

# Performance of Cucumber Cultivars in Northern Climate

NDSU PLANT SCIENCES



Zhigang Wu<sup>1\*</sup>, Xinhua Jia<sup>2</sup>, and Chiwon W. Lee<sup>1</sup>

<sup>1</sup>Department of Plant Sciences, North Dakota State University, Fargo, ND 58108

<sup>2</sup>Department of Agricultural and Biosystems Engineering, North Dakota State University, Fargo, ND 58108

\*Presenting author (zhigang.wu@ndsu.edu)

## Introduction

Vegetable production for local consumption has been popular in recent years. Cucumber (*Cucumis sativus*) is one of the widely cultivated vegetables grown for farmer's markets throughout the country. As a warm season crop, cucumber grows well in high temperature and moist soil conditions, producing fruits through the summer months. In northern states with short growing seasons, early marketing as well as cessation of fruiting by the quick arrival of cool weather pose challenges to cucumber growers. This study was carried out to evaluate 10 cucumber cultivars for their suitability for local production and consumption in the northern climate. In addition, the efficacy of using three different mulching materials (natural degradable bio-film, clear plastic poly film, black poly film) was studied using both the pickling and slicing types of cucumber for grower recommendation.

## Objectives

- To evaluate the performance of cucumber cultivars for local growing and consumption in the northern climate.
- To determine the effectiveness of using three different mulching materials (bio-film, clear poly film, black clear film) in growing two different types of cucumber for grower recommendation.

## Materials and Methods

### Materials

#### Cucumber cultivars

- A&C Pickling (SSE-Seed Savers Exchange)
- Bushy (SSE)
- Double Yield (SSE)
- Eureka (Jung)
- Marketmore 76 (High Mowing)
- Marketmore 97 (Territorial)
- National Pickling (High Mowing)
- Parade (SSE)
- Russian Pickling (SSE)
- Straight 8 (Veseys)



Fig. 1. Close-up picture of fruits of 10 different cucumber cultivars.

For mulching studies, two cultivars were used: Regal F1 (pickling) and Raider F1 (slicing), both from Harris Seeds.

#### Mulching materials

Three mulching materials used: 1) clear polyethylene plastic film, 2) bio-film (starch-based), and 3) black polyethylene plastic film.

### Methods

#### Cultivar trials

Seeds were sown directly in the field on June 20, 2014, on raised beds (20-ft long, 4 replications) mulched with black polyethylene film. Plants were spaced 3 feet apart on rows which were spaced 4 feet apart. Cucumber fruits were harvested weekly from August 13 for two months.

#### Mulching study

Raised beds (20-ft long, 4 replications) were covered with 3 different mulching materials. Seeds of two cucumber cultivars (one pickling, one slicing) were planted on June 20 in holes made on the mulching material. In control rows, seeds were sown directly on raised beds without plastic cover. Fruit was harvested weekly from August 13 for two months.

## Results

### 1. Cultivar performance

The number of fruits harvested for 2 months from 10 plants is shown in Table 1. Parade and Eureka produced the largest number of fruits (180 and 169 per 10 plants, respectively). Top yielding cultivars on a fruit weight basis were Marketmore 76 and A&C Pickling with 62 kg and 60 kg per 10 plants, respectively (Fig.2). Bushy had the lowest yield with 101 fruits and 29 kg per 10 plants. Soluble solids content did not vary significantly by cultivar with a range of 3.2 to 4.2 (Table 2).

Table 1. Total number and weights of cucumber fruits.

