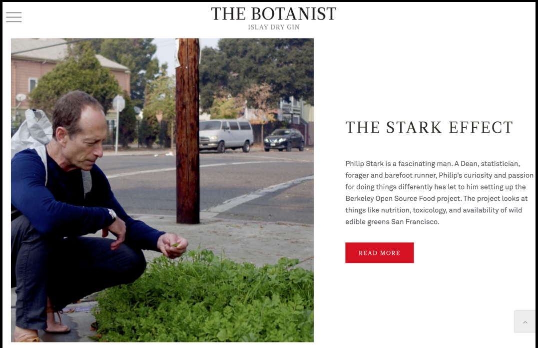
Urban Foraging: Nutrition, Safety, and Food Security

Garden to Table Nutrition Dietetic Internship

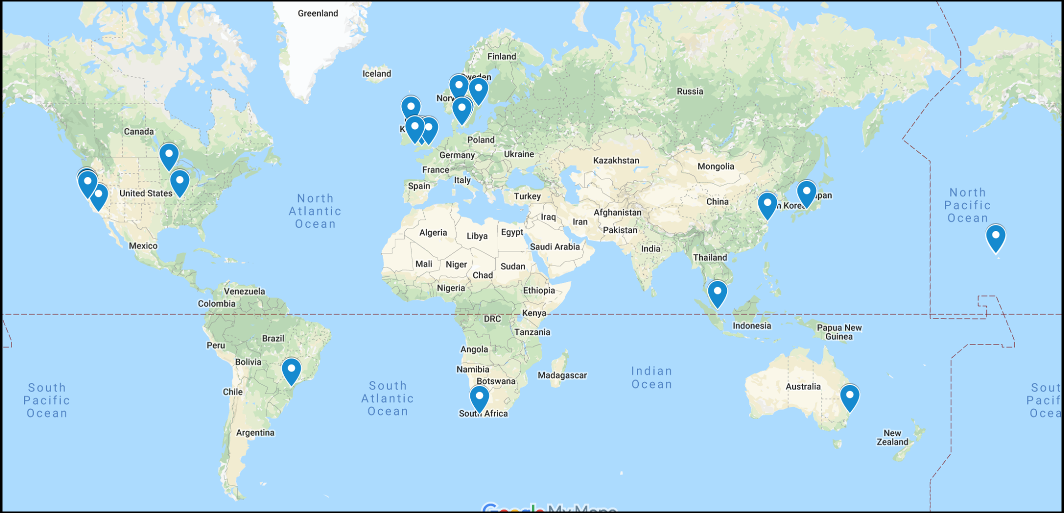
Philip B. Stark

22 July 2022

University of California, Berkeley



THE BOTANIST
ISLAY DRY GIN
THE STARK EFFECT
Philip Stark is a fascinating man. A Dean, statistician, forager and barefoot runner, Philip's curiosity and passion for doing things differently has let to him setting up the Berkeley Open Source Food project. The project looks at things like nutrition, toxicology, and availability of wild edible greens San Francisco.
READ MORE

Wild/Feral Food Week 2019 (7th annual)




THE
BAY AREA
BAKER'S
DOZEN
WILD
EDIBLES


CHEZ PANISSE

An apéritif

A WILD FOODS DINNER
WITH BERKELEY OPEN SOURCE FOOD

Wild king salmon carpaccio with nasturtiums and watercress

Foraged spring greens pansotti with morel mushrooms and sage

Elliott Ranch lamb cooked in the fireplace; with wild fennel fritters and asparagus

Wildflower honey panna cotta with strawberries and candied rose

Tuesday, May 28, 2019


Weed tourism (not that kind of weed)

Denmark (Copenhagen)

Australia (Melbourne)

Belgium (Brussels in the dead of winter)

California (Berkeley)

Canada (Vancouver)

China (Hubei)

Estonia (Baltic coast)

France (Loire Valley)

