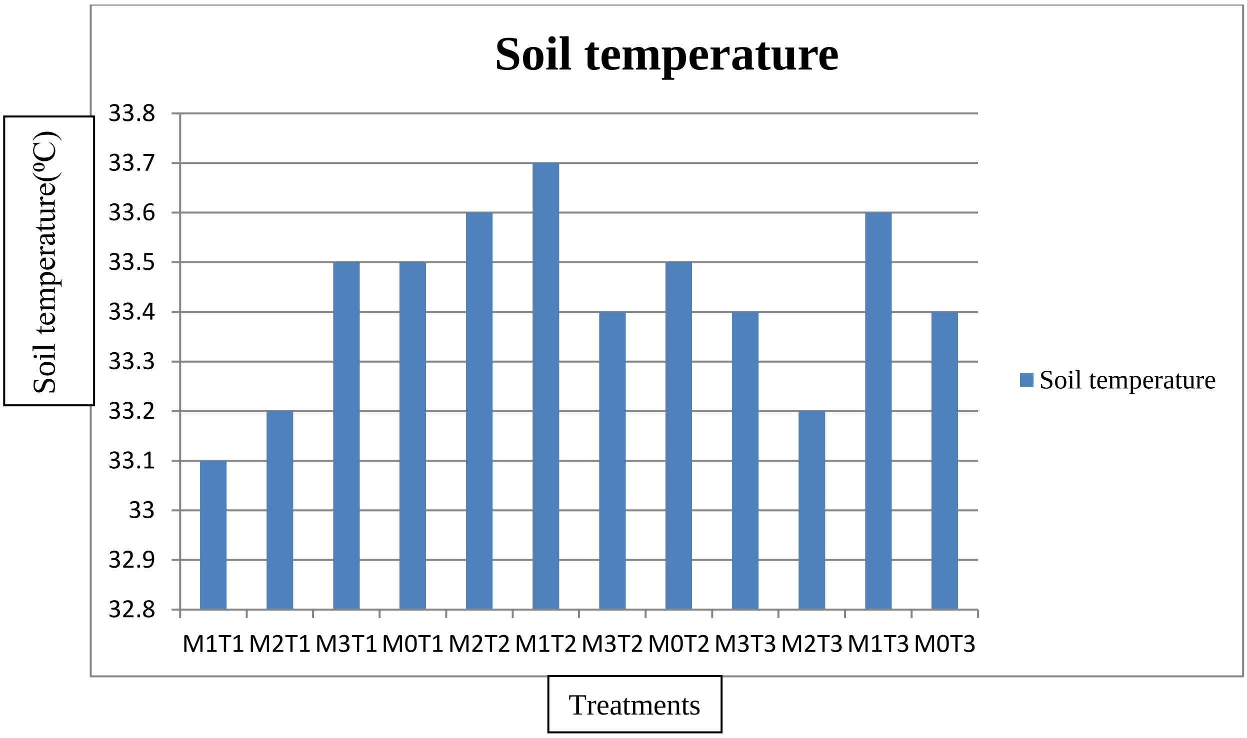

Fig.4.13 Soil temperature at the time of transplanting

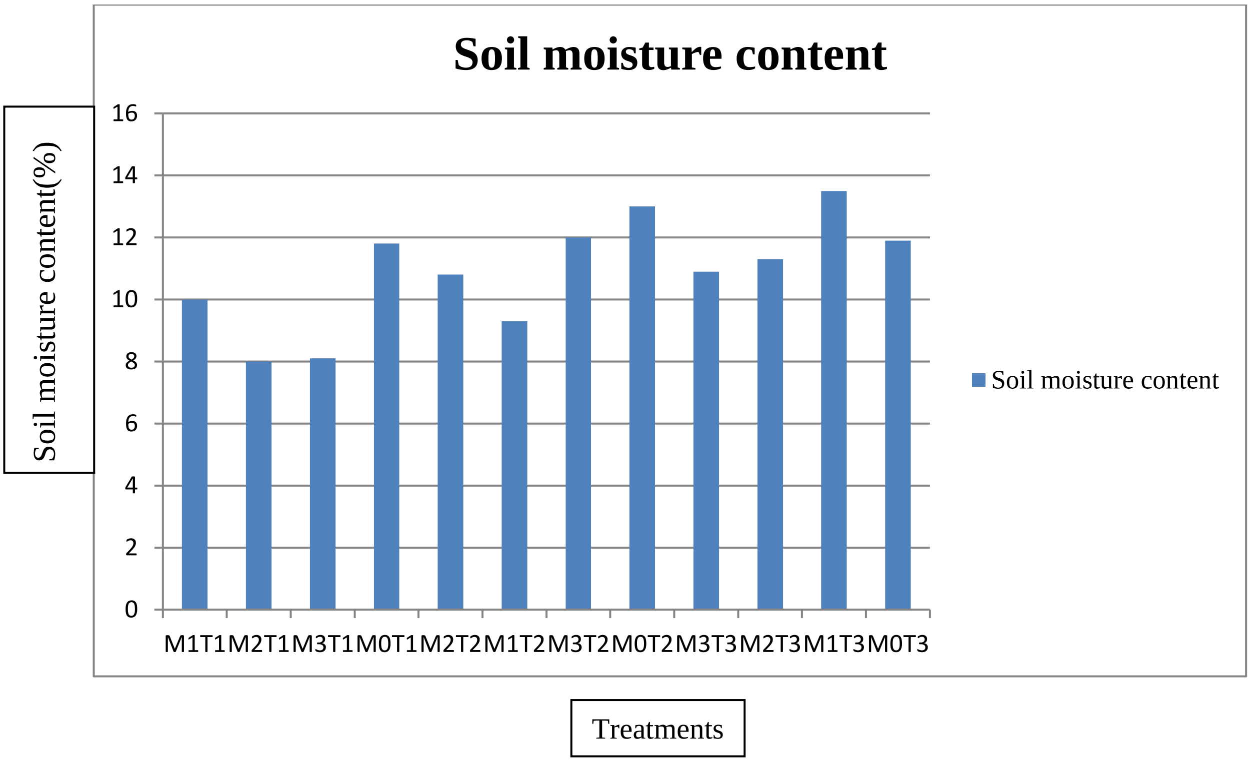

Fig.4.14 Soil moisture content at the time of transplanting

From the table 4.9 and figures 4.12, 4.13 and 4.14 shows that there is not much significant difference between soil pH, soil temperature and soil moisture content. Soil pH in all treatments, value shows it is neutral and soil temperature is in between 33^0C and 33.7^0C and soil moisture content is ranging between 8 to 12%.

