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IMPROVED GROWTH AND YIELD OF "WEST INDIES RED" HOT PEPPER (*CAPSICUM* SPP.) WHEN GROWN UNDER TROPICAL ROW COVERS

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ABSTRACT: The benefits of protected agriculture in assuring production under suboptimal climatic conditions, are well recognised. Microclimate control is further seen as a likely approach for small farmers in mitigating the effects of climate change. However, the typical greenhouse can be a prohibitively large investment for a small-scale farmer. Tropical row covers can be a flexible, low-cost approach to protected agriculture in open fields of small farms, especially if modular designs are used. The effect of tropical row covers on the growth and yield of hot pepper (*Capsicum* spp.) was tested using specially built covers. These were made as mini-tunnels from PVC conduit, insect screen and plastic to make them durable and mobile. Each structure was 1.7 m wide x 3.3 m long x 1.3 m high. The upper arch was covered with clear plastic while the lower sides and ends had fine insect mesh. These covers were distributed in the field and each one had an adjoining open plot, occupying the same area, as a control. There were six replicates. For plants growing under the covers, the average number of fruit per plant was 73.6 versus 15.2 in the open (FPr, <.001). Pepper berries grown under the covers were larger on average (12.59 g vs. 7.44 g; FPr< .05). The covers also reduced the incidence of broad mite (*Polyhagotarsonemus latus*) and bacterial spot (*Xanthomonas* campestris), thus facilitating good growth.

Keywords: protected agriculture, tropical row covers, hot pepper, yield, growth.

Introduction

Row covers are usually used in cooler countries to enhance the microclimate in cold air temperature conditions, buffering against frosts (Hochmuth, 2009). In such conditions the aim is to increase temperature. In the tropical environment a different role is expected. Crop protection from excessive rain, pests and from strong desiccating winds are some of likely aims.

Farming in Barbados is characterised by suboptimal climatic conditions. In recent times such conditions are quite erratic and intense. Off season rains and intense winds outside of storm season are well known occurrences. Some farmers have already been observed to try row covers made from polythene when growing tomatoes in the rainy season. Wherever successful, a good price is obtained for the produce. Climate change theory predicts an intensification of erratic climatic trends. Nowadays, greenhouses are being increasingly utilised for assuring the quality and timing of crop production. However, the cost of even a small greenhouse can be a deterrent to a small farmer.

Row covers are flexible and can be moved around, varying the material to cover different crops and offer different types of protection (Skeete, 2011). For example, a farmer could use a series of hoops and change from one crop to the other changing the

covering materials. Such materials can be purchased by the foot, so a farmer can buy the amount that is affordable at any point in time and gradually accumulate the equivalent crop protection that a larger greenhouse would offer. This would be at a fraction of the cost of a greenhouse structure. This introduces an element of scale neutrality.

One of the problems associated with using protective structures in the tropics is the build-up of heat within. Ventilation can be a difficult and power consuming exercise. There is a scarcity of documentation on the performance of crops under row covers in the Barbadian environment.

Objectives

The aim of the trial was to examine the effect of the covers on the growth and yield of Hot pepper plants.

Materials and Methods

Row cover structures were placed in a field of West Indies Red (*Capsicum* spp.). The trial was established at Central Agronomic Research Station in July, 2011. Graeme Hall falls in a low rainfall zone with an average of less than 1,143 mm annually. The soil belongs to the black associate grouping (Vernon & Carroll, 1966). The crop was grown following the recommendations of the Ministry of Agriculture. The trial was planted on standard 1.7 m (5'6") beds. The peppers were planted on 6th of July and the covers were placed just after planting. There were six replicates distributed in the field, each one had an adjoining open plot occupying the same area as a control. The area of each plot was 1.7 m by 3.3 m, the area covered by each tunnel.

The covers were made as tunnels from PVC conduit, insect screen and plastic to make them durable and mobile (see photo in Figure 1 in appendix). Each structure was 1.7 m wide x 3.3 m long x 1.3 m high. The upper arch was covered with clear plastic while the lower sides and ends had fine insect mesh. The combination of clear plastic at the top and mesh for ventilation distinguishes these covers from the ones used in temperate countries. Growth was observed and recorded qualitatively. Fruiting was assessed by counts at 40 and 69 days after planting. The second count was done by harvesting all fruit that were set in the plot (10 plants) at all stages. Fruit size was measured at 69 days by random sampling of five ripe fruit from each plot harvested. All data were analysed statistically using Genstat.

Results and Discussion

Growth: Vegetative growth was more vigorous under the covers. The leaves were larger and healthier looking (see Figure 3 in appendix). Fruit were glossier and in better condition under the covers. There was a notable absence of the symptoms of bacterial spot and broad mite. In the open, plants were shorter and more chlorotic with symptoms of bacterial spot (*Xanthomonas campestris*) and broad mite (*Polyhagotarsonemus latus*)

[see Figure 4 in appendix]. The canopy of plants under the covers showed the square shaped architecture that W.I red variety assumes when growing in an unimpeded way.

Fruit Set: From the early stage, fruit set was significantly higher in the covered plots (F.Pr<001). Covered plants had approximately 40 fruit per plant while those in the open had about five per plant. It is worth noting that the five fruit per plant is an average for the plot and, in fact, many of the plants in the open did not set any fruit at all.

Fruit Size and Condition: Fruit grown under the covers were significantly larger (12.59 g vs. 7.44 g [F.Pr=.041]) when mature. This has an important significance for exporting peppers, since the minimum weight is specified at 10 g (Medlicott, 1990). By visual observation, fruit condition was better under the covers.

