Cornell Cooperative Extension
Cornell Vegetable Program

Nitrogen Fertility Management for Garlic – It is Less Than You Think

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Garlic Fertility Recommendations

PLANT NUTRIENT RECOMMENDATION ACCORDING TO SOIL TEST RESULTS FOR GARLIC

GARLIC	NITROGEN (N) LBS PER ACRE	PHOSPHORUS (P) LBS P_2O_5 PER ACRE				POTASSIUM (K) LBS K_2O PER ACRE			
SOIL TEST RESULTS		VERY LOW	LOW	OPTIMUM	ABOVE OPTIMUM	VERY LOW	LOW	OPTIMUM	ABOVE OPTIMUM
Broadcast and Incorporate in fall	40	150	100	25-50	0	150	100	50	0
Sidedress in spring when shoots are 6 inches high	40	0	0	0	0	0	0	0	0
Sidedress 3-4 weeks later	40	0	0	0	0	0	0	0	0
TOTAL RECOMMENDED	**120**	**150**	**100**	**25-50**	**0**	**150**	**100**	**50**	**0**

Garlic crop uses 150-175 lb/A of nitrogen

Garlic Fertility Recommendations

GARLIC SOIL TEST RESULTS	PLANT NUTRIENT RECOMM NITROGEN (N) LBS PER ACRE
Broadcast and Incorporate in fall	40
Sidedress in spring when shoots are 6 inches high	40
Sidedress 3-4 weeks later	40
TOTAL RECOMMENDED	**120**

Deduct 10-15 lbs of N per 1% of OM

→ 95 lbs N

Deduct nitrogen credits for previous crop/cover crop – soil test!

2017-2018 Garlic Research Trials

	2017		2018	
	Batavia	**Long Island**	**Albion**	**Long Island**
Soil type	Gravelly loam	Sandy loam	Hilton loam	Sandy loam
Previous crop	Sod, turned over in the fall	Rye cover crop, turned over in spring	Oat cover crop, turned over in the fall	Sunflower windbreaks
Planting configuration	• **2 rows 15-inch** apart **per 5 ft** • **6-inch plant** spacing • **34,848** plants/A • **Flat** bed	• **2 rows 15-inch** apart **per 5.6 ft** • **6-inch plant** spacing • **31,114** plants/A • **Flat** bed	• **2 rows 7-inch** apart per **2.5 ft** • **6-inch plant** spacing • **69,696** plants/A • **Flat + hill**	• **2 rows 15-inch** apart per **5.6 ft** • **6-inch plant** spacing • **31,114** plants/A • **Flat** bed
Seed Sources (all German hardneck)	1, 2 & 3 (infested)	1 & 2	Combo of healthy bulbs from 1 & 2 **Medium & Large Bulbs**	Combo of bulbs from sources 1 & 2