Table 4.9 Soil properties at 12/01/2021

Sl. No.	**Treatment**	**Soil pH**	**Soil temperature**(⁰C)	**Soil moisture content(%)**
1	M1T1	6.8	33.8	11.5
2	M2T1	6.8	33.5	9.7
3	M3T1	6.9	33.4	9.1
4	M0T1	6.9	33.1	10.1
5	M2T2	6.9	33.4	11.7
6	M1T2	6.8	33.5	11.8
7	M3T2	6.8	33.7	11.4
8	M0T2	6.8	33.4	10
9	M3T3	6.8	33.4	11.3
10	M2T3	6.8	33.6	10.8
11	M1T3	6.8	33.6	13.5
12	M0T3	6.8	33.7	9.7

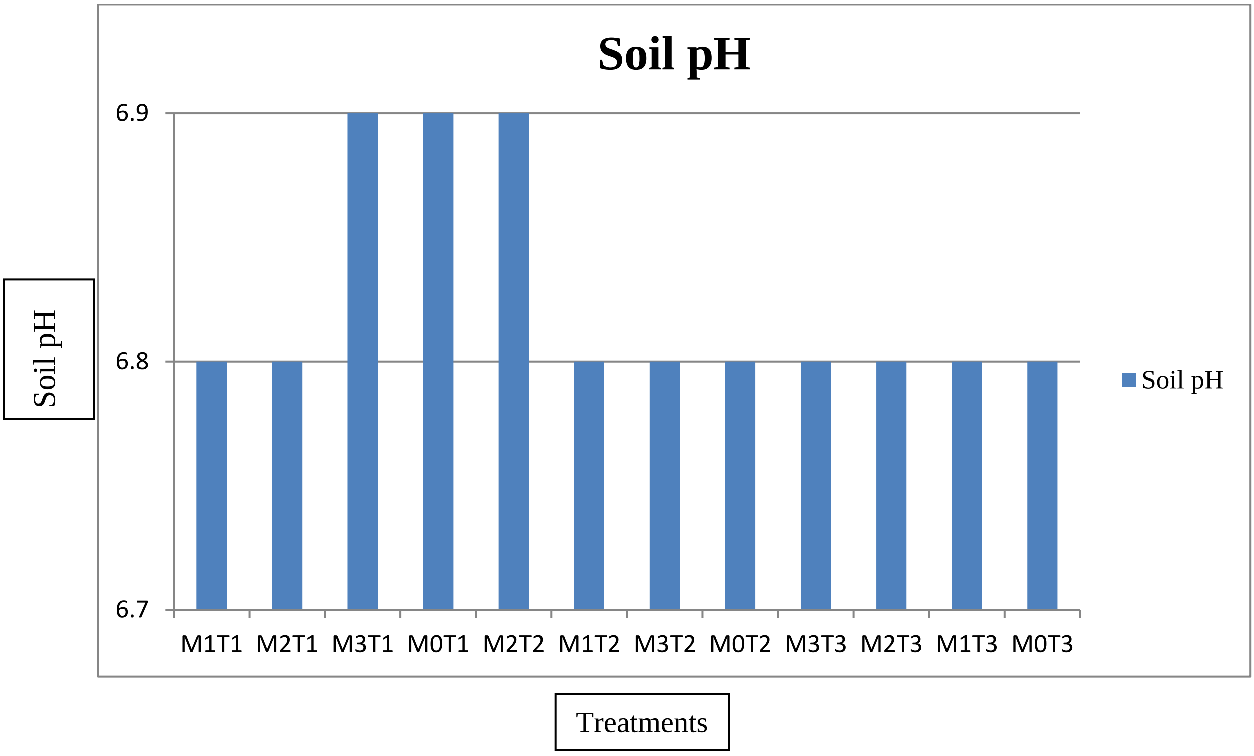

Fig.4.15 Soil pH after 2nd week of transplanting

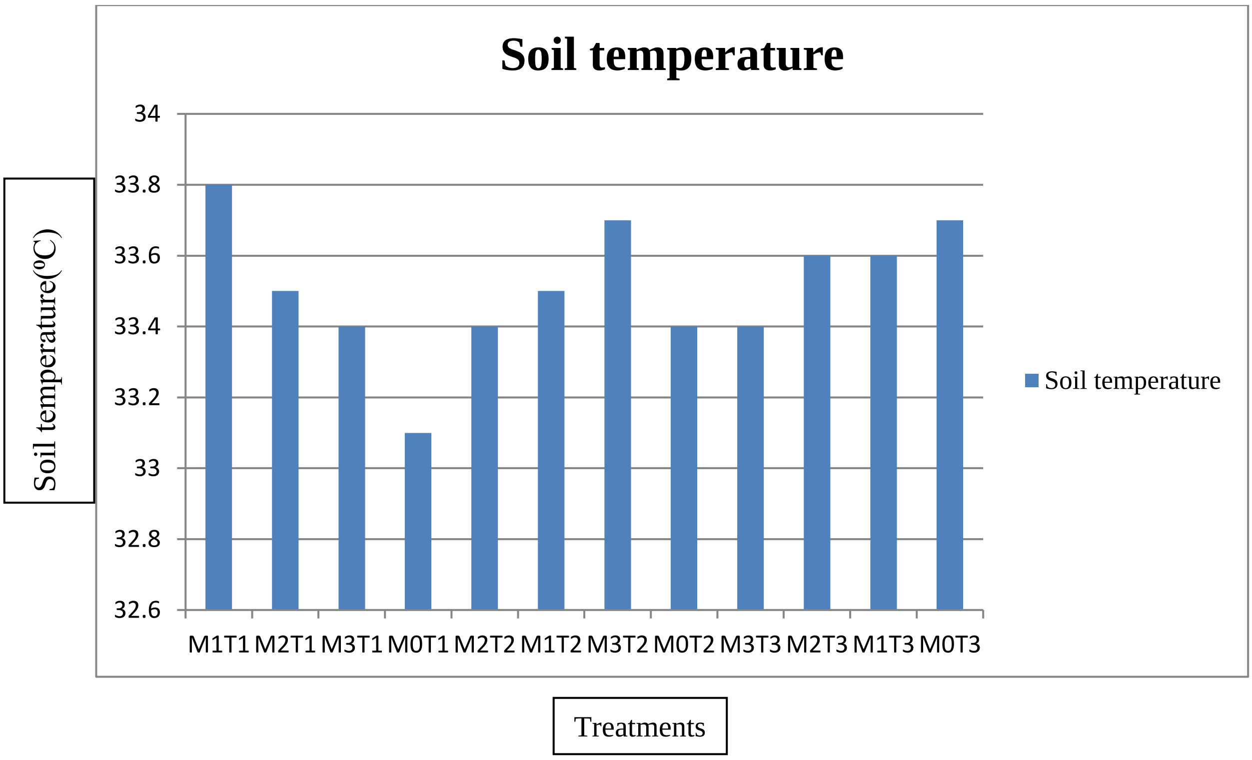

Fig.4.16 Soil temperature after 2nd week of transplanting

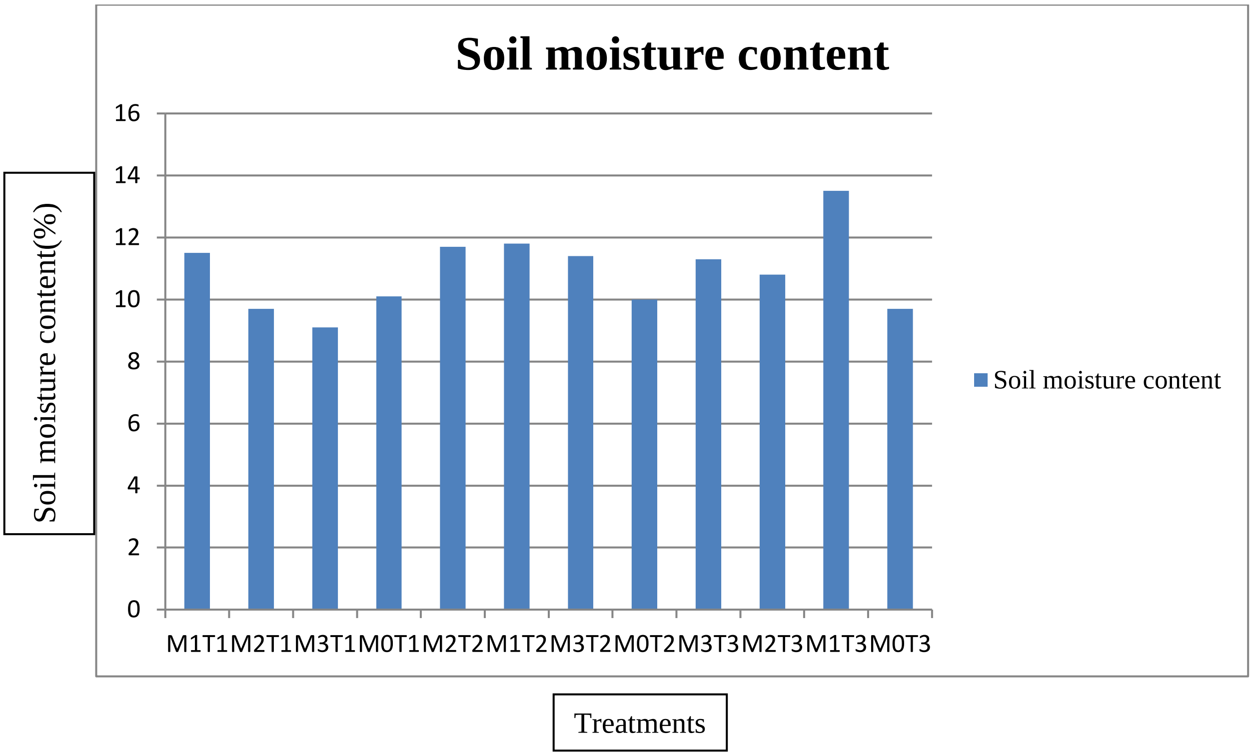

Fig.4.17 Soil moisture content after 2nd week of transplanting

From the table 4.10 and figures 4.15,4.16 and 4.17 shows there is not much significant difference between soil pH and soil temperature after 2nd week of transplanting. Soil pH in all treatments, value shows it is neutral and soil temperature is between 33.1^{0}C and 33.8^{0}C. The moisture content is observed less in control plot compared to mulched plots. The moisture content is more observed in 80% and 100% irrigation level of ETc compared to 60% of irrigation level of ETc. The moisture content is also observed more in black mulch which was followed silver/black mulch. From this it is clear that even though mulch is not having any significant influence on soil P^H and soil temperature, it is having influence on soil moisture content, can retain water effectively. The black mulch showed best performance and yellow/black mulch was almost par with silver/black mulch also followed good performance for retaining water on 2nd week after transplanting.