Cultivar	Number of fruits <sup>a</sup>	Weight of fruits (kg) <sup>b</sup>	Number of marketable fruits <sup>c</sup>	Weight of marketable fruit (kg) <sup>d</sup>	% Avg. yield
1. A&C pickling	166.6 ± 20.2 ab	60.44 ± 7.34 a	111.25 ± 12.48 bc	43.36 ± 4.89 b	145.75 ± 14.95 a
2. Bushy	100.9 ± 8.3 de	29.05 ± 2.63 e	66.25 ± 5.31 d	20.39 ± 1.75 d	69.41 ± 4.27 e
3. Double Yield	122.7 ± 12.9 cde	35.19 ± 3.16 de	96.50 ± 8.97 bcd	29.91 ± 2.62 cd	84.86 ± 8.53 de
4. Eureka F1	168.9 ± 14.8 ab	47.16 ± 4.09 bcd	124.50 ± 10.27 ab	35.84 ± 2.87 bc	113.42 ± 9.67 bcd
5. Marketmore 76	152.7 ± 13.6 abc	61.95 ± 5.48 a	127.75 ± 11.25 ab	54.15 ± 4.78 a	148.63 ± 11.26 ab
6. Marketmore 97	141.8 ± 16.9 abcd	56.31 ± 6.87 ab	113.00 ± 12.19 abc	46.40 ± 5.04 ab	134.27 ± 12.66 ab
7. National Pickling	130.9 ± 20.3 bcde	37.33 ± 6.74 cde	93.00 ± 12.85 cd	27.74 ± 4.35 cd	89.47 ± 14.31 cde
8. Parade	180.4 ± 12.7 a	49.89 ± 3.25 abc	143.75 ± 9.76 a	41.08 ± 2.67 b	120.09 ± 8.66 abc
9. Russian Pickling	147.7 ± 20.5 abc	37.67 ± 4.94 cde	113.50 ± 13.91 abc	30.01 ± 3.53 cd	89.97 ± 9.59 cde
10. Straight 8	98.5 ± 4.3 e	40.95 ± 2.03 cde	68.50 ± 2.39 d	30.05 ± 1.09 cd	98.61 ± 6.49 cde
LSD <sub>0.05</sub> <sup>e</sup>	46.0	14.81	31.34	10.63	32.21

<sup>a</sup>Average number of fruits harvested from 10-plant row.

<sup>b</sup>Average weight of fruits harvested from 10- plant row.

<sup>c</sup>Average number of marketable fruits harvested from 10- plant row.

<sup>d</sup>Average weight of marketable fruits harvested from 10- plant row.

<sup>e</sup>Values for the least significant difference (LSD) at  $p < 0.05$  for comparing means in each column.