2017 Trial - Batavia, NY

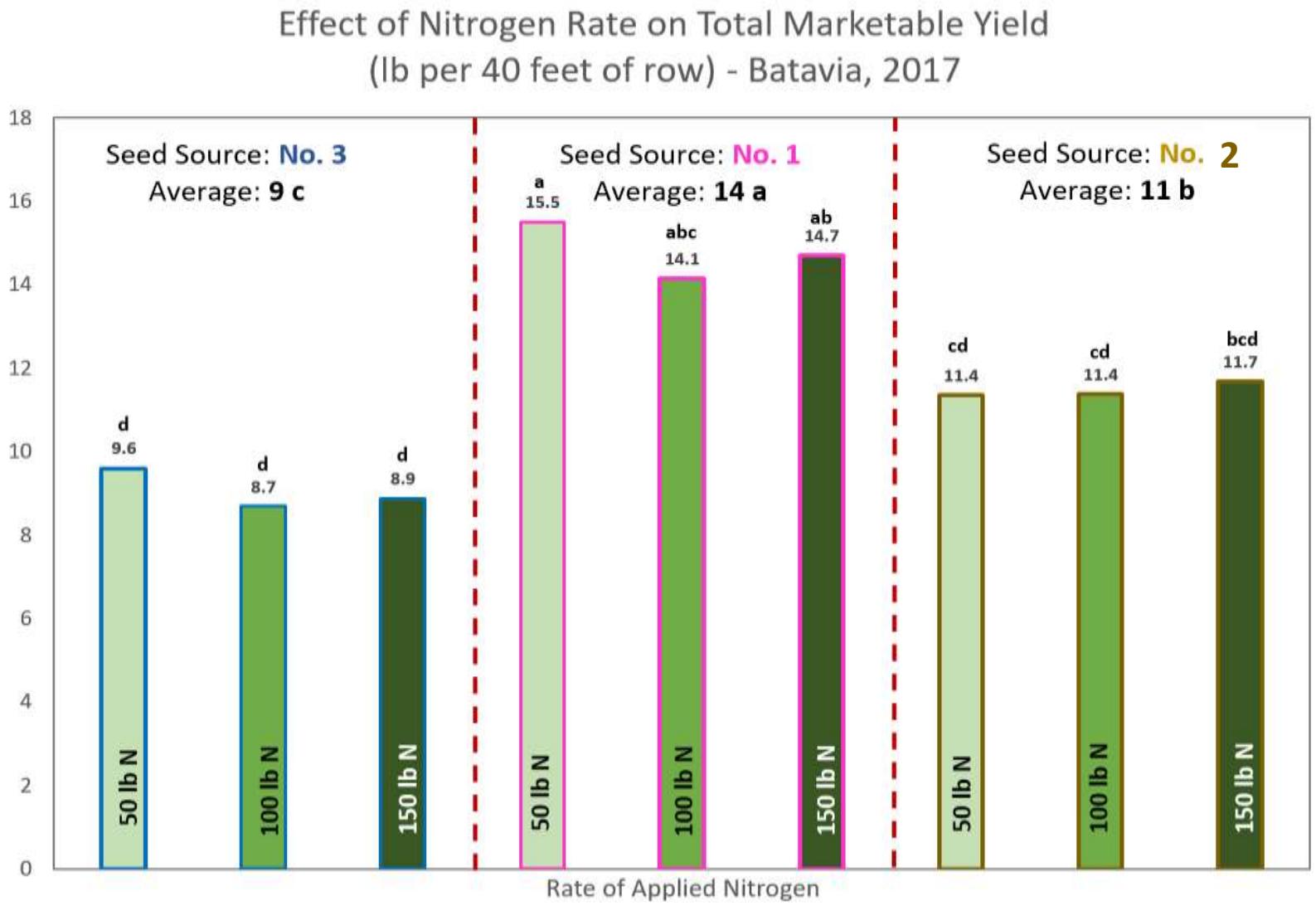
2018 Trial – Albion,NY

Oct 26, 2017

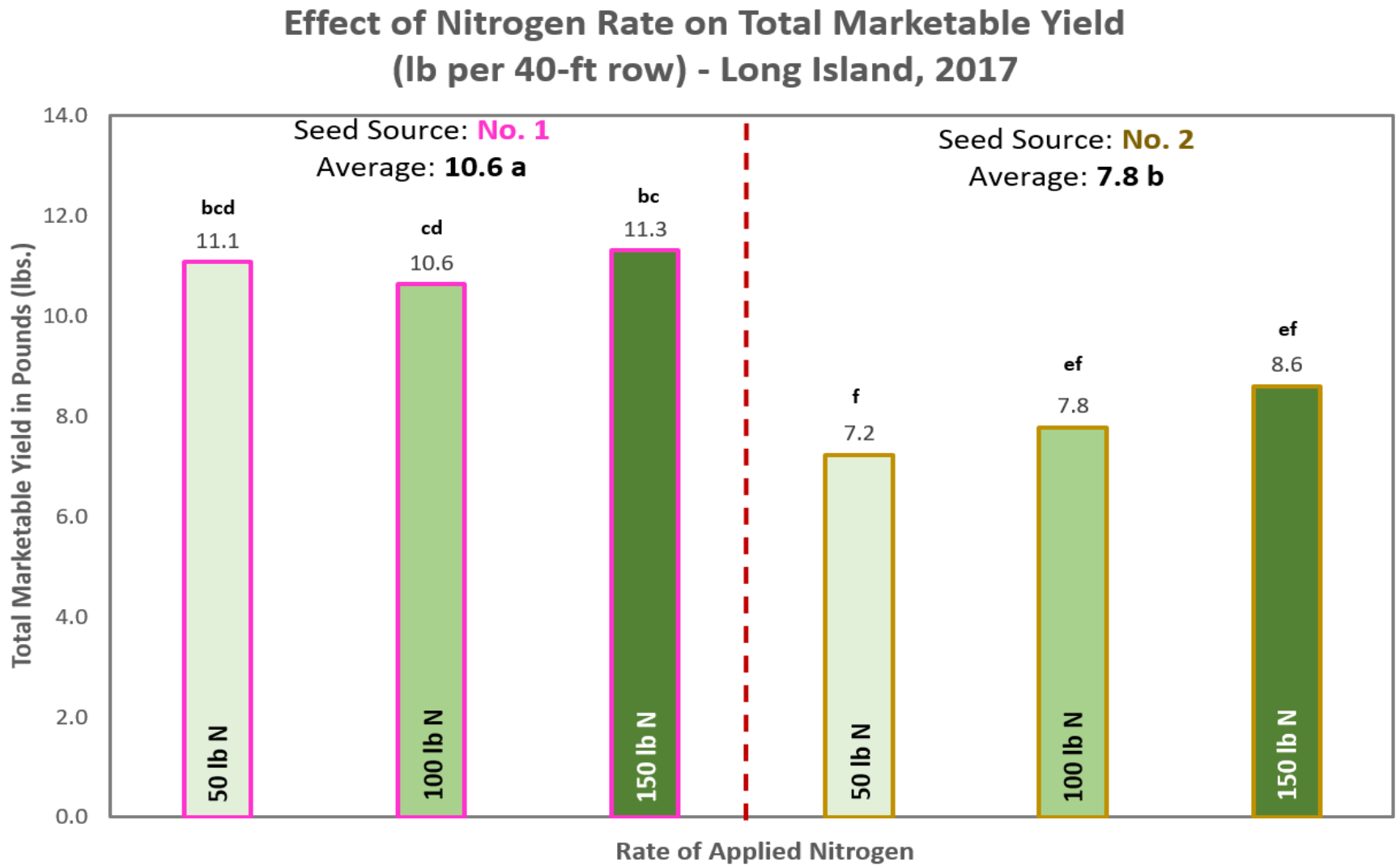
2017-2018 Garlic Research Trials

	2017		2018	
	Batavia	**Long Island**	**Albion**	**Long Island**
Nitrogen application	50, 100, 150 lb/A Urea (**46-0-0**) **broadcast per area and rained