Table 4.10 Soil properties at 03/03/2021

Sl. No.	Treatment	Soil pH	Soil temperature(°C)	Soil moisture content(%)
1	M1T1	6.1	33.78	10.1
2	M2T1	6.9	33.4	16.3
3	M3T1	6.8	33.4	11.3
4	M0T1	6.9	33.17	9.6
5	M2T2	6.7	33.32	15.6
6	M1T2	6.8	33.41	12.0
7	M3T2	6.9	33.84	13.2
8	M0T2	6.7	33.62	10.1
9	M3T3	6.6	33.5	21.2
10	M2T3	6.8	33.1	14.8
11	M1T3	6.8	33.7	16.5
12	M0T3	6.9	33.3	14.5

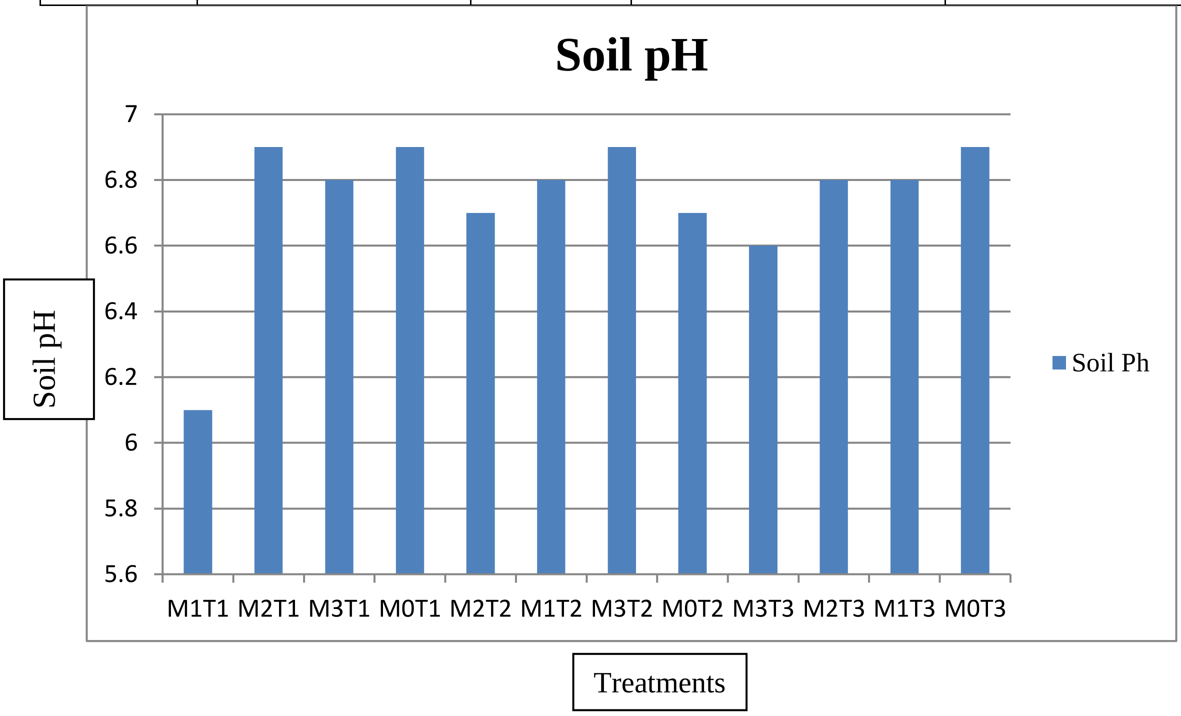

Fig.4.18 Soil pH after9th week of transplanting

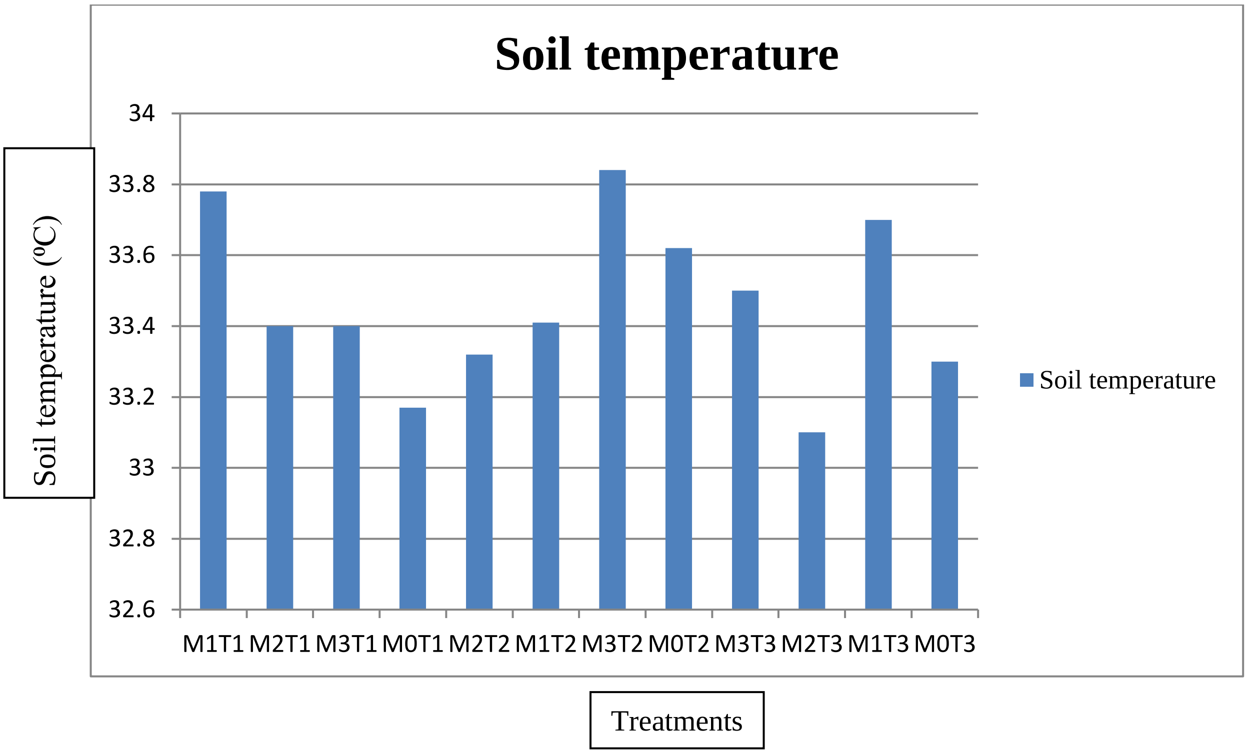

Fig.4.19 Soil temperature after9th week of transplanting

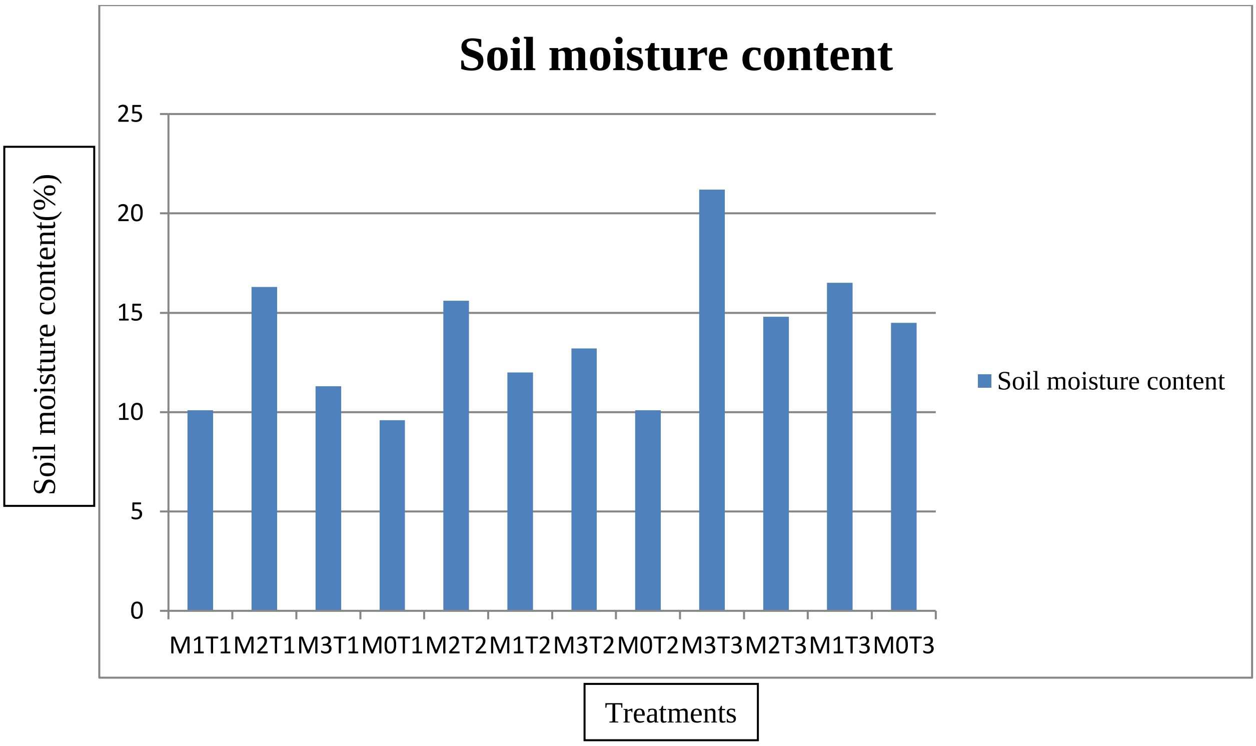

Fig.4.20 Soil moisture content after9thweek of transplanting

From the table 4.11 and figures 4.18,4.19 and 4.20 shows there is not much significant difference between soil pH and soil temperature after 9th week of transplanting. Soil pH in all treatments, value shows near to or above 6.6 in almost all treatments. Soil temperature is between 33.1^0C and 33.84^0C. The moisture content is observed less in control plot compared to mulched plots. The moisture content is more observed in 80% and 100% irrigation level of ETc compared to 60% of irrigation level of ETc. Yellow/black mulch shows a moisture content near to 15% for all irrigation levels. The maximum moisture content of 21.2% is observed in silver/black mulch for 100% irrigation level of ETc. From this it is clear that even though mulch is not having any significant influence on soil P^H and soil temperature, it is having influence on soil moisture