

Effect of Different Irrigation Methods and Mulches on Leaf Curl Complex Attack in Chilli in Jaffna District of Sri Lanka

P.Maheswaren¹, C.S. de Silva¹ and T Karunainathan²

¹Department of Agricultural and Plantation Engineering, The Open University of Sri Lanka, Nugegoda, Sri Lanka

²Agricultural Research Station, Thirunelvely

*Corresponding author: Email: rrdihybridrice@gmail.com

1 INTRODUCTION

Chilli (*Capsicum annum L.*) is a member of the Solanaceae family. Chilli is an indispensable spice due to its pungency, taste, appealing colour and flavour. A large extent under chilli is cultivated in the dry zone of Sri Lanka. At present major chilli growing districts are Anuradhapura, Moneragala, Ampara, Puttalam, Vavuniya, Kurunegala, Hambantota and Mahaweli system. The Department of Agriculture has recommended 8 Chilli varieties up to now namely MI-1, MI-2, KA-2, Arunalu, MI-Hot, MI green, Galkiriyagama selection and the recently released varieties, MICH 3, MI Waraniya 1 and PC 1. The potential yield of these varieties are 10–12 ton / ha. But the national average yields are as poor as 8–10 ton / ha. Such low yields are mainly due to high incidences of pest and disease, moisture stress, the use of inferior seeds, poor crop management and high input costs. Chilli leaf curl complex (CLCC) is the major problem resulting in heavy yield losses up to 53% especially during the yala season. CLCC is caused by several factors (Thrips, mites and viruses) of which thrips are the most important factor (Lewis, 1997). The irrigation method plays a major role in increasing the yield and enhancing cropping intensity. In the north water scarcity and inefficient irrigation methods are major reasons for increasing

cost of production. Therefore micro irrigation methods proved to be an efficient method in saving water and reducing cost of production. Micro irrigation has an influence on increasing yield up to 20% to 30% and reduces the pest attack. Most of the Jaffna farmers cultivate the crop in field under traditional irrigation systems in small holdings (Geroge, 2004; Senathirajah, 2005). Even in small holdings with well lift irrigation system water has been expensive because of the energy crisis. Therefore this study was designed to study the impact of irrigation system and mulch on leaf curl complex and yield of chilli during Yala season May to October).

2 METHODOLOGY

2.1 Site selection

A Field experiment was carried out at the District Agricultural Training Centre, Thirunelvely during May end to October end 2016 in Calcic Red Yellow Latasol soil to study the impact of different mulches under different irrigation systems on growth and yield of green chilli.

2.2 Experimental design

The experiment was conducted in split plot design with 3 replicates. For the

design 3 types of irrigation systems namely sprinkler irrigation system (I1), Drip irrigation system (I2) and Basin irrigation system (I3) were selected. There varieties were Galkiriyagame selection; Super Hybrid and Vijaya hybrid were planted under two types of mulches such as Neem and Gliciridia and no mulch. Irrigation was included in the main plot. Subplot contained variety and mulches in the split-plot design. 27 treatments were tested in this experiment. Statistical Analysis was done using SAS (University version). Treatments used in this experiment were as follows:

Irrigation treatments were,

- I1- sprinkler irrigation system;
- I2- drip irrigation system;
- I3- basin irrigation system.

Varieties were,

- V1- Galkiriyagame selection;
- V2- Super hybrid
- V3- Vijaya hybrid.

Mulches were,

- M1- Control;
- M2- Neem;
- M3- Giliciridia.

27 treatments will be tested in this experiment. Following treatments were tested in this experiment.

- T1- I1VIMI-Sprinkler system, Galkiriyagame selection with no mulch;
- T2- I1V2M1-Sprinklersystem Super variety with no mulch;
- T3- I1V3M1SprinklersystemVijaya hybrid with no mulch;
- T4- I1V1M2-Sprinkler system, Galkiriyagame selection with Neems leaves;
- T5- I1V2M2-Sprinklersystem Super variety with Neems leaves;
- T6- I1V3M2-SprinklersystemVijaya hybrid with Neems leaves;
- T7- I1V1M3-Sprinklersystem Galkiriyagame selection with Gliciridia;