Hong Kong

Japan (Wakayama)

India (Shillong)

Israel (Tel Aviv)

Jordan (Petra)

Latvia (Baltic coast)

Luxembourg

Mexico (Tecate)

New York (Manhattan)

Portugal (Lisbon)

Scotland (Islay)

Sweden (Skane)

Switzerland (Lausanne)

Qatar (Doha)


ملوخية
QR 25
زهرة الفيحاء
prod. 10/12/2018
Exp.: 09/12/2020
AL FAYHAA
DRY MALLOW
100% NATURAL
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HALAL
Net We
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Product Free From Genetically Modified Organism
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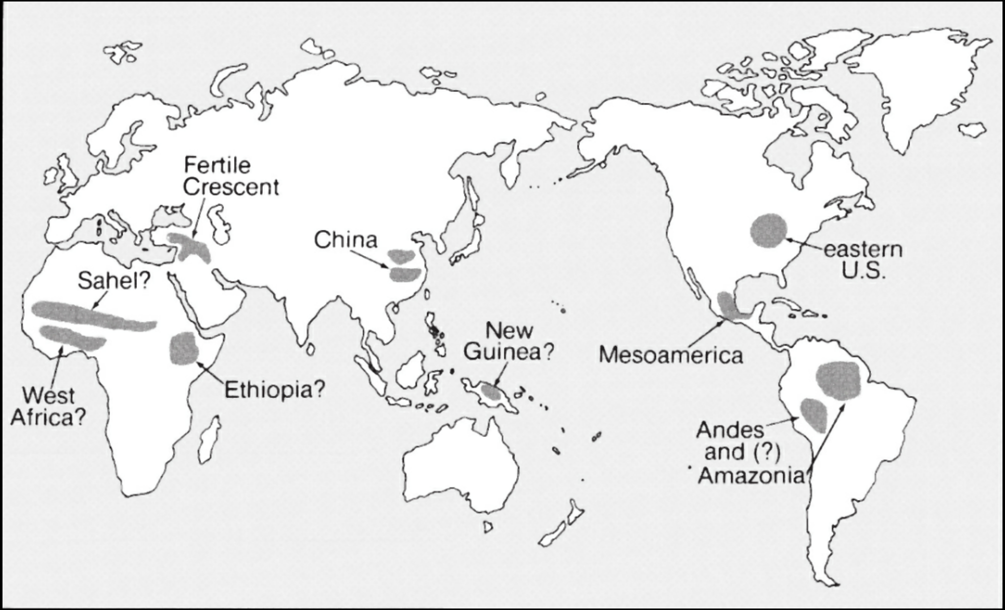
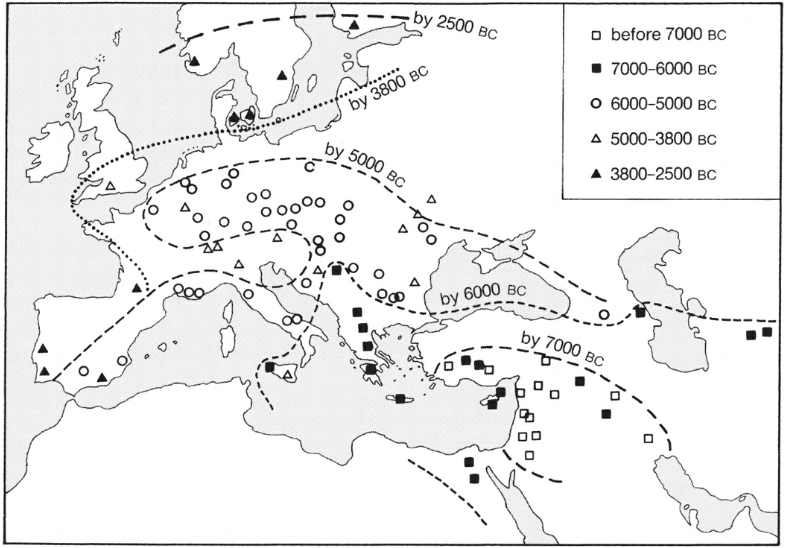
Why are the same wild foods all over the world?

