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WEED SEEDS FOUND IN VEGETABLE SEEDS

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OLIVE M. HOEFLE



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## WEED SEEDS FOUND IN VEGETABLE SEEDS

OLIVE M. HOEFLE<sup>1</sup>

### ABSTRACT

This bulletin deals with the rate of occurrence and the kinds of weed seeds and other foreign materials found in packets of vegetable seeds. The data show that out of 3,828 samples collected over a period of 9 years, 1,681, or 43.9 per cent, contained impurities of one kind or another, while 2,147, or 56.1 per cent, of the samples, representing probably the better grades, contained a trace or negligible amount of inert material and no weed seeds.

In all, 165 different weed species and other crop seed kinds were found in these 3,828 samples. Careless or possibly unavoidable practises in growing, harvesting, and cleaning the seed crops, together with later unavoidable or intentional contamination, as well as re-packeting processes, appeared to be largely responsible for the contamination of these garden seeds which proved to be potential distributors of many garden weeds.

### INTRODUCTION

It is evident that but little attention has been given to the question of vegetable seeds as carriers of what may be termed garden weed seeds. Probably because of the special methods of production of vegetable seeds, the usual conclusion seems to have been that vegetable seeds carry no weed seeds and thus are not a source of weed infestation to the garden. However, when one examines critically a series of these packets, quite a different condition is found to exist.

At the outset, it was found difficult to classify the various seed impurities on the basis of whether they were weeds in the strict sense of the term or whether they might better be classed as "other crop seeds" or "extraneous crop seeds" in the sense used by seed analysts. In like-manner it became difficult to classify and still more difficult to account for the presence of some of the various kinds or types of inert material which were found in a large number of these packets. It seems best, then, to present these data in tabular form (Table 1)

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TABLE 1.—Continued.

	KIND OF VEGETABLE SEED EXAMINED																				
	Beans	Beet	Cabbage	Carrot	Cauliflower	Celery	Cucumber	Endive	Lettuce	Onion	Parsley	Parsnip	Peas	Radish	Rutabaga	Spinach	Swiss Chard	Tomato	Turnip	Miscellaneous	
Cress ( <i>Lepidium sativum</i> )	—	—	1	2	—	1	—	1	2	—	—	—	—	—	—	—	—	—	—	—	—
<i>Croton</i> sp.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Cucumber ( <i>Cucumis</i> sp.)	1	2	—	1	—	—	—	—	2	—	—	—	—	—	—	—	—	2	—	—	—
Dandelion ( <i>Taraxacum officinale</i> )	—	—	—	—	—	1	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—
Dandelion, fall ( <i>Leontodon autumnale</i> )	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—
Dead nettle ( <i>Lamium amplexicaule</i> )	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Delphinium</i> spp.	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—
Deptford pink ( <i>Dianthus armeria</i> )	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Dill ( <i>Anethum graveolens</i> )	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Dock, curled ( <i>Rumex crispus</i> )	—	2	2	6	—	2	—	2	—	1	7	4	—	—	1	—	—	—	—	—	—
Dodder, field ( <i>Cuscuta arvensis</i> )	—	—	—	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Dondia</i> sp.	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—
Eggplant ( <i>Solanum melongena</i> )	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Endive ( <i>Cichorium endivia</i> )	—	—	2	14	1	—	—	—	7	3	6	—	—	—	—	—	—	—	—	—	—
<i>Escholtzia</i> sp.	—	—	—	1	—	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Fenugreek ( <i>Trigonella foenum-graecum</i> )	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Festuca</i> spp.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Field bindweed ( <i>Convolvulus arvensis</i> )	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	—	16	—	17	—	—	—	—	2	12	6	1	—	9	—	1	—	—	—	—	—



TABLE 1.—Continued.

	KIND OF VEGETABLE SEED EXAMINED																				
	Beans	Beet	Cabbage	Carrot	Cauli- flower	Celery	Cucumber	Endive	Lettuce	Onion	Parsley	Parsnip	Peas	Radish	Rutabaga	Spinach	Swiss Chard	Tomato	Turnip	Miscel- laneous	
Mallow ( <i>Malva parviflora</i> )	-	-	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Marjoram ( <i>Origanum</i> spp.)	-	-	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Marsh elder ( <i>Iva xanthi- folia</i> )	-	-	-	3	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
Mayweed ( <i>Anikemis cotula</i> )	-	-	-	-	2	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Melon ( <i>Citrullus vulgaris</i> )	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Millet, pearl ( <i>Pennisetum glaucum</i> )	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-
Morning glory ( <i>Ipomoea purpurea</i> )	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mustard ( <i>Brassica</i> spp.)	1	14	-	50	-	17	9	12	29	19	26	4	1	55	-	17	2	10	1	21	-
Mustard, wormseed ( <i>Ery- simum cheiranthoides</i> )	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nettle-leaved goosefoot ( <i>Chenopodium murale</i> )	-	-	-	14	-	7	-	18	18	-	17	-	-	1	1	-	-	-	-	-	-
Nippewort ( <i>Lapsana com- munis</i> )	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oats ( <i>Avena sativa</i> )	2	7	-	-	-	-	-	-	-	-	-	1	-	1	-	1	-	-	1	2	3
Onion ( <i>Allium cepa</i> )	-	3	1	3	-	-	1	-	7	-	3	3	-	3	4	3	1	2	-	-	-
Orchard grass ( <i>Dactylis glomerata</i> )	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Ox-eye daisy ( <i>Chrysanthem- um leucanthemum</i> )	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Pale persicaria ( <i>Polygonum lapathifolium</i> )	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Parsley ( <i>Petroselinum hor- tense</i> )	-	4	4	1	-	2	1	5	1	1	-	2	1	3	2	4	1	3	-	-	5





