BULLETIN No. 681 JULY, 1938

New York State Agricultural Experiment Station

Geneva, N. Y.

THE PLANTING VALUE OF OATS AND BARLEY COLLECTED FROM FARMERS' DRILLS AND GRANARIES

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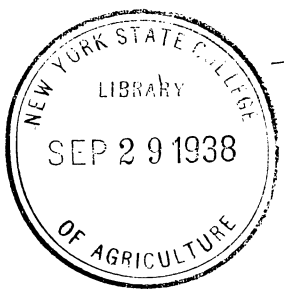

PUBLISHED BY THE STATION
UNDER AUTHORITY OF CORNELL UNIVERSITY

ABSTRACT

THE study reported in this bulletin is based on laboratory examinations and detailed reports by the users of 176 samples of spring grains and on analyses of thresher-run seed stocks collected directly from farmers' granaries. Very few seed stocks were obtained from dealers.

A strain of oats or barley was often planted by a grower for several consecutive years. Misleading or meaningless varietal names were commonly used. Cornellian and Ithacan varieties were very popular.

Many seedstocks were cleaned on the farm, a small percentage was taken to a commercial cleaning mill, and a few were planted in uncleaned condition.

Seedstocks were commonly treated with either formaldehyde or New Ceresan. At least 19 growers treated oats in 1937 who did not treat in 1936. Smut developed in most of the untreated seedstocks.

Percentages of pure seed, of weed seeds and of other crop seeds were determined in the laboratory. Germination and the influence of cleaning upon percentages of viable seed were studied critically. The removal of unfilled grains by a fanning mill markedly increased the apparent germination of many seed stocks.

Locally grown oats were contaminated with several noxious weed seeds, such as wild mustard, curled dock, and quack grass. Cleaning substantially reduced the percentage of weed seeds. Seeds of wheat, buckwheat, corn, rye, and certain other small grains were observed occasionally.

Smut spores were present in 174 of the 176 samples collected. Root-rot and seedling blight organisms infected nearly one-half of the barley samples. New Ceresan is suggested as a remedial measure.

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THE PLANTING VALUE OF OATS AND BARLEY COLLECTED FROM FARMERS' DRILLS AND GRANARIES

WILLARD F. CROSIER, *Associate in Research (Seed Investigations)*

INTRODUCTION

NEARLY 84,000 farmers in this State grew oats in 1935. An additional 10,000 fields of barley and 18,000 fields of mixed oats and barley were harvested. In some years the number of farms producing oats alone may exceed 100,000. The price of western grain and weather conditions in the spring exert slight fluctuations on the annual acreage of spring grains, but oats and barley are always important crops and the bushels of seed required to plant these acreages number into the hundreds of thousands. Annually, several hundred samples of oats are sent to the Division of Seed Investigation of this Station for purity analysis, germination, and smut detection. Most of them have been inferior to certified stocks. They have often been of unapproved varieties and more frequently are not cleaned and are of low germination.

The meager information accompanying the samples usually does not permit their accurate classification into cleaned or uncleaned and locally grown or western grown seed. Moreover, how many of the seed stocks are actually planted and in what condition is unknown. It is certain that less than 5 of every 1,000 growers care enough about the quality of their seed to submit samples of their intended seed stocks for purity analyses or germination tests.

Inspection of grain samples by the State Department of Agriculture and Markets also provides a means for determining the value of a few seed stocks that are handled thru dealers. They are by no means representative, however, of the bulk of the seed grains planted on the farms of this State. Examinations of oats and barley collected from farmers' granaries or direct from drills offer the most accurate means of determining the condition of seed stocks. Since oats produced in 1936 were seriously affected by the dry weather, many

growers anticipated that seed stocks would be both low in quality and difficult to obtain. In order to study the possibility of increasing the planting value of grains and as a basis for future work, uncleaned oats were collected from 54 farmers' granaries during January of 1937. Thoro cleaning increased the average germination from 72.8 to 96.2 per cent and increased the bushel weight from 27.2 to 35.1 pounds. This was due entirely to the removal of chaffy unfilled grains. Weed seed removal was nearly absolute.

Oats grown in the western states and offered for sale in this State during recent years have been bright, heavy, plump, and of high germination, but their appearance has been found to be deceiving. Noxious weed seeds had not been removed from many seed stocks and there has been no proof that the oats were of varieties adapted to growing conditions of this State. However, being attractive to the casual observer, they were bought readily, often in preference to local seed. The demand has been accentuated thru failure on the part of the farmer to realize the potential seeding value of his own oats.

In order to determine the comparative use of western, locally grown, and certified seed oats in 1937, a drill survey was conducted thru the cooperation of county agricultural agents. Information pertaining to the distribution of varieties, methods of cleaning, popularity of various seed disinfectants, and the occurrence of smut was secured at the time the samples were collected. These facts, together with summaries of analyses and germination studies, are presented in this bulletin. It is hoped that they will serve to increase the demand for oats meeting the requirements of certified seed and to emphasize the need for thoro cleaning and careful treating of locally grown seed stocks.

COLLECTION AND EXAMINATION OF THE SAMPLES

The farm census of 1935 showed that oats and barley were grown in all but 5 of the 62 counties of the State. To be thoroly representative, therefore, samples should be obtained thru a Statewide survey. The weather conditions prevailing during the growing season of 1936 were so varied that it was doubly important to secure collections from all sections of the State.

Thru the assistance of Professors F. P. Bussell, F. B. Morris, and M. F. Barrus, of the State College of Agriculture at Ithaca, the following questionnaire was prepared:

Number.....

Survey of Oats used for Seed

1937

Seed is from crop grown in 193..... Was it grown on home farm?.....
Was seed purchased from?..... (a) from neighbor.....
(b) from dealer.....
Variety..... Was seed certified? Yes..... No.....
Is germination known?..... If so, what percentage?.....
Is purity known?..... If so, what percentage?.....
Was seed cleaned?..... If so, was cleaning done on farm.....
or by dealer in grain?.....
Has seed been treated for smut?..... With formaldehyde?..... New improved Ceresan?..... 2% Ceresan?..... Copper carbonate?.....
Was treatment made at home?.....or by dealer?..... Treated.....
days or.....hours before sowing Not yet treated but will be with.....
Was seed planted last spring (1936) treated?.....
It was treated at home.....by dealer.....with.....
Was that seed certified?..... Variety used..... Acreage.....
Amount of smut in 1936 crop? None..... Trace.....
Considerable..... Much.....
I would like information about.....
.....
.....
Name..... P.O..... County.....

Either 5 or 10 copies of this questionnaire, together with envelopes for mailing oat samples, were sent to each county agricultural agent. The agents were requested to interview farmers and to collect 1-pound samples of pure oats direct from drills or from bags ready for planting. A few cooperators obtained samples from cleaned but untreated bulks and a number were taken from uncleaned lots.[1] The questionnaires, however, were filled out completely and accurately so that differentiation could be made between fully prepared, partially prepared, and unprepared samples.

It is interesting to note that pure oats, i.e., not admixtures with barley, cannot readily be collected in abundance. Even tho the need for oats alone was emphasized, several agents were forced to return mixtures in order to meet their quotas. This was in reality an advantage because in spite of increasing the work of securing and assembling the results, the completed summaries very closely represent the condition of seed oats and barley for the entire State.

[1]The agricultural agents of the counties listed in Table 1 collected all of the samples and offered much constructive criticism and advice.

The samples and questionnaires were numbered consecutively upon receipt and filed in numerical order. To avoid contamination, two 15-gram samples were drawn from each envelope before the contents were disturbed by analytical examinations. Field space had been reserved so that one sample was planted immediately in a rod row. Only 121 lots were included in the field studies since the others were received too late for planting. Disease observations, particularly for smut, were recorded. Unfortunately, inclement weather prevented cooperators from the College of Agriculture examining the rows for varietal mixtures.

To test the accuracy of laboratory determination of smut, the second 15-gram lots were studied microscopically for adhering smut spores. The seeds were soaked in water for 1 hour to dislodge the spores. The water was poured off, the seeds rinsed several times, and one-tenth of the entire amount of liquid centrifuged to concentrate the spores. A definite fraction of the concentrate was examined and the number of smut spores counted. The presence of other fungus spores was also recorded.

Bushel weights of each individual sample and of the oats and barley components were determined in triplicate. The percentages of pure seed, the relative percentages of pure oats and barley, and the number of weed and other crop seeds were computed from analysis of 100- or 200-gram working samples. The entire bulk was examined for noxious weed seeds, for pieces of smutted grains, and for unusual types of inert matter.

Germination studies were based on two or four 100-seed tests on paper towels. Grains were taken only from the pure seed. When less than 90 per cent of normal seedlings were found, the number of unfilled seeds was recorded and the sample retested. Believing that removal of the chaffy grains would increase the percentage of normal sprouts, 44 samples were passed thru a strong air blast and germinated as before.

Each 100-seed lot counted for germination was weighed on balances sensitive to about one-tenth the weight of an individual seed. Particular attention was given to increase in weight of 100-seed lots due to recleaning for removal of unfilled grains. Bushel weights were also determined for each of the recleaned samples.

ANSWERS TO QUESTIONNAIRES

Considerable emphasis has been placed on the accurate and detailed completion of the questionnaires. The reasons for low germination, weed seed contamination, and chemical injury can best be obtained and understood thru a study of the common practices of acquiring, cleaning, and treating seed stocks. It is very interesting to determine the popularity of certain varieties and more so to find that many farmers grow "just oats". Information about new or better varieties was not asked very often by the growers. Several farmers expressed a desire to learn the correct methods and dosages of treating materials. The number and kind of weed seeds in their own seed stock was requested by a number of growers.

SOURCE OF SEED

In spite of the lack of heavy, clean oats in 1936 and 1937, few farmers purchased seed from dealers. Of the 167 growers answering this question, 126 used seed obtained from their own farms. Neighbors supplied oats for 14 plantings, while dealers had made only 27 sales. Most of these were in the central or southern counties. With one exception farmers in the northern portion of the State apparently had satisfactory oats of their own growing.

The extent of the introduction of western oats was not determined. Doubtless several dealers had sold seed grown in other states since regional names like Northwestern, Ohio, and Montana were used for varietal designations. The tagging information stated the percentages of pure seed and normal sprouts which was confirmed in our laboratory. The principal objection to western oats was their probable lack of adaptability to New York growing conditions. The inclusion of troublesome or noxious weed seeds also reduced their comparative planting value. The practice of exchanging seed stocks among farmers has been criticized on the basis of distributing weed seeds. There is little justification in this contention. Neighbor-purchased oats were weedier than certified or dealers' mixed varieties but were at least as clean as the grower's own seed. Very likely neighbor purchases were substituted for definitely inferior oats.

VARIETIES OF OATS AND BARLEY

Recent publications have emphasized the value of growing only certain adapted varieties, namely, Cornellian, Ithacan, Lenroc, Up-

TABLE 1.—ANSWERS TO QUESTIONNAIRES GIVING DETAILED INFORMATION CONCERNING SOURCE, VARIETAL NAME OF OATS, AND PREPARATION OF EACH SEED STOCK FOR PLANTING.

SURVEY NO.	COUNTY OF COLLECTION	SEED PLANTED IN 1937				SEED PLANTED IN 1936	
		Varietal name	Year grown	Source of seed	Cleaned by	Varietal name	Amount of smut
1[1]	Tioga	Not known	1935	Own farm	Farmer	Not known	None
2	Wayne	Shadeland Victory	1936	Own farm	Farmer[6]	Shadeland Victory[6]	Definite
3	Wayne	Not known	1935	Own farm	Not cl.[7]	Not known	Trace[7]
4	Chenango	Heavyweight	1936	Own farm	Not cl.	Heavyweight	None
5	Lewis	Not known	1935	Own farm	Farmer[7]	Not known	Trace[7]
6	Schoharie	Standwell	1936	Own farm	Farmer[7]	Standwell	None[7]
7	Schoharie	Not known	1936	Own farm	Not cl.	Not known	Trace
8	Wayne	Ithacan[3]	1935	Own farm	Farmer[7]	Ithacan[2]	Trace[7]
9	Lewis	Not known	1936	Own farm	Farmer[7]	Not known	Trace[7]
10	Lewis	Early	1936	Own farm	Not cl.[7]	Early	Definite
11	Lewis	Not known	1936	Own farm	Dealer[7]	Not known	None[7]
12	Schoharie	Traver	1936	Own farm	Not cl.	Not known	None
13	Wayne	Ithacan[2]	1936[5]	Dealer	Dealer[7]	Ithacan	None[7]
14	Tioga	Heavyweight	1936	Own farm	Farmer	Not known	
15	Oneida	Not known	1936	Own farm	Farmer[7]	Not known	None
16	Oneida	Not known	1936	Own farm	Not cl.	Not known	Trace
17	Oneida	Not known	1936	Own farm	Not cl.	Not known	Trace[7]
18	Oneida	Cornellian	1935	Own farm	Not cl.[7]	Not known	Trace[7]
19	Oneida	Ithacan[2]	1936[5]	Own farm	Farmer[6]	Ithacan[2]	Trace
20	Oneida	Mammoth Cluster	1936	Own farm	Farmer[6]	Mammoth Cluster	Trace[6]
21	Jefferson	White Swedish Select	1936	Own farm	Farmer[6]	White Swedish Select	None[7]
22	Jefferson	Eshelmans	1936	Own farm	Farmer[6]	Eshelmans	None[7]
23	Jefferson	Ithacan	1936	Own farm	Farmer[7]	Ithacan	Trace[7]
24	Jefferson	Not known	1936	Own farm	Farmer[6]	Not known	Trace[7]
25	Lewis	Cornellian	1936	Own farm	Farmer[7]	Not known	Trace
26	Lewis	Not known	1936	Own farm	Farmer[7]	Not known	Trace[7]
27	Jefferson	Not known	1936	Dealer	Dealer[6]	Not known	
29	Lewis	Not known	1936	Own farm	Farmer[7]	Not known	Trace[7]

