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Response of Cucumber, Yellow Squash, and Zucchini to Six Nitrogen Rates

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Objective

Nitrogen can be a limiting factor for many commercial vegetable crops. Cucurbit crops (vine crops) often respond to excess nitrogen by producing more plant but not necessarily more fruit. Excess foliage can potentially lead to increased disease issues and hinder harvest activity. This trial was conducted to determine fruit yield and quality response of slicing cucumber, yellow squash, and zucchini to 50, 75, 100, 125, 150, and 175 pounds of nitrogen per acre.

Summary

There were few significant differences across the six nitrogen levels for the traits measured for all three crops. No clear trends were observed as nitrogen level was increased from 50 to 175#/acre. Better separation may have been obtained with more replication. Results indicate growers of slicing cucumber, yellow squash, and zucchini should be able to obtain adequate fruit yields using a season total of between 75 and 100#/acre nitrogen.

Methods

Planting

On 29 May 2019, seed of 'Diomede' slicing cucumber (Syngenta), 'Grandprize' yellow squash (Syngenta), and 'Spineless Supreme' zucchini (Syngenta) were direct seeded into a plasticulture system. Beds were six-inches high with a spacing of 5.5 feet between beds and 24 inches between plants in the row. Cucumbers were seeded two to a hill (7920 plants/acre) while yellow squash and zucchini were seeded one to a hill (3,960 plants/acre). A drip irrigation line was inserted in the bed at the time of bed shaping and plastic mulch application. The trial was planted and analyzed as a completely randomized design with four replications. Each plot consisted of eight (yellow squash and zucchini) or 16 (cucumber) plants. Each plot contained all three species. Plots receiving similar nitrogen rates were connected with appropriate plumbing using solid tubes. All treatments received similar amounts of irrigation water other than the difference needed to apply the fertilizer treatments.

Fertilizer

Prior to bed shaping, 33-0-0, 0-0-61, sulfur and Solubor were broadcast and incorporated at a rate of 100, 175, 25 and 10 pounds per acre, respectively. After planting, liquid 28-0-0 was applied through the drip system once a week at a rate that provided a season total of 50, 75, 100, 125, 150, and 175 pounds/acre of nitrogen. Fertilization began 17 June and continued until 29 July (7 weeks). Weekly rates were

determine by dividing the amount needed for that treatment by 7 and injecting that amount each week.

Pest Control
Weeds between rows were controlled by cultivation. Diseases and insects were controlled using commercially recommended practices.

Harvest and Data Collection
Cucumbers were harvested ten times between 15 July and 5 August and fruit graded into Number 1, Number 2 and Cull fruit. Fruit was then weighed and converted into 1-1/9 bushels/acre. Yellow squash and zucchini were harvested ten times between 23 July and 12 August and fruit graded into Small, Medium, Large, Number 2, and Cull fruit. Fruit was then weighed and converted into ½ bushels per acre. Each species was statistically analyzed separately.

Results and Discussion
A surprising amount of non-significance was found between the yield traits measured across all three crops and all six nitrogen levels (Table 1, 2, and 3). There were no significant differences in any trait measured for 'Diomede' slicing cucumber (Table 1). 'Spineless Supreme' zucchini had differences in yield of Medium and Cull fruit (Table 2). 'Grandprize' yellow squash had the greatest amount of difference with statistical differences in Total Yield, Yield Small, Yield Number 2, and Yield Cull fruit (Table 3).

Fertilizer trials generally result in increasing yields with increased rates until such a high rate is reached that the nutrient tested becomes damaging and yield declines. It is possible in this study that the damaging rate was not reached. However, there was not a clear trend of increased yield in any of the three crops. Field trials often have high standard deviation rates, which can be reduced by increasing the number of replications. Higher rates and more replications should be considered in future trials.

Even though there was not clear separation between treatments, it can be concluded that increasing nitrogen rates in the range tested did not have an effect on fruit yield or quality of the three crops evaluated. Therefore, from an economic and environmental standpoint it does growers no good to have seasonal nitrogen levels higher than 80 to 100#/acre if they are applying it weekly through drip irrigation This may change in a bare ground system due to loss through greater leaching and volatilization.

Table 1. Yield in 1-1/9 bushels/acre of 'Diomede' slicing cucumber under six nitrogen levels in 2019 at the Southwest Michigan Research and Extension Center, Benton Harbor, Michigan. Plants were spaced at 5.5' between rows and 2' in the row with two plants/hill

Treatment	Total Yield	Yield No. 1	Yield No. 2	Yield Cull
50# N/Acre	689	311	120	259
75# N/Acre	1072	463	209	400
100# N/Acre	924	383	220	321
125# N/Acre	673	253	156	264
150# N/Acre	1033	432	227	376
175# N/Acre	740	353	129	259
Lsd 0.05	**ns**	**ns**	**ns**	**ns**

Table 2. Yield in ½ bushels/acre of 'Spineless Supreme' zucchini under six nitrogen levels in 2019 at the Southwest Michigan Research and Extension Center, Benton Harbor, Michigan. Plants were spaced at 5.5' between rows and 2' in the row with one plant/hill.

N Treatment	Total Yield	Yield Small	Yield Medium[1]	Yield Large	Yield No. 2	Yield Cull
50# N/Acre	2132	709	366	287	273	**498**
75# N/Acre	2229	805	342	360	192	**531**
100# N/Acre	2411	713	**394**	321	216	**767**
125# N/Acre	2192	685	**482**	333	209	**482**
150# N/Acre	2690	820	**569**	335	249	**717**
175# N/Acre	1975	755	375	308	189	348
Lsd 0.05	**ns**	**ns**	**185**	**ns**	**ns**	**353**

[1]Numbers in bold are not significantly different from the highest number in that column.

Table 3. Yield in ½ bushels/acre of 'Grandprize' Yellow Squash under six nitrogen levels in 2019 at the Southwest Michigan Research and Extension Center, Benton Harbor, Michigan. Plants were spaced at 5.5' between rows and 2' in the row with one plant/hill.

Treatment	Total Yield[1]	Yield Small	Yield Medium	Yield Large	Yield No. 2	Yield Cull
50# N/Acre	1440	658	160	69	37	516
75# N/Acre	**1719**	**828**	211	86	**123**	470
100# N/Acre	**2007**	**983**	198	59	**124**	**643**
125# N/Acre	**1730**	**761**	217	103	**156**	493
150# N/Acre	**2053**	**893**	244	96	**109**	**711**
175# N/Acre	**1772**	**823**	209	97	**124**	519
Lsd0.05	**435**	**225**	**ns**	**ns**	**95**	**161**

[1]Numbers in bold are not significantly different from the highest number in that column.