content, can retain water effectively. The yellow/black mulch maintained almost same level of moisture content for different irrigation levels. The silver/black mulch showed good performance for retaining water for maximum irrigation level.

As a whole all the above charts help to find out the most suitable type of mulch and irrigation level for the growth and yield of brinjal crop. It was observed that application of mulches increased all the growth parameters significantly over the unmulched treatment at all the stages. The growth in terms of length of plant and stem girth is maximum for silver/black mulch with all most all cases of 100% irrigation level of ETc. The growth of number of leaves is slightly higher in black mulch with 100% irrigation. Since the two irrigation levels (80% and 100% of ET) doesn’t cause much noticeable changes in growth, a combination of yellow/black mulch with 80% irrigation level can be adopted. Also, black mulch with 100% irrigation level can also be adopted as its growth level in comparison to yellow/black mulch with 100% irrigation is very less.

4.6 Observation of yield from various treatments in the field

The yield upto 4th harvest was observed under each treatment combinations. They are tabulated and plotted as shown in Table 4.11 and Fig. 4.21.

Table 4.11 Yield from various treatments up to 4^th^ harvest

TREATMENT	YIELD UP TO 4TH HARVEST (kg)
M1T1	2.4
M2T1	2.4
M3T1	2.5
M0T1	1.9
M1T2	2.65
M2T2	3.65
M3T2	2.90
M0T2	1.95
M1T3	2.15
M2T3	2.25
M3T3	2.45
M0T3	1.75

