



ETHYLENE FOR SEED ACCUMULATION

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Introducing Ethylene...

- Ethylene is a natural gas produced by many vegetables/fruit during ripening/storage
- Produced in substantial quantities by apples in storage
- In potatoes, exposure to ethylene has two effects:
 - Can break apical dominance and cause more eyes to sprout
 - Acts as a sprout inhibitor as long as ethylene gas is present



Restrain

- Company based in United Kingdom
- Electric generator that creates ethylene gas from liquid ethanol, sensors keep ethylene gas at constant ppm in storage
- Can be used for sprout inhibition in table or seed potatoes
- A higher concentration of ethylene has been shown to produce more stems/tubers per plant in certain varieties



2018 Trial

- AIM Seed Working Group wished to see how ethylene gas would effect seed from 5 processing varieties
 - Russet Burbank, Shepody, Prospect, Ranger Russet, Dakota Russet
- Also assessed 3 privately controlled fresh market varieties, two of which were creamer varieties
- Seed from each variety was split between treated and not treated, with the same storage conditions
 - 4 C through majority of storage period, 95% RH
 - Warmed up to 10 C a week before planting



2018 Trial



2018 Trial

- Ethylene generator started on February 14th.
- Temperature for treated seed kept at 7.5 C until mid-March, then lowered to 4 C over a week.
- Temp raised again for a short time in April to encourage sprouting to 2 mm after consultation with Restrain staff.
- Non-treated seed stored at 4 C, but with some daily temp fluctuation. Some varieties were well sprouted by planting.
- Ethylene generator turned off on May 10th
- Temp increased to 10 C on May 17th
- Both sites planted on May 22nd



2018 Trial



2018 Trial

- Planted to a seed standard, with tighter spacings and lower nitrogen fertility than commercial standard
 - RB and Ranger: 12 inches
 - Dakota and Shepody: 10 inches
 - Prospect: 9 inches
- Topkilled Sept 5th at Harrington, Sept 12th at AAT
- Harvested Sept 27th at Harrington, Sept 25th at AAT



Accelerated Emergence

- Most varieties emerged faster from the ethylene treated seed than the control.
- Difference in emergence most noticeable for Dakota Russet and Russet Burbank. 2-3 days difference in full emergence
- All varieties had full emergence by late June/early July



Processing Varieties

Variety	Stems/ Plant	# tubers/ 6 m	Yield (cwt/ac)	Ave Tuber Wt (g)
R. Burbank (Ctrl)	4.5	175.7	289.7	113.0
R. Burbank (Eth)	4.6	230.5	315.7	88.3
Difference	0.1	54.8	26.0	-24.7
Dakota R (Ctrl)	1.9	130.9	250.9	120.1
Dakota R (Eth)	2.0	148.1	253.0	124.3
Difference	0.1	17.2	2.1	4.2
Ranger R (Ctrl)	2.9	160.9	229.1	91.8
Ranger R (Eth)	3.4	181.2	215.5	77.6
Difference	0.5	20.3	-13.6	-14.2

Bold were significantly different at $p=0.05$

Processing Varieties

Variety	Stems/ Plant	# tubers/ 6 m	Yield (cwt/ac)	Ave Tuber Wt (g)
Prospect (Ctrl)	2.7	148.4	310.8	140.1
Prospect (Eth)	2.6	136.1	304.9	146.0
Difference	-0.1	-12.3	-5.9	5.9
Shepody (Ctrl)	3.6	195.0	290.3	97.2
Shepody (Eth)	3.2	195.7	282.3	96.8
Difference	-0.4	0.7	-8.0	-0.4



Fresh Market Varieties

Variety	Stems/ Plant	# tubers/ 6 m row	Yield (cwt/ac)
Creamer 1 (Ctrl)	4.8	317.3	202.6
Creamer 1 (Eth)	6.5	381.8	234.3
Difference	1.7	64.5	31.7
Creamer 2 (Ctrl)	4.8	348.2	193.1
Creamer 2 (Eth)	5.5	338.0	157.7
Difference	0.7	-10.2	-35.4
Round White 1 (Ctrl)	3.2	136.2	232.7
Round White 2 (Eth)	3.9	193.7	280.5
Difference	0.7	57.5	47.8

Bold were significantly different at $p=0.05$

General Observations

- Only Russet Burbank had significant difference ($p=0.05$) in tuber number among the processing varieties. Dakota and Ranger small numerical increase...will require a further year of study to see if repeated. Shepody and Prospect showed no effect.
- Where tuber number was increased, average tuber size generally decreased
- All three fresh market varieties showed significant difference in number of stems per plant
- Creamer varieties were not managed strictly as creamers. This likely had an impact on average tuber size.



Moving Forward

- Response to ethylene is very variety dependent. Will require evaluation of different varieties to assess their level of response.
- Trial will be repeated in 2019 with addition of a couple of new russet varieties.
- For certain varieties, ethylene may have a definite value in multiplying more tubers/acre, which would have significant value in a whole seed planting system.



Moving Forward

- Seed producers would only treat varieties that show an effect from ethylene. Would treat seed for multiplication, not for commercial planting year (in processing varieties) unless trying to control size/tuber number.
- Both of the creamer varieties showed increased stem numbers and a trend toward increased tuber numbers in the creamer size category. Ethylene could have potential value for commercial creamer production.





Questions?

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Agriculture and
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