

# A Report Regarding the Application of Organic Gem to Lemons for the 2010-2011 Season

Dr. Glenn C. Wright  
Citrus Specialist  
University of Arizona

**Introduction:**

This experiment was initiated for the purpose of determining whether the application of Organic Gem liquid fish fertilizer, in place of a certain portion of the normal nitrogen applications for lemons, would maintain or increase yield, fruit size or fruit quality parameters.

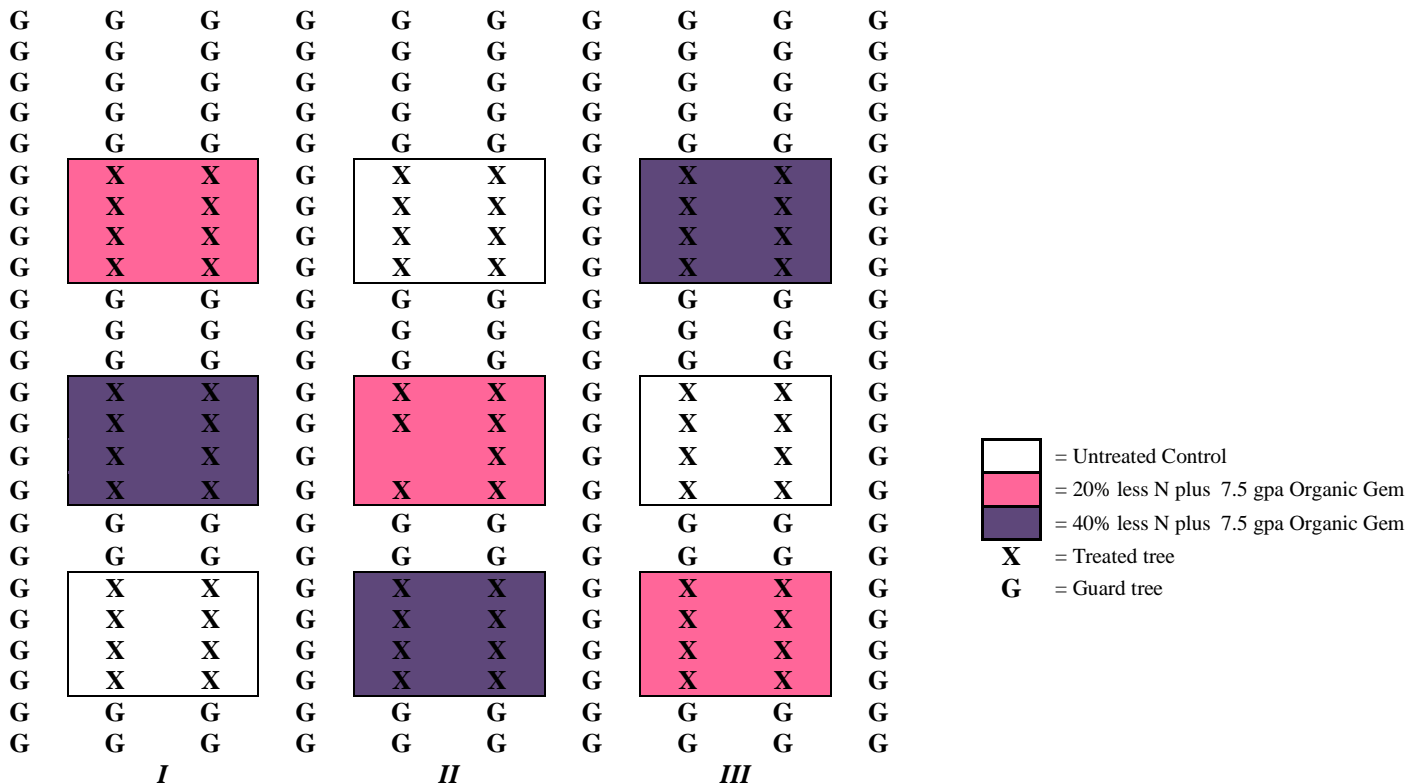
**Methodology:**

The experiment was conducted on lemons (*Citrus limon*) and was laid out in May, 2010 at the University of Arizona Yuma Mesa Agriculture Center (YMAC) at Somerton, AZ, in Block 8. This field consisted of 12-year old trees on volkameriana rootstock. Trees spacing was 23 x 23 feet.

There were three treatments: 1) Untreated control, consisting of 5 applications of one pound of granular urea (46-0-0) per tree, for a total of 2.3 lbs N per tree; 2) 20% less N (Four applications of one pound of granular urea per tree - 1.84 lbs. N per tree) plus 7.5 gallons per acre Organic Gem fertilizer; and 3) 40% less N (Three applications of one pound of granular urea per tree - 1.38 lbs. N per tree) plus 7.5 gallons per acre Organic Gem fertilizer.

