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NB Gohil
Agriculture Experimental Station, Navsari Agricultural University, Paria, Pardi, Valsad, Gujarat, India

Swapnil Deshmukh
Agriculture Experimental Station, Navsari Agricultural University, Paria, Pardi, Valsad, Gujarat, India

NK Gajre
Agriculture Experimental Station, Navsari Agricultural University, Paria, Pardi, Valsad, Gujarat, India

SJ Patil
Agriculture Experimental Station, Navsari Agricultural University, Paria, Pardi, Valsad, Gujarat, India

DK Sharma
Agriculture Experimental Station, Navsari Agricultural University, Paria, Pardi, Valsad, Gujarat, India

Corresponding Author:
NB Gohil
Agriculture Experimental Station, Navsari Agricultural University, Paria, Pardi, Valsad, Gujarat, India

Response of brinjal to irrigation schedules and mulches under drip irrigation system

NB Gohil, Swapnil Deshmukh, NK Gajre, SJ Patil and DK Sharma

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Abstract
The purpose of this examination was to study the response of brinjal to irrigation schedules and mulches under drip irrigation system during 2020 to 2021 at the Agriculture Experimental Station, Navsari Agricultural University, Paria, Gujarat. Nine treatments were simulated thrice in a factorial concept of randomized block design with two factors. 1. Irrigation regimes *viz.,* Drip irrigation at 0.4 PEF, Drip irrigation at 0.6 PEF and Drip irrigation at 0.8 PEF. 2. Mulching *viz.,* No mulch, Sugarcane mulch @ 5 t ha^{-1} and Black plastic mulch (50 µ). The result unveiled that, application of drip irrigation at 0.8 PEF with black plastic mulch (50µ) treatments showed notably enhanced plant height, dry and fresh weight of plant, fruit girth and length, number of fruits and yield. An application of mulching with drip ensures results in better yield, control weeds and further increases the efficiency of the system.

Keywords: Black plastic mulching, brinjal, drip irrigation, sugarcane mulch, yield

Introduction

Brinjal (*Solanum melongena* L.) is an important vegetable crop cultivated throughout India. It is popular amongst small-scale farmers and low income consumers due to its wider adaptability and low price often described as poor man's vegetable. It is of great importance because its fruits have medicinal properties, white brinjal contain highest Vitamin-A so it is effective for diabetic patients (Rajan and Markos, 2002) [11]. India grows brinjal in an area 741 hectare with production of 1300 MT and productivity 19.1 MT per hectare (NHB, 2019-20). The availability of timely and assured supply of water is an important determinant on productivity of any crop. Drought is the most vital environmental stress limiting the production of crops throughout the world. Greenhouse production of brinjal is thus more advantageous than field production since irrigation water and fertilizer are used more effectively and controlled. But, in open field condition the factors affecting the water requirement are evaporation and transpiration. Among this the evaporation may be minimized with the help of mulching. So far, Mulch is one of the good management techniques that can preserve the soil and reduce weed infestation also. Non-living mulch can be termed as protective coverings for plants used them against extreme temperature changes and loss of soil, ground water protection.

The application of irrigation water by traditional method causes 27 to 42 percent loss of water through deep percolation depending on the soil type (Agarwal and Khanna, 1983) [1]. Due to depletion of water sources and non availability of labour, micro irrigation has a significant adaptability all over the world. Drip irrigation is an effective tool for conserving water resources and studies had revealed significant water saving ranging between 40 percent and 70 percent compared with surface irrigation. Drip irrigation helps to 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.

Materials and Methods

To find out brinjal would react in response to irrigation schedules and mulches under drip irrigation system, a field trial was carried out from 2020 to 2021 at the Agriculture Experimental Station, Navsari Agricultural University, Paria, Gujarat. The soil at the experiment location was a heavy black color, alkaline in reaction (7.74 pH), normal in EC (0.40 dS/m), high in organic carbon (1.10%), with low to medium nitrogen availability (234 kg/ha), medium to high availability phosphorus (59 kg/ha), and adequate potassium availability (430 kg/ha). The experiment was laid out in factorial concept of randomized block design with two factors. 1. Irrigation regimes *viz.*, Drip irrigation at 0.4 PEF, Drip irrigation at 0.6 PEF and Drip irrigation at 0.8 PEF. 2. Mulching *viz.*, No mulch, Sugarcane mulch @ 5 t/ha and Black plastic mulch (50 µ). There were 9 treatments and replicated thrice.