J. Diamond, *Guns, Germs, and Steel: The Fates of Human Societies*



The spread of Fertile Crescent crops across western Eurasia



Area	*Domesticated*		*Earliest Attested Date of Domestication*
	Plants	*Animals*	
Independent Origins of Domestication			
1. Southwest Asia	wheat, pea, olive	sheep, goat	8500 B.C.
2. China	rice, millet	pig, silkworm	by 7500 B.C.
3. Mesoamerica	corn, beans, squash	turkey	by 3500 B.C.
4. Andes and Amazonia	potato, manioc	llama, guinea pig	by 3500 B.C.
5. Eastern United States	sunflower, goosefoot	none	2500 B.C.
? 6. Sahel	sorghum, African rice	guinea fowl	by 5000 B.C.
? 7. Tropical West Africa	African yams, oil palm	none	by 3000 B.C.
? 8. Ethiopia	coffee, teff	none	?
? 9. New Guinea	sugar cane, banana	none	7000 B.C.?
Local Domestication Following Arrival of Founder Crops from Elsewhere			
10. Western Europe	poppy, oat	none	6000–3500 B.C.
11. Indus Valley	sesame, eggplant	humped cattle	7000 B.C.
12. Egypt	sycamore fig, chufa	donkey, cat	6000 B.C.

Many modern crops were once weeds:

- rye, oats, turnips, radishes, beets, leeks, lettuce.

Top 10 World's Worst Weeds

The chart displays the 10 most serious weed in the approximate order in which they are troublesome to the world's agriculturalist. The bowl with grain icon represents the reported number of different crops that weed affects, and the flag represents the number of countries that consider the weed a pest. It is important to mention that the water hyacinth only affects paddy crops and is a weed of the tropics and subtropics. There is no calculable data.

1.

Purple Nutsedge
Cyperus rotundus L.
Crops: 52
Countries: 92

2.

Bermuda grass
Cynodon dactylon
Crops: 40
Countries: 80

3.

Barnyardgrass
Echinochloa crus-galli
Crops: 36
Countries: 80

4.

Junglerice
Echinolchloa colona
Crops: 32
Countries: 60

5.

Indian goosegrass
Eleusine indica
Crops: 46
Countries: 60

6.

Johnsongrass
Sorghum halepense
Crops: 30
Countries: 53

7.

Cogongrass
Imperata cylindrical
Crops: 35
Countries: 73

8.

Water Hyacinth
Eichhornia crassipes
Crops: 1
Countries: no # data

9.

Purselane
Portulaca oleracea
Crops: 45
Countries: 81

10.

Lambsquarters
Chenopodium album
Crops: 40
Countries: 47

Holm, L.G., Plucknett, D.L., Pancho, J.V., Herberger, J.P.; (1977). The World's Worst Weeds: Distribution and Biology. Honolulu, HI: University Press of Hawaii.

USDA National Resource Conservation Service: Plant Database. [Pictures from Internet]. Retrieved October 12, 2012, from http://plants.usda.gov/java/

