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CULTURAL STUDIES ON CUCUMBERS FOR PROCESSING
1979 and 1980

Dale W. Kretchman, Mark A. Jameson,
Charles C. Willer and Demetrio G. Ortega, Jr.

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1979 and 1980 Research Report on Cucumbers for Processing

Dale W. Kretchman, Mark A. Jameson,
Charles C. Willer and Demetrio G. Ortega, Jr.

Research on the culture and physiology of cucumbers for processing in 1979 was conducted at the Vegetable Crops Branch (VCB) near Fremont. The 1980 studies were conducted at the VCB and on the main campus at Wooster. The soil at the VCB is a sandy loam with 3-4% organic matter content. The Wooster soil is a silt loam with about 3% organic matter.

A Stan-Hay seeder was used for planting at the VCB and a Planet-Jr was used at Wooster. Vegiben 2E at 2 lb/A was applied broadcast immediately after seeding at all locations. One or more active hives of honey bees were placed in the plot areas when the plants started to bloom. All other cultural practices were according to standard recommendations. Weed control was good and no serious insect or disease problems developed either season at both locations. More specific details for each study are given in the results section.

Time and labor limitations prevented harvesting the first time at optimum maturity for maximum returns (a few over-sized fruits in each plot). Therefore, the first harvest was made when a few over-sized fruit were present in the total plot area. This undoubtedly influenced the first harvest yields and values, but we felt that data from subsequent harvest would compensate for the lack of correct timing on the first harvest.

The plots were harvested by hand and the cucumbers were graded and sized using a commercial sizer. Fruits were classed into the following sizes and values placed on each size according to the following values:

<u>Size</u>	<u>\$/Ton*</u>	
	<u>PCIC</u>	<u>Ohio</u>
1. less than 1 1/6 in.	120	240
2. 1 1/6 to 1 1/2 in.	60	120
3. 1 1/2 to 2 in.	40	60
4. 2 to 2 1/4 in.	20	10

Nitrogen and Time of Application - 1979, 1980 VCB

This study was a continuation of one initiated at the Green Springs Crops Research Unit to attempt to determine a nitrogen fertilization schedule for pickling cucumbers under Ohio conditions. The treatments were: 1) 100 lbs. N/A pre-plant broadcast; 2) 50 lbs. N/A pre-plant broadcast + 50 lbs. N/A at vine tip; 3) 50 lbs. N/A pre-plant broadcast + 1 gal/A of 28% N liquid weekly starting at vine tip; 4) No N pre-plant + 1 gal/A of 28% N liquid weekly starting at vine tip. Ammonium nitrate was used as the general source of N.

* PCIC values established by the Pickling Cucumber Improvement Committee of Pickle Packers International. Ohio values based upon estimated average prices in 1975-79 period.

Details for study in 1979, VCB:

Variety: Premier
Seeded: 6-11-79
Fertilizer: Pre-plant broadcast: 800 lb/A of 0-20-20
In-Row at seeding: 100 lbs/A of 6-24-12
Plants thinned to 4 in. single plant spacing
Rows 30 ft. long on 30 in. centers
Four replications per treatment
Harvested 8 times, July 30 through August 16
Rainfall: June 11 to 30 = 2.54 in.
July = 3.86 in.
Aug. 1-16 = 1.59 in.

Details for study in 1980, VCB:

Variety: Premier
Seeded: 6-13-80
Fertilizer: Pre-plant broadcast: 825 lbs/A of 0-26-26
In-row at seeding: 100 lbs/A of 6-24-12
Plants thinned to 4 in. single plant spacing
Rows 30 ft. long on 30 in. centers
Four replications per treatment
Harvested 8 times, July 24 through August 18
Rainfall: June 13 to 30 = 1.87 in.
July = 4.63 in.
Aug. 1-18 = 1.64 in.