in** (Apr 13)	50, 100, 150 lb/A Ammonium Nitrate (**34-0-0**) **Side-dressed** at emergence and **incorporated** (Apr 10)	**0**, 50, 100, 150 lb/A Urea (**46-0-0**) **rate/A concentrated over rows and rained in** (Apr 23)	50, 100, 150 lb/A (**32-0-1**) **Side-dressed** at emergence and **incorporated** (Apr 12)
Other fertilizer	**P & K** according to soil test in **fall**	**P & K** according to soil test in **fall**	**Dairy manure in fall**; **P & K** in **fall** according to soil test	**P & K** according to soil test in **fall**

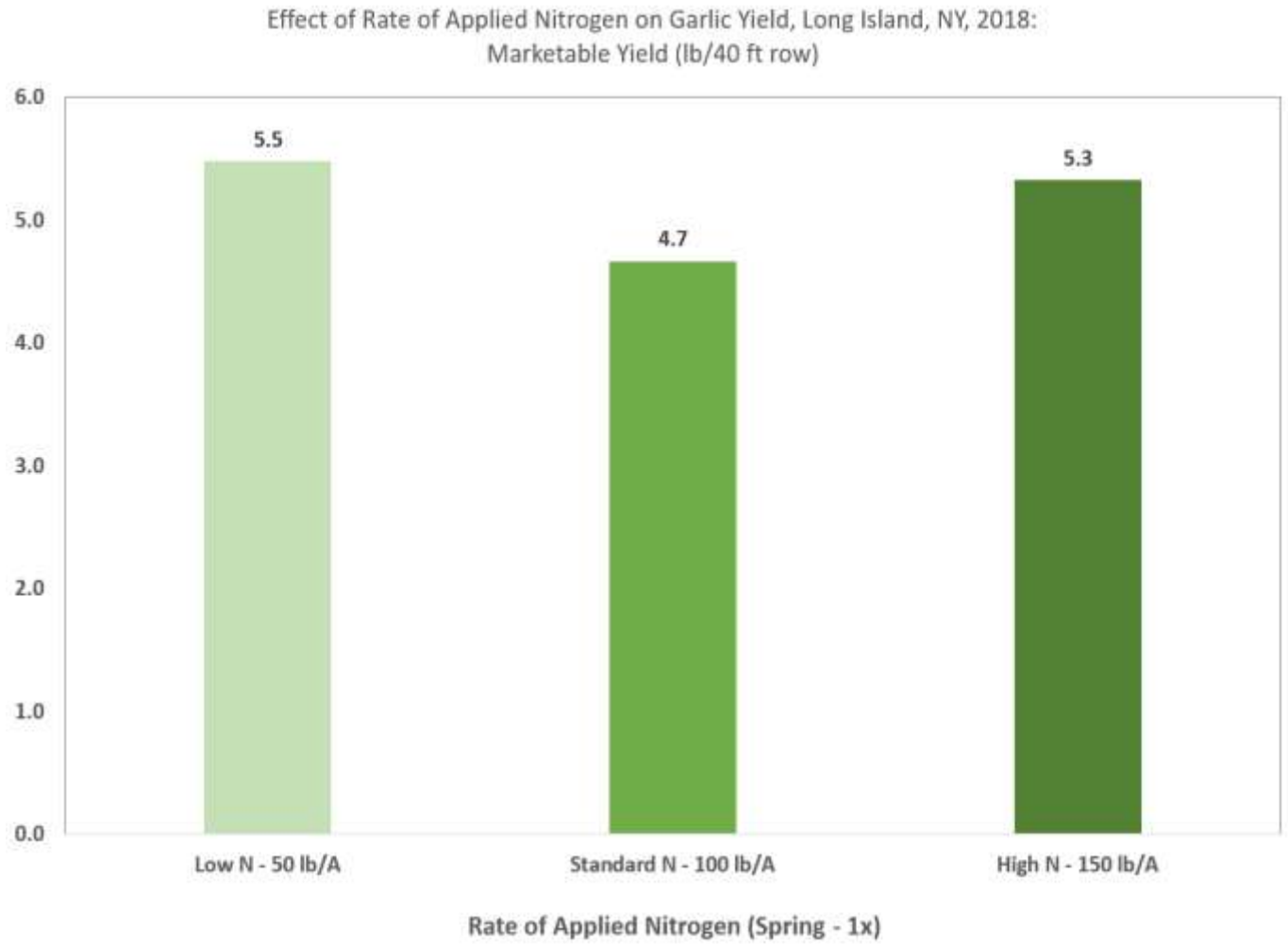
Results: 2017 Trial - **Batavia**, NY
Total Marketable Yield (lb/ 40 ft row)