31	Jefferson	Scotch Abundance	1936	Neighbor	Not cl.[6]	Not known	None[7]
32	Jefferson	Cornellian	1936	Own farm	Farmer[6]	Not known	Trace[6]
33	Jefferson	New Victory	1936	Own farm	Not cl.[6]	New Victory	Trace
34	Oneida	Cornellian	1936	Own farm	Not cl.[6]	Cornellian	None
35	St. Lawrence	Not known	1936	Neighbor	Dealer	Not known	None
36	Lewis	Not known	1936	Own farm	Not cl.[7]	Not known	None
37	Wayne	Ithacan and Cornellian	1935	Own farm	Not cl.[7]	Ithacan and Cornellian	Trace[7]
38	Oneida	Not known	1936	Dealer	Dealer[6]	Not known	None
39	Oneida	Not known	1936	Dealer	Dealer	Not known	Trace
40	Oneida	Not known	1936	Own farm	Not cl.	Not known	Trace
41	St. Lawrence	Not known	1936	Own farm	Dealer[7]	Not known	None[7]
42	St. Lawrence	Ithacan	1935	Own farm	Not cl.[7]	Ithacan	Trace[7]
43	St. Lawrence	Not known	1936	Own farm	Farmer	Not known	None
44	St. Lawrence	Not known	1936	Own farm	Farmer	Not known	None
45	St. Lawrence	Not known	1936	Own farm	Not cl.	Not known	None
46	St. Lawrence	Not known	1936	Own farm	Not cl.[7]	Not known	Trace[7]
47	St. Lawrence	Cornellian	1936	Own farm	Not cl.	Cornellian[2]	None[7]
48	Tioga	Not known	1935	Own farm	Not cl.	No oats grown	
49	Chautauqua	Cornellian	1936	Own farm	Farmer[7]	Not known	Trace
50	Chautauqua	Victory	1936	Own farm	Farmer[7]	Victory	None[7]
51	Livingston	Not known	1935	Own farm	Farmer[6]	Not known	None[7]
52	Livingston	Ithacan	1936	Dealer	Dealer[7]	Ithacan	None[7]
53	Livingston	Not known	1936	Own farm	Not cl.[6]	Not known	Trace
54	Livingston	Ithacan	1935	Neighbor	Not cl.[6]	Not known	None[7]
55	Livingston	Not known	1935	Own farm	Not cl.	Not known	None
56	Livingston	Canadian	1935[4]	Own farm	Farmer[6]	Not known	None[7]
57	Cortland	Not known	1936	Own farm	Farmer[7]	Not known	None[7]
58	Saratoga	Not known	1936	Own farm	Not cl.	Not known	None
59	Cortland	Swedish Select	1936[5]	Dealer	Dealer[7]	Not known	
60	Cortland	Not known	1936	Own farm	Farmer[7]	Not known	Trace

[1]The numbers omitted indicate that the questionnaires were not returned with the samples.
[2]Certified by the New York Seed Improvement Cooperative Association, Inc.
[3]Certified seed used previously.
[4]Percentage of germination stated.
[5]Percentage of both germination and pure seed stated.
[6]Treated with New Ceresan for control of smut.
[7]Treated with formaldehyde for control of smut.

TABLE 1.—*Continued.*

SURVEY NO.	COUNTY OF COLLECTION	SEED PLANTED IN 1937				SEED PLANTED IN 1936	
		Varietal name	Year grown	Source of seed	Cleaned by	Varietal name	Amount of smut
61	Cortland	Not known	1936	Own farm	Farmer[7]	Not known	Trace[7]
62	Cortland	Northern Wonder	1936	Own farm	Farmer[7]	Not known	Trace
63	Saratoga	Heavyweight Montana	1936	Own farm	Farmer	Not known	Trace
64	Chenango	Mammoth Cluster	1936	Own farm	Not cl.	Mammoth Cluster	None[7]
65	Chenango	Utility Swedish	1936[5]	Dealer	Dealer[7]	Utility	None[7]
66	Chenango	Not known	1936	Own farm	Farmer	Not known	None
67	Chenango	Cornellian[2]	1936[5]	Dealer	Dealer[6]	———	———
68	Chenango	Ithacan[2]	1936[5]	Own farm	Dealer[7]	Cornellian	Trace
69	Chenango	Mixed	1936	Own farm	Farmer	Mixed	———
70	Chenango	Not known	1936[4]	Own farm	Farmer	Not known	Trace
71	Chenango	Not known	1936	Own farm	Farmer[7]	Not known	Trace
72	Chenango	New Victory	1936	Own farm	Farmer[7]	New Victory	Trace
73	Chenango	Not known	1936	Neighbor	Neighbor	———	———
74	Essex	Swedish Select	1936	Own farm	Farmer[6]	Not known	Definite
75	St. Lawrence	New Alberta	1936[5]	Own farm	Dealer[7]	Alberta	Trace
76	Saratoga	Utility Swedish	1936[5]	Dealer	Dealer[7]	Utility Swedish[7]	None
77	Saratoga	Ithacan[3]	1936	Own farm	Farmer	Ithacan[2]	None
78	Washington	Clydesdale	1936	Own farm	Farmer[7]	Clydesdale	Definite
79	Washington	Cornellian	1936[4]	Own farm	Farmer[7]	Not known	Trace[7]
80	Washington	Ithacan	1936[4]	Own farm	Dealer[7]	Ithacan	Trace[7]
81	Saratoga	Banner	1936	Own farm	Farmer	Banner	None
82	Wayne	Cornellian	1936	Own farm	Farmer	Cornellian	None
83	Chautauqua	Not known	1936	Own farm	Farmer[7]	Not known	Trace
84	Chautauqua	Ithacan	1936	Own farm	Farmer	Ithacan	Trace
85	Chautauqua	Cornellian	1935	Own farm	Farmer[6]	Cornellian	Trace[7]
86	Chautauqua	Not known	1936	Own farm	Farmer	Not known	Trace
87	Wayne	Cornellian	1936[4]	Own farm	Farmer[7]	Cornellian	None[7]
88	Essex	Utility Swedish	1936[5]	Dealer	Dealer[7]	Not known	None[7]

89	Onondaga	Not known	1936	Own farm	Farmer	Not known	Trace[7]
90	Onondaga	Upright	1936	Own farm	Farmer[7]	Upright	None[7]
91	St. Lawrence	Lenroc[3]	1936	Own farm	Farmer[6]	Dibble Heavyweight	Trace[7]
92	Onondaga	Not known	1935	Own farm	Dealer	Not known	None
93	Onondaga	Upright	1936	Dealer	Not cl.	Not known	None[7]
94	Wayne	Swedish Select	1936[5]	Dealer	Dealer[7]	Not known	None
95	Chautauqua	Storm King	1936	Neighbor	Farmer[7]	Storm King	Trace
96	Essex	Dibbles Heavyweight	1936	Own farm	Not cl.[7]	Dibbles Heavyweight	Trace[7]
97	Essex	Not known	1936	Own farm	Farmer	Not known	Definite
98	Essex	Not known	1936	Neighbor	Farmer	Not known	Definite
99	Schenectady	Big Ben Swedish	1936	Own farm	Farmer	Big Ben Swedish	None
100	Schenectady	Swedish	1936	Own farm	Farmer	Not known	Trace
101	Schenectady	Not known	1935	Own farm	Not cl.	Not known	None
102	Schenectady	Not known	1936	Neighbor	Farmer[7]	Not known	None[7]
103	Schenectady	Cornellian	1936	Dealer	Dealer[7]	Cornellian	Trace
104	Schenectady	Northwestern	1936[5]	Dealer	Dealer[7]	Not known	Trace
105	Allegany	Cornellian	1936	Own farm	Farmer	Cornellian	Trace
106	Schuyler	Not known	1936	Dealer	Dealer[7]	Not known	None[7]
107	Schuyler	Not known	1936	Own farm	Farmer	Not known	None[7]
108	Schuyler	Superior	1936[5]	Dealer	Dealer[7]	Not known	Definite
109	Schuyler	Cornellian	1936	Own farm	Farmer[7]	Cornellian[2]	None
110	Schuyler	Not known	1936	Dealer	Dealer[7]	Not known	None
111	Allegany	Not known	1936	Own farm	Not cl.[7]	Not known	Trace
112	Wyoming	Not known	1936	Own farm	Farmer[5]	Not known	Trace[7]
113	Wyoming	Stiff Straw	1936[6]	Dealer	Dealer[7]	Upright	None[6]
114	Wyoming	Ohio	1936[5]	Dealer	Dealer[7]	Not known	Definite[7]
115	Wyoming	Great Dane	1935	Own farm	Farmer[7]	Great Dane	Trace[7]
116	Allegany	Not known	1936	Own farm	Farmer[7]	Not known	None[7]
117	Erie	Not known	1936	Own farm	Farmer[7]	Not known	None[7]
120	Erie	Not known	1936	Dealer	Dealer[7]	Ithacan	Trace[7]

[1]The numbers omitted indicate that the questionnaires were not returned with the samples.
[2]Certified by the New York Seed Improvement Cooperative Association, Inc.
[3]Certified seed used previously.
[4]Percentage of germination stated.
[5]Percentage of both germination and pure seed stated.
[6]Treated with New Ceresan for control of smut.
[7]Treated with formaldehyde for control of smut.

TABLE 1.—*Concluded.*

SURVEY NO.	COUNTY OF COLLECTION	SEED PLANTED IN 1937				SEED PLANTED IN 1936	
		Varietal name	Year grown	Source of seed	Cleaned by	Varietal name	Amount of smut
121	Erie	American Banner[3]	1936	Own farm	Farmer[7]	American Banner	None[7]
122	Erie	Swedish Select[3]	1936	Own farm	Farmer[7]	Swedish Select[3]	None[7]
123	Monroe	Not known[3]	1935	Own farm	Farmer	Not known	Trace[7]
124	Monroe	Ithacan	1935	Neighbor	Farmer	Cornellian	Trace
125	Monroe	Cornellian	1935	Neighbor	Farmer[7]	Cornellian	Definite
126	Monroe	Ithacan	1935	Neighbor	Farmer	Ithacan	Definite[7]
127	Monroe	Cornellian[3]	1935	Own farm	Not cl.[7]	Cornellian[3]	None[7]
128	Monroe	Not known	1936	Own farm	Farmer	Not known	Trace
129	Monroe	Not known	1936	Own farm	Farmer[7]	Not known	None[7]
130	Monroe	Ithacan	1936	Own farm	Dealer[7]	Ithacan	Definite
131	Monroe	Cornellian	1936	Own farm	Farmer[7]	Cornellian	None[7]
132	Monroe	Cornellian	1936	Own farm	Farmer	Cornellian	Trace
133	Monroe	Not known	1935	Own farm	Farmer[7]	Not known	Trace[7]
134	Monroe	Not known	1936	Own farm	Farmer	Not known	Trace
135	Onondaga	Not known	1936	Own farm	Farmer	Not known	Trace
138	Onondaga	Not known	1936	Own farm	Farmer[7]	Not known	None
139	Onondaga	Cornellian[3]	1936	Own farm	Farmer[7]	Cornellian[2]	None[7]
140	Wyoming	Ithaca Chief[3]	1936	Own farm	Farmer	Ithaca Chief	None[7]
141	Chemung	Mixed	1936	Own farm	Farmer	Not known	Trace
142	Chemung	Cornellian	1936	Own farm	Farmer[7]	Cornellian	None[7]
143	Chemung	Not known	1936	Own farm	Farmer[7]	Not known	Trace[7]
144	Chemung	Not known	1936	Own farm	Farmer[7]	Not known	None[7]
145	Chemung	Saltzer National	1936	Own farm	Farmer[7]	Not known	Trace[7]
146	Monroe	Twentieth Century	1935	Own farm	Farmer	Twentieth Century	Trace
149	Steuben	Not known	1936[4]	Own farm	Farmer[7]	Not known[7]	None[7]
150	Steuben	Swedish Select	1936	Dealer	Farmer	Swedish Select	Trace[7]
151	Steuben	Champion	1936	Own farm	Farmer[7]	Champion	Trace[7]
152	Steuben	Cornellian	1936	Neighbor	Dealer	Cornellian	Trace[7]

153	Steuben	Swedish Select	1936[5]	Dealer	Dealer[7]	No oats grown	———
154	Steuben	Lenroc	1936	Own farm	Farmer[7]	Lenroc	Trace
155	Steuben	Swedish	1936[4]	Dealer	Dealer[7]	No answer	Trace
156	Steuben	Not known	1936	Neighbor	Farmer	Not known	Trace[7]
157	Montgomery	Not known	1936	Own farm	Farmer	Not known	Trace
158	Montgomery	Not known	1936[4]	Own farm	Farmer	Stiff Straw	Trace[7]
159	Montgomery	Not known	1936	Neighbor	Farmer	Not known	Trace
160	Montgomery	Not known	1936	Own farm	Not cl.	Not known	Trace
161	Montgomery	Not known	1936[4]	Own farm	Farmer[7]	Not known	Trace
162	Onondaga	No answer	1936	Own farm	Farmer	Not known	None
167	Seneca	Not known	1936[4]	Dealer	Dealer	Not known	None
168	Seneca	Dibbles Heavyweight	1935[4]	Own farm	Farmer[6]	Dibbles Heavyweight	None[6]
169	Seneca	Swedish Type	1936[5]	Dealer	Dealer	Swedish Type	None
170	Seneca	Not known	1935	Own farm	Farmer[7]	Not known	Trace
171	Seneca	Swedish Type	1936[5]	Dealer	Dealer	Not known	None
172	Seneca	Ithacan	1936	Dealer	Dealer[7]	No oats grown	———
173	Seneca	Ithacan	1935	Own farm	Farmer	Ithacan	None
174	Seneca	Ithacan	1936	Own farm	Farmer[7]	Ithacan	None[7]
175	Seneca	Ithacan	1936[4]	Own farm	Farmer	Ithacan	None[7]
176	Seneca	Not known	1936[4]	Own farm	Farmer	Not known	Trace
177	Jefferson	Not known	1936	Neighbor	Farmer[6]	Not known	None[6]
178	Jefferson	Swedish Select	1936	Own farm	Farmer	Not known	None[7]
179	Jefferson	Not known	1936	Own farm	Farmer[6]	Not known	Trace[7]

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[3]Certified seed used previously.
[4]Percentage of germination stated.
[5]Percentage of both germination and pure seed stated.
[6]Treated with New Ceresan for control of smut.
[7]Treated with formaldehyde for control of smut.

right, and Victory oats and Alpha and Wisconsin 38 barley. Ithacan oats were found to yield about 13 bushels per acre more than common or unknown varieties. Growers are generally familiar with both Ithacan and Cornellian oats yet for some unexplainable reason many of them continue to purchase unknown or unapproved varieties. Certified seed must be of an approved variety and it appeared that considerable neighbor and dealer purchased oats were also. As shown in Table 1, the ratio of approved to nonapproved varieties was higher for seed obtained from neighbors than for the farmer's own seed or for oats purchased from dealers. This is a condition that the buyers of oats from dealers could, and for their own profit should, remedy.