Results presented in tables 1-8 suggest that the nitrogen treatments had no real influence on production of cucumbers for processing on this excellent soil at the Vegetable Crops Branch in 1979 and 1980. These results were similar to those from similar studies conducted at the Green Springs Crops Research Unit in previous seasons. It is likely that the organic matter present in the sandy loam soils at both locations (3-4%) supplied sufficient nutrients, especially N for the production of the crops. However, based upon 5 seasons of study, it appears that a split application of about 50 lbs. per acre of N pre-plant broadcast plus 50 lbs. per acre of N applied as a side dress at vining may be the more desirable treatment. Of course, with any fertilizer treatment, growers must use judgment based upon their knowledge of their particular soils and past experiences.

We have been unable to obtain any positive response from foliar applications of solutions containing small amounts of N. Vines do appear slightly greener from these treatments but no effect on yield has been found from several trials with several treatments.

Again, based upon 5 seasons of study, there is little doubt that excessive rates of N (over 150 lbs. total) and especially heavy applications at vining or later, will cause excessive plant vigor and later, reduced yields.

Table 1. First harvest yields from nitrogen x time of application treatments on pickling cucumbers. VCB - 1979.

Treatments	Size =	Tons/A				Total	Culls
		1	2	3	4		
Check		.25	1.21	1.99	.82	4.27	.34
100 lbs/A Preplant Broadcast		.24	.84	2.17	1.09	4.34	.40
50 lbs/A Preplant Broadcast + 50 lbs/A at vine tip		.25	.91	2.02	1.01	4.19	.28
50 lbs/A Preplant Broadcast + 1 gal/A 28-0-0 liquid; weekly starting at vine tip		.30	1.00	2.32	.93	4.55	.41
0 lbs/A Preplant + 1 gal/A 28-0-0 weekly, starting at vine tip		.29	1.06	2.35	.70	4.40	.30

No statistically significant differences between treatment means.

Table 2. Total yields from nitrogen x time of application treatment on pickling cucumbers. VCB - 1979.

Treatment	Yield at 8 harvest dates - tons/A								Total
	7/30	8/1	8/3	8/6	8/8	8/10	8/13	8/16	
Check	4.27	.57	1.21	2.34	1.31	1.00	.95	.58	12.23
100 lbs/A Preplant broadcast	4.34	.46	1.04	2.25	.90	.85	.96	.57	11.37
50 lbs/A Preplant broadcast 50 lbs/A at vine tip	4.19	.58	1.19	1.90	1.43	.83	.90	.52	11.54
50 lbs/A Preplant broadcast + 1 gal/A 28-0-0 weekly starting at vine tip	4.55	.60	1.26	2.47	.92	1.25	.73	.62	12.40
0 lbs/A Preplant + 1 gal/A 28-0-0 liquid weekly starting at vine tip	4.40	.48	1.04	2.47	.96	1.22	.94	.63	12.14

No statistically significant differences between treatment means.

Table 3. Values of harvested cucumbers from nitrogen x time of application treatments based on PCIC values. VCB - 1979.

Treatments	Value at 8 harvest dates - \$/A								Total
	7/30	8/1	8/3	8/6	8/8	8/10	8/13	8/16	
Check	198	45	98	156	100	83	79	55	814
100 lbs/A Preplant broadcast	188	42	91	152	71	73	74	48	738
50 lbs/A Preplant broadcast + 50 lbs/A at vine tip	186	46	94	138	105	70	82	47	768
50 lbs/A Preplant broadcast + 1 gal/A 28-0-0 liquid weekly starting at vine tip	207	45	101	165	69	97	61	58	803
0 lbs/A Preplant + 1 gal/A liquid weekly starting at vine tip	207	40	89	169	70	94	80	58	798

No statistically significant differences between treatment means.

Table 4. Values of harvested cucumbers from nitrogen x time of application treatments based on Ohio values. VCB - 1979.

