



Study Of Response Of Chilli Under Shade Net And Open Field Cultivation

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Abstract: The present investigation was conducted to Study of Response of Chilli under Shadenet and open field cultivation during September to November 2018. The results revealed that growing of chilli vegetables in shade net with mulching situations favoured plant growth and yield. The chilli vegetables grown in shade net with mulching situation favoured plant growth attributes and gave higher production as compared to open field situation. Chilli grown in 50 % shade net with mulching produced vigorous growth in terms of plant height, root depth, number of branches and leaf area. The study revealed that crop yield was increased under shade net as compared to open field cultivation along with water saving of about 50-60 % in covered cultivation. The influence of environmental variable temperature, relative humidity and evaporation were studied. Optimum environmental conditions in shadenet caused plant height, number of branches, leaf area, root depth, number of chilli per plant, chilli length, and yield per plant to be higher in shade net house than open field. Hence, the growing of chilli under shade net house condition will be more profitable.

Keywords: Chilli, Shadenet, Open field, Mulching, yield.

I. INTRODUCTION

Chilli (*Capsicum annum L.*) is an important spice crop and belongs to the family Solanaceae. Chilli is widely cultivated throughout warm temperature, tropical and subtropical countries and it is native to Mexico. It is used in every Indian cuisine due to pungency, spicy taste, appealing odour and flavours. Chilli fruits are rich source of vitamin C, A and E. The area under chilli in India is 844 thousand hectares with production of 2106 thousand metric tonnes. India is the major producer, consumer and exporter of chillies and contributes 50 per cent to total world production. Export comprised chilli powder, dried chilli, pickled chillies and chilli oleoresin. In India, important chilli growing states are Andhra Pradesh (26 % area), Maharashtra (15 % area), Karnataka (11 % area), Orissa (11 % area) and Tamil Nadu (8 % area) forming more than 70 per cent area under its cultivation. The area under chilli in Maharashtra is 9,950 ha with an average production of 45.60 thousand metric tonnes. About 75% area under chilli production is in Ahmednagar, Jalgoan, Dhule, Nashik, Solapur, Kolhapur, Nanded, Nagpur, Amravti, Chandrapur and Usmnabad districts in Maharashtra.

Growing vegetable demand can be achieved through bringing additional area under cultivation crops and adoption of improved agro-techniques. Protected cultivation for vegetable can be used to improve the yield quantity and quality. The protected cultivation can solve the problems of low productivity during extreme weather conditions. Therefore in the present scenario of perpetual demand for vegetables and drastically shrinking land holding protected cultivation of vegetables crops suitable for domestic as well as export purpose in the best alternatives for using land and other resources more efficiently. Production of major crops under shade net cultivation plays an important role in improving the economic conditions of farmers. A study of the major crops under shade net cultivation marketing is necessary to improve the marketing system to aid development and provide efficient services in transfer of farm produce and input

from producers to consumers. An efficient marketing system minimizes cost and benefits in all sections of society. There is an urgent need to assess the cultivation and suitability of different vegetables under shade net house to meet the growing demand of the vegetables. The extents of abundance and deficiency in production cause considerable fluctuation in the prices and quality of leafy vegetables. The income per area is high. Producing vegetables under net house has several benefits including reduce use of pesticide, off-season vegetable production, advancing maturity, increased productive period and improved quality. A correct determination of irrigation scheduling is one of the main factors in achieving high yields and avoiding loss of quality in protected cultivation. Protected cultivation is a widely used technology to achieve optimum plant growth and more yield from unit area with increased input use efficiency.

The word mulch has probably derived from the German word "Molsh" means soft to decay, which apparently referred to the process or practice of covering the soil/ground to make more favourable condition for plant growth, development and efficient crop production. Mulches are usually done with the organic materials like green leaves, dry leaves, straw, rice husk, sugarcane trash, dry grasses, weeds and compost have been used for centuries. During last 60 years, the advent of synthetic material has altered the method and benefits of mulching. 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. Organic or inorganic soil mulches influence the crop in a number of ways. Plastic mulches can offer a barrier against weeds, moisture loss, nutrient loss, erosion, insect and disease injury, while it encourages plant establishment and an earlier crop of potentially higher quality. The combined effects of soil temperature, soil moisture and weed suppression not only work to improve crop growth but they also facilitate hand picking and lead to higher yield and increased fruit size. Increase in soil temperature by application of plastic mulch caused a significant reduction in pathogen levels. The effect of plastic mulch and its colour improves soil structure, crop growth and its development. Mulching reduces the deterioration of soil by way of preventing the runoff and soil loss, minimizes the weed infestation and checks the water evaporation. Thus, it facilitates more retention of soil moisture, helps in control of temperature fluctuations, improves physical, chemical and biological properties of soil, as it adds nutrients to the soil and ultimately enhances the growth and yield of crop.