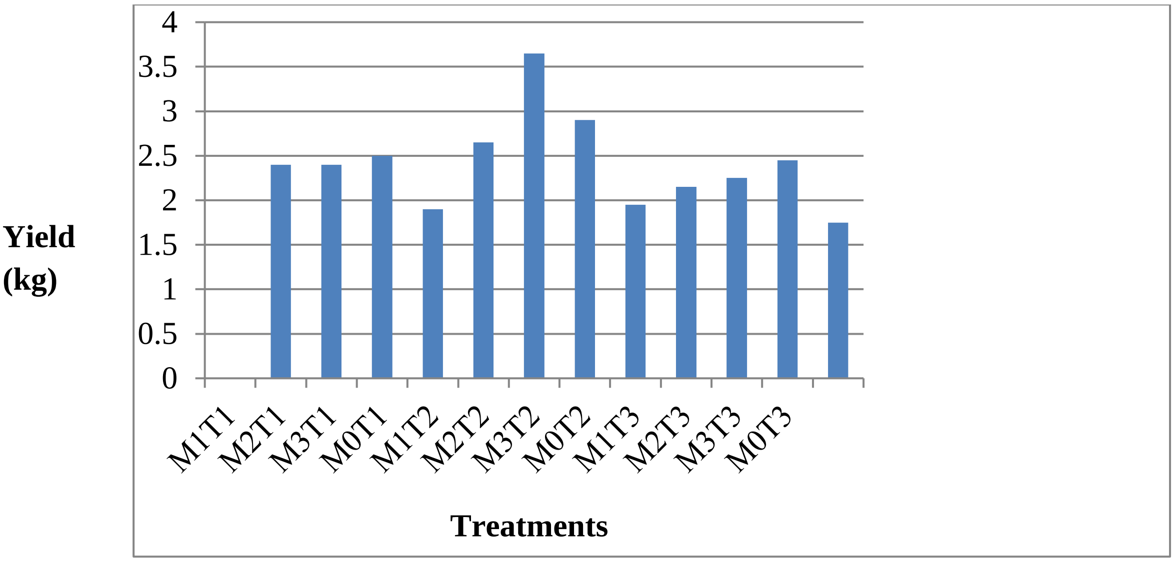

Fig.4.21 Yield from various treatments up to 4th harvest

After one month of harvesting, it was observed that the M3T2 combination have higher yield which was followed by M0T2 and M2T2 without much difference. The results obtained are similar to the results of the study conducted by Sreedevi *et al.,* The data on number of fruits per plant revealed that significantly maximum number of fruits were recorded under drip irrigation 80 per cent ET with silver colour mulch. While, lowest was recorded in control plot without mulch (Sreedevi *et al.*, 2017).

As a whole all the above charts help to find out the most suitable type of mulch and irrigation level for the growth and yield of brinjal crop. It was observed that application of mulches increased all the growth parameters significantly over the control treatment at all the stages. The growth in terms of length of plant and stem girth is maximum for yellow/black mulch with 100% irrigation. But there is no significant difference in growth for yellow/black mulch with 100% irrigation and 80% irrigation. The growth of number of leaves is very slightly higher in black mulch with 100% irrigation. Since the two irrigation levels (80% and 100% of ET) doesn’t cause much noticeable changes in growth, a combination of yellow/black mulch with 80% irrigation level can be adopted. Also, black mulch with 100% irrigation level can also be adopted as its growth level in comparison to yellow/black mulch with 100% irrigation is very less.

SUMMARY AND CONCLUSION

CHAPTER 5

SUMMARY AND CONCLUSION

Brinjal is a staple vegetable, which is tender, bushy, erect plant, belongs to the Solanaceae family. It requires a long, warm growing season to produce optimum yields and is very susceptible to injury due to frosts and long period of cold temperatures.

Drip irrigation is an effective tool for conserving water resources and it increase water use efficiency by reducing soil evaporation and drainage losses, maintain soil moisture conditions that are favourable to crop growth and helps to sustain the productivity of the land.

Plastic mulching in agriculture has increased dramatically throughout the world. This helps to improve crop performance, minimizes the nutrient losses, reduced weed pressure, conserves moisture, reduces certain insect pests, higher crop yields, and more efficient use of soil nutrients. The present study was designed to performance evaluation of coloured plastic mulch and drip irrigation on brinjal under open field condition and to find out the best suited mulch type in combination with irrigation to use.

Based on this work, field experiment was conducted at the open field near farm, KCAET, Tavanur. The experiment was laid out in randomized block design with three main treatments with irrigation levels (60, 80, 100 % ET_C), four sub treatments with mulches (black, silver/black and yellow/black mulch) and its three replications.

Following conclusions are summarized from the present study:

- The irrigation water requirement of brinjal crop was lowest at initial stage in drip irrigation and increases for development, mid, late and harvest stages.
- The M3T2 replication has increased yield and high values of growth parameters compared to other replications.
- The growth components like height of plant, number of leaves and stem girth were significantly influenced by drip irrigation levels as well as the type of mulch used. The maximum height of plant (66.4), stem girth (2.6) was recorded under drip irrigation at 60%ET_c with silver on black plastic mulch when compared to other treatments throughout the growing period while the maximum number of leaves were observed under irrigation at 100%ET_c with silver on black mulch.

- The data on yield per treatment revealed that significantly maximum yield was recorded under drip irrigation 80 per cent ET with silver/black mulch which also shows about 20% of water is saved during the treatment. While, lowest was recorded in control plot without mulch.

On the basis of experimental observations and analysis, it is concluded that silver on black mulch out of all three colored plastic mulches studied (black, silver/black and yellow/black mulch) found to be best for growth in brinjal crop and it is able to maintain optimum growing conditions that are required for crop to flourish well and results in higher yield of fruit throughout the growing season and brinjal crop responded well to drip irrigation with plastic mulches.

Suggestions for further work

In the light experience gained during the course of investigation and results obtained it is felt that the following point should be given to consideration for further studies.

- The experiment should be conducted during different season also to see its effectiveness during different season on different color mulches.
- The above treatments should be tested with different varieties of brinjal in different environment to assess the susceptibility of various varieties/hybrids.
- It is worthwhile to study the effect of various levels of fertigation along with irrigation levels.

REFERENCES

REFERENCES

Allen, R.G., Pereira, L.S., Raes, D., and Smith, M. 1998. Crop evapotranspiration-guidelines for computing crop water requirements, *FAO Irrigation and drainage paper.* 56(97): 17-28.

Bastug, R., Karaguzel, O., Aydinsakir, K. and Buyuktas, D. 2006. The effects of drip irrigation on flowering and flower quality of glasshouse gladiolus plant. *Int. J. Agric. Water. Management.*81:132-144.

Baye, Berihun. 2011. Effect of mulching and amount of water on the yield of tomato under drip irrigation. *J. Hort.* 3: 200-206.