Treatments	Value of 8 harvest dates - \$/A								Total
	7/30	8/1	8/3	8/6	8/8	8/10	8/13	8/16	
Check	344	89	196	307	197	165	158	110	1566
100 lbs/A Preplant broadcast	311	84	182	295	138	143	146	96	1395
50 lbs/A Preplant broadcast + 50 lbs/A at vine tip	311	91	187	272	206	138	164	93	1462
50 lbs/A Preplant broadcast + 1 gal/A 28-0-0 liquid weekly starting at vine tip	354	87	200	322	137	191	121	117	1529
0 lbs/A Preplant + 1 gal/A 28-0-0 liquid weekly starting at vine tip	362	78	178	310	137	185	157	115	1522

No statistically significant differences between treatment means.

Table 5. First harvest yields from nitrogen x time of application treatments on pickling cucumbers. VCB-1980.

Treatment	Size =	Tons/A				Total	Culls
		1	2	3	4		
Check		.38	.80	.03	0	1.22	.11
100 lb/A Preplant broadcast		.38	.75	.11	0	1.24	.13
50 lbs/A Preplant broadcast + 50 lbs/A at vine tip		.33	.54	.06	0	.93	.05
50 lbs/A Preplant broadcast + 1 gal/A 28-0-0 weekly starting at vine tip		.41	.80	.08	0	1.29	.09
0 Preplant + 1 gal/A 28-0-0 weekly starting at vine tip		.38	.67	.11	0	1.16	.08

No statistically significant differences between treatment means.

Table 6. Total yields from nitrogen x time of application treatments on pickling cucumbers. VCB 1980.

Treatment	Yield at 8 harvest dates - Tons/A								Total
	7/24	7/28	7/31	8/4	8/7	8/11	8/14	8/18	
Check	1.22	1.49	1.04	2.43	1.47	3.86	.34	2.41	14.26
100 lbs/A Preplant broadcast	1.24	1.75	.94	2.58	1.45	4.02	.52	2.02	14.52
50 lbs/A Preplant broadcast + 50 lbs/A at vine tip	.93	1.52	.93	2.80	1.59	4.05	.57	2.37	14.76
50 lbs/A Preplant broadcast + 1 gal/A 28-0-0 weekly starting at vine tip	1.29	1.64	.98	2.59	1.26	3.91	.52	2.14	14.33
0 Preplant + 1 gal/A 28-0-0 weekly starting at vine tip	1.16	1.65	.91	2.99	1.15	3.97	.42	2.08	14.33

No statistically significant differences between treatment means.

Table 7. Values of harvested cucumbers from nitrogen x time of application treatments based on PCIC values. VCB-1980.

Treatment	Value of 8 harvest dates - \$/A								Total
	7/24	7/28	7/31	8/4	8/7	8/11	8/14	8/18	
Check	95	122	93	148	121	200	28	170	977
100 lbs/A Preplant broadcast	96	136	82	156	115	196	44	156	981
50 lbs/A Preplant broadcast + 50 lbs/A at vine tip	74	125	84	169	128	206	43	173	1002
50 lbs/A Preplant broadcast + 1 gal/A 28-0-0 weekly starting at vine tip	100	133	83	158	105	200	40	162	981
0 Preplant + 1 gal/A 28-0-0 weekly starting at vine tip	90	130	75	175	104	195	40	150	959

No statistically significant differences between treatment means.

Table 8. Values of harvested cucumbers from nitrogen x time of application treatments based on estimated Ohio values. VCB-1980.

Treatment	Value of 8 harvest dates - \$/A								Total
	7/24	7/28	7/31	8/4	8/7	8/11	8/14	8/18	
Check	189	243	184	282	238	352	54	331	1873
100 lbs/A Preplant broadcast	189	267	163	298	223	334	85	307	1866
50 lbs/A Preplant broadcast + 50 lbs/A at vine tip	148	247	167	318	249	360	81	339	1909
50 lbs/A Preplant broadcast + 1 gal/A 28-0-0 weekly starting at vine tip	199	262	163	301	204	351	76	320	1876
0 Preplant + 1 gal/A 28-0-0 weekly starting at vine tip	178	255	148	329	204	337	79	293	1823

No statistically significant differences between treatments.