- T8- I1V2M3-Sprinklersystem Super variety with Gliciridia;
- T9- I1V3M3-SprinklersystemVijaya hybrid with Gliciridia;
- T10- I2V1M1-Drip system, Galkiriyagame selection with no mulch;
- T11- I2V2M1-Drip system, Super variety with no mulch;
- T12- I2V3M1-Drip system, Vijaya hybrid with no mulch;
- T13- I2V1M2-Drip system, Galkiriyagame selection with Neem leaves;
- T14- I2V2M2-Drip system, Super variety with Neem leaves;
- T15- I2V3M2-Drip system, Vijaya hybrid with Neem leaves;
- T16- I2V1M3-Drip system, Galkiriyagame selection with Gliciridia;
- T17- I2V2M3-Drip system, Super variety with Gliciridia;
- T18- I2V3M3-Drip system, Vijaya hybrid with Gliciridia;
- T19- I3VIM1-Basin system, Galkiriyagame selection with no mulch;
- T20- I3V2M1-Basin system, Super variety with no mulch;
- T21- I3V3M1-Basin system, Vijaya hybrid with no mulch;
- T22- I3V1M2-Basin system, Galkiriyagame selection with Neem leaves;
- T23- I3V2M2-Basin system, Super variety with Neem leaves;
- T24- I3V3M2-Basin system, Vijaya hybrid with Neem leaves;
- T25- I3VIM3-Bsin System, Galkiriyagame selection with Giliciridia;
- T26- I3V2M3-Basin system, Super variety with Giliciridia;
- T27- I3V3M3-Basin system, Vijaya hybrid with Giliciridia

2.3 Nursery management

Soil was sterilized by burning straw and beds (3 m×1 m×15 cm) were prepared. Seeds were soaked by using attonic for



one hour to enhance root formation. Seeds were directly sown at 10 cm between lines and 1 cm depth. A Thin layer of top soil was laid above the seed lines. After that, beds were treated with Homai (6g / 5l H2O). Nursery beds were covered with dried banana leaves to prevent water loss. Then the beds were treated with Elson to prevent the termite and ant problem. The nursery bed was protected from rain by covering it with white polythene.

2.4 Field preparation and layout

For proper establishment of seedlings, soil should be moist, friable, well aerated and weed free. Thus ploughing (2376m²) and two hoeing were done to obtain the fine tilled condition. 3 blocks were made and one block was further divided in to 27 plots of 3m×3m size. Nine plots were covered by drip or basin or sprinkler irrigation system. One block included 675 hills and every block included sprinkler, drip and basin irrigation system. Each plot contained 9m² land areas with 25 hills.

2.5 Field planting

The 35 day old seedlings were transplanted at 60 cm×60 cm (1pts / hill). Healthy, disease free and good quality seedlings were selected from nursery. Shade was provided for 2 to 3 days. Seedlings were irrigated immediately after transplanting by basin, drip sprinkler and hand. The gap filling was done after one week of transplanting.

2.6 Cultural practices

Watering, fertilizer application, weeding, pest and disease control were done according to the Department of Agriculture recommendations. Parameters measured were number of CLCC affected plants in all three mulches and three irrigation methods, and yield as 1st, 2nd and 3rd harvesting in each treatments.

3 RESULTS AND DISCUSSION

3.1 Incidence of Thrips for chili leaf curl complex attack.

Chilli leaf curl complex (CLCC) incidence was significantly different between blocks and significantly differed between the variety and mulches (Figure 1). Thus it could be concluded that there is 3 way interaction between I*M*V. Incidence of chilli leaf curl complex (CLCC) attack was low at 5th week after transplanting. After that CLCC damage increased due to hot weather (Figure 1). Figure 2 shows, graphically at maximum CLCC observed (10 plants) in Galkiriyagama selection with no mulch under basin irrigation system at 12th weeks after planting and minimum thrips damage was observed (2 plants) in super hybrid with neem mulch under sprinkler irrigation system at 5th week after planting due to the better microclimate.

3.2 Chilli leaf curl complex attack among the irrigation

CLCC was significantly different among the irrigation systems (Figure 2). Incidence of CLCC was low at under sprinkler irrigation at 5th week. After that CLCC was increased due to the hot weather.

3.3 Chilli leaf curl complex attack among the mulches

CLCC was significantly different among the mulch systems and lowest affected plants were observed in neem mulch at 5th week after transplanting. Highest was observed in basin irrigation at 8th week after transplanting in shown below Figure 3.