The Solapur district comes under sub montane zone of Maharashtra, where the temperature during summer season goes upto 45°C. During summer season the chilli is grown for green chilli, where there is maximum demand in market; but because of shortage of irrigation water there is limitation for its cultivation. To overcome such a problems in the production of chilli in open field cultivation. In India, in spite of its great potential the yield per unit area is very low than that of developed countries, mainly due to the lack of proper production technologies especially, the environment and the nutrient management. This technique can play vital role in the developing countries like Indian for increasing agriculture production and productivity in off season also. Keeping in view the importance of shade net cultivation in the present work was taken up with the objectives of study the effect of shade net on environmental parameter, water requirement, effect of mulching on growth characteristics under shade net and open field for the chilli crop.

II. MATERIALS AND METHODS

The study was conducted during Kharif season of 2018-19 at Paniv, situated at an altitude of 493 m above mean sea level which comes under dry and hot region. The main source of rainfall is south west monsoon. It receives an annual average rainfall 550 to 650 mm. The maximum temperature goes as high as 45 °C during summer and minimum as low as 12 °C under winter months (Metrological dept. in Shriram College of Agriculture, Paniv). The experimental plot selected was with uniform topography & well drained soil with good tilth. Soil type was black cotton with pH 6.5 and electrical conductivity 0.66 ds/m. (Soil analysis in Soil Science lab of Shriram College of Agriculture, Paniv)

The land was ploughed with tractor operated M.B. plough. Ridges and furrow were prepared for transplantation of chilli by using M.B. plough. For water application drip irrigation system consisting of 2 hp pump, sand filter, NRV, 63 mm main line, venturi, 50 mm submain, flush valve, 16 mm lateral with 2 LPH inline dripper was installed on ridges. Mulching paper of 25 µ thickness, 2 ft width and 12 ft length was installed on ridges for weed control and to reduce the loss of water through evaporation. Net plot size selected for experimentation was 50 ft².

Chilli (*Capsicum annum L.*) crop of Pusa Jwala variety was cultivated in September at a spacing of 1.5 ft between plants and 1ft between rows with a pathway of 1.5ft between the pairs on raised bed of 0.5ft height and 1ft width under shade net house of 50 % shade factor and in open field with and without mulching. The crop growth along with crop yield was monitored.

The experiment was laid out with 4 treatments as mention below:

T1 = Open field cultivation without mulching.

T2 = Open field cultivation with mulching

T3 = Shade net cultivation without mulching.

T4 = Shade net cultivation with mulching.

Biometric observation such as Plant height (cm), Number of branches, Leaf area (cm²), Number of days required for flower initiation, Number of days required for fruit initiation, Number of days required for first harvesting, Root depth (cm) for chilli crop were recorded at 15 days interval upto 90 days (maturity) by selecting 8 random plants. Chilli yield such as Chilli length (20 Chilli selected in each treatment), No. of Chilli per plant, Weight of chilli per plant (gm), Yield per plot (kg) and Yield per ha (tonne) were recorded. The data obtained was subjected to statistical analysis using analysis of variance (ANOVA). Moisture content of soil, Soil pH and Crop water requirement of crop was measured using standard formulae and procedures.