TABLE 1.—Continued.

	KIND OF VEGETABLE SEED EXAMINED																			
	Beans	Beet	Cabbage	Carrot	Cauliflower	Celery	Cucumber	Endive	Lettuce	Onion	Parsley	Parsnip	Peas	Radish	Rutabaga	Spinach	Swiss Chard	Tomato	Turnip	Miscellaneous
Purslane, pussley ( <i>Portulaca oleracea</i> )	-	-	-	-	-	5	-	1	1	-	-	-	-	-	-	-	-	-	-	3
Quack grass ( <i>Agropyron repens</i> )	-	-	-	-	-	1	1	1	-	-	-	-	-	-	-	6	-	-	2	5
Radish ( <i>Raphanus sativus</i> )	-	3	4	6	1	-	1	1	2	2	3	2	3	-	2	-	-	3	-	-
Ragweed ( <i>Ambrosia artemisiifolia</i> )	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	1	-	-	-
<i>Ranunculus</i> sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
<i>Ranunculus muricatus</i>	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Red clover ( <i>Trifolium pratense</i> )	-	1	1	3	-	1	1	-	2	3	1	2	1	1	1	1	1	1	3	1
Redtop ( <i>Agrostis alba</i> )	1	1	1	1	-	1	-	-	-	-	-	1	2	1	1	1	-	-	1	1
Rye ( <i>Secale cereale</i> )	1	1	1	1	-	1	-	-	-	-	-	1	7	1	1	1	-	-	4	2
Ryegrass ( <i>Lolium</i> spp.)	-	-	-	5	-	1	-	-	-	1	1	-	-	-	-	1	-	1	-	-
Sage ( <i>Salvia</i> spp.)	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Salsify ( <i>Tragopogon porrifolius</i> )	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	3
Savory, summer ( <i>Satureia hortensis</i> )	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Saltbush, Orache ( <i>Atriplex patula</i> )	-	-	1	3	-	-	-	1	-	-	6	1	-	-	3	-	-	1	-	-
Saltbush ( <i>Atriplex rosea</i> )	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scentless camomile ( <i>Matri-caria inodora</i> )	-	-	1	1	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Sheep sorrel ( <i>Rumex acetosella</i> )	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Shepherd's purse ( <i>Capsella bursa-pastoris</i> )	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-



TABLE 1.—Concluded.

	KIND OF VEGETABLE SEED EXAMINED																			
	Beans	Beet	Cabbage	Carrot	Cauliflower	Celery	Cucumber	Endive	Lettuce	Onion	Parsley	Parsnip	Peas	Radish	Rutabaga	Spinach	Swiss Chard	Tomato	Turnip	Miscellaneous
Wheat ( <i>Triticum aestivum</i> )	—	3	—	—	—	—	—	—	—	—	1	—	—	15	—	2	—	1	—	1
White clover ( <i>Trifolium repens</i> )	—	1	1	1	—	1	—	—	3	1	1	—	1	3	—	—	—	—	1	1
White hoarhound ( <i>Marubium vulgare</i> )	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—
Wild buckwheat ( <i>Polygonum convolvulus</i> )	—	62	5	1	—	—	—	—	—	3	1	5	—	44	5	43	3	1	—	1
Wild oats ( <i>Avena fatua</i> )	—	—	—	—	—	—	—	—	—	—	—	6	—	—	—	—	—	—	—	—
Wood sage ( <i>Teucrium</i> sp.)	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—
Yellow trefoil ( <i>Medicago lupulina</i> )	—	—	—	4	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
<i>Zinnia</i> sp.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Quartz, stone and sand	—	18	6	15	—	4	14	—	4	5	25	—	1	13	6	17	—	3	9	14
Stems, sticks	—	9	—	97	—	4	5	—	—	—	96	—	—	—	—	1	—	1	—	—
Dirt, earth particles	—	19	8	57	—	4	5	1	37	—	5	17	—	50	2	5	6	3	8	9
Shell	—	3	—	6	—	1	—	—	—	1	—	—	—	—	—	2	—	2	—	—

which shows the kinds of impurities found, together with the rate of occurrence and the kinds of garden seeds in which they occurred.