The names "Swedish Select", "Swedish Type", and "Swedish Utility" were mentioned in several questionnaires. Certain companies appear habitually to describe a recleaned type of feed oats as "Swedish" or "Utility". Clearly, these offerings should be labeled "variety unknown" or "mixed varieties". Farmers are advised to buy them on the basis of purity and germination alone and not with the idea of obtaining a superior or high-yielding strain or even one true to name.

Several other varietal names listed in Tables 1 and 2 have no real meaning. They may be trade or brand names, as "Eshelmans", "Shadeland Victory", and "Dibble's Heavyweight"; locally coined or altered names, as "Early", "Standwell", "Ithaca Chief", and "Superior"; or regional descriptions, as "Ohio" and "Northwestern".

Several questionnaires disclosed the fact that the oats being planted were mixtures of two varieties. Often one was a superior type while the other was not. More frequently neither variety was on the recommended list. A large portion of the farmers, 59 per cent in 1936 and 44 per cent in 1937, represented their seed stocks as "just oats".

The majority of the names in Table 2 are of varieties of *Avena sativa* or tree-type oats. A few are of the banner or side-oat type. The latter are said to be inferior to the tree-type both in yield and in feeding value. Two farmers, however, stated that they regularly grew the "Mammoth Cluster" variety, while another had obtained "Storm King" oats from a neighbor. These statements may be taken to indicate that the side oats are satisfactory in some localities.

The survey as a whole clearly demonstrated that the popularity of varieties is quite stable. Few growers exchange or purchase seed in an attempt to obtain better varieties. The questionnaire answers

showed that only 20 changes in varieties were made in 1937, whereas 147 farmers planted the same variety in 1937 as in 1936. Many of the changes were due to the purchases of so-called "Swedish" oats, a practice which cannot be considered a forward step in the improvement of seed stocks.

Only two farmers reported buying certified oats in 1936 and five in 1937, altho others had purchased certified seed stocks within the last few years and were attempting to maintain their own pure strains. Questionnaires were returned from two farmers who were growers of certified oats. It appears that, in general, farmers are not inclined to substitute approved varieties for their own seed nor do they prefer certified seed to commercial utility mixtures.

TABLE 2.—DISTRIBUTION OF OATS ACCORDING TO VARIETAL NAMES REPORTED IN THE QUESTIONNAIRES.

VARIETY STATED TO BE	NUMBER PLANTED IN		VARIETY STATED TO BE	NUMBER PLANTED IN	
	1936	1937		1936	1937
American Banner	1	1	Northern Wonder	0	1
Banner	1	1	Northwestern	1	0
Big Ben Swedish	1	1	Ohio	0	1
Canadian	0	1	Saltzer National	0	1
Champion	1	1	Scotch Abundance	0	1
Clydesdale	1	1	Shadeland Victory[2]	1	1
Cornellian[1]	19	23	Standwell	1	1
Dibbles Heavyweight	3	2	Stiff Straw	1	1
Early	1	1	Storm King[3]	1	1
Eshelmans	0	1	Superior	0	1
Great Dane	1	1	Swedish Select	3	9
Heavyweight	1	2	Swedish Type	2	4
Ithaca Chief	1	1	Traver	0	1
Ithacan[1]	16	19	Twentieth Century	1	1
Lenroc[1]	1	2	Upright[1]	2	2
Mammoth Cluster[3]	2	2	Utility	1	0
Montana Heavyweight	0	1	Utility Swedish	1	3
New Alberta	1	1	Victory[1]	1	1
New Victory[2]	2	2	Total	69	94

[1]Varieties recommended by the Department of Plant Breeding, Cornell University Agricultural Experiment Station.
[2]Apparently selections of Victory.
[3]Varieties of side oats (*Avena orientalis*).

A grower has a legal right to demand the varietal name of oats purchased from a dealer and common sense should prompt him to do so. Western seed, or in fact, any unapproved variety, should be the last resort. Unlabeled seed stocks are likely to be undesirable, the dealer's oral statements to the contrary notwithstanding. Field

trials of inspector's collections have repeatedly shown that "Swedish Select" is not a definite variety and that oats labeled "Swedish Utility" are mixtures. These names may indicate the good intentions of the dealer but cannot be considered very informative.

The answers in Table 1 show that oats purchased from dealers may be classified as follows: Certified, 2; approved but not certified, 4; Swedish Select, Swedish Utility, or Swedish Type, 10; other varietal names, 4; and no name, 7.

AGE OF SEED

Normally there is no necessity for planting 1-year-old seed of oats and barley. Usually these grains are not held over from one year to the next and therefore would not be available. In many storage bins rodents may damage the seed and insect infestations may occur during the summer.

The 1936 crop of oats was very light and of poor quality in certain localities. To assure themselves of good seed stocks several farmers fed oats of the 1936 crop and saved the 1935 crop for planting purposes. At least 25, or 14 per cent, of the samples collected in the survey represented seed grown in 1935. According to the questionnaires, 7 of the 12 collections from Monroe County, 4 of 6 in Livingston County, 3 of 9 in Seneca County, 2 of 3 in Tioga County, and 1 each in the counties of Chautauqua, Lewis, Onondaga, Oneida, Schenectady, and Wyoming were taken from the 1935 crop. Only 6 of the entire 22 samples contained less than 90 per cent of live seeds.

It appears that 1-, 2-, or even 3-year-old seed may be as valuable as new crop oats for planting purposes. If properly stored the germination of oats is not materially lower until at least 4 years have elapsed. Samples of certified Ithacan have annually been submitted to the Division of Seed Investigations by a grower in Ontario County. Seeds of the 1933, 1934, 1935, and 1936 crops were compared during the spring of 1937. At least 94 per cent of strong sprouts emerged in every soil test regardless of the age of the seed. The green weights of the sprouts from the 1933 oats exceeded the weights of the others in several tests, but in general there was no difference in the number, vitality, or size of the plants.

LABELING AS TO PURITY AND GERMINATION

Annually, several hundred samples of spring grains are received at the Station for determination of live seeds. Purity analyses are

rarely requested. The percentage of live seeds usually exceeds 90, but germinations of 60 to 85 per cent were not uncommon in 1937. The presence of unfilled grains accounted for most of the low germinating samples. However, several lots of plump, heavy-weight oats were found to be unsatisfactory for planting. During the summer of 1937 several complaints of poor stands were received together with samples of the seed stocks. Causes of the low field germinations were judged to be due to unfilled grains, humid storage, or excessive dosages of chemicals. Germination tests before planting would have protected the grower against a partial or nearly complete loss of a crop.

According to the questionnaires, only two growers had determined the percentage of live seeds by home tests. Another 12 farmers knew the percentage of live seeds presumably from samples submitted to the Station. Only three farmers stated that they knew the purity of their home-grown seed.

Legally any agricultural seed offered for sale must be labeled with the approximate percentage of pure seed, percentage germination, and variety. At least 27 of the 167 farmers reporting had purchased oats from dealers but only 14 had seen labeled information concerning the purity and germination of the seed. Another two growers knew only the percentage of live seeds. Apparently 11 farmers had bought oats with no knowledge of these two factors.

Statements often are made to prospective buyers of spring grains that the offerings are "suitable for seed" or "satisfactory for planting". Oats sold under these representations are usually well cleaned, heavy, and not discolored or weathered. However, they may not germinate properly, often contain noxious weed seeds, and almost invariably are varietal mixtures. When a premium over feed prices is paid to obtain seed oats, it is only reasonable to expect adequate proof that they are suitable for seed. Oats sold without this evidence are probably of feeding quality and are worth only a feed price.

CLEANING OF SEED STOCKS

Fanning mills are recognized as indispensable equipment for the preparation of seed for planting. Too often, however, they are used in a routine manner without proper regard to the separation of weed seeds or to the removal of chaffy grains. Several species of weed seeds, such as quack grass and chess, are eliminated by an air blast. The removal of chaffy or unfilled grains is especially desirable and

is accomplished by the fanning action of the mill. The pure seed naturally has a higher bushel weight than the mixture of filled oats, unfilled grains, and weed seeds. Bushel weight is an approximate indication of clean seed, but the true measure of successful cleaning is the percentage of filled oats. The data in Table 3 show the effect of cleaning on purity. Pure seed included both oats and barley and in one sample peas as well. Oat grains were considered as pure seed irrespective of the presence or size of the groats. The results indicated that cleaning operations on the farm are nearly as efficient as are dealers' mills. A purity percentage of 91.4 was obtained for a certain home-cleaned mixture of oats and barley. This seed was claimed to contain 99.6 per cent pure seed. The fact that rye was present in the sample indicates that accidental mixing may have occurred after the seed stock was cleaned and the percentages of pure seed determined.

TABLE 3.—RELATION OF METHOD OF CLEANING TO PURITY OF 164 SAMPLES OF OATS AND BARLEY.

PERCENTAGE OF PURE SEED IN EACH SAMPLE	FANNING MILL ON FARM		DEALER'S MILL		NOT CLEANED	
	Number	Per cent	Number	Per cent	Number	Per cent
99.75–99.99....	18	18	8	23.5	1	3.3
99.50–99.74....	38	38	9	26.5	4	13.3
99.00–99.49....	24	24	8	23.5	7	23.3
98.50–98.99....	9	9	6	17.7	2	6.7
98.00–98.49....	3	3	1	2.9	2	6.7
97.00–97.99....	7	7	2	5.9	7	23.3
96.00–96.99....	0	0	0	0.0	3	10.0
93.00–95.99....	0	0	0	0.0	2	6.7
90.00–92.99....	1	1	0	0.0	2	6.7

Perhaps it is not justifiable to compare farm-cleaned with dealer-cleaned samples. Usually dealers select oats for seed stocks because they are clean or are plump and heavy and therefore easy to clean. The majority of the oats grown in this State in 1936 were of poor quality originally. Since over one-half of all those cleaned on the farm contained less than 0.50 per cent of impurities, fanning-mill purification appears to be relatively efficient.

The questionnaires indicated that oats were not commonly taken to dealers' mills for cleaning. Only eight seed stocks were taken from farms to commercial mills. A purity of 99.99 was recorded for one of these and the others contained from 98.55 to 99.78 per cent pure seed.

SEED TREATMENT FOR CONTROL OF SMUT

Chemical elimination of smut is more commonly practiced for oats and barley than for wheat. Smuts occur in the spring grains every year varying somewhat with the source of seed, treatments, and climatic conditions. Because of the nature of the organisms involved only volatile materials effect complete control. Copper carbonate, copper sulfate, ethanol mercury chloride, and other nonvolatile compounds which are excellent fungicides for stinking smut of wheat are only partially effective against smuts of oats and barley. The commonly recognized materials for use with small spring grains are 40 per cent formaldehyde liquid, 4 to 6 per cent formaldehyde dust, and 5 per cent ethyl mercuric phosphate sold as "New Ceresan". Certain other chemicals, namely, "Grainaide", a mixture of methyl aldehyde and organic mercury; para-formaldehyde sold as "Formacide"; 1 per cent ethyl mercuric phosphate, sold as "New Semesan"; and 2 per cent ethyl mercuric chloride, sold as "Ceresan", will control the smuts but because of cost or unavailability are not generally used in this State.

In order to ascertain the relative popularity and efficiency of the different fungicides, the questionnaires emphasized seed treatments. The data presented in Table 4 are summarized from two entirely separate surveys in different sections of the State. It might appear that New Ceresan lost favor in 1936, but information concerning seed treatments in 1937 shows that chemical smut control, especially with New Ceresan, had gained popularity. Whereas, only 6 out of 156 growers used this latter material in 1936, 21 treated their oats with it in 1937. At least 10 growers who used formaldehyde in 1936 changed to New Ceresan in 1937. Since both fungicides effect excellent control if applied correctly, it is more encouraging to note that the percentage of untreated seed stocks is decreasing than that one material is being substituted for another. Oats treated with formal-

TABLE 4.—CHEMICAL TREATMENT OF SEED OATS ON GROWERS' FARMS FOR CONTROL OF SMUT IN 1935, 1936, AND 1937.

OATS TREATED WITH	1935		1936		1937	
	Number	Per cent	Number	Per cent	Number	Per cent
Formaldehyde	38	38.0	76	48.7	80	47.8
New Ceresan..	7	7.0	6	3.9	21	12.6
All others.....	3	3.0	0	0.0	0	0.0
Not treated....	52	52.0	74	47.4	66	39.6

dehyde dust, Sanoseed, and ammonia in 1935 were said to have produced smut-free, lightly smutted, and heavily smutted crops, respectively.

The methods of treating the seed, and especially the periods of storage, were not at all uniform. The two materials differ in that formaldehyde is a liquid and New Ceresan a dust. The former chemical can be easily applied by spraying or sprinkling over the seed. Either fungicide should be mixed with the seed, altho, since both are volatile, contact of the chemical with each grain is not necessary for smut control.

A machine illustrated in Fig. 1 was devised for use with New Ceresan, but it might also be of value in applying formaldehyde. Usually the treated grain is scooped from one cone-shaped pile into another. The efficiency of this method depends somewhat upon the number of times the grain is re-shoveled. The gravity treater method is not only more efficient than the scoop method, but it is faster, is less hazardous to the operator, and reduces the loss of grain. The treater is built of wood and is not expensive nor difficult to construct. Plans are available from any county agricultural agent or from the Department of Plant Pathology at Cornell University.

