

Green Tea And DDT Residues

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This laboratory became involved with the examination of green tea imported from Japan, which included the analysis of the tea for pesticide residues. Surprisingly, it was noted that a number of the 1969 samples contained significant amounts of DDT. The residues were determined by gas chromatography and confirmed by thin-layer chromatography. Although smaller amounts of the DDT analogs were observed in the samples, only the p,p'-DDT component was recorded.

Some of the samples were randomly selected from local retail outlets and, fortunately, similarly labeled teas (18 samples) were obtained for the years 1969 and 1970 (See Table 1). A total of 28 samples was obtained for the year 1969 in which DDT residues ranged from 0.02 to 17.40 parts per million (p.p.m.), with an average amount of 2.44 p.p.m.; 31 samples, obtained for the year 1970, had a DDT residue range of 0.01 to 4.00 p.p.m., with an average amount of 0.55 p.p.m., indicating a downward trend and a tangible decrease in DDT residues for the 1970 imports. Ten of the 1970 samples were received directly from Japan the latter part of the year and these samples indicated a residue range of 0.01 to 0.89 p.p.m., with an average value of 0.24 p.p.m. The smaller amounts of DDT residues noted in the samples for the year 1970 are no doubt due to the increased legal restrictions on pesticide residues on or in agricultural commodities initiated by the Japanese government in 1970 (1); in particular, Japan established a DDT residue tolerance of 0.5 p.p.m. on Japanese tea on the dried leaf basis.

Powdered green tea imports from Japan for the years 1969 and 1970 were also examined for DDT residues; the average residue content for both years was about the same, 0.73-0.78 p.p.m. (See Table 2).

For comparative reasons, a few samples of tea were obtained which had been imported from areas other than Japan. DDT residues in these samples ranged from 0.02 to 0.28 p.p.m., with an average value of 0.13 p.p.m. (See Table 3). Also, samples of black tea bags and green tea, both packed in the United States under a well-known label, were examined; the black tea contained DDT residues of 0.11 and 0.06 p.p.m. for the years 1969 and 1970, respectively, whereas the green tea (1970 sample) contained 1.50 p.p.m.

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TABLE 1

p,p'-DDT residues in green leaf tea imported from Japan for the years 1969 and 1970*

Sample No.**		Residue (parts per million)	
		1969	1970
26		0.02	0.01
22		0.05	0.09
25		0.06	0.07
7		0.07	0.02
21		0.07	0.03
8		0.08	0.02
12		0.24	0.06
5		0.33	1.00
24		0.38	0.36
27		0.41	0.25
35	tea bags	1.02	0.90
23		1.35	0.38
20		1.45	0.13
18	roasted tea	5.04	0.08
16		7.81	0.77
15		10.98	0.13
29		16.90	2.32
19		<u>17.40</u>	<u>0.90</u>
	Minimum	0.02	0.01
	Maximum	17.40	2.32
	Average	3.54	0.42

* Average moisture content was 6 per cent.

** Similarly labeled teas for both years.

Four of the leaf tea samples, with DDT residues ranging from 5 to 17 p.p.m., were subjected to the hot water infusion process to determine the amount of DDT that would be present in the water extract. One sample indicated no DDT in the water, two samples of the tea extract contained 0.1 per cent of the DDT originally found in the leaf, and one extract contained 2 percent of the DDT. Therefore, since little, if any, DDT residue in the tea leaf transfers to the hot water infusion, the residue in the leaf cannot be considered detrimental from the health viewpoint. However, powdered tea, as used in the tea ceremony (2), would be ingested with the liquid by the user and, therefore, any DDT residue would also be ingested by the tea drinker.

TABLE 2

p,p'-DDT residues in powdered teas imported from Japan for the years 1969 and 1970*

Sample No.**	Residue (parts per million)	
	1969	1970
30	0.26	----
37	0.27	0.08
2	0.44	----
32	0.52	0.69
1	0.56	0.70
28	0.60	1.64
33	0.68	----
31	1.16	----
34	2.10	----
46	----	0.80
47	----	0.64
	Minimum	0.26
	Maximum	2.10
	Average	0.73

* One cup of prepared tea contains 0.5 g. tea in 200 ml. water. Therefore, based on the above number of tea samples examined for the years 1969 and 1970, the individual's intake of p,p'-DDT per cup of tea would have been:

	<u>1969</u>	<u>1970</u>
Minimum	0.13 ug.	0.04 ug.
Maximum	1.05 ug.	0.82 ug.
Average	0.37 ug.	0.39 ug.