Influence of N Source on Yield, VCB, 1980

This study was established at the Green Springs Crops Research Unit, in 1977, 1978 and continued at the VCB in 1980 to determine the influence of source of N in yield and gross returns. Sources were Urea (45%), Liquid N (28%), ammonium nitrate (33 1/3%), calcium nitrate (15 1/2%), ammonium sulfate (21%), and in 1978 only, a controlled release methylene urea (39%). All were applied preplant broadcast at rate of 60 lbs. N/A. Rows were on 30-inch centers with single plants of Premier 4 inches apart. Plots were harvested twice weekly for 7 harvests in 1977, 8 in 1978 and 6 in 1980. The plots were harvested by hand and the cucumbers were graded and sized using a commercial sizer as previously described.

Details for study in 1980 (previous studies were very similar):

Variety: Premier
 Seeded: 6-13-80
 Fertilizer: Pre-plant broadcast 825 lbs/A of 0-26-26
 In-row at planting: 100 lbs/A of 6-24-12
 Treatment N applied at 60 lbs/A of N
 Rows on 30 inch centers
 Plants 4 inches apart in row
 Harvested 7 times in 1977, 8 in 1978 and 6 in 1980
 All treatments replicated 4 times
 Rainfall in 1980: June 13-30 = 1.87 in.
 July = 4.63 in.
 Aug. 1-18 = 1.64 in.

Results summarized in Table 9 indicate that source of N had little significant influence on yield and dollar value. However, the data do suggest that under the conditions of this study, ammonium sulfate as a source of N may provide slightly higher yields over a period of time.

Table 9. Influence of source of N on yield and returns from pickling cucumber. Green Springs Crops Research Unit, 1977, 1978, and VCB 1980.

N Source	Yield Tons/A						Yield \$/A					
	First Harvest			Total Yield			First Harvest			Total Yield		
	1977	1978	1980	1977	1978	1980	1977	1978	1980	1977	1978	1980
Urea	2.75	3.05	1.20	12.33	13.32	11.93	152	161	174	1346	1350	1473
Liquid N	2.73	2.64	1.16	11.34	13.39	11.38	136	165	173	1237	1369	1402
Amm. Nitrate	1.94	3.34	1.12	10.86	12.75	11.09	135	176	174	1273	1287	1379
Cal. Nitrate	2.04	3.26	1.18	12.46	13.63	11.20	136	188	173	1439	1414	1388
Amm. Sulfate	2.25	4.15	1.01	13.54	14.32	12.05	143	191	150	1509	1345	1495
Meth. Urea	----	3.93	----	-----	13.32	-----	---	195	---	----	1324	----
LSD 5%	--	1.43	--	--	--	--	--	--	--	--	--	--

* Based on Ohio estimated values

Leaf Injury Study - 1980

Destruction of foliage on cucumbers occurs in varying degrees each year. It can occur from insects or diseases, mechanical damage from machinery or hail and from picking labor. To get some initial data on the effects of severe injury to leaves (removal of the entire leaf blade) which may occur at different times during the season, a study was initiated in 1980. We also included a shading treatment at the Wooster location to gain additional insight into the efficiency of the cucumber plant.

The leaf removal treatments were admittedly severe, 50 - 90 % of leaves removed at the different stages of plant development. However, this was considered desirable to get initial data.

Details for the VCB study:

Variety: Premier
Seeded: 6-13-8-
Fertilizer: Pre-plant broadcast 1000 lbs/A 10-20-20
In-row at planting: 100 lbs/A 6-24-12
Sidedress at vine tip: 33 lbs/A of N 28% applied
Rows on 30 inch centers, 30 ft. long
Plants thinned to 6 inches within row
Harvested 8 times, July 24 through August 8
Four replications per treatment
Rainfall: June 13-30 = 1.87 in.
July = 4.63 in.
August 1-18 = 1.64 in.