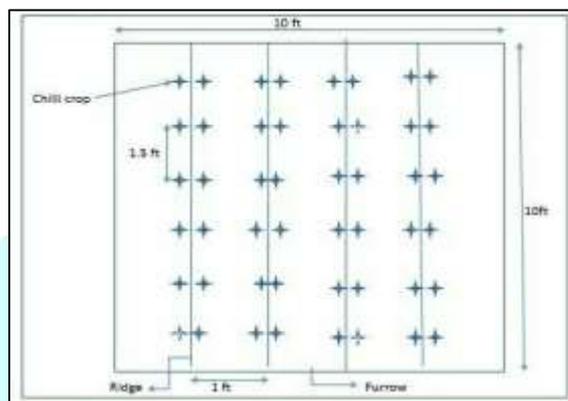


Fig. 1 Field Layout

III. RESULTS AND DISCUSSION

The planting of chilli plant was carried out in the month of September, 2018 and fruit harvesting was continued up to November 2018. Relative humidity%, Temperature °C and Evaporation mm/day recorded were in the range of 65-93%, 12.1-28.1°C and 0.2 to 2.7 mm/day respectively in shadenet and 57-89%, 19.5-35°C & 0.8-6 mm/day in open field condition respectively. The crop water requirement for chilli was computed for the duration of September to November. The water requirement varies from maximum 1527.40 lit in the month of October to minimum 308.84 lit in the month of September for open field and maximum 758.24 lit in the month October to minimum 144.76 lit in the month September for shade net. 50-60% water saving was observed in shadenet as compared to open field condition due to controlled temperature, high relative humidity and less evaporation in shadenet.

Influence on biometric observation of chilli crop under different treatment.

Plant height, number of branches per plant of chilli and leaf area recorded at 15, 30, 45, 60, 75 and 90 days after transplanting was influenced by different treatment as shown in fig 2, fig 3 and fig 4 respectively. The result showed that as the number of days increased the plant height, number of branches per plant of chilli and leaf area were rapidly increased (maximum level) upto 60 days. i.e. upto full vegetative growth period of chilli. After that these parameters becomes constant due to starting of flowering and fruiting stage after 60 days.

The Plant height, number of branches per plant of chilli and leaf area was maximum/more in shade net with mulching cultivation as compared to other type of cultivation due to optimum environmental conditions available for growth of plant in shadenet. Plant height, number of branches per plant of chilli and leaf area cultivated in open field without mulching was minimum/less and it was gradually increased as protected cultivation of mulching and shadenet increased.

Plant height (cm)

Among all the treatments, shadenet with mulching recorded the maximum plant height of 92.15 cm followed by shadenet cultivation without mulching (85.50 cm) and the minimum plant height was observed for open field cultivation (40.42 cm).

Number of branches per plant

Among all the treatments, shadenet with mulching recorded the maximum number of branches (27) followed by shadenet cultivation without mulching (25) and the less number of branches were observed for open field cultivation (18).

Leaf area (cm²)

Among all the treatments, shadenet with mulching recorded the maximum leaf area (115.91 cm²) followed by shadenet cultivation without mulching (101.30 cm²) and minimum leaf area was observed for open field cultivation (21.68 cm²).

Root depth of chilli (cm)

Root depth (cm) was recorded at the time of completing harvesting. The root depth of chilli was maximum in open field cultivation because in open field cultivation the root goes deep into soil for meeting their high water requirement. Root depth of chilli was minimum in shade net with mulching because in shade net the temperature was low and relative humidity was high. Due to this parameter the moisture content was higher in shade net with mulching and the root met water requirement earlier than any other treatments which adversely affects the root growth.

Among all the treatments, open field cultivation recorded the maximum root depth (9 cm) followed by open field with mulching (8.33 cm) and the minimum root depth was observed for shadenet with mulching (5.32 cm).

Number of days required for flower and fruit initiation

Flowering set time of chilli plant for both the shadenet treatments was found early (45 days) than that of both the open field treatments (50 days) whereas fruit initiation under both the treatments of shade net was 8-9 days earlier than open field treatments.

This may be due to conservation of moisture, no adverse effect of disease and pest and weed control under micro climate had possible early vegetative growth than open condition.

Number of days required for harvesting of chilli

Number of days required for first and second harvesting after transplanting for both the shadenet treatments was found minimum (72 and 83 days respectively) as compared with both open field treatments (83 and 90 days respectively). This may be due to due to early and higher vegetative growth and early flower and fruit initiation s in both the shadenet treatments as compared with both the open field treatments.

