

In-Season Use of Liquid Organic Fertilizers



**Richard Smith, University of California Cooperative Extension
Monterey County**
Joji Muramoto, University of California Santa Cruz

Liquid Organic Fertilizers

- **Most of the traditional liquid materials are made from fish wastes, grains and other materials such as guano**
- **They have specific properties that make their use attractive to growers**
- **They can be injected into drip systems which is of great interest in long-season strawberry production where the use of plastic mulch precludes being able to apply fertilizer later in the cropping cycle**

Liquid Organic Fertilizers

- **Tim Hartz did a study published in 2010 that looked at the mineralization characteristics of three commonly available material back then:**
 - **Fish waste, seabird guano (6-1.3-1)**
 - **Soy meal, plant extracts (4-1.6-1.6)**
 - **Grain fermentation (2.6-2.8-2.3)**

Nutrient Composition

Parameter	Fish waste, seabird guano	Soy meal, plant extracts	Grain fermentation
Total Nitrogen	6.0%	4.0%	2.6%
Particulate-N ^a	0.5%	0.7%	0.6%
Particulate-N ^a (percent of total)	8%	17%	23%

a – particles that would not pass through No. 4 filter paper

Nutrient Composition

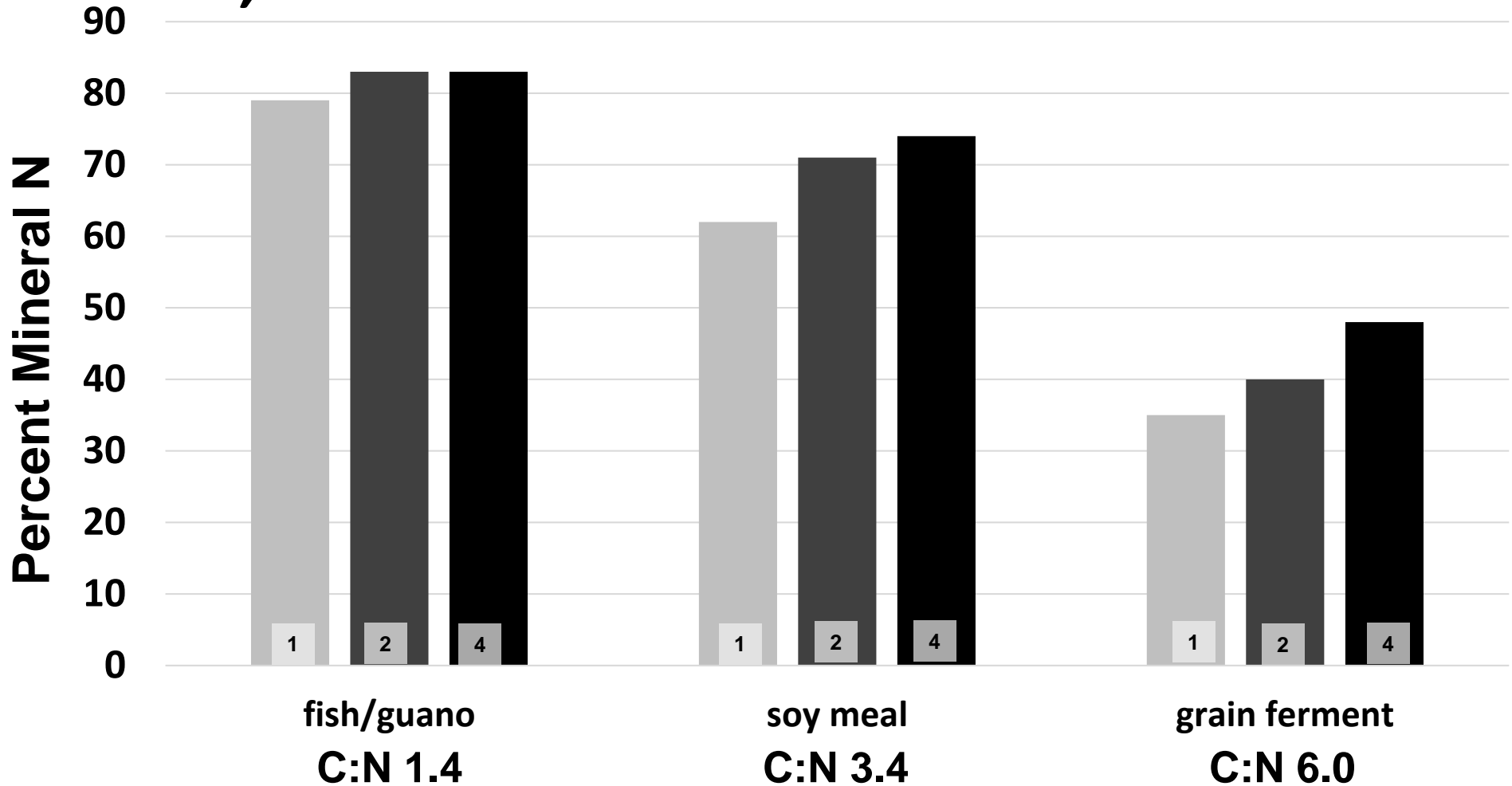
Parameter	Fish waste, seabird guano	Soy meal, plant extracts	Grain fermentation
Total Nitrogen	6.0%	4.0%	2.6%
Ammonium-N	1.3%	0.5%	0.2%
Nitrate-N	<0.1%	0.7%	0.2%
Total mineral (percent of total)	22%	30%	15%