The chosen plants were manually sown in *rabi* at a 90 cm × 60 cm spacing. Before 10 days of sowing, FYM @5 t/ha was evenly spread and incorporated into the soil. Applying N, P_2O_5, and K_2O at 100:50:50 kg/ha. The emitters (4 litre/h discharge) and dripper laterals (90 centimetre) were spaced 0.90 m x 0.60 m apart. All laterals had control valves installed to make it easier to regulate the water flow in accordance with system procedures. Crop evapotranspiration (ETc) and potential evapotranspiration (ETO; mm) were used to determine the timing of drip watering at 2-day intervals throughout the week was based on crop evapotranspiration (ETc) potential evapotranspiration (ETO; mm) was estimated using Penman-Montieth method.

$$ET_O = Ep \times Kp$$

Where, EP, daily pan evaporation (mm); KP, pan-coefficient (0.75).

The daily pan evaporation data was collected by Class A Open Pan Evaporimeter of Agromet Observation of AES in Paria. Daily evaporation was observed from 1st fortnight November through 1st fortnight March during the crop growth season in 2019, 2020 and 2021. Five plants were randomly selected from the net plot and labelled with label for various growth and yield component observations and the data was statistically analysed and interpreted.

Results and Discussion

Data were used to investigate the observations on plant height, dry and fresh plant weight, fruit length and girth, number of fruits per plant, and yield factors. Table 1 displays the information on plant height under various treatments at 30 and 60 days after transplanting (DAT). When compared to the other lower irrigation regimes, the plant height at 30 DAT was significantly higher in the irrigation at 0.8 PEF (I_3) (35.36 cm) and was on par with I_2 irrigation level. Treatment M_3 (black plastic mulch, 50 µ) significantly increased plant height at 30 DAT (35.41 cm) in the mulching scenario (Table 1). Mulching and drip irrigation have a considerable impact on plant height at 30 DAT and on each other. Similar trend were observed in 60 DAT and also they were significant in their interactions.

Dry and fresh weight of plant was observed during the crop period and it is presented in the Table 2. In irrigation regimes, significantly higher dry and fresh plant weight was observed in treatment I_3 and it was at par with irrigation at 0.6 PEF (I_2). In case of mulches, same trend was found with dry and fresh plant weight. The data regarding higher fruit girth and length was observed with the application of irrigation at 0.8 PEF (I_3) (16.56 cm and 10.09 cm) and it was statistically at par with irrigation at 0.6 PEF (I_2). In application of different mulches, black plastic mulch (M_3) was found highest fruit girth and length (17.05 cm and 9.97 cm) (Table 3). Interaction of all as drip irrigation and mulching the two factors showed significant effect on the dry and fresh weight of plant and fruit girth and length.

Higher plant growth was due to improved moisture conditions, and these results are in line with the results from Bagele *et al.* (2022) [4]. Plastic mulch tends to have wider leaf surfaces that allow for more transpiration and may even reduce water loss. Weed growth was reduced in mulch plots compared to non-plastic plots, and soil moisture was retained throughout the growing season, resulting in less overall water consumption.

Table 1: Effect of different treatments on plant height (cm) of brinjal

Treatments	30 DAT	60 DAT
Irrigation regimes		
I_1: Drip irrigation at 0.4 PEF	30.76	69.52
I_2: Drip irrigation at 0.6 PEF	33.26	73.86
I_3: Drip irrigation at 0.8 PEF	35.36	81.21
S. Em±	0.55	1.11
CD @ 5%	1.56	3.13
Mulch		
M_1: No Mulch	30.70	70.26
M_2: Sugarcane mulch @ 5 t/ha	33.26	74.23
M_3: Black plastic mulch (50 µ)	35.41	80.10
S. Em±	0.55	1.11
CD @ 5%	1.56	3.13

Table 2: Effect of different treatments on dry and fresh plant weight (g) of brinjal