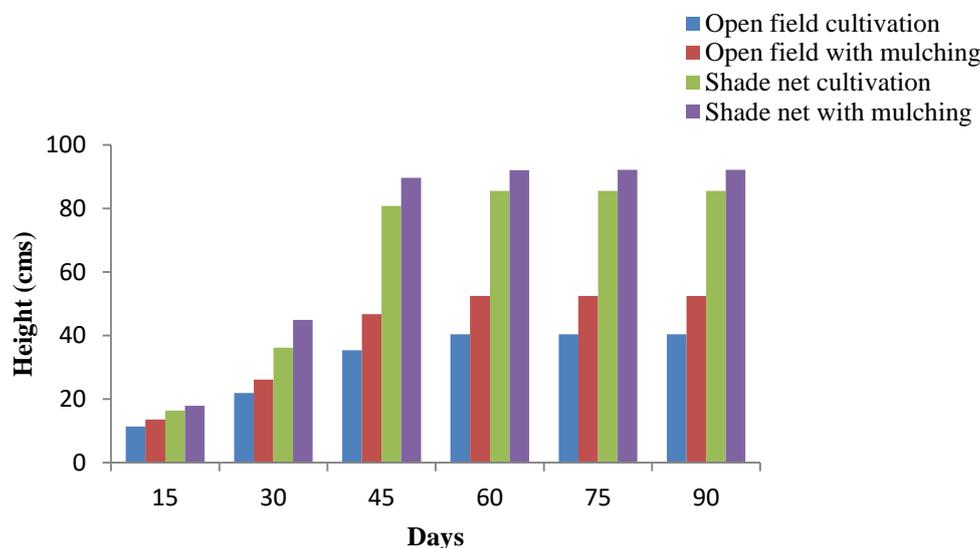


Fig. 2 Effect of different cultivation treatments on height of chilli plant

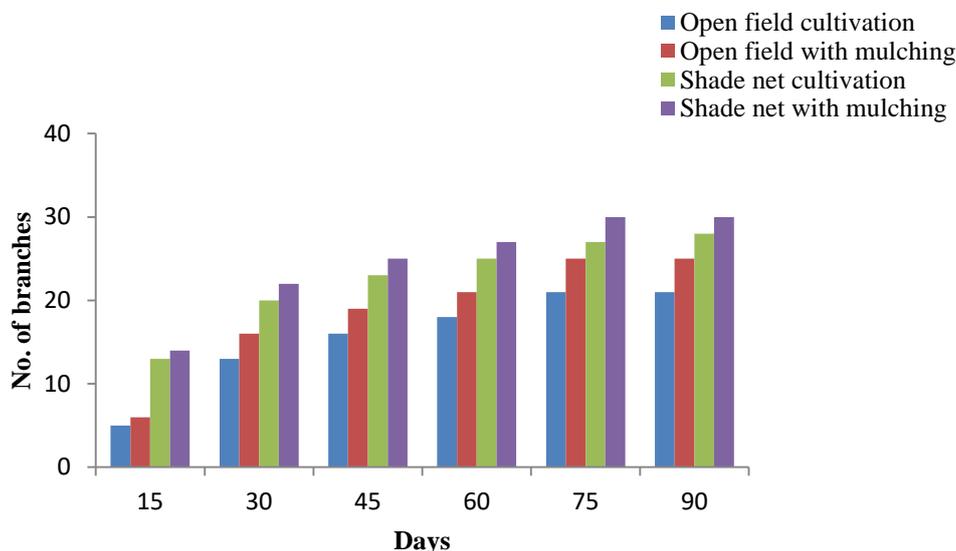


Fig. 3 Effect of different cultivation treatments on number of branches of chilli plant