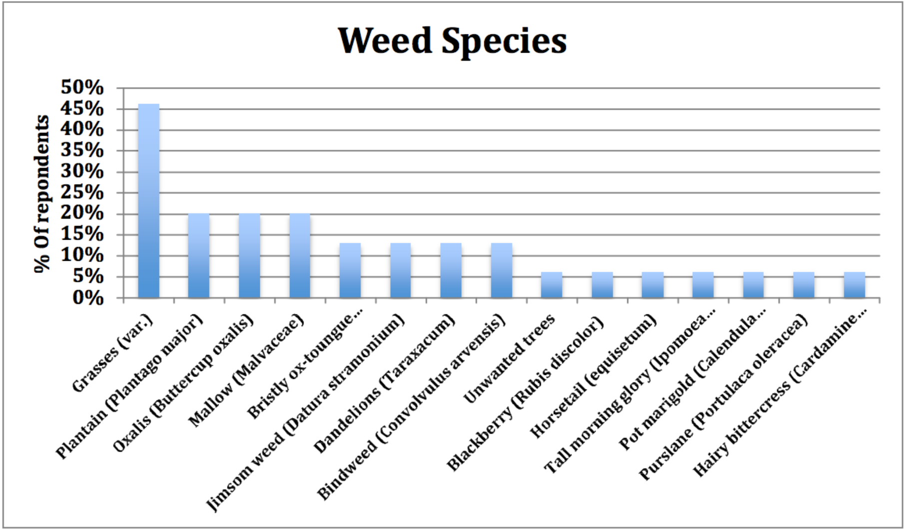


Fig 1.7 Weed species

Altieri et al., 2014. Survey of 21 urban farms in the East Bay.

PLOS ONE

RESEARCH ARTICLE

Open-source food: Nutrition, toxicology, and availability of wild edible greens in the East Bay

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OPEN ACCESS

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Abstract

Significance

Foraged leafy greens are consumed around the globe, including in urban areas, and may play a larger role when food is scarce or expensive. It is thus important to assess the safety and nutritional value of wild greens foraged in urban environments.

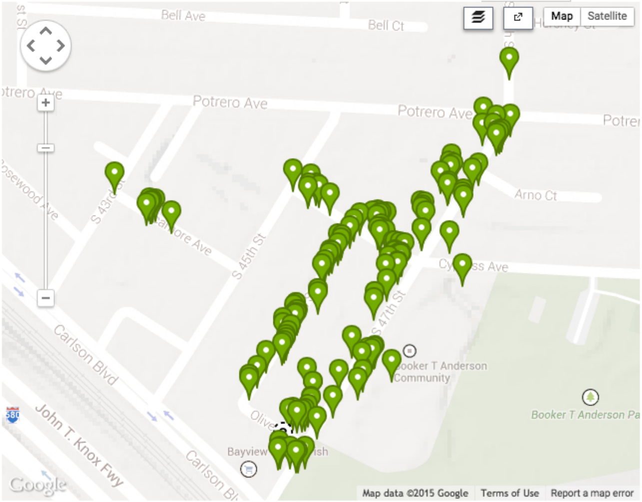
Methods

Field observations, soil tests, and nutritional and toxicology tests on plant tissue were conducted for three sites, each roughly 9 square blocks, in disadvantaged neighborhoods in the East San Francisco Bay Area in 2014–2015. The sites included mixed-use areas and areas with high vehicle traffic.

« Back to Berkeley Open Source Food

Observations for Berkeley Open

1 - 200 of 584 results Search *Views* Map Table



Redo search in map area

Cat's-Ears Genus *Hypochaeris*

Observe pbstark
Date March 11, 2015
01:38 PM PDT
Place 1515 Campbell St, Oakland, CA, US (Google, OSM)
1 ID | Research Grade View »
Project curator ID : Genus *Hypocha*

common chickweed *Stellaria media*

Observe pbstark
Date March 11, 2015
01:32 PM PDT
Place 1301-1381 Campbell St, Oakland, CA, US (Google, OSM)
View »
Project curator ID : *Stellaria media*

common mallow *Malva neglecta*

Observe pbstark
Date March 11, 2015

Soil v plant tissue

Element	USEPA limit (mg/kg)	1–10	11–18	20–22	23–26	27	28	29
Zn	23600	187.2	243.3	261.8	212.2	349.1	2887.2	453.1
Cu	N/A	41.4	38.6	40.8	25.6	37.8	66.8	63.8
As	25	N/A	N/A	3.4	1.7	2.8	5.1	4.1
Se	20	N/A	N/A	2.4	2.1	2.7	3.4	3.7
Pb	400	199.8	359.7	196.5	120.1	150.0	354.6	700.9
Ni	1600	32.4	30.5	32.7	23.3	32.3	73.7	40.9
Cr	230	43.7	35.5	51.3	39.1	54.9	56.7	83.6
Cd	70	1.2	0.7	25.7	21.3	30.9	58.8	41.9
Mo	N/A	N/A	N/A	0.8	0.4	1.0	0.9	0.7