Bhat, S. A., Pandit, B. A., Khan, J. N., Kumar, R., and Jan, R., 2017. Water Requirements and Irrigation Scheduling of Maize Crop using CROPWAT Model. *Int. J. Curr. Microbial. App. Sci*. 6 (11): 1662-1670.

Biswas, S., K., Akanda, A., R., Rahman, M., S., and Hossain, M., A. 2015. Effect of drip irrigation and mulching on yield, water-use efficiency and economics of tomato. *Plant. Soil. Environment.* 61(3):97-102.

Bozkurt, S., Yazar, A. and Mansuroglu, G. S. 2011. Effects of different drip irrigation levels on yield and some agronomic characteristics of raised bed planted corn. *Afr. J. Agric. Res*., 6(23): 5291- 5300.

D´ıaz-P_erez, J. C. and Eaton, T. E. 2015. Eggplant (Solanum melongena L.) Plant Growth and Fruit Yield as Affected by Drip Irrigation Rate. hortscience 50(11):1709–1714

Devaranavadgi, V. S., Shirahatti, S. S. and Patil, M. G. 2011. Effect of different drip irrigation levels on growth and yield of bitter gourd (*Momordica chanrantia*L.) in semi-arid conditions of Karnataka. *Int. J. Agric. Eng*., 4(2): 179-182.

Hakkim, A. V. M. and Chand, J. A. R. 2014. Effect of drip irrigation levels on yield of salad cucumber under naturally ventilated polyhouse. *Int. Org. Sci. Res*., 4(4): 18-21.

Kahangi, H. K., Rajablarijani, H. R. and Nasri, M., 2014, Effect of mung bean living mulch, plastic mulch and herbicides on foragemaize yield and weed control. *Int. J. Agri. Crop Sci.*, 7 (14):1452-1456.

Manohar, N., Nagaraj, K., Patil, M.G., 2001. Studies on evapotranspiration and consumptive use of different crops - part 2 (Vegetable crops). *Karnataka. J. Agric. Sci*., 14(2): 281-285.

Rajasekar, M., Nandhini, D. U., Swaminathan, V. and K Balakrishnan., 2017. Impact of mulching and fertigation on growth and yield of grafted brinjal (*Solanum melongena* L.) under drip irrigation system. *Int. J. Chem. Stud*., 5(3): 163-166.

Rajbir, S., Kumar, S., Nangare, D., D., and Meena, M., S. 2009. Drip irrigation and black polyethylene mulch influence on growth, yield and water-use efficiency of tomato. *African. J. Agric. Research.* 4(12):1427-1430.

Sankar, V., Thangasamy, A. and Lawande, K. E. 2015. Effect of drip irrigation on onion (*Allium cepa*) seed production under Western Maharashtra condition. *Inj. J. Tropical. Agric*., 33(2): 621-625.

Singh, I.S., Awasthi, O.P., and Meena, S.R. 2006. Influence of mulch on soil hydrothermal regimes, leaf and soil nutrient concentrations, growth and fruit yield of brinjal grown under arid ecosystem. *Agropedology*16 (2): 112-116.

Sreedevi, S., Babu, M.B., Kandpal, K., Satishkumar, U., and Kanannavar, T.S., 2017. Effect of colour plastic mulching at different drip irrigation levels on growth and yield of brinjal. *J. Farm Sci.*,30(4):525-529.

Tariq.M.S., A. Bano, and K. M. Qureshi, "Response of strawberry (Frageriaannanasa) cv. Chandler to different mulching materials," *Science, Technology and Development*, vol. 35, no. 3, pp. 117–122, 2016.

Trivedi, H., Kumar, R., Yadav, R., Das, B., and Bist, A.S. 2016. Effect of drip irrigation on yield and water use efficiency on brinjal. *Int. J. Eng. Sci. Research. Technol.* 5(10):07-17.

Xiukang, W. and Yingying, X. 2016. Evaluation of effect of irrigation and fertilization by drip fertigation on tomato yield and water use efficiency in greenhouse. *Int. J. Agronomy*. 6(3): 01-10.

APPENDICES

APPENDIX 1

Nutritional value of brinjal per 100g

Energy	104 kJ
Carbohydrates	5.0 g
Sugars	3.53 g
Dietary fiber	3 g
Fat	0.3 g
Protein	0.98 mg
Vitamins	
Thiamine (B1)	0.039 mg
Riboflavin (B2)	0.037 mg
Niacin (B3))	0.649 mg
Pantothenic acid (B5)	0.281 mg
Vitamin B6	0.084 mg
Vitamin C	2.2 mg
Vitamin E	0.3 mg
Vitamin K	3.5 µg
Minerals	
Calcium	18 mg
Magnesium	14 mg
Manganese	0.232 mg
Phosphorus	24 mg
Potassium	229 mg
Zinc	0.16 mg
Iron	0.38 mg

APPENDIX 2

Schedule of cultural operations carried out during crop duration of brinjal

Sl No.	Cultural operations	Date
1	Land preparation	
2	Bed preparation	23/12/2020
3	Drip installation	24/12/2020
4	Application of mulches	25/12/2020
5	Transplanting of healthy seedlings	30/12/2020
6	Weeding	03/02/2021
7	First harvesting	15/04/2021

APPENDIX 3

Particle size distribution

Sieve size	Weight of soil retained	% Of soil retained	Cumulative%	% Finer
2	97.7	19.5	19.5	80.5
0.6	97.5	19.5	39	61
0.425	48.7	9.74	48.74	51.26
0.3	73.9	14.78	63.52	36.48
0.212	159.3	31.86	95.38	4.62
0.15	12.5	2.5	97.88	2.12
0.075	8.8	1.76	99.64	0.36
Pan	1.6	0.32	99.95	