Since both formaldehyde and New Ceresan are volatile, the treating process is disagreeable unless air circulation rapidly removes the fumes. Formaldehyde is highly volatile at temperatures of 60°F or above. If confined around the grain the gases evolved from the usual dosage of 1 pint of chemical to 50 bushels of grain will kill the smut organisms in about 4 hours. Further confinement is not necessary nor advisable and may result in serious injury to germination. The recommended procedure has been to drill the oats as soon as possible after a 4-hour treating period. If other work or inclement weather interferes, the seed should be aerated to allow escape of the gases.

Several growers reported that they had drilled or intended to drill their oats within 4 to 12 hours after formaldehyde was applied. The trial plantings at Geneva indicated good smut control for most of the seed stocks. Low percentages of germination (70 and 72 per cent) which might be attributable to the treatment were recorded for two samples. Answers from other growers gave storage periods of 2 to 40 days. The oats stored for 40 days germinated very poorly, as may be seen in Fig. 2, and were unmistakably injured by formaldehyde. Reported storage periods of 14, 15, 20, and 21 days had no

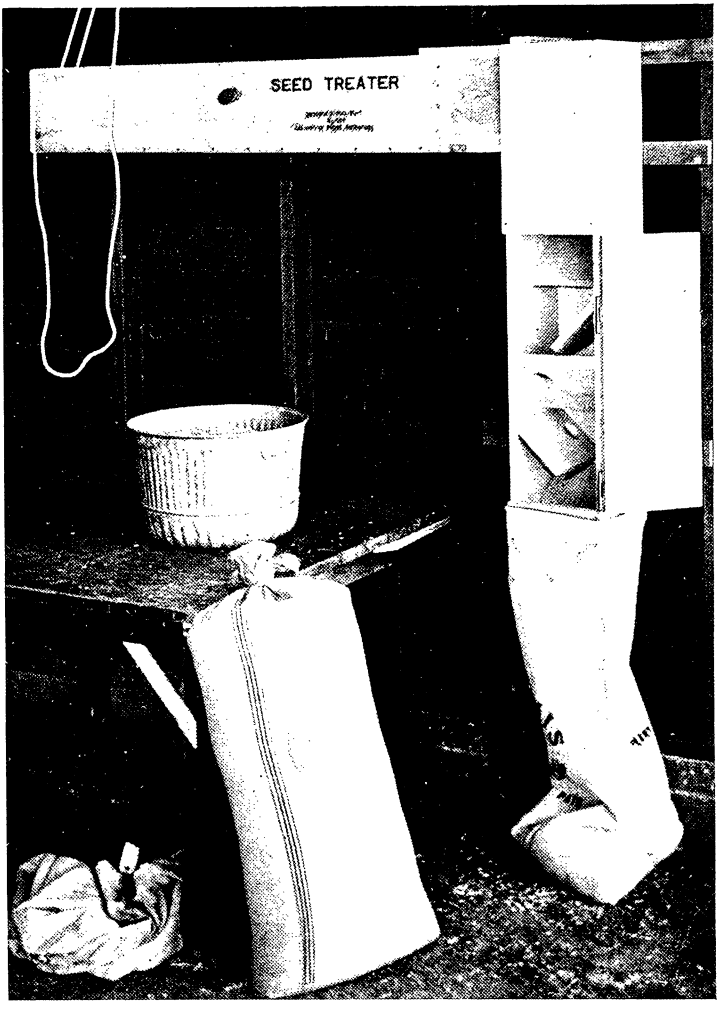

FIG. 1.—A PRACTICAL AND INEXPENSIVE GRAVITY SEED TREATER.

Designed by Dr. M. B. Moore for use on Minnesota farms. It costs nothing to operate and mixes seed and chemical very efficiently.

apparent affect on germination. At least 10 samples represented dealers' seed stocks which had been treated with formaldehyde and stored for 3 to 4 months before planting. The germinations on May 15 varied from 92 to 98 per cent. It is understood that the company

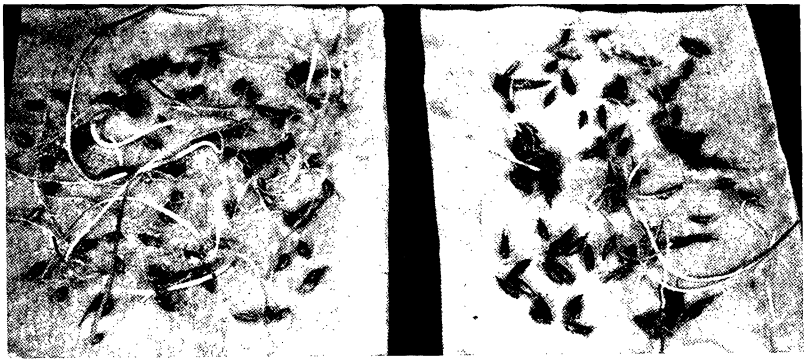

FIG. 2.—STORAGE OF FORMALDEHYDE-TREATED SEED DEPRESSES THE GERMINATION.
This seed was not planted until 40 days after treatment. Removal of the formaldehyde gas by aeration in a fanning mill would have prevented much of the injury.

which treated these oats confined the formaldehyde fumes around the seed for 4 hours and then blew off the volatilized gases. A similar process can be practiced on the farm. To save time oats can be treated before cleaning and then thoroly cleaned and aerated in the same fanning mill operation.

The recommended practice for smut control with New Ceresan is to apply ½ ounce of chemical to each bushel of cleaned seed approximately 48 hours before planting. Reports from several states show that this treatment insures complete freedom from smut with no decrease in germination. Storage of several days to 3 months is not generally advisable, but data from this survey do not indicate any noticeable injury. With one exception germinations, regardless of the period of storage, have been satisfactory. One sample was definitely injured by New Ceresan, as shown in Fig. 3. Only 10 per cent of normal sprouts were counted in laboratory tests of oats, while an additonal 39 were markedly abnormal. The seed had been treated only 10 days prior to planting. The presence of excess dust and the heavy covering on the oats clearly showed that at least 2 ounces instead of the recommended ½ ounce of chemical had been applied to each bushel of seed. The grower had not only increased the cost of treating by 300 per cent but had also minimized his chances for a profitable crop.

Experiments at this Station, as well as very exhaustive trials in

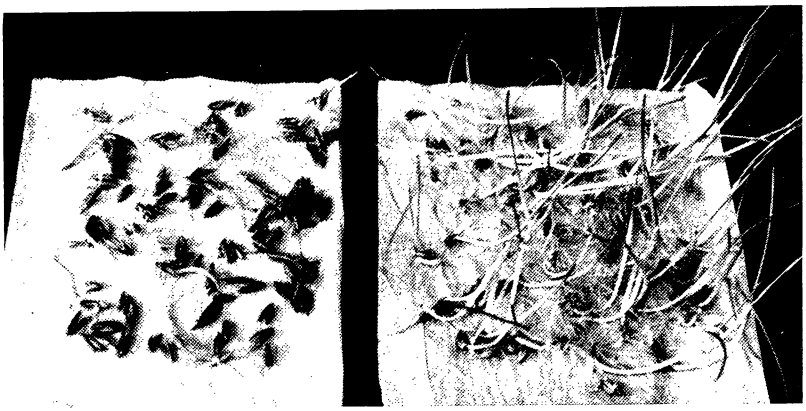

FIG. 3.—AN EXCESS OF MERCURY DUST MAY CAUSE INJURY TO EITHER OATS OR BARLEY.

Nearly five times the recommended dosage of ethyl mercury phosphate was used on the mixture of oats and barley shown at the left; correctly treated barley on right.

Illinois, have proved that as the period of storage is lengthened, the dosage of New Ceresan may be reduced. Thus 3/8 ounce per bushel is adequate if the oats are thoroly treated and held for 5 days before planting, and 1/4 ounce per bushel will control oat smut if the seed is stored for 10 days. Heavier dosages than 1/2 ounce per bushel should never be applied. It is not possible to remove the chemical by aeration, so treated seed cannot be rendered safe for feeding. Surpluses can be placed in coarse burlap bags and held over until the next season.

Both the reports of growers and the trials at Geneva prove that chemical treatment reduces or eliminates oat smut. As may be seen in Table 5, statistical data are slightly in favor of New Ceresan as a fungicide. Properly treated oats never contain more than a trace of smut. The use of very dilute formaldehyde or failure to confine the gases probably accounts for the presence of considerable (1 to 3 per cent) smut in seed stocks treated with this material. New Ceresan is more dependable because less than the recommended dosage is efficient and the unused material retains its fungicidal value for several years.

The samples collected from granaries in 1937 were divided into three portions. One was dusted with New Ceresan, another was

TABLE 5.—SEVERITY OF SMUT IN GROWERS' FIELDS IN 1935 AND 1936 AND IN TRIAL ROWS AT GENEVA IN 1937.

SEVERITY OF SMUT	FIELDS OR ROWS GROWN FROM SEED STOCKS TREATED WITH							
	Formaldehyde		New Ceresan		All others		Not treated	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Growers' Fields in 1935								
None	28	73.8	4	57.1	1	33.3	20	38.4
Trace	9	23.6	3	42.9	1	33.3	23	44.2
Considerable	1	2.6	0	0.0	0	0.0	6	11.6
Much	0	0.0	0	0.0	1	33.4	3	5.8
Growers' Fields in 1936								
None	38	50.0	4	66.7	—	—	28	37.8
Trace	36	47.3	2	33.3	—	—	37	50.0
Considerable	2	2.7	0	0.0	—	—	9	12.2
Much	0	0.0	0	0.0	—	—	0	0.0
Trial Rows from Drill Survey of 1937								
None	19	70.4	10	76.9	—	—	30	37.5
0 to 1 per cent	5	18.5	3	23.1	—	—	18	22.5
1 to 3 per cent	3	11.1	0	0.0	—	—	15	18.7
3 to 5 per cent	0	0.0	0	0.0	—	—	9	11.2
5 to 10 per cent	0	0.0	0	0.0	—	—	7	8.8
Over 10 per cent	0	0.0	0	0.0	—	—	1	1.3
Trial Rows from Granary Survey of 1937								
None	35	94.6	34	91.9	—	—	7	18.9
0 to 1 per cent	1	2.7	2	5.4	—	—	5	13.5
1 to 3 per cent	1	2.7	1	2.7	—	—	9	24.3
3 to 5 per cent	0	0.0	0	0.0	—	—	6	16.2
5 to 10 per cent	0	0.0	0	0.0	—	—	2	5.4
Over 10 per cent	0	0.0	0	0.0	—	—	8	21.7

sprayed with formaldehyde, and a third was used as a control. The results as given in Table 5 again proved that either material is effective in controlling the oat smuts and emphasized the fact that many seed stocks are infected with smut organisms and should be treated.

Oat fields in nine counties in central New York were examined in 1937 to determine the presence and severity of smut. The percentage of smutted panicles was determined in several parts of each field bordering the road. The results expressed in percentages of smutted panicles and for each 100 fields inspected were: No smut, 42 fields; trace of smut, 11 fields; 0.1 per cent smut, 8 fields; 0.11 to 1.0 per cent smut, 10 fields; 1.1 to 3.0 per cent smut, 10 fields; 3.1 to 5.0 per cent smut, 3 fields; 5.1 to 10.0 per cent smut, 8 fields; 10.1 to 20.0

per cent smut, 7 fields; and 25.0 per cent smut, 1 field. It is not known if any of these fields were grown from treated seed. Undoubtedly many seed stocks had been treated and certainly smut control would have been profitable in many other cases.

RESULTS FROM LABORATORY EXAMINATION OF SAMPLES AND FROM FIELD PLANTINGS

In addition to summarizing answers given in the questionnaires, every sample was analyzed to determine the percentage of pure seed, inert matter, weed seeds, and other crop seeds. Particular attention was given to the prevalence of noxious weed seeds. Germination studies were made as soon as the samples were received and again at irregular intervals. If any determination varied widely from the averages, the sample involved was examined again in duplicate. It is hoped that the findings given in detail in Table 6 and summarized in the following tables will express the planting value of the various seed stocks and demonstrate in what respects the seed stocks should have been improved. The planting value of purchased seed can be compared with farm-grown oats on the basis of the laboratory studies. The purity and germination percentages of cleaned and uncleaned seed are presented as obvious reasons for thoro cleaning of oats, especially when unfilled grains are present.

BUSHEL WEIGHT

Seed dealers often mention and even feature the bushel weight of heavy oats as irrefutable proof of their worth. Heavily clipped seed from the western states usually exceeds the legal weight of 32 pounds per bushel, not uncommonly by 8 or 10 pounds. Locally grown oats may weigh, or rarely exceed, 35 pounds per bushel but weights of 25 to 30 pounds have been the rule during the past three years. Comparison of western with locally grown oats on the basis of bushel weight alone would give an inaccurate or deceptive result. A heavy stock of oats might justifiably be preferred to another lighter one but only if the former equalled the other in all other characteristics.

A grower in Seneca County observed that Victory oats weighing 35 pounds per bushel produced a crop in 1936 weighing only 23 pounds per bushel. These were planted in 1937 and a heavier product, 29 pounds per bushel from the threshing machine, was obtained.

TABLE 6.—RESULTS OF LABORATORY ANALYSES OF 176 SAMPLES OF OATS OR MIXED OATS AND BARLEY SEED REPRESENTING SEED STOCKS PLANTED ON NEW YORK FARMS IN 1937.