Details for the Wooster study:

Variety: Premier
Seeded: 6-24-80
Fertilizer: 600 lbs/A 10-20-20 pre-plant broadcast
Rows on 4 ft. centers, 30 ft. long
Plants thinned to 6 in. within the row
Harvested 7 times from August 6 to 20
Four replications per treatment
Rainfall: June 24-30 = 0.28 in.
July = 5.73 in.
Aug. 1-20 = 5.48 in.

Reaching positive conclusions from this study may be hazardous, but the data (Tables 10-17) suggest that 90% leaf removal at any stage of plant development will likely cause significant yield reduction.

Table 10. First harvest yield from leaf removal study of pickling cucumbers - VCB - 1980.

Treatments	Size =	Tons/A				Total	Culls
		1	2	3	4		
Check		.28	.32	.02	0	.62	.08
Remove 90% leaves at vine tip (7/14/80)		.01	0	0	0	.01	0
Remove 50% leaves at vine tip (7/14/80)		.17	.08	0	0	.25	.06
Remove 90% leaves at first bloom (7/18/80)		.03	.01	0	0	.04	0
Remove 50% leaves at first bloom (7/18/80)		.17	.17	0	0	.34	.09
Remove 90% leaves at first harvest (7/24/80)		.35	.65	.02	0	1.36	.15
Remove 50% leaves at first harvest (7/24/80)		.33	.51	.04	0	.88	.20
	LSD 5%	.08	.22	---	0	.25	.08

Table 11. Total yields from leaf removal study of pickling cucumbers. VCB - 1980.

Treatments	Yield at 8 harvest dates - Tons/A								Total	
	7/24	7/28	7/31	8/4	8/7	8/11	8/14	8/18		
Check	.62	1.38	1.12	3.14	1.69	5.75	.62	2.79	17.11	
Remove 90% leaves/vine tip	.01	.17	.66	2.04	1.34	4.51	.73	3.22	12.68	
Remove 50% leaves/vine tip	.25	.85	.93	2.43	1.67	4.52	.76	2.40	13.81	
Remove 90% leaves/first bloom	.04	.15	.41	1.78	1.27	4.50	.56	2.61	11.32	
Remove 50% leaves/first bloom	.34	1.23	.96	2.98	1.33	5.66	.66	2.48	15.64	
Remove 90% leaves/first harvest	1.36	.06	.37	1.47	1.14	3.64	.66	2.42	11.12	
Remove 50% leaves/first harvest	.88	.67	1.11	2.66	1.43	5.15	.62	2.84	15.36	
	LSD 5%	.25	.25	.36	.57	----	1.24	---	----	2.6

Table 12. Values of harvested cucumbers from leaf removal study based on PCIC values. VCB-1980.

Treatments	Yield at 8 harvest dates - \$/A								Total
	7/24	7/28	7/31	8/4	8/7	8/11	8/14	8/18	
Check	50	109	92	180	117	265	50	203	1066
Remove 90% leaves/vine tip	1	16	59	113	103	222	62	215	791
Remove 50% leaves/vine tip	26	70	82	142	129	230	61	175	915
Remove 90% leaves/first bloom	4	13	38	107	99	217	53	188	719
Remove 50% leaves/first bloom	30	92	84	166	103	252	67	195	989
Remove 90% leaves/first harvest	82	6	32	89	92	188	55	190	734
Remove 50% leaves/first harvest	72	58	85	147	102	232	53	200	949
LSD 5%	17	14	27	31	---	---	--	---	165

Table 13. Harvested cucumbers from leaf removal study based on estimated Ohio values. VCB - 1980.