Final Yield: The number of fruit per plant at 69 days after planting (harvested and counted) was significantly greater for the covered plots. Plants under covers produced an average of 73.6/plant as compared to 15.2/plant in the open field control [P=.002] (See Table 2 and Figure 2 in appendix). When plot yield was projected based on average fruit weight, the covered plots produced 6.5 kg vs. 0.79 kg for open plots.

Table 1. Number of fruit on pepper plants grown under cover and in open field (40 days after planting).

	Mean Fruit/plant
Open	5.2
Covered	37.9
F.Pr	*<.001*
SED	*9.72*
LSD	*25*

Table 2. Number of fruit harvested from whole plot of hot peppers at 69 days from planting.

	Mean fruit per plant	Mean fruit per plot
Open	15.2	106
Covered	73.6	515
F.Pr		*.002*
SED		*.01*
LSD		*.03*

Table 3. Size (weight) of fruit harvested and projected yield from whole plot of hot peppers at 69 days after planting.

	Mean weight of a fruit (g)	yield per plot (kg)
Open	7.44	.789
Covered	12.59	6.484
F.Pr	*.041*	
SED	*5*	
LSD	*4.823*	

Conclusions

Production can be enhanced by growing hot pepper plants under row covers. In the wet season, the usually poor yield can be increased by five times the amount obtained in the open. The difference is that the plants under cover grow as they should while the performance in the open falls off sharply. It is really a matter of yield assurance rather than an increase per se.

- Vegetative growth can be improved in the wet season by using protective cover to keep the rain off the foliage.
- There could be a reduced need for use of pesticides when covers are used. Farmers may get away from the problem of being unable to spray while harvesting.
- There is also potential to allow farmers to harvest when it is raining. Normally, wet peppers are prone to post harvest problems.
- Tropical row covers offer potential for assuring good production of hot pepper in the rainy season. One important advantage of using covers is that the export quality specifications (size and condition) can be maintained.

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Appendix

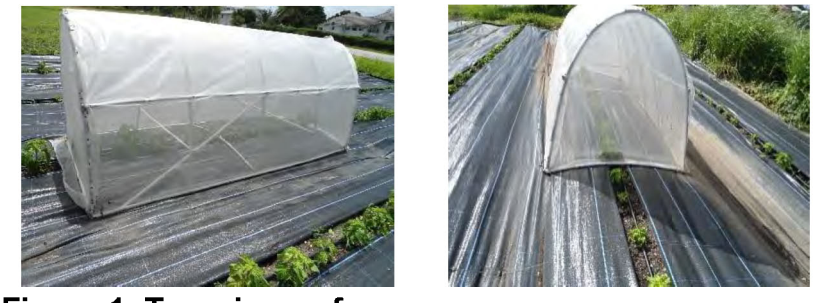

Figure 1. Two views of row cover.

Figure 2. Fruit from open plot (left) versus from covered plot (right).

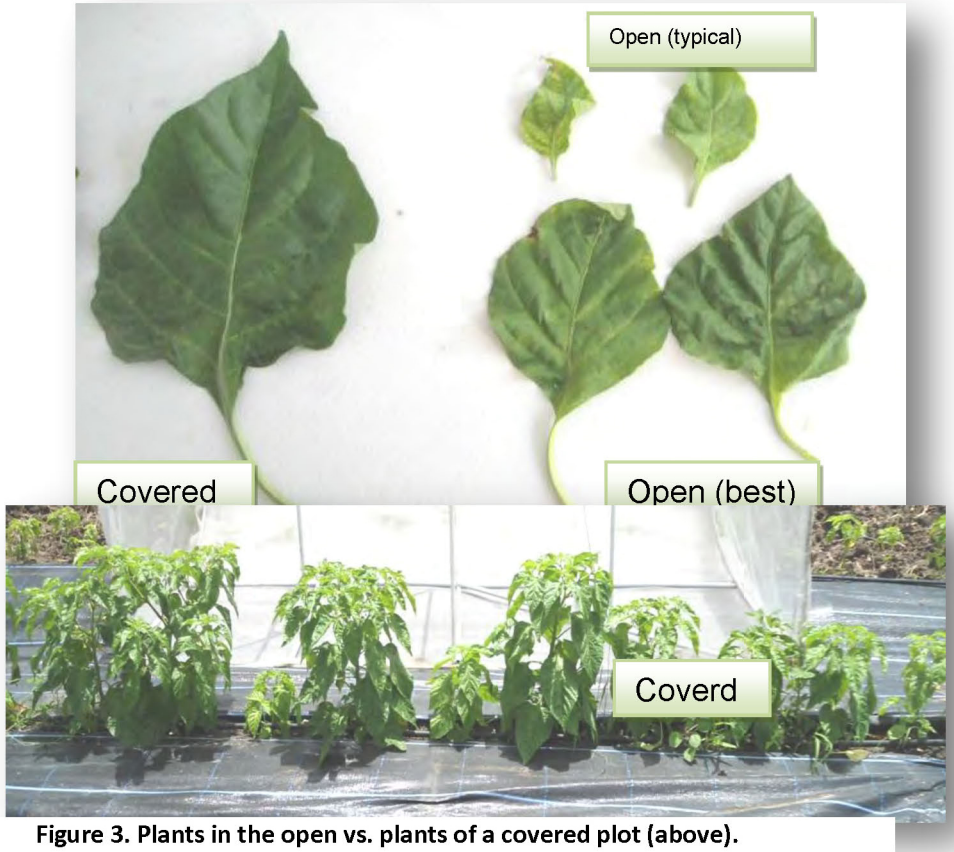

Figure 3. Plants in the open vs. plants of a covered plot (above).

Figure 4. Leaf from covered plants vs. leaves from open.