Treatments	Dry plant weight (g)	Fresh plant weight(g)
Irrigation regimes		
I_1: Drip irrigation at 0.4 PEF	310.15	696.11
I_2: Drip irrigation at 0.6 PEF	337.49	733.74
I_3: Drip irrigation at 0.8 PEF	344.50	749.90
S. Em±	5.99	11.35
CD @ 5%	16.92	32.07
Mulch		
M_1: No Mulch	307.23	688.75
M_2: Sugarcane mulch @ 5 t/ha	334.53	732.01
M_3: Black plastic mulch (50 µ)	350.38	758.99
S. Em±	5.99	11.35
CD @ 5%	16.92	32.07

Table 3: Effect of different treatments on fruit girth and length (cm) of brinjal

Treatments	Fruit length (cm)	Fruit girth (cm)
Irrigation regimes		
I_1: Drip irrigation at 0.4 PEF	14.92	8.58
I_2: Drip irrigation at 0.6 PEF	16.24	9.79
I_3: Drip irrigation at 0.8 PEF	16.56	10.09
S. Em±	0.21	0.11
CD @ 5%	0.59	0.30
Mulch		
M_1: No Mulch	14.96	9.22
M_2: Sugarcane mulch @ 5 t/ha	15.72	9.27
M_3: Black plastic mulch (50 µ)	17.05	9.97
S. Em±	0.21	0.11
CD @ 5%	0.59	0.30

The canopy of the crops was one of the most crucial growing factors that affected productivity. In comparison to the no-mulch plot under various irrigation levels, the treatments with mulch had higher plant height, more leaves, and a higher Leaf Area Index. Mulch application showed improved plant development metrics as a result. The results were concord with the findings of Rajasekar *et al.* (2017) [12].

Significantly higher no. of fruits/plant (13.89) was noted with the irrigation at 0.8 PEF (I_3) and it was on par with treatment I_2. While in case of mulches, significantly higher no. of fruits/plant (13.67) was found with the black plastic mulch (M_3) and it was statistically similar with treatment M_2 (Table 4). The statistical analysis showed that all two factors (i.e. drip irrigation, mulching) had a significant impact on the total fruit yield. The increase in fruit per plant is most likely due to moisture conservation, reduced weed growth, and improved microclimate both under and above the surface of the soil. This is in line with the findings of Vinuta *et al.* (2019) [15]. The yield characteristics (i.e., fruit per plant, fruit per cluster, fruit diameter, and fruit weight) were highest under the polythene mulching and lowest under the control.

The maximum yield was observed in the treatment I_3 (12.26 t ha^{-1}) followed by I_2 and the lowest fruit yield of 9.55 t ha^{-1} was observed in I_1 i.e., drip irrigation at 0.4 PEF. In case of mulches, maximum yield (12.35 t/ha) was observed with black plastic mulch (M_3). The two factors and interactions showed significant effect on the fruit yield per plant (Table 4). Among the treatments at different irrigation levels the drip irrigation at 0.8 PEF with black plastic mulch was recorded the maximum yield and the minimum yield was recorded in control plot at drip irrigation at 0.8 PEF and no mulch. Drip by direct to the root zone provides free soil moisture which promotes crop growth and productivity. The results are consistent with Kaur *et al.* (2021) [8].

The drip irrigation treatments with 0.8 PEF showed a statistically significant higher yield compared with other drip irrigation treatments. This can be explained by the fact that water is supplied directly to the root zone of the crop in drip irrigation. As a result, leaching is decreased and nutrients are available to the plants more easily. Yields of plants grown in control were significantly lower than plants grown under mulch. Higher yield may be attributed to increased soil temperature and efficient use of water, fertilizer and nutrients due to the use of plastic mulch. This is in line with the findings of Shweta *et al.*, (2018) [13].

Table 4: Effect of different treatments on no. of fruits/plant and fruit yield (t ha^{-1}) of brinjal

Treatments	No. of fruits/plant	Fruit yield (t ha^{-1})
Irrigation regimes		
I_1: Drip irrigation at 0.4 PEF	15.14	9.55
I_2: Drip irrigation at 0.6 PEF	16.55	11.68
I_3: Drip irrigation at 0.8 PEF	16.99	12.26
S. Em±	0.23	0.20
CD @ 5%	0.85	0.58
Mulch		
M_1: No Mulch	15.26	9.67
M_2: Sugarcane mulch @ 5 t/ha	16.39	11.61
M_3: Black plastic mulch (50 µ)	17.03	12.35
S. Em±	0.23	0.20
CD @ 5%	0.85	0.58

In this study, the results showed that the drip irrigation at a PEF of 0.8 with a mulch condition of 50µ black mulch led to a higher yield. The combination of drip irrigation and plastic mulch improves the moisture availability of the soil. This is due to the fact that the evaporation of water prevents water loss. Therefore, the use of 0.8 PPEF drip irrigation with 50µ Black plastic mulch proved to be more suitable and effective than conventional methods for the cultivation of Brinjal.

