Materials & Procedures



Preparing the strawberry and spinach samples; one pair of triplicates shown with their respective centrifuge tubes

- 5 grams of organic strawberries and spinach were placed into 6 small containers.
- Both were tested in triplicate.
- All containers were soaked in 10 mL of distilled water for 1 minute.
- The soaked water was then poured into centrifuge tube & stored in refrigerator until shipping.

The photos below were taken by Lance Ford from Attogene Lab





Examples of strawberry and spinach centrifuge tubes at the lab

- 80 test tubes containing controls (distilled water, tap water, and Orthene) and the rinsed residue of organic and conventional strawberries and spinach as described above were sent to the Attogene Lab (Austin, TX) to be tested using ELISA (Enzyme-Linked Immunosorbent Assay).
- ELISA is an immunological assay utilizing antibodies specific for an antigen of interest (in this case, organophosphates).



Wells placed in spectrophotometer

Pesticide Residue On Organic Versus Conventional Produce and the Effect of Simple Washing Techniques

- This project investigates whether organic produce has less pesticides than conventional produce and whether simple washing techniques can remove any pesticide residue.
- Hypothesis: Organic produce will have less pesticide residue than conventional and simple washing techniques (tap water and liquid dish soap) can remove the pesticide residue from conventional produce.
- This project is a continuation from last year using a much more sophisticated assay, ELISA, which was used to examine the presence of pesticides on strawberries and spinach.
- Negative controls: Distilled and tap water
- Positive controls: Known organophosphates
- **Conclusion**: The results showed that the organic and most of the conventional produce had trivial amounts of pesticide residue, with the one exception easily washed off using tap water. If consumers wished to save money while avoiding pesticides, they could buy conventional produce (rinsing if desired) instead of paying more for organic produce.

1	2.019	9	1.934	17	2.002	25	2.007	33	2.040	41	1.918	49	1.890	57	1.609	65	1.919	73	1.920
2	1.946	10	1.890	18	1.851	26	1.867	34	1.916	42	1.873	50	1.868	58	1.887	66	1.845	74	1.786
3	1.981	11	1.923	19	1.911	27	1.878	35	1.941	43	1.865	51	1.810	59	1.852	67	1.880	75	1.836
4	1.943	12	1.840	20	1.774	28	1.844	36	1.899	44	1.833	52	1.863	60	1.783	68	1.850	76	1.911
5	1.665	13	1.904	21	1.855	29	1.835	37	1.909	45	1.835	53	1.775	61	1.858	69	1.778	77	1.881
6	1.451	14	2.013	22	1.997	30	1.923	38	1.957	46	1.885	54	1.719	62	1.697	70	1.870	78	1.880
7	2.003	15	1.923	23	1.997	31	1.991	39	1.928	47	1.918	55	1.261	63	1.809	71	1.885	79	1.858
8	2.149	16	2.015	24	2.118	32	2.050	40	1.942	48	1.240	56	1.251	64	2.000	72	2.058	84	1.881

Chart of optical densities of all samples

The chart on the right shows the numbered centrifuge tubes (numbers 1–79 and 84). The centrifuge tube numbers are paired with their optical densities above. Note that test tubes 3 and 84 (the Orthene x1 and x10) did not react with the antibody.

Conversion of color scale to parts per billion (ppb) under the equation y (ppb) = 359*e*-2.63x (color scale)



Controls	Distilled Water	Tap Water	Orthene Solution	Orthene x10		
	1	2	3	84		
Strawberries	Conventional	Distilled rinse	Tap rinse	Tap + soap		
	Driscoll	4,5,6	7,8,9	10,11,12		
	Well•Pict	13,14,15	16,17,18	19,20,21		
	Seven Seas	22,23,24	25,26,27	28,29,30		
	Organic					
	Driscoll	31,32,33				
	Well•Pict	34,35,36				
	Manassero Farm	37,38,39				
Spinach	Conventional					
	Ocean Mist	40,41,42	43,44,45	46,47,48		
	Pacific	49,50,51	52,53,54	55,56,57		
	Bonipak	58,59,60	61,62,63	64,65,66		
	Organic					
	Lakeside	67,68,69				
	Cal Organic	70,71,72				
	Organic Farm	73,74,75				
Orthene Soak	Driscoll Strawbe	rry	76	77		
	Lakeside Spinac	h	78	79		

Drisc Mana

25.000

12.500

• The conventional strawberries showed an overall similar amount of pesticide residue as the organic, except for Driscoll's strawberries. Washing the Driscoll's with distilled water decreased these levels by 60%.

Org

 The conventional spinach also showed an overall similar amount of pesticide residue as the organic. Interestingly again, washing with soap seemed to increase the amounts of residue on Ocean Mist and particularly Pacific spinach.

Results

Amount of Residue in ppb in Organic Vs Conventional Strawberries

	Distilled	Тар	Soap
oll (Conv)	42.606	17.286	25.312
Pict (Conv)	21.447	20.945	27.899
n Seas (Conv)	16.926	23.208	26.469
coll (Org)	17.377		
Pict (Org)	23.086		
issero Farms (Org)	22.369		



 Interestingly, washing with soap seemed to increase the amounts of residue somewhat.

	Distilled	Тар	Soap
ean Mist (Conv)	23.577	28.12	43.17
cific (Conv)	27.246	32.753	96.792
nipak (Conv)	28.342	32.582	22.965
keside (Org)	28.717		
Organic (Org)	21.961		
ganic Farm (Org)	27.899		

Amount of Residue in ppb in Organic Vs Conventional Spinach



Unless otherwise noted, all images created by Veronica Howard