 KNOWLEDGE TRANSFER	Document: Effect of Using Spunbond in Cucumber (<i>Cucumis sativus L.</i>) Production During Dry Season	
	Date: June 25,2021	Action Research No: 008

Title Effect of Using Spunbond in Cucumber (*Cucumis sativus L.*) Production During Dry Season

Objective This study was to evaluate the production, visual disease incidence, and severity of cucumber under the row cover of spunbond.

Material and methods

The study was conducted during the dry season in 2021 (April - May) at KT Farm in Chiangmai Province, Thailand. The mean temperature of the study area was 29.4°C, and the mean rainfall was 122.3 mm. (www.tmd.or.th; Thailand National Meteorological Department). Seeds of the commercial variety Speed Max and Northern C were obtained from East-West Seed Thailand. Both are high-yielding cucumber varieties with high resistance and intermediate resistance to ToLCNDV (Tomato Leaf Curl New Delhi Virus) and Downy mildew, respectively. The experiment was designed in a randomized complete block design (RCBD) with three (3) replicates. Cucumbers were grown under two different growing conditions as follows: i) Open field (Control), ii) Protected cultivation - Under the Spunbond. The plot was 9 m² per replication. The seedlings were raised in seed trays and transplanted to the raised beds. After transplanting, all treatment was sprayed Lambda-cyhalothrin at the rate of 20 mL/20L to avoid trapping insects inside the cover at the beginning of the experiment and the 20 gsm (grams/m²; the unit of the fabric) spunbond has covered the bed after sprayed with insecticide immediately (Figure 1). Spacing between plants (26,660 plants/hectare) and fertilization was based on KT crop guide recommendations. The Spunbond was removed 30 days after transplanting (Figure 2 and 3)

Disease incidence (%): At 14 days after removing the spunbond, it was assessed by counting diseased plants in the net plot area and expressed as percentage.

Disease severity: At 14 days after removing the spunbond, 24 plants per plot were used to determine the disease severity. Disease severity was recorded on the base of 0-5 rating scale, where scale 1 = absent, 2 = very mild symptoms up to 25% leaves, 3 = appearance of disease between 26-50% leaves, 4 = symptom between 51-75% leaves, 5 = severe disease infection at 75% leaves and 6 = above 75% leaves.

Figure 1 The picture shows the plot set up after being transplanted and sprayed with insecticide.



Figure 2 The picture shows the cucumber of *Speed max* variety at 31 DAT, a) open field condition and b) at one day after the spunbond was removed.

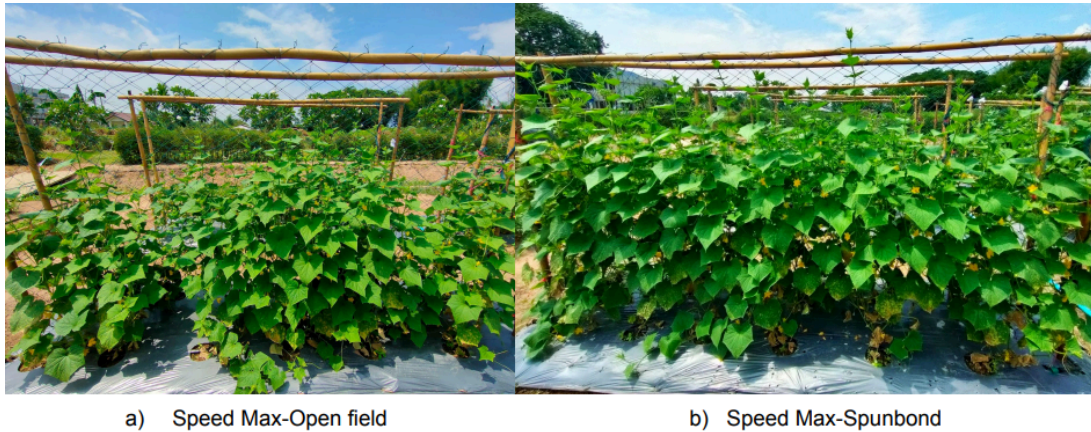
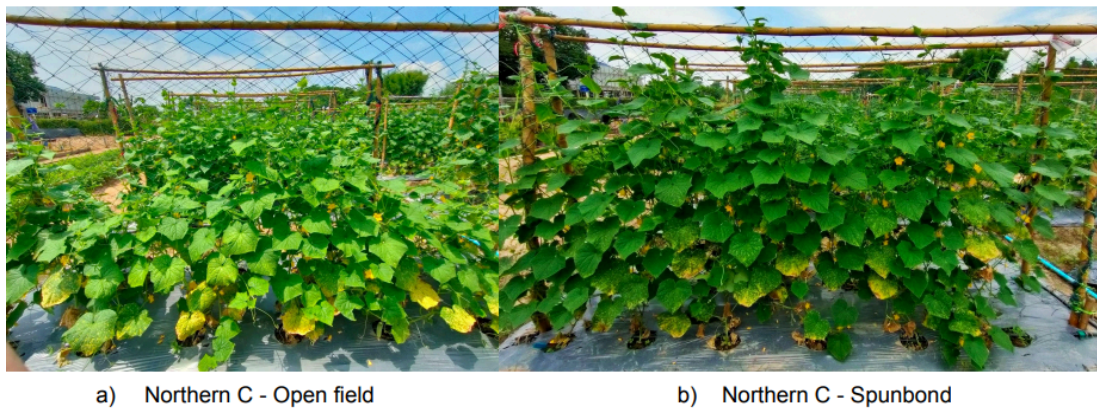