Nutrient Composition

Parameter	Fish waste, seabird guano	Soy meal, plant extracts	Grain fermentation
Carbon:nitrogen	1.6	3.4	6.0
Total Phosphorus	0.6%	0.7%	1.2%
Total Potassium	0.9%	1.4%	1.9%

Nitrogen Availability

1,2 and 4 Weeks of Incubation at 59°F



The same trends were evident at 77 °F with only small increases in N availability

Apparent Recovery of Fertilizer Nitrogen

Percent of Nitrogen Applied Recovered in Fescue Grass Tops

Fertilizer	2 weeks	4 weeks
Fish/guano	39	60 ^a
Soy meal	22	38
Grain ferment	20	36
Ammonium sulfate	25	39 ^a

a – Higher N uptake than the ammonium sulfate may have been due to denitrification of AMS that occurred in pot culture; also the P and K in the fertilizer may have improved growth

- The slower N availability of the plant-based suggests more complex forms of N
- The liquid materials released faster than equivalent dry materials due to smaller particle size and higher initial N

Costs¹ of Liquid Organic Fertilizers

Material	Type	Cost/lb of Nitrogen
5-1-2	Liquid – Fish, corn	\$12.10
4-1-3	Liquid – Fish	\$13.30
14-0-0	Liquid – Soy protein	\$18.50 – 35.70
4-4-2	Dry – Poultry manure, feather and meat&bone	\$4.20

1 – cost can vary depending on quantity purchased

Liquid Organic Fertilizers

Joji

- **A portion of liquid organic materials are soluble but a portion is made up of suspended particles**

Liquid Organic Fertilizers

- **As a result of suspended solids in the organic fertilizers, plugging of drip irrigation systems commonly occurs**
- **Mark Gaskell, noted that systems can plug with just 4-6 weeks of fertigation**
- **Plugging causes loss of uniformity of the drip system causes many issues for the field**

N Supply: Need of In-season N applications

- **In-season band application and cultivation with organic pelleted or milled fertilizer...impractical under plasticulture CA strawberry systems**
- **Fertigation: liquid organic fertilizer applications via drip tapes are popular among organic strawberry growers in CA....but some issues**

Anecdotal data for poor fertigation performance

- **“Small plants” and lower yields relative to conventional fields**
- **Rapid plugging of system filters**
- **Little or no effects on soil N or yield from varying rate field trials**
- **Early deterioration of distribution uniformity**
- **Low tissue N test regardless of fertigation in organic strawberries**

Field trails to quantify N applied via fertigation with organic fertilizer materials