SURVEY NO.	ANALYSIS, PERCENTAGE BY WEIGHT					NO. OF WEED SEEDS PER POUND	BUSHEL WEIGHT, POUNDS		WEIGHT OF 100 SEEDS, GRAMS		SMUT SPORES, MILLIONS PER POUND	GERMINATION, PER CENT	
	Pure seed		Inert matter	Other crop seeds	Weed seeds								
	Oats	Barley					Oats	Barley	Oats	Barley		Oats	Barley
1	73.79	26.10	0.11	0.00	0.00	0	32.5	47.2	2.43	3.22	60	84	—
2	82.99	14.20	2.34	0.12	0.35	252[1]	31.5	44.5	2.60	2.85	270[2]	95	—
3	96.96	0.00	3.00	0.80	0.24	297[1]	25.0	—	2.11	—	525[2]	92	—
4	92.72	0.07	5.30	1.11	0.73	3546[1]	22.5	—	1.81	—	42[2]	45	—
5	97.28	0.44	0.83	0.00	1.01	2367[1]	25.0	—	1.94	—	3	100	—
6	99.71	0.05	0.23	0.00	0.01	18[1]	34.5	—	2.53	—	16	96	—
7	91.59	0.39	7.70	*0.11	0.21	198[1]	27.5	—	2.36	—	135[2]	91	—
8	97.69	0.20	0.06	1.85	0.00	0	34.0	—	2.07	—	67[2]	94	—
9	93.57	6.10	0.31	0.00	0.02	27[1]	35.0	46.0	2.90	3.84	11	97	99
10	74.46	25.22	0.14	0.15	0.03	54[1]	31.8	45.0	2.15	3.49	305	98	95
11	84.95	13.60	0.60	0.00	0.85	2400[1]	30.0	48.0	2.56	4.16	6	94	76
12	96.31	0.25	2.20	0.24	0.75	2619[1]	27.0	—	2.19	—	33	85	—
13	99.87	0.00	0.13	0.00	0.00	0	33.0	—	3.07	—	12	97	—
14	98.47	1.20	0.29	0.00	0.04	9	35.0	—	2.58	—	130[2]	94	—
15	94.80	2.56	2.28	0.00	0.36	713[1]	26.5	—	2.02	3.66	61[2]	23	89
16	48.59	49.80	1.49	0.00	0.12	117[1]	26.0	44.0	2.19	3.25	223[2]	76	98
17	80.32	18.32	0.95	0.32	0.09	189[1]	29.0	45.0	2.25	3.67	135[2]	76	100
18	49.60	44.00	5.36	0.00	1.04	3028[1]	30.0	46.5	1.83	3.33	11[2]	94	95
19	61.39	30.00	4.90	3.70	0.01	9	25.0	47.5	2.32	3.95	7	59	72
20	35.90	64.00	0.09	0.00	0.01	9[1]	30.5	45.0	2.30	3.31	53	48	43
21	69.54	30.10	0.28	trace	0.08	270	37.5	47.0	2.67	3.81	45	92	94
22	86.28	12.79	0.83	0.07	0.03	9	36.0	45.0	2.91	3.48	6[2]	93	99
23	59.77	40.05	0.16	0.00	0.02	9	36.0	47.0	2.75	3.97	10	92	98
24	70.20	29.10	0.69	0.00	0.01	9	33.0	47.0	2.73	3.80	26	83	95
25	93.94	5.54	0.40	0.10	0.02	9	35.0	47.0	2.70	—	44	94	—
26	90.60	6.43	1.20	0.00	1.77	4090[1]	33.5	45.0	2.35	3.74	8	95	99
27	99.36	0.22	0.12	0.08	0.00	0	39.0	—	2.83	—	29	93	—

28	59.71	40.18	0.10	0.00	0.01	18[1]	31.0	46.3	2.53	3.34	19	93	98
29	97.33	2.50	0.17	0.00	0.00	0	34.5	—	2.89	—	41	52	—
30	95.68	4.16	0.16	0.00	0.00	0	38.0	—	2.87	—	680	99	—
31	71.60	26.17	2.20	0.00	0.03	117[1]	29.5	49.0	2.47	3.45	135	89	92
32	60.12	39.50	0.36	0.00	0.02	27[1]	33.0	44.5	2.71	3.30	7[2]	96	98
33	97.78	trace	2.05	0.10	0.07	153[1]	56.5	—	2.21	3.81	33	59	100
34	78.12	20.14	1.20	0.00	0.54	1206[1]	26.0	46.5	2.17	3.91	5[2]	90	99
35	97.79	1.20	0.61	0.00	0.40	818[1]	34.0	—	2.51	—	353[2]	94	—
36	33.14	66.55	0.30	0.00	0.01	18	33.0	43.5	2.60	3.09	503[2]	92	98
37	75.19	24.20	0.60	0.00	0.01	45[1]	30.0	47.0	2.21	3.79	3	94	90
38	93.33	5.52	0.66	0.00	0.49	954[1]	35.0	47.5	2.76	4.28	9	98	97
39	99.22	0.31	0.18	0.29	0.00	0	38.5	—	2.67	—	6[2]	94	—
40	99.37	0.00	0.56	0.00	0.07	1036[1]	27.5	—	2.07	—	118[2]	77	—
41	89.92	9.50	0.42	0.00	0.16	180[1]	35.0	—	2.61	3.75	44[2]	96	96
42	99.12	0.38	0.29	0.01	0.20	495	27.5	—	2.03	—	238[2]	96	—
43	97.75	0.33	0.66	0.12	1.14	2715[1]	34.0	—	2.59	—	19[2]	92	—
44	75.38	24.20	0.21	0.00	0.12	226[1]	30.0	45.5	2.72	3.68	5	100	98
45	93.99	3.24	0.72	0.00	2.05	3978[1]	34.0	—	2.13	—	87[2]	99	—
46	61.81	37.23	0.70	0.04	0.22	1206	26.0	48.0	2.07	4.27	213[2]	80	100
47	99.33	0.00	0.42	0.00	0.25	450[1]	36.0	—	2.29	—	2[2]	99	—
48	97.45	0.22	2.60	0.00	0.73	8028[1]	26.0	—	1.86	—	37[2]	65	—
49	95.40	2.11	0.23	2.04	0.22	477[1]	34.0	—	2.18	—	17[2]	97	—
50	97.36	0.36	1.88	0.00	1.40	3858[1]	17.5	—	1.73	—	1	72	—
51	99.06	0.66	0.20	0.08	0.00	00	32.0	—	2.74	—	3	95	—
52	98.08	1.11	0.36	0.45	0.00	0	34.5	—	3.05	—	6[2]	99	—
53	66.60	28.00	5.10	trace	0.30	1044[1]	31.0	50.0	2.16	3.78	411[2]	70	97
54	99.67	0.00	0.32	0.00	0.01	63	34.0	—	2.58	—	8[2]	96	—
55	96.58	2.44	0.45	0.08	0.45	1130	30.0	—	2.34	—	124[2]	92	—
56	70.58	29.00	0.27	0.13	0.02	18[1]	33.0	46.5	2.83	3.46	2	96	96
57	65.90	33.50	0.58	0.00	0.02	63[1]	31.0	50.0	2.19	3.55	6	96	99
58	82.85	14.50	1.90	0.00	0.75	369[1]	34.0	48.0	3.02	3.99	26	92	95
59	99.16	0.74	0.10	0.00	0.00	0	40.0	—	2.43	—	1[2]	92	—
60	99.86	0.00	0.10	0.00	0.04	90[1]	27.5	—	2.39	—	9	39	—
61	91.89	5.98	2.10	0.00	0.03	81[1]	37.5	47.0	1.88	—	3[2]	77	99
62	54.19	45.58	0.22	0.00	0.01	9	31.5	45.0	2.75	3.34	1275[2]	67	99

[1]Noxious weed seeds present.
[2]Smut developed in trial rows; numbers 1 to 125 only were planted.

TABLE 6.—*Continued.*

SURVEY NO.	ANALYSIS, PERCENTAGE BY WEIGHT					NO. OF WEED SEEDS PER POUND	BUSHEL WEIGHT, POUNDS		WEIGHT OF 100 SEEDS, GRAMS		SMUT SPORES, MILLIONS PER POUND	GERMINATION, PER CENT	
	Pure seed		Inert matter	Other crop seeds	Weed seeds								
	Oats	Barley					Oats	Barley	Oats	Barley		Oats	Barley
63	82.89	16.60	0.48	0.00	0.03	9	32.0	47.0	3.05	3.50	215[2]	90	95
64	97.23	0.36	1.45	0.00	0.96	1791	30.0	—	1.99	—	860	14	—
65	72.15	25.75	1.50	0.60	0.00	0	38.5	45.5	2.42	3.25	2	93	96
66	99.73	0.00	0.27	0.00	0.00	0	25.5	—	2.42	—	18	54	—
67	99.71	0.00	0.28	0.00	0.01	9	33.5	—	2.09	—	3	95	—
68	99.52	0.00	0.16	0.32	0.00	0	38.0	—	2.57	—	2	96	—
69	99.91	0.00	0.08	0.00	0.01	9[1]	33.5	—	3.13	—	8	86	—
70	99.41	0.07	0.42	0.09	0.01	27[1]	32.0	—	2.51	—	26[2]	85	—
71	83.46	15.50	1.03	0.00	0.01	9	29.0	46.5	2.09	3.52	13[2]	68	94
72	98.74	0.00	1.04	0.13	0.09	108[1]	34.0	—	3.02	—	29	92	—
73	80.72	19.02	0.25	0.00	0.01	27[1]	34.0	48.0	3.15	3.57	131[2]	95	99
74	99.74	0.00	0.23	0.00	0.03	153	35.5	—	2.51	—	312[2]	98	—
75	99.12	0.00	0.85	0.01	0.02	18[1]	32.5	—	2.41	—	19[2]	95	—
76	99.01	0.28	0.30	0.37	0.07	18	43.0	—	2.31	—	28	94	—
77	99.37	0.30	0.18	0.15	0.00	0	34.0	—	2.44	—	13[2]	98	—
78	99.46	0.08	0.41	trace	0.05	135[1]	35.0	—	2.80	—	590[2]	98	—
79	99.60	0.00	0.39	0.00	0.01	90	34.0	—	2.30	—	24[2]	98	—
80	71.28	28.50	0.20	0.00	0.02	27	30.2	46.0	2.40	3.25	43[2]	88	94
81	89.58	10.10	0.32	0.00	trace	9	30.2	46.5	2.18	2.49	40[2]	98	100
82	98.44	0.56	0.20	0.24	trace	18[1]	29.0	—	2.29	—	176[2]	92	—
83	66.25	33.50	0.22	0.00	0.03	45[1]	35.0	47.0	2.41	3.72	29	94	99
84	99.34	0.36	0.30	0.00	0.00	0	26.5	—	2.11	—	33	53	—
85	56.40	43.00	0.20	0.30	0.10	270[1]	27.0	48.0	1.89	3.40	37	96	95
86	99.95	0.00	0.05	0.00	trace	9	25.0	—	2.42	—	2	63	—
87	93.48	6.25	0.25	0.00	0.02	18	28.5	45.5	2.09	3.12	0	96	99
88	97.86	0.84	0.55	0.50	0.25	72[1]	42.0	—	2.32	—	1	93	—
89	84.68	13.90	1.12	0.30	0.00	0	34.5	44.5	2.41	3.09	11[2]	94	—

90	97.32	1.85	.48	0.00	0.35	513[1]	25.0	—	2.89	—	2[2]	90	—
91	99.84	0.00	0.07	0.00	0.09	199[1]	35.0	—	2.39	—	2	93	—
92	94.05	5.94	0.00	0.00	0.01	18[1]	35.0	46.5	2.40	—	32[2]	88	92
93	95.28	1.10	3.02	0.60	0.00	0	26.5	—	2.05	—	16[2]	67	—
94	99.56	0.07	0.12	0.24	0.01	9	40.0	—	2.39	—	3[2]	92	—
95	99.82	0.00	0.14	0.00	0.04	40	33.0	—	2.40	—	16	83	—
96	98.62	0.50	0.80	0.00	0.08	234	36.5	48.0	2.26	—	117[2]	96	—
97	98.07	0.49	0.30	0.33	0.32	522	30.0	—	1.71	—	9[2]	98	—
98	74.35	25.30	0.35	0.00	trace	1	32.5	49.0	2.66	3.50	3[2]	93	94
99	99.09	0.78	0.11	0.00	0.02	36	35.5	—	2.88	—	14[2]	95	—
100	97.99	1.58	0.03	0.40	0.04	27[1]	35.5	47.5	2.80	—	266[2]	98	—
101	98.07	0.42	0.70	0.01	0.74	1818	27.5	—	1.92	—	673[2]	87	—
102	57.83	40.50	1.66	0.00	0.01	42[1]	31.5	47.0	1.99	3.66	9	70	98
103	99.07	0.14	0.35	0.43	0.01	2	35.0	—	2.18	—	22	95	—
104	98.68	1.20	0.06	0.04	0.02	27[1]	43.8	—	2.65	—	207	95	—
105	93.34	5.50	0.34	0.80	0.02	36[1]	33.2	—	2.79	—	52	13	12
106	97.93	0.94	0.58	0.54	0.01	9	35.0	—	2.73	—	53[2]	96	—
107	75.33	23.80	0.76	0.10	0.01	9	26.0	47.2	1.91	3.15	6	23	95
108	98.03	0.46	0.16	1.35	0.00	0	41.0	—	2.51	—	64	96	—
109	97.38	1.94	0.48	0.20	trace	27[1]	34.0	47.5	2.25	—	16[2]	89	—
110	73.58	26.30	0.12	0.00	0.00	0	31.0	48.5	2.73	3.23	17[2]	89	99
111	65.55	31.22	0.68	0.00	1.55	2239[1]	31.0	44.5	1.97	2.71	18[2]	96	99
112	95.95	2.05	1.35	0.60	0.05	72[1]	33.0	—	1.99	2.53	12	93	95
113	99.65	0.07	0.28	0.00	0.00	0	37.5	—	2.88	—	9	98	—
114	99.04	0.63	0.00	0.33	0.00	0	36.5	—	3.69	—	1	92	—
115	99.62	0.00	0.14	0.04	0.20	405	31.0	—	2.65	—	4	87	—
116	97.26	1.62	0.26	0.82	0.04	63[1]	31.0	—	2.00	3.24	74[2]	97	—
117	99.64	0.00	0.36	0.00	0.00	0	37.0	—	3.03	—	1	61	—
119	54.07	45.04	0.87	0.00	0.02	72	25.0	45.0	2.46	3.19	1	70	96
118	90.56	7.52	1.52	0.38	0.02	27	32.2	46.5	2.54	—	9	62	—
120	97.51	0.46	0.20	1.83	0.00	0	41.0	—	2.46	—	2	85	—
121	44.08	55.01	0.89	0.02	0.00	0	32.0	48.0	2.61	3.32	4[2]	90	97
122	98.47	0.03	1.50	0.00	trace	9[1]	32.5	—	2.51	—	trace	45	—
123	83.10	16.12	0.60	0.18	0.00	0	30.5	46.0	2.29	—	1	96	98
124	99.80	0.00	0.20	0.00	0.00	0	35.0	—	2.55	—	1	77	—

[1]Noxious weed seeds present.
[2]Smut developed in trial rows; numbers 1 to 125 only were planted.