APPENDIX 4

Biometric observations taken at 13 DAT

Biometric Observations-12/01/2021				
Treatment	**Replication**	**Height of plant (cm)**	**Number of leaves (Nos)**	**Girth of stem (cm)**
M1T1	R1	9	2	0.75
	R2	7	2	0.7
	R3	8.6	1	0.65
M2T1	R1	8.2	3	0.65
	R2	8.4	2	0.95
	R3	9.5	3	1
M3T1	R1	8.5	2	0.9
	R2	10.5	2	0.9
	R3	8.3	2	1
M0T1	R1	6.6	3	0.9
	R2	7.4	1	0.8
	R3	6	1	0.75
M2T2	R1	6.7	2	0.65
	R2	3.5	2	0.75
	R3	9	3	0.9
M1T2	R1	10	2	1
	R2	7.1	1	0.75
	R3	9	2	1
M3T2	R1	7.5	4	0.85
	R2	7.6	3	0.9
	R3	6.7	3	0.75
M0T2	R1	7	3	0.65
	R2	8.2	3	0.9
	R3	6	2	0.65
M3T3	R1	9.1	2	0.75

	R2	11.1	3	0.75
	R3	8.1	1	0.6
M2T3	R1	7.6	2	0.75
	R2	2.1	4	0.65
	R3	7.1	1	0.75
M1T3	R1	6.3	2	0.6
	R2	6.4	2	0.6
	R3	3	3	0.5
M0T3	R1	4.4	4	0.75
	R2	5.6	2	0.65
	R3	3.1	2	0.5

APPENDIX 5

Biometric observations taken at 31 DAT

Biometric Observations-29/01/2021				
Treatment	**Replication**	**Height of plant (cm)**	**Number of leaves (Nos)**	**Girth of stem (cm)**
M1T1	R1	10	5	1.2
	R2	7.5	4	1.5
	R3	10	5	2
M2T1	R1	9.5	9	1.1
	R2	9.5	16	1.8
	R3	10.5	6	1.6
M3T1	R1	9.5	10	2
	R2	10	8	1.6
	R3	10.5	9	2
M0T1	R1	8.5	5	1.6
	R2	8	3	1.9
	R3	8	5	1.5
M2T2	R1	7.5	12	1
	R2	9	10	1.5
	R3	14	13	1.8
M1T2	R1	10.2	5	1.8
	R2	7.2	3	2.1
	R3	7	7	1.6
M3T2	R1	12	9	0.8
	R2	15	20	2
	R3	8.5	12	2
M0T2	R1	13	20	1.9
	R2	10	22	1.6
	R3	9	12	1.7
M3T3	R1	11.2	7	1.8

	R2	12	9	1.7
	R3	9	7	1.5
M2T3	R1	9.5	7	1.7
	R2	8	12	1.8
	R3	7.2	4	1.6
M1T3	R1	8	7	1.6
	R2	10	6	2
	R3	6	5	0.9
M0T3	R1	-	-	-
	R2	6.5	9	1.4
	R3	5	6	1

APPENDIX 6

Biometric observations taken at 55 DAT

Biometric Observations-26/02/2021				
Treatment	**Replication**	**Height of plant (cm)**	**Number of leaves (Nos)**	**Girth of stem (cm)**
M1T1	R1	42	22	2.2
	R2	36.2	24	2.5
	R3	41.2	23	2.5
M2T1	R1	39.5	20	2.1
	R2	37.5	30	2.8
	R3	57.3	24	2.6
M3T1	R1	34.3	21	2.6
	R2	48.2	19	2.6
	R3	50.4	22	2.4
M0T1	R1	35.7	15	2.6
	R2	40.1	17	2.9
	R3	33.8	16	2.5
M2T2	R1	28.1	23	2.1
	R2	36.5	29	2.5
	R3	58	30	2.8
M1T2	R1	49.4	28	2.8
	R2	27.7	13	2.9
	R3	26.2	16	2.6
M3T2	R1	54.6	20	1.8
	R2	48.2	41	2.6
	R3	32.2	26	3.0
M0T2	R1	50.7	24	2.9
	R2	50.3	18	2.6
	R3	39	19	2.7
M3T3	R1	46.6	28	2.8

	R2	51.4	31	2.6
	R3	32.6	36	2.7
M2T3	R1	30.2	33	2.9
	R2	29.3	30	2.8
	R3	25.4	24	2.6
M1T3	R1	36.4	37	2.6
	R2	50.3	26	2.2
	R3	22.1	24	1.9
M0T3	R1	-	-	-
	R2	20.2	21	2.6
	R3	19.1	24	2.5

PERFORMANCE EVALUATION OF COLOURED PLASTIC MULCH AND DRIP IRRIGATION ON BRINJAL UNDER OPEN FIELD CONDITION

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ABSTRACT OF THESIS

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ABSTRACT

A field experiment was conducted, with a view to study the effect of different type of mulches along with irrigation levels on growth, yield and quality of brinjal (*Solanum melongena* L.) at an open field of the Instructional Farm, KCAET, Tavanur. The experiment was comprised of 12 treatments in a randomized block design with three replications, namely M1T1: 60 % ETc with black mulch, M2T1: 60% ETc with yellow/black mulch, M3T1: 60% ETc with silver/black mulch, M0T1: 60% ETc with no mulch, M1T2: 80% ETc with black mulch, M2T2: 80% ETc with yellow/black mulch, M3T2: 80% ETc with silver/black mulch, M0T2: 80% ETc with no mulch M1T3: 100% ETc with black mulch, M2T3: 100% ETc with yellow/black mulch, M3T3: 100%ETc with silver/black mulch, M0T3: 100% ETc with no mulch.

The yield as well as growth and yield attributing characters of brinjal were found to be significantly affected by different treatments of mulches as well as irrigation. The vegetative parameters such as maximum plant height, number of leaves per plant and stem girth were recorded under the treatment of silver/black mulch with 80% irrigation followed by yellow/black mulch with 80% irrigation. The data on yields per treatment revealed that significantly maximum yield was recorded under drip irrigation 80 per cent ET with silver/black mulch. While, lowest was recorded in control plot without mulch Based on the results obtained in the investigation, it can be concluded that the maximum growth rate was obtained under silver/black mulch followed by black mulch which were significantly superior over control mulch. Also, the best irrigation level was adopted as 80% of ETc on the basis of growth rate and economic considerations.