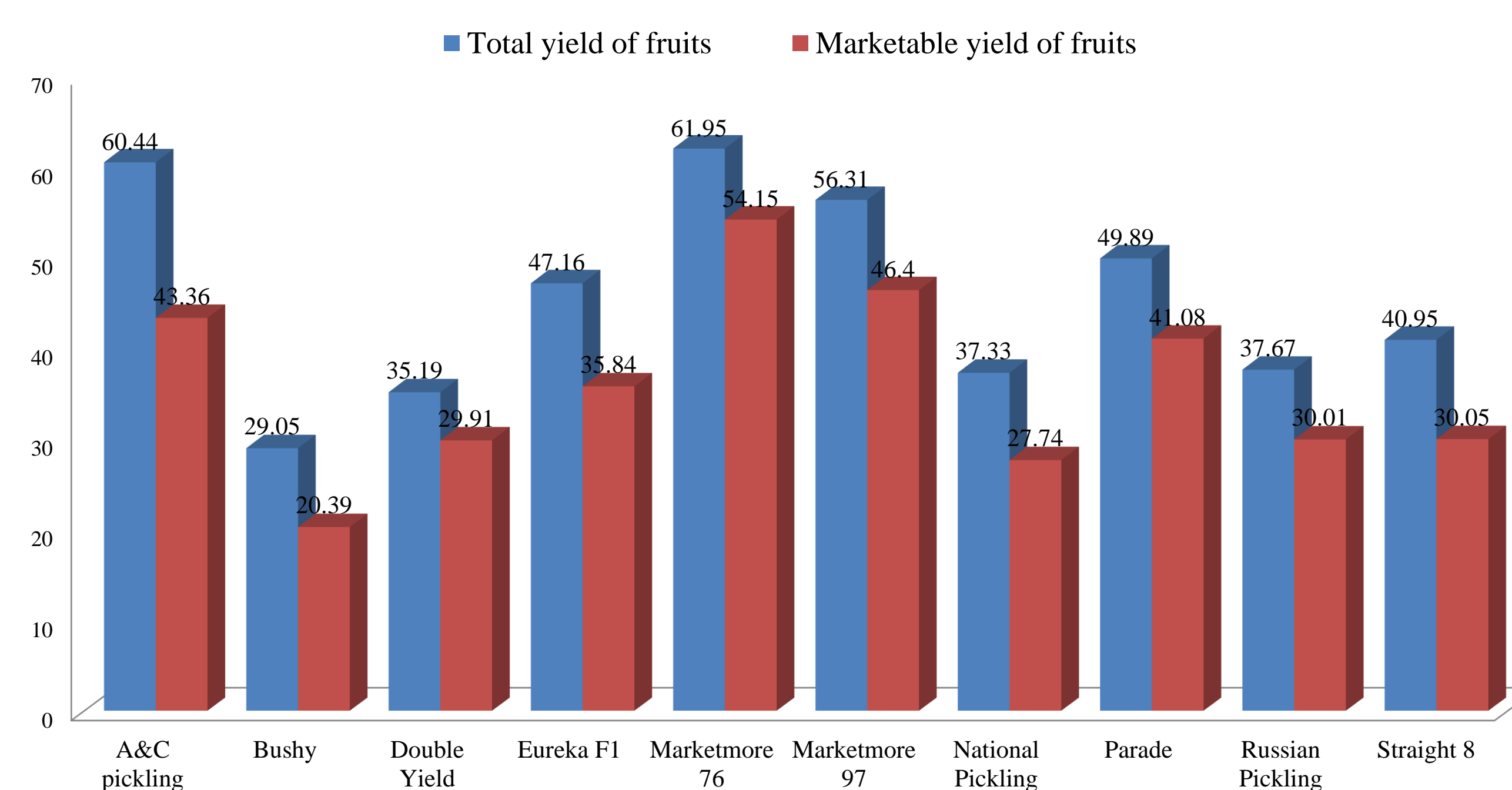


Fig.2. Comparison of total yield of fruits and marketable fruits for 10 different cucumber cultivars.

Table 2. Fruit size and quality obtained for ten cucumber cultivars.

Cultivar	Avg. fruit weight (g)	Avg. length of fruits (cm)	Avg. width of fruits (cm)	Flavor <sup>a</sup>	Soluble Solid Content (%) Flesh	Soluble Solid Content (%) Core
1. A&C pickling	366.6 ± 14.7 b	20.0 ± 0.8 a	5.3 ± 0.1 b	2.78 ± 0.32 ab	3.35 ± 0.22 bc	3.21 ± 0.15 d
2. Bushy	294.7 ± 24.0 c	15.9 ± 0.4 b	6.0 ± 0.1 a	2.67 ± 0.41 ab	3.50 ± 0.11 bc	3.63 ± 0.16 bc
3. Double Yield	297.4 ± 26.7 c	15.9 ± 0.9 b	5.7 ± 0.2 ab	2.67 ± 0.29 ab	3.43 ± 0.08 bc	3.85 ± 0.23 abc
4. Eureka F1	290.7 ± 35.0 c	15.2 ± 0.9 b	5.8 ± 0.2 ab	2.56 ± 0.41 ab	3.15 ± 0.06 c	3.47 ± 0.11 cd
5. Marketmore 76	406.7 ± 2.5 ab	22.3 ± 1.0 a	5.7 ± 0.1 ab	3.00 ± 0.47 a	3.95 ± 0.15 a	3.91 ± 0.16 ab
6. Marketmore 97	396.8 ± 12.1 ab	22.3 ± 1.1 a	5.7 ± 0.2 ab	3.11 ± 0.35 a	3.53 ± 0.11 bc	3.86 ± 0.14 abc
7. National Pickling	301.0 ± 25.2 c	14.7 ± 0.7 b	5.9 ± 0.3 a	2.67 ± 0.33 ab	3.35 ± 0.06 bc	3.55 ± 0.11 bcd
8. Parade	283.3 ± 25.4 c	14.4 ± 1.4 b	5.7 ± 0.1 ab	2.89 ± 0.42 ab	3.63 ± 0.19 ab	4.17 ± 0.12 a
9. Russian Pickling	261.0 ± 35.9 c	15.0 ± 0.6 b	5.6 ± 0.3 ab	2.56 ± 0.29 ab	3.45 ± 0.03 bc	4.05 ± 0.21 a
10. Straight 8	417.8 ± 29.8 a	22.1 ± 0.6 a	5.8 ± 0.1 ab	2.11 ± 0.39 b	3.50 ± 0.11 bc	3.91 ± 0.19 ab
LSD <sub>0.05</sub> <sup>a</sup>	41.9	2.5	0.5	0.85	0.38	0.41

<sup>a</sup>Determination of flavor of cucumber fruit were made by 20 individual volunteers using a score of 1 (low) to 5 (high).  
<sup>a</sup>Values for the least significant difference (LSD) at  $p < 0.05$  for comparing means in each column.

