

Sustainable King Chilli Production Through Mulching in Chandel District of Manipur, India

K. Sonamani Singh

ICAR-KVK, Chandel, Manipur

*Corresponding Author: sonamanisingh@gmail.com

The district of Chandel is situated at a distance of about 64 km from Imphal, the state capital. The district has a total geographical area of about 3,313 square km and it lies between coordinates 23.49 degree and 24.28-degree north latitude and 94.09 degree to 94.31-degree east longitude in the south- eastern part of the state of Manipur.

King Chilli (*Capsicum chinellse*) belonging to the family Solanaceaea, being an important spice and cash crop in the district is traditionally cultivated in and forms an important part of the local cuisine and is consumed both as fresh or in dried form. It is grown round the year in all parts of the country while winter chilli is grown between the months of October to April and accounts for about 70% of total production.

Very often water deficit often limits the crop growth and development. Chilli is sensitive to water stress. Also, young chilli seedlings cannot withstand either water deficit or excess of soil moisture while mature plants can withstand deficit or excess water. The demand of the king chilli in the state is much higher than its production. Heavy rainfall is a problem for chilli cultivation because chilli cannot tolerate heavy rainfall. In the winter, production is hampered due to lack of life-saving irrigation as well as scanty rainfall. Like most determinate crops, king chilli too are sensitive to water stress especially at the time of floral initiation, during flowering, and to a lesser extent, during fruit development.

In order to improve the productivity of crops where either water deficiency or excess frequently occurs, proper water management is necessary. During the winter season, proper and judicious use and conservation of available soil moisture may help in minimising if not totally preventing the loss of water through evaporation from the soil facilitating maximum utilization of soil moisture by the plants. In such a situation, mulching with plastic is a method by which soil moisture can be effectively conserved.

Mulching stimulates the essential microbial activity in soil through enhancement of soil agro-physical properties. Mulching has also been shown to minimize the use of N fertilizer, increase the soil temperature, improve the soil physical conditions and effectively suppress weed growth and could account for increased crop yield. The present study was undertaken to evaluate the changes, if any, in temperature and soil moisture and to evaluate the growth and yield of chilli under tropical conditions grown with plastic mulches.

Among mulching treatments different growth parameters were observed to be significantly influenced.

Effect on plant height and primary branches

The data among mulching treatments showed that plant height in black plastic mulch (31.28 cm) as compared to minimum plant height (24.18 cm) was observed in no mulch condition at 30 days after transplantation. The same plant height was observed as (44.21 cm) in black plastic mulch as compared to (35.43 cm) in no mulch condition at 60 days after transplantation.

In the case of primary branches per plant, it was recorded that the maximum number of primary branches per plant in black plastic mulch (4.86, 6.34) and minimum primary branches in no mulch condition (3.42, 4.88) at 30 and 60 DAT respectively.

Effect on fruit yield & quality

Among mulching treatments, plastic mulch recorded average number of fruits/plant (118) with 38 fruits/plant observed in no mulch condition. Also, the weight of fruit in mulched plants was recorded to be 8.7 g as compared to 4.3 g in no mulch plants. The increase in the fruit yield of mulched plot was probably associated with the conservation of soil moisture and improved microclimate in both beneath and above the soil surface. The amiable conditions are supposed to have enhanced the plant growth and

development and produced increased fruit bearing nodes compared to the control. The increase in the number of fruits per plant of mulched plot was probably associated with the conservation of moisture and improved microclimate both beneath and above the soil surface. The amiable condition enhanced the plant growth and development and produced increased fruit bearing nodes compared to the control. Keeping in consideration the relationship between the soil moisture content and fruit number, it was clear that fruit number had a strong relation with soil moisture content. Hence, mulching produced higher fruit yield per plant and fruit yield per hectare than for the control, indicating that the mulch had positive effect in generating increased fruit yield

Effect on soil temperature

The average soil temperature at 5 to 10 cm depth was different due to the effect of mulch. Soil temperature varied significantly with mulch, time of the day and the depth of soil. Soil temperature was less in the early morning and gradually increased until it peaked at 3:30 pm in all the fields and then decreased gradually. The soil temperature under mulch was higher than that of the control plots for all the times. The maximum difference in temperatures between mulched and control plots was 4.8 to 5.3°C at 5 cm soil depth at 3:30 pm. In general, soil temperature was higher at 5 cm than at 10 cm depth. The polythene mulch seemingly allowed part of the radiation to pass through it but acted as barrier against outgoing thermal radiation.

Effect on plant height

The measurements of plant height was done from 30 DAT to 105 DAT at 15 days interval. The plant height was observed to vary significantly due to mulching at different growth stages and increased with plant age. Plastic mulches showed better and remarkable performance in plant height than control, indicating mulches had favourable effect on the growth and development of chilli. At the maturity stage, the plants under mulch was recorded as 74.36 cm as compared to plant height of 59.21 cm in control plot. The difference in average plant height in mulched plants was possibly due to better availability of soil moisture and optimum soil temperature provided by the mulch film.

Very interestingly, fruit length, fruit diameter and number of seeds per fruit were statistically similar over the treatments with a clear indication that these traits were mainly genetically, not environmentally controlled.

Conclusion

Based on the experimental results, it could be concluded that plastic mulches had tremendous effects on the growth, and yield of chilli, and black plastic showed superior performance among the plastic mulches. Black plastic mulch was suppressed the weed growth and thereby, increased the fruits yield. Therefore, the cultivation of chilli using black plastic mulch could bring an ample scope for producing more spices.

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