Element	5001	5002a	5002b	5003	5004-1	5004-2	5005	5006	5007	5009-1	5009-2
As	1.709	1.687116	1.664110	1.679687	1.518404	1.607692	1.65625	1.623277	1.690590	1.590909	1.573482
Cd	0.709	0.858895	<0.3834	<0.3906	0.506134	0.499999	5.382812	<0.3828	<0.3987	<0.3918	<0.3993
Cr	<0.787	<0.7668	<0.7668	<0.7812	<0.7668	<0.7692	<0.7812	<0.7656	<0.7974	<0.7836	<0.7987
Cu	13.929	13.55828	7.967791	7.867187	8.872699	9.038461	17.47656	4.785604	8.508771	5.266457	5.071884
Pb	<3.9370	<3.8343	<3.8343	<3.9062	<3.8343	<3.8461	<3.9062	<3.8284	<3.9872	<3.9184	<3.9936
Hg	<0.0393	<0.0383	<0.0383	<0.0390	<0.0383	<0.0384	<0.0390	<0.0382	<0.0398	<0.0391	<0.0399
Mo	<3.9370	<3.8343	<3.8343	<3.9062	<3.8343	<3.8461	<3.9062	<3.8284	<3.9872	<3.9184	<3.9936
Ni	<0.7874	<0.7668	<0.7668	<0.7812	<0.7668	<0.7692	<0.7812	<0.7656	<0.7974	<0.7836	<0.7987
Se	<2.3622	<2.3006	<2.3006	<2.3437	<2.3006	<2.3076	<2.3437	<2.2970	<2.3923	<2.3510	<2.3961
Zn	161.0236	69.64723	71.78680	110.625	183.0521	183.5384	398.2031	115.1607	70.86921	30.70532	30.54313
DWT%	24.3	13.9	12.8	12.6	19.6	19.6	12.6	15.1	12.7	19.3	19.3

Pesticides & other organic contaminants

Fresh/wet plant tissue samples rinsed in tapwater to remove soil and dust, as if to make salad.

- QuEChERS multi-pesticide residue ($\sim$330 pesticides & herbicides): nondetect
- glyphosate: nondetect
- PCBs: nondetect

MALLOW

(foraged)

Nutrition Facts			
Serving Size 1/2 cup (68g) Servings Per Container			
Calories		35	
Total Fat		0 g	
Sodium		30 mg	
Potassium		240 mg	
Total Carbohydrate		5 g	
Dietary Fiber		5 g	
Sugar		0 g	
Protein		3 g	
Calcium	20%	Iron	15%

*Comparison of total polyphenols awaiting lab results

(Source: SCSglobalServices.com)

SPINACH

(conventional)

Nutrition Facts			
Serving Size 1 cup (30g) Servings Per Container			
Calories		7	
Total Fat		0 g	
Sodium		24 mg	
Potassium		167 mg	
Total Carbohydrate		1 g	
Dietary Fiber		1 g	
Sugar		0 g	
Protein		1 g	
Calcium	3%	Iron	4%

(Source: USDA)

OXALIS

(foraged)

Nutrition Facts	
Serving Size 1/2 cup (84g) Servings Per Container	
Calories	25
Total Fat	0 g
Sodium	25 mg
Potassium	110 mg
Total Carbohydrate	4 g
Dietary Fiber	3 g
Sugar	0 g
Protein	1 g
Calcium 4%	Iron 8%