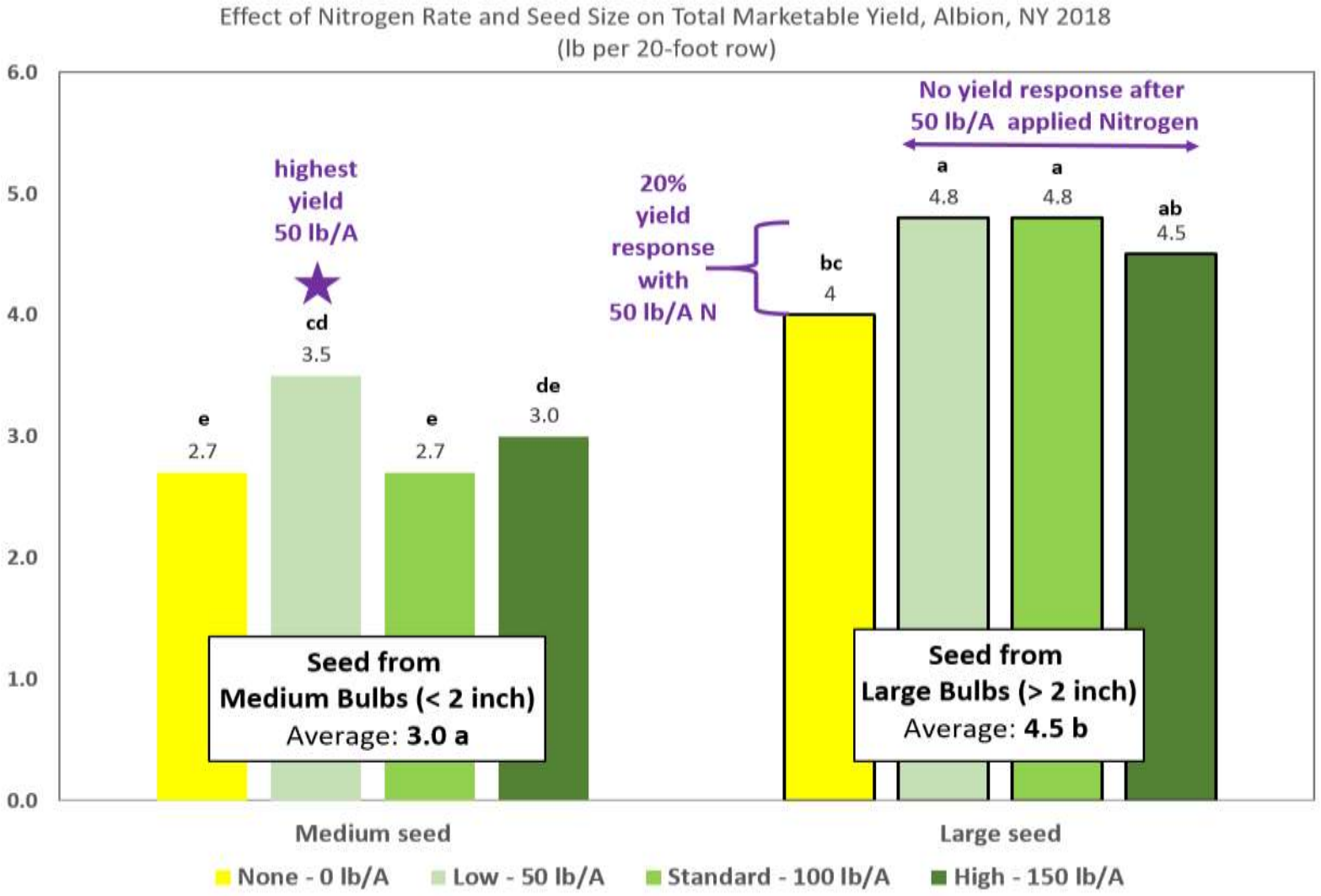
Results: 2017 Trial – **Long Island**, NY
Total Marketable Yield (lb/ 40 ft row)



Results: 2018 Trial – **Long Island**, NY Total Marketable Yield (lb/ 40 ft row)