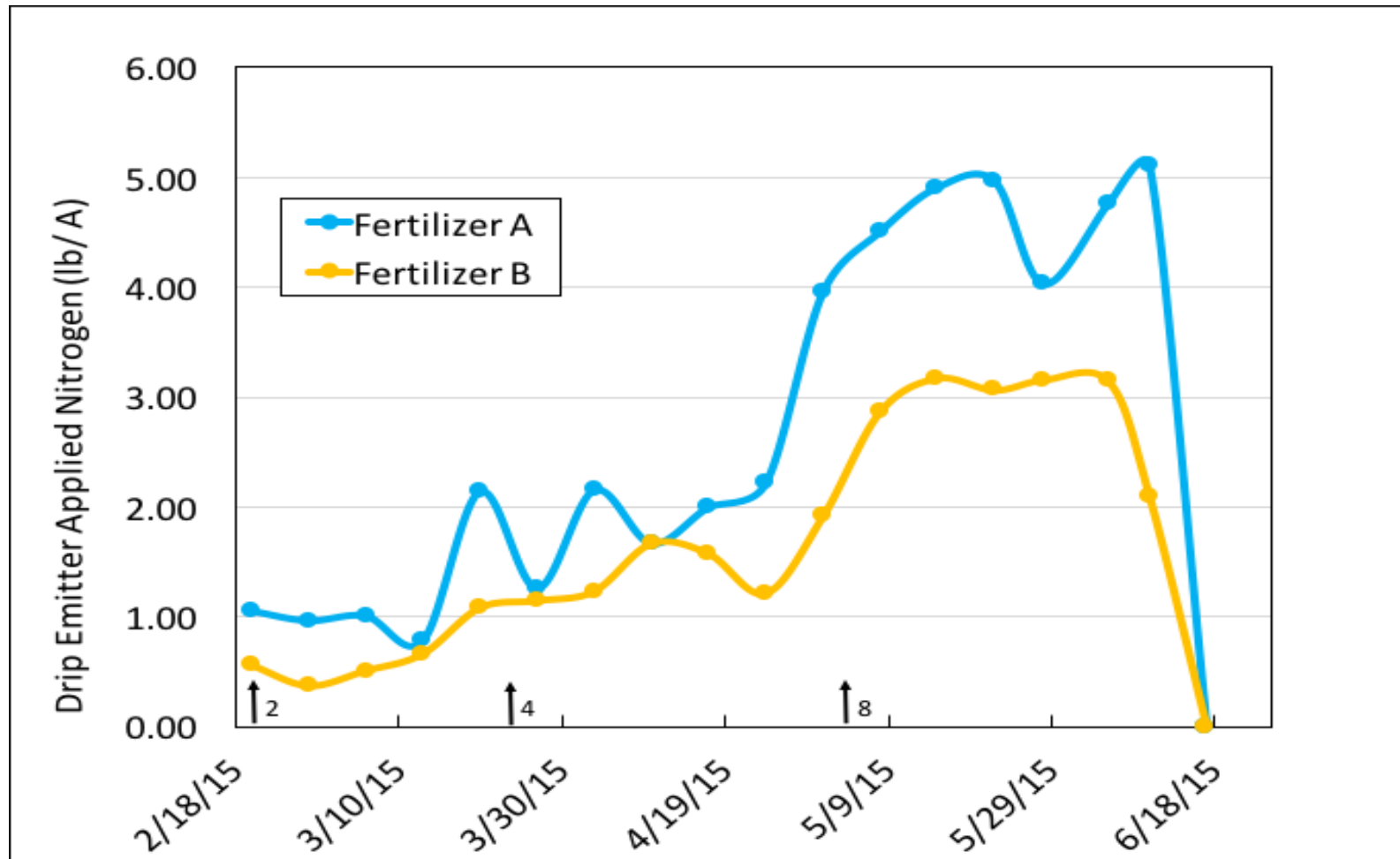


(Courtesy of Mark Gaskell, UCCE San Luis Obispo)