Figure 3 The picture shows the cucumber of *Northern C* variety at 31 DAT, a) open field condition and b) at one day after the spunbond was removed.

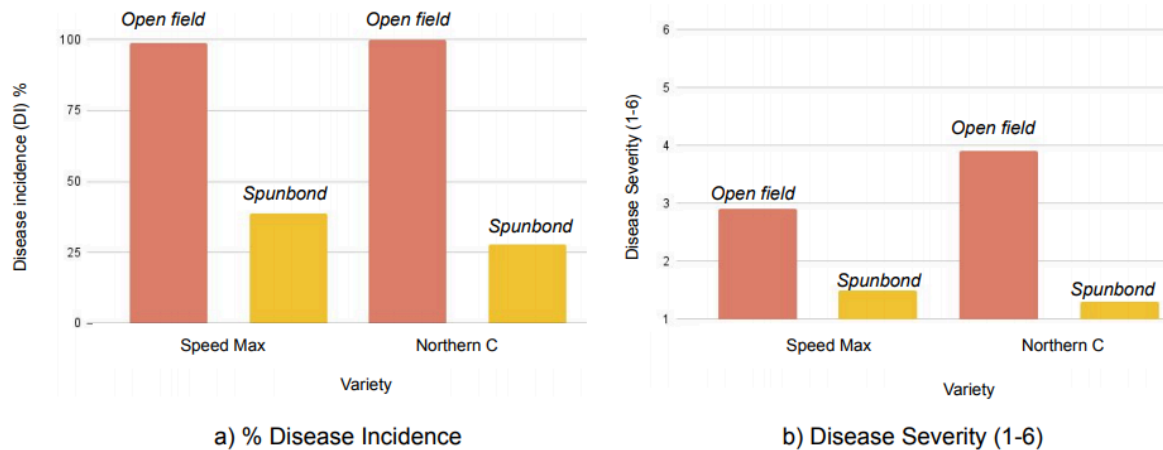


Results

The assessment of disease incidence and severity was conducted on cucumber plant leaves after 14 days of removing the spunbond. The viral disease incidence and severity on cucumber leaves were highly different between growth conditions as shown in Figure 3. Cucumbers grown in the open field showed higher viral disease incidence and severity than those grown under spunbond conditions. Speed max and Northern C variety in open field increased disease incidence by 153.5% and 259.7% and increased disease severity by 93.3% and 200%, respectively.



Figure 3 Effect of growth condition on (a) viral disease incidence and (b) severity in cucumber (14 days after spunbond was removed and 44 DAT)



The results of the analysis of variance revealed that growing conditions significantly affected the marketable yield, unmarketable yield and total yield (Table 1). The growth condition under the spunbond increased the marketable yield in both varieties. The yield increase ranged from 62.7% (Speed Max) to 67.6% (Northern C) compared to the open field condition.

Table 1 Interaction effects of growth conditions on yield of cucumber.

Variety	Growing Condition	Yield (ton/ha)		
		Marketable	Unmarketable	Total Yield
Speed Max	Open field	4.3C	1.0A	5.3C
	Spunbond	7.0A	0.7AB	7.7A
Northern C	Open field	3.4C	0.8AB	4.2C
	Spunbond	5.7B	0.6AB	6.3B
Growing condition (T)		**	**	**
F-Test (P<0.05)	Variety (V)	**	ns	**
	TxV	ns	ns	ns
LSD_{0.05} (TxV)		1.0	0.3	1.0

Table 2 The investment of cultivation in 1 m² between open field and spunbond condition.