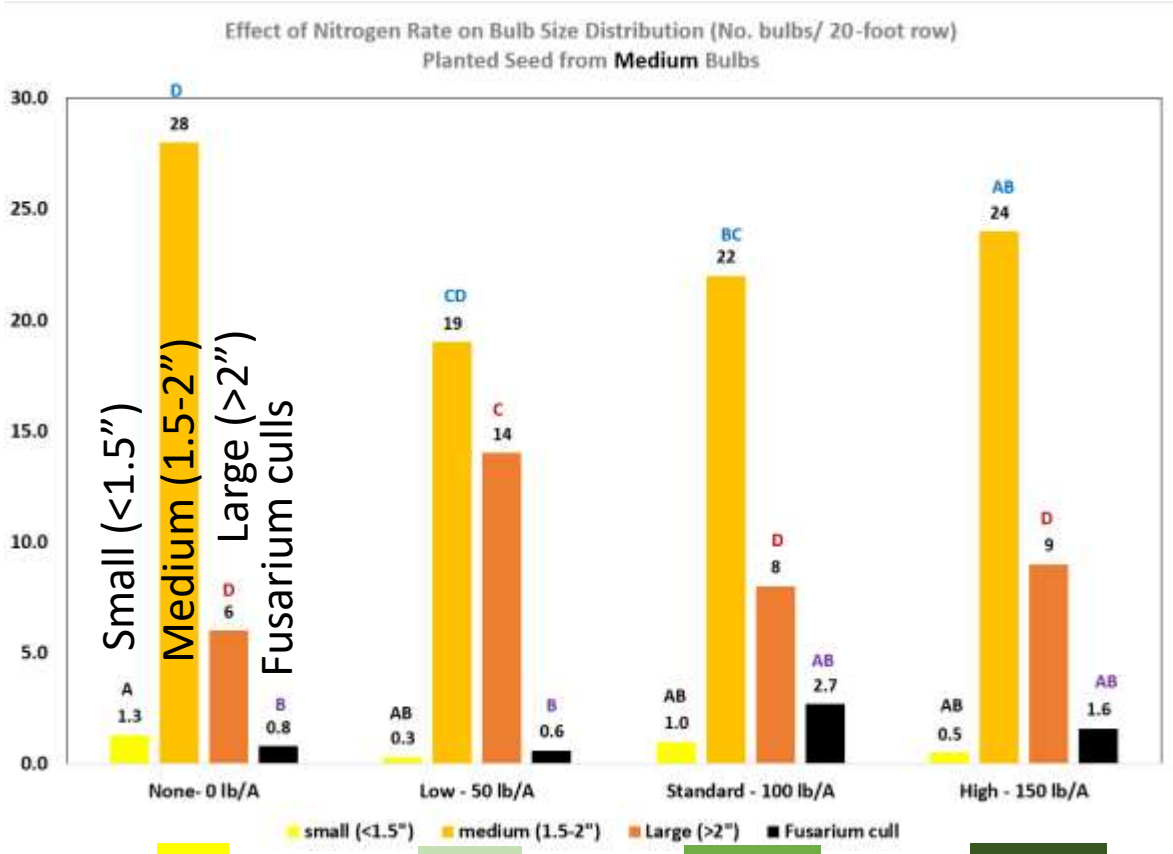


Results: 2018 Trial – **Albion**, NY
Total Marketable Yield (lb/ 20 ft row)



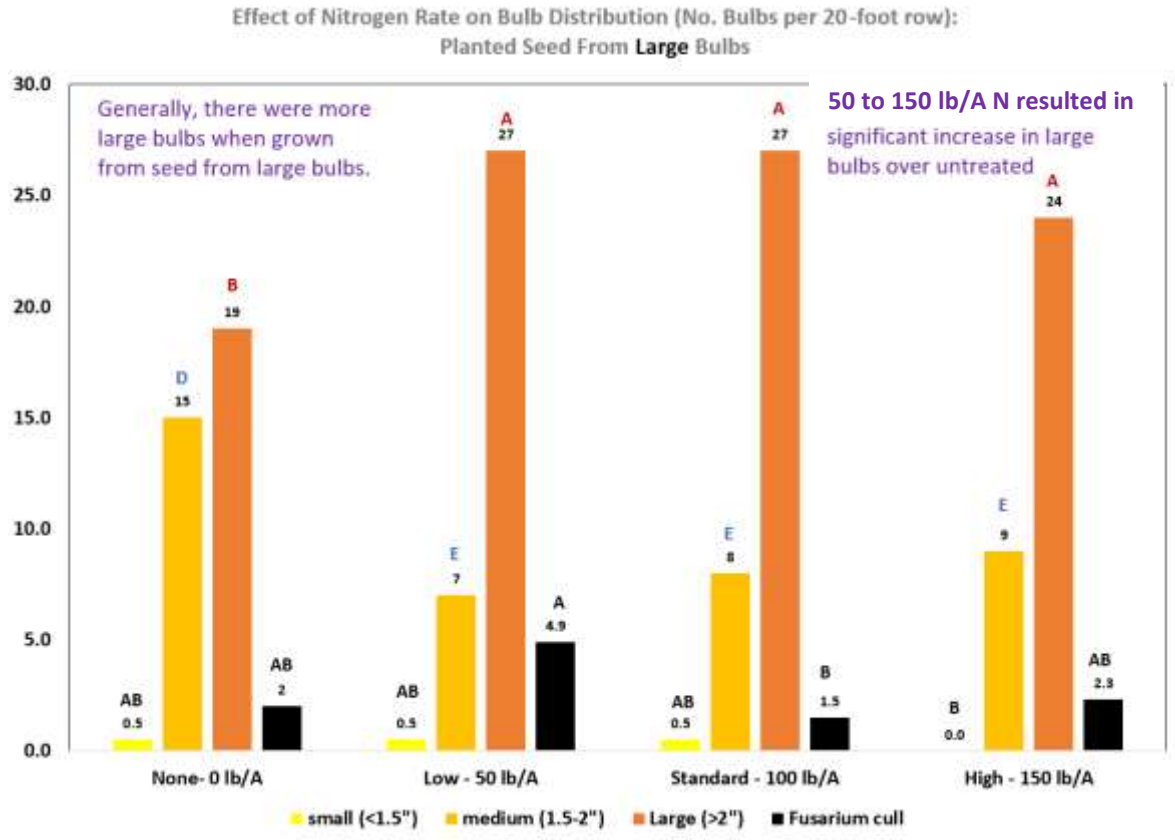
Results: 2018 Trial – **Albion**, NY
Bulb Size Distribution