A treatment unit consisted of eight adjacent trees (0.097 acres), and experimental design was randomized complete block, with three blocks. Therefore, there were a total of 9 treatment units, (72 trees total) included in the experiment. Plot plan is as follows:

**2010 Lemons Organic Gem Experiment  
University of Arizona, Yuma Mesa Ag Center**



Applications of urea were made on 15 February, 15 March, 15 April and 15 May (treatment 1 only) by the University of Arizona farm crew. An additional application of urea was made on August 30 by Dr. Wright's laboratory technician on treatments 1 and 2.

Applications of Organic Gem were made with a boom sprayer pulled by a tractor. We used several TeeJet 8004 nozzles and one or two offset nozzles. Applications of Organic Gem were made on 24 May (2.5 gpa), 4 June (1.25 gpa), 18 June (1.25 gpa), 2 July (1.25 gpa), 16 July (1.25 gpa), and 30 July. All applications were followed by irrigation not less than 2 days later.

Fruit were harvested on 10/29/10. Fruit from each tree was harvested by hand using professional pickers from a local packinghouse. Fruit from each tree was harvested into picking sacks, each holding approximately 60 lbs. Yield was calculated based on the number of whole and fractional sacks of fruit harvested from each tree. About 100 lbs. of fruit from each tree was optically sorted using a completely automated photographic sorter (Aweta-Autoline, Inc., Reedley, CA). This sorter is trailer-mounted so that it can be towed to the citrus orchard study site. Each fruit that passes through the sorter was photographed and weighed. Weight, color, exterior quality (% blemish), fruit shape and fruit diameter data was collected for each fruit. Fruit were not physically sorted, but the data collected was stored in a laptop computer that is an integral part of the sorter. Data collected from the sorter were later analyzed and the percentage of fruit from the nine fruit sizes and fruit grades (fancy, choice and juice) were determined.

Data was analyzed statistically using analysis of variance (SPSS, Chicago, IL).

### **Results and Discussion:**

Leaf Nutrient Concentration. Treatments had no apparent significant effect upon leaf nutrient concentrations (Table 1). All trees showed leaf N levels that were slightly deficient, a common occurrence on the sandy soils of the Yuma region. Control trees did not have lower N concentrations than did the treated trees. This data is also shown in Figure 1. All other nutrients were well within the satisfactory concentration ranges for citrus, except Mn and Zn which were slightly deficient. Fe level for the 40% less N treatment was most likely excessive due to contamination of a sample during analysis.

Yield, Fruit Color and Shape: There were no apparent significant effects upon yield (Table 2), likely due to high variability among the treatments, and the small number of replications. All the treatments led to yields between 68 and 85 lbs of fruit per tree. Despite the lack of significance, yields for the 20% less N and the 40% less N were 22% and 23% greater than the yields for untreated control. These results are also shown in Figure 1. There was no effect of the treatments upon fruit color or shape.

Packout (Fruit Size): Similar to yield, there were no significant effects of the treatment upon fruit size (Table 3). Fruit size for all treatments peaked on size 165. There was a trend for the treated trees to have more fruit of size 115 than the untreated.

Fruit Grade: There was no effect of the treatments upon fruit exterior grade (Table 4). All the trees produced about 86 to 89% fancy fruit, 9 to 10% choice, and 2 to 3% juice quality fruit.

**Table 1. Leaf nutrient concentration of lemons treated with Organic Gem**

Treatment	Leaf Nutrient Concentration <sup>z</sup>									
	N	P	K	S	Ca	Mg	Zn	Fe	Mn	Cu
Untreated Control	2.05	0.12	1.40	0.38	4.37	0.41	12.7	121.5	12.8	6.4
20% less N plus 7.5 gallons per acre Organic Gem fertilizer	2.12	0.12	1.57	0.35	4.15	0.40	14.3	106.7	14.3	5.6
40% less N plus 7.5 gallons per acre Organic Gem fertilizer	1.94	0.12	1.51	0.35	4.13	0.38	13.5	247.5	9.8	5.4
p-value <sup>y</sup>	0.34	0.62	0.52	0.58	0.21	0.78	0.47	0.17	0.23	0.61

<sup>z</sup> Nutrient concentrations expressed as % for N, P, K, S, Ca and Mg, and as parts per million for Zn, Fe, Mn and Cu.

<sup>y</sup> P-value of 0.10 or less indicates statistical significance.

**Table 2. Yield, fruit color and fruit shape of lemons treated with Organic Gem**

Treatment	10-29-10Yield (lbs. per tree)	Fruit Shape <sup>z</sup>	Fruit Color <sup>y</sup>
Untreated Control	68.50	0.79	0.82
20% less N plus 7.5 gallons per acre Organic Gem fertilizer	83.55	0.80	0.82
40% less N plus 7.5 gallons per acre Organic Gem fertilizer	84.62	0.79	0.80
p-value <sup>x</sup>	0.71	0.64	0.36

<sup>z</sup> A value of 1.00 signifies a completely round fruit.