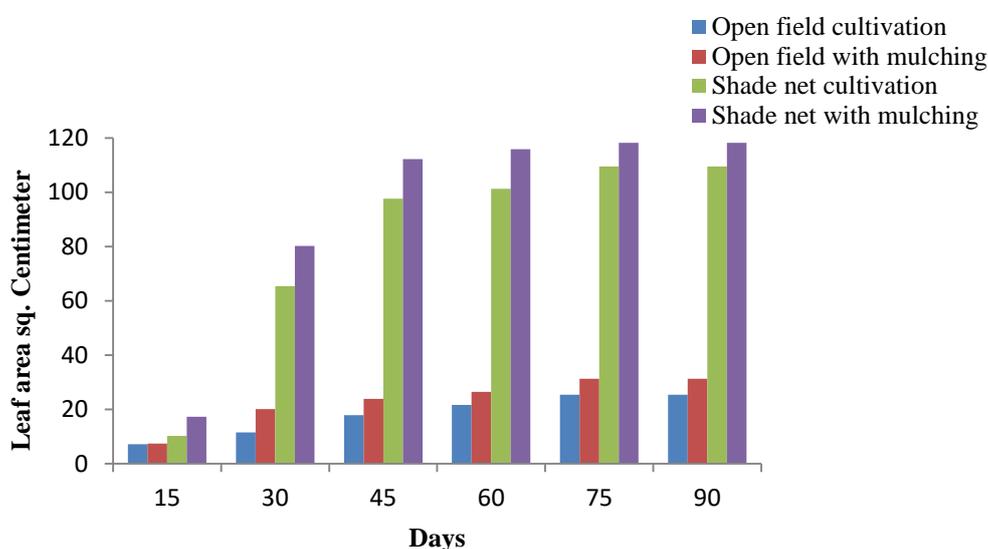


Fig. 4 Effect of different cultivation treatments on leaf area of chilli plant

Influence on yield observation of chilli crop under different treatment.

Weight, length, number of chilli per plant and yield of chilli

Weight, length, number of chilli per plant and yield of chilli were maximum/more in shade net with mulching cultivation as compared to other type of cultivation due to optimum environmental conditions available for growth of plant in shadenet which provided advancing maturity, improved quality and quantity of product. Weight, length, number of chilli per plant and yield of chilli were minimum/less in open field without mulching and it was gradually increased as protected cultivation of mulching and shadenet increased.

Weight of chilli (gm)

Weight of Twenty chilli per treatment was found maximum for shadenet with mulching and shadenet without mulching (105 and 102 gm respectively) at first harvesting and (115 and 110 gm respectively) at second harvesting whereas length of chilli per plant was found minimum for open field with mulching and open field without mulching (62 and 55 gm respectively) at first harvesting and (72 and 65 gm respectively) at second harvesting. (fig. 7)

Length of chilli (cm)

Length of chilli per plant was found maximum for shadenet with mulching and shadenet without mulching (10.67 and 9.99 cm respectively) at first harvesting and (12.10 and 11 cm respectively) at second harvesting whereas length of chilli per plant was found minimum for open field with mulching and open field without mulching (7.9 and 6.4 cm respectively) at first harvesting and (8.5 and 8 cm respectively) at second harvesting. (fig. 8)

Number of chillies

Number of chillies per plant was found maximum for shadenet with mulching and shadenet without mulching (20-22 and 18-20 respectively) at first harvesting and (25-24 and 20-22 respectively) at second harvesting whereas number of chillies per plant was found minimum for open field with mulching and open field without mulching (25-27 and 20-22 respectively) at first harvesting and (17-19 and 15-18 respectively) at second harvesting.

Yield of chilli per treatment (Kg)

Yield of chilli per treatment per plot was found maximum for shadenet with mulching and shadenet without mulching (1.49 and 1.17 Kg respectively) at first harvesting and (1.65 and 1.21 Kg respectively) at second harvesting whereas length of chilli per plant was found minimum for open field with mulching and open field without mulching (0.79 and 0.67 Kg respectively) at first harvesting and (72 and 65 gm respectively) at second harvesting. (fig. 9)

Pest and disease under different treatment

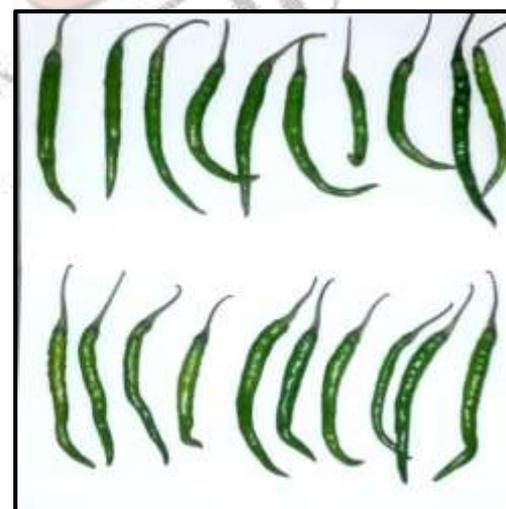
The result concluded that the pest and disease attack on chilli crop is minimum under both the treatment in shade net cultivation as compared to open field treatments. The reduction of pest and disease attack on chilli under this treatment was due to the controlled environment and better heating of soil under black polythene mulching of 25 micron. Shade net cultivation protected the crop from microorganism attack.