Medium



0 **50** **100** **150**

Large

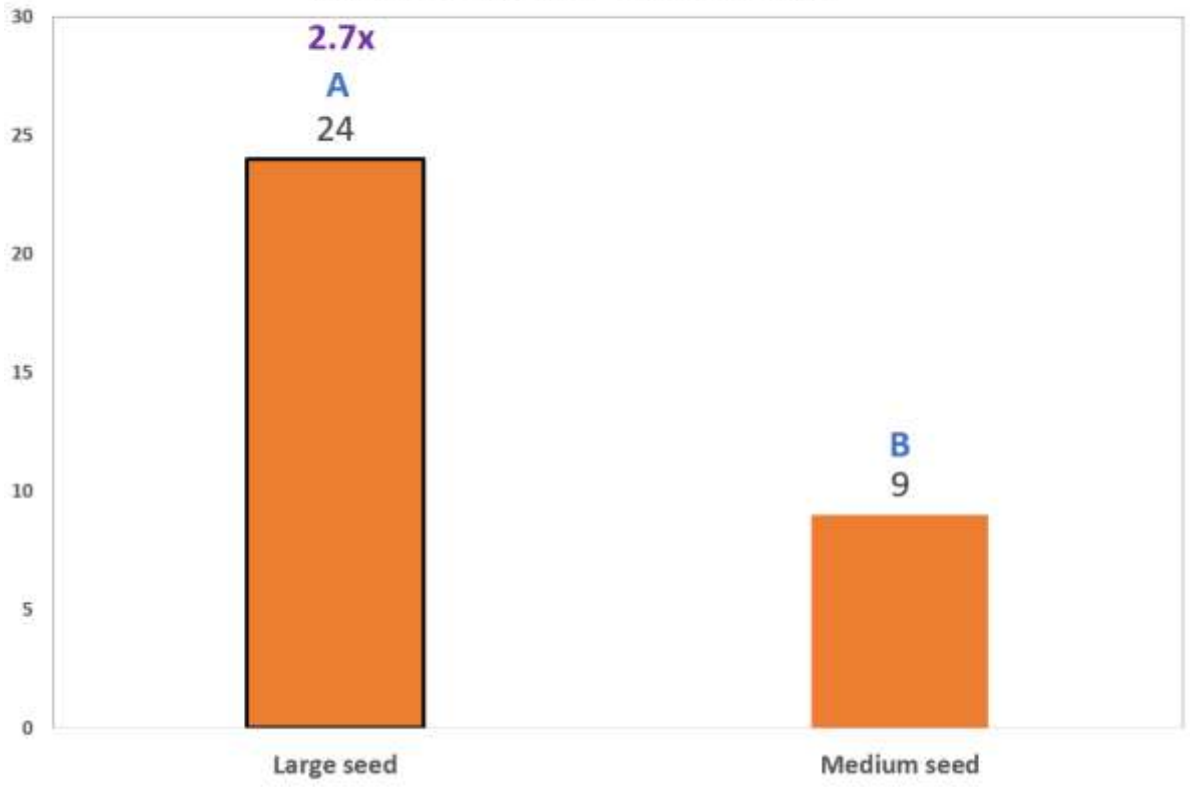


0 **50** **100** **150**

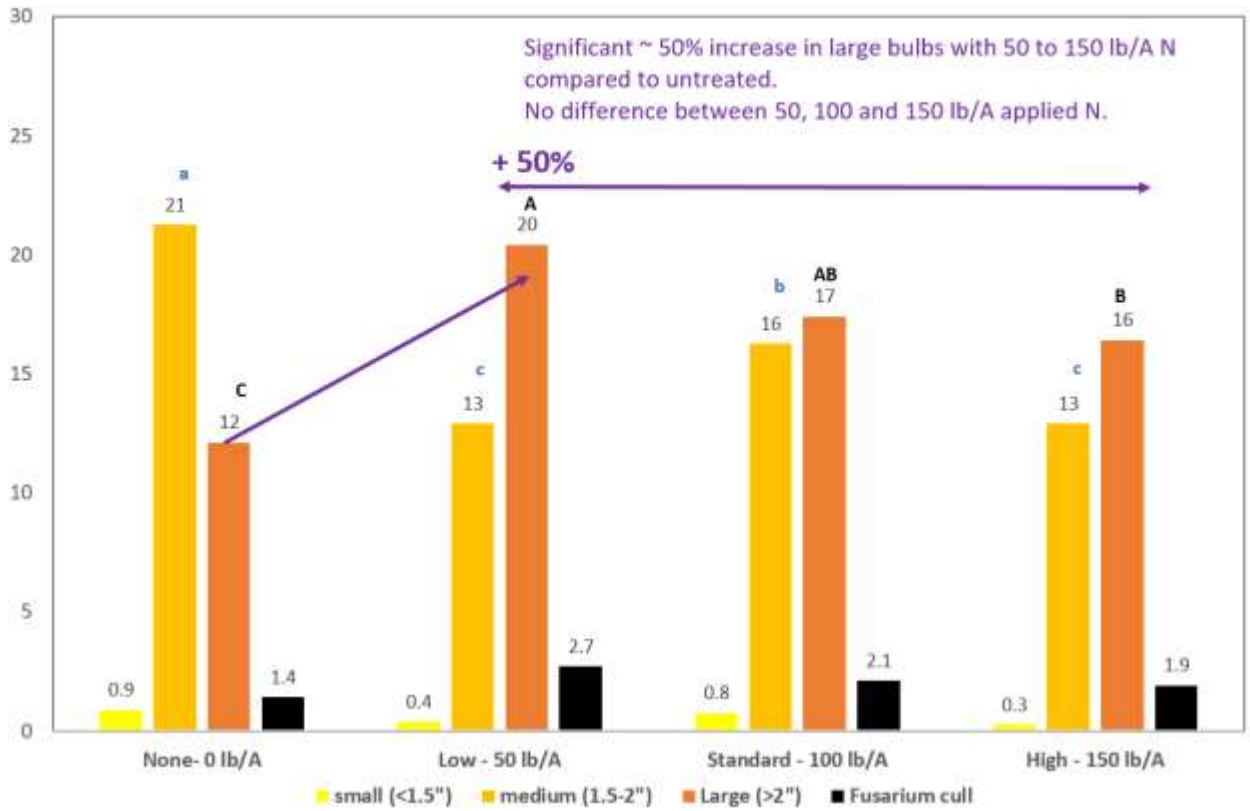
Albion, 2018

Results: 2018 Trial – **Albion**, NY
Bulb Size Distribution – Pooled Data

Large bulbs (pooled across N rate)



Bulb Size Distribution (Pooled across seed size))



Garlic grown from large seed had almost triple the number of large bulbs at harvest.