*Comparison of total polyphenols awaiting lab results

(Source: SCSglobalServices.com)

SPINACH

(conventional)

Nutrition Facts	
Serving Size 1 cup (30g) Servings Per Container	
Calories	7
Total Fat	0 g
Sodium	24 mg
Potassium	167 mg
Total Carbohydrate	1 g
Dietary Fiber	1 g
Sugar	0 g
Protein	1 g
Calcium 3%	Iron 4%

(Source: USDA)

NASTURTIUM

(foraged)

Nutrition Facts	
Serving Size 1/2 cup (72g) Servings Per Container	
Calories	35
Total Fat	0 g
Sodium	30 mg
Potassium	210 mg
Total Carbohydrate	5 g
Dietary Fiber	2 g
Sugar	0 g
Protein	2 g
Calcium 10%	Vitamin A 120%

Comparison of total polyphenols awaiting lab results

(Source: SCSglobalServices.com)

SPINACH

(conventional)

Nutrition Facts	
Serving Size 1 cup (30g) Servings Per Container	
Calories	7
Total Fat	0 g
Sodium	24 mg
Potassium	167 mg
Total Carbohydrate	1 g
Dietary Fiber	1 g
Sugar	0 g
Protein	1 g
Calcium 3%	Vitamin A 56%

(Source: USDA)

	chickweed *Stellaria media*	dandelion *Taraxacum officinale*	dock *Rumex crispus*	mallow *Malva sylvestris*	nasturtium *Tropaeolum majus*	oxalis *Oxalis pes-caprae*	kale *Brassica oleraceae*
cal (Kcal)	29.09	34.86	33.37	52.14	46.91	27.52	35.0
fat cal (Kcal)	2.40	3.47	2.47	3.58	6.39	2.52	13.41
fat (g)	0.27	0.39	0.27	0.40	0.71	0.28	1.49
saturated fat (g)	0.01	0.01	0.02	0.01	0.04	0.01	0.18
TFA (g)	0	0	0	0	0	0	0
cholesterol (mg)	0	0	0	0	0	0	0
carbohydrates (g)	5.19	5.55	4.79	7.81	6.90	5.27	4.42
dietary fiber (g)	3.64	5.26	3.39	7.20	3.10	2.99	4.10
total sugars (g)	0	0	0	0	0.37	0	0.99
protein (g)	1.43	2.27	2.63	4.10	3.23	0.98	2.92
Vitamin A (IU)	2282	6577	5396	4637	8182	2369	4812
Vitamin C (mg)	10.66	4.49	36.19	8.65	1.49	9.40	93.40
Na (mg)	45.17	52.34	101.04	42.87	39.97	28.85	53.0
Ca (mg)	65.96	95.90	68.47	273.39	148.46	48.69	254.0
Fe (mg)	1.54	2.73	1.31	3.35	1.18	1.87	1.60
K (mg)	439.82	440.08	310.24	357.09	297.97	128.29	348.0
total phenolics (mg/g)	0.77	0.49	2.77	1.29	2.82	1.68	NA
oxalic acid-soluble (mg/g)			0.18			10.94	
oxalic acid-total (mg/g)			0.39			15.42	

https://doi.org/10.1371/journal.pone.0239794.t001

Why are wild/feral foods more nutritious?

Why are wild/feral foods more nutritious?

What traits are we breeding for?

Why are wild/feral foods more nutritious?

What traits are we breeding for?

Is stress good for nutrition?