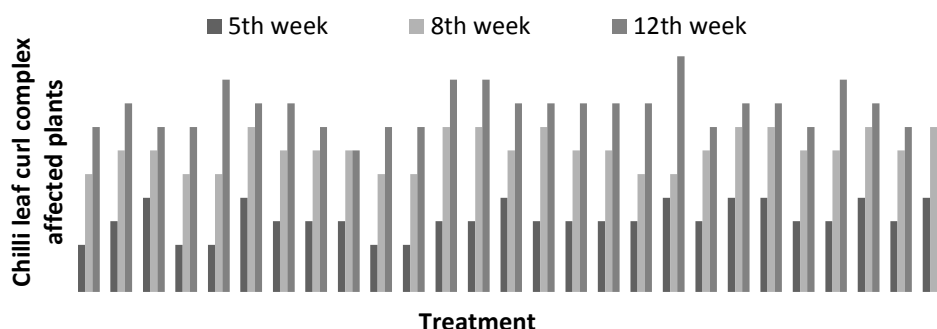


Figure 1: Chilli leaf curl complex in different treatment at 5th, 8th and 12th weeks

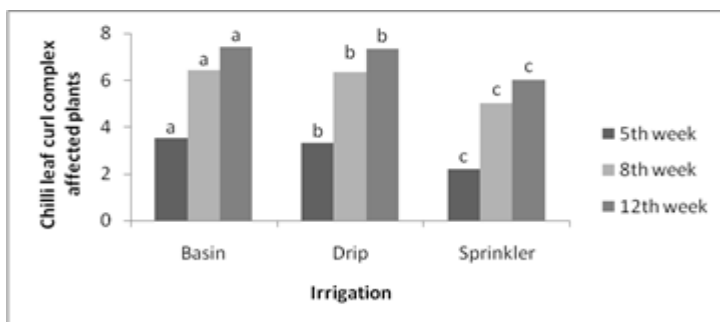


Figure 2: Chilli leaf curl complex attack under different irrigation systems

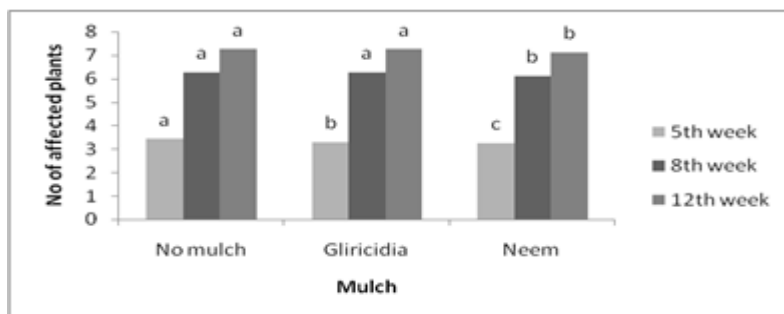


Figure 3: CLCC attack among the mulch

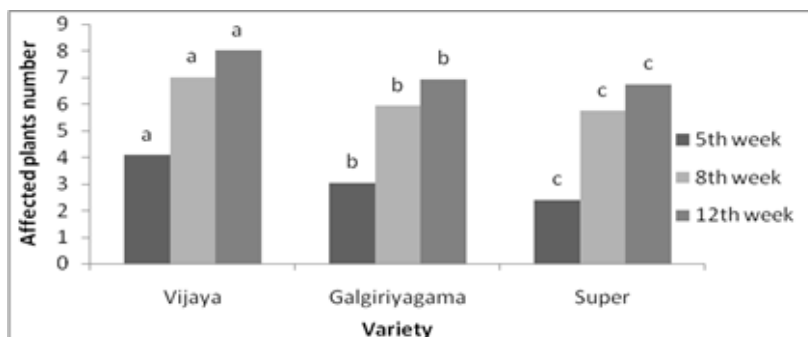


Figure 4: CLCC attack among the varieties

3.4 Chilli leaf curl complex attack among the mulches

CLCC was significantly different among the mulch systems and lowest affected plants were observed in neem mulch at 5th week after transplanting. Highest was observed in basin irrigation at 8th week after transplanting in shown below Figure 3.

3.5 Chilli leaf curl complex attack among the variety

CLCC was significantly different among the variety. Minimum attack was observed in super hybrid and maximum attack was observed in Vijaya at 8th week after transplanting in shown in Figure 4.

3.6 Yield

Chilli yield was significantly different between the irrigation, variety and mulch and non-significant between block. The highest yield was obtained in super hybrid with neem mulch under sprinkler irrigation system at 2nd harvesting. The lowest yield was recorded Galkiriyagama selection with no mulch under basin irrigation system. These findings agree with Shinde *et al*, (1999) and Wijerathana Banda, (1997).

4 CONCLUSIONS AND RECOMMENDATIONS

Maximum yield was recorded under sprinkler irrigation system super hybrid variety with neem mulch due to the low incidence of pest attack at 2nd harvesting (12ton / ha. Therefore sprinkler irrigation system is the best in Chilli cultivation with the use of neem mulch to reduce the thrips attack and Chilli leaf curl complex. The micro climate of the plant and soil will also change respectively by the sprinkler irrigation and neem mulch which reduce the soil temperature. Low temperature leads to biological control of the pest resulting in a higher yield.

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