<sup>y</sup> Signifies the red to green intensity ratio of the fruit. A greater value signifies more yellow color

<sup>x</sup> P-values of 0.10 or less indicate statistical significance.

**Table 3. 10-29-10 packout of lemons treated with Organic Gem**

Treatment	Packout (%) <sup>z</sup>							
	75	95	115	140	165	200	235	280
Untreated Control	6.05	12.99	10.31	16.60	20.19	13.56	15.02	5.28
20% less N plus 7.5 gallons per acre Organic Gem fertilizer	7.63	11.00	12.38	17.95	22.53	13.39	13.06	2.09
40% less N plus 7.5 gallons per acre Organic Gem fertilizer	4.94	14.77	14.29	16.32	18.86	13.18	12.94	4.70
p-value <sup>y</sup>	0.83	0.72	0.15	0.89	0.82	0.99	0.83	0.53

<sup>z</sup> Packout is expressed as the percentage of fruit within the eight size categories. Size categories are expressed as the number of fruit per standard 37.5 lb. carton, thus fruit of size 75 is larger than fruit of size 95.

<sup>y</sup> P-value of 0.10 or less indicates statistical significance.

**Table 4. 10-29-10 exterior fruit quality of lemons treated with Organic Gem**

Treatment	Exterior Quality(% blemish) <sup>z</sup>		
	Fancy	Choice	Juice
Untreated Control	89.07	8.85	2.08
20% less N plus 7.5 gallons per acre Organic Gem fertilizer	86.68	10.62	2.71
40% less N plus 7.5 gallons per acre Organic Gem fertilizer	86.86	10.22	2.92
p-value	0.68	0.74	0.55

<sup>z</sup> Exterior quality is expressed as the percentage of fruit within the three exterior quality categories. Exterior quality is determined by the % of the peel that is blemished. Fancy grade fruit is 90-100% free of blemish. Choice fruit is 80-89% free of blemish. Juice fruit is less than 80% free of blemish.

<sup>y</sup> P-value of 0.10 or less indicates statistical significance.

2010 Results

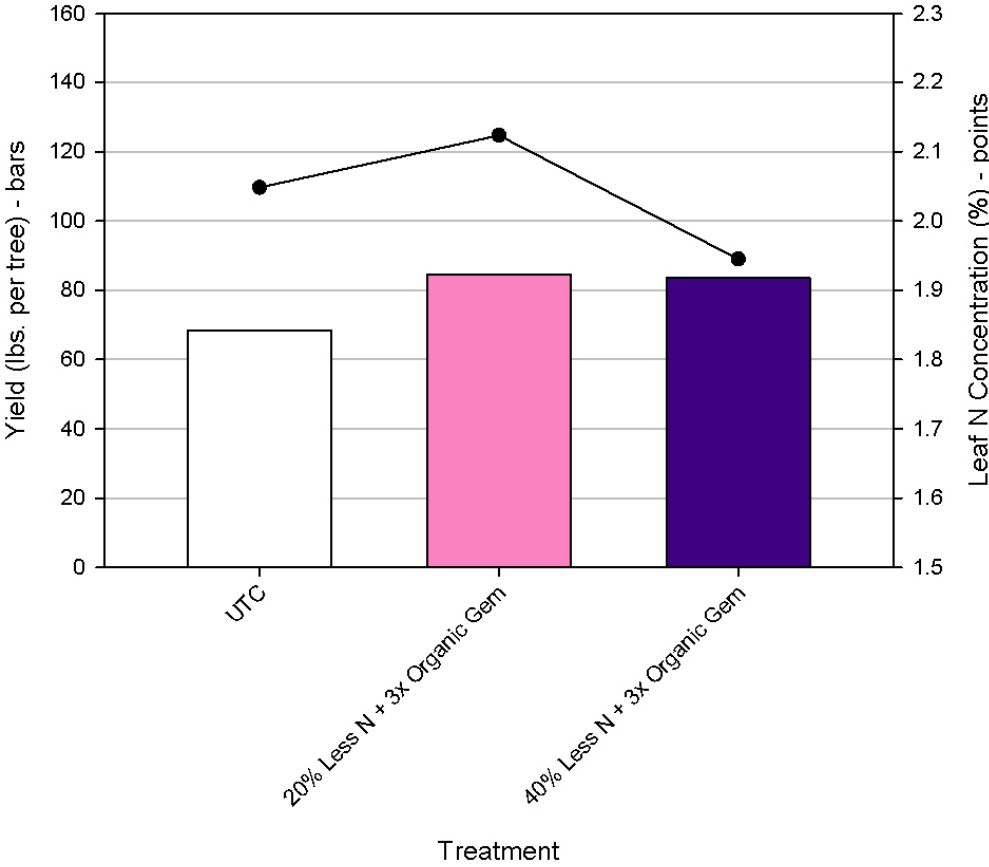


Figure 1. Yield and Leaf N Concentration of Lemon trees treated with Organic Gem.