DANDELION

(foraged)

Nutrition Facts	
Serving Size 1 cup (70g) Servings Per Container	
Calories	25
Total Fat	0 g
Sodium	35 mg
Potassium	310 mg
Total Carbohydrate	4 g
Dietary Fiber	4 g
Sugar	0 g
Protein	2 g
Calcium 6%	Iron 10%

*Comparison of total polyphenols awaiting lab results

(Source: SCSglobalServices.com)

DANDELION

(conventional)

Nutrition Facts	
Serving Size 1 cup (70g) Servings Per Container	
Calories	32
Total Fat	0 g
Sodium	54 mg
Potassium	279 mg
Total Carbohydrate	6 g
Dietary Fiber	2 g
Sugar	0 g
Protein	2 g
Calcium 3%	Iron 4%

(Source: USDA)

	chickweed *Stellaria media*	dandelion *Taraxacum officinale*	dock *Rumex crispus*	mallow *Malva sylvestris*	nasturtium *Tropaeolum majus*	oxalis *Oxalis pes-caprae*	kale *Brassica oleraceae*
cal (Kcal)	29.09	34.86	33.37	52.14	46.91	27.52	35.0
fat cal (Kcal)	2.40	3.47	2.47	3.58	6.39	2.52	13.41
fat (g)	0.27	0.39	0.27	0.40	0.71	0.28	1.49
saturated fat (g)	0.01	0.01	0.02	0.01	0.04	0.01	0.18
TFA (g)	0	0	0	0	0	0	0
cholesterol (mg)	0	0	0	0	0	0	0
carbohydrates (g)	5.19	5.55	4.79	7.81	6.90	5.27	4.42
dietary fiber (g)	3.64	5.26	3.39	7.20	3.10	2.99	4.10
total sugars (g)	0	0	0	0	0.37	0	0.99
protein (g)	1.43	2.27	2.63	4.10	3.23	0.98	2.92
Vitamin A (IU)	2282	6577	5396	4637	8182	2369	4812
Vitamin C (mg)	10.66	4.49	36.19	8.65	1.49	9.40	93.40
Na (mg)	45.17	52.34	101.04	42.87	39.97	28.85	53.0
Ca (mg)	65.96	95.90	68.47	273.39	148.46	48.69	254.0
Fe (mg)	1.54	2.73	1.31	3.35	1.18	1.87	1.60
K (mg)	439.82	440.08	310.24	357.09	297.97	128.29	348.0
total phenolics (mg/g)	0.77	0.49	2.77	1.29	2.82	1.68	NA
oxalic acid-soluble (mg/g)			0.18			10.94	
oxalic acid-total (mg/g)			0.39			15.42	

https://doi.org/10.1371/journal.pone.0239794.t001

Union of Concerned Scientists

POLICY BRIEF

The Rise of Superweeds—and What to Do About It

Solutions based on the science of agroecology can avert a looming crisis for farmers and the environment.

In what may sound like science fiction but is all too real, "superweeds" are over-running America's farm landscape, immune to the herbicides that used to keep crop-choking weeds largely in check. This plague has spread across much of the country—some 60 million acres of U.S. cropland are infested—and it is wreaking environmental havoc, driving up farmers' costs and prompting them to resort to more toxic weed-killers.

How did this happen? It turns out that big agribusiness, including the Monsanto Company, has spent much of the last two decades selling farmers products that would ultimately produce herbicide-resistant weeds. And now that thousands of farmers are afflicted with this problem, those same companies are promising new "solutions" that will just make things worse.

Herbicide-resistant weeds are also symptomatic of a bigger problem: an outdated system of farming that relies on planting huge acreages of the same crop year after year. This system, called monoculture, has provided especially good habitat for weeds and pests and accelerated the development of resistance. In

Ideal crops

- outcompete other plants
- no/low input
- long productive season
- edible root to fruit
- promiscuous and fecund
- highly nutritious
- delicious

Ideal crops

- outcompete other plants
- no/low input
- long productive season
- edible root to fruit
- promiscuous and fecund
- highly nutritious
- delicious

Edible weeds!

C.f. H.G. Baker, 1965. Characteristics and modes of origin of weeds.

Seismic Salad: Fresh Food after The Big One

by Philip B. Stark, Berkeley Open Source Food

Follow

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THANK

From Herbicide-Free Cal to Edible Cal