Treatments	Value of 8 harvest dates - \$/A								Total
	7/24	7/28	7/31	8/4	8/7	8/11	8/14	8/18	
Check	107	213	179	335	222	438	96	401	1991
Remove 90% leaves/vine tip	2	33	118	207	201	384	120	417	1482
Remove 50% leaves/vine tip	51	139	163	266	247	405	114	342	1727
Remove 90% leaves/first bloom	8	27	75	202	192	371	104	369	1348
Remove 50% leaves/first bloom	60	180	167	307	201	411	134	383	1843
Remove 90% leaves/first harvest	164	12	63	168	181	328	105	375	1396
Remove 50% leaves/first harvest	143	115	164	267	193	380	103	392	1757
LSD 5%	33	27	56	58	---	---	---	---	319

Table 14. First harvest yield from leaf removal study of pickling cucumber - Wooster - 1980.

Treatments	Size =	Tons/A				Total	Culls
		1	2	3	4		
Check		.03	.22	.51	.15	.91	.01
50% leaf removal at first bloom (8-1-80)		.01	.18	.34	--	.53	.01
90% leaf removal at first bloom (8-1-80)		.05	.03	.11	--	.19	.03
50% leaf removal at first harvest (8-7-80)		.06	.22	.71	.13	1.12	.11
90% leaf removal at first harvest (8-7-80)		.03	.26	.63	.08	1.00	.09
Shade starting at vine tip (cheesecloth) (7-24-80)		.01	.29	.62	.03	.95	.03
Shade starting at first bloom (cheesecloth) (8-1-80)		.04	.17	.71	.16	1.08	.09
	LSD 5%	---	---	.39	---	.57	.07

Table 15. Total yields from leaf removal study of pickling cucumbers - Wooster - 1980.

Treatment	Yield at 7 harvest dates - tons/A							Total	
	8/6	8/8	8/11	8/13	8/15	8/18	8/20		
Check	.91	.62	1.93	.94	1.24	1.27	1.81	8.72	
50% leaf removal at first bloom	.53	.60	1.56	.88	1.14	1.44	1.56	7.71	
90% leaf removal at first bloom	.19	.37	.97	.40	.72	1.26	1.68	5.59	
50% leaf removal at first harvest	1.12	.37	1.11	.26	.99	.60	1.87	6.32	
90% leaf removal at first harvest	1.00	.29	.26	.28	.54	.90	1.03	4.30	
Shade starting at vine tip	.95	.60	2.21	.65	1.25	1.28	2.37	9.31	
Shade starting at first bloom	1.08	.77	2.07	.74	1.05	1.65	2.00	9.36	
	LSD 5%	.57	---	.57	---	----	----	.74	1.43

Table 16. Values of harvested cucumbers from leaf removal study based on PCIC values - Wooster-1980.

Treatments	Yield at 7 harvest dates - \$/A							Total
	8/6	8/8	8/11	8/13	8/15	8/18	8/20	
Check	40	33	84	50	73	69	100	449
50% leaf removal at first bloom	25	32	69	42	51	81	82	382
90% leaf removal at first bloom	13	21	56	22	39	65	88	304
50% leaf removal at first harvest	51	18	48	16	57	34	97	321
90% leaf removal at first harvest	47	16	15	15	34	53	66	246
Shade starting at vine tip	44	32	99	30	66	68	113	452
Shade starting at first bloom	47	41	103	33	55	79	97	455
LSD 5%	23	--	20	--	--	29	---	60

Table 17. Values of harvested cucumbers from leaf removal study based on estimated Ohio values - Wooster-1980.

Treatment	Yield at 7 harvest dates - \$/A							Total
	8/6	8/8	8/11	8/13	8/15	8/18	8/20	
Check	66	61	138	92	134	126	183	800
50% leaf removal at first bloom	44	60	111	73	83	150	146	667
90% leaf removal at first bloom	24	40	102	40	71	113	154	544
50% leaf removal at first harvest	85	32	75	31	105	62	169	559
90% leaf removal at first harvest	79	29	27	27	65	96	124	447
Shade starting at vine tip	76	58	165	53	118	122	190	782
Shade starting at first bloom	75	75	180	53	98	134	166	781
LSD 5%	39	--	34	43	--	49	---	112

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