Particulars	Cost of Input in 1 m ² (USD)	
	Open field	Spunbond
A. Labor Cost		
Land preparation	0.26	0.26
Rise beds	0.38	0.38
Mulching	0.13	0.13
Drip irrigation	0.50	0.50
Care of Plant (Watering, Fertilization, and Trellising)	2.75	2.75
Spunbond set up	0.00	0.63
Harvest	0.75	0.75
B.Input		
Seed	0.03	0.03
Fertilizer	0.004	0.004
Insecticide	0.10	0.10
Plastic mulch	0.08	0.08
Drip irrigation	0.48	0.48
Bamboo for trellis	0.19	0.19
Spunbond	0.00	0.12
Total	4.66	5.41

Table 2 showed the investment of the cultivation under the open field and the spunbond condition. The cost of investment under the spunbond condition increased by 17.17% when compared to the open field condition. The difference of investment is attributed to the spunbond material and the labor cost of setting up the spunbond.

To compare the return on investment (Table 3) between each growth condition, the price of cucumber production was 0.45 USD/kg referred to the average market price in May 2021([LINK](#)). The average price per kilogram from 2016-2021 is 0.50 USD/kg. Both conditions could not get the return.

Table 3 Return of investment in the 1 m² experimental area (Based on 2021;0.45 USD/kg).



Variety	Condition	Yield (kg/m ²)	Cost of Investment	Net Income	Return
			(USD)		
Speed Max	Open field	4.3	4.7	1.9	-2.7
	Spunbond	6.9	5.5	3.1	-2.2
Northern C	Open field	3.4	4.7	1.5	-3.1
	Spunbond	5.7	5.5	2.6	-2.8

Conclusions and Recommendations

Pests and diseases are major biotic constraints to the production of cucurbits worldwide (Loenebstein and Thottappilly, 2009). Among these, plant viral diseases are the most important limitation to cucurbit production (Lecoq and Katis, 2014; Ayo-John et al., 2014), causing physiological disorders and enormous losses all over the world in terms of quality and/or quantity of products (Nicaise, 2014). The result of the present study clearly showed that cucumber production under the spunbond would help reduce the incidence and severity of viral diseases and thus increase the marketable yield of the crop plant as well. The innovation of structures has proved to be beneficial for growing off-season vegetables to raise the production of vegetables when supply is low and prices are high. Nevertheless, the investment should be studied and decrease the cost of inputs and labor such as organic mulch, reuse materials, and others to find a way to increase the farmer's income.

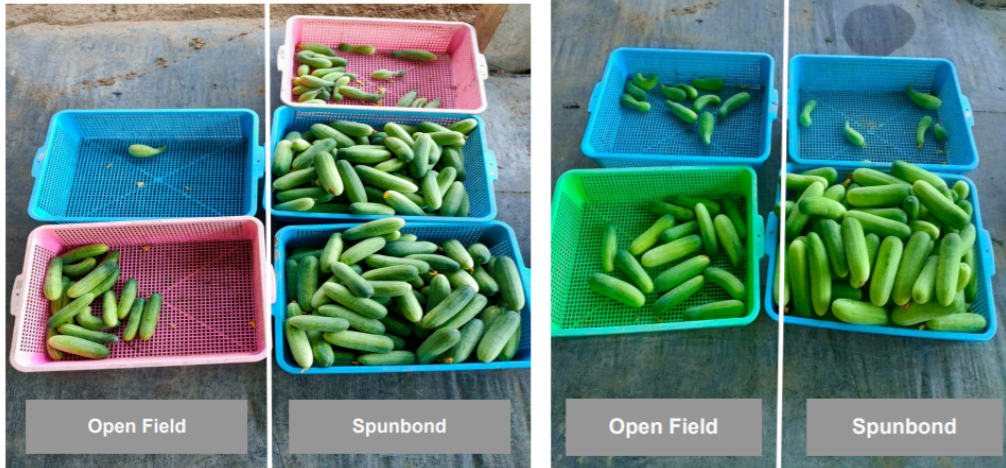


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Speed max

Northern C

Annex 2 Cucumber production under different growing conditions; Open field and Spunbond condition.