TABLE 6.—*Concluded.*

SURVEY NO.	ANALYSIS, PERCENTAGE BY WEIGHT					NO. OF WEED SEEDS PER POUND	BUSHEL WEIGHT, POUNDS		WEIGHT OF 100 SEEDS, GRAMS		SMUT SPORES, MILLIONS PER POUND	GERMINATION, PER CENT	
	Pure seed		Inert matter	Other crop seeds	Weed seeds								
	Oats	Barley					Oats	Barley	Oats	Barley		Oats	Barley
125	64.80	34.90	0.06	0.07	0.16	45	35.5	50.0	2.38	—	1	90	92
126	99.38	0.09	0.53	0.00	0.00	0	35.0	—	2.59	—	0	72	—
127	75.02	24.18	0.46	0.34	0.00	0	29.5	46.5	2.08	—	1	96	96
128	98.52	0.88	0.33	0.27	0.00	0	35.0	—	3.19	—	9	97	—
129	77.20	22.25	0.55	0.00	0.00	0	30.5	44.5	2.41	—	1	97	98
130	96.24	3.07	0.54	0.15	0.00	0	31.0	—	2.45	—	4	73	—
131	90.35	9.20	0.26	0.15	0.04	18	30.8	—	2.25	—	8	78	—
132	97.77	1.75	0.27	0.14	0.07	18	30.5	—	2.11	—	3	75	—
133	99.39	0.40	0.20	0.00	0.01	27[1]	35.5	—	2.82	—	2	97	—
134	99.65	0.00	0.32	0.00	0.03	9[1]	31.0	—	2.29	—	1	89	—
135	97.56	1.90	0.26	0.00	0.28	54[1]	35.0	—	2.48	3.65	37	99	100
136	99.98	0.00	0.02	0.00	0.00	0	35.5	—	2.79	—	1	33	—
137	92.50	6.40	0.30	0.60	0.20	99[1]	33.8	—	2.73	4.15	8	96	99
138	37.81	61.29	0.30	0.60	0.00	0	27.0	46.0	2.49	3.72	54	80	94
139	98.65	0.34	0.85	0.14	0.02	18[1]	34.0	—	2.40	—	5	98	—
140	72.97	25.99	0.71	0.32	0.01	9[1]	31.5	48.0	2.51	4.18	2	89	99
141	40.90	56.76	2.34	0.00	0.00	0	33.8	44.5	2.09	2.99	7	93	90
142	97.89	1.32	0.29	0.50	0.00	0	26.0	—	1.92	—	8	71	—
143	74.54	25.35	0.06	0.05	0.00	0	28.2	46.0	2.45	3.69	1	74	89
144	89.45	10.40	0.15	0.00	0.00	0	32.5	—	2.63	—	2	90	99
145	83.59	15.72	0.60	0.08	0.01	1	29.5	—	2.48	3.14	2	59	88
146	99.38	0.07	0.12	0.43	0.00	0	33.5	—	2.56	—	3	96	—
147	98.86	0.00	0.30	0.40	0.44	783[1]	36.0	—	3.03	—	79	94	—
148	99.89	0.00	0.08	0.00	0.03	72	33.0	—	2.67	—	10	96	—
149	94.05	5.50	0.45	0.00	0.00	0	30.0	—	2.67	—	14	74	—
150	98.44	1.14	0.16	0.14	0.12	45[1]	33.5	—	2.84	—	143	89	—
151	99.40	0.09	0.46	0.05	0.00	0	29.0	—	2.50	—	432	75	—

152	98.99	0.00	0.90	0.10	0.01	5	31.1	—	2.15	—	43	89	—
153	99.45	0.19	0.36	0.00	0.00	0	41.5	—	2.40	—	18	93	—
154	99.71	0.14	0.09	0.06	0.00	0	32.5	—	2.32	—	5	92	—
155	99.02	0.00	0.66	0.30	0.02	9[1]	44.0	—	2.19	—	19	94	—
156	80.21	5.50	0.15	14.12	0.02	45	33.0	—	2.68	—	1	92	—
157	82.70	16.55	0.70	0.00	0.05	90[1]	31.5	47.0	2.79	3.75	51	95	98
158	70.05	29.55	0.38	0.00	0.02	36[1]	34.5	47.5	3.21	3.95	1	87	94
159	89.64	10.10	0.25	trace	0.01	9	28.0	49.0	2.86	3.70	14	76	86
160	73.50	26.31	0.16	0.00	0.03	45	29.5	46.0	3.59	3.71	67	96	95
161	98.01	1.70	0.19	0.10	0.01	27	38.5	—	2.53	—	4	97	—
162	84.97	14.25	0.34	0.40	0.04	63[1]	33.0	—	3.12	3.42	12	95	99
163	97.22	1.88	0.15	0.74	0.01	9	37.0	—	2.51	3.15	6	95	97
164	99.12	0.07	0.80	0.00	0.01	9	31.0	—	2.28	—	3	94	—
165	81.77	17.10	1.02	0.11	0.00	0	33.0	48.2	3.00	3.14	94	85	13
166	97.64	0.00	0.16	2.16	0.04	36	30.5	46.0	2.47	3.87	2	86	96
167	99.69	0.00	0.24	0.07	0.00	0	35.0	—	2.78	—	11	98	—
168	84.81	15.02	0.17	0.00	0.00	0	32.0	47.8	2.51	3.36	38	95	92
169	99.01	0.75	0.17	0.07	0.00	0	35.0	—	2.49	—	15	96	—
170	98.62	1.10	0.18	0.07	0.03	36	29.5	—	2.38	3.10	18	96	94
171	99.96	0.00	0.04	0.00	0.00	0	37.0	—	2.71	—	22	93	—
172	99.30	0.40	0.20	0.10	0.00	0	32.5	—	2.33	—	23	99	—
173	99.18	0.00	0.60	0.08	0.14	198[1]	25.5	—	2.35	—	4	93	—
174	99.23	0.30	0.16	0.28	0.03	63[1]	30.0	—	2.90	—	7	85	—
175	99.13	0.00	0.34	0.36	0.17	207[1]	30.0	—	2.59	—	2	93	—
176	98.68	0.68	0.50	0.07	0.07	54[1]	29.5	—	2.28	—	177	83	—

[1]Noxious weed seeds present.
[2]Smut developed in trial rows; numbers 1 to 125 only were planted.

Undeniably the potential planting value of the oat strain was not impaired by climatically induced changes in bushel weight. It is important, however, to bear in mind that some seed oats may be improved by increasing their bushel weight. If a seed stock contains no light, chaffy, inert matter or poorly filled grains, the bushel weight cannot be increased markedly. On the other hand, those seeds or other components which are responsible for light weight oats should be removed to insure a more uniform stand and to minimize trouble in planting.

During January 1937, 60 growers in 15 counties were visited and asked if their oats were suitable for planting. Many were doubtful if they should use their own grain for seed. The invariable complaint was low bushel weight. Several stated that their oats were simply chaff and could not possibly have any planting value. One grower said that he despaired of finding any plump seeds in his grain. Laboratory studies of a sample of this seed showed a bushel weight of 23 pounds and a germination of 32 per cent with 64 per cent of unfilled grains. After cleaning by two vigorous operations of a fanning mill, the bushel weight was found to be 31 pounds and the germination 95 per cent. The unfilled grains had been removed entirely. These figures are significant because they indicate the close correlation between increases in bushel weight and improvement in the more important factors of germination, purity, weed seed content, and weight of individual seeds.

PURE SEED CONTENT

The percentages of pure oats and barley in samples collected in this survey showed more variation than did the percentages of pure wheat seed in a similar study. Weed seeds, apparently, can be almost completely removed but were common in all uncleaned samples. Other crop seeds were not found in 73 samples, many of which were not cleaned. The principal reason for the differences in purity of the individual samples was the presence of varying percentages of inert matter. As shown in Table 6, a few samples contained 0.10 per cent or less of inert matter, but percentages in excess of 1.00 were not unusual. The pure seed content (oats and barley only) of the entire 176 samples varied from 85.71 to 99.99 per cent. The range of purity for the dealer-cleaned samples was 97.90 to 99.99 per cent, with an average of 99.30. The 30 uncleaned samples contained from 85.71 to 99.81 per cent pure seed, with an average purity of 97.99 per cent.

The farm-cleaned samples contained from 91.40 to 99.98 per cent pure oats and barley, with an average of 99.22 per cent.

Inert matter was present in higher percentages in uncleaned than in farm-cleaned or commercially cleaned seed. The ranges were for uncleaned seed, 0.14 to 7.70 per cent; dealer-cleaned, 0.00 to 1.50 per cent; and farm-cleaned, 0.02 to 4.90 per cent. The averages were for uncleaned, 1.76 per cent; dealer-cleaned, 0.36 per cent; and farm cleaned, 0.50 per cent.

A further study of Table 6 shows that 18 samples contained 0.10 per cent or less of inert matter; 93 contained 0.11 to 0.50 per cent; 34 had 0.51 to 1.00 per cent, 25 had 1.01 to 3.00 per cent, while 6 samples contained over 3.00 per cent of inert matter. Only one sample out of this latter group had been cleaned.

WEED SEEDS

A number of troublesome weeds are common in fields of oats and barley. Seeds of the noxious weeds, such as wild mustard and quack-grass, were found in the majority of uncleaned spring grains. Even after cleaning wild mustard seeds often were present in oat seed stocks. Seeds of certain other troublesome weeds, as chess, curled dock, green foxtail, wild buckwheat, wild oats, and yellow foxtail, were encountered in varying numbers. Seeds of cockle, barnyard grass, buckhorn plantain, buttercup, Canada thistle, corn spurry, hedge nettle, lamb's quarters, ox-eye daisy, night-flowering catchfly, Rugel's plantain, sheep sorrel, wild carrot, wild radish, and wild vetch were recorded as present in a few uncleaned samples.

As indicated in Tables 6 and 7, the total number of weed seeds was much greater for the uncleaned than for the cleaned samples. The number of seeds per pound of oats varied from 0 to 8,028 for the uncleaned seed, from 0 to 3,858 for the farm-cleaned samples, from 0 to 2,400 for the commercially cleaned lots, and from 0 to 8,400 for the uncleaned oats collected from granaries. In the case of the last-named approximately 756,000 weed seeds would have been distributed on every acre during planting. Since three species of noxious weeds were represented, this grain was unfit to plant in its uncleaned condition.

On the basis of percentage by weight of weed seeds the uncleaned samples varied from 0.0 to 2.05, the farm-cleaned samples from 0.0 to 1.40, the commercially cleaned samples from 0.0 to 0.85, and the granary collections from 0.0 to 3.42. The species of weed seeds pres-

TABLE 7.—DISTRIBUTION OF SAMPLES CONTAINING VARIOUS NUMBERS OR PERCENTAGES OF WEED SEEDS AS INFLUENCED BY THE METHOD OF CLEANING THE SEED STOCKS.

NUMBER OF WEED SEEDS PER POUND IN EACH SAMPLE	NUMBER OF SAMPLES RECEIVED IN DRILL SURVEY			NUMBER OF SAMPLES COLLECTED IN GRANARY SURVEY
	Fanning mill	Dealer's mill	Not cleaned	
0	30	16	2	3
1–25	27	10	1	3
26–50	18	2	2	6
51–100	11	1	3	5
101–200	5	1	4	8
201–300	5	0	2	1
301–500	2	0	3	6
501–1,000	4	2	0	4
1,001–2,000	0	0	7	1
2,001–5,000	3	1	5	1
Over 5,000	0	0	1	1
Total.....	105	33	30	39

ent were very interesting. One uncleaned sample contained seeds of three kinds of noxious weeds and of nine other common troublesome weeds. The greatest number found in farm-cleaned seed stocks was 11, in commercially cleaned oats 10, and in the granary collections 8. The occurrence of certain weed seeds is shown in Table 8.

Wild mustard seed are evidently difficult to remove entirely from

TABLE 8.—RELATION OF METHOD OF CLEANING TO OCCURRENCE OF CERTAIN WEED SEEDS IN SAMPLES OF OATS AND OF OATS AND BARLEY MIXTURES.

COMMON NAME OF WEED	METHOD OF CLEANING OF SAMPLES RECEIVED IN DRILL SURVEY						UNCLEANED SAMPLES FROM GRANARY SURVEY	
	Fanning mill		Dealer's mill		Not cleaned			
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Free of all weeds	28	26.7	19	57.6	2	6.7	3	7.7
Barnyard grass.	4	3.8	4	12.1	7	23.3	4	10.3
Chess or cheat..	4	3.8	9	27.3[1]	1	3.3	2	5.1
Curled dock....	13	12.4	4	12.1	12	40.0	28	70.1
Green foxtail...	6	5.7	2	6.1	6	20.0	4	10.3
Lamb's quarters	1	0.9	0	0.0	3	10.0	6	15.4
Quack grass....	14	13.4	2	6.1	17	56.7	18	46.1
Wild buckwheat	16	15.3	7	21.1	10	33.3	17	43.6
Wild mustard...	32	30.5	4	12.1	17	56.7	21	53.8
Wild oats.....	4	3.8	1	3.0	1	3.3	3	7.7
Yellow foxtail...	27	25.7	5	15.1	18	60.0	15	38.4
Other weeds....	10	9.5	6	18.2	11	36.7	15	38.4

[1]This relatively high percentage probably due to out-of-state origin.

seed oats. This seems to be due to their lodging in the oat grains. Yellow foxtail and wild buckwheat seeds being heavy and not easily blown out were not separated from the pure seed in fanning mill cleaning of several samples. Lamb's quarters and curled dock were found in many fields of oats and the seeds were abundant in a number of uncleaned samples. They were easily eliminated by screening and, therefore, should not be present in well cleaned samples.

That cleaning of seed stocks, either by a small fanning mill or commercial mill, substantially reduces the number of weed seed infested lots of spring grains seems definitely proved. On the other hand, complete elimination of all weed seeds was not obtained for many of the samples.