** Similarly labeled teas for both years.

The United States federal regulations contain no finite tolerance for DDT residues in tea. Therefore, from the legal standpoint, the allowable tolerance for DDT in tea is zero. If one ignores the residue contents of the tea in the range of 0.05 p.p.m. (or less) as practiced in the past by administrative personnel of the regulatory agencies on other agricultural commodities, then the following facts are of interest to the regulatory chemist: Referring to Table 1, about 72 per cent of the 1969 and 67 per cent of the 1970 leaf tea imports would have been in violation of federal pesticide tolerance regulations. Referring to Table 2, all of the powdered tea imports would have been in violation of federal restrictions. It is also of interest to note (Table 3) that green tea packaged in the United States contained DDT residue above the legal tolerance.

TABLE 3

p,p'-DDT residues in leaf tea imported from areas other than Japan
for the year 1970

Sample No.	Imported from	Type of tea	Residue p.p.m.
CH-2	Hong Kong	green	0.02
CH-4	Hong Kong	green	0.05
CH-3	Hong Kong	green (Jasmine)	0.16
CH-1	Hong Kong	Oolong (partially fermented)	0.06
43)	Taiwan	Oolong (partially fermented)	0.22
CH-5	Taiwan	green (Jasmine)	0.28
Average			0.13
44)	Packed in	green	1.50
45)	United States*	black tea bags	0.06

* Origin of tea unknown. The tea contents of the bags were in a finely ground state.

The presence of excess DDT residues in tea is of secondary importance compared to the ever-present dilemma experienced by the regulatory chemist when a decision must be made concerning an over-tolerance residue of any pesticide on any commodity and to reconcile his interpretation of the regulatory laws with possible seemingly contradictory administrative decisions made by the federal agencies. For example:

1) The Tea Importation Act (3) states that "The importation of any merchandise as tea which is inferior in purity, quality, and fitness for consumption to the standards fixed by the Secretary of Health, Education, and Welfare is prohibited." The question is raised: Are teas which contain tangible amounts of residues of DDT inferior in purity and quality as prescribed by the standards fixed by the Secretary?

2) Federal regulations state that "A zero tolerance means that no amount of the pesticide chemical may remain on the raw agricultural commodity when it is offered for shipment." (4). Tea is classed as a processed foodstuff and would therefore come under the ruling "-----the concentration of the pesticide in the preserved or processed food when ready to eat is not (may not be) greater than the tolerance permitted on the raw agricultural commodity (5), which, in the case of tea, is zero."

3) A recent ruling by a district FDA office stipulated that they would not regard action on a tea shipment containing 8 to 9 p.p.m. DDT as warranted because the pesticide would not be expected to be extracted from the leaves and become a component of the beverage. However, as noted earlier in this report, powdered tea would be a component of the ingested beverage.

4) Another FDA official recently ruled that "It is FDA's position, and supported by court decisions, that adulterated (over-tolerance residues) foods cannot be considered legal until the adulteration has been removed.-----ordinarily crops containing illegal residues may not be shipped in interstate commerce for processing" (6).

We have, therefore, examples of two different rulings by two different officials of the same agency on the same subject matter, over-tolerance residues. One opinion was made from the health viewpoint, the other opinion was made from the legal viewpoint. The legal tolerance of a pesticide for any food or foodstuff should have a realistic relationship to health and official pronouncements, interpretations, or administrative rulings from the regulatory agency, and it should be consistent at all times.

Another area of concern relates specifically to the pesticide DDT. A report issued by the Secretary of Health, Education, and Welfare on November 17, 1969 (7) recommended the elimination within two years of all uses of DDT in the United States except those essential to human health. On January 19, 1970, the Pesticides Regulation Division of the United States Department of Agriculture issued a notice which included the statement "-----the Department is considering cancellation of all uses of DDT unless it can be shown that certain uses are essential to the protection of human health and welfare." If these recommendations are implemented - and all pertinent events which have occurred since the above-mentioned announcements suggest that they will become effective - then, based on the DDT residues found in recent tea imports, the ironic situation may exist where DDT usage and/or DDT residues on foodstuffs may be illegal in the United States, but such residues will continue to appear in the United States via food imports from countries where DDT restrictions are not practiced unless, of course, the federal agencies increase their surveillance over food imports and enforce the regulations pertinent to over-tolerance pesticide residues.

References

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