### 2. Mulching study

Compared to no mulching (Fig.3), all of the 3 different mulching materials (bio-film, clear poly film, and black poly film) improved the fruit yield (20.7%). Mulching with black poly film provided the highest fruit yield for both pickling and slicing cultivars tested (Table 3). Mulching treatment also improved fruit quality such as texture, flavor etc. But there was no significant difference (Table 4).



Fig. 3. A research plot showing cucumber production with soil mulching.

Table 3. Influence of mulching on total number and quality of fruits harvested.

Treatment	Total number of fruits		Total yield of fruits (kg)	
	Regal F1	Raider F1	Regal F1	Raider F1
No mulch	64.5 ± 4.7 b	73.5 ± 3.7 b	21.81 ± 1.49 c	25.74 ± 1.42 a
Clear plastic	77.5 ± 5.7 b	81.8 ± 14.1 ab	27.43 ± 1.95 b	29.67 ± 4.99 a
Bio-film plastic	79.8 ± 7.9 b	83.8 ± 7.3 ab	25.28 ± 2.41 b	29.03 ± 2.67 a
Black plastic	103.0 ± 4.3 a	95.8 ± 7.0 a	32.38 ± 1.31 a	32.64 ± 2.46 a
LSD <sub>0.05</sub> <sup>a</sup>	15.3	21.4	4.68	7.49

Table 4. Changes in texture, flavor, appearance and soluble solids content of cucumber fruits as influenced by mulching treatment.

Treatment	Texture <sup>a</sup>		Flavor <sup>a</sup>		Color/appearance <sup>a</sup>		Sugar	
	Regal F1	Raider F1	Regal F1	Raider F1	Regal F1	Raider F1	Regal F1	Raider F1
No mulch	3.25 ± 0.25 a	3.00 ± 0.41 ab	2.75 ± 0.25 ab	2.89 ± 0.42 a	3.00 ± 0.41 a	3.11 ± 0.39 a	3.33 ± 0.33 b	3.50 ± 0.10 a
Clear plastic	3.50 ± 0.29 a	3.56 ± 0.29 a	3.00 ± 0.41 ab	2.67 ± 0.29 a	3.25 ± 0.25 a	3.33 ± 0.33 a	3.80 ± 0.06 a	3.47 ± 0.03 a
Bio-film plastic	3.50 ± 0.29 a	3.11 ± 0.35 a	3.25 ± 0.25 a	2.56 ± 0.29 a	2.75 ± 0.48 a	3.22 ± 0.22 a	3.47 ± 0.19 ab	3.50 ± 0.10 a
Black plastic	3.25 ± 0.63 a	3.33 ± 0.23 a	3.50 ± 0.29 a	3.00 ± 0.47 a	3.25 ± 0.48 a	3.00 ± 0.24 a	3.13 ± 0.07 b	3.43 ± 0.09 a
LSD <sub>0.05</sub> <sup>a</sup>	1.14	0.77	1.01	0.85	1.00	0.78	0.35	0.27

<sup>a</sup>Determination of flavor of cucumber fruit was made by 20 individual volunteers on a score of 1 (low) to 5 (high).  
<sup>a</sup>Values for the least significant difference (LSD) at  $p < 0.05$  for comparing means in each column.

## Conclusions

While all of the ten cultivars showed good horticultural traits with decent yield, Marketmore 76 provided the highest fruit yield and quality as a slicing cucumber. A&C Pickling was top-performing pickling cucumber. Soil mulching was proven to be effective in enhancing fruit yield and quality. Among the 3 different mulching materials (bio-film, clear poly film, and black poly film) tested, the black poly film was found to be the best.

## Acknowledgements

Support for this study was made available by a research grant fund received by the Northern Plains Sustainable Agriculture Society from the Specialty Crop Block Grant Program administered through the ND Department of Agriculture.