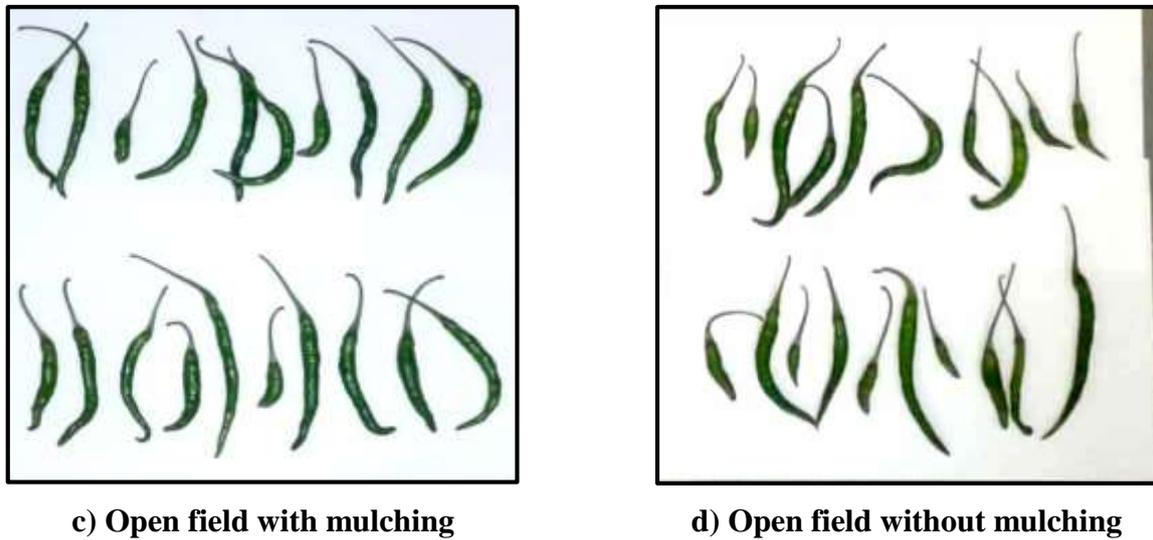
Fig. 5 Chilli cultivation with & without mulching in open field & under shadenet