OTHER CROP SEEDS

The occurrence of other agricultural seeds in lots of oats and barley is of little importance. As an examintion of Table 6 will show, only a few seed stocks, either cleaned or uncleaned, contained other crop seeds. Cleaning seemed to have no significant relation to this type of impurity. For example, small seeds, such as those of timothy, alfalfa, clovers, and bluegrass, were recorded for nine farm-cleaned, five dealer-cleaned, and seven uncleaned samples. Unquestionably thoro cleaning would have eliminated these small seeds. It appears, however, that these seeds were also introduced into the seed stocks during and after cleaning probably thru sweepings and the use of old grain bags. Approximately 3,600 timothy seeds were present in each pound of one sample. On the basis of weight this amounted to 0.27 per cent, while an additional 0.84 per cent of crop seeds was attributable to only 166 seeds of buckwheat. In another sample, 333 buckwheat seeds per pound accounted for 2.04 per cent of the weight. Approximately 19 per cent of the farm-cleaned, 12 per cent of the dealer-cleaned, and 20 per cent of the uncleaned samples contained buckwheat.

A few seeds of field corn were present in a sample taken from an uncleaned seed stock and also in one commercially cleaned lot. Field peas were found in two farm-cleaned and one uncleaned sample. Since a percentage by weight of 14.12 was determined for one lot, it appears that the peas should have been considered as part of the seeding mixture rather than as undesirable other crop seeds. Seeding mixtures including peas are not uncommon in some localities, altho usually a larger percentage of peas is included.

Rye seeds occurred in only seven samples. In one analysis an average of 828 seeds per pound, or 3.70 per cent by weight, was found. Only insignificant numbers, 9 to 18 per pound, were recorded for the other six samples. Why any rye seeds should be present in samples of oats is difficult to explain except on the basis of volunteer plants or, more likely, careless storage of the grain.

Wheat was a very common crop seed in the drill survey samples. A total of 47 analyses revealed wheat seeds in numbers ranging from 4 to 513 per pound and from 0.03 to 1.85 per cent by weight. Cleaning effected no material reduction in the number of samples containing wheat. Wheat seeds were present in approximately 29 per cent of the farm-cleaned and in 42 per cent of the commercially cleaned samples, but in only 13 per cent of the uncleaned seed stocks. Since nearly one-half of all of the seed stocks sold by dealers contained wheat seeds, it would appear that these lots are merely feed oats diverted into seed channels.

GERMINATION

Oats grown in many localities of New York State in 1936 were affected by adverse weather conditions during filling and maturation of the seeds. As previously mentioned, this resulted in a high percentage of shrivelled or unfilled grains which reduced the apparent germination of poorly cleaned lots. When uncleaned samples were received by the Division of Seed Investigations, it often was necessary to remove the unfilled grains either by an air blast or by hand; otherwise the germination reported to the owner would have had no meaning or value to him as a planting guide.

The survey of granary oats and barley emphasized this condition very clearly. In their original condition only 19 of the 54 samples studied contained a sufficiently high proportion, 90 per cent or more, of germinating seeds to qualify for seeding purposes. The average germination for the entire 54 lots was 72.8 per cent. After thoro cleaning in a small fanning mill, laboratory and greenhouse tests showed that only two samples failed to qualify. The average germination had been increased to 96.2 per cent. In order to illustrate the influence of weather conditions and of cleaning on the viability of oats and barley, pertinent data are summarized by counties in Table 9.

The increases in percentages of germination were due not to removal of dead seeds, but to an elimination of oat grains which

TABLE 9.—EFFECT OF CLEANING WITH A FANNING MILL ON OATS OR OATS AND BARLEY MIXTURES GROWN IN 15 COUNTIES IN 1936 AND COLLECTED DIRECTLY FROM THE OWNERS' GRANARIES.

COUNTY OF COLLECTION	GERMINATION OF OATS, PER CENT		GERMINATION OF BARLEY, PER CENT		FILLED GRAINS OF OATS, PER CENT		LOSS IN WEIGHT OF OATS, PER CENT
	Before cleaning	After cleaning	Before cleaning	After cleaning	Before cleaning	After cleaning	
Allegany	63.3	98.3	96.7	98.3	67.7[2]- 82.1[3]	100.0	16.2
Chenango	87.7	98.3	98.0	99.3	95.5– 98.0	100.0	15.2
Cortland	92.0	100.0	90.0	99.0	96.0– 98.2	100.0	17.6
Erie	82.7	98.0	97.7	97.7	82.8– 94.9	100.0	12.5
Jefferson	99.0	99.0	—	—	100.0–100.0	100.0	0.5
Livingston	51.0	99.0	94.0	97.5	55.3– 77.5	100.0	20.5
Montgomery	93.0	97.7	92.3	97.3	95.8– 98.0	99.7	10.3
Ontario	68.0	97.0	97.3	98.3	76.2– 87.4	99.4	19.8
Seneca	58.6	96.8	96.9	97.6	65.0– 81.2	99.0	26.8
Steuben	76.7	99.3	97.0	99.0	81.8– 92.6	100.0	13.4
St. Lawrence	93.7	98.3	91.0	95.3	97.0– 99.4	100.0	7.8
Tompkins	38.0	94.0	92.5	93.0	57.5– 75.9	99.0	24.9
Washington	95.3	99.8	96.5	99.5	98.0– 99.3	100.0	6.9
Wayne	60.4[1]	98.0[1]	98.5	98.5	64.8– 75.0	88.8	18.9
Yates	68.2	94.8	94.5	94.5	68.6– 85.3	99.4	25.6

[1]Does not include a sample of pure oats which germinated 1 per cent before and 17 per cent after cleaning.
[2]Per cent by number based on 400 to 800 seeds.
[3]Per cent by weight based on 400 to 800 seeds.

contained no groats or seeds. The percentage of live seeds in the filled normal grains was not altered by an air blast. Most of the 54 samples were of this type in which the apparently low germinations were the result of unfilled grains. A further examination of Table 9 makes this explanation understandable. It will be seen that the percentages of germination and of numbers of filled grains parallel each other rather closely. On the basis of normal seeds, approximately the same percentages were obtained both before and after cleaning. The data in Table 10 show that each of 22 uncleaned samples contained at least 90 per cent of filled grains. Cleaning in a small fanning mill greatly improved the condition of the other 18 samples. On the basis of weight of seeds cleaning effected definite improvement in all of the 40 lots.

There was no relation between germination and percentages by weight of filled oat grains in the uncleaned samples. This can be understood when either the weights of individual oats or the bushel weights are considered. Whereas, 100 filled grains weighed 2.17 to 3.62 grams, the unfilled grains rarely exceeded 1.00 gram per 100.

Comparative bushel weights were 27.0 to 37.0 pounds for the cleaned and 9.5 to 17.5 for the unfilled grains removed by an air blast. This also explains why the samples from Livingston County which germinated only 51.0 per cent before cleaning contained 99.0 per cent of live seeds after only 20.5 pounds of unfilled oats had been removed from each 100 pounds of the original seed stocks.

Barley was not seriously affected by the lack of moisture in the field. Yields in general were low, but the quality of the thresher-run lots was comparable to that of former years. Many growers of mixed oats and barley complained of the increase in the percentage of barley in the harvested grain. This condition was augmented by thoro cleaning or blowing of the mixtures, as illustrated in Fig. 4.

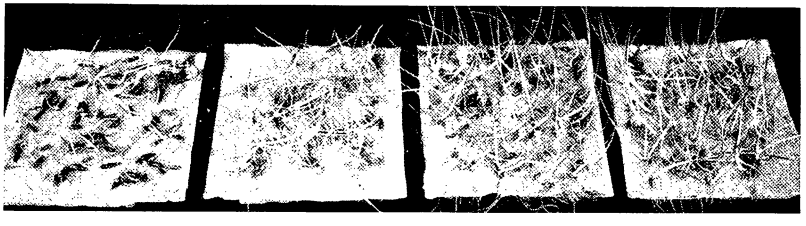

FIG. 4.—EFFECT OF CLEANING WITH A FANNING MILL UPON THE GERMINATION OF A MIXTURE OF OATS AND BARLEY.

Left to right, oats before cleaning; oats after cleaning; barley before cleaning; and barley after cleaning.

The data in Table 9 definitely prove that the germination of barley was satisfactory even before cleaning; in fact, cleaning rarely effected an increase in viable seeds. Low germinations were never due to poorly filled grains but rather to improper harvesting, drying, or storing. Cleaning produced no resultant increases in germinating seeds of injured barley.

Since the obvious reason for removal of unfilled grains is to increase the field stand, a number of samples were tested in soil. The lots taken directly from growers' bins were compared in their original and heavily cleaned conditions. Usually, four test samples of 50 oats each were counted from each portion of the seed. These were weighed, examined for groats, and planted in parallel rows in rich homogenous soil. The seedlings were counted in 20 to 30 days after planting. The seedling tops were then cut and weighed immediately. The results are presented in Table 10.

TABLE 10.—EFFECT OF CLEANING WITH A FANNING MILL ON CERTAIN CHARACTERISTICS OF OATS PLANTED IN GREENHOUSE SOIL.

Survey No.	Grains with seeds, number		Weight of 100 grains, grams		Seedlings emerged, per cent		Weight per seedling, grams	
	Original	Cleaned	Original	Cleaned	Original	Cleaned	Original	Cleaned
14	95	100	2.02	2.32	86	96	0.26	0.34
15	20	100	1.01	2.39	29	93	0.46	0.46
16	86	99	2.56	2.97	75	95	0.87	0.94
17	89	100	1.77	2.17	71	94	0.49	0.52
18	86	100	2.35	2.88	71	98	0.70	0.76
19	76	99	1.68	2.82	56	93	0.66	0.62
20	91	100	1.97	3.06	62	85	0.57	0.67
21	58	99	1.50	2.51	42	80	0.49	0.52
22	76	100	1.82	2.45	58	99	0.37	0.49
23	83	100	2.31	2.68	73	95	0.68	0.63
24	77	99	1.86	2.57	68	100	0.19	0.24
25	83	100	2.13	2.56	68	90	0.44	0.50
26	97	100	2.72	2.78	92	92	0.48	0.54
27	58	98	1.90	2.51	57	89	0.34	0.46
28	80	99	1.84	2.73	51	83	0.53	0.62
29	92	100	1.70	2.24	63	80	0.50	0.52
31	90	100	2.16	2.39	86	92	0.54	0.53
32	94	100	2.29	2.46	92	93	0.61	0.62
33	100	100	2.29	2.81	89	96	0.42	0.42
34	99	100	2.92	3.62	78	77	0.54	0.67
35	100	100	2.40	2.78	92	90	0.44	0.52
36	86	100	2.22	2.57	76	82	0.48	0.55
37	63	100	2.06	3.23	56	88	0.51	0.69
38	88	100	1.76	2.58	47	85	0.39	0.39
41	93	100	2.30	2.53	86	87	0.30	0.36
42	97	98	2.21	2.30	93	92	0.37	0.46
43	100	100	2.54	2.63	91	92	0.47	0.48
44	93	100	2.26	2.79	68	93	0.54	0.53
45	99	100	2.16	2.46	88	97	0.52	0.54
46	91	99	2.15	2.40	85	95	0.53	0.57
48	53	98	1.46	2.54	39	90	0.91	0.95
49	100	100	2.53	2.82	100	98	0.67	0.72
50	99	100	2.61	2.79	96	96	0.59	0.65
51	91	99	2.22	2.74	73	99	0.54	0.52
52	96	100	2.68	2.91	91	91	0.47	0.56
53	56	99	1.47	2.32	47	82	0.50	0.53
54	93	100	1.88	2.48	81	84	0.45	0.48
55	97	100	2.34	2.84	84	84	0.46	0.50
56	84	100	2.13	2.69	72	93	0.44	0.51
58	98	100	2.82	3.14	90	99	0.62	0.61

Increases in weight naturally are accompanied by decreases in number of seeds per legal bushel. Cleaning of high-germinating lots to be profitable should result in still higher germinations or in more vigorous seedlings. Usually the soil emergence was increased by cleaning, sometimes to a greater extent than the comparative per-

centages of filled oats would indicate. Several seed stocks, however, showed no gain in number of seedlings attributable to cleaning. On the basis of green weight per seedling the cleaned oats usually excelled the original samples. In samples nos. 34, 35, 42, 52, and others listed in Table 10, the differences are quite marked and undeniably would compensate for the decrease in seeds per bushel. In other samples, as nos. 31, 32, and 33, there appears to be no return from cleaning.

All of the granary survey lots were subjected to two and several to three operations of the fanning mill. Complete records of filled grains, laboratory germination, soil emergence, weight of plants, and weight of dry seeds were secured for each succession of cleaned oats and of blowings. The results indicated that progressively stronger seedlings were obtained by each operation of the fanning mill. When the oats needed for planting can be secured from a large bulk, it would seem desirable to remove not only the unfilled grains but the lighter filled ones as well. For example, in samples nos. 15, 17, 20, 22, and 37 the soil emergence from each 100 seeds was, respectively, original, 29, 71, 62, 58, and 56; first-cleaned, 72, 94, 93, 96, and 88; first inert, 1, 16, 13, 16, and 9; second-cleaned, 91, 94, 95, 99, and 88; and second blowings, 29, 91, 53, 83, and 82. The weights in grams per 100 seedlings were, respectively, original, 46, 49, 57, 37, and 60; first-cleaned, 48, 51, 61, 39, and 66; first blowings 2, 28, 55, 25, and 50; second-cleaned, 49, 52, 66, 48, and 70; and second blowings, 36, 46, 52, 31, and 54.

On the basis of green weight of seedlings per unit weight of dry seeds, however, the data indicated that a bushel of well-filled small oats would produce a definitely greater weight of plants than would a bushel of larger oats. Often the ratio of green weight of tops to dry weight of seeds was greater for the second or third blowings than for the heavy re-cleaned oats. In sample no. 15 the third re-cleaned oats weighed 2.39 grams per 100 seeds, the 93 seedlings emerging in soil weighed 42.9 grams, or a ratio of 17.8:1; while the third blowings weighed 1.75 grams for 100 dry seeds, the 94 seedlings emerging in soil tests weighed 33.5 grams, or a ratio of 19:1. In sample no. 49, the data for the third re-cleaned oats were dry seeds, 2.82 grams, 98 seedlings, weighing 70.9 grams, with a ratio of 25:1. Similar data for the third blowings were dry seeds, 2.08 grams, 90 seedlings weighing 54.5 grams, and a ratio of 26.2:1.