Conclusion

The study demonstrates that drip irrigation at 0.8 PEF combined with black plastic mulch (50 µ) significantly enhances brinjal growth, fruit yield, and water use efficiency. The combination of these techniques minimizes water loss, promotes moisture retention, reduces weed growth, and improves the overall microclimate, resulting in better crop performance. This approach is more effective than traditional irrigation methods and provides a sustainable solution for brinjal cultivation, especially under water-scarce conditions. The findings suggest that integrating drip irrigation with plastic mulching can optimize brinjal productivity and resource management in agricultural practices.

References

1. Agarwal MG, Khanna SS. Efficient soil and water management in Haryana Agricultural University, Hisar. Bull. 1983, 118.
2. Ashrafuzzaman M, Halim A, Razi Ismail M, Shahidullah SM, Alamgir Hossain M. Effect of plastic mulch on growth and yield of *chilli* (*Capsicum annuum* L.). Braz Arch Biol Technol. 2011;54:321-330.
3. Awodoyin FI, Ogbedide, Oluwole FO. Effects of three mulch types on growth and yield of *tomato* and weed suppression in Ilbadan, Rainforest-savanna transition zone of Nigeria. 2007.
4. Bagele RD, Khandare VS, Waskar DP, Pawar SV. Performance of different mulches on growth and yield of *brinjal* (*Solanum melongena* L.). The Pharma Innovation J. 2022;11:2987-2989.
5. Bhogi BH, Polisgowdar BS, Patil MG. Effectiveness and cost economics of fertigation in *brinjal* (*Solanum melongena*) under drip and furrow irrigation. Karnataka J Agric Sci. 2011;24:666-667.
6. Davis AR, Perkins PV, Sakata Y, Galarza SL, Maroto SG, Lee YC, *et al*. Cucurbit grafting. Crit Rev Plant Sci. 2008;27:50-74.
7. Iqbal M, Sahi FH, Hussain T, Aadal NK, Azeem MY, Tariq M, *et al*. Evaluation of comparative water use efficiency of furrow and drip irrigation systems for off-season vegetables under plastic tunnel. Int J Agric Crop Sci. 2014;7:185-190.
8. Kaur K, Seth M, Singh S. Response of brinjal to FYM, mulch and irrigation under Palam valley conditions. J Crop Weed. 2021;17:190-194.
9. Agrawal H, Panigrahi K, Sharma D. Effect of different colour mulches on the growth and yield of tomato under Chhattisgarh region. Indian J Hortic. 2010;67:295-300.
10. National Horticulture Board (NHB). Available at: http://nhb.gov.in/DB/statistics/area-production-statistics.pdf. 2020.
11. Rajan S, Markos BL. Propagation of horticultural crops. Horticult Sci Ser. 2002;6:94.
12. Rajasekar M, Udhaya Nandhini D, Swaminathan V, Balakrishnan K. Impact of mulching and fertigation on growth and yield of grafted *brinjal* (*Solanum melongena* L.) under drip irrigation system. Int J Chem Stud. 2017;5:163-166.
13. Mal DS, Singh L, Gharde S, Kaur P, Datta S. Effect of mulching in *brinjal* (*Solanum melongena* L.): A review. Int J Curr Microbiol Appl Sci. 2018;7:504-509.
14. Singandhupe RB, Rao N, Patil NG, Brahmanand PB. Fertigation studies and irrigation scheduling in drip irrigation system in *tomato* (*Lycopersicon esculentum* L.). Eur J Agron. 2003;19:1-17.
15. Vinuta M, Betageri, Kottiswaran SV. Effect of plastic mulching on fertigation of grafted brinjal under drip irrigation system. Int J Agric Eng. 2019;12:48-52.