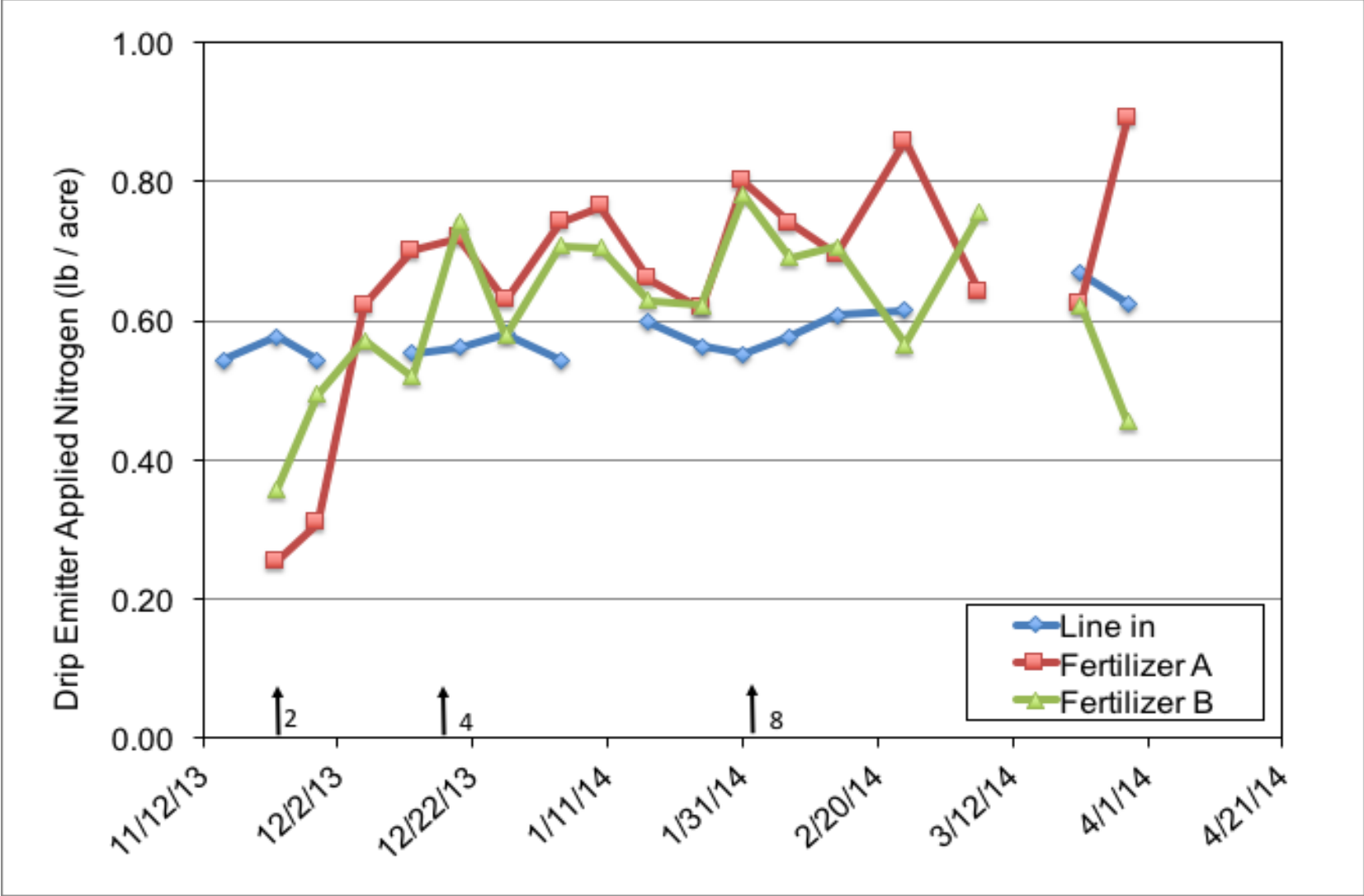




Total nitrogen passing emitters (lb/A) during 1 hr fertigation (injection below filter)



Total nitrogen passing emitters (lb/A) during 1 hr fertigation (injection above filter)



Other aspects of Injecting Liquid Organic Fertilizers

- Some drip tape manufacturers recommend special attention when using organic fertilizers**
- In addition to the suspended particulates, there are interactions between the injected materials and microorganisms living inside drip systems which can create bacterial slimes which can cause further plugging**

Other aspects of Injecting Liquid Organic Fertilizers

- **Manufacturers recommend letting the fertilizer to sit in a tank for 7-10 days to allow the suspended particles to settle out to reduce the risk of plugging**

Hydrolyzed Protein Fertilizers

Richard

- The fertilizer is produced from soybean meal, a co-product from soy oil production
- The fertilizer is produced by proteolytic enzyme (protease) hydrolysis to reduce proteins to small-size, water-soluble, nitrogen-containing compounds including protein, peptides, amino acids, amines and ammonia
- The resulting fertilizer has a total nitrogen content between one and thirteen percent
- The product commonly used is a 14-0-0

One Evaluation of 14-0-0

- In 2018 BioLink N14 was included in a fertilizer trial of conventional fertilizers**
- 80 lbs N/A were applied to experimental treatments**
- Standard applied in 2 40-lbs N/A apps (UN32)**
- BioLink applied in 8 10-lbs N/A apps (due to the lower solubility)**

Fertilizer Application Madness



14-0-0 Evaluation

Treatment	Yield T/A	Mean Head lbs	Dry Biomass lbs/A	Biomass %N	Biomass Lbs N/A
Standard*	25.8	1.65	3024	2.9	87
BioLink N14	24.3	1.55	2848	3.0	84
Untreated	17.0	1.09	2365	2.1	49

14-0-0 Summary

- In one trial, 14-0-0 performed well in comparison with a standard fertilizer treatment**
- This material may be capable of overcoming the inefficiencies of other organic liquid fertilizers in drip irrigation applications**
- The improved efficiencies may offset the higher cost**

Thank You for Your Attention