0 **50** **100** **150**

Albion, 2018

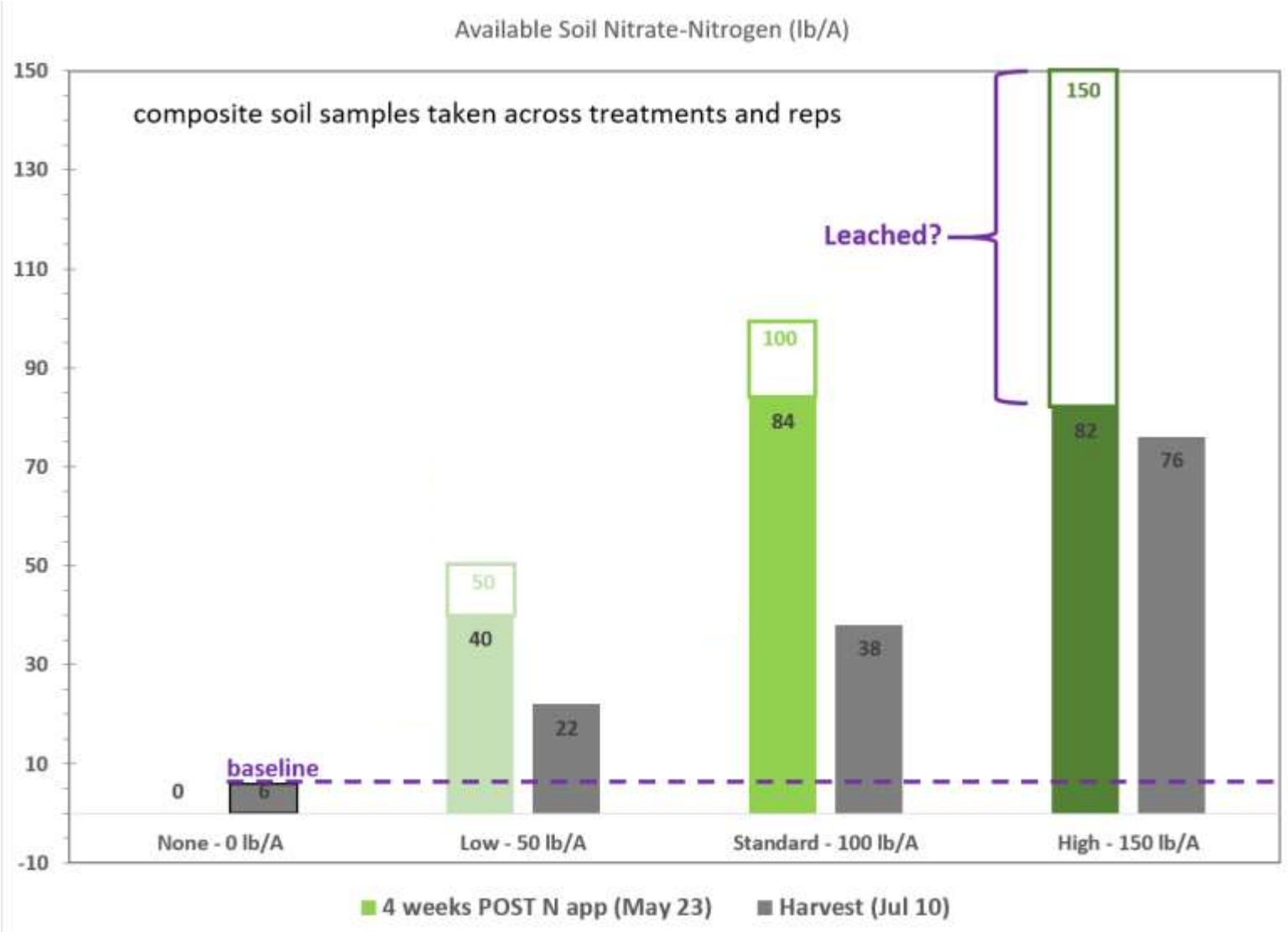
Results: 2018 Trial – **Albion**, NY

Foliar Nitrogen (% dry weight): May 23, Scaping (Jun 20)

3% = sufficient

No change between May 23 and Jun 20 suggests crop has all it needs by the end of May.

Results: 2018 Trial – **Albion**, NY
Available NO_3-N in Soil: May 23 & Harvest (Jul 10)



Albion, 2018

Effect of Nitrogen on Garlic: Summary

- In 8 out of 8 datasets (= 100%), no difference in yield between 50, 100 and 150 lb/A of inorganic nitrogen applied in the spring
  - **2** growing seasons (2017, 2018)
  - **3** trial locations (Batavia, Albion, Long Island)
  - **3** planting configurations/planting densities (31,114 to 69,696 plants/A)
  - **3** types of inorganic nitrogen (46-0-0, 34-0-0, 32-0-1)
  - **3** fertilizer application techniques (broadcast & rained in, concentrate over row & rained in, side-dressed between rows and incorportated)
  - Different seed sources/sizes
- Compared to no nitrogen, 50 lb/A resulted in significantly 20% higher total yield due to 1.4x to 2.3x more large bulbs

Effect of Nitrogen on Garlic: Summary

- **Garlic only needs 50 lb/A nitrogen (available in spring when crop begins to grow)**
  - **Higher rates (75-100 lb/A) may be needed in no N-credit situations**
  - **Higher rates (75-100 lb/A) for organic (applied in fall, lag in availability in cold soil)**
- To determine whether you need to side-dress 3-4 weeks after spring application, take a tissue test
  - Side-dress if <3.5% N per dry weight, <50 lb/A of available NO3-N in the soil?
- Seed size was the most important factor associated with yield
  - Seed from large bulbs had significantly almost 3x greater yield than seed from medium bulbs

Effect of Nitrogen on Fusarium in Garlic: Summary

- In 2 out of 7 datasets (= 29%), Fusarium clove coverage was higher with higher rates of applied N:
  - 2017 Batavia Seed Source No. 1: 150 lb/A (16%) 2x more than 100 lb/A (9.3%), 3x more than 50 lb/A (6%)
  - 2018 Albion Medium Seed: 100 & 150 lb/A (~19%) greater than 0 & 50 lb/A (~12%)
  - 2018 Albion Large Seed: 100 & 150 lb/A (~23%) greater than 0 & 50 lb/A (~17%)
  - **NOT ENOUGH OF A RELATIONSHIP BETWEEN NITROGEN & FUSARIUM TO BE RELEVANT**

Questions?

- Anyone interested in participating in a post-harvest practices survey in 2020?

Thanks to McAllister Family for hosting so many garlic trials!