With the inception of the vegetable seed control law in this State, when the actual examination of packeted seeds began, it was soon noted that weight for weight and type for type, vegetable seeds were as frequently contaminated with weed seeds and other materials as were farm crop seeds such as clovers and grasses. In an effort to obtain definite information as to the extent to which vegetable seeds, particularly those sold in sealed paper packets, carried weed seeds, a careful examination was made of such parcels as were obtained each season. The results of such a study covering 9 years are reported in this bulletin. The material used consisted of 3,828 samples, the greater proportion of which were sealed paper packets, better known in the trade as "commission-box packets," and which were actually purchased during the active selling seasons of 1924 to 1932, inclusive, by the State's seed inspector or agent in the course of his duties in investigating or inspecting the sale of seeds.

## DISCUSSION

Table 1 shows that out of 3,828 samples examined, 1,681, or 43.9 per cent, contained impurities of one kind or another; while 2,147, or 56.1 per cent, of the samples contained a trace or negligible amount of inert material and no seed impurities of any kind. In all, 165 different weed species and other crop seeds were found. It is interesting to note from the table that all of the weed seed species listed in the New York State seed law as noxious weeds were among those found. Also, it is significant that practically all of the weeds listed as troublesome garden weeds were found with more or less frequency in these samples.

To put this into more definite gardening terms, if a gardener used all of these 3,828 vegetable seed packets for planting purposes, he would be using 2,147 packets, or 56 out of every 100, which would contain no weed seeds or other seed impurities. On the other hand, he would be using 1,681 packets, or 44 out of every 100, which would contain weed seeds or other seed impurities varying in amounts from 1 in each packet to as high as 504 in a single packet, or an average of nearly 5 per packet. In one extreme yet fairly typical case there were 103 weed seeds present representing 12 different kinds, all in a packet

of endive weighing approximately one-fourth ounce. According to reliable planting tables this would mean 105 weed seeds per 100 foot of row.

Among the vegetable seeds carrots were found to be most frequently contaminated, 92.6 per cent of the samples carrying weed seeds or foreign materials with 79 different kinds of impurities. The 10 kinds of vegetable seeds most frequently contaminated in the order of frequency were as follows: Carrot, endive, parsley, celery, lettuce, spinach, parsnip, radish, turnip, and rutabaga.

It is not possible to undertake here a discussion of the relative demerits of the several kinds of seed impurities found in these packets. In fact the troublesome or noxious nature of some of these weeds would depend upon whether the crop seed itself were planted directly into the garden row or was used in greenhouse flats or in the cold frame to produce plants to be later transplanted into the garden. It has been pointed out that while some of these seed impurities were common crop plants, in practise they really become weeds or plants out of place and as such bring about a weeding, thinning, or cultivation problem which adds to the cost of production.

In justice to the seed trade it should be said that there was ample evidence to show that high weed seed content (low mechanical purity) was usually associated closely with low quality stock, i. e., with low viability and vitality and with degenerate stock, and that the quantities of very low quality vegetable seed packets seem to be largely responsible for the distribution of these weed seeds.

There were found to be present four quite distinct types of inert materials as shown in the table. In this study it was not possible to go into the investigation of the actual source of these inert materials as contaminants, but suffice it to say that they were found to be present and in some cases in unreasonable and unexplainable quantities and conditions. That is to say, the materials, as compared with the size and weight of the seed in which they were found, being markedly lighter or heavier, should not be present if any reasonable amount of care in production or re-cleaning had been practised.

It is plainly evident from the character and nature of the impurities found that there are separate and definite sources of contamination, as follows: First, the growing field, and in this connection the best growers state, in answer to definite inquiry, that while each crop has its special weed problem under reasonable cultural care there is no excuse for seed crops of these kinds showing such

an unreasonable amount and prevalence as is found in many of these packets; second, re-bulking machinery, storage bins, and similar rehandling processes. The probability of this source of contamination is evidenced by the presence in many packets of two quite unlike kinds of seed from two widely different harvesting periods or production regions. There was ample evidence that a third serious source of contamination was operative, namely, yearly re-packeting and re-bulking processes practised by some commission packet houses which would contribute to this condition. For instance, bits of paper which were the remains of packets of the preceding season's use were found in new packets. This re-packeting process and its attendant problems of contamination are a natural sequence of the requirements of the seed law that "the year for which the seeds were packeted or put up be stated on the packet," thereby making it necessary either to discard, tear up, or slit packets of the current season's distribution.

There appears, then, to be growing, harvesting, cleaning, and vending problems contributing to the contamination of garden seeds and thus making them a source of actual weed infestation of gardens.