a) Shade net with mulching



b) Shade net without mulching



c) Open field with mulching

d) Open field without mulching

Fig. 6 Quality comparison of chilli grown under different treatments

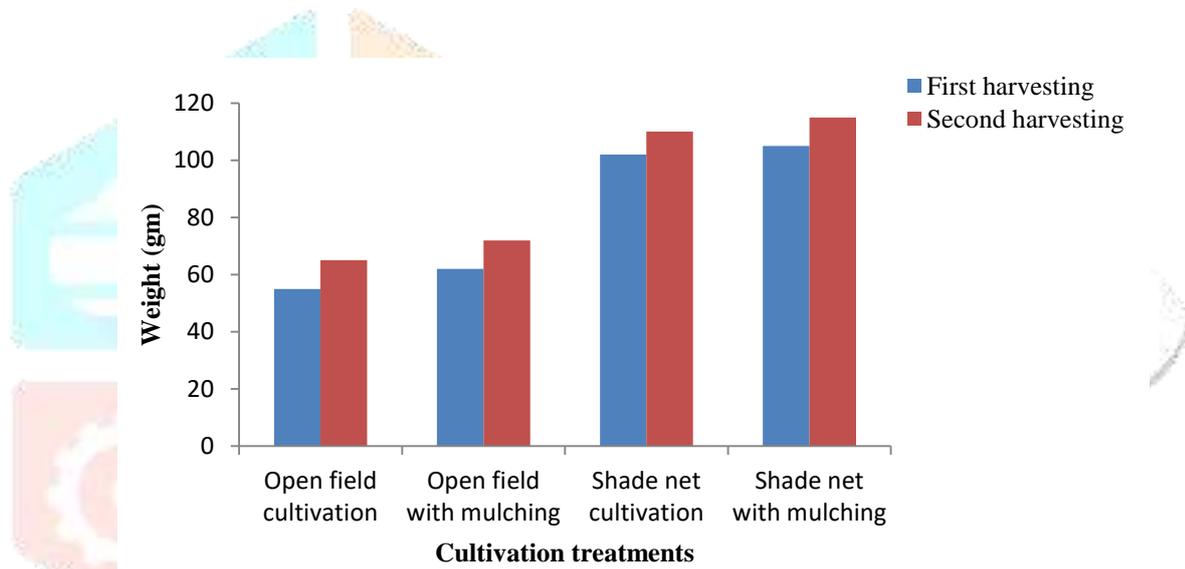


Fig. 7 Effect of different cultivation treatments on weight of chilli

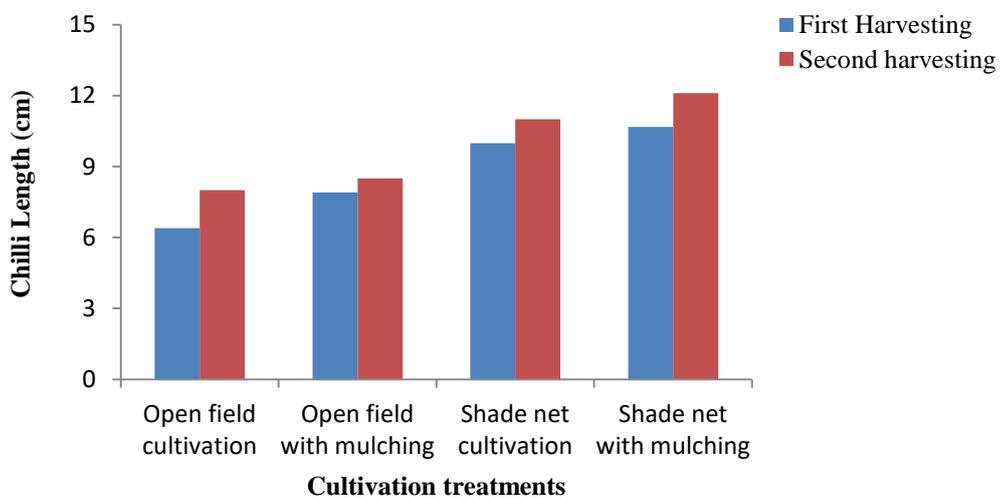


Fig. 8 Effect of different cultivation treatments on length of chilli

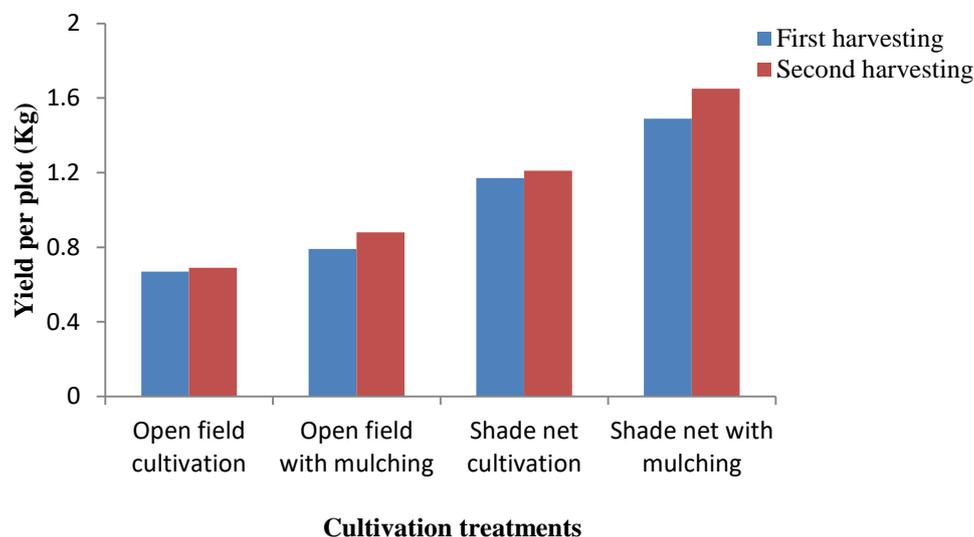


Fig. 9 Effect of different cultivation treatments on yield of chilli

IV. CONCLUSION

- 1) Among all the cultivation treatments shadenet cultivation with mulching has pronounced effects on plant height, number of branches, leaf area, flower and fruit initiation as compared to open field cultivation treatments.
- 2) Root depth of chilli plant was maximum in open field cultivation treatments as compared to other protective cultivation treatments as roots get more area to penetrate into soil to fulfil water requirement.
- 3) Overall protective cultivation treatments i.e mulching as well as shadenet has pronounced effect on quality and quantity of chilli in terms of weight, length, number of chilli per plant and yield.

V. REFERENCES

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