The germination percentages for both the oats and barley components of each sample in the drill survey are included in Table 6 and oats of varying degrees of vitality are shown in Fig. 5. The seed stocks may be grouped as follows with respect to germination of oats: 96 to 100 per cent, 50 samples; 90 to 95 per cent, 59 samples; 80 to 89 per cent, 28 samples; 70 to 79 per cent, 17 samples; 60 to 69 per cent, 8 samples; 50 to 59 per cent, 6 samples; and 8 to 49 per

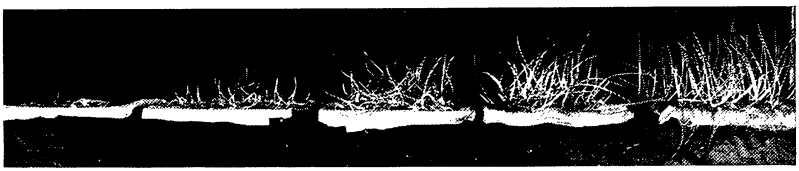

FIG. 5.—LABORATORY GERMINATION OF FIVE SAMPLES OF OATS, SHOWING VARYING DEGREES OF VITALITY.

cent, 8 samples. Thus at least one-third of the entire 176 samples were unsatisfactory for planting purposes. As shown in Table 11, the percentages of viable seeds were increased by re-cleaning. Usually the increase paralleled the decrease in number of unfilled grains. Re-cleaning of 40 samples with original germination percentages of less than 90 resulted in 21 samples with germinations of 92 to 98 per cent and 19 samples with only slightly increased germination percentages.

Factors other than unfilled grains were responsible for low germinations in these 19 samples. It is definitely known that chemical treatments injured several seed stocks. The musty odor of other lots indicated improper storage facilities. A number of seed stocks did not appear to contain any nonviable seed. Germination tests, however, revealed that these particular lots were not suitable for seed. The loss resulting from the use of these oats probably exceeded the cost which would be involved in securing accurate germination records annually during each grower's lifetime.

Uniformly plump heavy seeds of barley were found in samples containing light chaffy oats. The average germination, therefore, was much higher for barley than for oats. The samples may be grouped as follows with respect to viable seeds: 99 to 100 per cent, 23 samples; 95 to 98 per cent, 25 samples; 90 to 95 per cent, 15 samples; 80 to 90 per cent, 4 samples; 70 to 80 per cent, 2 samples; and 12 to 69 per cent, 3 samples. The data in Table 11 show that a sub-

TABLE 11.—EFFECT OF RE-CLEANING WITH A FANNING MILL ON CERTAIN CHARACTERISTICS OF OATS AND BARLEY.

SURVEY NO.	CHANGES IN OATS						CHANGES IN BARLEY					
	Germination, per cent		Unfilled grains, per cent		Bushel weight, pounds		Weight of 100 grains, grams		Germination, per cent		Weight of 100 grains, grams	
	Original	Re-cleaned	Original	Re-cleaned	Original	Re-cleaned	Original	Re-cleaned	Original	Re-cleaned	Original	Re-cleaned
4	46	88	32	5	22.5	30.0	1.81	2.65	—	—	—	—
17	74	96	24	2	31.0	33.0	2.71	2.86	100	98	3.67	3.63
19	59	77	8	0	35.0	32.5	2.32	2.46	72	77	3.96	3.92
20	52	78	0	0	30.5	33.5	2.30	2.49	48	78	3.31	3.30
24	83	93	0	0	33.0	37.5	2.73	2.77	95	94	3.80	3.85
31	89	97	6	0	29.5	32.2	2.47	2.49	92	97	3.45	3.46
40	77	96	20	2	27.5	35.7	2.07	2.30	—	—	—	—
48	65	68	2	0	26.0	31.0	1.86	2.23	—	—	—	—
60	39	36	0	0	27.0	31.0	2.40	2.45	—	—	—	—
61	77	96	20	1	37.5	38.0	1.83	2.08	99	100	2.70	2.72
71	68	96	14	2	29.0	35.0	2.08	2.71	94	98	3.61	3.97
80	88	92	1	0	30.0	30.5	2.40	2.52	93	83	3.27	3.37
101	87	98	9	0	27.5	27.5	1.92	2.23	—	—	—	—
102	70	97	27	1	31.5	36.2	1.99	2.78	98	99	3.72	3.96
105	12	9	0	0	34.0	35.2	2.78	2.76	—	—	—	—
107	23	72	73	0	26.0	32.0	1.91	2.94	94	89	3.17	3.25
118	62	73	1	0	33.0	31.7	2.54	2.29	—	—	—	—
119	70	96	27	2	31.0	35.5	2.45	2.58	96	99	3.17	3.35
138	80	92	15	1	33.0	32.0	2.49	2.69	93	93	3.72	3.81
140	88	95	10	3	33.5	35.0	2.51	2.80	99	98	4.16	4.11
143	74	69	3	0	32.0	31.5	2.44	2.38	88	84	3.69	3.80
149	72	83	10	0	30.0	31.8	2.67	2.86	99	100	2.70	2.77
158	87	98	8	0	33.5	34.0	3.21	3.37	94	94	3.94	3.95
159	77	85	6	1	28.0	35.2	2.86	2.93	85	83	3.70	3.84
165	85	96	2	0	33.0	36.5	3.00	3.16	13	9	3.14	3.15

stantial increase in germination due to re-cleaning was effected for only one seed stock. Usually lots with dead barley seeds also contained dead oats.

SMUT AND OTHER DISEASES

Both oats and barley are susceptible to smuts. The diseases are influenced by environmental conditions during the growth of the plants, particularly during formation of the seeds and the initial development of the sprouts. In a comparison of oats sold by dealers in 1932 it was found that higher percentages of smutted panicles were present in plantings in 1934 than in 1932. Apparently the organisms remain alive longer than oats are ordinarily stored for planting purposes.

A portion of each sample received in the 1937 drill survey was examined microscopically for spores of the smut organisms. The various species of *Ustilago* were not separated. The results are given in Table 6. At least 1,275 millions of spores were present in each pound of one sample. This could be expressed as 80,000 spores for each seed or about 115,000 millions per acre. Each pound of this sample also was contaminated with 60 large pieces of smutted seeds. The oats had not been treated and 8 per cent of smutted panicles developed in the 1937 trial rows at Geneva. Other poorly cleaned samples contained 450, 260, 240, 192, 180, and 135 fragments of, or entire, smutted oat grains.

The number of spores per pound of seed was only indicative of the smutted condition of the resultant crop. Usually oats grown from seed stocks with less than 100 million spores per pound were free of smut or contained only a few infected seeds. The severity of the disease in rod rows grown from heavily spore-contaminated seeds was roughly in proportion to the number of spores. Sample no. 106, however, had only 53 million spores per pound of seed but in excess of 17 per cent of smutted panicles developed on the field.

Other organisms were found in many samples. A lot of oats not contaminated with *Alternaria* spp. was exceptional. All of the New York grown seed was blackened by this fungus, often so severely that the germinating seeds appeared as irregular black masses. Western oats were usually clean and bright in color since *Alternaria* was not present. Poorly cleaned and chaffy oats were blackened more than were heavy samples because the fungus grows only on dead tissue. It has never been observed to attack the growing seedlings.

Weakly pathogenic bacteria were common in locally grown oats. In germination studies, 25 to 50 per cent of the seedlings were regularly infected. The roots were either disintegrated or prevented from elongating normally. Field and greenhouse plantings have not shown a high correlation between bacterial infections and seedling vigor. Seed treatment with New Ceresan was beneficial to the more severely infected seed stocks.

Dr. Charlotte Elliott of the United States Department of Agriculture has isolated several of these bacteria and inoculated them into young seedlings. No lesions were observed nor were the roots injured in dry greenhouse soil. Apparently the bacteria are of little importance as a factor in evaluating seed stocks of oats.

Stripe and seedling blights of barley are caused by the seed-borne organisms *Helminthosporium* spp. In some years all seed stocks are infected, 25 to 50 per cent of the seeds being diseased. In 1937 this trouble was not serious since the dry summer of 1936 prevented dissemination and establishment of the fungi. In germination studies of the drill survey samples collected in 1937 the root-rot phase of the disease developed in 29 of 60 samples. From 2 to 30 per cent of the seedlings were affected with an average of only 5 per cent. Occasionally all of the roots were destroyed on severely diseased seedlings. Dusting the dry seeds with a volatile mercury compound, such as Ceresan or New Ceresan, completely eliminated the trouble. Significant increases in both seedling emergence and vigor were

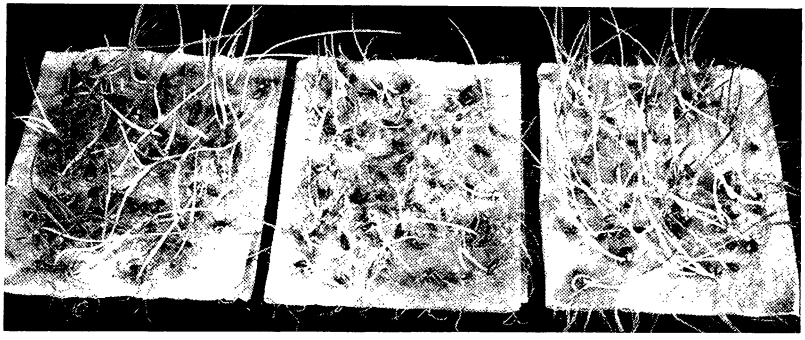

FIG. 6.—INFLUENCE OF SEED TREATMENTS UPON THE GERMINATION AND FUNGUS CONTAMINATION OF BARLEY SEED.

Left to right, no seed treatment; treated with formaldehyde dust; treated with 5 per cent ethyl mercury phosphate.

secured from treating *Helminthosporium*-infected samples. Non-volatile copper compounds and formaldehyde were not effective. Germinating tests of treated and untreated Alpha barley are shown in Fig. 6.

Uredospores of the common stem rust were observed in microscopic studies of 60 samples. Spores of the black or telial stage of rust were seen in only one sample. *Fusarium* spp. very rarely cause a disease of oats; nevertheless, the centrifuged suspensions from 28 samples contained a few to many spores of these fungi. Oats are not susceptible to stinking smut of wheat, but 25 samples were contaminated with the spores of this organism. While the microscopic examinations revealed spores of the oat smuts in all but 10 samples, 42 seed stocks did not contain spores of any other fungus.

SUMMARY AND CONCLUSIONS

The bulk of the seed oats and barley planted in New York State in 1936 and 1937 was taken from the current season's crop. Unusually poor conditions for maturation of grain existed in central New York in 1936 so that many farmers resorted to the 1935 crop for seed stocks in 1937. In seven counties 19 growers had used 1-year-old seed, while 31 apparently preferred the 1936 crop. Over three-fourths of the 176 seed stocks collected were grown on the farm where planted. At least 14 seed stocks were obtained from neighbors and only 27 from dealers.

Cornellian and Ithacan oats were more generally planted than other varieties but many growers continued to use low-yielding types. Side oats were being planted on only three farms.

A few dealers apparently sell seed oats and barley on the basis of price alone with slight regard to quality or variety. Meaningless or actually misleading names were not uncommonly mentioned.

Certified seed seemed not to be widely distributed.

According to the questionnaires, 12 farmers had determined the approximate germination of their own seed while 16 of the 27 purchasers of oats were given information concerning purity and germination. The statements of the various growers indicate that oats vended by dealers are inferior to those grown on farms, and that certain dealers do not provide the legal tag or label information.

Only a few seed stocks were not cleaned. Fanning-mill cleaning was generally practiced. Only eight seed stocks were taken from the farm to commercial mills.

Over one-half of the oats lots were treated for smut in 1936, and an additional 19 farmers treated their seed in 1937. Formaldehyde remains the most popular disinfectant.

The bushel weight of uncleaned oats was in no manner indicative of their ultimate planting value. The inclusion of unfilled grains usually was responsible for light-weight seed stocks. In general the pure seed content of the cleaned lots was significantly higher than that of the uncleaned ones. The average purity of dealer-cleaned seed stocks was 99.30 per cent and of farm-cleaned seed stocks 99.22 per cent. The percentage of weed seeds was also significantly greater for uncleaned than for cleaned samples. The number of weed seeds per pound ranged from 0 to 8,400. Noxious weed seeds were found in nearly one-half of all the samples. Wild mustard seeds were present in 30 per cent of the cleaned and 57 per cent of the uncleaned seed stocks. Other crop seeds were of little importance. A few seeds of wheat were observed in nearly one-half of the purchased lots of oats but in less than one-third of the home-grown seed.

Fanning-mill cleaning of thresher-run oats markedly increased the percentage of viable grains because most of the chaffy seeds were blown out. The average germination of 54 lots was increased from 72.8 per cent in their uncleaned conditon to 96.2 per cent after thoro cleaning. Several samples of oats germinated poorly after passage thru a fanning mill. Excessive doses of chemicals, long storage periods after treatment, or, more commonly, storage under humid conditions, were responsible for the dead seeds. Cleaning produced no significant increases in the germination of barley seed. Only a few samples contained less than 90 per cent of live seeds whether cleaned or not cleaned.

The number of smut spores per pound of seed varied from 0 to 1,275 millions. The severity of the field disease was somewhat proportional to the number of spores. Chemical treatment plainly was needed to insure a smut-free crop from most of the seed stocks. Smut infections in the trial rows occasionally exceeded 15 per cent.

A saprophytic *Alternaria* sp. was common to the oat samples. It produced no actual disease but severely discolored the infested grains. New Ceresan eliminated both the *Alternaria* sp. and weakly parasitic bacteria. Nearly one-half of the barley samples was infected by *Helminthosporium* spp. causing a root-rot or seedling blight. New Ceresan prevented injury to the seedlings but other chemicals effected no control.